Appendix G

Hydrology Reports

FUSCOE
ENGINEERING

DRAINAGE STUDY

COSTCO WHOLESALE

MURRIETA, CA

MARCH 2018
REVISED OCTOBER 2019

prepared for:
COSTCO WHOLESALE
999 Lake Drive
Issaquah, WA 98027

Prepared By Jesus Garcia Under the Responsible Charge of:

10.8.19

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EXP. 06/30/20
CIVIL
STATE OF CALIFORNIA



full circle thinking®

DRAINAGE STUDY

COSTCO WHOLESALE

Murrieta, California

Fuscoe Engineering, San Diego, Inc.
6390 Greenwich Dr., Ste 170
San Diego, CA 92122

For

COSTCO WHOLESALE
999 Lake Drive
Issaquah, WA 98027

March 30th 2018
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TABLE OF CONTENTS

1. INTRODUCTION 3

Project Description 3
Pre-Development Conditions 3
Proposed Conditions 4

2. METHODOLOGY 4

2.1 Rational Method 5
2.2 Runoff Coefficient 6
2.3 Rainfall Intensity 6
2.4 Tributary Areas 7

3. CALCULATIONS/RESULTS 7

3.1 Peak Flow Comparison to Ultimate POC's. 7
3.2 Peak Flow Comparison to SD systems in adjacent proposed developments. 8
3.3 Storm Water Quality 8
3.4 Hydromodification 9

4. CONCLUSION 9

5. DECLARATION OF RESPONSIBLE CHARGE 10

ATTACHMENTS
Attachment A ..... Vicinity Map & Regional Maps
Attachment B ..... Site Plan & Concept Grading Plans
Attachment C ..... RCFC & WCD Hydrology Manual References
Attachment D ..... USGS 7.5 Min. Quadrangle Topographic Map
Attachment E ..... NCSS Web Soil Survey Hydrologic Soil Group Map
Attachment F ..... FEMA Flood Insurance Rate Map
Attachment G ..... Pre & Post-Development Hydrology Maps
Attachment H .... Rational Method Pre & Post-Development Q100 (1hr) Peak Flows
Attachment I ..... Annotated exhibits for proposed SD of adjacent developments
Attachment J ..... Pages from the Hydrology Report of The Vineyard I CK-17
Attachment K ..... Existing SD plans at points of comparisons

1. INTRODUCTION

This report presents the drainage study prepared for Costco Wholesale, Murrieta project and supports the drainage design for Unit 1 of Tentative Parcel Map No. 37511. The Hydrology report for Unit 2 of TPM 37511, The Vineyards II, is to be referenced for the proposed development and storm drain system east of Warms Springs Parkway (WSP). The following is a summary of the analysis which was performed in accordance with the Riverside County Flood Control and Water Conservation District (RCFC & WC) Hydrology Manual.

Project Description

The project proposes development on approximately 16.47 acres of vacant land located at the northeast corner of the Interstate 215 (I-215) and Clinton Keith Road interchange in the norther part of the City of Murrieta, California. The site is bordered by Clinton Keith Road on the south, Antelope Road to the West, Cape Aire Way on the north and a 20 foot wide drainage channel to the east. The development is for new warehouse and fuel facility. Reference Attachment A for the vicinity map and Attachment B for the proposed site plan.

The warehouse will be a single-story, steel-framed structure approximately 30 feet high. The fuel facility will contain fueling stations and a pre-manufactured metal canopy. The building surroundings will consist mainly of surface parking with some landscape areas. Parking and drive areas will be paved with either Portland cement concrete or asphalt concrete pavements.

Pre-Development Conditions

The pre-development conditions within the projects limits are composed of two adjacent hills about 660 feet apart with prominent peaks rising to about 100-130 feet above adjacent Clinton Keith Road on the south and Cape Aire Way on the North. The hills drain to three (3) surrounding points of comparison (POC) identified as POC-A, south-west of the site to an existing curb inlet on Antelope Road; POC-B east of the site to a culvert along the channel; POC-C northeast of the site to an existing grate inlet along Cape Aire Way and the existing channel.

The proposed limits of the project is dominated by the steep slopes of the pre-development peaks. The SW hill (with a peak elevation of about1620 feet) drains to all three POC's with initial steep slopes over 20% for about 400-500 feet within the project limits then eventually tapering to mild slopes beyond project limits. The NE hill (with peak elevation of about 1640 feet) predominantly drains to POC-B & POC-C with steep slopes over 20% for about 400 feet within the project limits. Distances below 400ft from the peaks are steeper with slopes averaging about 30%.

A review of historical topographic maps and aerial photographs show that about after 2009 the site has been disturbed by ongoing excavation activities at both hill peaks and south to Clinton Keith Road.

Please refer to Attachment G for the Pre-Development Hydrology Map.

Proposed Conditions

The proposed grading patterns and drainage facilities will match the existing drainage patterns to the maximum extent practical. Onsite proposed parking lot slopes are designed to about 2%, and the two entry driveway entry aisles to a maximum 5% slope. The onsite drainage will be collected and treated via a combination of onsite bio-filtration basins with retention and partial infiltration, bio-filtration units with storm drain retention tanks and routed to three (3) primary pipes leaving the project boundary and conveyed to the three POC's. This project proposes the construction two offsite storm drain pipes to convey runoff to POC's A & C. The storm drain facilities of POC-B outside the project limits will be constructed by separate projects. Half of POC-B's tributary area is conveyed east into a 24" pipe across WSP and through Unit 2 of TPM 37511, The Vineyards II. The other half south into The Vineyards I SD system being a 12" pipe and a 48" pipe (sized for detention). Please refer to the approved Hydrology/Hydraulics study by Excel Engineering for the Vineyard CK-17, revised June 12th, 2018 for Tentative Parcel Map 36493. Pages of this report have been annotated and included in the appendix to illustrate how the Costco development is incorporated into the SD of TPM 36493.

The proposed storm drain system for the Costco development maintains existing drainage areas by discharging to three different points of comparison (POC). POC-A being at the intersection of Clinton Keith Road and the historical Antelope Road where runoff is collected via catch basins and conveyed west into Interstate 215. This project proposes an offsite SD to tie-in at this point. POC-B being a culvert located directly east where the Costco SD system ties-in half of the equivalent drainage area through a proposed pipe within WSP per the Vineyards II development. The other half of POC-B is met through two tie-ins south into the proposed SD system of The Vineyards I per TPM 16499 where the Costco development matches the proposed acreage and runoff per the Hydrology report for "The Vineyard CK-17' per Excel Engineering dated June 12, 2018. The third POC-C is located at catch basins NE at the dead-end of Cape Aire Way. The Costco development ties-in to this point with a second proposed offsite SD, as permitted with the City Engineer (email included in the appendix for reference).

The project's proposed cut slope (west of WSP) maintains the same discharge point (POC-C). In existing conditions runoff travels in a clockwise direction to Antelope, then due east along Cape Aire Way to the dead end where it enters a SD system with grates located in the public ROW. In proposed conditions WSP is lower than Antelope making the site and cut slope flow towards WSP. The offsite SD collects a portion of the cut slope runoff equal to existing conditions and conveys it to POC-C. Please reference email from City Engineer granting permission to connect to existing SD at Cape Aire Way.
See Post-Development Hydrology Map on Attachment G.

2. METHODOLOGY

This study complies with the Riverside County Flood Control & Water Conservation District Hydrology Manual (RCFC&WCD HM), publication date April 1978. The tables and figures utilized from the manual are presented in attachment 'C'. The AES-2014 computer program was used to calculate the peak runoff from the 100-year, 1 hour storm event using the rational method as described in the RCFC&WCD HM. Please refer to this report's Attachment 'H' for the results of these calculations.
Onsite hydraulics calculations and inlet sizing calculations are to be presented in the final hydrology report as part of the construction documents for permit issuance.

For offsite hydraulic calculations refer to the approved drainage report by Excel Engineering for the Tentative Parcel Map 36493.

2.1 Rational Method

As mentioned above, runoff on the project site was calculated for the 100-year storm event. Runoff was calculated using the Modified Rational Method which is given by the following equation:

$Q = C \times I \times A$

Where:
Q = Flow rate in cubic feet per second (cfs)
C = Runoff coefficient
I = Rainfall Intensity in inches per hour (in/hr)
A = Drainage basin area in acres, (ac)

Modified Rational Method calculations were performed using the AES-2014 computer program. To perform the hydrology routing, the total watershed area is divided into sub-areas which discharge at designated nodes. Referenced plates from the RCFC&WCD HM are included in Attachment C. The procedure for the sub-area summation model is as follows:

(1) Subdivide the watershed into an initial sub-area and subsequent sub-areas, which are generally less than 10 acres in size. Assign upstream and downstream node numbers to each sub-area. Determine initial and sub-area size in acres, A.

(2) Estimate an initial T_c by using the appropriate nomograph or overland flow velocity estimation (per RCFC&WCD HM Plate D-3). The minimum T_c considered is 5.0 minutes.

(3) Using the initial T_c, determine the corresponding values of I, (per RCFC&WCD HM standard intensity – duration curve data table on Plate D-4.1).

(4) Using I, estimate the runoff coefficient C using the percentage of impervious cover (per corresponding curve for hydrologic soil type D and urban landscaping AMC-II RCFC&WCD HM runoff coefficient curves Plate D-5.4). Then Q = CIA.

(5) Using Q, estimate the travel time between this node and the next by Manning's equation as applied to particular channel or conduit linking the two nodes. Then, repeat the calculation for Q based on the revised intensity (using the tabling aid per RCFC&WCD HM Plates D-6 through D-9)

(6) At points of stream confluences, compute the peak Q at the junction per the rational method instructions and formulas (per RCFC&WCD HM rational method instructions Plate D-1.1).

The nodes are joined together by links, which may be street gutter flows, drainage swales, drainage ditches, pipe flow, or various channel flows. The AES-2014 computer sub-area menu is as follows:

SUBAREA HYDROLOGIC PROCESS

1. Confluence analysis at node.
2. Initial sub-area analysis (including time of concentration calculation).

3. Pipe flow travel time (computer estimated).
4. Pipe flow travel time (user specified).
5. Trapezoidal channel travel time.
6. Street flow analysis through sub-area.
7. User-specified information at node.
8. Addition of sub-area runoff to main line.
9. V-gutter flow through area.
10. Copy main stream data to memory bank
11. Confluence main stream data with a memory bank
12. Clear a memory bank

At the confluence point of two or more basins, the following procedure is used to combine peak flow rates to account for differences in the basin's times of concentration. This adjustment is based on the assumption that each basin's hydrographs are triangular in shape.

(1). If the collection streams have the same times of concentration, then the Q values are directly summed,

$$Q_p = Q_a + Q_b; \; T_p = T_a = T_b$$

(2). If the collection streams have different times of concentration, the smaller of the tributary Q values may be adjusted as follows:

(i). The most frequent case is where the collection stream with the longer time of concentration has the larger Q. The smaller Q value is adjusted by a ratio of rainfall intensities.

$$Q_p = Q_b + Q_a (I_b/I_a); \; T_p = T_a$$

(ii). In some cases, the collection stream with the shorter time of concentration has the larger Q. Then the smaller Q is adjusted by a ratio of the T values.

$$Q_p = Q_b + Q_a (T_b/T_a); \; T_p = T_b$$

2.2 Runoff Coefficient

Runoff coefficients C, was determined by calculating the percentage of impervious cover of each subarea and by AES using RCFC&WCD HM Plate D-5.4, runoff coefficient curves corresponding impervious covers curves for hydrologic soil type D and urban landscaping for Antecendent Moisture Condition II.

2.3 Rainfall Intensity

Rainfall intensity was determined by AES using RCFC&WCD HM standard intensity – duration curve data table on Plate D-4.1.

2.4 Tributary Areas

Drainage basins are delineated on the attached Existing and Proposed Hydrology Condition Maps in Attachments G. Bold lines graphically portray the tributary area for the drainage basin.

3. CALCULATIONS/RESULTS

3.1 Peak Flow Comparison to Ultimate POC's.

Below is a hydrology node information table at each POC which summarize the hydrology calculations provided for Pre- and Post-Development Conditions per the Attachment 'H' of this report.

HYDROLOGY SUMMARY OF PEAK 100-YR 1HR STORM RUNOFF FLOW RATES AT ULTIMATE POC'S				
	PRE-DEVELOPMENT	POST-DEVELOPMENT	RATIO OF POST/PRE	AREA DIVERSION
POC-A (NODE 100)				
Q100 (CFS)	17.03	14.41	84.6%	
TC (MIN)	9.01	11.12	123.4%	
A (AC)	4.66	4.67	100.2%	+0.01
POC-B (NODE 200)				
Q100 (CFS)	55.92	56.47	101.0%	
TC (MIN)	21.13	20.86	98.7%	
A (AC)	29.88	29.46	98.6%	-0.42
POC-C (NODE 500)				
Q100 (CFS)	65.36	54.46	83.3%	
TC (MIN)	14.45	19.61	135.7%	
A (AC)	23.84	24.25	101.7%	+0.41

Table 1. Peak Drainage Flow Rate POC Comparisons

The point of comparison POC-A, POC-B and POC-C are composed of offsite and onsite basin areas. The offsite areas designated by prefix EX-, are modeled with pre-development runoff coefficients corresponding to undeveloped land area with 0% impervious cover, soil group D. The onsite areas are designated by prefix PR- are modeled as commercial impervious cover of 90% where applicable and at 0% of impervious cover where sub-area are composed of less than 5% impervious improvements (ditches, catch basin structures).
At POC-A (Node 100) the post development basins are composed of offsite basin areas (EX-A2) and onsite basin areas (PD-A1-1, PD-A1-2 and PD-A1-3). The overall post-development 100-year peak flow rates are reduced by about 15% and the pre/post diversion area is less than 0.01 acres.

At POC-B (Node 200) the post development basins are composed of offsite basin areas (EX-B1) and onsite basin areas (PD-B2-4, PD-B2-5, PD-B2-6A, PD-B2-6A, PD-B2-7, PD-B2-A, PD-B2-B and PD-B2-C). The overall post-development 100-year peak flow rates are increased about 1% and the pre/post diversion area is 0.42 acres.

At POC-C (Node 500) the post development basins are composed of offsite basin areas (EX-C1, EX-C2) and onsite basin areas (PR-C1, PR-C2, PR-C3, PR-C4, PR-C5, PR-C6 and PR-C7). The overall post-development 100-year peak flow rates are decreased about 15% and the pre/post diversion area is 0.41 acres.

As shown in the table above, the proposed project results in a decrease of unmitigated 100-year runoff flow rates compared to pre-developed project conditions. Unmitigated conditions presented in table 1 are conservative since they do not take into account any mitigation provided by bio-retention basins and retention storm drain tanks provided for hydromodification. Overall the results show that the unmitigated post-development flows are effectively less or equal to pre-development conditions. This conclusion can be attributed to the fact that the project lies on two hills with predominant peaks over 100 feet above adjacent street grades and the post-developed conditions will effectively level the site to adjacent street grades. Please reference the WQMP report for this project for a tabulated summary of existing slopes for each drainage areas.

3.2 Peak Flow Comparison to SD systems in adjacent proposed developments.

Below is a hydrology node information table at tie-ins to adjacent SD systems per separate developments. Reference pages of this report have been annotated and included in the appendix to illustrate how the Costco development is incorporated into the SD of TPM 36493.

HYDROLOGY SUMMARY OF PEAK 100-YR 1HR STORM RUNOFF FLOW RATES AT ADJACENT DEVELOPMENT TIE-INS				
SOUTH TIE-INS TO VINEYARDS I NODE 300 VS (CK17 NODE 11+CK17 NODE 3)				
	PRE-DEVELOPMENT	POST-DEVELOPMENT	VINEYARDS I	COMMENT
Q100 (CFS)	10.74	10.39	11.22	PEAK SUM
TC (MIN)	7.28	7.33	7.86	MIN TC
A (AC)	3.15	3.11	3.95	SUM
WEST TIE-IN AT WSP TO VINEYARDS II NODE 400				
	PRE-DEVELOPMENT	POST-DEVELOPMENT	RATIO OF POST/PRE	
Q100 (CFS)	13.77	13.71	99.6%	
TC (MIN)	6.76	9.46	140.0%	
A (AC)	3.88	3.50	90.2%	

Table 2. Peak Drainage Flow Rate to adjacent development tie-ins

3.3 Storm Water Quality

On-site biofiltration basins and biofiltration units throughout the site are designed to meet water quality treatment requirements outlined in the current Water Quality Management Plan (WQMP) under the MS4 Permit for the Santa Margarita Region of Riverside County.

A more detailed discussion of the project's storm water quality BMPs can be found in the project's WQMP titled *Water Quality Management Plan for Costco Wholesale – Murrieta* by Fuscoe Engineering, under separate cover.

3.4 Hydromodification

On-site biofiltration basins with partial retentention and partial infiltration are designed to serve dual purpose for water quality and hydromodification requirements. Storm drainage storage tanks throughout the site supplement biofiltration-only units are designed to meet hydromodificaiton requirements to attenuate 10-year storm events and have additional available storage for 100-year attenuation, as necessary. The project's specific WQMP report addresses the requirements both water quality and hydromodification and presents the calculations for sizing of the facilities.

4. CONCLUSION

As shown in the analysis, the proposed project will effectively maintain existing drainage patterns and flow directions. Discharge rates up to the 10-year storm event will be mitigated to pre-developed conditions in accordance with the WQMP prepared for this project. The post-development 100-year peak flow rates at the points of comparison are below or effectively equal to the pre-development conditions. The post-development overall flow rates are not anticipated to cause a significant impact to the public drainage facilities.

5. DECLARATION OF RESPONSIBLE CHARGE

I, HEREBY DECLARE THAT I AM THE CIVIL ENGINEER OF WORK FOR THIS PROJECT, THAT I HAVE EXCERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THE PROJECT AS DEFINED IN SECTION 6703 OF THE BUSINESS AND PROFESSIONS CODES, AND THAT THE DESIGN IS CONSISTENT WITH CURRENT STANDARDS.

I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE COUNTY OF RIVERSIDE IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY REPONSIBILITES FOR PROJECT DESIGN.

FUSCOE ENGINEERING, INC.
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SAN DIEGO, CA 92122
(858) 554-1500



10.8.19

BRYAN D. SMITH
R.C.E. No. 75822
REGISTRATION EXPIRES JUNE 30, 2020

DATE

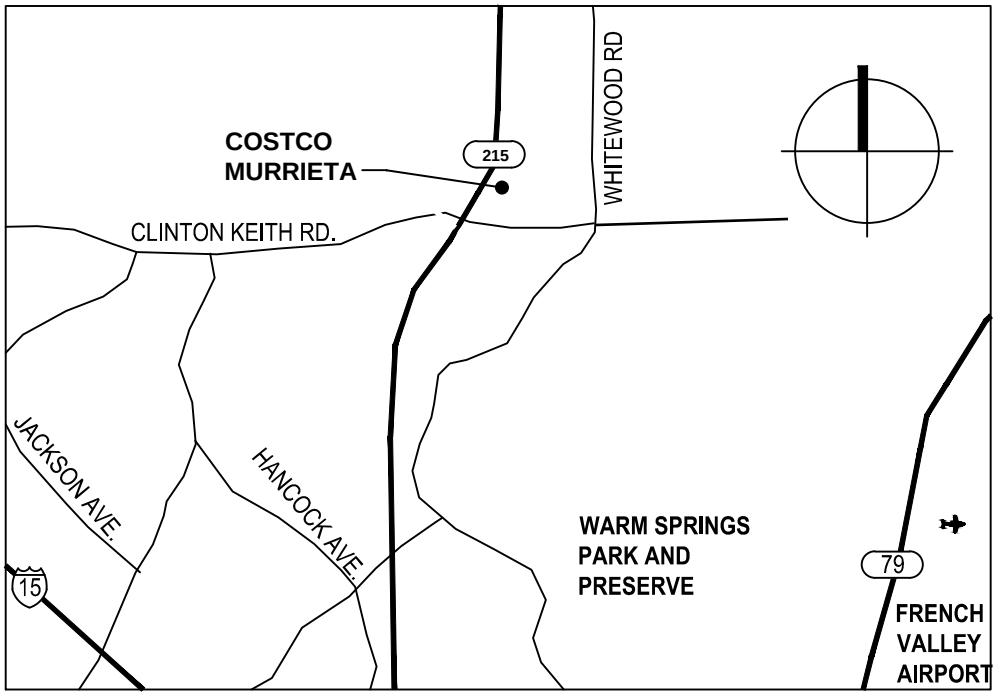
ATTACHMENTS

ATTACHMENT A

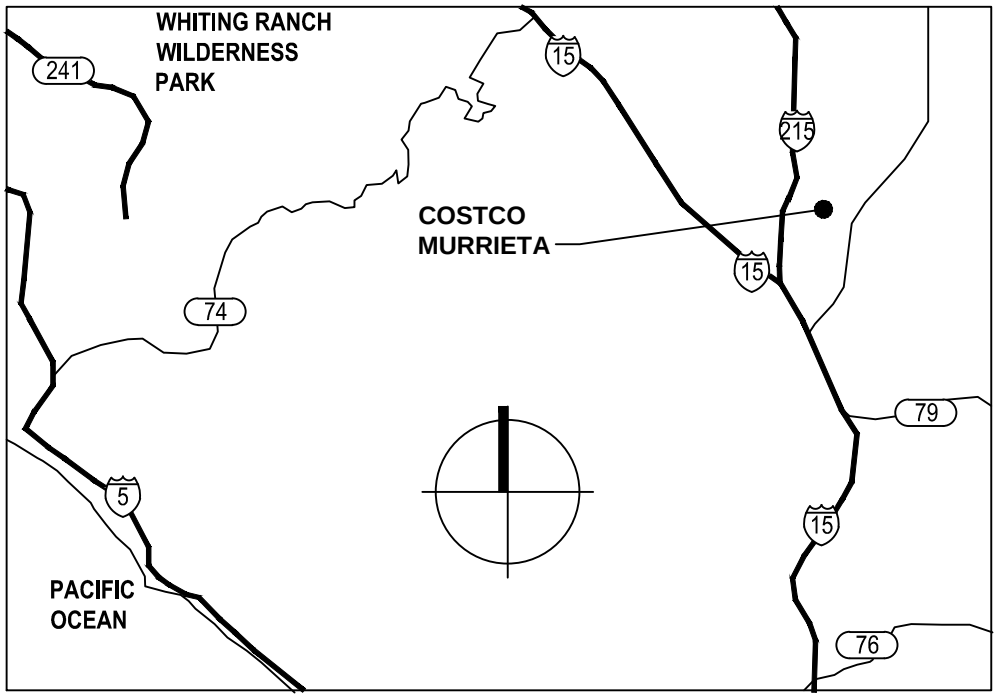
VICINITY MAP

REGIONAL MAP

VICINITY MAP

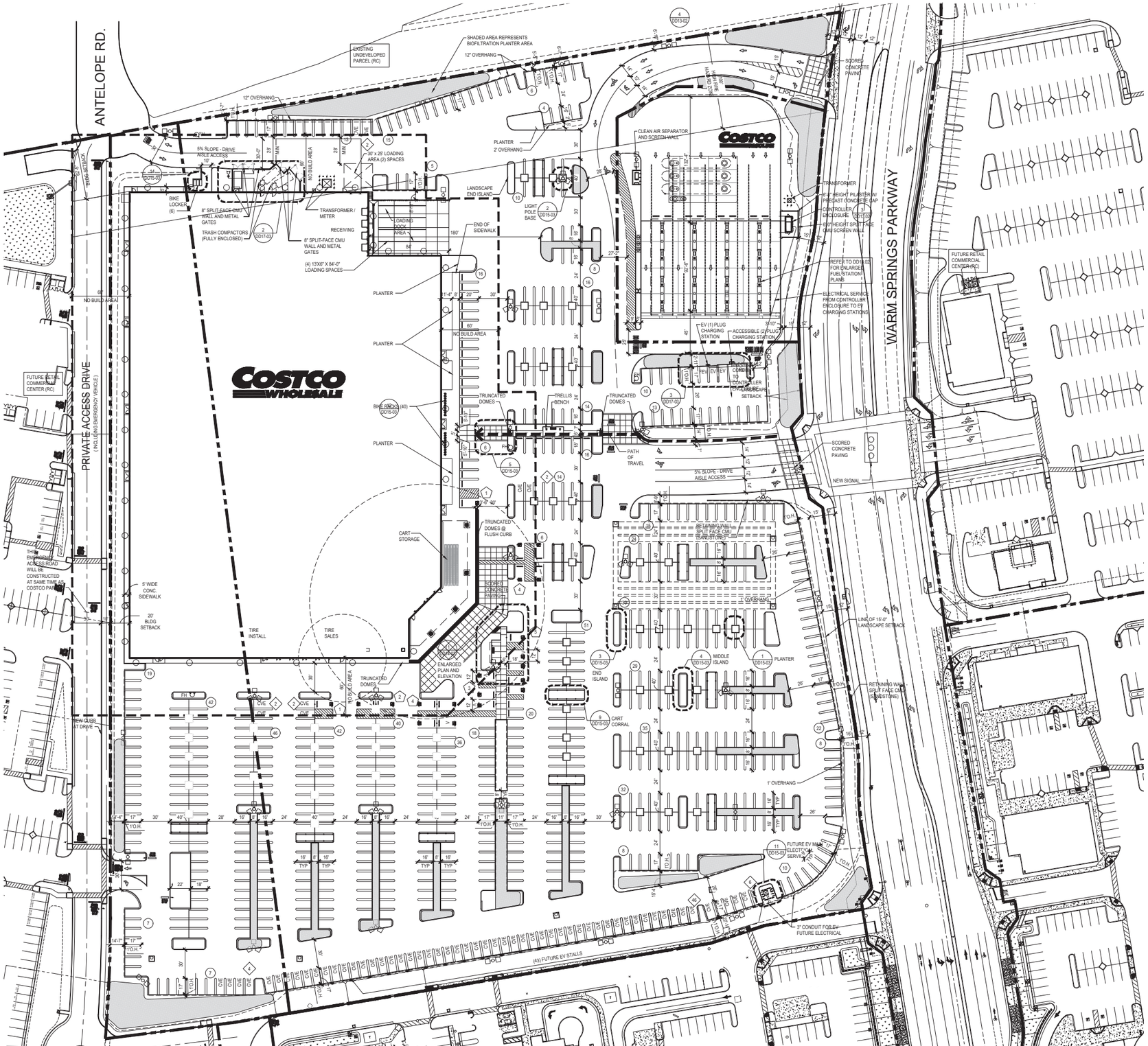


REGIONAL MAP



ATTACHMENT B

SITE PLAN
CONCEPT GRADING PLANS



COSTCO WHOLESALE

MURRIETA, CA

PRELIMINARY ENLARGED SITE PLAN

AUGUST 21, 2019

PROJECT DATA

APPLICANT:	COSTCO WHOLESALE 999 LAKE DRIVE ISSAQUAH, WA 98027
PROJECT ADDRESS:	NEC OF I-215 & CLINTON KEITH RD. MURRIETA, CA
APN'S:	NOTE, THESE DESCRIBE THE EFFECTS ON THE EXISTING PARCEL MAP 392-290-025-4 (AFFECTS PARCEL 1 OF PARCEL A) 392-290-026-5 (AFFECTS PARCEL 2 OF PARCEL A) 392-290-028-7(AFFECTS PARCEL 3 OF PARCEL A) 392-290-029-8 (AFFECTS PARCEL 4 OF PARCEL A) 392-290-051 (PARCEL B) 392-270-030 392-270-033 (PARCEL C)
LEGAL DESCRIPTION:	THE LAND REFERRED TO IN THIS SURVEY IS IN THE STATE OF CALIFORNIA, COUNTY OF RIVERSIDE, CITY OF MURRIETA, AND IS DESCRIBED AS FOLLOWS: ALL OF PARCELS 1,2,3 AND 4 OF PARCEL MAP NO. 16499, FILED ON BOOK 96, PAGE 17, OR PARCEL RECORDS OF RIVERSIDE COUNTY, TOGETHER WITH THE REVERSIONARY RIGHTS TO LOTS A,B,C AND D ON SAID PARCEL MAP, DEDICATED AND ACCEPTED FOR PUBLIC ROAD PURPOSES. PARCEL B OF THAT CERTAIN LOT LINE ADJUSTMENT, LLA - 17-3851, RECORDED BY THE CITY OF MURRIETA FEBRUARY 22, 2018, AS DOCUMENT NO. 2018-0066471, OF OFFICIAL RECORDS. PARCEL 5, 6, 7, 8 AND 9 OF TPM NO. 36493
ZONING:	REGIONAL COMMERCIAL
SETBACKS:	FRONT: 25' BLDG / 15' LANDSC. REAR: 5' BLDG / 5' LANDSC. SIDE: 5' BLDG / 5' LANDSC.
FAR:	NUMBER OF FUEL PUMPS : 32 PUMPS BLDG/ GAS CANOPY/ CONTROL ENCLOSURE : 166,165 SF TOTAL COSTCO SITE AREA : 715,448 SF FAR = 166,166 / 715,448 = .232 LOT COVERAGE = 23.2% COSTCO WAREHOUSE IS AN M OCCUPANCY 1-STORY FIRE SPRINKLERS AND 60' CLEAR AREA AT ALL SIDES OF STRUCTURE, THEREFORE THE BUILDING FALLS UNDER THE CBC BUILDING CODE SECTION FOR ALLOWED UNLIMITED AREA STRUCTURES

SITE DATA:

PARCEL 1 & 2 OF TPM 37511

NUMBER OF FUEL PUMPS:	32 PUMPS
COSTCO SITE AREA:	15.21 ACRES (662,538 SF.)
COSTCO FUEL FACILITY AREA:	1.21 ACRES (52,910 SF)
TOTAL COSTCO SITE	16.42 ACRES (715,448 SF.)

BUILDING DATA:

NET BUILDING AREA	149,856 SF
NET FIRE DEPT. ROOM	430 SF
NET MACHINE ROOM	1,488 SF
ENVELOPE/EXTERIOR WALLS	1,588 SF
TOTAL COSTCO WAREHOUSE	153,362 SF
FUEL STATION CANOPY	12,678 SF
FUEL CONTROLLER ENCLOSURE	125 SF

CODE ANALYSIS:

OCCUPANCY CLASSIFICATION:
NON-SEPARATED USES - GROUP 'M' (MERCANTILE)
NO OCCUPANCY SEPARATIONS REQUIRED

ALLOWABLE FLOOR AREA (CBC SECTION 507):
- UNLIMITED AREA
- AUTOMATIC SPRINKLER SYSTEM
- ENTIRELY SURROUNDED & ADJOINED BY PUBLIC WAYS OR YARDS NOT LESS THAN 60 FEET
- YARDS USED FOR UNLIMITED BUILDING AREA SHALL BE PERMANENTLY MAINTAINED

BUILDING HEIGHT AND NUMBER OF STORIES:
ALLOWABLE: 40 FEET - 1 STORY
ACTUAL: 32'-8" FEET - 1 STORY

TYPE OF CONSTRUCTION: TYPE V-B

PARKING DATA:

TOTAL PARKING:	799 STALLS
INCLUDES:	
10' WIDE STALLS	706 STALLS
9' WIDE STALLS	10 STALLS
ACCESSIBLE STALLS (1 IN 6 VAN = 4 VAN REQUIRED)	19 STALLS
10' WIDE CLEAN AIR/ VAN POOL/ EV STALLS (8% OF PARKING)	64 STALLS

NOTE: (2) CHARGING STATIONS AND (1) ACCESSIBLE CHARGING STATION WILL BE INSTALLED - INDICATED AS EV ON PLAN

FUTURE EV CHARGING STALLS (FEV) LESS (3) ACTUAL CHARGING STATIONS (6% OF PARKING) - NOT PART OF PARKING COUNT	*45 STALLS*
NUMBER OF STALLS PER 1000 SF OF BUILDING AREA:	5.21 STALLS
JURISDICTION REQUIRED PARKING INSTALL / 200 S.F. (5/1000):	767 STALLS

LEGEND
FEV - FUTURE ELECTRICAL VEHICLE PARKING
CVE - CLEAN AIR/VAN POOL PARKING (12 / 2015-02)

REQ'D BICYCLE RACKS (5% OF TOTAL PARKING) = 40 BIKES
PROVIDE BICYCLE RACKS = 40 BIKES
REQ'D LONG TERM BICYCLES
STORAGE/ LOCKER (5% OF EMPLOYEE) = 120 EMPLOYEES/ SHIFT X 5% = 6 LOCKERS
PROVIDED BIKE LOCKERS = 6 LOCKERS

LOADING SPACES REQUIRED: 153,362 SF/10,000 SF	(15) SPACES - 15' X 35' SPACES
LOADING SPACES PROVIDED:	(2) SPACES - 15' X 35' SPACES (4) SPACES - 13'-0" X 84' SPACES FOR SEMIS (6) TOTAL SPACES

LANDSCAPE DATA:

PERCENTAGE OF LANDSCAPE AREA:	20% MINIMUM REQUIRED
OVERALL SITE AREA	715,448 SF
REQUIRED LANDSCAPE AREA (20%)	143,309 SF
SQUARE FOOTAGE LANDSCAPE AREA PROVIDED	105,790 SF
PERCENTAGE OF LANDSCAPE AREA	14.8 %
PARKING AREA	387,090 SF
REQUIRED LANDSCAPE AREA (10%)	38,709 SF
SQUARE FOOTAGE LANDSCAPE AREA PROVIDED	61,780 SF
PERCENTAGE OF LANDSCAPE AREA	15.96 %
SQUARE FOOTAGE OF LANDSCAPING:	
RIGHT-OF-WAY:	4,991 SF
PARKING OVERHANG:	12,875 SF
ON-SITE:	87,924 SF
TOTAL LANDSCAPE AREA:	105,790 SF

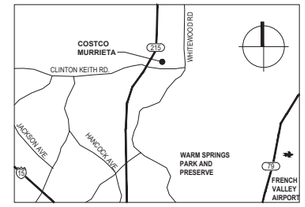
CURRENT OWNERS

1. CANDEE FAMILY LLC
2. CK 17, A CALIFORNIA LIMITED PARTNERSHIP
3. SCOTT-215, LP, A CALIFORNIA LIMITED PARTNERSHIP
4. LAMBDA INVESTMENTS, LLC, A DELAWARE LIMITED LIABILITY COMPANY

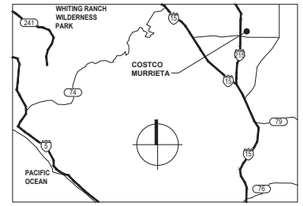
UTILITY COMPANIES:

ELECTRIC:	SOUTHERN CALIFORNIA EDISON (SCE) 2244 WALNUT GROVE AVENUE ROSEMEAD, CA 91770 (951) 249-8356	PHONE:	VERIZON 24520 VILLAGE WALK PL., STE A MURRIETA, CA 92562 (951) 672-9490
GAS:	SOUTHERN CALIFORNIA GAS COMPANY 1981 WEST LUGONIA AVENUE REDLANDS, CA 92374 800-427-2200	CABLE:	FRONTIER COMMUNICATIONS 9 S. 4TH STREET REDLANDS, CA 92373 (951) 7779567
SEWER/ WATER:	EASTER MUNICIPAL WATER DISTRICT (EMWD) 2270 TRUMBLE ROAD PERRIS, CA 92570 (951) 928-3777	SCHOOL DISTRICT:	MENIFEE UNION SCHOOL DISTRICT 29775 HAUN ROAD MENIFEE, CA 92586 (951) 672-1851

VICINITY MAP



REGIONAL MAP



DEVELOPMENT PLAN
DP-2018-1652
CUP-2018-1653
TPM-2018-1654

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△	DATE	DESCRIPTION
1	07/02/18	RESPOND TO CITY COMMENTS

0 20' 40' 80'
1" = 40'-0"

COSTCO WHOLESALE
MURRIETA, CA

NEC OF I-215 &
CLINTON KEITH RD.
MURRIETTA, CA

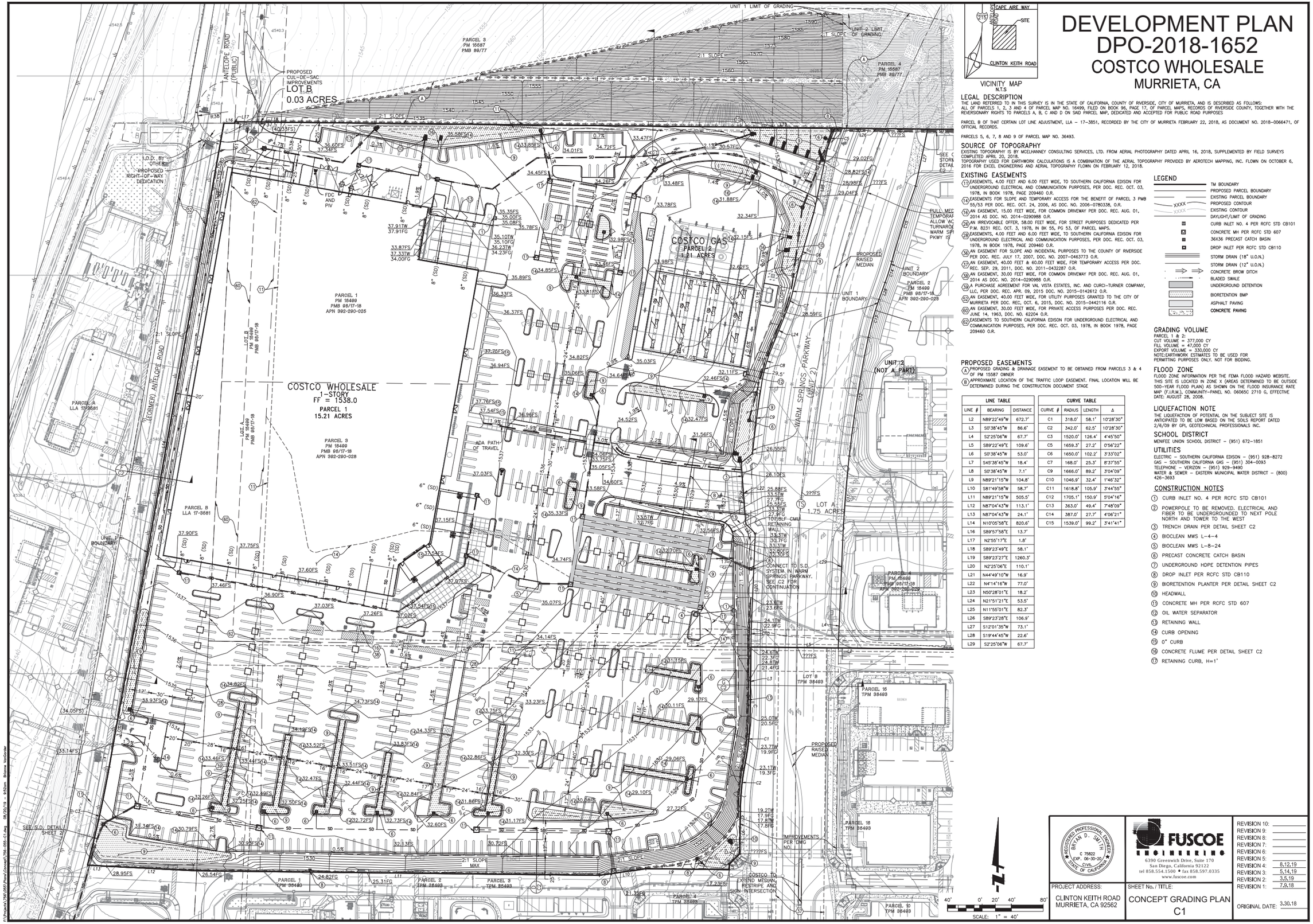
MG2

17-0091-01
AUGUST 21, 2019

PRELIMINARY ENLARGED SITE PLAN W/O CARWASH

DD12-03

DEVELOPMENT PLAN
DPO-2018-1652
COSTCO WHOLESALE
MURRIETA, CA



VICINITY MAP
N.T.S

LEGAL DESCRIPTION

THE LAND REFERRED TO IN THIS SURVEY IS IN THE STATE OF CALIFORNIA, COUNTY OF RIVERSIDE, CITY OF MURRIETA, AND IS DESCRIBED AS FOLLOWS:
ALL OF PARCELS 1, 2, 3 AND 4 OF PARCEL MAP NO. 16499, FILED ON BOOK 96, PAGE 17, OF PARCEL MAPS, RECORDS OF RIVERSIDE COUNTY, TOGETHER WITH THE REVERSIONARY RIGHTS TO PARCELS A, B, C AND D ON SAID PARCEL MAP, DEDICATED AND ACCEPTED FOR PUBLIC ROAD PURPOSES

PARCEL B OF THAT CERTAIN LOT LINE ADJUSTMENT, LLA – 17–3851, RECORDED BY THE CITY OF MURRIETA FEBRUARY 22, 2018, AS DOCUMENT NO. 2018–0066471, OF OFFICIAL RECORDS.

PARCELS 5, 6, 7, 8 AND 9 OF PARCEL MAP NO. 36493.

SOURCE OF TOPOGRAPHY

EXISTING TOPOGRAPHY IS BY MCELHANNEY CONSULTING SERVICES, LTD. FROM AERIAL PHOTOGRAPHY DATED APRIL 16, 2018, SUPPLEMENTED BY FIELD SURVEYS COMPLETED APRIL 20, 2018.
TOPOGRAPHY USED FOR EARTHWORK CALCULATIONS IS A COMBINATION OF THE AERIAL TOPOGRAPHY PROVIDED BY AEROTECH MAPPING, INC. FLOWN ON OCTOBER 6, 2016 FOR EXCEL ENGINEERING AND AERIAL TOPOGRAPHY FLOWN ON FEBRUARY 12, 2018.

EXISTING EASEMENTS

(11) EASEMENTS, 4.00 FEET AND 6.00 FEET WIDE, TO SOUTHERN CALIFORNIA EDISON FOR UNDERGROUND ELECTRICAL AND COMMUNICATION PURPOSES, PER DOC. REC. OCT. 03, 1978, IN BOOK 1978, PAGE 209460 O.R.
(14) EASEMENTS FOR SLOPE AND TEMPORARY ACCESS FOR THE BENEFIT OF PARCEL 3 PMB 55/53 PER DOC. REC. OCT. 24, 2006, AS DOC. NO. 2006–0780338, O.R.
(16) AN EASEMENT, 15.00 FEET WIDE, FOR COMMON DRIVEWAY PER DOC. REC. AUG. 01, 2014 AS DOC. NO. 2014–0290988 O.R.
(26) AN IRREVOCABLE OFFER, 58.00 FEET WIDE, FOR STREET PURPOSES DEDICATED PER P.M. 8231 REC. OCT. 3, 1978, IN BK 55, PG 53, OF PARCEL MAPS.
(28) EASEMENTS, 4.00 FEET AND 6.00 FEET WIDE, TO SOUTHERN CALIFORNIA EDISON FOR UNDERGROUND ELECTRICAL AND COMMUNICATION PURPOSES, PER DOC. REC. OCT. 03, 1978, IN BOOK 1978, PAGE 209460 O.R.
(56) AN EASEMENT FOR SLOPE AND INCIDENTAL PURPOSES TO THE COUNTY OF RIVERSIDE PER DOC. REC. JULY 17, 2007, DOC. NO. 2007–0463773 O.R.
(57) AN EASEMENT, 40.00 FEET & 60.00 FEET WIDE, FOR TEMPORARY ACCESS PER DOC. REC. SEP. 29, 2011, DOC. NO. 2011–0432287 O.R.
(58) AN EASEMENT, 30.00 FEET WIDE, FOR COMMON DRIVEWAY PER DOC. REC. AUG. 01, 2014 AS DOC. NO. 2014–0290988 O.R.
(59) A PURCHASE AGREEMENT FOR VAL VISTA ESTATES, INC. AND CURCI–TURNER COMPANY, LLC, PER DOC. REC. APR. 09, 2015 DOC. NO. 2015–0142612 O.R.
(52) AN EASEMENT, 40.00 FEET WIDE, FOR UTILITY PURPOSES GRANTED TO THE CITY OF MURRIETA PER DOC. REC, OCT. 6, 2015, DOC. NO. 2015–0442116 O.R.
(60) AN EASEMENT, 30.00 FEET WIDE, FOR PRIVATE ACCESS PURPOSES PER DOC. REC. JUNE 14, 1963, DOC. NO. 62204 O.R.
(62) EASEMENTS TO SOUTHERN CALIFORNIA EDISON FOR UNDERGROUND ELECTRICAL AND COMMUNICATION PURPOSES, PER DOC. REC. OCT. 03, 1978, IN BOOK 1978, PAGE 209460 O.R.

PROPOSED EASEMENTS

(A) PROPOSED GRADING & DRAINAGE EASEMENT TO BE OBTAINED FROM PARCELS 3 & 4 OF PM 15587 OWNER
(B) APPROXIMATE LOCATION OF THE TRAFFIC LOOP EASEMENT. FINAL LOCATION WILL BE DETERMINED DURING THE CONSTRUCTION DOCUMENT STAGE

LINE TABLE		
LINE #	BEARING	DISTANCE
L2	N89°22'49"W	672.7'
L3	S0°38'45"W	86.6'
L4	S2°25'06"W	67.7'
L5	S89°22'49"E	109.6'
L6	S0°38'45"W	53.0'
L7	S45°38'45"W	18.4'
L8	S0°38'45"W	7.1'
L9	N89°21'15"W	104.8'
L10	S81°49'58"W	58.7'
L11	N89°21'15"W	505.5'
L12	N87°04'43"W	113.1'
L13	N87°04'43"W	24.1'
L14	N10°05'58"E	820.6'
L16	S89°57'58"E	13.7'
L17	N2°55'17"E	1.8'
L18	S89°23'49"E	58.1'
L19	S89°23'27"E	1260.3'
L20	N2°25'06"E	110.1'
L21	N44°49'10"W	16.9'
L22	N4°14'16"W	77.0'
L23	N50°28'01"E	18.2'
L24	N21°51'21"E	53.5'
L25	N11°55'01"E	82.3'
L26	S89°23'28"E	106.9'
L27	S12°01'35"W	73.1'
L28	S19°44'45"W	22.6'
L29	S2°25'06"W	67.7'

CURVE TABLE			
CURVE #	RADIUS	LENGTH	Δ
C1	318.0'	58.1'	10°28'30"
C2	342.0'	62.5'	10°28'30"
C3	1520.0'	126.4'	4°45'50"
C5	1659.3'	27.2'	0°56'22"
C6	1650.0'	102.2'	3°33'02"
C7	168.0'	25.3'	8°37'55"
C8	1666.0'	89.2'	3°04'09"
C9	1666.0'	89.2'	3°04'09"
C10	1046.9'	32.4'	1°46'32"
C11	1618.8'	105.9'	3°44'55"
C12	1705.1'	150.9'	5°04'16"
C13	363.0'	49.4'	7°48'09"
C14	387.0'	27.7'	4°06'21"
C15	1539.0'	99.2'	3°41'41"

LEGEND

- TM BOUNDARY
- PROPOSED PARCEL BOUNDARY
- EXISTING PARCEL BOUNDARY
- PROPOSED CONTOUR
- EXISTING CONTOUR
- DAYLIGHT/LIMIT OF GRADING
- CURB INLET NO. 4 PER RCFC STD CB101
- CONCRETE MH PER RCFC STD 607
- 36X36 PRECAST CATCH BASIN
- DROP INLET PER RCFC STD CB110
- STORM DRAIN (18" U.O.N.)
- STORM DRAIN (12" U.O.N.)
- CONCRETE BROW DITCH
- BLADED SWALE
- UNDERGROUND DETENTION
- BIORETENTION BMP
- ASPHALT PAVING
- CONCRETE PAVING

GRADING VOLUME

PARCEL 1 & 2:
CUT VOLUME = 377,000 CY
FILL VOLUME = 47,000 CY
EXPORT VOLUME = 330,000 CY
NOTE:EARTHWORK ESTIMATES TO BE USED FOR PERMITTING PURPOSES ONLY. NOT FOR BIDDING.

FLOOD ZONE

FLOOD ZONE INFORMATION PER THE FEMA FLOOD HAZARD WEBSITE. THIS SITE IS LOCATED IN ZONE X (AREAS DETERMINED TO BE OUTSIDE 500–YEAR FLOOD PLAIN) AS SHOWN ON THE FLOOD INSURANCE RATE MAP (F.I.R.M.), COMMUNITY–PANEL NO. 06065C 2710 G, EFFECTIVE DATE: AUGUST 28, 2008.

LIQUEFACTION NOTE

THE LIQUEFACTION OF POTENTIAL ON THE SUBJECT SITE IS ANTICIPATED TO BE LOW BASED ON THE SOILS REPORT DATED 2/6/09 BY GPI, GEOTECHNICAL PROFESSIONALS INC.

SCHOOL DISTRICT

MENIFEE UNION SCHOOL DISTRICT – (951) 672–1851

UTILITIES

ELECTRIC – SOUTHERN CALIFORNIA EDISON – (951) 928–8272
GAS – SOUTHERN CALIFORNIA GAS – (951) 304–0093
TELEPHONE – VERIZON – (951) 929–9490
WATER & SEWER – EASTERN MUNICIPAL WATER DISTRICT – (800) 426–3693

CONSTRUCTION NOTES

(1) CURB INLET NO. 4 PER RCFC STD CB101
(2) POWERPOLE TO BE REMOVED. ELECTRICAL AND FIBER TO BE UNDERGROUNDED TO NEXT POLE NORTH AND TOWER TO THE WEST
(3) TRENCH DRAIN PER DETAIL SHEET C2
(4) BIOCLEAN MWS L–4–4
(5) BIOCLEAN MWS L–8–24
(6) PRECAST CONCRETE CATCH BASIN
(7) UNDERGROUND HDPE DETENTION PIPES
(8) DROP INLET PER RCFC STD CB110
(9) BIORETENTION PLANTER PER DETAIL SHEET C2
(10) HEADWALL
(11) CONCRETE MH PER RCFC STD 607
(12) OIL WATER SEPARATOR
(13) RETAINING WALL
(14) CURB OPENING
(15) 0" CURB
(16) CONCRETE FLUME PER DETAIL SHEET C2
(17) RETAINING CURB, H=1'

REGISTERED PROFESSIONAL ENGINEER BRYAN D. SMITH C 75822 EXP. 06-30-20 CIVIL STATE OF CALIFORNIA

FUSCOE ENGINEERING
6390 Greenwich Drive, Suite 170
San Diego, California 92122
tel 858.554.1500 • fax 858.597.0335
www.fuscoe.com

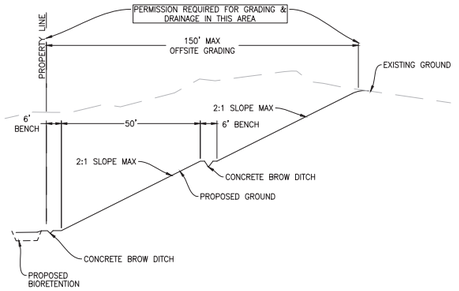
PROJECT ADDRESS:
CLINTON KEITH ROAD
MURRIETA, CA 92562

SHEET No. / TITLE:
CONCEPT GRADING PLAN
C1

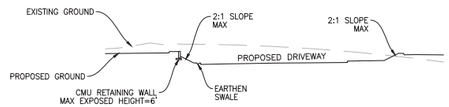
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REVISION 9:	
REVISION 8:	
REVISION 7:	
REVISION 6:	
REVISION 5:	
REVISION 4:	8.12.19
REVISION 3:	5.14.19
REVISION 2:	3.5.19
REVISION 1:	7.9.18
ORIGINAL DATE:	3.30.18

F:\Projects\1765\1065\Plans\Concept\1765-dsdc-C1.dwg 08/03/18 - 9:52am Brianne VanGorder

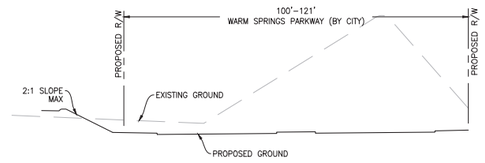
DEVELOPMENT PLAN
DPO-2018-1652
COSTCO WHOLESALE
MURRIETA, CA



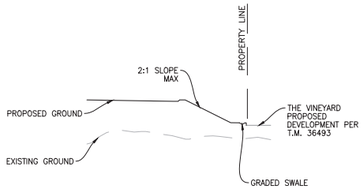
SECTION A C2
1"=20'



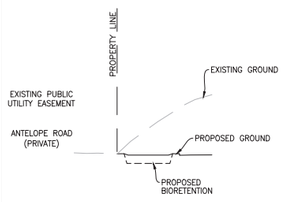
SECTION B C2
1"=20'



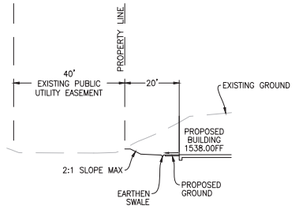
SECTION C C2
1"=20'



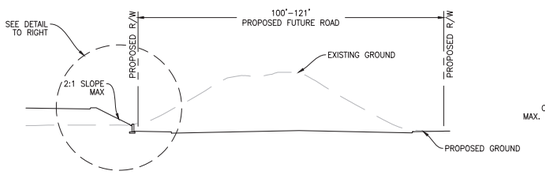
SECTION D C2
1"=20'



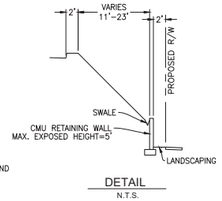
SECTION E C2
1"=20'



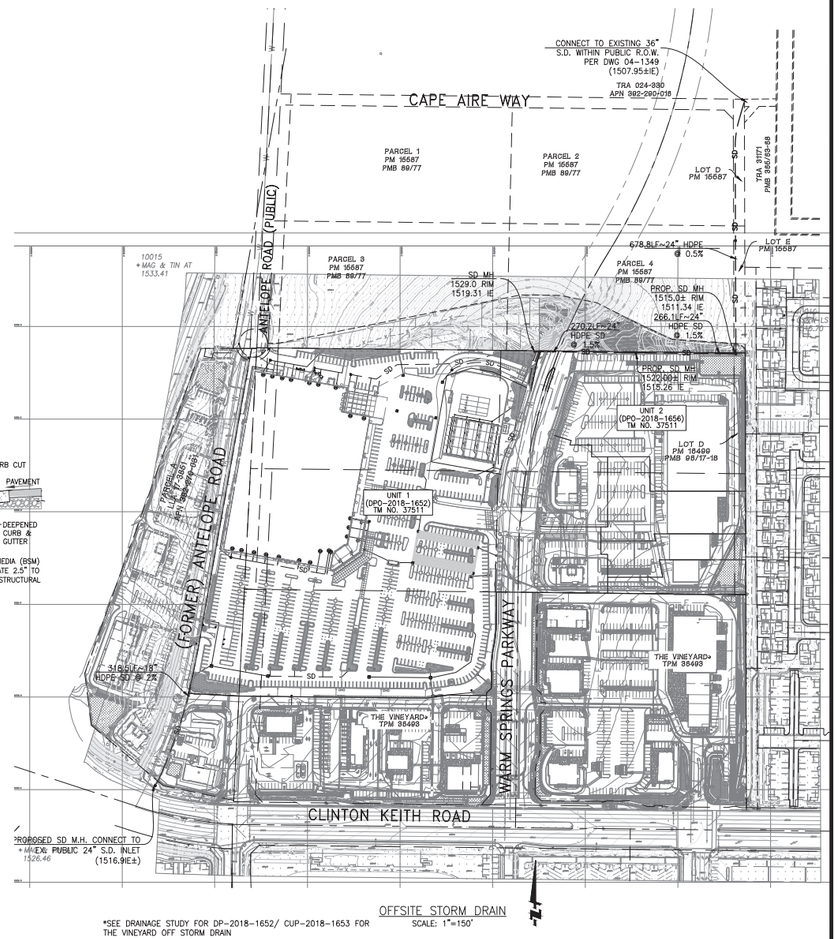
SECTION F C2
1"=20'



SECTION G C2
1"=20'

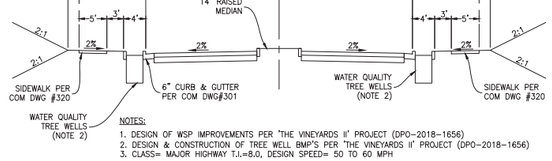


DETAIL
N.T.S.



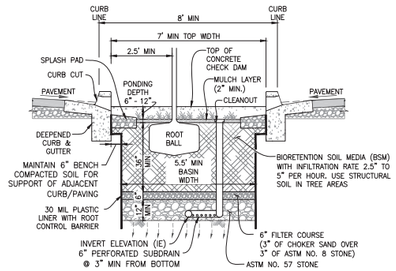
OFFSITE STORM DRAIN
SCALE: 1"=150'

*SEE DRAINAGE STUDY FOR DP-2018-1652/ CUP-2018-1653 FOR THE VINEYARD OFF STORM DRAIN

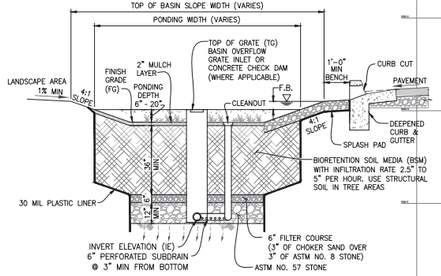


NOTES:
1. DESIGN OF WSP IMPROVEMENTS PER "THE VINEYARDS II" PROJECT (DPO-2018-1656)
2. DESIGN & CONSTRUCTION OF TREE WELL BMP'S PER "THE VINEYARDS II" PROJECT (DPO-2018-1656)
3. CLASS= MAJOR HIGHWAY T.I.=8.0, DESIGN SPEED= 50 TO 60 MPH

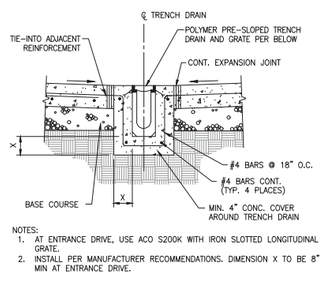
TYPICAL WARM SPRINGS PARKWAY SECTION*
NOT TO SCALE
*BY CITY



TYPICAL BIORETENTION PARKING PLANTER SECTION
NOT TO SCALE

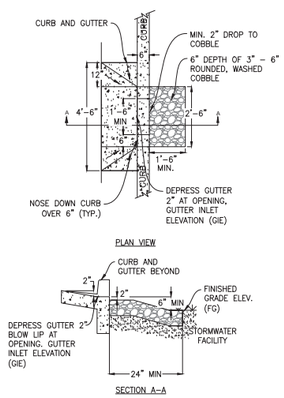


TYPICAL BIORETENTION BASIN SECTION
NOT TO SCALE

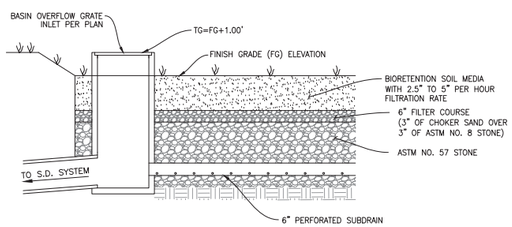


NOTES:
1. AT ENTRANCE DRIVE, USE ACO S200K WITH IRON SLOTTED LONGITUDINAL GRATE.
2. INSTALL PER MANUFACTURER RECOMMENDATIONS. DIMENSION X TO BE 8" MIN AT ENTRANCE DRIVE.

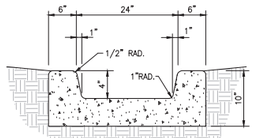
TRENCH DRAIN DETAIL
N.T.S.



CURB OPENING DETAIL
N.T.S.



BIORETENTION TYPICAL LONGITUDINAL SECTION
N.T.S.



CONCRETE FLUME DETAIL
N.T.S.

REGISTERED PROFESSIONAL ENGINEER BRYAN D. SMITH C 75822 EXP. 06-30-20 CIVIL STATE OF CALIFORNIA

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www.fuscoe.com

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REVISION 9:	
REVISION 8:	
REVISION 7:	
REVISION 6:	
REVISION 5:	
REVISION 4:	8.12.19
REVISION 3:	5.14.19
REVISION 2:	3.5.19
REVISION 1:	7.9.18
ORIGINAL DATE:	3.30.18

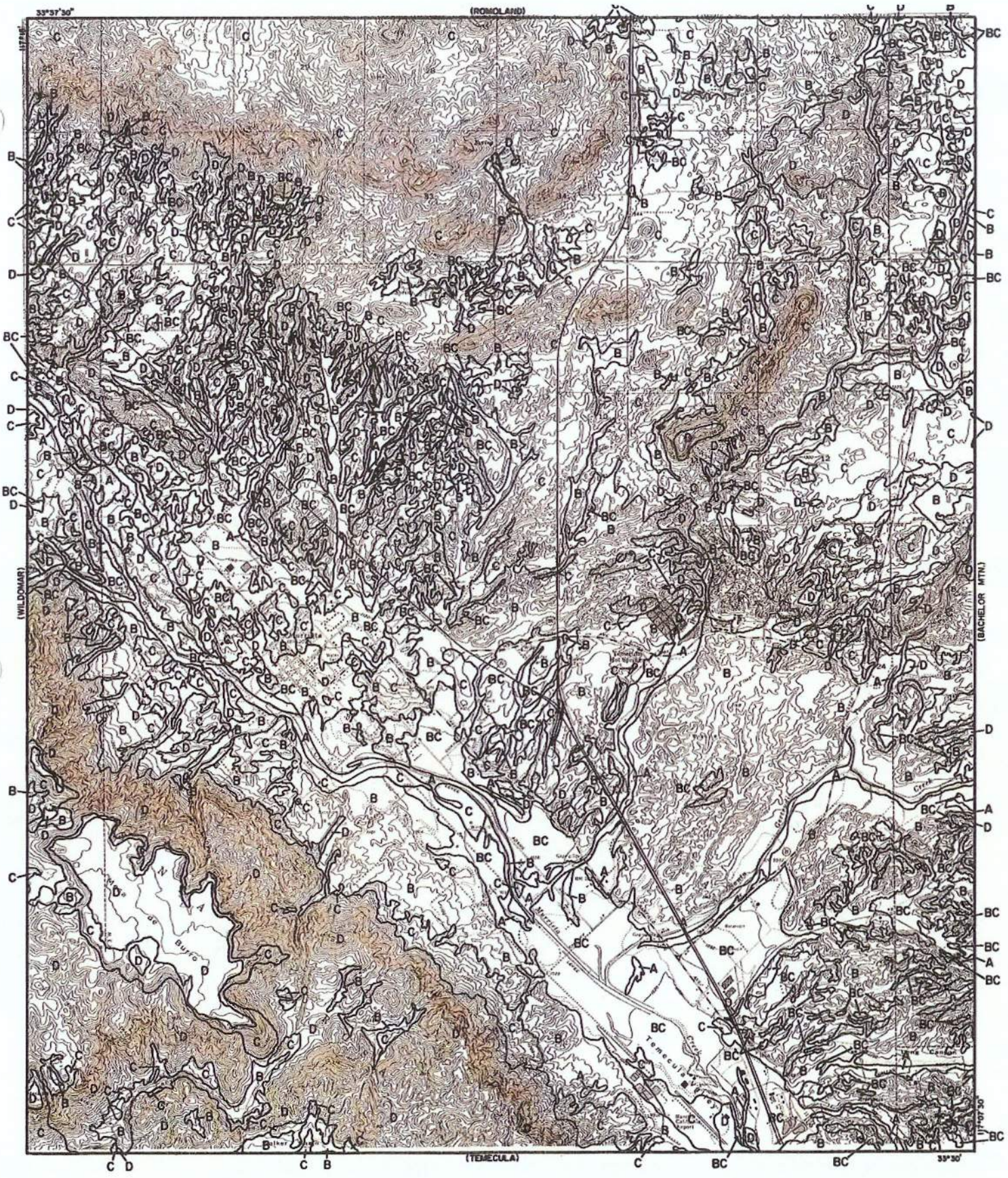
PROJECT ADDRESS:
CLINTON KEITH ROAD
MURRIETA, CA 92562

SHEET No. / TITLE:
SECTIONS AND DETAILS
C2

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ATTACHMENT C

RCFC & WCD HYDROLOGY MANUAL REFERENCES



LEGEND

—— SOILS GROUP BOUNDARY

A SOILS GROUP DESIGNATION

RCFC&WCD

HYDROLOGY MANUAL

N

0 FEET 5000

HYDROLOGIC SOILS GROUP MAP FOR MURRIETA

PLATE C-1.52

INSTRUCTIONS FOR RATIONAL METHOD HYDROLOGY CALCULATIONS

(Based on the Rational Formula, Q = CIA)

1. On map of drainage area, draw drainage system and block off subareas tributary to it.

2. Determine the initial time of concentration, "T", using Plate D-3. The initial area should be less than 10 acres, have a flow path of less than 1,000 feet, and be the most upstream subarea.

3. Using the time of concentration, determine "I", intensity of rainfall in inches per hour, from the appropriate intensity-duration curve for the particular area under study. For areas where standard curves are available, use Plates D-4.1 and D-4.2 to reproduce the standard curve. For areas where curves have not been published by the District, use Plates D-4.3 through D-4.7 to develop a suitable intensity-duration curve.

4. Determine "C", the coefficient of runoff, using the runoff coefficient curve which corresponds as closely as possible with the soil, cover type and development of the drainage area. Standard curves (Plates D-5.1 through D-5.4) have been developed by the District for the common case of urban landscaping type cover. Where these curves are not applicable, curves may be developed using Plates D-5.5 through D-5.8.

5. Determine "A", the area of the subarea in acres.

6. Compute Q = CIA for the subarea.

7. Measure the length of flow to the point of inflow of the next subarea downstream. Determine the velocity of flow in this reach for the peak Q in the type of conveyance being considered (natural channel, street, pipe, or open channel), using the tabling aids on Plates D-6 through D-9.

   Using the reach length and velocity determined above, compute the travel time, and add this time to the time of concentration for the previous subarea to determine a new time of concentration.

8. Calculate Q for the new subarea, using steps 3 through 6 and the new time of concentration. Determine "Q_p", the peak Q for all subareas tributary to the system to this point by adding Q for the new subarea to the summation of Q for all upstream subareas. Determine the time of concentration for the next subarea downstream using Step 7. Continue tabling downstream in similar fashion until a junction with a lateral drain is reached.

9. Start at the upper end of the lateral and table its Q down to the junction with the main line, using the methods outlined in the previous steps.

10. Compute the peak Q at the junction. Let Q_A, T_A, I_A correspond to the tributary area with the longer time of concentration, and Q_B, T_B, I_B correspond to the tributary area with the shorter time of concentration and Q_p, T_p correspond to the peak Q and time of concentration.

    a. If the tributary areas have the same time of concentration, the tributary Q's are added directly to obtain the combined peak Q.

$$Q_p = Q_A + Q_B \qquad T_p = T_A = T_B$$

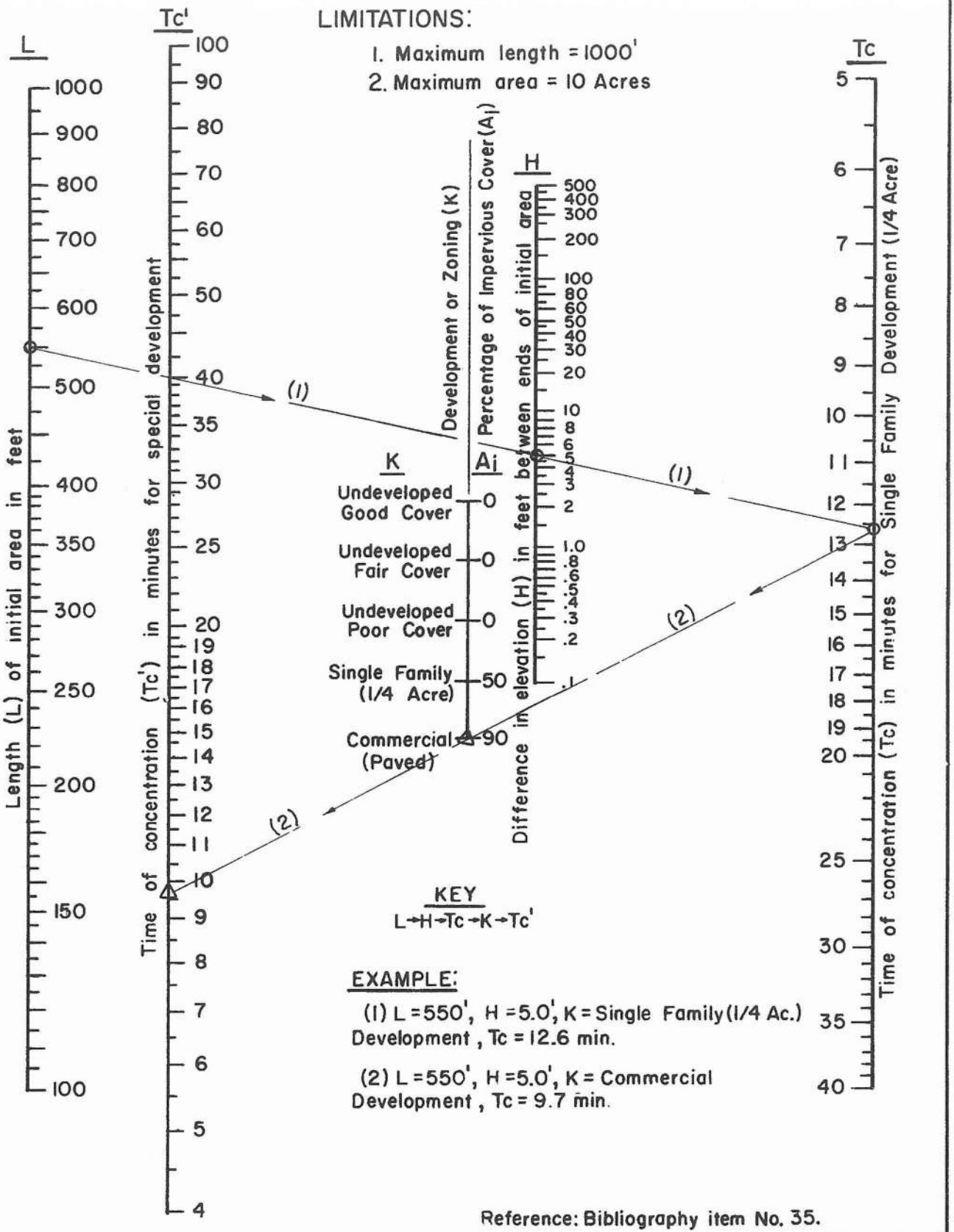
    b. If the tributary areas have different times of concentration, the smaller of the tributary Q's must be corrected as follows:

        (1) The usual case is where the tributary area with the longer time of concentration has the larger Q. In this case, the smaller Q is corrected by a ratio of the intensities and added to the larger Q to obtain the combined peak Q. The tabling is then continued downstream using the longer time of concentration.

$$Q_p = Q_A + Q_B \frac{I_A}{I_B} \qquad T_p = T_A$$

        (2) In some cases, the tributary area with the shorter time of concentration has the larger Q. In this case, the smaller Q is corrected by a ratio of the times of concentration and added to the larger Q to obtain the combined peak Q. The tabling is then continued downsteam using the shorter time of concentration.

$$Q_p = Q_B + Q_A \frac{T_B}{T_A} \qquad T_p = T_B$$



Reference: Bibliography item No. 35.

RCFC & WCD
HYDROLOGY MANUAL

TIME OF CONCENTRATION FOR INITIAL SUBAREA

PLATE D-3

RAINFALL INTENSITY–INCHES PER HOUR

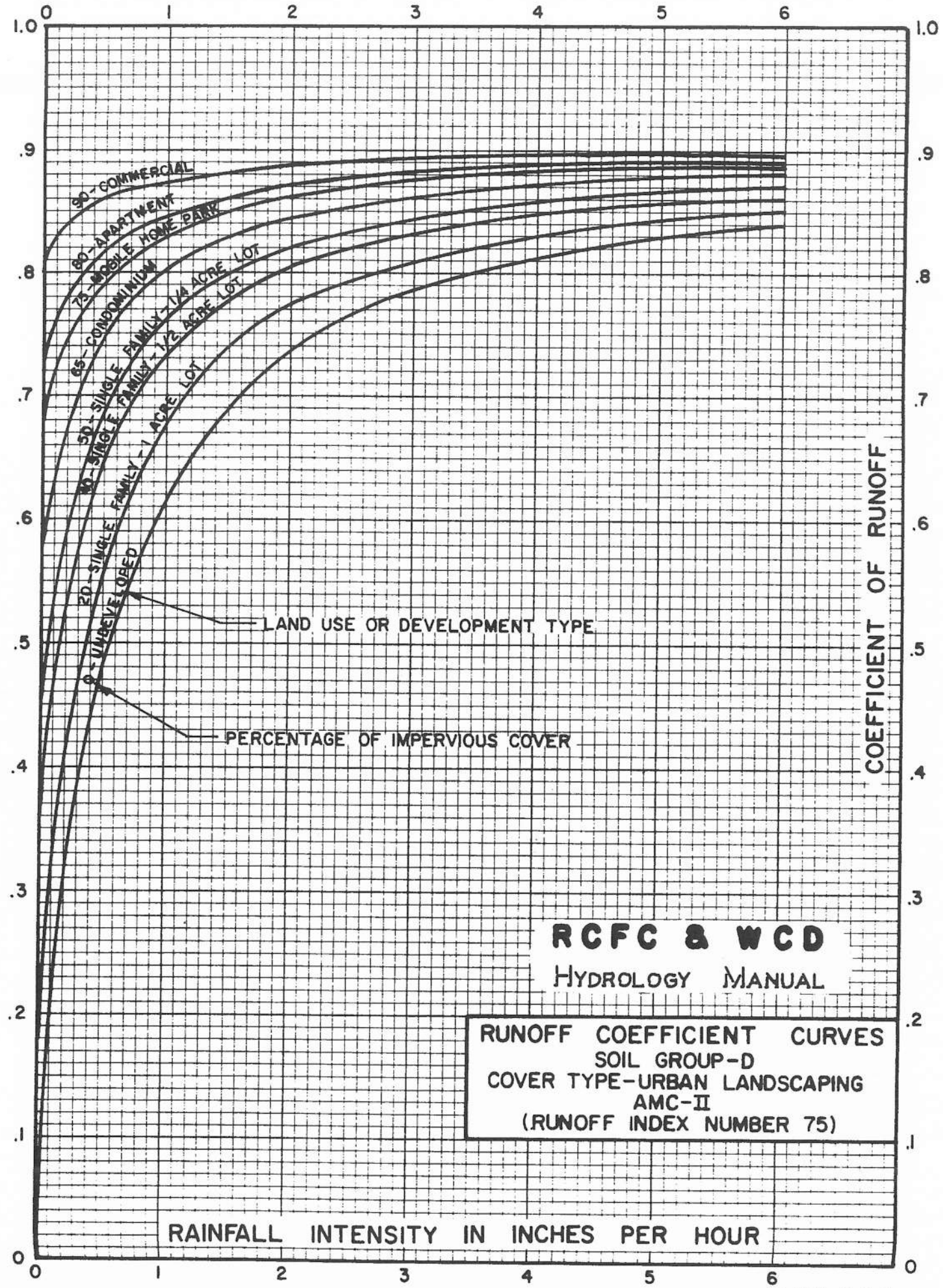
MIRA LOMA			MURRIETA - TEMECULA & RANCHO CALIFORNIA			NORCO			PALM SPRINGS			PERRIS VALLEY		
DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY	
	10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR
5	2.84	4.48	5	3.45	5.10	5	2.77	4.16	5	4.23	6.76	5	2.64	3.78
6	2.58	4.07	6	3.12	4.61	6	2.53	3.79	6	3.80	6.08	6	2.41	3.46
7	2.37	3.75	7	2.87	4.24	7	2.34	3.51	7	3.48	5.56	7	2.24	3.21
8	2.21	3.49	8	2.67	3.94	8	2.19	3.29	8	3.22	5.15	8	2.09	3.01
9	2.08	3.28	9	2.50	3.69	9	2.07	3.10	9	3.01	4.81	9	1.98	2.84
10	1.96	3.10	10	2.36	3.48	10	1.96	2.94	10	2.83	4.52	10	1.88	2.69
11	1.87	2.95	11	2.24	3.30	11	1.87	2.80	11	2.67	4.28	11	1.79	2.57
12	1.78	2.82	12	2.13	3.15	12	1.79	2.68	12	2.54	4.07	12	1.72	2.46
13	1.71	2.70	13	2.04	3.01	13	1.72	2.58	13	2.43	3.88	13	1.65	2.37
14	1.64	2.60	14	1.96	2.89	14	1.66	2.48	14	2.33	3.72	14	1.59	2.29
15	1.58	2.50	15	1.89	2.79	15	1.60	2.40	15	2.23	3.58	15	1.54	2.21
16	1.53	2.42	16	1.82	2.69	16	1.55	2.32	16	2.15	3.44	16	1.49	2.14
17	1.48	2.34	17	1.76	2.60	17	1.50	2.25	17	2.08	3.32	17	1.45	2.08
18	1.44	2.27	18	1.71	2.52	18	1.46	2.19	18	2.01	3.22	18	1.41	2.02
19	1.40	2.21	19	1.66	2.45	19	1.42	2.13	19	1.95	3.12	19	1.37	1.97
20	1.36	2.15	20	1.61	2.38	20	1.39	2.08	20	1.89	3.03	20	1.34	1.92
22	1.29	2.04	22	1.53	2.26	22	1.32	1.98	22	1.79	2.86	22	1.28	1.83
24	1.24	1.95	24	1.46	2.15	24	1.26	1.90	24	1.70	2.72	24	1.22	1.75
26	1.18	1.87	26	1.39	2.06	26	1.22	1.82	26	1.62	2.60	26	1.18	1.69
28	1.14	1.80	28	1.34	1.98	28	1.17	1.76	28	1.56	2.49	28	1.13	1.63
30	1.10	1.73	30	1.29	1.90	30	1.13	1.70	30	1.49	2.39	30	1.10	1.57
32	1.06	1.67	32	1.24	1.84	32	1.10	1.64	32	1.44	2.30	32	1.06	1.52
34	1.03	1.62	34	1.20	1.78	34	1.06	1.59	34	1.39	2.22	34	1.03	1.48
36	1.00	1.57	36	1.17	1.72	36	1.03	1.55	36	1.34	2.15	36	1.00	1.44
38	.97	1.53	38	1.13	1.67	38	1.01	1.51	38	1.30	2.09	38	.98	1.40
40	.94	1.49	40	1.10	1.62	40	.98	1.47	40	1.27	2.02	40	.95	1.37
45	.89	1.40	45	1.03	1.52	45	.92	1.39	45	1.18	1.89	45	.90	1.29
50	.84	1.32	50	.97	1.44	50	.88	1.31	50	1.11	1.78	50	.85	1.22
55	.80	1.26	55	.92	1.36	55	.84	1.25	55	1.05	1.68	55	.81	1.17
60	.76	1.20	60	.88	1.30	60	.80	1.20	60	1.00	1.60	60	.78	1.12
65	.73	1.15	65	.84	1.24	65	.77	1.15	65	.95	1.53	65	.75	1.08
70	.70	1.11	70	.81	1.19	70	.74	1.11	70	.91	1.46	70	.72	1.04
75	.68	1.07	75	.78	1.15	75	.72	1.07	75	.88	1.41	75	.70	1.00
80	.65	1.03	80	.75	1.11	80	.69	1.04	80	.85	1.35	80	.68	.97
85	.63	1.00	85	.73	1.07	85	.67	1.01	85	.82	1.31	85	.66	.94
SLOPE = .530			SLOPE = .550			SLOPE = .500			SLOPE = .580			SLOPE = .490		

RCFC & WCD

HYDROLOGY MANUAL

STANDARD INTENSITY–DURATION CURVES DATA

PLATE D-4.1 (4 of 6)

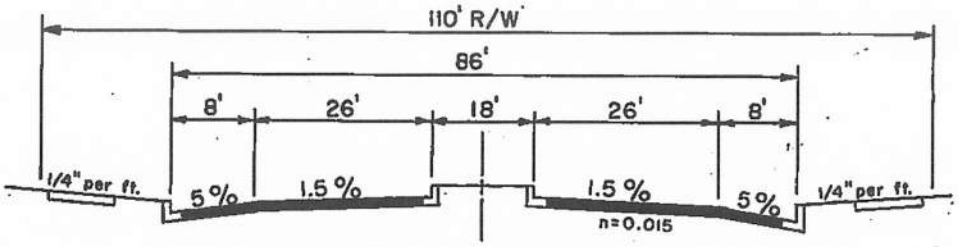


RCFC & WCD

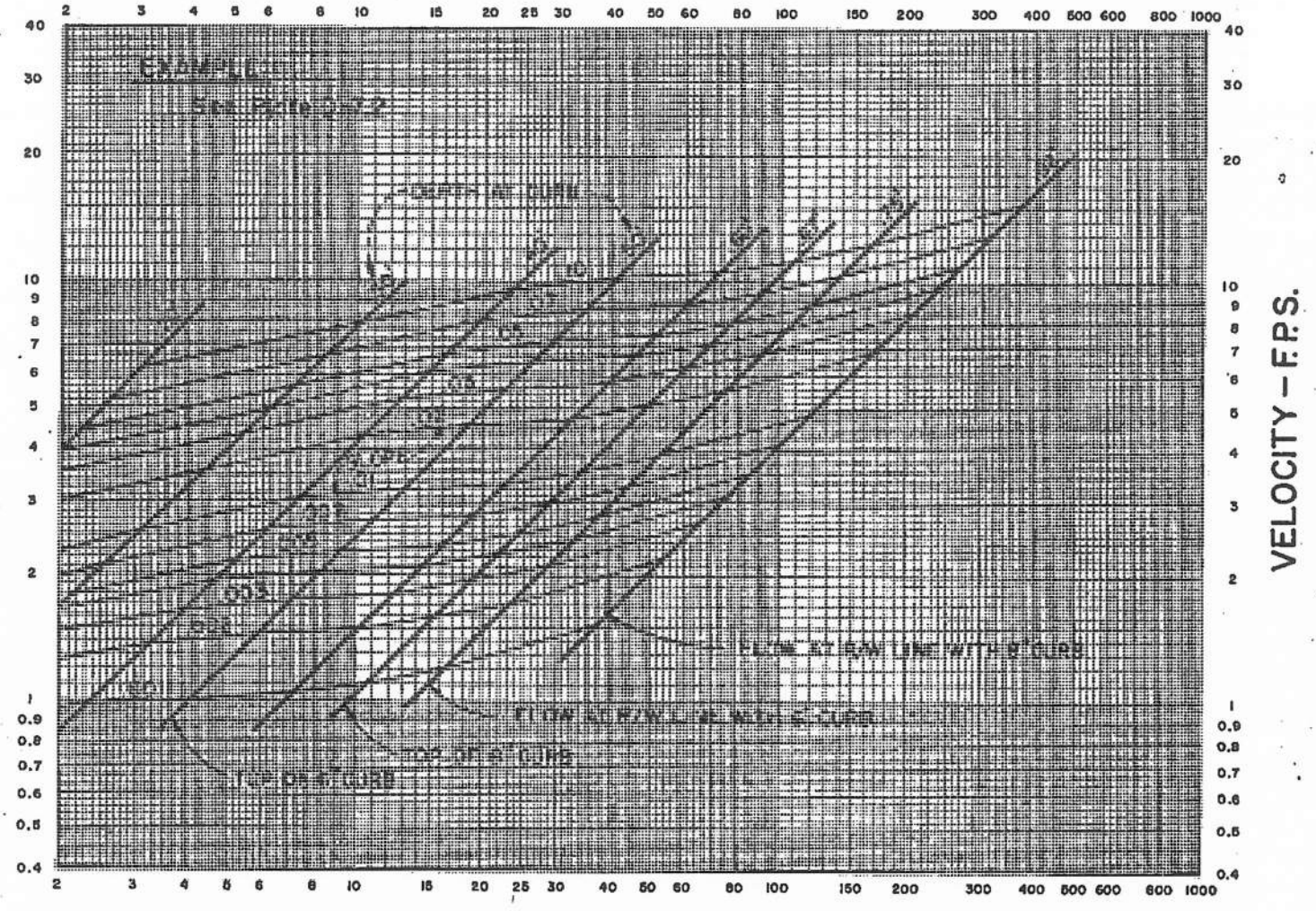
HYDROLOGY MANUAL

RUNOFF COEFFICIENT CURVES
SOIL GROUP-D
COVER TYPE-URBAN LANDSCAPING
AMC-II
(RUNOFF INDEX NUMBER 75)

PLATE D-5.4



TYPICAL SECTION



DISCHARGE – C.F.S.
(TOTAL FLOW IN STREET)

NOTE:

Flow does not top the crown of this section until d_w = 1.45 feet (6 inch curb).

RCFC & WCD

HYDROLOGY MANUAL

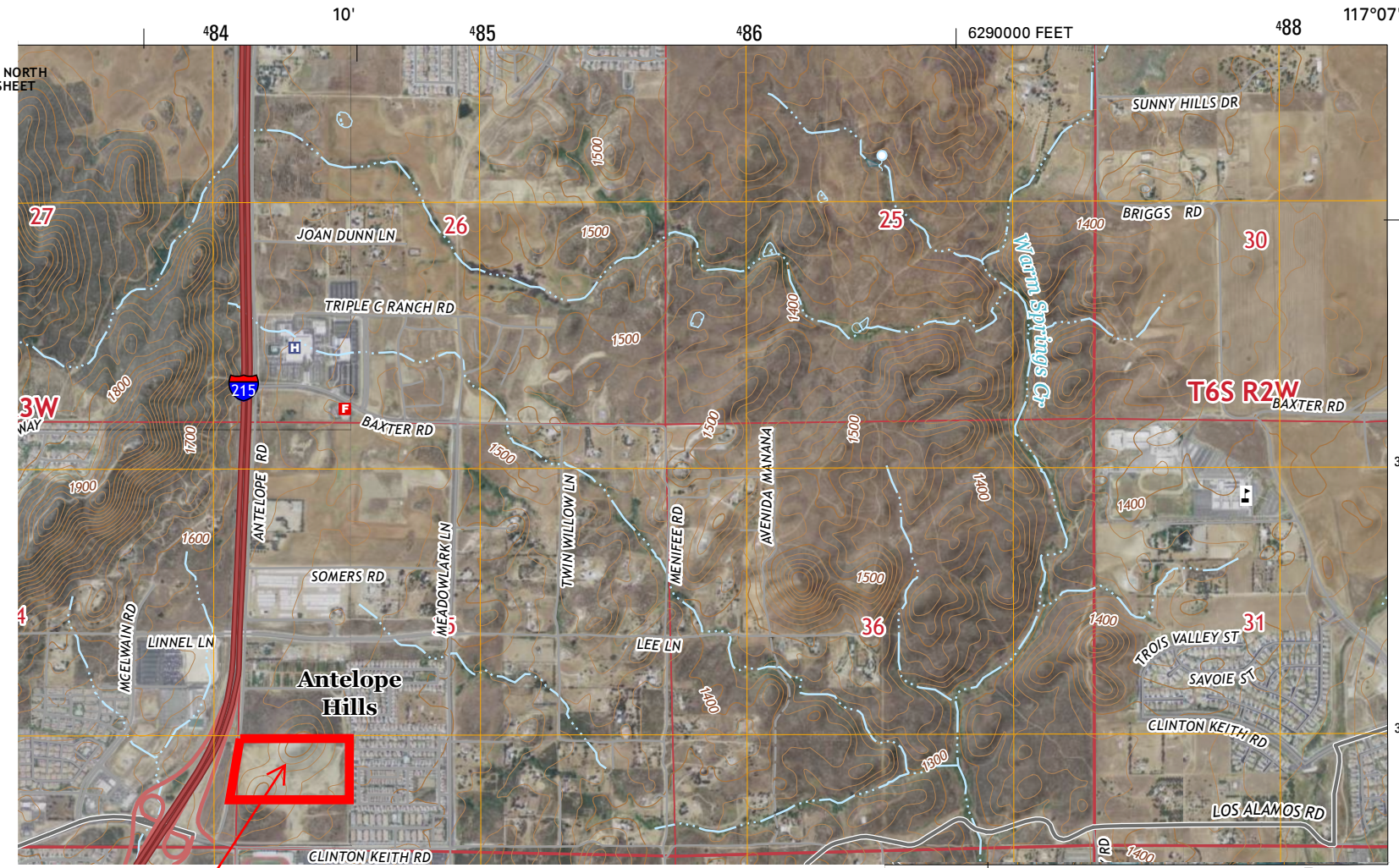
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT		
VELOCITY DISCHARGE CURVES COUNTY STANDARD No. 100 86' ROADWAY 6" & 8" CURBS		
APPROVED: CHIEF ENGINEER R.E. NO. 6555	DRAWN BY: R.A.S.	SHEET NO.
DATE	CHECKED BY: P.V.P-R.A.N.	
REVISED:	DATE DRAWN: JAN. 91	DR. NO

PLATE D-7.1

ATTACHMENT D

USGS 7.5 MIN QUADRANGLE TOPOGRAPHIC MAP

MURRIETA QUADRANGLE
CALIFORNIA-RIVERSIDE CO.
7.5-MINUTE SERIES



PROJECT SITE

SCALE 1:24 000

1 0.5 0 KILOMETERS 1 2

1000 500 0 METERS 1000 2000

1 0.5 0 1

MILES

1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

FEET

CONTOUR INTERVAL 20 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the
National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.18

MN
GN
11° 56′
212 MILS
0° 6′
2 MILS

UTM GRID AND 2015 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000-m Square ID
MT
Grid Zone Designation
11S

ROAD CLASSIFICATION

Expressway	Local Connector
Secondary Hwy	Local Road
Ramp	4WD

Interstate Route US Route State Route

Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid: Universal Transverse Mercator, Zone 11S
10 000-foot ticks: California Coordinate System of 1983 (zone 6)

This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

7643016357163
NSN. 7643016357163
NGA REF NO. USGSX24K31180

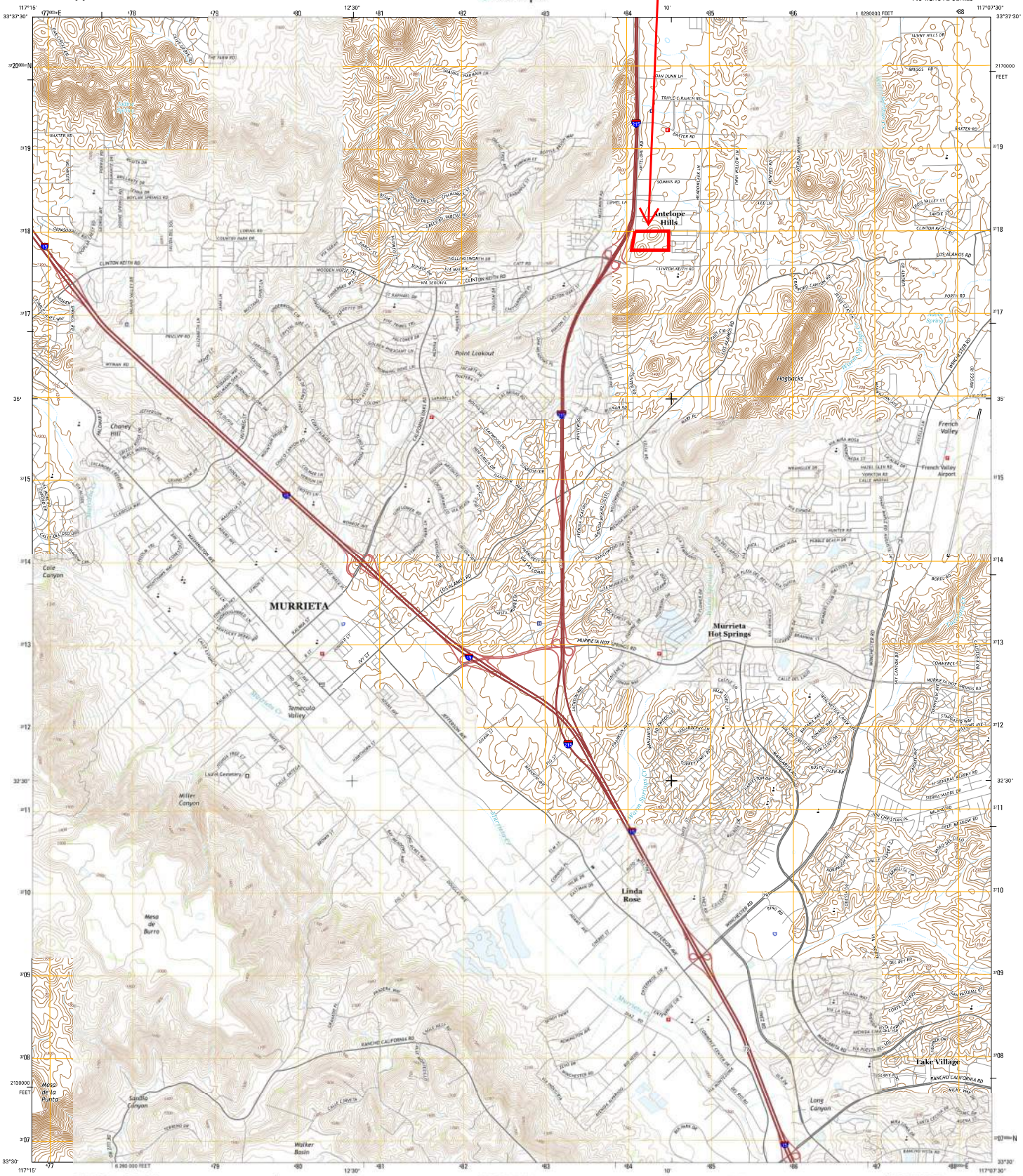
PROJECT SITE

USGS
science for a changing world

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map
US Topo

MURRIETA QUADRANGLE
CALIFORNIA-RIVERSIDE CO.
7.5-MINUTE SERIES



Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and 1 000-meter grid: Universal Transverse Mercator, Zone 11S
10 000-foot ticks: California Coordinate System of 1983 (zone 6)

This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery.....NAIP, May 2012
Roads.....HERE, ©2013 - 2014
Names.....GNIS, 2015
Hydrography.....National Hydrography Dataset, 2012
Contours.....National Elevation Dataset, 1999
Boundaries.....Multiple sources; see metadata file 1972 - 2015
Public Land Survey System.....BLM, 2011

UTM GRID AND 2015 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000-m Square ID
MT
Grid Zone Designation
11S

SCALE 1:24 000

KILOMETERS 0 0.5 1 2
METERS 1000 500 0 1000 2000
MILES 0 0.5 1
FEET 1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

CONTOUR INTERVAL 20 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011. A metadata file associated with this product is draft version 0.6.18

ADJOINING QUADRANGLES

1	2	3
4		5
6	7	8

1 Lake Elsinore
2 Romoland
3 Winchester
4 Wildomar
5 Bachelor Mountain
6 Fallbrook
7 Temecula
8 Pechanga

ROAD CLASSIFICATION
Expressway
Secondary Hwy
Ramp
Local Connector
Local Road
4WD
Interstate Route
US Route
State Route

MURRIETA, CA
2015

7643016357163*
NAD83 REF NO. U.S.G.S.2.4.3.1.1.9.0

ATTACHMENT E

NCSS WEB SOIL SURVEY HYDROLOGIC SOIL GROUP MAP

Hydrologic Soil Group—Western Riverside Area, California
(Costro Murrieta)



Map Scale: 1:4,300 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this 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 do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Western Riverside Area, California
Survey Area Data: Version 9, Sep 12, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Feb 24, 2015—Feb 26, 2015

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CaC2	Cajalco fine sandy loam, 2 to 8 percent slopes, eroded	C	23.6	34.3%
CaD2	Cajalco fine sandy loam, 8 to 15 percent slopes, eroded	C	5.5	7.9%
ChD2	Cieneba sandy loam, 8 to 15 percent slopes, eroded	D	0.3	0.4%
LaC2	Las Posas loam, 5 to 8 percent slopes, eroded	D	0.1	0.1%
LaD2	Las Posas loam, 8 to 15 percent slopes, eroded	D	16.3	23.7%
LaE3	Las Posas loam, 8 to 25 percent slopes, severely eroded	D	4.8	7.0%
LkF3	Las Posas rocky loam, 15 to 50 percent slopes, severely eroded	D	18.3	26.6%
Totals for Area of Interest			**68.8**	**100.0%**

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CaC2	Cajalco fine sandy loam, 2 to 8 percent slopes, eroded	C	23.6	34.3%
CaD2	Cajalco fine sandy loam, 8 to 15 percent slopes, eroded	C	5.5	7.9%
ChD2	Cieneba sandy loam, 8 to 15 percent slopes, eroded	D	0.3	0.4%
LaC2	Las Posas loam, 5 to 8 percent slopes, eroded	D	0.1	0.1%
LaD2	Las Posas loam, 8 to 15 percent slopes, eroded	D	16.3	23.7%
LaE3	Las Posas loam, 8 to 25 percent slopes, severely eroded	D	4.8	7.0%
LkF3	Las Posas rocky loam, 15 to 50 percent slopes, severely eroded	D	18.3	26.6%
Totals for Area of Interest			**68.8**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

ATTACHMENT F

FEMA FLOOD INSURANCE RATE MAP

National Flood Hazard Layer FIRMette

FEMA



0 250 500 1,000 1,500 2,000 Feet

1:6,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) Zone A, V, A99
- With BFE or Depth
- Regulatory Floodway Zone AE, AO, AH, VE, AR

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Area of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
- Future Conditions 1% Annual Chance Flood Hazard Zone X
- Area with Reduced Flood Risk due to Levee. See Notes. Zone X
- Area with Flood Risk due to Levee Zone D

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard Zone X
- Effective LOMRs
- Area of Undetermined Flood Hazard Zone

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The base map shown complies with FEMA's base map accuracy standards

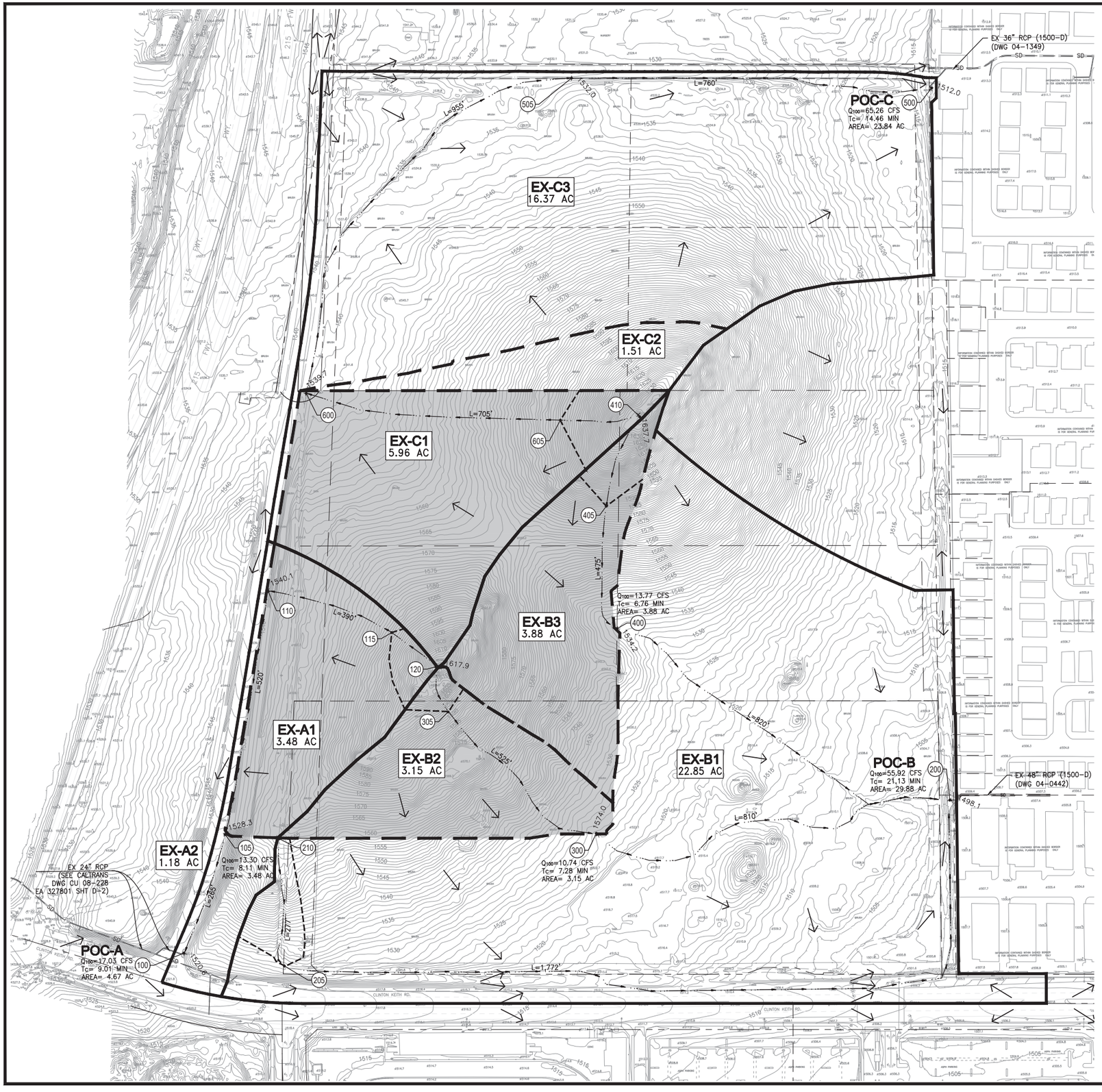
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 4/2/2018 at 1:23:34 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: base map imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

ATTACHMENT G

PRE-DEVELOPMENT HYDROLOGY MAP

POST-DEVELOPMENT HYDROLOGY MAP



LEGEND

PROPERTY LIMITS	
RIGHT-OF-WAY	
STREET CENTERLINE	
EXISTING STORM DRAIN	SD
EXISTING MAJOR CONTOUR	260
EXISTING MINOR CONTOUR	259
BASIN LIMITS	
SUB-BASIN LIMITS	
INITIAL SUB-AREA	
FLOW PATH	
DIRECTION OF FLOW	
HYDROLOGY NODE	(100)
BASIN DESIGNATION BASIN AREA	EX-A1 3.48 AC

N

100' 0' 50' 100'

SCALE: 1" = 100'

COSTCO MURRIETA

EXISTING CONDITIONS
HYDROLOGY MAP

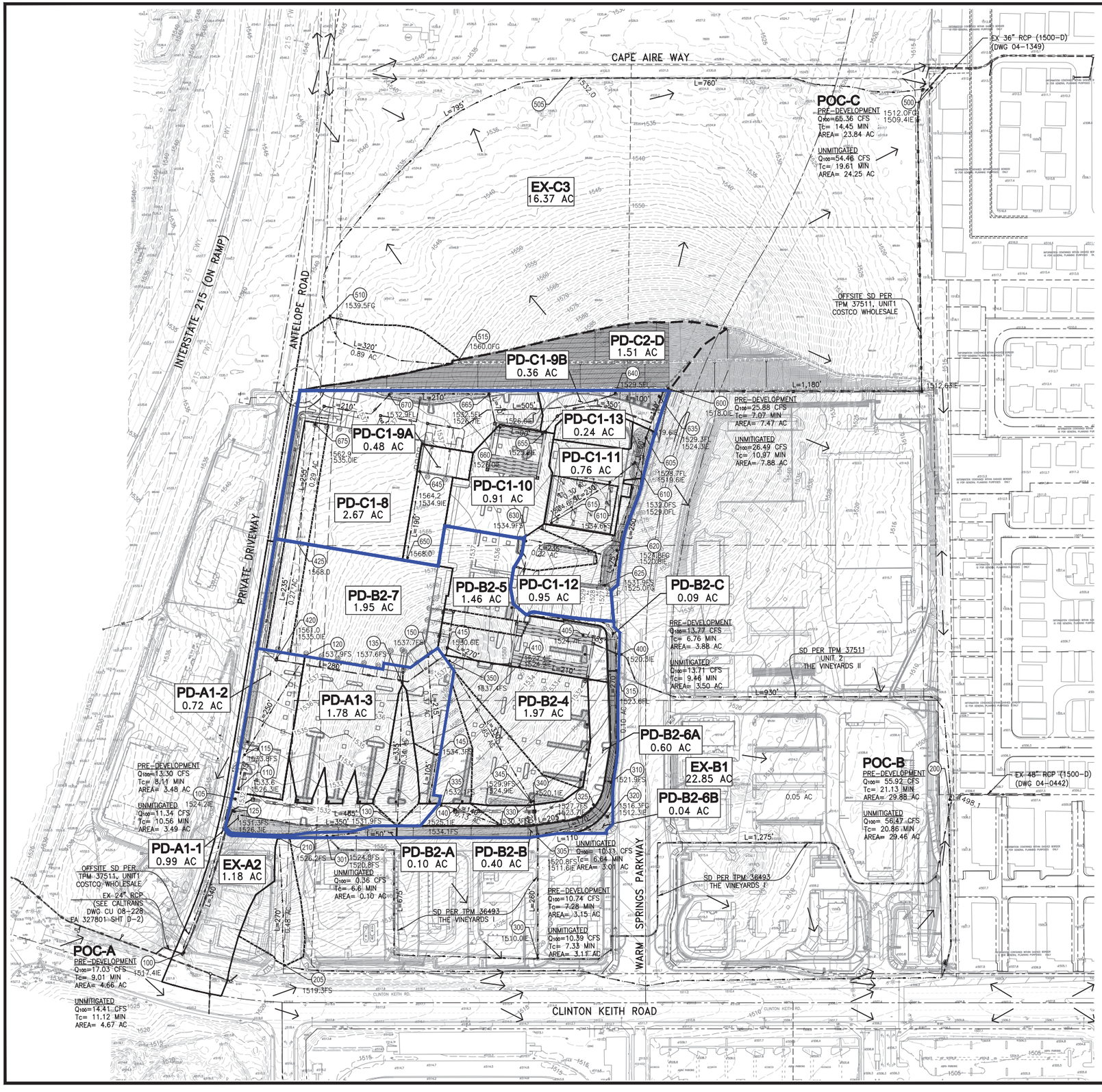
FUSCOE
ENGINEERING
6390 Greenwich Dr., Suite 170
San Diego, California 92122
tel 858.554.1500 • fax 858.597.0335
www.fuscoe.com

JOB NO. 756-055

DRAWN BY: J.G.

SHEET 1 of 1

F:\Projects\756\055_Support Files\Reports\Hydrology\756-055HYD-EX.dwg (6/22/2018 9:01 AM) Plotted by: Jesus Garcia



LEGEND

- PROPERTY LINE
- RIGHT-OF-WAY
- STREET CENTERLINE
- EXISTING STORM DRAIN
- EXISTING MAJOR CONTOUR — 260
- EXISTING MINOR CONTOUR — 259
- PROPOSED MAJOR CONTOUR — 260
- PROPOSED MINOR CONTOUR — 259
- BASIN LIMITS
- SUB-BASIN LIMITS
- INITIAL SUB-AREA
- FLOW PATH
- DIRECTION OF FLOW
- HYDROLOGY NODE (100)
- BASIN DESIGNATION / BASIN AREA — PD-A1-1 / 3.48 AC

SCALE: 1" = 100'

COSTCO MURRIETA

PROPOSED CONDITIONS
HYDROLOGY MAP

FUSCOE
ENGINEERING
6390 Greenwich Dr., Suite 170
San Diego, California 92122
tel 858.554.1500 • fax 858.597.0335
www.fuscoe.com

JOB NO. 756-055
DRAWN BY: J.G.
SHEET 1 of 1

F:\Projects\756\055_Support Files\Reports\Hydrology\756-055HYD-PR.dwg (10/3/2019 8:27 PM) Plotted by: Jesus Garcia

ATTACHMENT H

RATIONAL METHOD PRE-DEVELOPMENT
Q100 (1HR) STORM RUNOFF PEAK FLOWS

RATIONAL METHOD POST-DEVELOPMENT
Q100 (1HR) STORM RUNOFF PEAK FLOWS

FUSCOE ENGINEERING
6390 Greenwich Drive, Suite 170
San Diego, California 92122
tel 858.554.1500 • fax 858.597.0335
www.fuscoe.com

Analysis: Existing - 100 Yr, 1Hr Storm
Description: Pre-Development Condition
Soil Type D

Job Name: Costco Murrieta
Job #: 756-055
Date: 3/14/2018
File Name: Murr-EX

Node to Node		Code	Elev 1 (feet)	Elev 2 (feet)	Length (feet)	SubArea Land Use	Area (ac.)	Comments
120	115	2	1,617.9	1,585.0	115.0	8.00	0.23	INITIAL SUBAREA OF EX-A2
115	110	5	1,585.0	1,540.1	275.0			OPEN CHANNEL FLOW
110	110	8				8.00	3.25	ADDITION OF SUBAREA EX-A2
							3.48	**TOTAL AREA OF EX-A2**
110	105	5	1,540.1	1,528.3	520.0			OPEN CHANNEL FLOW
105	105	8				8.00	1.18	ADDITION OF SUBAREA EX-A1
105	100	5	1,528.3	1,520.6	265.0			OPEN CHANNEL FLOW
							4.66	**TRIBUTARY AREA OF POC-A**
410	405	2	1,637.7	1,585.0	205.0	8.00	0.37	INITIAL SUBAREA OF EX-B3
405	400	5	1,585.0	1,534.2	270.0			OPEN CHANNEL FLOW
400	400	8				8.00	3.51	ADDITION OF SUBAREA EX-B3
							3.88	**TOTAL AREA OF EX-B1**
400	200	5	1,534.2	1,498.1	820.0			OPEN CHANNEL FLOW
200	200	1						CONFLUENCE 1 OF 3
120	305	2	1,617.9	1,592.0	102.0	8.00	0.15	INITIAL SUBAREA OF EX-B2
305	300	5	1,592.0	1,574.0	423.0			OPEN CHANNEL FLOW
300	300	8				8.00	3.00	ADDITION OF SUBAREA EX-B2
							3.15	**TOTAL AREA OF EX-B2**
300	200	5	1,574.0	1,498.1	810.0			OPEN CHANNEL FLOW
200	200	1						CONFLUENCE 2 OF 3
210	205	2	1,564.0	1,530.0	277.0	8.00	0.48	INITIAL SUBAREA OF EX-B1
205	200	5	1,530.0	1,498.1	1,772.0			OPEN CHANNEL FLOW
200	200	8				8.00	22.37	ADDITION OF SUBAREA EX-B1
							22.85	**TOTAL AREA OF EX-B1**
200	200	1						CONFLUENCE 3 OF 3
							29.88	**TRIBUTARY AREA OF POC-B**
410	605	2	1,637.7	1,595.0	165.0	8.00	0.45	INITIAL SUBAREA OF EX-C3
605	600	5	1,595.0	1,539.7	540.0			OPEN CHANNEL FLOW
600	600	8				8.00	5.51	ADDITION OF SUBAREA EX-C3
							5.96	**TOTAL AREA OF EX-C3**
600	600	8				8.00	1.51	ADDITION OF SUBAREA EX-C2
600	505	5	1,539.7	1,532.0	955.0			OPEN CHANNEL FLOW
505	505	8				8.00	16.37	ADDITION OF SUBAREA EX-C1
505	600	5	1,532.0	1,512.0	760.0			OPEN CHANNEL FLOW
							23.84	**TRIBUTARY AREA OF POC-C**

```
**************************************************************************
           RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-2014 Advanced Engineering Software (aes)
                    (Rational Tabling Version 21.0)
                Release Date: 06/01/2014  License ID 1355

                         Analysis prepared by:

                           Fuscoe Engineering
                          6390 Greenwich Drive
                               Suite 170
                          San Diego, CA 92122

 ************************* DESCRIPTION OF STUDY *************************
* COSTCO MURRIETA                                                       *
* PRE-DEVELOPMENT CONDITION                                             *
* 100 YR, 1HR STORM EVENT                                               *
 *************************************************************************

  FILE NAME: MURR-EX.DAT
  TIME/DATE OF STUDY: 16:30 03/29/2018
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.360
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.880
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.480
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.300
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.5505732
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.5495536
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.300
  SLOPE OF INTENSITY DURATION CURVE = 0.5496
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
```

```
  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    115.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH POOR COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   115.00
  UPSTREAM ELEVATION(FEET) =   1617.90
  DOWNSTREAM ELEVATION(FEET) =   1585.00
  ELEVATION DIFFERENCE(FEET) =     32.90
  TC = 0.533*[(  115.00**3)/(    32.90)]**.2 =    4.564
  COMPUTED TIME OF CONCENTRATION INCREASED TO 5 MIN.
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.093
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .8278
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      0.97
  TOTAL AREA(ACRES) =      0.23   TOTAL RUNOFF(CFS) =      0.97

****************************************************************************
  FLOW PROCESS FROM NODE    115.00 TO NODE    110.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1585.00  DOWNSTREAM(FEET) =   1540.10
  CHANNEL LENGTH THRU SUBAREA(FEET) =   275.00   CHANNEL SLOPE =  0.1633
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.97
  FLOW VELOCITY(FEET/SEC) =   4.74 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.97   Tc(MIN.) =    5.97
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    110.00 =     390.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
```

```
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.622
UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .8211
SOIL CLASSIFICATION IS "D"
SUBAREA AREA(ACRES) =    3.25   SUBAREA RUNOFF(CFS) =   12.33
TOTAL AREA(ACRES) =        3.5   TOTAL RUNOFF(CFS) =      13.30
TC(MIN.) =    5.97

****************************************************************************
FLOW PROCESS FROM NODE    110.00 TO NODE    105.00 IS CODE =  52
----------------------------------------------------------------------------
>>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   1540.10  DOWNSTREAM(FEET) =   1528.30
CHANNEL LENGTH THRU SUBAREA(FEET) =   520.00   CHANNEL SLOPE =  0.0227
CHANNEL FLOW THRU SUBAREA(CFS) =      13.30
FLOW VELOCITY(FEET/SEC) =   4.05 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) =   2.14   Tc(MIN.) =    8.11
LONGEST FLOWPATH FROM NODE    120.00 TO NODE    105.00 =     910.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.906
UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .8081
SOIL CLASSIFICATION IS "D"
SUBAREA AREA(ACRES) =    1.18   SUBAREA RUNOFF(CFS) =    3.72
TOTAL AREA(ACRES) =        4.7   TOTAL RUNOFF(CFS) =      17.03
TC(MIN.) =    8.11

****************************************************************************
FLOW PROCESS FROM NODE    105.00 TO NODE    100.00 IS CODE =  52
----------------------------------------------------------------------------
>>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   1528.30  DOWNSTREAM(FEET) =   1520.60
CHANNEL LENGTH THRU SUBAREA(FEET) =   265.00   CHANNEL SLOPE =  0.0291
CHANNEL FLOW THRU SUBAREA(CFS) =      17.03
FLOW VELOCITY(FEET/SEC) =   4.89 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) =   0.90   Tc(MIN.) =    9.01
LONGEST FLOWPATH FROM NODE    120.00 TO NODE    100.00 =    1175.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    410.00 TO NODE    405.00 IS CODE =  21
----------------------------------------------------------------------------
```

```
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH POOR COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   205.00
  UPSTREAM ELEVATION(FEET) =   1637.70
  DOWNSTREAM ELEVATION(FEET) =   1585.00
  ELEVATION DIFFERENCE(FEET) =     52.70
  TC = 0.533*[(  205.00**3)/(    52.70)]**.2 =    5.876
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.661
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .8217
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      1.42
  TOTAL AREA(ACRES) =      0.37   TOTAL RUNOFF(CFS) =      1.42

******************************************************************************
  FLOW PROCESS FROM NODE    405.00 TO NODE    400.00 IS CODE =  52
------------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1585.00  DOWNSTREAM(FEET) =   1534.20
  CHANNEL LENGTH THRU SUBAREA(FEET) =   270.00   CHANNEL SLOPE =  0.1881
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       1.42
  FLOW VELOCITY(FEET/SEC) =   5.07 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.89   Tc(MIN.) =    6.76
  LONGEST FLOWPATH FROM NODE    410.00 TO NODE    400.00 =     475.00 FEET.

******************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    400.00 IS CODE =  81
------------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.314
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .8159
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    3.51   SUBAREA RUNOFF(CFS) =   12.36
  TOTAL AREA(ACRES) =        3.9   TOTAL RUNOFF(CFS) =      13.77
  TC(MIN.) =    6.76

******************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    200.00 IS CODE =  52
------------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =   1534.20  DOWNSTREAM(FEET) =   1498.10
  CHANNEL LENGTH THRU SUBAREA(FEET) =   820.00   CHANNEL SLOPE =  0.0440
  CHANNEL FLOW THRU SUBAREA(CFS) =      13.77
  FLOW VELOCITY(FEET/SEC) =   5.69 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.40   Tc(MIN.) =    9.16
  LONGEST FLOWPATH FROM NODE    410.00 TO NODE    200.00 =    1295.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    200.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.16
  RAINFALL INTENSITY(INCH/HR) =   3.65
  TOTAL STREAM AREA(ACRES) =     3.88
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     13.77

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    305.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH POOR COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   102.00
  UPSTREAM ELEVATION(FEET) =   1617.90
  DOWNSTREAM ELEVATION(FEET) =   1592.00
  ELEVATION DIFFERENCE(FEET) =     25.90
  TC = 0.533*[(  102.00**3)/(    25.90)]**.2 =    4.456
  COMPUTED TIME OF CONCENTRATION INCREASED TO 5 MIN.
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.093
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .8278
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      0.63
  TOTAL AREA(ACRES) =      0.15   TOTAL RUNOFF(CFS) =      0.63

****************************************************************************
  FLOW PROCESS FROM NODE    305.00 TO NODE    300.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1592.00  DOWNSTREAM(FEET) =   1574.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   423.00   CHANNEL SLOPE =  0.0426
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
```

```
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.63
  FLOW VELOCITY(FEET/SEC) =   3.09 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.28   Tc(MIN.) =    7.28
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    300.00 =     525.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    300.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.144
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .8128
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    3.00   SUBAREA RUNOFF(CFS) =   10.10
  TOTAL AREA(ACRES) =        3.2   TOTAL RUNOFF(CFS) =      10.74
  TC(MIN.) =    7.28

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    200.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1574.00  DOWNSTREAM(FEET) =   1498.10
  CHANNEL LENGTH THRU SUBAREA(FEET) =   810.00   CHANNEL SLOPE =  0.0937
  CHANNEL FLOW THRU SUBAREA(CFS) =      10.74
  FLOW VELOCITY(FEET/SEC) =   7.79 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.73   Tc(MIN.) =    9.01
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    200.00 =    1335.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    200.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.01
  RAINFALL INTENSITY(INCH/HR) =   3.68
  TOTAL STREAM AREA(ACRES) =     3.15
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     10.74

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    205.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
          ASSUMED INITIAL SUBAREA UNIFORM
```

```
        DEVELOPMENT IS: UNDEVELOPED WITH POOR COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   277.00
  UPSTREAM ELEVATION(FEET) =   1564.00
  DOWNSTREAM ELEVATION(FEET) =   1530.00
  ELEVATION DIFFERENCE(FEET) =     34.00
  TC = 0.533*[(  277.00**3)/(    34.00)]**.2 =    7.684
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.022
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .8104
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      1.56
  TOTAL AREA(ACRES) =      0.48   TOTAL RUNOFF(CFS) =      1.56

****************************************************************************
  FLOW PROCESS FROM NODE    205.00 TO NODE    200.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1530.00  DOWNSTREAM(FEET) =   1498.10
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1772.00   CHANNEL SLOPE =  0.0180
  CHANNEL FLOW THRU SUBAREA(CFS) =       1.56
  FLOW VELOCITY(FEET/SEC) =   2.20 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =  13.45   Tc(MIN.) =   21.13
  LONGEST FLOWPATH FROM NODE    210.00 TO NODE    200.00 =    2049.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    200.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.307
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7546
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =   22.37   SUBAREA RUNOFF(CFS) =   38.94
  TOTAL AREA(ACRES) =       22.9   TOTAL RUNOFF(CFS) =      40.50
  TC(MIN.) =   21.13

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    200.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =   21.13
  RAINFALL INTENSITY(INCH/HR) =   2.31
```

```
 TOTAL STREAM AREA(ACRES) =    22.85
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     40.50

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       13.77     9.16        3.651          3.88
     2       10.74     9.01        3.685          3.15
     3       40.50    21.13        2.307         22.85

 ********************************WARNING*************************************
 IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
 ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
 WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ****************************************************************************

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  3 STREAMS.

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc      INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       41.55     9.01       3.685
     2       41.97     9.16       3.651
     3       55.92    21.13       2.307

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      55.92   Tc(MIN.) =   21.13
 TOTAL AREA(ACRES) =       29.9
 LONGEST FLOWPATH FROM NODE    210.00 TO NODE    200.00 =    2049.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    410.00 TO NODE    605.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH POOR COVER
 TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   165.00
 UPSTREAM ELEVATION(FEET) =   1637.70
 DOWNSTREAM ELEVATION(FEET) =   1595.00
 ELEVATION DIFFERENCE(FEET) =     42.70
 TC = 0.533*[(  165.00**3)/(    42.70)]**.2 =    5.380
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.892
 UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .8250
 SOIL CLASSIFICATION IS "D"
 SUBAREA RUNOFF(CFS) =      1.82
```

```
  TOTAL AREA(ACRES) =      0.45   TOTAL RUNOFF(CFS) =      1.82

****************************************************************************
  FLOW PROCESS FROM NODE    605.00 TO NODE    600.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1595.00  DOWNSTREAM(FEET) =   1539.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =   540.00   CHANNEL SLOPE =  0.1024
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       1.82
  FLOW VELOCITY(FEET/SEC) =   5.33 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.69   Tc(MIN.) =    7.07
  LONGEST FLOWPATH FROM NODE    410.00 TO NODE    600.00 =     705.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    600.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.211
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .8141
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    5.51   SUBAREA RUNOFF(CFS) =   18.89
  TOTAL AREA(ACRES) =        6.0   TOTAL RUNOFF(CFS) =      20.71
  TC(MIN.) =    7.07

****************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    600.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.211
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .8141
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    1.51   SUBAREA RUNOFF(CFS) =    5.18
  TOTAL AREA(ACRES) =        7.5   TOTAL RUNOFF(CFS) =      25.88
  TC(MIN.) =    7.07

****************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    505.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1539.70  DOWNSTREAM(FEET) =   1532.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   955.00   CHANNEL SLOPE =  0.0081
```

```
  CHANNEL FLOW THRU SUBAREA(CFS) =      25.88
  FLOW VELOCITY(FEET/SEC) =   2.89 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   5.51   Tc(MIN.) =   12.58
  LONGEST FLOWPATH FROM NODE    410.00 TO NODE    505.00 =    1660.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    505.00 TO NODE    505.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.067
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7861
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =   16.37   SUBAREA RUNOFF(CFS) =   39.47
  TOTAL AREA(ACRES) =       23.8   TOTAL RUNOFF(CFS) =      65.36
  TC(MIN.) =   12.58

****************************************************************************
  FLOW PROCESS FROM NODE    505.00 TO NODE    500.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1532.00  DOWNSTREAM(FEET) =   1512.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   760.00   CHANNEL SLOPE =  0.0263
  CHANNEL FLOW THRU SUBAREA(CFS) =      65.36
  FLOW VELOCITY(FEET/SEC) =   6.79 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.87   Tc(MIN.) =   14.45
  LONGEST FLOWPATH FROM NODE    410.00 TO NODE    500.00 =    2420.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       23.8  TC(MIN.) =     14.45
  PEAK FLOW RATE(CFS)   =      65.36
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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Analysis: Proposed - 100 Yr, 1Hr Storm
Description: Unmitigated Condition, POC-A
Soil Type D

Job Name: Costco Murrieta
Job #: 756-055
Date: 3/29/2018
File Name: Mur-UnMt

Node to Node		Code	Elev 1 (feet)	Elev 2 (feet)	Length (feet)	SubArea Land Use	Area (ac.)	Comments
150	145	2	1,537.7	1,534.3	215.0	1	0.37	INITIAL SUBAREA OF PD-A1-3
145	140	5	1,534.3	1,534.1	105.0			OPEN CHANNEL FLOWL, BASIN
140	140	8				1	1.41	ADD SUBAREA PD-A1-3
140	105	3	1,525.1	1,524.2	465.0			PIPE FLOW, TANK
105	105	1						CONFLUENCE 1 OF 3
135	130	2	1,537.6	1,531.9	335.0	1	0.34	INITIAL SUBAREA OF PD-A1-1
130	125	6	1,531.9	1,531.3	350.0	1	0.65	HALF STREET FLOW, 6" C&G
								ADDTION OF SUBAREA PD-A1-
125	105	3	1,526.3	1,524.2	25.0			PIPE FLOW
105	105	1						CONFLUENCE 2 OF 3
120	115	2	1,537.9	1,533.8	250.0	1	0.72	INITIAL AREA , PD-A1-2
115	110	5	1,533.8	1,533.6	75.0			OPEN CHANNEL FLOW, BASIN
110	105	3	1,526.3	1,524.2	25.0			PIPE FLOW
105	105	1						CONFLUENCE 3 OF 3
							3.49	SUM AT NODE 105
105	100	3	1,524.2	1,517.4	340.0			PIPE FLOW
100	100	8				8	1.18	ADD SUBAREA EX-A2
							4.67	SUM AT POC - A
350	345	2	1,537.4	1,529.9	330.0	1	0.65	INITIAL SUBAREA OF PD-B2-4
345	340	3	1,524.9	1,520.1	20.0			PIPE FLOW
340	340	8				1	1.32	ADD SUBAREA PD-B2-4

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Description: Unmitigated Condition, POC-A
Soil Type D

Job Name: Costco Murrieta
Job #: 756-055
Date: 3/29/2018
File Name: Mur-UnMt

340	305	3	1,520.1	1,511.6	60.0			PIPE FLOW
305	305	1						CONFLUENCE 1 OF 3
335	330	2	1,532.1	1,530.3	140.0	1	0.13	INITIAL SUBAREA OF PD-B2-6A
330	325	6	1,530.3	1,527.7	205.0	1	0.47	HALF STREET FLOW, 6" C&G
								ADD SUBAREA PD-B2-6A
325	320	3	1,523.7	1,516.3	35.0			PIPE FLOW
320	320	8				8	0.04	ADD SUBAREA PD-B2-B
320	305	3	1,512.3	1,511.6	110.0			PIPE FLOW
305	305	1						CONFLUENCE 2 OF 3
315	310	2	1,523.6	1,521.9	270.0	10	0.10	INITIAL SUBAREA OF PR-B2-B
310	305	9	1,521.9	1,520.8	440.0	8	0.30	ADD SUBAREA PR-B2-B
305	305	1						CONFLUENCE 3 OF 3
							3.01	SUM AT NODE 305
305	300	3	1,511.6	1,510.0	260.0			PIPE FLOW
300	300	1						CONFLUENCE 1 OF 2
130	301	2	1,531.9	1,524.8	145.0	10	0.10	INITIAL AREA, PD-B2-A
301	300	3	1,520.8	1,510.0	675.0			PIPE FLOW
300	300	1						CONFLUENCE 2 OF 2
							3.11	SUM AT NODE 300
300	200	3	1,510.0	1,498.1	1,275.0			PIPE FLOW
200	200	1						CONFLUENCE 1 OF 3
425	420	2	1,568.0	1,561.0	235.0	1	0.27	INITIAL SUBAREA OF PD-B2-7

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Analysis: Proposed - 100 Yr, 1Hr Storm
Description: Unmitigated Condition, POC-A
Soil Type D

Job Name: Costco Murrieta
Job #: 756-055
Date: 3/29/2018
File Name: Mur-UnMt

420	415	3	1,535.0	1,530.6	280.0			PIPE FLOW
415	415	8				1	1.68	ADD SUBAREA PD-B2-7
415	410	3	1,530.6	1,527.4	270.0			PIPE FLOW
410	410	8				COM	1.46	ADD SUBAREA PD-B2-5
410	405	3	1,524.9	1,524.7	210.0			PIPE FLOW, TANK
405	405	8				10	0.09	ADD SUBAREA PD-B2-C
405	400	3	1,524.7	1,520.3	85.0			PIPE FLOW
							3.50	SUM AT NODE 400
400	200	3	1,520.3	1,498.1	930.0			PIPE FLOW
200	200	1						CONFLUENCE 2 OF 3
210	205	2	1,526.2	1,519.3	270.0	Coeff.	0.48	INITIAL SUBAREA OF EX-B1
205	200	5	1,519.3	1,498.1	1,772.0			OPEN CHANNEL FLOW
200	200	8				8	22.37	ADD SUBAREA EX-B1
200	200	1						CONFLUENCE 3 OF 3
							29.46	SUM AT POC-B
425	675	2	1,568.0	1,562.9	255.0	roof	0.29	INITIAL SUBAREA OF PD-C1-8
675	670	3	1,535.0	1,532.0	210.0			PIPE FLOW
670	670	8				COM	2.38	ADD SUBAREA PD-C1-8
670	665	5	1,532.9	1,532.5	210.0			OPEN CHANNEL FLOW, BASIN
665	660	3	1,526.7	1,526.0	70.0			PIPE FLOW
660	660	8				COM	0.91	ADD SUBAREA PD-C1-10
660	655	3	1,526.0	1,525.8	90.0			PIPE FLOW, TANK
655	600	3	1,525.8	1,518.0	350.0			PIPE FLOW

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Soil Type D

Job Name: Costco Murrieta
Job #: 756-055
Date: 3/29/2018
File Name: Mur-UnMt

600	600	1						CONFLUENCE 1 OF 2
								150
650	645	2	1,568.0	1,564.2	190.0	ROOF	0.48	INITIAL SUBAREA PD-C1-9A
645	640	3	1,534.9	1,529.5	505.0			PIPE FLOW
640	640	8				1	0.36	ADD SUBAREA PD-C1-9B
640	635	5	1,529.5	1,529.3	100.0			CHANNEL FLOW, BASIN
635	635	8				COM	0.24	ADD SUBAREA PD-C1-11
635	600	3	1,524.3	1,518.0	20.0			PIPE FLOW
600	600	1						CONFLUENCE 2 OF 2
600	600	10						MEMORY BANK 1
630	625	2	1,534.9	1,531.9	235.0	COM	0.22	INITIAL SUBAREA PD-C1-12
625	625	8				COM	0.73	ADD SUBAREA PD-C1-12
625	620	5	1,525.0	1,524.8	75.0			CHANNEL FLOW, BASIN
620	605	3	1,520.8	1,519.6	250.0			PIPE FLOW
605	605	1						CONFLUENCE 1 OF 2
615	610	2	1,534.6	1,532.0	230.0	COM	0.30	INITIAL SUBAREA PD-C1-11
610	610	8				COM	0.46	ADD SUBAREA PD-C1-11
610	605	5	1,529.0	1,528.7	60.0			CHANNEL FLOW, BASIN
605	605	1						CONFLUENCE 2 OF 2
605	600	3	1,519.6	1,518.0	110.0			PIPE FLOW
600	600	11						CONFLUENCE MEM. BANK 1
600	600	12						CLEAR MEMORY BANK 1

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Job Name: Costco Murrieta
Job #: 756-055
Date: 3/29/2018
File Name: Mur-UnMt

600	600	8				8	1.51	ADD SUBAREA EX-C2
							7.88	SUM AT NODE 600
600	500	3	1,518.0	1,509.4	1,180.0			PIPE FLOW
500	500	1						CONFLUENCE 1 OF 2
515	510	2	1,560.0	1,539.5	320.0	8	0.89	INITIAL SUBAREA EX-C3
510	505	5	1,539.5	1,532.0	795.0			OPEN CHANNEL FLOW
505	505	8				8	15.48	ADD SUBAREA EX-C3
505	500	5	1,532.0	1,512.0	760.0			OPEN CHANNEL FLOW
500	500	1						CONFLUENCE 2 OF 2
							24.25	SUM AT POC-C

```
**************************************************************************
           RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-2014 Advanced Engineering Software (aes)
                    (Rational Tabling Version 21.0)
                Release Date: 06/01/2014  License ID 1355

                         Analysis prepared by:

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                               Suite 170
                          San Diego, CA 92122

 ************************* DESCRIPTION OF STUDY *************************
* COSTCO MURRIETA                                                        *
* UN-MITIGATED CONDITION                                                 *
* 100 YR, 1HR STORM EVENT                                                *
 ************************************************************************

  FILE NAME: MUR-UNMT.DAT
  TIME/DATE OF STUDY: 11:05 06/19/2018
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.360
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.880
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.480
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.300
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.5505732
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.5495536
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.300
  SLOPE OF INTENSITY DURATION CURVE = 0.5496
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   24.0     19.0    0.018/0.018/0.020   0.50    1.50 0.0312 0.125 0.0150
```

```
  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.67 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    145.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   215.00
  UPSTREAM ELEVATION(FEET) =   1537.70
  DOWNSTREAM ELEVATION(FEET) =   1534.30
  ELEVATION DIFFERENCE(FEET) =      3.40
  TC = 0.303*[(  215.00**3)/(     3.40)]**.2 =    5.953
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.628
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8921
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      1.53
  TOTAL AREA(ACRES) =      0.37   TOTAL RUNOFF(CFS) =      1.53

****************************************************************************
  FLOW PROCESS FROM NODE    145.00 TO NODE    140.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1534.30  DOWNSTREAM(FEET) =   1534.10
  CHANNEL LENGTH THRU SUBAREA(FEET) =   105.00   CHANNEL SLOPE =  0.0019
  CHANNEL FLOW THRU SUBAREA(CFS) =       1.53
  FLOW VELOCITY(FEET/SEC) =   0.71 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.46   Tc(MIN.) =    8.41
  LONGEST FLOWPATH FROM NODE    150.00 TO NODE    140.00 =     320.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    140.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.826
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8906
  SOIL CLASSIFICATION IS "D"
```

```
  SUBAREA AREA(ACRES) =    1.41   SUBAREA RUNOFF(CFS) =    4.80
  TOTAL AREA(ACRES) =        1.8   TOTAL RUNOFF(CFS) =       6.33
  TC(MIN.) =    8.41

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    105.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1525.10  DOWNSTREAM(FEET) =  1524.20
  FLOW LENGTH(FEET) =   465.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.62
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.33
  PIPE TRAVEL TIME(MIN.) =   2.14    Tc(MIN.) =   10.56
  LONGEST FLOWPATH FROM NODE    150.00 TO NODE    105.00 =     785.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.56
  RAINFALL INTENSITY(INCH/HR) =   3.38
  TOTAL STREAM AREA(ACRES) =     1.78
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.33

****************************************************************************
  FLOW PROCESS FROM NODE    135.00 TO NODE    130.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   335.00
  UPSTREAM ELEVATION(FEET) =   1537.60
  DOWNSTREAM ELEVATION(FEET) =   1531.90
  ELEVATION DIFFERENCE(FEET) =      5.70
  TC = 0.303*[(  335.00**3)/(     5.70)]**.2 =    7.005
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.232
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8914
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      1.28
```

```
  TOTAL AREA(ACRES) =      0.34   TOTAL RUNOFF(CFS) =      1.28

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    125.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) = 1531.90  DOWNSTREAM ELEVATION(FEET) = 1531.30
  STREET LENGTH(FEET) =   350.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 24.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  19.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.18
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.39
    HALFSTREET FLOOD WIDTH(FEET) =   14.61
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.08
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.42
  STREET FLOW TRAVEL TIME(MIN.) =   5.42   Tc(MIN.) =   12.42
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.089
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8887
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.65      SUBAREA RUNOFF(CFS) =    1.78
  TOTAL AREA(ACRES) =        1.0        PEAK FLOW RATE(CFS) =       3.07

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.43   HALFSTREET FLOOD WIDTH(FEET) =  16.76
  FLOW VELOCITY(FEET/SEC.) =  1.17   DEPTH*VELOCITY(FT*FT/SEC.) =   0.50
  LONGEST FLOWPATH FROM NODE    135.00 TO NODE    125.00 =     685.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    125.00 TO NODE    105.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1526.30  DOWNSTREAM(FEET) =  1524.20
  FLOW LENGTH(FEET) =    24.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.8 INCHES
```

```
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.75
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.07
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =   12.45
  LONGEST FLOWPATH FROM NODE    135.00 TO NODE    105.00 =     709.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   12.45
  RAINFALL INTENSITY(INCH/HR) =   3.08
  TOTAL STREAM AREA(ACRES) =     0.99
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.07

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    115.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   250.00
  UPSTREAM ELEVATION(FEET) =   1537.90
  DOWNSTREAM ELEVATION(FEET) =   1533.80
  ELEVATION DIFFERENCE(FEET) =      4.10
  TC = 0.303*[(  250.00**3)/(     4.10)]**.2 =    6.278
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.495
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8919
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      2.89
  TOTAL AREA(ACRES) =      0.72   TOTAL RUNOFF(CFS) =      2.89

****************************************************************************
  FLOW PROCESS FROM NODE    115.00 TO NODE    110.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1533.80  DOWNSTREAM(FEET) =   1533.60
  CHANNEL LENGTH THRU SUBAREA(FEET) =    75.00   CHANNEL SLOPE =  0.0027
  CHANNEL FLOW THRU SUBAREA(CFS) =       2.89
  FLOW VELOCITY(FEET/SEC) =   0.96 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.30   Tc(MIN.) =    7.58
```

```
 LONGEST FLOWPATH FROM NODE    120.00 TO NODE    110.00 =     325.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    110.00 TO NODE    105.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  1526.30  DOWNSTREAM(FEET) =  1524.20
 FLOW LENGTH(FEET) =    25.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  12.38
 ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       2.89
 PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    7.61
 LONGEST FLOWPATH FROM NODE    120.00 TO NODE    105.00 =     350.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
 TIME OF CONCENTRATION(MIN.) =    7.61
 RAINFALL INTENSITY(INCH/HR) =   4.04
 TOTAL STREAM AREA(ACRES) =     0.72
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.89

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1        6.33    10.56        3.378          1.78
     2        3.07    12.45        3.085          0.99
     3        2.89     7.61        4.043          0.72

 ********************************WARNING*********************************
 IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
 ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
 WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ************************************************************************

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  3 STREAMS.

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc      INTENSITY
```

```
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        9.33     7.61       4.043
      2       11.34    10.56       3.378
      3       11.05    12.45       3.085

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      11.34   Tc(MIN.) =   10.56
  TOTAL AREA(ACRES) =        3.5
  LONGEST FLOWPATH FROM NODE    150.00 TO NODE    105.00 =     785.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    100.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1524.20  DOWNSTREAM(FEET) =  1517.40
  FLOW LENGTH(FEET) =   340.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.14
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.34
  PIPE TRAVEL TIME(MIN.) =   0.56    Tc(MIN.) =   11.12
  LONGEST FLOWPATH FROM NODE    150.00 TO NODE    100.00 =    1125.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.283
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7927
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    1.18   SUBAREA RUNOFF(CFS) =    3.07
  TOTAL AREA(ACRES) =        4.7   TOTAL RUNOFF(CFS) =      14.41
  TC(MIN.) =   11.12

****************************************************************************
  FLOW PROCESS FROM NODE    350.00 TO NODE    345.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  UPSTREAM ELEVATION(FEET) =   1537.40
  DOWNSTREAM ELEVATION(FEET) =   1529.90
```

```
  ELEVATION DIFFERENCE(FEET) =      7.50
  TC = 0.303*[(  330.00**3)/(     7.50)]**.2 =    6.572
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.383
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8917
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      2.54
  TOTAL AREA(ACRES) =      0.65   TOTAL RUNOFF(CFS) =      2.54

****************************************************************************
  FLOW PROCESS FROM NODE    345.00 TO NODE    340.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1524.90  DOWNSTREAM(FEET) =  1520.10
  FLOW LENGTH(FEET) =    20.00   MANNING'S N =  0.011
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO  8.000
  DEPTH OF FLOW IN   8.0 INCH PIPE IS   3.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.75
  ESTIMATED PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.54
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    6.59
  LONGEST FLOWPATH FROM NODE    350.00 TO NODE    340.00 =     350.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    340.00 TO NODE    340.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.376
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8917
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    1.32   SUBAREA RUNOFF(CFS) =    5.15
  TOTAL AREA(ACRES) =        2.0   TOTAL RUNOFF(CFS) =       7.69
  TC(MIN.) =    6.59

****************************************************************************
  FLOW PROCESS FROM NODE    340.00 TO NODE    305.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1520.10  DOWNSTREAM(FEET) =  1511.60
  FLOW LENGTH(FEET) =    60.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  19.25
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.69
```

```
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    6.64
  LONGEST FLOWPATH FROM NODE    350.00 TO NODE    305.00 =     410.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    305.00 TO NODE    305.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.64
  RAINFALL INTENSITY(INCH/HR) =   4.36
  TOTAL STREAM AREA(ACRES) =     1.97
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.69

****************************************************************************
  FLOW PROCESS FROM NODE    335.00 TO NODE    330.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   140.00
  UPSTREAM ELEVATION(FEET) =   1532.10
  DOWNSTREAM ELEVATION(FEET) =   1530.30
  ELEVATION DIFFERENCE(FEET) =      1.80
  TC = 0.303*[(  140.00**3)/(     1.80)]**.2 =    5.227
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.971
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8926
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      0.58
  TOTAL AREA(ACRES) =      0.13   TOTAL RUNOFF(CFS) =      0.58

****************************************************************************
  FLOW PROCESS FROM NODE    330.00 TO NODE    325.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) = 1530.30  DOWNSTREAM ELEVATION(FEET) = 1527.70
  STREET LENGTH(FEET) =   205.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 24.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  19.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018
```

```
  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.48
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.27
    HALFSTREET FLOOD WIDTH(FEET) =    8.01
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.13
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.58
  STREET FLOW TRAVEL TIME(MIN.) =   1.60   Tc(MIN.) =    6.83
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.292
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8916
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.47      SUBAREA RUNOFF(CFS) =    1.80
  TOTAL AREA(ACRES) =        0.6        PEAK FLOW RATE(CFS) =       2.38

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.31   HALFSTREET FLOOD WIDTH(FEET) =   9.94
  FLOW VELOCITY(FEET/SEC.) =  2.37   DEPTH*VELOCITY(FT*FT/SEC.) =   0.73
  LONGEST FLOWPATH FROM NODE    335.00 TO NODE    325.00 =     345.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    325.00 TO NODE    320.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1523.70  DOWNSTREAM(FEET) =  1516.30
  FLOW LENGTH(FEET) =    35.00   MANNING'S N =  0.011
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO  8.000
  DEPTH OF FLOW IN   8.0 INCH PIPE IS   3.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.65
  ESTIMATED PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.38
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    6.86
  LONGEST FLOWPATH FROM NODE    335.00 TO NODE    320.00 =     380.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    320.00 TO NODE    320.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.280
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .8153
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.04   SUBAREA RUNOFF(CFS) =    0.14
```

```
  TOTAL AREA(ACRES) =        0.6   TOTAL RUNOFF(CFS) =       2.51
  TC(MIN.) =    6.86

****************************************************************************
  FLOW PROCESS FROM NODE    320.00 TO NODE    305.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1512.30  DOWNSTREAM(FEET) =  1511.60
  FLOW LENGTH(FEET) =   110.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   8.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.49
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.51
  PIPE TRAVEL TIME(MIN.) =   0.41    Tc(MIN.) =    7.27
  LONGEST FLOWPATH FROM NODE    335.00 TO NODE    305.00 =     490.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    305.00 TO NODE    305.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.27
  RAINFALL INTENSITY(INCH/HR) =   4.15
  TOTAL STREAM AREA(ACRES) =     0.64
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.51

****************************************************************************
  FLOW PROCESS FROM NODE    315.00 TO NODE    310.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH GOOD COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   270.00
  UPSTREAM ELEVATION(FEET) =   1523.60
  DOWNSTREAM ELEVATION(FEET) =   1521.90
  ELEVATION DIFFERENCE(FEET) =      1.70
  TC = 0.937*[(  270.00**3)/(     1.70)]**.2 =   24.247
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.139
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7452
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      0.16
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.16
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    310.00 TO NODE    305.00 IS CODE =  92
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =   1521.90
  DOWNSTREAM NODE ELEVATION(FEET) =   1520.80
  CHANNEL LENGTH THRU SUBAREA(FEET) =   440.00
  "V" GUTTER WIDTH(FEET) =   3.00   GUTTER HIKE(FEET) =  0.125
  PAVEMENT LIP(FEET) =  0.031   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.20000
  MAXIMUM DEPTH(FEET) =   1.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.874
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7275
  SOIL CLASSIFICATION IS "D"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      0.36
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.11
  AVERAGE FLOW DEPTH(FEET) =   0.17   FLOOD WIDTH(FEET) =    3.15
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   6.59   Tc(MIN.) =   30.84
  SUBAREA AREA(ACRES) =    0.30       SUBAREA RUNOFF(CFS) =    0.41
  TOTAL AREA(ACRES) =        0.4          PEAK FLOW RATE(CFS) =       0.57

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.20   FLOOD WIDTH(FEET) =    3.48
  FLOW VELOCITY(FEET/SEC.) =   1.30   DEPTH*VELOCITY(FT*FT/SEC) =   0.27
  LONGEST FLOWPATH FROM NODE    315.00 TO NODE    305.00 =     710.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    305.00 TO NODE    305.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =   30.84
  RAINFALL INTENSITY(INCH/HR) =   1.87
  TOTAL STREAM AREA(ACRES) =     0.40
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.57

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        7.69     6.64        4.357          1.97
      2        2.51     7.27        4.146          0.64
      3        0.57    30.84        1.874          0.40
```

```
 **********************************WARNING***********************************
  IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
  ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
  WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ****************************************************************************

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       10.11     6.64       4.357
      2        9.97     7.27       4.146
      3        5.01    30.84       1.874

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      10.11   Tc(MIN.) =    6.64
  TOTAL AREA(ACRES) =        3.0
  LONGEST FLOWPATH FROM NODE    315.00 TO NODE    305.00 =     710.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    305.00 TO NODE    300.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1511.60  DOWNSTREAM(FEET) =  1510.00
  FLOW LENGTH(FEET) =   260.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.32
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.11
  PIPE TRAVEL TIME(MIN.) =   0.69    Tc(MIN.) =    7.33
  LONGEST FLOWPATH FROM NODE    315.00 TO NODE    300.00 =     970.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    300.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.33
  RAINFALL INTENSITY(INCH/HR) =   4.13
  TOTAL STREAM AREA(ACRES) =     3.01
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     10.11
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH GOOD COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =   1531.90
  DOWNSTREAM ELEVATION(FEET) =   1524.80
  ELEVATION DIFFERENCE(FEET) =      7.10
  TC = 0.937*[(   50.00**3)/(     7.10)]**.2 =    6.623
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.364
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .8168
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      0.36
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.36

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    300.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1520.80  DOWNSTREAM(FEET) =  1510.00
  FLOW LENGTH(FEET) =   675.00   MANNING'S N =  0.011
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO  8.000
  DEPTH OF FLOW IN   8.0 INCH PIPE IS   2.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.90
  ESTIMATED PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.36
  PIPE TRAVEL TIME(MIN.) =   2.88    Tc(MIN.) =    9.50
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    300.00 =     725.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    300.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.50
  RAINFALL INTENSITY(INCH/HR) =   3.58
  TOTAL STREAM AREA(ACRES) =     0.10
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.36
```

```
 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       10.11     7.33        4.128          3.01
     2        0.36     9.50        3.579          0.10

 ********************************WARNING*********************************
 IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
 ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
 WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ************************************************************************

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc      INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       10.39     7.33       4.128
     2        9.12     9.50       3.579

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      10.39   Tc(MIN.) =    7.33
 TOTAL AREA(ACRES) =        3.1
 LONGEST FLOWPATH FROM NODE    315.00 TO NODE    300.00 =     970.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    300.00 TO NODE    200.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  1510.00  DOWNSTREAM(FEET) =  1498.10
 FLOW LENGTH(FEET) =  1275.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  13.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.30
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      10.39
 PIPE TRAVEL TIME(MIN.) =   2.91    Tc(MIN.) =   10.24
 LONGEST FLOWPATH FROM NODE    315.00 TO NODE    200.00 =    2245.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    200.00 TO NODE    200.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
```

```
  TIME OF CONCENTRATION(MIN.) =   10.24
  RAINFALL INTENSITY(INCH/HR) =   3.43
  TOTAL STREAM AREA(ACRES) =     3.11
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     10.39

****************************************************************************
  FLOW PROCESS FROM NODE    425.00 TO NODE    420.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   235.00
  UPSTREAM ELEVATION(FEET) =   1568.00
  DOWNSTREAM ELEVATION(FEET) =   1561.00
  ELEVATION DIFFERENCE(FEET) =      7.00
  TC = 0.303*[(  235.00**3)/(     7.00)]**.2 =    5.435
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.865
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8925
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      1.17
  TOTAL AREA(ACRES) =      0.27   TOTAL RUNOFF(CFS) =      1.17

****************************************************************************
  FLOW PROCESS FROM NODE    420.00 TO NODE    415.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1535.00  DOWNSTREAM(FEET) =  1530.60
  FLOW LENGTH(FEET) =   280.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.28
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.17
  PIPE TRAVEL TIME(MIN.) =   0.88    Tc(MIN.) =    6.32
  LONGEST FLOWPATH FROM NODE    425.00 TO NODE    415.00 =     515.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    415.00 TO NODE    415.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.479
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8919
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    1.68   SUBAREA RUNOFF(CFS) =    6.71
```

```
  TOTAL AREA(ACRES) =        1.9   TOTAL RUNOFF(CFS) =       7.88
  TC(MIN.) =    6.32

****************************************************************************
  FLOW PROCESS FROM NODE    415.00 TO NODE    410.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1530.60  DOWNSTREAM(FEET) =  1527.40
  FLOW LENGTH(FEET) =   270.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  12.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.33
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.88
  PIPE TRAVEL TIME(MIN.) =   0.61    Tc(MIN.) =    6.93
  LONGEST FLOWPATH FROM NODE    425.00 TO NODE    410.00 =     785.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    410.00 TO NODE    410.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.256
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8915
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    1.46   SUBAREA RUNOFF(CFS) =    5.54
  TOTAL AREA(ACRES) =        3.4   TOTAL RUNOFF(CFS) =      13.42
  TC(MIN.) =    6.93

****************************************************************************
  FLOW PROCESS FROM NODE    410.00 TO NODE    405.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1524.90  DOWNSTREAM(FEET) =  1524.70
  FLOW LENGTH(FEET) =   210.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  23.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.29
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.42
  PIPE TRAVEL TIME(MIN.) =   1.06    Tc(MIN.) =    8.00
  LONGEST FLOWPATH FROM NODE    425.00 TO NODE    405.00 =     995.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    405.00 TO NODE    405.00 IS CODE =  81
----------------------------------------------------------------------------
```

```
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.935
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .8087
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.09   SUBAREA RUNOFF(CFS) =    0.29
  TOTAL AREA(ACRES) =        3.5   TOTAL RUNOFF(CFS) =      13.71
  TC(MIN.) =    8.00

****************************************************************************
  FLOW PROCESS FROM NODE    405.00 TO NODE    400.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1524.70  DOWNSTREAM(FEET) =  1520.30
  FLOW LENGTH(FEET) =    85.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.02
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.71
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =    8.09
  LONGEST FLOWPATH FROM NODE    425.00 TO NODE    400.00 =    1080.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    200.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1520.30  DOWNSTREAM(FEET) =  1498.10
  FLOW LENGTH(FEET) =   930.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.31
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.71
  PIPE TRAVEL TIME(MIN.) =   1.37    Tc(MIN.) =    9.46
  LONGEST FLOWPATH FROM NODE    425.00 TO NODE    200.00 =    2010.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    200.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.46
  RAINFALL INTENSITY(INCH/HR) =   3.59
```

```
  TOTAL STREAM AREA(ACRES) =     3.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     13.71

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    205.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH POOR COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   270.00
  UPSTREAM ELEVATION(FEET) =   1526.20
  DOWNSTREAM ELEVATION(FEET) =   1519.30
  ELEVATION DIFFERENCE(FEET) =      6.90
  TC = 0.533*[(  270.00**3)/(     6.90)]**.2 =   10.410
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.404
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7961
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      1.30
  TOTAL AREA(ACRES) =      0.48   TOTAL RUNOFF(CFS) =      1.30

****************************************************************************
  FLOW PROCESS FROM NODE    205.00 TO NODE    200.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1519.30  DOWNSTREAM(FEET) =   1498.10
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1275.00   CHANNEL SLOPE =  0.0166
  CHANNEL FLOW THRU SUBAREA(CFS) =       1.30
  FLOW VELOCITY(FEET/SEC) =   2.03 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =  10.45   Tc(MIN.) =   20.86
  LONGEST FLOWPATH FROM NODE    210.00 TO NODE    200.00 =    1545.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    200.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.323
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7555
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =   22.37   SUBAREA RUNOFF(CFS) =   39.27
  TOTAL AREA(ACRES) =      22.9   TOTAL RUNOFF(CFS) =     40.57
  TC(MIN.) =   20.86

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

```
 FLOW PROCESS FROM NODE    200.00 TO NODE    200.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
 TIME OF CONCENTRATION(MIN.) =   20.86
 RAINFALL INTENSITY(INCH/HR) =   2.32
 TOTAL STREAM AREA(ACRES) =    22.85
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     40.57

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       10.39    10.24        3.435          3.11
     2       13.71     9.46        3.587          3.50
     3       40.57    20.86        2.323         22.85

**********************************WARNING***********************************
 IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
 ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
 WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
****************************************************************************

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  3 STREAMS.

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc      INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       41.71     9.46       3.587
     2       43.43    10.24       3.435
     3       56.47    20.86       2.323

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      56.47   Tc(MIN.) =   20.86
 TOTAL AREA(ACRES) =       29.5
 LONGEST FLOWPATH FROM NODE    315.00 TO NODE    200.00 =    2245.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    425.00 TO NODE    675.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
 TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
```

```
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   255.00
 UPSTREAM ELEVATION(FEET) =   1568.00
 DOWNSTREAM ELEVATION(FEET) =   1562.90
 ELEVATION DIFFERENCE(FEET) =      5.10
 TC = 0.303*[(  255.00**3)/(     5.10)]**.2 =    6.081
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.574
 COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8920
 SOIL CLASSIFICATION IS "D"
 SUBAREA RUNOFF(CFS) =      1.18
 TOTAL AREA(ACRES) =      0.29   TOTAL RUNOFF(CFS) =      1.18

****************************************************************************
 FLOW PROCESS FROM NODE    675.00 TO NODE    670.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  1535.00  DOWNSTREAM(FEET) =  1532.00
 FLOW LENGTH(FEET) =   210.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.10
 ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       1.18
 PIPE TRAVEL TIME(MIN.) =   0.69    Tc(MIN.) =    6.77
 LONGEST FLOWPATH FROM NODE    425.00 TO NODE    670.00 =     465.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    670.00 TO NODE    670.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.313
 COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8916
 SOIL CLASSIFICATION IS "D"
 SUBAREA AREA(ACRES) =    2.38   SUBAREA RUNOFF(CFS) =    9.15
 TOTAL AREA(ACRES) =        2.7   TOTAL RUNOFF(CFS) =      10.34
 TC(MIN.) =    6.77

****************************************************************************
 FLOW PROCESS FROM NODE    670.00 TO NODE    665.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   1532.90  DOWNSTREAM(FEET) =   1532.50
 CHANNEL LENGTH THRU SUBAREA(FEET) =   210.00   CHANNEL SLOPE =  0.0019
 CHANNEL FLOW THRU SUBAREA(CFS) =      10.34
 FLOW VELOCITY(FEET/SEC) =   1.10 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
```

```
  TRAVEL TIME(MIN.) =   3.18   Tc(MIN.) =    9.95
  LONGEST FLOWPATH FROM NODE    425.00 TO NODE    665.00 =     675.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    665.00 TO NODE    660.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1526.70  DOWNSTREAM(FEET) =  1526.00
  FLOW LENGTH(FEET) =    70.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  13.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.52
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.34
  PIPE TRAVEL TIME(MIN.) =   0.16    Tc(MIN.) =   10.10
  LONGEST FLOWPATH FROM NODE    425.00 TO NODE    660.00 =     745.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    660.00 TO NODE    660.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.460
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8898
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.91   SUBAREA RUNOFF(CFS) =    2.80
  TOTAL AREA(ACRES) =        3.6   TOTAL RUNOFF(CFS) =      13.14
  TC(MIN.) =   10.10

****************************************************************************
  FLOW PROCESS FROM NODE    660.00 TO NODE    655.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1526.00  DOWNSTREAM(FEET) =  1525.80
  FLOW LENGTH(FEET) =    90.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.58
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.14
  PIPE TRAVEL TIME(MIN.) =   0.33    Tc(MIN.) =   10.43
  LONGEST FLOWPATH FROM NODE    425.00 TO NODE    655.00 =     835.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    655.00 TO NODE    600.00 IS CODE =  31
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1525.80  DOWNSTREAM(FEET) =  1518.00
  FLOW LENGTH(FEET) =   350.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.91
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.14
  PIPE TRAVEL TIME(MIN.) =   0.53    Tc(MIN.) =   10.97
  LONGEST FLOWPATH FROM NODE    425.00 TO NODE    600.00 =    1185.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    600.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.97
  RAINFALL INTENSITY(INCH/HR) =   3.31
  TOTAL STREAM AREA(ACRES) =     3.58
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     13.14

****************************************************************************
  FLOW PROCESS FROM NODE    650.00 TO NODE    645.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
================================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   190.00
  UPSTREAM ELEVATION(FEET) =   1568.00
  DOWNSTREAM ELEVATION(FEET) =   1564.20
  ELEVATION DIFFERENCE(FEET) =      3.80
  TC = 0.303*[(  190.00**3)/(     3.80)]**.2 =    5.406
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.880
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8925
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      2.09
  TOTAL AREA(ACRES) =      0.48   TOTAL RUNOFF(CFS) =      2.09

****************************************************************************
  FLOW PROCESS FROM NODE    645.00 TO NODE    640.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
```

```
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1534.90  DOWNSTREAM(FEET) =  1529.50
  FLOW LENGTH(FEET) =   505.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.27
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.09
  PIPE TRAVEL TIME(MIN.) =   1.60    Tc(MIN.) =    7.00
  LONGEST FLOWPATH FROM NODE    650.00 TO NODE    640.00 =     695.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    640.00 TO NODE    640.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.232
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8914
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.36   SUBAREA RUNOFF(CFS) =    1.36
  TOTAL AREA(ACRES) =        0.8   TOTAL RUNOFF(CFS) =       3.45
  TC(MIN.) =    7.00

****************************************************************************
  FLOW PROCESS FROM NODE    640.00 TO NODE    635.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1529.50  DOWNSTREAM(FEET) =   1529.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   100.00   CHANNEL SLOPE =  0.0020
  CHANNEL FLOW THRU SUBAREA(CFS) =       3.45
  FLOW VELOCITY(FEET/SEC) =   0.87 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.92   Tc(MIN.) =    8.93
  LONGEST FLOWPATH FROM NODE    650.00 TO NODE    635.00 =     795.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    635.00 TO NODE    635.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.704
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8904
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.19   SUBAREA RUNOFF(CFS) =    0.63
  TOTAL AREA(ACRES) =        1.0   TOTAL RUNOFF(CFS) =       4.08
  TC(MIN.) =    8.93

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

```
 FLOW PROCESS FROM NODE    635.00 TO NODE    600.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  1524.30  DOWNSTREAM(FEET) =  1518.00
 FLOW LENGTH(FEET) =    20.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN   9.0 INCH PIPE IS   3.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  22.12
 ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       4.08
 PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    8.94
 LONGEST FLOWPATH FROM NODE    650.00 TO NODE    600.00 =     815.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    600.00 TO NODE    600.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.94
 RAINFALL INTENSITY(INCH/HR) =   3.70
 TOTAL STREAM AREA(ACRES) =     1.03
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.08

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       13.14    10.97        3.308          3.58
     2        4.08     8.94        3.700          1.03

 ********************************WARNING*********************************
 IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
 ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
 WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ************************************************************************

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc      INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       14.79     8.94       3.700
     2       16.78    10.97       3.308
```

```
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      16.78   Tc(MIN.) =   10.97
  TOTAL AREA(ACRES) =        4.6
  LONGEST FLOWPATH FROM NODE    425.00 TO NODE    600.00 =    1185.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    600.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    630.00 TO NODE    625.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   235.00
  UPSTREAM ELEVATION(FEET) =   1534.90
  DOWNSTREAM ELEVATION(FEET) =   1531.90
  ELEVATION DIFFERENCE(FEET) =      3.00
  TC = 0.303*[(  235.00**3)/(     3.00)]**.2 =    6.439
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.433
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8918
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      0.87
  TOTAL AREA(ACRES) =      0.22   TOTAL RUNOFF(CFS) =      0.87

****************************************************************************
  FLOW PROCESS FROM NODE    625.00 TO NODE    625.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.433
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8918
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.73   SUBAREA RUNOFF(CFS) =    2.89
  TOTAL AREA(ACRES) =        1.0   TOTAL RUNOFF(CFS) =       3.76
  TC(MIN.) =    6.44

****************************************************************************
  FLOW PROCESS FROM NODE    625.00 TO NODE    620.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =   1525.00  DOWNSTREAM(FEET) =   1524.80
  CHANNEL LENGTH THRU SUBAREA(FEET) =    75.00   CHANNEL SLOPE =  0.0027
  CHANNEL FLOW THRU SUBAREA(CFS) =       3.76
  FLOW VELOCITY(FEET/SEC) =   1.02 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.23   Tc(MIN.) =    7.66
  LONGEST FLOWPATH FROM NODE    630.00 TO NODE    620.00 =     310.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    620.00 TO NODE    605.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1520.80  DOWNSTREAM(FEET) =  1519.60
  FLOW LENGTH(FEET) =   250.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   9.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.48
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.76
  PIPE TRAVEL TIME(MIN.) =   0.93    Tc(MIN.) =    8.59
  LONGEST FLOWPATH FROM NODE    630.00 TO NODE    605.00 =     560.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    605.00 TO NODE    605.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.59
  RAINFALL INTENSITY(INCH/HR) =   3.78
  TOTAL STREAM AREA(ACRES) =     0.95
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.76

****************************************************************************
  FLOW PROCESS FROM NODE    615.00 TO NODE    610.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
          ASSUMED INITIAL SUBAREA UNIFORM
          DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   230.00
  UPSTREAM ELEVATION(FEET) =   1534.60
  DOWNSTREAM ELEVATION(FEET) =   1532.00
  ELEVATION DIFFERENCE(FEET) =      2.60
  TC = 0.303*[(  230.00**3)/(     2.60)]**.2 =    6.541
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.394
```

```
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8917
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      1.18
  TOTAL AREA(ACRES) =      0.30   TOTAL RUNOFF(CFS) =      1.18

****************************************************************************
  FLOW PROCESS FROM NODE    610.00 TO NODE    610.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.394
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8917
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.46   SUBAREA RUNOFF(CFS) =    1.80
  TOTAL AREA(ACRES) =        0.8   TOTAL RUNOFF(CFS) =       2.98
  TC(MIN.) =    6.54

****************************************************************************
  FLOW PROCESS FROM NODE    610.00 TO NODE    605.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1529.00  DOWNSTREAM(FEET) =   1528.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =    60.00   CHANNEL SLOPE =  0.0050
  CHANNEL FLOW THRU SUBAREA(CFS) =       2.98
  FLOW VELOCITY(FEET/SEC) =   1.33 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.75   Tc(MIN.) =    7.30
  LONGEST FLOWPATH FROM NODE    615.00 TO NODE    605.00 =     290.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    605.00 TO NODE    605.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.30
  RAINFALL INTENSITY(INCH/HR) =   4.14
  TOTAL STREAM AREA(ACRES) =     0.76
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.98

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        3.76     8.59        3.782          0.95
      2        2.98     7.30        4.139          0.76
```

```
 ***********************************WARNING************************************
  IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
  ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
  WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ******************************************************************************

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        6.17     7.30       4.139
      2        6.48     8.59       3.782

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       6.48   Tc(MIN.) =    8.59
  TOTAL AREA(ACRES) =        1.7
  LONGEST FLOWPATH FROM NODE    630.00 TO NODE    605.00 =     560.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    605.00 TO NODE    600.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1519.60  DOWNSTREAM(FEET) =  1518.00
  FLOW LENGTH(FEET) =   110.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   9.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.79
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.48
  PIPE TRAVEL TIME(MIN.) =   0.24    Tc(MIN.) =    8.83
  LONGEST FLOWPATH FROM NODE    630.00 TO NODE    600.00 =     670.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    600.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        6.48     8.83       3.726        1.71
  LONGEST FLOWPATH FROM NODE    630.00 TO NODE    600.00 =     670.00 FEET.
```

```
 ** MEMORY BANK #  1 CONFLUENCE DATA **
 STREAM     RUNOFF       Tc       INTENSITY     AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)   (ACRE)
     1       16.78    10.97        3.308        4.61
 LONGEST FLOWPATH FROM NODE    425.00 TO NODE    600.00 =    1185.00 FEET.

 ****************************WARNING*********************************
 IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
 ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
 WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ********************************************************************

 ** PEAK FLOW RATE TABLE **
 STREAM    RUNOFF       Tc       INTENSITY
 NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1      19.99       8.83        3.726
     2      22.53      10.97        3.308

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      22.53   Tc(MIN.) =   10.97
 TOTAL AREA(ACRES) =        6.3

****************************************************************************
 FLOW PROCESS FROM NODE    600.00 TO NODE    600.00 IS CODE =  12
----------------------------------------------------------------------------
 >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    600.00 TO NODE    600.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.308
 UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7934
 SOIL CLASSIFICATION IS "D"
 SUBAREA AREA(ACRES) =    1.51   SUBAREA RUNOFF(CFS) =    3.96
 TOTAL AREA(ACRES) =        7.8   TOTAL RUNOFF(CFS) =      26.49
 TC(MIN.) =   10.97

****************************************************************************
 FLOW PROCESS FROM NODE    600.00 TO NODE    500.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  1518.00  DOWNSTREAM(FEET) =  1509.40
 FLOW LENGTH(FEET) =  1180.00   MANNING'S N =  0.011
```

```
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  19.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.43
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      26.49
  PIPE TRAVEL TIME(MIN.) =   2.33    Tc(MIN.) =   13.30
  LONGEST FLOWPATH FROM NODE    425.00 TO NODE    500.00 =    2365.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    500.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   13.30
  RAINFALL INTENSITY(INCH/HR) =   2.98
  TOTAL STREAM AREA(ACRES) =     7.83
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     26.49

****************************************************************************
  FLOW PROCESS FROM NODE    515.00 TO NODE    510.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH POOR COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   350.00
  UPSTREAM ELEVATION(FEET) =   1560.00
  DOWNSTREAM ELEVATION(FEET) =   1539.50
  ELEVATION DIFFERENCE(FEET) =     20.50
  TC = 0.533*[(  350.00**3)/(    20.50)]**.2 =    9.783
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.522
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7992
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      2.51
  TOTAL AREA(ACRES) =      0.89   TOTAL RUNOFF(CFS) =      2.51

****************************************************************************
  FLOW PROCESS FROM NODE    510.00 TO NODE    505.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1539.50  DOWNSTREAM(FEET) =   1532.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   795.00   CHANNEL SLOPE =  0.0094
  CHANNEL FLOW THRU SUBAREA(CFS) =       2.51
  FLOW VELOCITY(FEET/SEC) =   1.75 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
```

```
 TRAVEL TIME(MIN.) =   7.56   Tc(MIN.) =   17.34
 LONGEST FLOWPATH FROM NODE    515.00 TO NODE    505.00 =    1145.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    505.00 TO NODE    505.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.572
 UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7674
 SOIL CLASSIFICATION IS "D"
 SUBAREA AREA(ACRES) =   15.48   SUBAREA RUNOFF(CFS) =   30.55
 TOTAL AREA(ACRES) =       16.4   TOTAL RUNOFF(CFS) =      33.05
 TC(MIN.) =   17.34

****************************************************************************
 FLOW PROCESS FROM NODE    505.00 TO NODE    500.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   1532.00  DOWNSTREAM(FEET) =   1512.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   760.00   CHANNEL SLOPE =  0.0263
 CHANNEL FLOW THRU SUBAREA(CFS) =      33.05
 FLOW VELOCITY(FEET/SEC) =   5.58 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   2.27   Tc(MIN.) =   19.61
 LONGEST FLOWPATH FROM NODE    515.00 TO NODE    500.00 =    1905.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    500.00 TO NODE    500.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =   19.61
 RAINFALL INTENSITY(INCH/HR) =   2.40
 TOTAL STREAM AREA(ACRES) =    16.37
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     33.05

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       26.49    13.30        2.975          7.83
     2       33.05    19.61        2.404         16.37

 ********************************WARNING*********************************
```

```
  IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
  ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
  WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ************************************************************************

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       48.91    13.30       2.975
      2       54.46    19.61       2.404

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      54.46   Tc(MIN.) =   19.61
  TOTAL AREA(ACRES) =       24.2
  LONGEST FLOWPATH FROM NODE    425.00 TO NODE    500.00 =    2365.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       24.2  TC(MIN.) =     19.61
  PEAK FLOW RATE(CFS)   =      54.46
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

ATTACHMENT I

EXHIBITS FOR PROPOSED SD OF ADJACENT DEVELOPMENTS

COSTCO (PORTION)
PER PARCEL 1 OF
UNIT 1 TPM 37511

LEGEND

DENOTES HYDROLOGY
NODE PER COSTCO
DEVELOPMENT

NODE
200

NODE
301

NODE
305

NODE
300

NODE
200

ARMSPRING PARKWAY

CLINTION KEITH ROAD

CLINTION KEITH ROAD

SITE MAP
VINEYARD – CK 17

KEY MAP

COSTCO (PORTION)
PER PARCEL 1 OF
UNIT 1 TPM 37511

ANTELOPE ROAD

CLINTON KEITH ROAD

CREIGHTON AVE

WARM SPRINGS PARKWAY

BRONCO WAY

NODE 301

NODE 305

NODE 300

NODE 200

SHEET 2 · SHEET 5 · SHEET 6 · SHEET 7 · SHEET 8 · SHEET 9 · SHEET 10 · SHEET 11 · SHEET 12 · SHEET 13 · SHEET 14 · SHEET 19

PARCEL 1 · PARCEL 2 · PARCEL 3 · PARCEL 4 · PARCEL 5 · PARCEL 6 · PARCEL 9 · PARCEL 10 · PARCEL 11 · PARCEL 12 · PARCEL 13 · PARCEL 14 · PARCEL 15 · PARCEL 16

BUILDING N

P/L · R/W · F W · G G

SCALE: 1"=50'
0 50 100 150 200

LINE TABLE

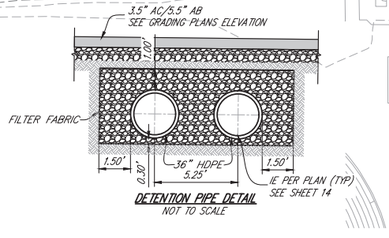
NO.	BEARING	LENGTH
L1	N87°04'51"W	45.97'
L2	N43°13'02"W	27.22'
L3	N00°38'45"E	47.67'
L4	N89°21'15"W	17.11'
L5	N89°21'15"W	49.00'
L6	N39°48'10"E	36.29'
L7	N44°21'15"W	18.38'
L8	N00°38'45"E	43.10'
L9	N45°38'45"E	18.38'
L10	N00°38'45"E	45.90'
L11	N00°38'45"E	27.32'
L12	N42°13'59"W	33.80'
L13	N00°38'45"E	35.65'
L14	N00°38'45"E	60.00'
L15	N00°38'45"E	29.53'
L16	N00°38'45"E	30.00'
L17	N89°21'15"W	24.51'
L18	N44°21'15"W	18.38'
L19	N00°38'45"E	24.05'
L20	N89°21'15"W	12.00'
L21	N00°38'45"E	19.05'
L22	N45°38'45"E	18.38'
L23	N44°21'15"W	23.31'

LINE TABLE (CONT'D)

NO.	BEARING	LENGTH
L24	N70°46'19"E	41.77'
L25	N89°32'20"W	67.47'
L26	N69°54'54"W	43.33'
L27	N89°21'10"W	19.04'
L28	N00°38'50"E	3.00'
L29	N89°21'10"W	22.00'
L30	N00°38'50"E	3.00'
L31	N78°48'26"E	14.62'
L32	N89°21'10"W	7.21'
L33	N17°55'26"W	15.14'
L34	N89°21'10"W	14.13'
L35	N45°36'54"E	26.44'
L36	N89°21'15"W	37.53'
L37	N89°21'15"W	24.98'
L38	N44°21'15"W	26.87'

CURVE TABLE

NO.	DELTA	RADIUS	LENGTH
C1	02°19'48"	939.00'	38.19'
C2	12°55'38"	274.20'	61.87'
C3	08°53'53"	262.20'	40.72'
C4	00°10'49"	262.20'	0.82'
C5	18°55'53"	206.22'	68.14'
C6	18°55'53"	182.00'	60.14'
C7	22°37'11"	90.00'	35.53'
C8	22°37'11"	66.00'	26.06'
C9	02°25'45"	206.22'	8.74'
C10	16°30'08"	206.22'	59.40'
C11	08°26'21"	37.83'	5.57'
C12	43°27'12"	100.00'	75.84'
C13	22°12'43"	42.00'	16.28'



DETENTION PIPE DETAIL
NOT TO SCALE

LEGEND

SHEET MATCH LINES

"AS BUILT"

THE RECEIPT OF AS-BUILT PLANS AND CITY'S ACCEPTANCE THEREOF DOES NOT ABSOLVE THE ENGINEER OF WORK OF ANY RESPONSIBILITY FOR THE PROJECT DESIGN.

ENGINEER OF WORK — DATE

RCE NO. — EXPIRATION DATE

SEAL: REGISTERED PROFESSIONAL ENGINEER · ROBERT D. DENTINO · No. 45629 · Exp.12-31-18 · CIVIL · STATE OF CALIFORNIA

SCALE: HORIZONTAL AS NOTED · VERTICAL AS NOTED

EXCEL ENGINEERING
LAND PLANNING • ENGINEERING • SURVEYING
440 STATE PLACE, ESCONDIDO, CA 92029
PH (760)745-8118 FX (760)745-1890

PREPARED BY — DATE
ROBERT D. DENTINO — May 25, 2018
RCE NO. 45929 EXP. DATE 12-31-18

DATE	INITIAL	REVISION DESCRIPTION	SHT. NO.	DATE	INITIAL
ENGINEER OF WORK				CITY APPROVAL	

Underground Service Alert
DIG BEFORE YOU DIG
Call: TOLL FREE 1-800 422-4133
TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK
DESCRIPTON: RIVERSIDE COUNTY DESIGNATION "600-20-68", DISK STAMPED
LOCATION: BRASS DISK STAMPED "600-20-68" IN CONCRETE POST. 0.2 MILES SOUTH ON WASHINGTON AVE FROM THE POST OFFICE IN MURRIETA
RECORDED: 1970
ELEVATION: 1517.543 DATUM: NGVD 29

RECOMMEND APPROVAL
WILLIAM G. BIXBY — DATE
BUREAU VERITAS NORTH AMERICA, INC.
RCE NO. 48819

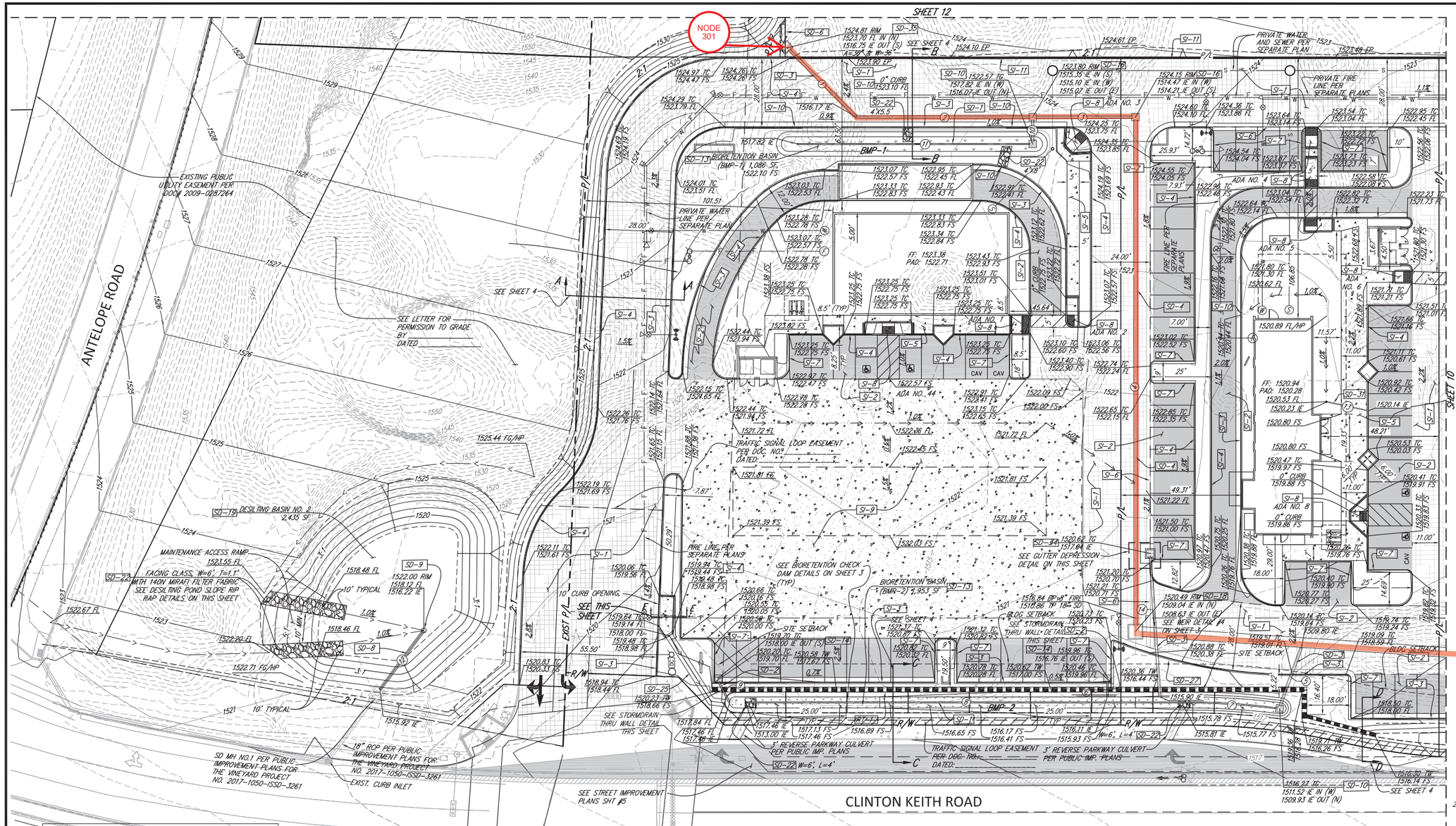
SHEET 2 · CITY OF MURRIETA · ENGINEERING DEPARTMENT · SHEETS 19

PRECISE GRADING PLAN – KEY MAP
PM 36493 / DP-2012-3260
THE VINEYARD
WDID# 9 33C380916

APPROVED
ROBERT K. MOEHLING — DATE
CITY ENGINEER — RCE 63056

DWN BY: · CHKD BY: · FIELD BK:
PROJECT NO. 2017-1132 GP 3517
DRAWING NO.

I:\16\16063\engineering\DP&P\current\DP\16063DP02Key Map.dwg 5/25/2018 4:50 PM ORIGINAL PLOT SIZE: MODEL LIMITS



SURFACE IMPROVEMENT

SI-1	3.5" A/C OVER 5.5" CLASS 2 BASE (MIN) OR PER SOIL'S ENGINEER
SI-2	3" A/C OVER 4" CLASS 2 BASE (MIN) OR PER SOIL'S ENGINEER
SI-3	6" PCC CURB & GUTTER PER COM STD 301
SI-4	6" PCC CURB PER COM STD 305
SI-5	4" PCC SIDEWALK PER COM STD 320
SI-6	CONCRETE RIBBON GUTTER SEE DETAIL SHEET 4
SI-7	12" PCC STEP OUT, SEE DETAIL ON SHEET 3
SI-8	ADA CURB RAMP, SEE DETAILS ON SHEETS 15 & 16
SI-9	7" PCC CONCRETE
SI-10	0" PCC CURB & GUTTER, SEE 2' CURB OPENING DETAIL ON SHEET 3
SI-11	2" X 6" REDWOOD HEADER, SEE DETAIL ON SHEET 3
RT-1	GEO-GRID WALL SEE SHEET XX-XX
RT-2	RETAINING WALL PER CALTRANS STD DWG B3-7A, TYPE 6B
RT-3	SCREEN WALL PER LANDSCAPE PLANS
RT-4	RETAINING WALL PER CALTRANS STD DWG B3-7A, TYPE 6A

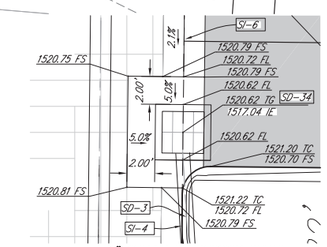
STORM DRAIN IMPROVEMENTS (PVT)

SD-1	6" PERFORATED PIPE
SD-2	8" HDPE PIPE
SD-3	12" HDPE PIPE
SD-4	18" HDPE PIPE
SD-5	24" HDPE PIPE
SD-6	18" BROW DITCH PER DETAIL ON SHEET 4
SD-7	36" HDPE PIPE
SD-8	12" CMP
SD-9	18" CMP RISER/OUTLET STRUCTURE SEE DETAILS ON SHEET 3
SD-10	24" CATCH BASIN
SD-11	36" CATCH BASIN
SD-12	48" CATCH BASIN
SD-13	BIORETENTION BASIN PER DETAILS ON SHEET 3
SD-14	24" CATCH BASIN W/ TRAFFIC GRATE
SD-15	18" CATCH BASIN W/ TRAFFIC GRATE
SD-16	24" CATCH BASIN W/ TRAFFIC LID
SD-17	36" CATCH BASIN W/ TRAFFIC LID
SD-18	60" CATCH BASIN
SD-19	DESILTING BASIN PER DETAILS ON SHEET 3
SD-20	CURB INLET PER COM STD 401
SD-21	PRIVATE HEADWALL PER CALTRANS STD. DWG. D89
SD-22	RIP-RAP, TYPE 2, NO.2 BACKING, T=1.1', WIDTH AND LENGTH PER PLAN, COM STD 446A
SD-23	3' REVERSE PARKWAY CULVERT TYPE A PER COM 409
SD-24	48" CATCH BASIN W/ TRAFFIC LID
SD-25	CONCRETE DITCH, SEE DETAIL ON SHEET 3
SD-26	4' U SHAPED CONCRETE DITCH, SEE DETAIL SHEET 3
SD-27	48" HDPE PIPE
SD-28	60" CATCH BASIN W/ TRAFFIC LID
SD-34	36" CATCH BASIN W/ TRAFFIC GRATE
SD-35	CONCRETE DROP INLET PER RCFC & WCD STD CB110

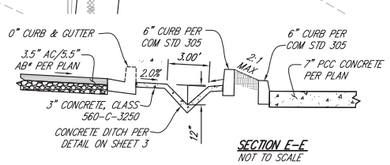
NOTE:
RETAINING WALLS TO BE UNDER SEPARATE PERMIT WITH THE CITY OF MURRIETA BUILDING DEPARTMENT

STORM DRAIN DATA TABLE

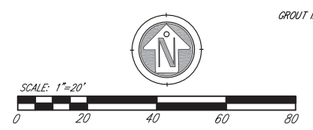
NO	DIRECTION/DELTA	RADIUS	LENGTH	REMARK
1	S44°21'15"E		39.00'	12" HDPE
2	S89°21'15"E		72.00'	" "
3	S89°21'15"E		40.74'	" "
4	S0°38'45"W		218.17'	18" HDPE
5	N20°36'24"E		25.60'	12" HDPE WTJ
6	S0°38'45"W		6.50'	8" HDPE
7	Δ= 7°32'26"	282.20'	37.14'	6" PERF PIPE
8	N89°21'14"W		180.00'	" "
9	S26°52'45"E		9.95'	8" HDPE
10	N0°38'45"E		9.00'	12" HDPE
11	N89°21'15"W		95.00'	6" PERF PIPE
12	S37°08'24"W		30.00'	12" CMP
13	N77°12'50"W		17.00'	3" PVC
14	S3°18'46"E		57.25'	12" PVC

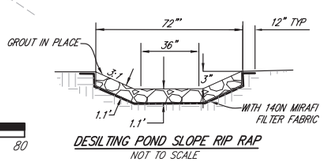


1" GUTTER DEPRESSION DETAIL
NOT TO SCALE

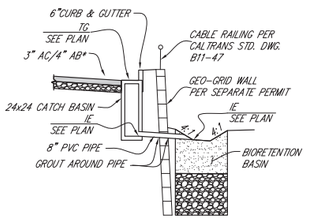


SECTION E-E
NOT TO SCALE





DESILTING POND SLOPE RIP RAP
NOT TO SCALE



STORMDRAIN THRU WALL DETAIL
NO SCALE

"AS BUILT"

THE RECEIPT OF AS-BUILT PLANS AND CITY'S ACCEPTANCE THEREOF DOES NOT ABSOLVE THE ENGINEER OF WORK OF ANY RESPONSIBILITY FOR THE PROJECT DESIGN.

ENGINEER OF WORK _____ DATE _____

RCE NO. _____ EXPIRATION DATE _____

SEAL: REGISTERED PROFESSIONAL ENGINEER ROBERT D. DENTINO No. 45629 Exp.12-31-18 CIVIL STATE OF CALIFORNIA

SCALE	
HORIZONTAL	
AS NOTED	
VERTICAL	
AS NOTED	

EXCEL ENGINEERING
LAND PLANNING • ENGINEERING • SURVEYING
440 STATE PLAZA, ESCONDIDO, CA 92029
PH (760)745-8118 FX (760)745-1890

PREPARED BY DATE
Jun 12, 2018
ROBERT D. DENTINO
RCE NO. 45929 EXP. DATE 12-31-18

DATE	INITIAL	ENGINEER OF WORK

REVISION DESCRIPTION	SHT. NO.	DATE	INITIAL	CITY APPROVAL

Underground Service Alert
Call: TOLL FREE 1-800 422-4133
TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK
DESCRIPTON: RIVERSIDE COUNTY DESIGNATION "600-20-68", DISK STAMPED
LOCATION: BRASS DISK STAMPED "600-20-68" IN CONCRETE POST. 0.2 MILES SOUTH ON WASHINGTON AVE FROM THE POST OFFICE IN MURRIETA
RECORDED: 1970
ELEVATION: 1517.543 DATUM: NGVD 29

RECOMMEND APPROVAL
WILLIAM G. BIXBY DATE
BUREAU VERITAS NORTH AMERICA, INC.
RCE NO. 48819

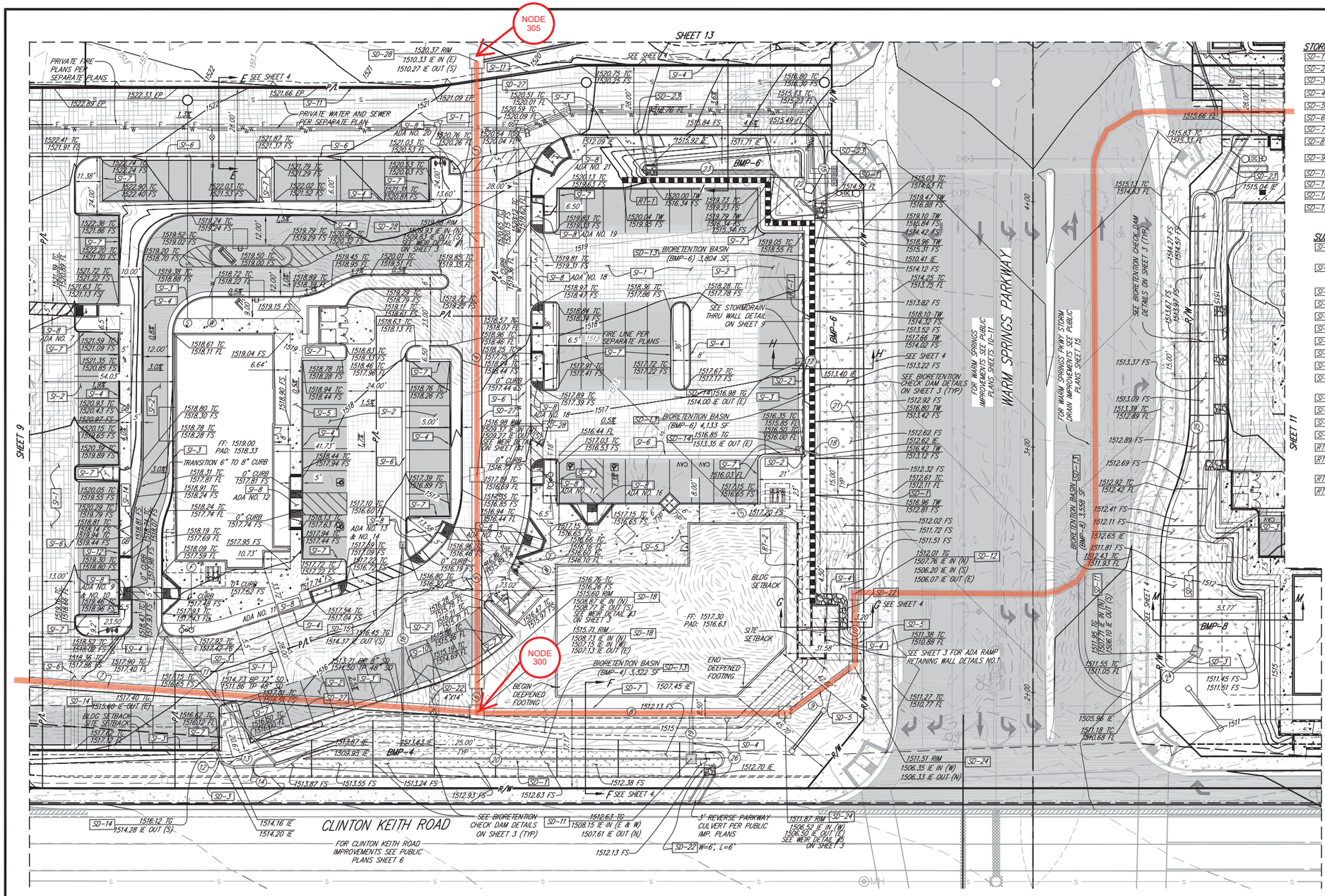
SHEET 9	CITY OF MURRIETA ENGINEERING DEPARTMENT	SHEETS 19

PRECISE GRADING PLAN & STORM DRAIN PLAN
PM 36493 / DP-2012-3260
THE VINEYARD
WDID# 9 33C380916

APPROVED
ROBERT K. MOEHLING _____ DATE _____
CITY ENGINEER RCE 63056

DWN BY:	PROJECT NO.	DRAWING NO.
CHKD BY:	2017-1132 GP 3517	
FIELD BK:		

k:\16\16063\engineering\GPRP\current\GPR\16063_GP_08_Grading Plans.dwg 6/12/2018 9:18 AM ORIGINAL PLOT SIZE: MODEL LIMITS



STORM DRAIN IMPROVEMENTS (PVT)

SD-1	6" PERFORATED PIPE
SD-2	8" HDPE PIPE
SD-3	12" HDPE PIPE
SD-4	18" HDPE PIPE
SD-5	24" HDPE PIPE
SD-6	30" HDPE PIPE
SD-7	36" HDPE PIPE
SD-8	12" CMP
SD-9	18" CMP RISER/OUTLET STRUCTURE SEE DETAILS ON SHEET 3
SD-10	24" CATCH BASIN
SD-11	36" CATCH BASIN
SD-12	48" CATCH BASIN
SD-13	BIORETENTION BASIN PER DETAILS ON SHEET 3
SD-14	24" CATCH BASIN W/ TRAFFIC GRATE
SD-15	18" CATCH BASIN W/ TRAFFIC GRATE
SD-16	24" CATCH BASIN W/ TRAFFIC LID
SD-17	36" CATCH BASIN W/ TRAFFIC LID
SD-18	60" CATCH BASIN
SD-19	DESILTING BASIN PER DETAILS ON SHEET 3
SD-20	CURB INLET PER COM STD 401
SD-21	WING TYPE HEADWALL PER CALTRANS STD. DWG: D89
SD-22	RIP-RAP, TYPE 2, NO.2 BACKING, T=1.1', WIDTH AND LENGTH PER PLAN, COM STD 446A
SD-23	3' REVERSE PARKWAY CULVERT TYPE A PER COM 409
SD-24	48" CATCH BASIN W/ LID
SD-25	CONCRETE DITCH, SEE DETAIL ON SHEET 3
SD-26	4' U SHAPED CONCRETE DITCH, SEE DETAIL ON SHEET 3
SD-27	48" HDPE PIPE
SD-28	60" CATCH BASIN W/ TRAFFIC LID

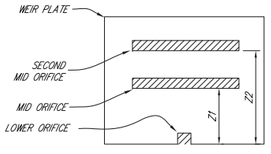
SURFACE IMPROVEMENT

S-1	3.5" A/C OVER 5.5" CLASS 2 BASE (MIN) OR PER SOIL'S ENGINEER
S-2	3" A/C OVER 4" CLASS 2 BASE (MIN) OR PER SOIL'S ENGINEER
S-3	6" PCC CURB & GUTTER PER COM STD 301
S-4	6" PCC CURB PER COM STD 305
S-5	4" PCC SIDEWALK PER COM STD 320
S-6	CONCRETE RIBBON GUTTER SEE DETAIL SHEET 4
S-7	12" PCC STEP OUT, SEE DETAIL ON SHEET 3
S-8	ADA CURB RAMP, SEE DETAILS ON SHEETS 15 & 16
S-9	7" PCC CONCRETE
S-10	0" PCC CURB & GUTTER, SEE 2' CURB OPENING DETAIL ON SHEET 3
S-11	2" X 6" REDWOOD HEADER, SEE DETAIL ON SHEET 3
S-12	MODIFIED CURB, SEE DETAIL ON SHEET 3
S-13	STABILIZED DECOMPOSED GRANITE
S-14	8" PCC CURB PER COM STD 305, TYPE A
RT-1	GEO-GRID WALL SEE SHEET XX-XX
RT-2	RETAINING WALL PER CALTRANS STD DWG B3-7A, TYPE 6B
RT-3	SCREEN WALL PER LANDSCAPE PLANS
RT-4	RETAINING WALL PER CALTRANS STD DWG B3-7A, TYPE 6A

NOTE:
RETAINING WALLS TO BE UNDER SEPARATE PERMIT WITH THE CITY OF MURRIETA BUILDING DEPARTMENT

STORM DRAIN DATA TABLE

NO	DIRECTION/DELTA	RADIUS	LENGTH	REMARK
1	N91°13'48"W		12.67'	3' REVERSE PARKWAY CULVERT
3	S0°38'45"W		68.00'	48" HDPE
4	S0°38'45"W		90.51'	" "
5	S0°38'45"W		79.30'	" "
6	S0°38'45"W		7.50'	" "
7	N85°27'30"W		296.74'	" "
8	N89°21'15"W		120.92'	36" HDPE
9	S54°08'25"W		30.59'	24" HDPE
10	S0°38'45"W		26.00'	" "
11	S40°27'29"E		68.28'	12" HDPE
12	S24°09'10"E		6.50'	" "
13	S69°09'10"E		5.00'	" "
14	N88°20'50"E		16.55'	" "
15	N91°13'48"W		28.50'	3' REVERSE PARKWAY CULVERT
16	S0°38'45"W		75.00'	8" HDPE
17	S89°21'15"E		7.20'	" "
18	S74°21'15"E		7.45'	" "
19	N0°38'45"E		17.50'	18" HDPE
20	N89°20'36"W		156.44'	6" PERFORATED PIPE
21	N0°38'45"E		137.00'	" "
22	N44°21'15"W		47.66'	" "
23	S89°21'15"E		53.00'	" "
24	S52°58'26"W		28.42'	12" HDPE
25	N0°38'45"E		180.00'	6" PERFORATED PIPE
26	N89°20'36"W		6.00'	" "



NOTE:
SEE WEIR STRUCTURE MEASUREMENT TABLE ON SHEET 3 FOR PLATE AND ORIFICE DIMENSIONS

WEIR PLATE DETAIL
NO SCALE

SCALE: 1"=20'
0 20 40 60 80

"AS BUILT"
THE RECEIPT OF AS-BUILT PLANS AND CITY'S ACCEPTANCE THEREOF DOES NOT ABSOLVE THE ENGINEER OF WORK OF ANY RESPONSIBILITY FOR THE PROJECT DESIGN.

ENGINEER OF WORK _____ DATE _____
RCE NO. _____ EXPIRATION DATE _____

SEAL: REGISTERED PROFESSIONAL ENGINEER ROBERT D. DENTINO No. 45629 Exp.12-31-18 CIVIL STATE OF CALIFORNIA

SCALE
HORIZONTAL: AS NOTED
VERTICAL: AS NOTED

EXCEL ENGINEERING
LAND PLANNING • ENGINEERING • SURVEYING
140 STATE PLACE, ESCONDIDO, CA 92029
PH (760)745-8118 FX (760)745-1890

PREPARED BY DATE
ROBERT D. DENTINO Jun 12, 2018
RCE NO. 45929 EXP. DATE 12-31-18

Underground Service Alert
DIG ALERT
Call: TOLL FREE
1-800
422-4133
TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK
DESCRIPTON: RIVERSIDE COUNTY DESIGNATION "600-20-68", DISK STAMPED
LOCATION: BRASS DISK STAMPED "600-20-68" IN CONCRETE POST. 0.2 MILES SOUTH ON WASHINGTON AVE FROM THE POST OFFICE IN MURRIETA
RECORDED: 1970
ELEVATION: 1517.543 DATUM: NGVD 29

RECOMMEND APPROVAL
WILLIAM G. BIXBY DATE
BUREAU VERITAS NORTH AMERICA, INC.
RCE NO. 48819

DATE	INITIAL	REVISION DESCRIPTION	SHT. NO.	DATE	INITIAL
ENGINEER OF WORK				CITY APPROVAL	

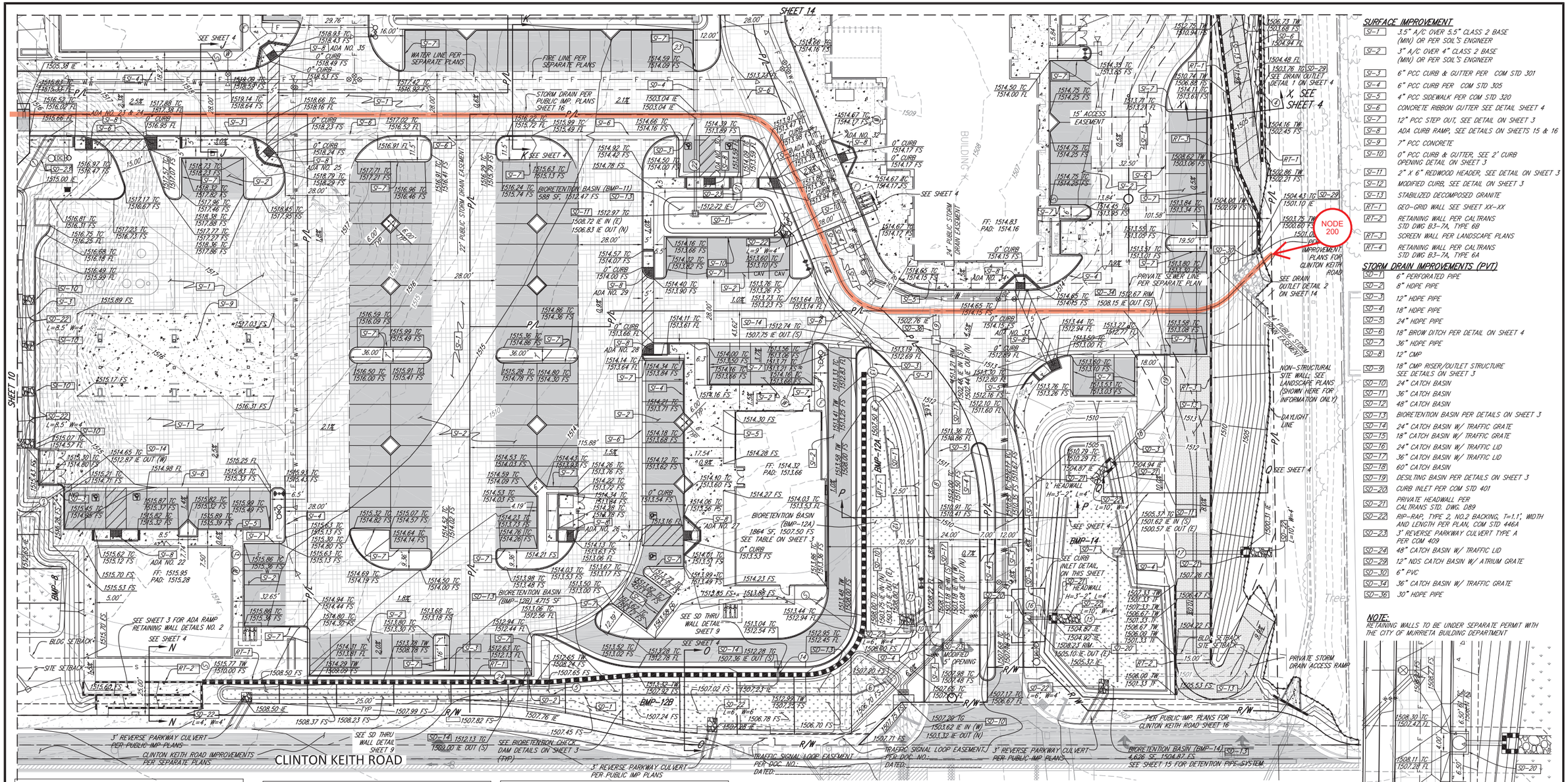
SHEET 10 — CITY OF MURRIETA ENGINEERING DEPARTMENT — SHEETS 19

PRECISE GRADING PLAN & STORM DRAIN PLAN
PM 36493 / DP-2012-3260
THE VINEYARD
WDID# 9 33C380916

APPROVED
ROBERT K. MOEHLING DATE
CITY ENGINEER RCE 63056

DWN BY: _____ CHKD BY: _____ FIELD BK: _____
PROJECT NO. 2017-1132 GP 3517
DRAWING NO.

V:\16\160651\engineering\CPRP\current\GP\160651GP 10.Grading Plans.dwg 6/12/2018 10:11 AM ORIGINAL PLOT SIZE: MODEL LIMITS



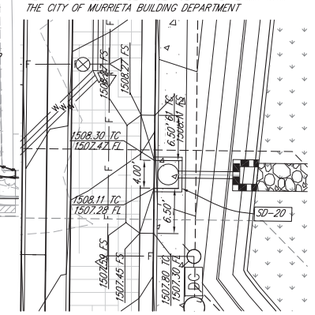
SURFACE IMPROVEMENT

SI-1	3.5" A/C OVER 5.5" CLASS 2 BASE (MIN) OR PER SOIL'S ENGINEER
SI-2	3" A/C OVER 4" CLASS 2 BASE (MIN) OR PER SOIL'S ENGINEER
SI-3	6" PCC CURB & GUTTER PER COM STD 301
SI-4	6" PCC CURB PER COM STD 305
SI-5	4" PCC SIDEWALK PER COM STD 320
SI-6	CONCRETE RIBBON GUTTER SEE DETAIL SHEET 4
SI-7	12" PCC STEP OUT, SEE DETAIL ON SHEET 3
SI-8	ADA CURB RAMP, SEE DETAILS ON SHEETS 15 & 16
SI-9	7" PCC CONCRETE
SI-10	0" PCC CURB & GUTTER, SEE 2' CURB OPENING DETAIL ON SHEET 3
SI-11	2" X 6" REDWOOD HEADER, SEE DETAIL ON SHEET 3
SI-12	MODIFIED CURB, SEE DETAIL ON SHEET 3
SI-13	STABILIZED DECOMPOSED GRANITE
RT-1	GEO-GRID WALL SEE SHEET XX-XX
RT-2	RETAINING WALL PER CALTRANS STD DWG B3-7A, TYPE 6B
RT-3	SCREEN WALL PER LANDSCAPE PLANS
RT-4	RETAINING WALL PER CALTRANS STD DWG B3-7A, TYPE 6A

STORM DRAIN IMPROVEMENTS (PVT)

SD-1	6" PERFORATED PIPE
SD-2	8" HDPE PIPE
SD-3	12" HDPE PIPE
SD-4	18" HDPE PIPE
SD-5	24" HDPE PIPE
SD-6	18" BROW DITCH PER DETAIL ON SHEET 4
SD-7	36" HDPE PIPE
SD-8	12" CMP
SD-9	18" CMP RISER/OUTLET STRUCTURE SEE DETAILS ON SHEET 3
SD-10	24" CATCH BASIN
SD-11	36" CATCH BASIN
SD-12	48" CATCH BASIN
SD-13	BIORETENTION BASIN PER DETAILS ON SHEET 3
SD-14	24" CATCH BASIN W/ TRAFFIC GRATE
SD-15	18" CATCH BASIN W/ TRAFFIC GRATE
SD-16	24" CATCH BASIN W/ TRAFFIC LID
SD-17	36" CATCH BASIN W/ TRAFFIC LID
SD-18	60" CATCH BASIN
SD-19	DESILTING BASIN PER DETAILS ON SHEET 3
SD-20	CURB INLET PER COM STD 401
SD-21	PRIVATE HEADWALL PER CALTRANS STD. DWG. D89
SD-22	RIP-RAP, TYPE 2, NO.2 BACKING, T=1.1', WIDTH AND LENGTH PER PLAN, COM STD 446A
SD-23	3' REVERSE PARKWAY CULVERT TYPE A PER COM 409
SD-24	48" CATCH BASIN W/ TRAFFIC LID
SD-29	12" NDS CATCH BASIN W/ ATRIUM GRATE
SD-30	6" PVC
SD-34	36" CATCH BASIN W/ TRAFFIC GRATE
SD-36	30" HDPE PIPE

NOTE:
RETAINING WALLS TO BE UNDER SEPARATE PERMIT WITH THE CITY OF MURRIETA BUILDING DEPARTMENT



CURB INLET DETAIL
SCALE: 1"=10'

STORM DRAIN DATA TABLE

NO.	DIRECTION/DELTA	RADIUS	LENGTH	REMARK
1	S30°38'45"W		28.00'	3' REVERSE PKWY CULVERT
2	S57°06'51"W		23.00'	12" HDPE
3	N44°21'15"W		1.50'	6" PVC
4	N89°51'34"E		2.50'	6" PVC
5	S89°22'44"E		265.00'	6" PERFORATED PVC
6	S68°07'16"W		14.45'	6" PERFORATED PVC
7	N45°38'45"E		29.00'	18" HDPE
8	N0°39'42"E		123.00'	24" HDPE
9	N0°37'51"E		9.50'	30" HDPE
10	N89°21'15"W		10.00'	18" HDPE
11	S55°09'44"W		5.70'	3' REVERSE PKWY CULVERT
12	N5°55'49"W		88.00'	6" PERFORATED PVC
13	S4°53'57"E		25.00'	12" HDPE

STORM DRAIN DATA TABLE

NO.	DIRECTION/DELTA	RADIUS	LENGTH	REMARK
14	S0°38'45"W		6.50'	8" HDPE
15	N0°38'45"E		50.00'	6" PERFORATED PVC
16	N89°21'15"W		8.80'	12" HDPE
17	N89°21'20"W		52.34'	18" HDPE
18	S45°00'00"W		32.00'	12" HDPE
19	S0°38'45"W		23.64'	12" HDPE
20	N89°21'15"W		30.00'	6" PERFORATED PVC
21	S0°39'49"W		10.00'	3' REVERSE PKWY CULVERT

STORM DRAIN DATA TABLE

NO.	DIRECTION/DELTA	RADIUS	LENGTH	REMARK
22	N0°38'45"E		40.40'	12" HDPE
23	N0°39'15"E		38.00'	18" HDPE
24	S0°38'45"W		6.50'	8" HDPE

"AS BUILT"

THE RECEIPT OF AS-BUILT PLANS AND CITY'S ACCEPTANCE THEREOF DOES NOT ABSOLVE THE ENGINEER OF WORK OF ANY RESPONSIBILITY FOR THE PROJECT DESIGN.

ENGINEER OF WORK _____ DATE _____

RCE NO. _____ EXPIRATION DATE _____

Underground Service Alert
Call: TOLL FREE 1-800 422-4133
TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK
DESCRIPTON: RIVERSIDE COUNTY DESIGNATION "600-20-68", DISK STAMPED
LOCATION: BRASS DISK STAMPED "600-20-68" IN CONCRETE POST. 0.2 MILES SOUTH ON WASHINGTON AVE FROM THE POST OFFICE IN MURRIETA
RECORDED: 1970
ELEVATION: 1517.543 DATUM: NGVD 29

RECOMMEND APPROVAL

WILLIAM G. BIXBY DATE

BUREAU VERITAS NORTH AMERICA, INC.
RCE NO. 48819

SEAL: REGISTERED PROFESSIONAL ENGINEER ROBERT D. DENTINO No. 45629 Exp.12-31-18 CIVIL STATE OF CALIFORNIA

SCALE
HORIZONTAL
AS NOTED
VERTICAL
AS NOTED

EXCEL ENGINEERING
LAND PLANNING • ENGINEERING • SURVEYING
740 STATE PLAZA, ESCONDIDO, CA 92029
PH (760)745-8118 FX (760)745-1890

PREPARED BY DATE
Jun 12, 2018
ROBERT D. DENTINO
RCE NO. 45929 EXP. DATE 12-31-18

DATE	INITIAL	ENGINEER OF WORK

REVISION DESCRIPTION	SHT. NO.	DATE	INITIAL CITY APPROVAL

SHEET 11

CITY OF MURRIETA
ENGINEERING DEPARTMENT

SHEETS 19

PRECISE GRADING PLAN & STORM DRAIN PLAN
PM 36493 / DP-2012-3260
THE VINEYARD
WDID# 9 33C380916

APPROVED
ROBERT K. MOEHLING _____ DATE _____
CITY ENGINEER RCE 63056

DWN BY: _____
CHKD BY: _____
FIELD BK: _____

PROJECT NO. 2017-1132 GP 3517

DRAWING NO.

V:\16\16063\engineering\DPP\current\DP\16063_GP_11_Grading Plans.dwg 6/12/2018 2:24 PM ORIGINAL PLOT SIZE: MODEL LIMITS

ATTACHMENT J

PAGES FROM HYDROLOGY REPORT OF THE VINEYARDS I CK-17

Hydrology/Hydraulics Study

For: **THE VINEYARD CK-17**

Clinton Keith Road

DEVELOPMENT NO. **TPM 36493 (TPM-012-3259)**
DESIGN REVIEW NO. **DPO-012-3260**

Prepared for:
CK 17
41623 MARGARITA ROAD #100
TEMECULA, CA 92591
PHONE: (951) 491-6300
FAX: (951) 491-6330

Prepared by:
Excel Engineering
440 State Place
Escondido, CA 92029
Telephone: (760) 745 8118

Hydrology/Hydraulics Study Preparation Date: June 9, 2017
Revision Dates: September 29, 2017
January 30, 2018
March 20, 2018
June 12, 2018

_____
ROBERT D. DENTINO, RCE 45629
Registration Expire: December 31, 2018

COSTCO (PORTION)
PER PARCEL 1 OF
UNIT 1 TPM 37511

LEGEND

DENOTES HYDROLOGY
NODE PER COSTCO
DEVELOPMENT

NODE
200

NODE
301

NODE
305

NODE
300

NODE
200

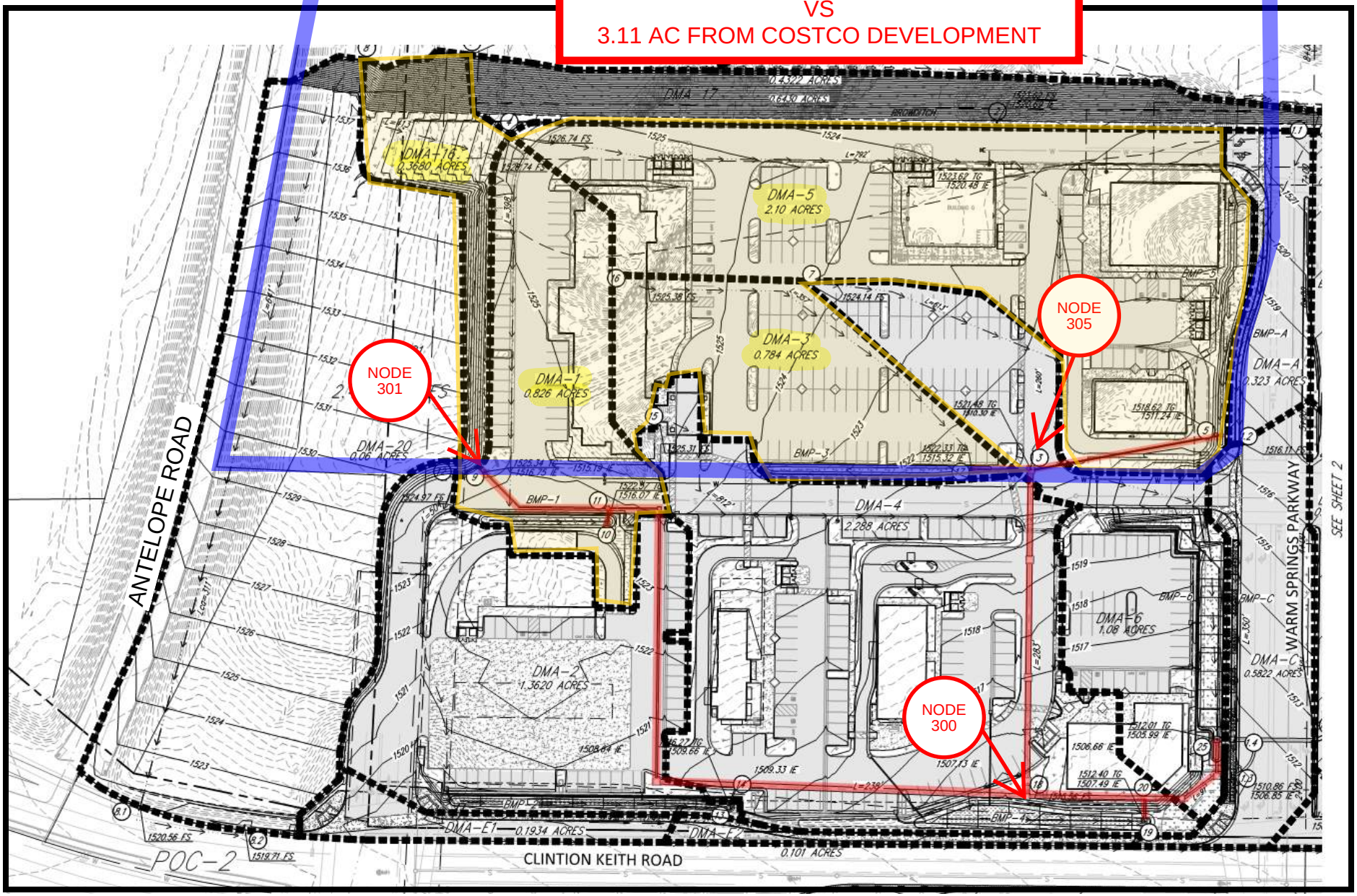
ARMSPRING PARKWAY

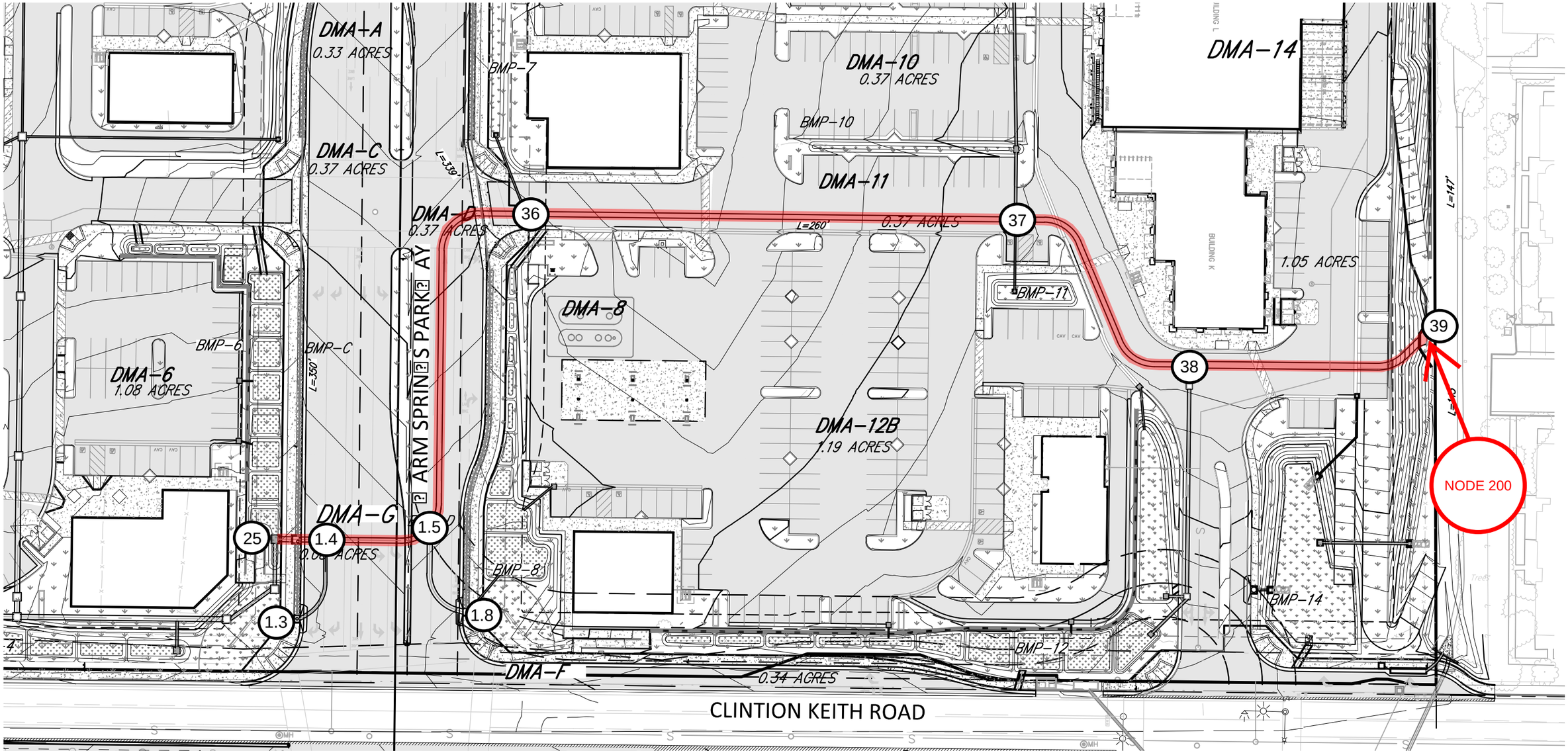
CLINTION KEITH ROAD

CLINTION KEITH ROAD

SITE MAP
VINEYARD – CK 17

AREA SWAP FROM STUDY
0.3680 +0.826 + 2.10+0.7484 = 4.08 AC
VS
3.11 AC FROM COSTCO DEVELOPMENT




DMA-A
0.33 ACRES
DMA-C
0.37 ACRES
DMA-6
1.08 ACRES
DMA-D
0.37 ACRES
DMA-8
DMA-10
0.37 ACRES
DMA-11
0.37 ACRES
DMA-12B
1.19 ACRES
DMA-14
1.05 ACRES
DMA-G
0.08 ACRES
DMA-F
0.34 ACRES
BMP-6
BMP-C
BMP-7
BMP-8
BMP-10
BMP-11
BMP-12
BMP-14
L=350'
L=339'
L=260'
L=147'
ARM SPRING PARK WAY
BUILDING K
BUILDING L
CLINTION KEITH ROAD
NODE 200
25
1.4
1.5
1.3
1.8
36
37
38
39

```
                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
       Rational Hydrology Study        Date: 01/28/18  File:16063POSTDET1TO25.out
------------------------------------------------------------------------
RATIONAL METHOD  - 100 YEAR 1 HOUR DURATION STORM EVENT
POST-DEVELOPMENT WITH DETENTION CALCS
NODE 1 THRU 25 - WEST PORTION
FILENAME: 16063POSTDET1TO25.RRV
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********
 English (in-lb) Units used in input data file
------------------------------------------------------------------------
Program License Serial Number 6332
------------------------------------------------------------------------
Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual
Storm event (year) =  100.00 Antecedent Moisture Condition = 2
Standard intensity-duration curves data (Plate D-4.1)
For the [ Murrieta,Tmc,Rnch CaNorco ] area used.
10 year storm 10 minute intensity =  2.360(In/Hr)
10 year storm 60 minute intensity =  0.880(In/Hr)
100 year storm 10 minute intensity =  3.480(In/Hr)
100 year storm 60 minute intensity =  1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity =  1.300(In/Hr)
Slope of intensity duration curve = 0.5500

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station       10.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   398.000(Ft.)
Top (of initial area) elevation =  1527.140(Ft.)
Bottom (of initial area) elevation =  1522.070(Ft.)
Difference in elevation =     5.070(Ft.)
Slope =    0.01274  s(percent)=       1.27
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.871 min.
Rainfall intensity =      3.973(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.891
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2)  =  75.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.860(CFS)
Total initial stream area =        0.808(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       11.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =  1516.070(Ft.)
Downstream point/station elevation =  1515.350(Ft.)
Pipe length  =     9.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.860(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     2.860(CFS)
Normal flow depth in pipe =    4.37(In.)
Flow top width inside pipe =   11.55(In.)
Critical Depth =    8.70(In.)
Pipe flow velocity =     11.05(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =     7.88 min.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       11.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.808(Ac.)
Runoff from this stream =      2.860(CFS)
Time of concentration =    7.88 min.
Rainfall intensity =     3.969(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station        9.000
**** INITIAL AREA EVALUATION ****
____________________________________________________________________________
Initial area flow distance =   371.000(Ft.)
Top (of initial area) elevation =  1536.720(Ft.)
Bottom (of initial area) elevation =  1524.840(Ft.)
Difference in elevation =    11.880(Ft.)
Slope =    0.03202  s(percent)=       3.20
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.244 min.
Rainfall intensity =      3.265(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.857
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2)  =  89.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      0.722(CFS)
Total initial stream area =        0.258(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.000 to Point/Station       11.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________________
Upstream point/station elevation =  1516.750(Ft.)
Downstream point/station elevation =  1515.350(Ft.)
Pipe length  =   110.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.722(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.722(CFS)
Normal flow depth in pipe =    3.88(In.)
Flow top width inside pipe =    8.92(In.)
Critical Depth =    4.64(In.)
Pipe flow velocity =      3.95(Ft/s)
Travel time through pipe =    0.46 min.
Time of concentration (TC) =    11.71 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       11.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.258(Ac.)
Runoff from this stream =      0.722(CFS)
Time of concentration =   11.71 min.
Rainfall intensity =     3.193(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                (In/Hr)


1        2.860      7.88                3.969
```

```
2        0.722     11.71                 3.193
Largest stream flow has longer or shorter time of concentration
Qp =      2.860 + sum of
          Qa          Tb/Ta
           0.722 *    0.673 =      0.486
Qp =      3.346

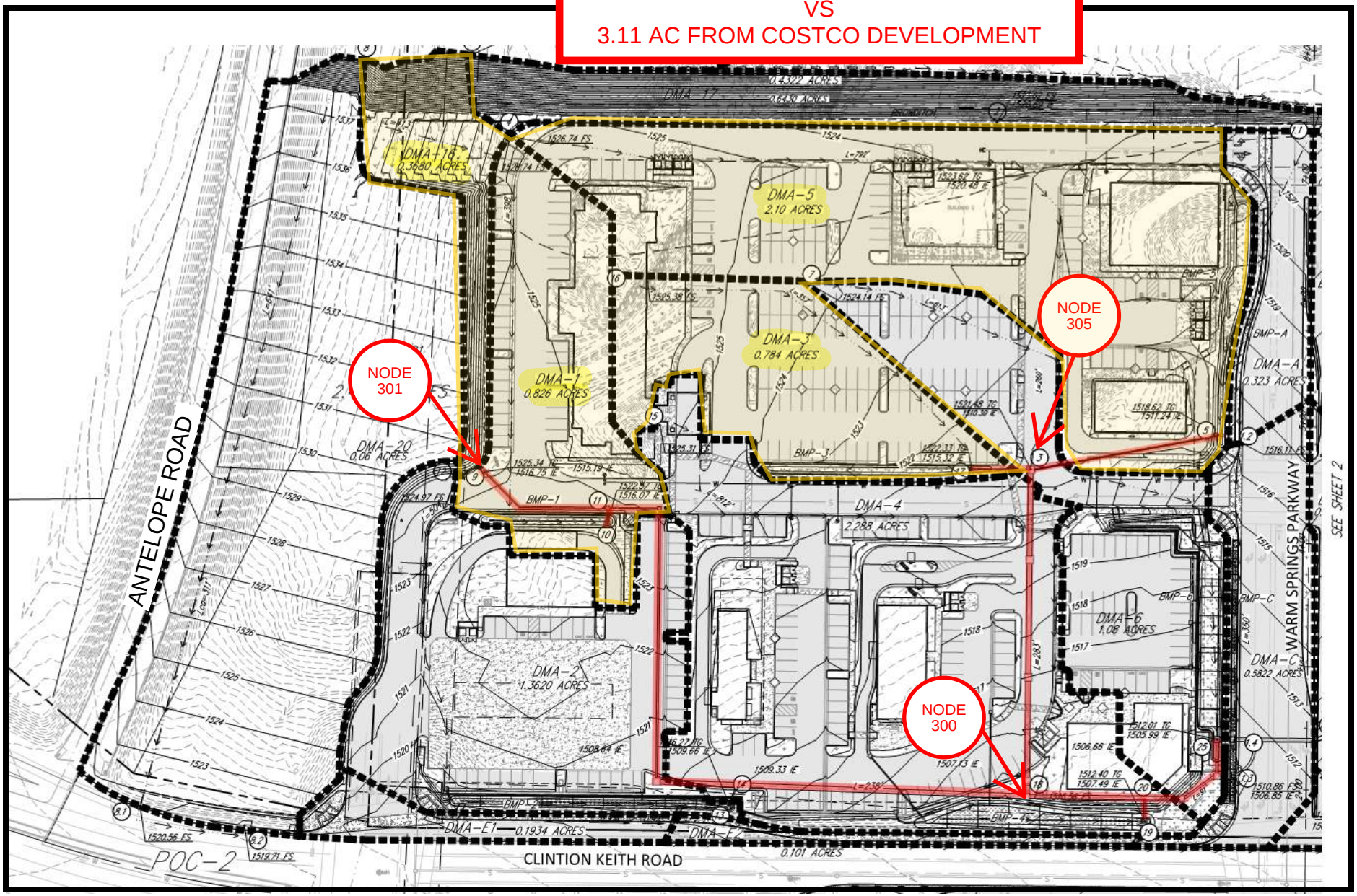
Total of 2 streams to confluence:
Flow rates before confluence point:
       2.860       0.722
Area of streams before confluence:
        0.808        0.258
Results of confluence:
Total flow rate =      3.346(CFS)
Time of concentration =     7.885 min.
Effective stream area after confluence =      1.066(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       14.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1515.350(Ft.)
Downstream point/station elevation =  1508.330(Ft.)
Pipe length  =   335.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.346(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     3.346(CFS)
Normal flow depth in pipe =    7.04(In.)
Flow top width inside pipe =   11.82(In.)
Critical Depth =    9.39(In.)
Pipe flow velocity =      6.99(Ft/s)
Travel time through pipe =    0.80 min.
Time of concentration (TC) =     8.68 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station       14.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      1.066(Ac.)
Runoff from this stream =      3.346(CFS)
Time of concentration =    8.68 min.
Rainfall intensity =     3.764(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       13.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   504.000(Ft.)
Top (of initial area) elevation =  1524.970(Ft.)
Bottom (of initial area) elevation =  1515.770(Ft.)
Difference in elevation =     9.200(Ft.)
Slope =    0.01825  s(percent)=       1.83
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.050 min.
Rainfall intensity =      3.924(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.891
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2)  =  75.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      4.834(CFS)
Total initial stream area =        1.383(Ac.)
Pervious area fraction = 0.100
```

AREA SWAP FROM STUDY
0.3680 +0.826 + 2.10+0.7484 = 4.08 AC
VS
3.11 AC FROM COSTCO DEVELOPMENT



ATTACHMENT K

EXISTING SD PLANS AT POC'S

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
8	Riv	215	R12.0 / R13.1		

REGISTERED CIVIL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — James A. Enriquez — No. C55520 — Exp. 12-31-08 — CIVIL — STATE OF CALIFORNIA

CITY OF MURRIETA
26442 BECKMAN COURT
CITY OF MURRIETA, CA 92562
Sponsoring Agency

DMJM HARRIS | AECOM
800 N HAVEN AVENUE, SUITE 410
ONTARIO, CA 91764

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Caltrans now has a website! To get to the Caltrans web site, go to: http://www.dot.ca.gov

DATE	REVISED BY	DATE REVISED

CALCULATED/ DESIGNED BY	CHECKED BY

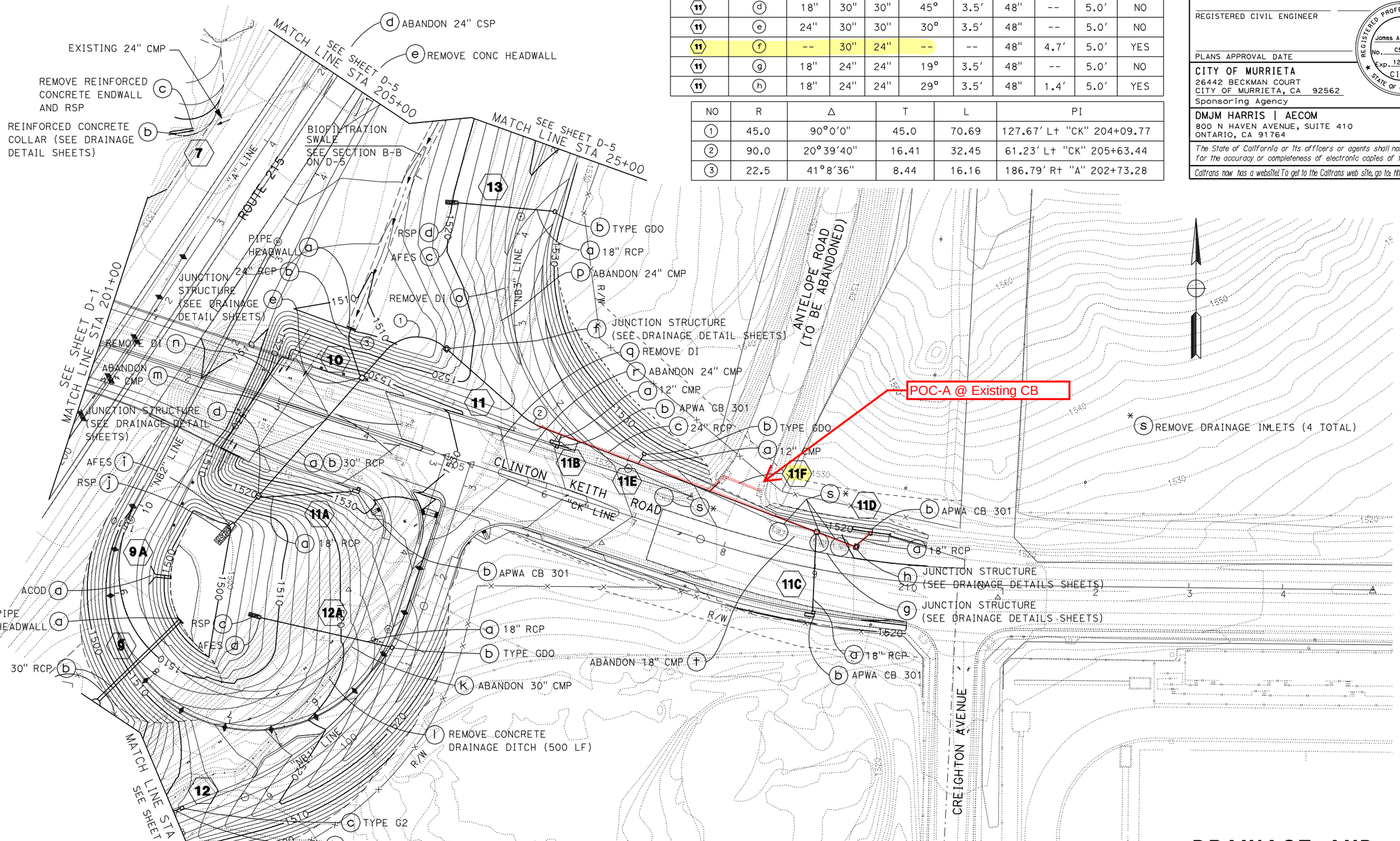
DESIGN OVERSIGHT
GEORGE MORHIG

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans

JUNCTION STRUCTURE DATA

SYS NO.	UNIT NO.	B	D_1	D_2	SKEW	C	H_b	H	L	MH
11	d	18"	30"	30"	45°	3.5′	48"	--	5.0′	NO
11	e	24"	30"	30"	30°	3.5′	48"	--	5.0′	NO
11	f	--	30"	24"	--	--	48"	4.7′	5.0′	YES
11	g	18"	24"	24"	19°	3.5′	48"	--	5.0′	NO
11	h	18"	24"	24"	29°	3.5′	48"	1.4′	5.0′	YES

NO	R	Δ	T	L	PI
1	45.0	90°0′0"	45.0	70.69	127.67′ Lt "CK" 204+09.77
2	90.0	20°39′40"	16.41	32.45	61.23′ Lt "CK" 205+63.44
3	22.5	41°8′36"	8.44	16.16	186.79′ Rt "A" 202+73.28



DRAINAGE AND GRADING PLANS

SCALE 1"= 50′

D-2

THIS PLAN ACCURATE FOR DRAINAGE AND GRADING WORK ONLY

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

USERNAME => enriquezj
DGN FILE => \\Usora1fp004\projects\2227\CADD\Civil\Sheet\832780a02.dgn

CU 08-228

EA 327801

LAST REVISION 00-00-00
DATE PLOTTED => 12-FEB-2008
TIME PLOTTED => 16:19

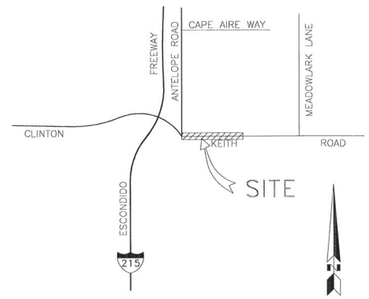
STREET AND STORM DRAIN IMPROVEMENT PLANS FOR

CLINTON KEITH ROAD

TENTATIVE TRACT NO.30842

IN THE CITY OF MURRIETA, RIVERSIDE COUNTY CALIFORNIA

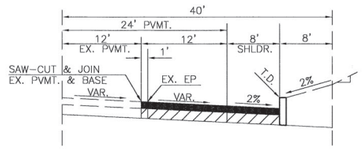
(FROM TRACT NO. 30842-3 TO ANTELOPE ROAD)



VICINITY MAP

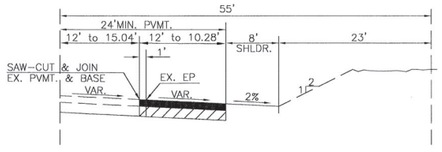
NO SCALE

2003 THOMAS GUIDE PAGE: 898 GRID: F7



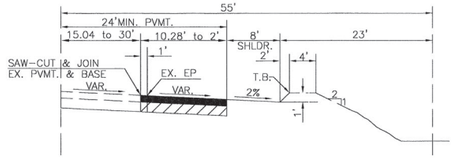
STA. 208+81.28 to 210+53.62

SCALE: 1" = 10"



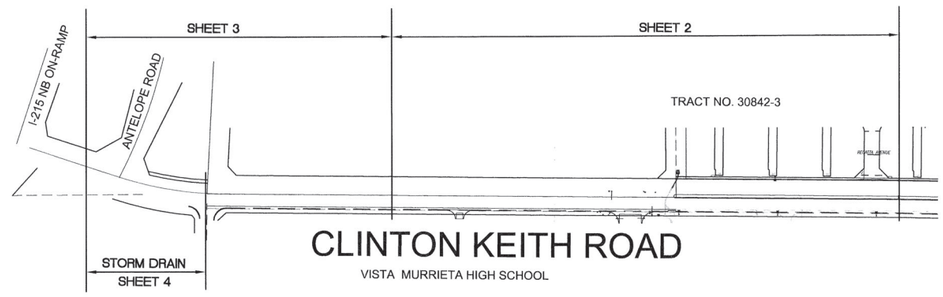
STA. 211+53.62 to 218+92.50

SCALE: 1" = 10"



STA. 218+92.50 TO 224+41.26

SCALE: 1" = 10"



CLINTON KEITH ROAD

VISTA MURRIETA HIGH SCHOOL

INDEX MAP

SCALE: 1" = 200'

GENERAL NOTES

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CLEARING OF THE PROPOSED WORK AREA, AND RELOCATION COST OF ALL EXISTING UTILITIES. PERMITTEE MUST INFORM THE CITY OF CONSTRUCTION SCHEDULE AT LEAST 48 HOURS PRIOR TO BEGINNING OF CONSTRUCTION.
PHONE: (909) 304-CITY (2489)
2. ALL WORK SHALL CONFORM TO THE REQUIREMENTS OF THE CITY OF MURRIETA PUBLIC WORKS DEPARTMENT IMPROVEMENT STANDARDS AND THE LATEST EDITION OF STANDARD SPECIFICATION FOR PUBLIC WORKS CONSTRUCTION (GREEN BOOK).
3. THE DEVELOPER WILL INSTALL STREET NAME SIGNS CONFIRMING TO CITY STANDARD NO. 601.
4. CURB DEPRESSIONS AND DRIVEWAY APPROACHES WILL BE INSTALLED AND CONSTRUCTED ACCORDING TO CITY STANDARD NO. 308, 309, OR 310, AS DIRECTED IN THE FIELD.
5. BLUE RAISED REFLECTIVE PAVEMENT MARKERS SHALL BE PLACED TO MARK FIRE HYDRANT AND/OR WATER SUPPLY LOCATIONS AT THE DIRECTION OF THE CITY INSPECTOR FOLLOWING FINAL SEALANT AND STRIPING.
6. WORK MAY NOT START UNTIL PERMITS HAVE BEEN OBTAINED.
7. THE CONTRACTOR SHALL VERIFY ALL UTILITY LOCATIONS WITH UNDERGROUND SERVICE ALERT AT 1-800-422-4133 AT LEAST TWO (2) WORKING DAYS PRIOR TO ANY EXCAVATION.
8. ALL PAVEMENT SECTIONS ARE AT MINIMUM REQUIREMENTS. ADDITIONAL SOIL TEST SHALL BE TAKEN AFTER ROUGH GRADING TO DETERMINE THE EXACT STRUCTURAL SECTION REQUIREMENTS. USE STANDARD NO. 320 IF EXPANSIVE SOILS ARE ENCOUNTERED.
9. DUST CONTROLS SHALL BE MAINTAINED AT ALL TIMES, BY WATER OR OTHER APPROVED METHODS.
10. EQUIPMENT AND MATERIALS SHALL BE STORED IN A NEAT AND PROTECTED MANNER.
11. THE CONTRACTOR WILL CONDUCT HIS OPERATIONS AS TO OFFER THE LEAST POSSIBLE OBSTRUCTION AND INCONVENIENCE TO PUBLIC TRAFFIC, AND HE SHALL HAVE UNDER CONSTRUCTION NO GREATER LENGTH OR AMOUNT OF WORK THAN HE CAN EXECUTE PROPERLY. ON EXISTING ROADS, TRAFFIC SHALL BE PERMITTED TO PASS THROUGH THE WORK AREA WITH AS LITTLE INCONVENIENCE AND DELAY AS POSSIBLE.
12. EXISTING TRAFFIC SIGNALS AND LIGHTING SYSTEMS SHALL BE KEPT IN OPERATION FOR THE BENEFIT OF THE TRAVELING PUBLIC, AND TO MINIMIZE ANY INTERFERENCE WITH ROUTINE MAINTENANCE OF EXISTING SYSTEMS DURING WORK PROGRESS.
13. WHENEVER THE CONTRACTOR'S OPERATION CREATES A HAZARDOUS CONDITION TO TRAFFIC OR TO THE PUBLIC, HE SHALL FURNISH AT HIS OWN EXPENSE, SUCH FLAGMEN AND GUARDS AS ARE NECESSARY TO GIVE ADEQUATE WARNING TO THE PUBLIC OF ANY DANGEROUS CONDITIONS. HE SHALL ALSO FURNISH, ERECT AND MAINTAIN SUCH FENCES BARRICADES, LIGHTS, SIGNS, AND OTHER DEVICES NECESSARY TO PREVENT ACCIDENTS AND INJURY TO THE PUBLIC.
14. WHERE SURVEY MONUMENTS EXIST, SUCH MONUMENTS WILL BE PROTECTED OR SHALL BE REFERENCED AND RESET, PURSUANT TO BUSINESS AND PROFESSIONS CODE, SECTIONS 8700 TO 8805 (LAND SURVEYOR'S ACT).
15. WHERE NEW A.C. PAVEMENT JOIN EXISTING PAVEMENT, SAWCUT TO A NEAT EDGE. THE SAWCUTS MUST BE PERPENDICULAR, PARALLEL OR RADIAL TO THE ROADWAY CENTERLINE. OVERLAY AND FEATHER NEW A.C. PAVEMENT TO PROVIDE SMOOTH TRANSITION.
16. ALL EXISTING STREET SIGNS, ROADSIDE MARKERS, ETC., SHALL BE PROTECTED AND/OR REPLACED IN KIND TO THE CURRENT CITY STANDARD PLANS AND CURRENT TRAFFIC MANUAL, AT NO COST TO THE CITY.
17. ASPHALTIC EMULSION (FOG SEAL) SHALL BE APPLIED NOT LESS THAN FOURTEEN (14) DAYS FOLLOWING PLACEMENT OF THE ASPHALT SURFACING AND SHALL BE APPLIED AT A MIN. RATE OF 0.05 GALLON PER SQUARE YARD. ASPHALTIC EMULSION SHALL CONFORM TO SECTION 37, 39, AND 94 OF THE STATE STANDARD SPECIFICATIONS.
18. ALL UNDERGROUND FACILITIES, WITH LATERALS SHALL BE IN PLACE PRIOR TO PAVING THE STREET SECTION INCLUDING, BUT NOT LIMITED TO, THE FOLLOWING: WATER, SEWER, GAS, ELECTRIC, CABLE T.V. , TELEPHONE, AND DRAINAGE.
19. THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF THE AVAILABLE RECORDS. TO THE BEST OF OUT KNOWLEDGE, THERE ARE NO EXISTING UTILITIES EXCEPT AS SHOWN ON THESE PLANS, THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT ALL UTILITY LINE, INCLUDING ANY OTHER LINES NOT SHOWN ON THESE PLANS OR NOT OF RECORD.
20. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO APPLY TO THE CITY OF MURRIETA ENGINEERING DEPARTMENT, FOR AN ENCROACHMENT PERMIT FOR ALL WORK ON EXISTING CITY MAINTAINED ROADS, AND FOR UTILITY WORK WITHIN OFFERS OF DEDICATION FOR PUBLIC USE.
21. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY THE ENGINEER TO INSTALL STREET CENTERLINE MONUMENTS AS REQUIRED BY CITY STANDARD DRAWINGS NO. 616, 617. AND 618.
22. STREET LIGHTS SHALL BE INSTALLED IN ACCORDANCE WITH THE CITY OF MURRIETA STANDARD NO. 619 OR 620.
23. APPROVAL OF THESE PLANS BY THE CITY OR ITS AGENTS DOES NOT RELIEVE THE APPLICANT AND HIS ENGINEER FROM THE RESPONSIBILITY FOR THE CORRECTION OF ERRORS OR OMISSIONS DISCOVERED DURING CONSTRUCTION. UPON REQUEST, THE APPROPRIATE PLAN REVISIONS SHALL BE PROMPTLY SUBMITTED TO THE CITY ENGINEER FOR REVIEW AND APPROVAL.
24. ALL GTE, SCE AND SCG FACILITIES WILL BE RELOCATED OR MODIFIED BY THE RESPECTIVE UTILITIES OR THEIR APPOINTED REPRESENTATIVES.
25. ALL WATER RELATED WORK SHALL BE DONE IN ACCORDANCE WITH THE SERVICING WATER DISTRICT STANDARDS AND SPECIFICATIONS.
26. ALL SEWER RELATED WORK SHALL BE DONE IN ACCORDANCE WITH THE SERVICING WATER DISTRICT STANDARDS AND SPECIFICATIONS.
27. ANY SERVICE SHUT DOWN SHALL BE DONE AT NIGHT, PRIOR TO ANY SHUT DOWN, THE CONTRACTOR SHALL NOTIFY THE DIRECTOR, ENGINEER, FIRE DEPARTMENT, SERVICING WATER DISTRICT, AND ALL OTHERS AFFECTED BY THE SHUT DOWN A MINIMUM OF THREE (3) WEEKS IN ADVANCE.
28. IT SHALL BE THE RESPONSIBILITY OF THE DEVELOPER OR CONTRACTOR TO APPLY TO CALIFORNIA DEPARTMENT OF TRANSPORTATION (CALTRANS) FOR AN ENCROACHMENT PERMIT FOR ALL WORK PERFORMED WITHIN THE STATE RIGHT-OF-WAY.

PAVING NOTES

1. Minimum porking lot grade shall be 1%
2. Minimum grade for ribbon drains shall be 0.5%.
3. An approved soil sterilizer shall be used an all subgrade surfaces priar to placement of paving.
4. Asphaltic emulsion (fag seal) shall be applied not less than fourteen (14) days following placement of asphalt surfacing and shall be applied at a rate of 0.05 gallons per square yard, asphalt emulsion shall conform to Section 37, 39 and 94 of the State Standord Specifications.
5. The subdivider or contractor shall apply to the City Engineering Department for an encroachment permit for all work within the right-of-way.
6. Two special inspections are required by the City Engineering Department. One inspection at the time the base is placed and the second with the A.C. has been placed.
7. The contractor shall be responsible for the clearing of the proposed work area, and relocation and cost of all existing utilities. The City shall be inframed 48 haurs priar to beginning of constructions at (909) 304-2489.
8. A compaction repart by a soil Engineer shall certify 95% compaction of base priar to calling for second inspection and placement of asphalt paving.

OWNER/DEVELOPER:

D.R. HORTON, LOS ANGELES
119 NORTH MAPLE STREET, SUITE "A"
CORONA, CA 92880
PHONE: 909-272-9000
FAX: 909-272-9797
CONTACT: MR. BRUCE NEW

DECLARATION OF RESPONSIBLE CHARGE:

I HEREBY DECLARE AND BY SIGNATURE AND SEAL BELOW ATTEST THAT I AM THE ENGINEER OF WORK FOR THIS PROJECT, THAT I HAVE EXCERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THE PROJECT AS DEFINED IN SECTION 6703 OF THE BUSINESS AND PROFESSIONS CODE, AND THAT THE DESIGN IS CONSISTENT WITH CURRENT STANDARDS.

I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE CITY OF MURRIETA IS CONFINED TO REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITIES FOR PROJECT DESIGN.

HUNSAKER AND ASSOCIATES
3 HUGHES
IRVINE, CALIFORNIA 92618-2082
(949) 458-5400

LAMAR H. STEWART — DATE 6/28/04

R.C.E. NO.: 29726
EXP. DATE: 03/31/07

REGISTERED PROFESSIONAL ENGINEER — LAMAR H. STEWART — NO. 29726 — Lic. Exp. 3/31/07 — CIVIL — STATE OF CALIFORNIA

GRADING QUANTITES

EXCAVATION	3000 C.Y	EMBANKMENT	1800 C.Y
		EXPORT	1200 C.Y

ESTIMATE OF QUANTITIES

NO.	DESCRIPTION	QUANTITIES	
	STREET CONSTRUCTION NOTES	TOTAL	UN.
1	CONST. 4" A.C. WITH SEALCOAT OVER 6" A.B. WITH PRIMECOAT PER C. OF M. STD. NOS. 103 & 120	17,668	S.F.
2	CONST. 6" A.C. DIKE PER C. OF M. STD. NO. 301	2:7	L.F.
3	INSTALL 2X4 REDWOOD HEADERS PER C. OF M. STD 613	1,386	L.F.
4	SAW-CUT, REMOVE AND DISPOSE OF EXIST. A.C. PAVEMENT	2,160	S.F.
5	REMOVE EXISTING 2X4 REDWOOD HEADER	660	L.F.
6	ADJUST TO GRADE (M.H RIM/VALVE BOXES)	1	E.A
7	CONSTRUCT 8" WHITE STRIPING W/8" CROSS HATCH - 50' OC	552	L.F.
9	REMOVE EXISTING AC-DIKE	140	L.F.
	STORM DRAIN CONSTRUCTION NOTES		
10	CONST. 18" C.S.P - 16 GA	107	L.F.
11	CONST. CATCH BASIN NO. 2 (SINGLE GRATE) PER C. OF M. STD. NO. 451	3	EA.
12	CONST. LOCAL DEPRESSION	3	EA.
13	CUT EXIST. 18" C.S.P AND JOIN WITH CONC. COLLAR PER C. O FM. STD. NO. 451	1	EA.

UNDERGROUND SERVICE ALERT

CALL BEFORE YOU DIG — Call:Toll FREE 1(800) 227-2600

TWO WORKING DAYS BEFORE YOU DIG

"CAUTION": Remember that the USA Center notifies only those utilities belonging to the center. There could be other utilities present at the work site. The center will inform you of whom they will notify.

BENCH MARK R-1-70

DESCRIPTION: BRASS DISK IN CONC POST,NW COR WASHINGTON AND C ST. 58 FT N/O CEN C ST. 58 FT W/O CEN OF WASH. AVE, 15.0 FT N/O SE COR OF MURRIETA POST OFFICE, 10 FT E/O THE E. WALL OF P.O. BRASS DISK SET INCONC. POST MARKED R-1-70.
ELEVATION: 1090.024'
RECORDED: 1-31-83
ADJ. ELEVATION: DATUM:

REGISTERED PROFESSIONAL ENGINEER — LAMAR H. STEWART — NO. 29726 — Lic. Exp. 3/31/07 — CIVIL — STATE OF CALIFORNIA

APPROVED FOR SIGNATURE
HAROLD GARCELON — DATE 6/29/04
RCE NO. 31681, EXP. 12/31/04
HALL AND FOREMAN, INC.

PREPARED BY:
HUNSAKER & ASSOCIATES IRVINE, INC
PLANNING ■ ENGINEERING ■ SURVEYING
Three Hughes • Irvine, CA 92618 • PH: (949) 583-1010 • FX: (949) 583-0759

PREPARED UNDER THE SUPERVISION OF:
LAMAR H. STEWART, R.C.E. NO. 29726, — 6/28/04 — EXPIRES 03/31/07

DATE	INITIAL	REVISION DESCRIPTION	SHT NO.	DATE	INITIAL
		ENGINEER OF WORK			CITY APPROVAL

SHEET 1 — CITY OF MURRIETA, ENGINEERING DEPARTMENT — SHEETS 4

CLINTON KEITH ROAD
TITLE SHEET

APPROVED BY: — 7-1-04 DATE
JAMES ELERY KINLEY, CITY ENGINEER
R.C.E. NO. 34908 LIC. EXP. 9/30/05

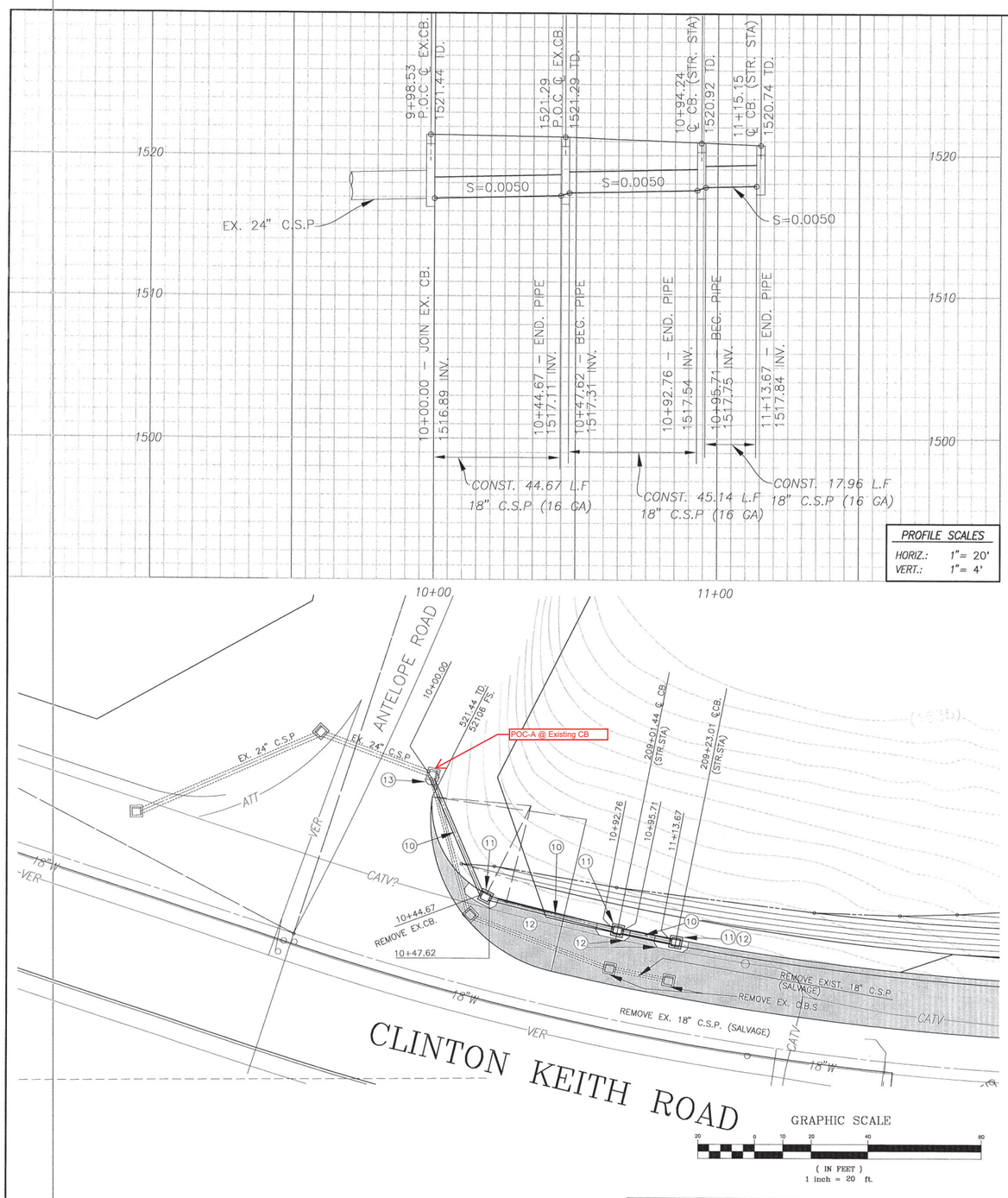
DWN BY: S.B.P.
DES BY: S.B.P.
CHKD BY: P.C.
PROJECT NO: PCE-000-003
DRAWING NO. 04-173

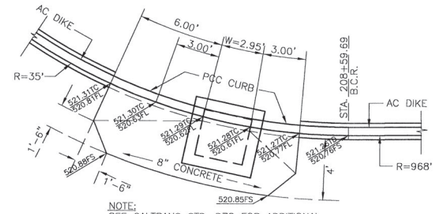
DOC. NO:
BIN:
ROOM:
W.O. 135-67
CLINTON KEITH STREET IMPROVEMENT PLANS

DRAWING NUMBER 04-173

DRAWING NUMBER

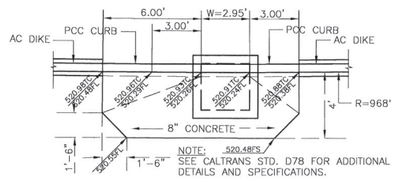
L:\Clinton Keith\IMP\STREET\OFF-SITE\FREEWAY EXTENSION\SHT01.dwg





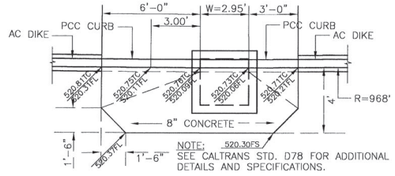
(12) LOCAL DEPRESSION DETAIL CATCH BASIN WITH GRATE

SCALE: 1/4" PER 1'



STA. 209+01.44–CL C.B.
(12) LOCAL DEPRESSION DETAIL CATCH BASIN WITH GRATE

SCALE: 1/4" PER 1'



STA. 209+23.01–CL C.B.
(12) LOCAL DEPRESSION DETAIL CATCH BASIN WITH GRATE

SCALE: 1/4" PER 1'

MATERIALS RE–USE NOTES:

WITH THE CONCURRANCE OF THE FIELD INSPECTOR, SALVAGED MATERIALS (C.S.P PIPE & C.B. GRATES). IF FOUND TO BE UNDAMAGED & SERVICEBALE, MAY BE RE–USED FOR THE STORM DRAIN CONSTRUCTION.

CONSTRUCTION NOTES

(10) CONST. 18" C.S.P – 16 GA
(11) CONST. CATCH BASIN NO. 2 (SINGLE GRATE) PER C. OF M. STD. NO. 404
(12) CONST. LOCAL DEPRESSION
(13) CUT EXIST. 18" C.S.P AND JOIN WITH CONC. COLLAR PER C. OF M. STD. NO. 451

MAP DATE IDENTIFIER
DATE OF LATEST CHANGE TO THIS MAP: 11/26//03 BY: A.T.
DATE OF THIS PLOT: 06/28/04

BENCH MARK R-1-70

DESCRIPTION: BRASS DISK IN CONC POST,NW COR WASHINGTON AND C ST. 59 FT N/O CEN C ST, 58 FT W/O CEN OF WASH. AVE, 15.0 FT N/O SE COR OF MURRIETA POST OFFICE, 10 FT E/O THE E. WALL OF P.O. BRASS DISK SET INCONC. POST MARKED R-1-70.
ELEVATION: 1090.024'
RECORDED: 1-31-83
ADJ. ELEVATION: DATUM:

REGISTERED PROFESSIONAL ENGINEER LAMAR H. STEWART NO. 29726 Lic. Exp. 3/31/07 CIVIL STATE OF CALIFORNIA

APPROVED FOR SIGNATURE
HAROLD GARCELON
RCE NO. 31681, EXP. 12/31/04
HALL AND FOREMAN, INC.
6/22/04 DATE

PREPARED BY:
HUNSAKER & ASSOCIATES
IRVINE, INC.
PLANNING • ENGINEERING • SURVEYING
Irvine, CA 92618 PH: (949) 583-1010 FX: (949) 583-0759
Steve Hughes

PREPARED UNDER THE SUPERVISION OF:
LAMAR H. STEWART
R.C.E. NO. 29726, EXPIRES 03-31-07
6/28/04

DATE	INITIAL	ENGINEER OF WORK

SHT NO.	REVISION DESCRIPTION	DATE	INITIAL CITY APPROVAL

SHEET 4 — CITY OF MURRIETA ENGINEERING DEPARTMENT — SHEETS 4

TENTATIVE TRACT NO. 30842
CLINTON KEITH ROAD
STA 211+00 TO STA 217+00

APPROVED BY:
JAMES ELERY KINLEY, CITY ENGINEER
FOR THE CITY OF MURRIETA
R.C.E. NO. 34908 EXP. 9/30/05
7-7-04 DATE

DWN. BY: S.B.P.
DES. BY: S.B.P.
CHKD. BY: T.G.
PROJECT NO. PCI-000-003
DRAWING NO. 04-1176

DOC. NO:
BNK:
ROW
W.O. 175-67
CLINTON KEITH STREET IMPROVEMENT PLANS

L:\Clinton Keith\IMP\STREET\OFF-SITE\FREEWAY EXTENSION\SHT04.dwg

DRAWING NUMBER

DRAWING NUMBER

DRAWING NUMBER 04-1176

STREET AND STORM DRAIN IMPROVEMENT PLANS FOR TRACT NO. 31171

INTERIOR STREETS

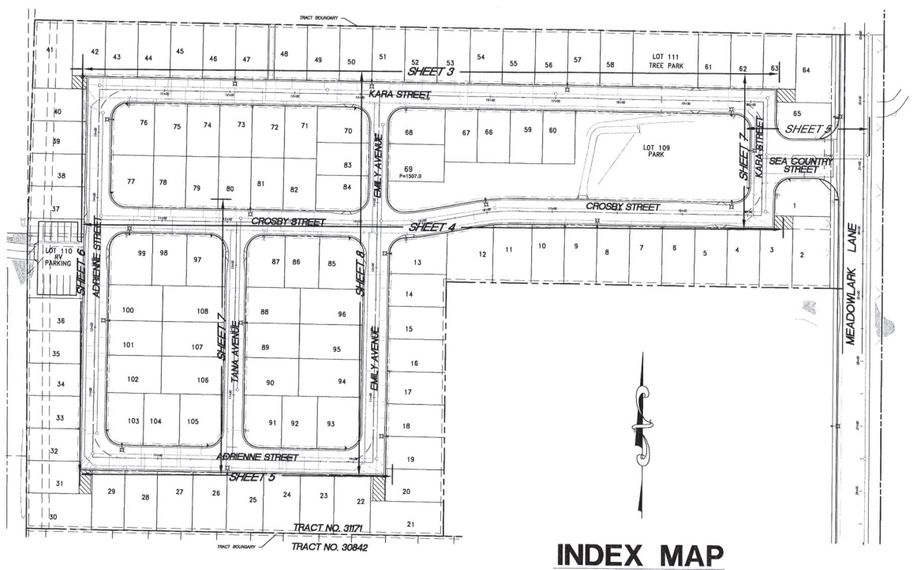
IN THE CITY OF MURRIETA, RIVERSIDE COUNTY, CALIFORNIA

GENERAL NOTES

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CLEARING OF THE PROPOSED WORK AREA, AND RELOCATION COST OF ALL EXISTING UTILITIES. PERMITTEE MUST INFORM THE CITY OF CONSTRUCTION SCHEDULE AT LEAST 48 HOURS PRIOR TO BEGINNING OF CONSTRUCTION.
PHONE: (909) 304-CITY (2489)
2. ALL WORK SHALL CONFORM TO THE REQUIREMENTS OF THE CITY OF MURRIETA PUBLIC WORKS DEPARTMENT IMPROVEMENT STANDARDS AND THE LATEST EDITION OF STANDARD SPECIFICATION FOR PUBLIC WORKS CONSTRUCTION (GREEN BOOK).
3. THE DEVELOPER WILL INSTALL STREET NAME SIGNS CONFIRMING TO CITY STANDARD NO. 601.
4. CURB DEPRESSIONS AND DRIVEWAY APPROACHES WILL BE INSTALLED AND CONSTRUCTED ACCORDING TO CITY STANDARD NO. 308, 309, OR 310, AS DIRECTED IN THE FIELD.
5. BLUE RAISED REFLECTIVE PAVEMENT MARKERS SHALL BE PLACED TO MARK FIRE HYDRANT AND/OR WATER SUPPLY LOCATIONS AT THE DIRECTION OF THE CITY INSPECTOR FOLLOWING FINAL SEALANT AND STRIPING.
6. WORK MAY NOT START UNTIL PERMITS HAVE BEEN OBTAINED.
7. THE CONTRACTOR SHALL VERIFY ALL UTILITY LOCATIONS WITH UNDERGROUND SERVICE ALERT AT 1-800-422-4133 AT LEAST TWO (2) WORKING DAYS PRIOR TO ANY EXCAVATION.
8. ALL PAVEMENT SECTIONS ARE AT MINIMUM REQUIREMENTS. ADDITIONAL SOIL TEST SHALL BE TAKEN AFTER ROUGH GRADING TO DETERMINE THE EXACT STRUCTURAL SECTION REQUIREMENTS. USE STANDARD NO. 320 IF EXPANSIVE SOILS ARE ENCOUNTERED.
9. DUST CONTROLS SHALL BE MAINTAINED AT ALL TIMES, BY WATER OR OTHER APPROVED METHODS.
10. EQUIPMENT AND MATERIALS SHALL BE STORED IN A NEAT AND PROTECTED MANNER.
11. THE CONTRACTOR WILL CONDUCT HIS OPERATIONS AS TO OFFER THE LEAST POSSIBLE OBSTRUCTION AND INCONVENIENCE TO PUBLIC TRAFFIC, AND HE SHALL HAVE UNDER CONSTRUCTION NO GREATER LENGTH OR AMOUNT OF WORK THAN HE CAN EXECUTE PROPERLY. ON EXISTING ROADS, TRAFFIC SHALL BE PERMITTED TO PASS THROUGH THE WORK AREA WITH AS LITTLE INCONVENIENCE AND DELAY AS POSSIBLE.
12. EXISTING TRAFFIC SIGNALS AND LIGHTING SYSTEMS SHALL BE KEPT IN OPERATION FOR THE BENEFIT OF THE TRAVELING PUBLIC, AND TO MINIMIZE ANY INTERFERENCE WITH ROUTINE MAINTENANCE OF EXISTING SYSTEMS DURING WORK PROGRESS.
13. WHENEVER THE CONTRACTOR'S OPERATION CREATES A HAZARDOUS CONDITION TO TRAFFIC OR TO THE PUBLIC, HE SHALL FURNISH AT HIS OWN EXPENSE, SUCH FLAGMEN AND GUARDS AS ARE NECESSARY TO GIVE ADEQUATE WARNING TO THE PUBLIC OF ANY DANGEROUS CONDITIONS. HE SHALL ALSO FURNISH, ERECT AND MAINTAIN SUCH FENCES BARRICADES, LIGHTS, SIGNS, AND OTHER DEVICES NECESSARY TO PREVENT ACCIDENTS AND INJURY TO THE PUBLIC.
14. WHERE SURVEY MONUMENTS EXIST, SUCH MONUMENTS WILL BE PROTECTED OR SHALL BE REFERENCED AND RESET, PURSUANT TO BUSINESS AND PROFESSIONS CODE, SECTIONS 8700 TO 8805 (LAND SURVEYOR'S ACT).
15. WHERE NEW A.C. PAVEMENT JOIN EXISTING PAVEMENT, SAWCUT TO A NEAT EDGE. THE SAWCUTS MUST BE PERPENDICULAR, PARALLEL OR RADIAL TO THE ROADWAY CENTERLINE. OVERLAY AND FEATHER NEW A.C. PAVEMENT TO PROVIDE SMOOTH TRANSITION.
16. ALL EXISTING STREET SIGNS, ROADSIDE MARKERS, ETC., SHALL BE PROTECTED AND/OR REPLACED IN KIND TO THE CURRENT CITY STANDARD PLANS AND CURRENT TRAFFIC MANUAL, AT NO COST TO THE CITY.
17. ASPHALTIC EMULSION (FOG SEAL) SHALL BE APPLIED NOT LESS THAN FOURTEEN (14) DAYS FOLLOWING PLACEMENT OF THE ASPHALT SURFACING AND SHALL BE APPLIED AT A MIN. RATE OF 0.05 GALLON PER SQUARE YARD. ASPHALTIC EMULSION SHALL CONFORM TO SECTION 37, 39, AND 94 OF THE STATE STANDARD SPECIFICATIONS.
18. ALL UNDERGROUND FACILITIES, WITH LATERALS SHALL BE IN PLACE PRIOR TO PAVING THE STREET SECTION INCLUDING, BUT NOT LIMITED TO, THE FOLLOWING: WATER, SEWER, GAS, ELECTRIC, CABLE T.V. , TELEPHONE, AND DRAINAGE.
19. THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF THE AVAILABLE RECORDS. TO THE BEST OF OUT KNOWLEDGE, THERE ARE NO EXISTING UTILITIES EXCEPT AS SHOWN ON THESE PLANS, THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT ALL UTILITY LINE, INCLUDING ANY OTHER LINES NOT SHOWN ON THESE PLANS OR NOT OF RECORD.
20. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO APPLY TO THE CITY OF MURRIETA ENGINEERING DEPARTMENT, FOR AN ENCROACHMENT PERMIT FOR ALL WORK ON EXISTING CITY MAINTAINED ROADS, AND FOR UTILITY WORK WITHIN OFFERS OF DEDICATION FOR PUBLIC USE.
21. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY THE ENGINEER TO INSTALL STREET CENTERLINE MONUMENTS AS REQUIRED BY CITY STANDARD DRAWINGS NO. 616, 617, AND 618.
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23. APPROVAL OF THESE PLANS BY THE CITY OR ITS AGENTS DOES NOT RELIEVE THE APPLICANT AND HIS ENGINEER FROM THE RESPONSIBILITY FOR THE CORRECTION OF ERRORS OR OMISSIONS DISCOVERED DURING CONSTRUCTION. UPON REQUEST, THE APPROPRIATE PLAN REVISIONS SHALL BE PROMPTLY SUBMITTED TO THE CITY ENGINEER FOR REVIEW AND APPROVAL.
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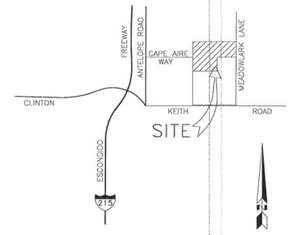
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8. A compaction report by a soil Engineer shall certify 95% compaction of base prior to calling far second inspection and placement af asphalt paving.



INDEX MAP

SCALE 1" = 100'



VICINITY MAP

NO SCALE

2003 THOMAS GUIDE PAGE: 898 GRID: F7

LEGEND

C&G	CURB AND GUTTER
S/W	SIDEWALK
R/W	RIGHT OF WAY
LL	LOT LINE

PLAN INDEX	SHEET NO.
TITLE SHEET, INDEX MAP	1
DETAILS	2
STREET IMPROVEMENT PLANS	3-8
STORM DRAIN IMPROVEMENT PLANS	9-12

DECLARATION OF RESPONSIBLE CHARGE:

I HEREBY DECLARE AND BY SIGNATURE AND SEAL BELOW ATTEST THAT I AM THE ENGINEER OF WORK FOR THIS PROJECT, THAT I HAVE EXCERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THE PROJECT AS DEFINED IN SECTION 6703 OF THE BUSINESS AND PROFESSIONS CODE, AND THAT THE DESIGN IS CONSISTENT WITH CURRENT STANDARDS.

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HUNSAKER AND ASSOCIATES
3 HUGHES
IRVINE, CALIFORNIA 92618-2082
(949) 458-5400

FREEDOUN GRAYLEE — DATE 7/15/04

REGISTERED PROFESSIONAL ENGINEER — FREEDOUN GRAYLEE — NO. 49118 Exp. 9/30/04 — CIVIL — STATE OF CALIFORNIA

R.C.E. NO.: 49118
EXP. DATE: 9/30/04

SeaCountry Homes
1808 Aston Avenue•Suite 100•Carlsbad•California 92008

DIGALERT
DIAL BEFORE YOU DIG — TOLL FREE 1-800-227-2600 — TWO WORKING DAYS BEFORE YOU DIG
A PUBLIC SERVICE BY UNDERGROUND SERVICE ALERT
"CAUTION": Remember that the USA Center notifies only those utilities belonging to the center. There could be other utilities present at the work site. The center will inform you of whom they will notify.

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ELEVATION: 1090.024'
RECORDED: 1-31-83
ADJ. ELEVATION: DATUM:

REGISTERED PROFESSIONAL ENGINEER — FREEDOUN GRAYLEE — NO. 49118 Exp. 9/30/04 — CIVIL — STATE OF CALIFORNIA

APPROVED FOR SIGNATURE
HAROLD GARCELON — DATE 6/03/04
RCE NO. 31681, EXP. 12/31/04
HALL AND FOREMAN, INC.

PREPARED BY:
HUNSAKER & ASSOCIATES IRVINE, INC.
PLANNING • ENGINEERING • SURVEYING
Three Hughes • Irvine, CA 92618 • PH: (949) 583-1010 • FX: (949) 583-0759

PREPARED UNDER THE SUPERVISION OF:
FREEDOUN GRAYLEE, R.C.E. NO. 49118, — DATE: 7/15/04 — EXPIRES 09-30-04

DATE	INITIAL	ENGINEER OF WORK	REVISION DESCRIPTION	SHT NO.	DATE	INITIAL	CITY APPROVAL

SHEET 1 — CITY OF MURRIETA, ENGINEERING DEPARTMENT — SHEETS 12

TRACT NO. 31171

APPROVED BY: JAMES ELERY KINLEY, CITY ENGINEER, FOR THE CITY OF MURRIETA — DATE 9-8-04 — R.C.E. NO. 34208 EXP. 9/30/05

DWN BY: S.B.P. DESD BY: S.B.P. CHKD BY: F.G. — PROJECT NO. 04-I-005 — DRAWING NO. 04-1941

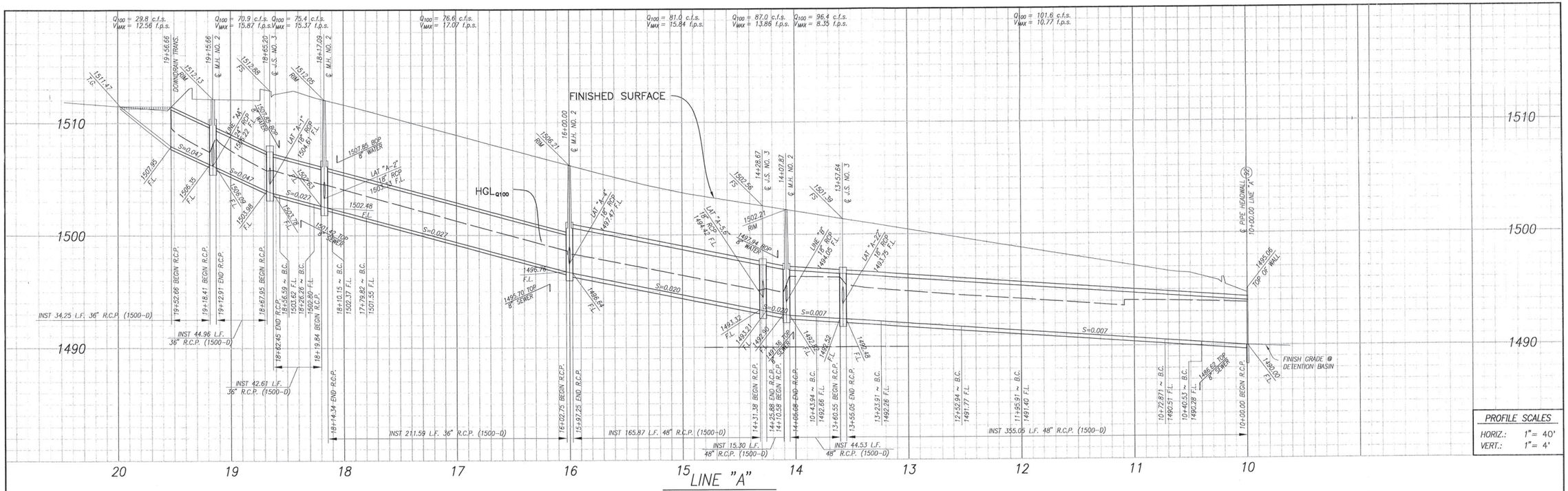
DOC. NO.: BIN: W.O. 1981-4 ROOM: TR 31171 IMPROVEMENT PLANS

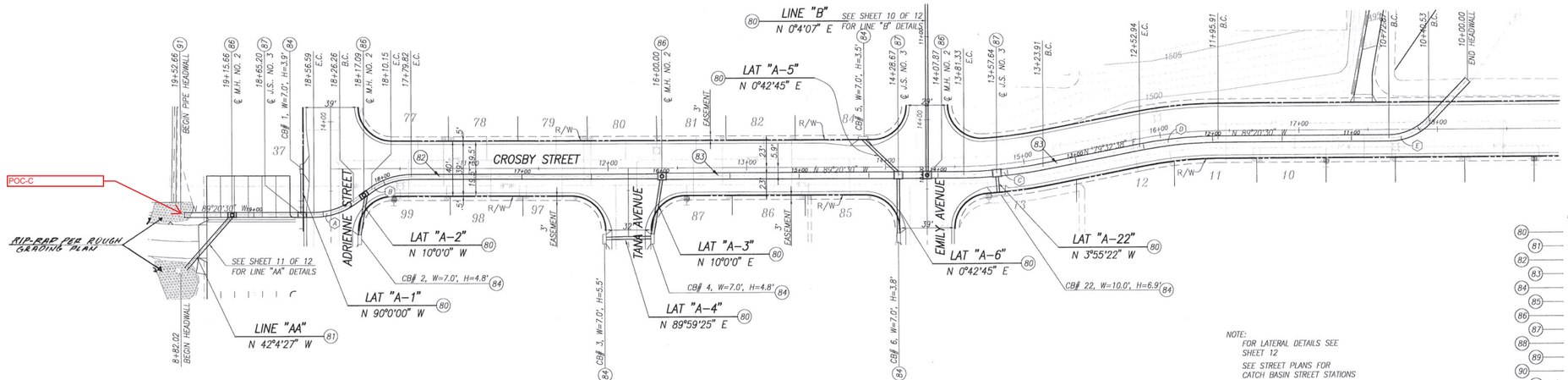
L:\Clinton Keith North\imp\STREET\SHT01.dwg

DRAWING NUMBER

DRAWING NUMBER

04-1941





HYDRAULIC DATA

LINE	STA to STA	Q_{100}	DIA	So	n	Dc	Vc	Sc	Dn	Vn	Vf	Sf
"A"	10+00.00 13+57.64	101.6	48"	0.0070	0.013	3.05	9.89	0.0058	2.82	10.73	8.09	0.0050
"A"	13+57.64 14+07.87	96.4	48"	0.0070	0.013	2.98	9.60	0.0055	2.71	10.63	7.67	0.0045
"A"	14+07.87 14+28.67	87.0	48"	0.0200	0.013	2.83	9.16	0.0051	1.83	15.54	6.92	0.0037
"A"	14+28.67 16+00.00	81.0	48"	0.0200	0.013	2.73	8.82	0.0048	1.76	15.25	6.45	0.0032
"A"	16+00.00 18+17.09	76.6	36"	0.0270	0.013	1.85	10.95	0.0115	1.85	16.77	10.84	0.0132
"A"	18+17.09 18+65.20	75.4	36"	0.0270	0.013	2.71	11.16	0.0111	1.85	16.71	10.67	0.0128
"A"	18+65.20 19+15.66	70.9	36"	0.0470	0.013	2.67	10.64	0.0100	1.48	20.36	10.04	0.0113
"A"	19+15.66 19+56.66	29.8	36"	0.0470	0.013	1.77	6.83	0.0046	0.92	16.11	4.22	0.0020

CURVE DATA

	BEARING/DELTA	RADIUS	LENGTH	TANGENT
A	34°45'36"	50.00'	30.33'	15.65'
B	34°45'36"	50.00'	30.33'	15.65'
C	11°06'51"	296.00'	57.42'	28.80'
D	11°06'51"	294.00'	57.03'	28.60'
E	46°19'22"	40.00'	32.34'	17.11'

CONSTRUCTION NOTES

(80) INST. 18" R.C.P. (SEE PROFILE FOR D-LOAD)
(81) INST. 24" R.C.P. (SEE PROFILE FOR D-LOAD)
(82) INST. 36" R.C.P. (SEE PROFILE FOR D-LOAD)
(83) INST. 48" R.C.P. (SEE PROFILE FOR D-LOAD)
(84) CONST. CURB INLET CATCH BASIN PER MURRIETA STD. DWG. NO. 401
(85) CONST. M.H. NO. 1 PER R.C.F.C. & W.C.D. STD. DWG. NO. MH 251
(86) CONST. M.H. NO 2 PER R.C.F.C. & W.C.D. STD. DWG. NO. MH 252
(87) CONST. J.S. NO. 3 PER R.C.F.C. & W.C.D. STD. DWG. NO. MH 228
(88) CONST. J.S. NO 6 PER R.C.F.C. & W.C.D. STD. DWG. NO. MH 231
(89) CONST. PIPE CULVERT HEADWALL PER CAL-TRANS STD. PLAN D89
(90) CONST. RIP-RAP PER MURRIETA STD. DWG. NO. 446A AND 446B
(91) CONST. DOWNDRAIN PIPE TRANSITION PER MURRIETA STD. DWG. NO. 431
(92) CONST. STAGE DISCHARGE STRUCTURE AS PER DETAIL ON SHEET 11 OF 12

NOTE:
FOR LATERAL DETAILS SEE SHEET 12
SEE STREET PLANS FOR CATCH BASIN STREET STATIONS

LINE "A"
GRAPHIC SCALE
40 0 20 40 80 160
(IN FEET)
1 inch = 40 ft.

PROFILE SCALES	
HORIZ.:	1"= 40'
VERT.:	1"= 4'

BENCH MARK R-1-70
DESCRIPTION: BRASS DISK IN CONC. POST,NW COR. WASHINGTON AND C ST. 58 FT N/O CEN C ST, 58 FT W/O CEN OF WASH. AVE, 15.0 FT N/O SE COR OF MURRIETA POST OFFICE, 10 FT E/O THE E. WALL OF P.O. BRASS DISK SET INCONC. POST MARKED R-1-70.
ELEVATION: 1090.024'
RECORDED: 1-31-83
ADJ. ELEVATION: DATUM:

REGISTERED PROFESSIONAL ENGINEER FREIDOUN GRAYLEE NO. 49118 Exp. 9/30/04 CIVIL STATE OF CALIFORNIA

APPROVED FOR SIGNATURE
HAROLD GARCELON
RCE NO. 31681, EXP. 12/31/04
HALL AND FOREMAN, INC.
8/03/04 DATE

PREPARED BY:
HUNSAKER & ASSOCIATES
IRVINE, INC.
PLANNING ▪ ENGINEERING ▪ SURVEYING
Three Hughes • Irvine, CA 92618 • PH: (949) 583-1010 • FX: (949) 583-0759

PREPARED UNDER THE SUPERVISION OF:
FREIDOUN GRAYLEE, R.C.E. NO. 49118,
7/27/04 DATE: EXPIRES 09-30-04

DATE	INITIAL	ENGINEER OF WORK

REVISION DESCRIPTION

SHT NO.	DATE	INITIAL	CITY APPROVAL

SHEET 9 | CITY OF MURRIETA ENGINEERING DEPARTMENT | SHEETS 12

PLAN & PROFILE FOR IMPROVEMENTS OF STORM DRAIN LINE "A" TRACT NO. 31171

APPROVED BY:
JAMES ELERY KINLEY, CITY ENGINEER
FOR THE CITY OF MURRIETA
R.C.E. NO. 34908 EXP. 9/30/05
9.8.04 DATE

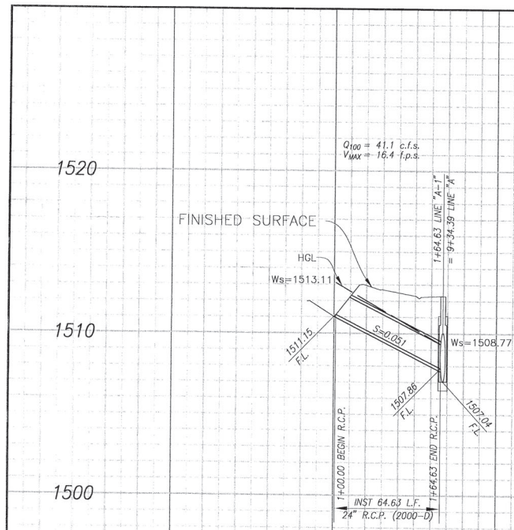
DWN BY: G.P. DES'D BY: G.P. CHK'D BY: F.G.
PROJECT NO. 04-I-005
DRAWING NO. 04-1349

DOC. NO.:
BIN:
ROOM:
W.O. 1981-4
TR 31171 IMPROVEMENT PLANS

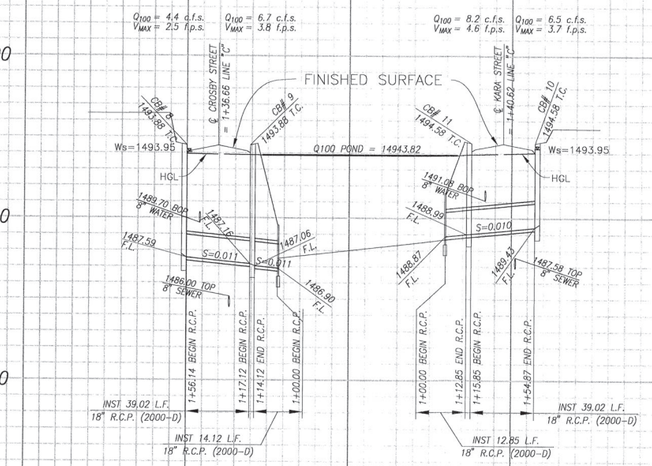
L:\Clinton Keith North\imp\STORM\Hydra\SHT09.dwg

DRAWING NUMBER
04-1349

HUNSAKER & ASSOCIATES IRVINE, INC. 3 HUGHES • IRVINE, CA 92618-2027 (949) 583-1010 • FAX (949) 583-0759

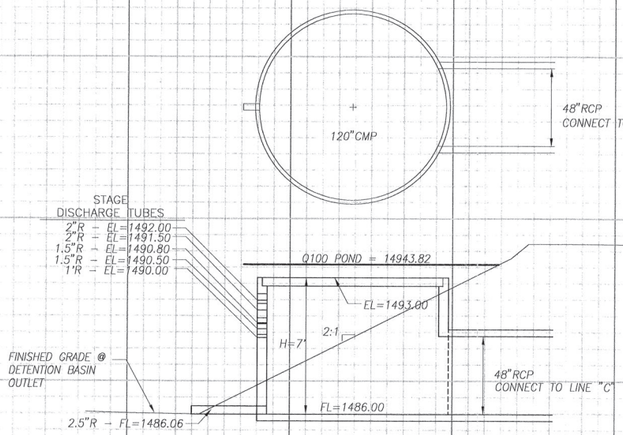


LINE "AA"



LINE "E"

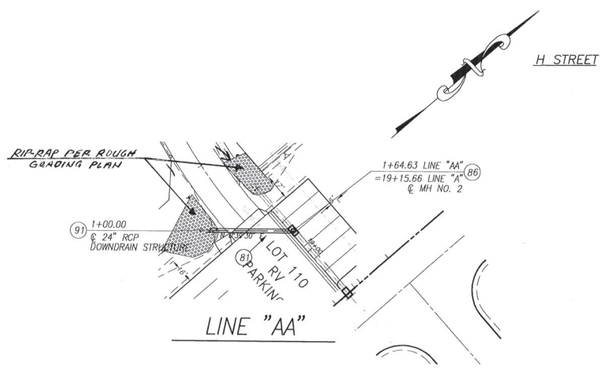
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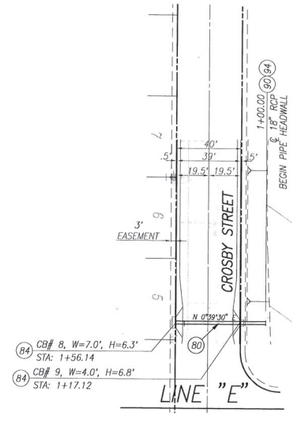


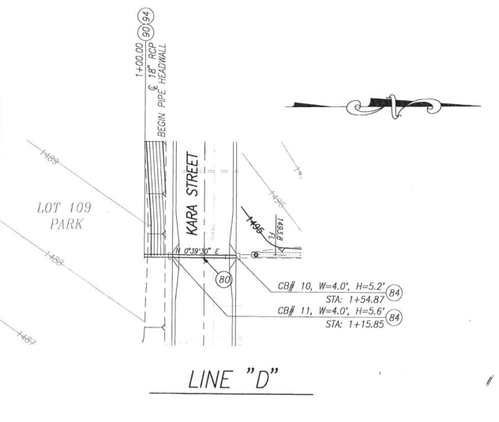
92 STAGE DISCHARGE HEADWALL DETAIL

NTS

PROFILE SCALES	
HORIZ.:	1"= 40'
VERT.:	1"= 4'







CONSTRUCTION NOTES

(80) INST. 18" R.C.P. (SEE PROFILE FOR D-LOAD)
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(91) CONST. DOWNDRAIN PIPE TRANSITION PER MURRIETA STD. DWG. NO. 431

GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)
1 inch = 40 ft.

HYDRAULIC DATA

LINE	STA to STA	Q_{100}	DIA	So	n	Dc	Vc	Sc	Dn	Vn	Vf	Sf
"AA"	1+00.00 1+64.63	41.1	24"	0.0510	0.013	1.96	13.13	0.0295	FULL	18.43	13.08	0.0330
"D"	1+00.00 1+12.85	6.5	18"	0.0100	0.013	0.99	5.29	0.0065	0.85	6.26	3.68	0.0038
"D"	1+12.85 1+54.87	8.2	18"	0.0100	0.013	1.11	5.86	0.0076	1.00	6.57	4.64	0.0061
"E"	1+00.00 1+14.12	4.4	18"	0.0100	0.013	0.80	4.53	0.0055	0.68	5.68	2.49	0.0018
"E"	1+14.12 1+64.63	6.7	18"	0.0100	0.013	1.00	5.30	0.0065	0.87	6.30	3.80	0.0041

BENCH MARK R-1-70

DESCRIPTION: BRASS DISK IN CONC POST,NW COR WASHINGTON AND C ST. 58 FT N/O CEN C ST. 58 FT W/O CEN OF WASH. AVE., 15.0 FT N/O SE COR OF MURRIETA POST OFFICE, 10 FT E/O THE E. WALL OF P.O. BRASS DISK SET INCONC. POST MARKED R-1-70.
ELEVATION: 1090.024'
RECORDED: 1-31-83
ADJ. ELEVATION: DATUM:

REGISTERED PROFESSIONAL ENGINEER FREIDOUN GRAYLEE NO. 49118 Exp. 9/30/04 CIVIL STATE OF CALIFORNIA

APPROVED FOR SIGNATURE
HAROLD GARCELON
RCE NO. 31691, EXP. 12/31/04
HALL AND FOREMAN, INC.
8/03/04 DATE

PREPARED BY:
HUNSAKER & ASSOCIATES
I R V I N E, I N C.
PLANNING • ENGINEERING • SURVEYING
Three Hughes • Irvine, CA 92618 • PH: (949) 583-1010 • FX: (949) 583-0759

PREPARED UNDER THE SUPERVISION OF:
FREIDOUN GRAYLEE, R.C.E. NO. 49118, DATE: 7/27/04
EXPIRES 09-30-04

DATE	INITIAL	ENGINEER OF WORK

REVISION DESCRIPTION	SHT NO.	DATE	INITIAL	CITY APPROVAL

SHEET 11 — CITY OF MURRIETA, ENGINEERING DEPARTMENT — SHEETS 12

PLAN & PROFILE FOR IMPROVEMENTS OF STORM DRAIN LINES "AA", "E" & "D"
TRACT NO. 31171

APPROVED BY: JAMES ELERY KNELEY, CITY ENGINEER FOR THE CITY OF MURRIETA, R.C.E. NO. 34908 EXP. 6/30/05 — 9-8-04 DATE

DWN BY: G.P. DESD BY: G.P. CHKD BY: F.G. — PROJECT NO. 04-1005 — DRAWING NO. 04-1351

DOC. NO.: BIN: W.O. 1981-4 FORM: TR 31171 IMPROVEMENT PLANS

DRAWING NUMBER 04-1351

DRAWING NUMBER

L:\Clinton Keith North\imp\STORM\Hydro\SHT11.dwg

Hydrology/Hydraulics Study

For: TPM 37511 UNIT 2

Clinton Keith Road

DEVELOPMENT NO. TPM 37511
DESIGN REVIEW NO.

Prepared for:
CK 17, LP, A CALIFORNIA LIMITED PARTNERSHIP
27890 CLINTON KEITH ROAD D-490
MURRIETA, CA 92562
PHONE: (760) 518-0660
FAX: (951) 679-8968

Prepared by:
Excel Engineering
440 State Place
Escondido, CA 92029
Telephone: (760) 745 8118

Hydrology/Hydraulics Study Preparation Date: MARCH 2018
Revision Dates:

_____
ROBERT D. DENTINO, RCE 45629
Registration Expire: December 31, 2018

TABLE OF CONTENTS

1.0 Purpose of Study
2.0 Project Description
3.0 Vicinity Map
4.0 Site Map
5.0 Description of Watershed
5.1 Existing Conditions Topography
5.2 Post Developed Project Topography
6.0 Methodology
8.0 Calculations
8.1 Analyze 100 Year 1 Hour Storm using the Rational Method
9.0 SUMMARY
10.0 REFERENCES
11.0 DECLARATION OF RESPONSIBLE CHARGE
ATTACHMENTS
Attachment A – Vicinity Map
Attachment B – Site Map
Attachment C – Figures & Tables from the RCFC & WCD Hydrology Manual
Attachment D – Watershed Information Topographic Maps
Attachment E – Interim Condition Drainage Map
Attachment F – Rational Method Pre & Post-Development 100 year storm

1.0 PURPOSE OF STUDY

The purpose of this study is to support the development of a commercial project. Calculations presented here establish pre-development and post development storm runoff, and assist in the sizing of proposed drainage improvements. Calculations will demonstrate that post developed peak runoff will not exceed pre-developed peak runoff, therefore insuring no negative impacts to downstream storm drain systems and adjacent properties. Runoff from both private and public improvements will be addressed by this report.

2.0 PROJECT DESCRIPTION

The project proposes to create 6 separate legal parcels with 6 buildings, occupied with varying shops and sports gym. The site improvements include parking, private drive isles, wet and dry utilities, storm drain, and water quality improvements. The extension of Warm Spring Parkway (a public road) is also a part of this development. The public road intersects with Clinton Keith Road to the south with a temporary terminus at the north side of the project.

3.0 VICINITY MAP

The project site is located in the City of Murrieta, northeast of Clinton Keith and Antelope Road as shown on the Vicinity Map. Please see Attachment A- Vicinity map.

4.0 SITE MAP

See Attachment B – Site map

5.0 DESCRIPTION OF WATERSHED

5.1 Existing Conditions Topography

There is an active mining/ grading operation on the project site and the operation has altered the surface topograhy and drainage patterns. For the purpose of this study, we will use the original topography of the site before the mining operation altered the scenery. This insures that no diversion of flow will happen.

There are 2 distinct basins on site. The northern basins drains into an existing storm drain system to the east of the site. This storm drain system was built as part of the improvement of Track No. 30842-1. We will designate this as POC 1.

POC 2 is the other basin on the site. This basin drains to the southeast corner of the project and eventually drains into an existing storm drain system about 200 feet south. This storm drain system was built as part of the improvement of Track No. 30842-1.

Please note that there is an active project directly south.The mentioned active project is known as “The Vineyard” PM 36493

.

Attachment D, found later in this report, contains the natural condition Watershed Topographic Map.

5.2 Post-Development Project Topography

At 100 percent buildout, the site will be more than 80 percent impervious. When brought to grade the site will become much flatter than its natural condition. At 100 percent buildout, all impervious areas will drain to onsite underground detention pipes and then into bioretention basins before eventually existing the project site. The proposed grades & improvements are such that the drainage patterns to the 2 POCs are maintained.

6.0 METHODOLOGY

This study complies with the April 1978 Riverside County Flood Control & Water Conservation District Hydrology

6.1 Hydrology Software

The "Rational" module of the CIVILCADD/CIVIL DESIGN engineering software version 9.0 was use hereon. See Attachment H.

6.2 Hydraulics Software

Hydroflow Storm Sewers Extension for Autodesk/Autocad./Civil3D will be used to analyze and size private storm drain pipes.

8.0 CALCULATIONS

8.1 Analyze 100 Year 1 Hour Storm using The Rational Method

Peaks flows for both the pre-developed and post developed conditions using Civil and the rational method. Peak flows were established at POC 1. Soil type D and C were used based on USDA Natural Water Resource Conservation Service website. Intensity-Duration data was taken for Plate D-4.1 and the post developed land use assumes commercial development. Table 4 below summarizes the results. Detailed CivilD input-output data can be found in Attachment F of this report.

SUMMARY OF THE 100 YEAR 1 HOUR STORM @ POC 1 - AMC=2			
	PRE-DEVPT PEAK RUNOFF	POST-DEVPT PEAK RUNOFF	UNITS
Q	19.30	16.345	CFS
A	6.54	6.19	ACRES
T_C	10.18	7.92	MINUTES

SUMMARY OF THE 100 YEAR 1 HOUR STORM @ POC 2 - AMC=2			
	PRE-DEVPT PEAK RUNOFF	POST-DEVPT PEAK RUNOFF	UNITS
Q	22.67	22.314	CFS
A	8.48	8.84	ACRES
T_C	14.00	11.214	MINUTES

8.2 Hydrology / Hydraulic for the Storm Drain System

The proposed storm drain system shown in this project will be design and analyzed in the construction stage of the permitting process.

9 SUMMARY

The hydrologic analysis indicated that post developed runoff will not exceed pre-developed runoff, even with the big increase in impervious areas. This will insure no negative impacts to downstream drainage systems, or properties as a result of this development.

10.0 REFERENCES

Riverside County Flood Control Water Conservation District, Flood Control Section, April 1978 Hydrology Manual.

Merritt, S.F., 1983. Standard Handbook for Civil Engineers. Third Edition, Mc Graw – Hill 21-29.

Minton, G.R. 2005.Revisiting Design Criteria for Stormwater Treatment Systems. Stormwater Magazine March/April 2005 Issue.

11.0 DECLARATION OF RESPONSIBLE CHARGE

I hereby declare that I am the engineer of work for this project. That I have exercised responsible charge over the design of the project as defined in section 6703 of the business and professions codes, and that the design is consistent with current design.

I understand that the check of the project drawings and specifications by the Riverside County is confined to a review only and does not relieve me, as engineer of work, of my responsibilities for project design.

ENGINEER OF WORK
Excel Engineering
440 State Place
Escondido, CA 92029
Tel – (760)745-8118
Fax – (760)745-1890

Project Number: 16-063

_____ _____

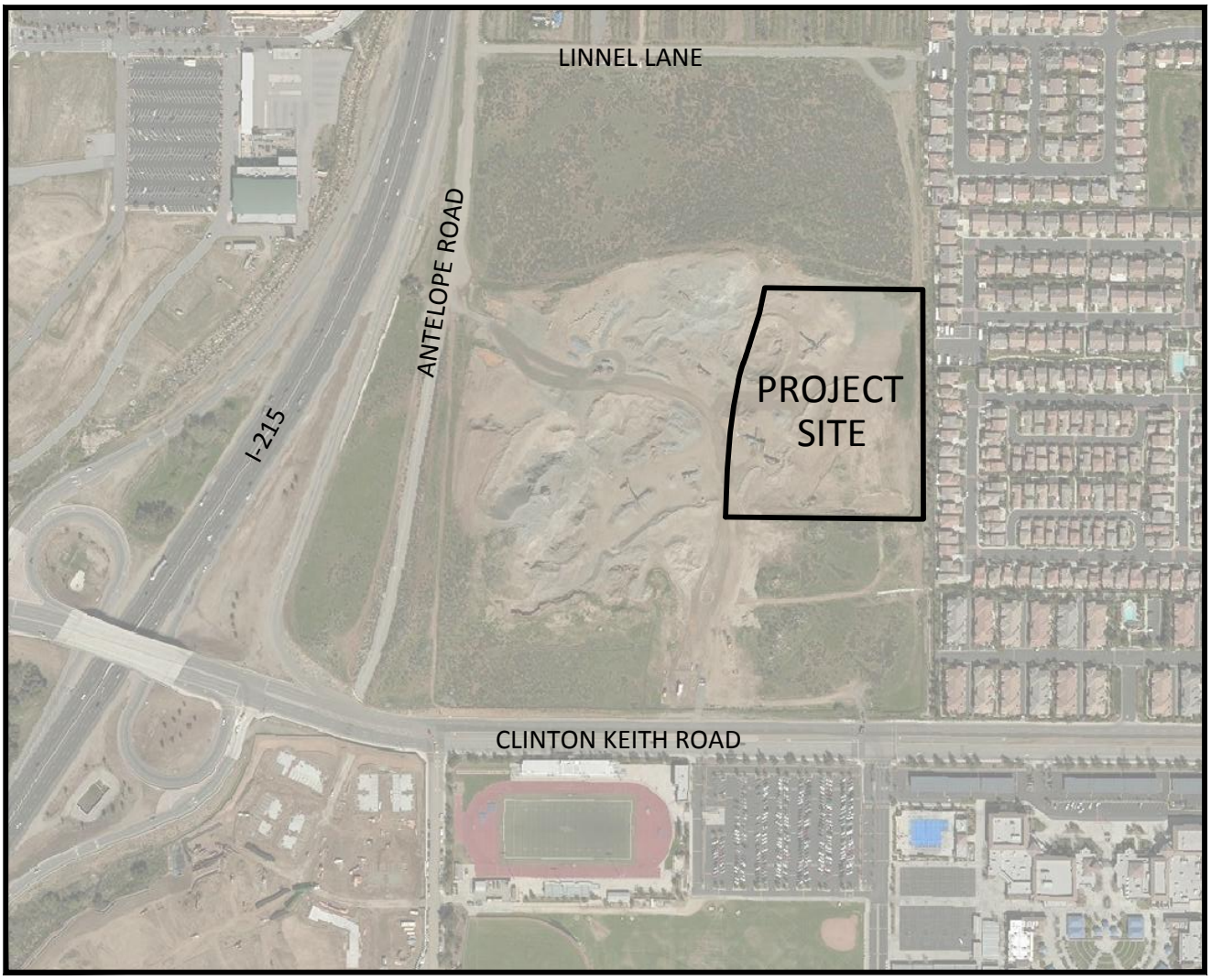
Robert D. Dentino, RCE 45629 Date
Registration Expire: December 31, 2018

ATTACHMENTS

ATTACHMENT A

VICINITY MAP

SCALE 1":500'



0 500 1000 Feet

TPM 37511 UNIT 2
VICINITY MAP

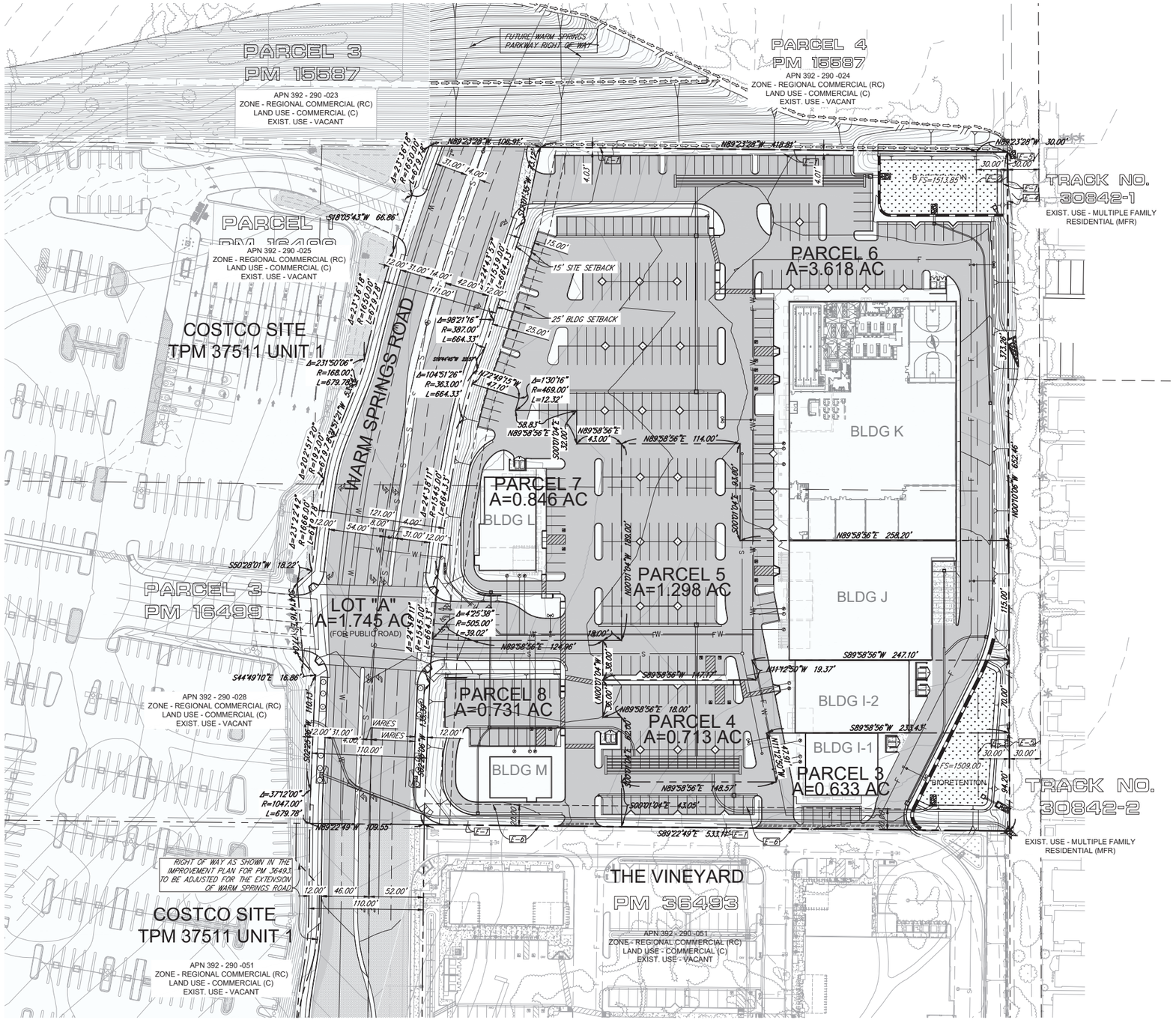
ATTACHMENT B

SITE MAP

SITE MAP

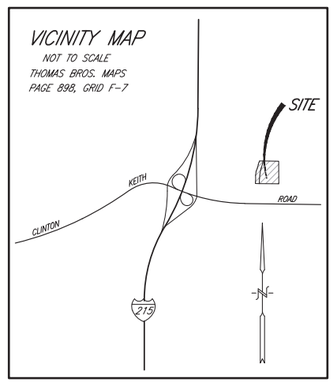
TPM 37511 UNIT 2

~ CITY OF MURRIETA ~



LEGEND

BOUNDARY LINE
RIGHT OF WAY LINE — RW —
PARCEL LOT LINE — PL —



I:\171\7065\engineering\TM\CURRENT\STORM\HYD\17065 SITE MAP.dwg 4/2/2018 3:46 PM ORIGINAL PLOT SIZE: ----

ATTACHMENT C

FIGURES & TABLES FROM THE RCFC & WCD HYDROLOGY MANUAL

RAINFALL INTENSITY—INCHES PER HOUR

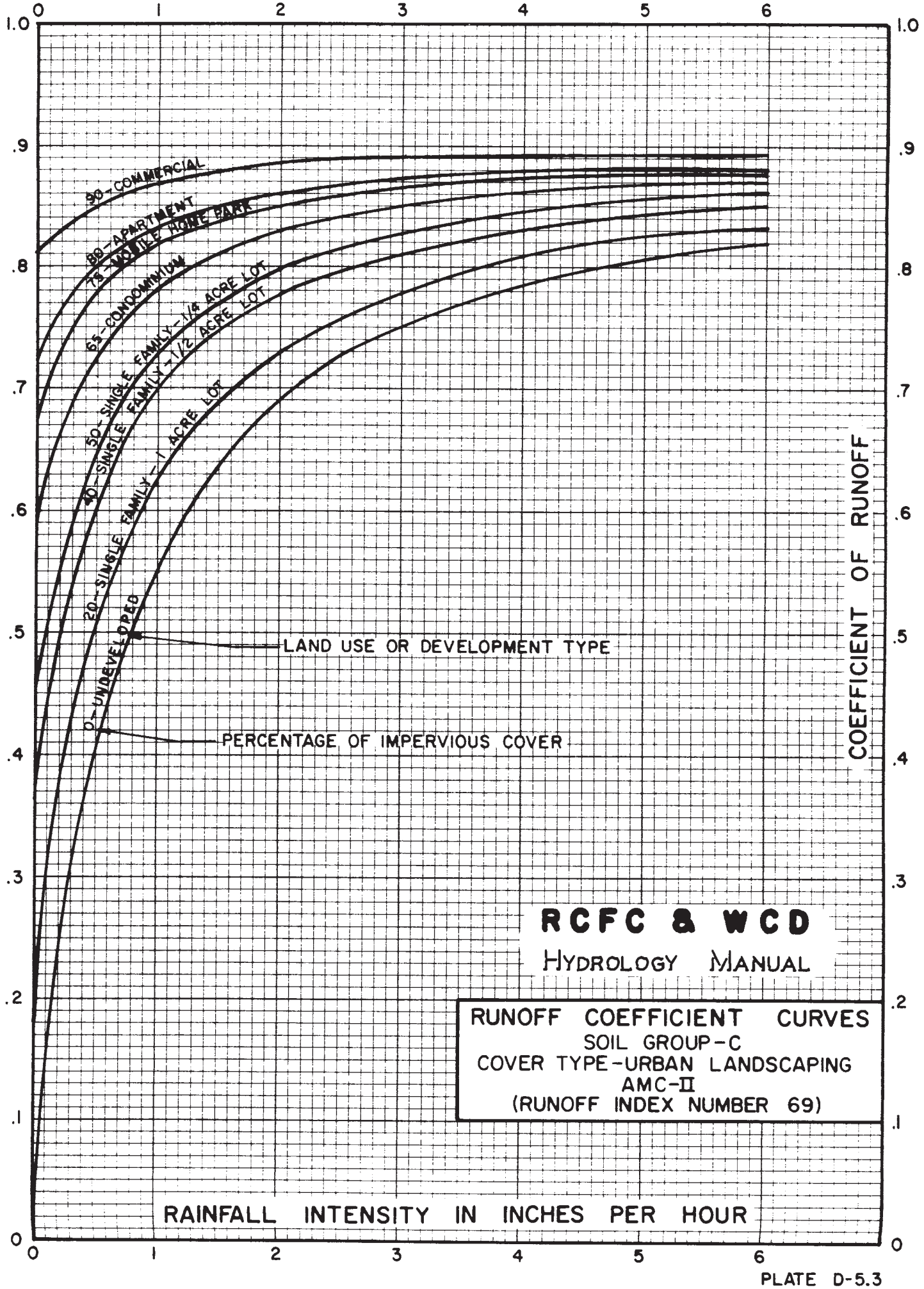
MIRA LOMA			MURRIETA - TEMECULA & RANCHO CALIFORNIA			NORCO			PALM SPRINGS			PERRIS VALLEY		
DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY	
	10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR
5	2.84	4.48	5	3.45	5.10	5	2.77	4.16	5	4.23	6.76	5	2.64	3.78
6	2.58	4.07	6	3.12	4.61	6	2.53	3.79	6	3.80	6.08	6	2.41	3.46
7	2.37	3.75	7	2.87	4.24	7	2.34	3.51	7	3.48	5.56	7	2.24	3.21
8	2.21	3.49	8	2.67	3.94	8	2.19	3.29	8	3.22	5.15	8	2.09	3.01
9	2.08	3.28	9	2.50	3.69	9	2.07	3.10	9	3.01	4.81	9	1.98	2.84
10	1.96	3.10	10	2.36	3.48	10	1.96	2.94	10	2.83	4.52	10	1.88	2.69
11	1.87	2.95	11	2.24	3.30	11	1.87	2.80	11	2.67	4.28	11	1.79	2.57
12	1.78	2.82	12	2.13	3.15	12	1.79	2.68	12	2.54	4.07	12	1.72	2.46
13	1.71	2.70	13	2.04	3.01	13	1.72	2.58	13	2.43	3.88	13	1.65	2.37
14	1.64	2.60	14	1.96	2.89	14	1.66	2.48	14	2.33	3.72	14	1.59	2.29
15	1.58	2.50	15	1.89	2.79	15	1.60	2.40	15	2.23	3.58	15	1.54	2.21
16	1.53	2.42	16	1.82	2.69	16	1.55	2.32	16	2.15	3.44	16	1.49	2.14
17	1.48	2.34	17	1.76	2.60	17	1.50	2.25	17	2.08	3.32	17	1.45	2.08
18	1.44	2.27	18	1.71	2.52	18	1.46	2.19	18	2.01	3.22	18	1.41	2.02
19	1.40	2.21	19	1.66	2.45	19	1.42	2.13	19	1.95	3.12	19	1.37	1.97
20	1.36	2.15	20	1.61	2.38	20	1.39	2.08	20	1.89	3.03	20	1.34	1.92
22	1.29	2.04	22	1.53	2.26	22	1.32	1.98	22	1.79	2.86	22	1.28	1.83
24	1.24	1.95	24	1.46	2.15	24	1.26	1.90	24	1.70	2.72	24	1.22	1.75
26	1.18	1.87	26	1.39	2.06	26	1.22	1.82	26	1.62	2.60	26	1.18	1.69
28	1.14	1.80	28	1.34	1.98	28	1.17	1.76	28	1.56	2.49	28	1.13	1.63
30	1.10	1.73	30	1.29	1.90	30	1.13	1.70	30	1.49	2.39	30	1.10	1.57
32	1.06	1.67	32	1.24	1.84	32	1.10	1.64	32	1.44	2.30	32	1.06	1.52
34	1.03	1.62	34	1.20	1.78	34	1.06	1.59	34	1.39	2.22	34	1.03	1.48
36	1.00	1.57	36	1.17	1.72	36	1.03	1.55	36	1.34	2.15	36	1.00	1.44
38	.97	1.53	38	1.13	1.67	38	1.01	1.51	38	1.30	2.09	38	.98	1.40
40	.94	1.49	40	1.10	1.62	40	.98	1.47	40	1.27	2.02	40	.95	1.37
45	.89	1.40	45	1.03	1.52	45	.92	1.39	45	1.18	1.89	45	.90	1.29
50	.84	1.32	50	.97	1.44	50	.88	1.31	50	1.11	1.78	50	.85	1.22
55	.80	1.26	55	.92	1.36	55	.84	1.25	55	1.05	1.68	55	.81	1.17
60	.76	1.20	60	.88	1.30	60	.80	1.20	60	1.00	1.60	60	.78	1.12
65	.73	1.15	65	.84	1.24	65	.77	1.15	65	.95	1.53	65	.75	1.08
70	.70	1.11	70	.81	1.19	70	.74	1.11	70	.91	1.46	70	.72	1.04
75	.68	1.07	75	.78	1.15	75	.72	1.07	75	.88	1.41	75	.70	1.00
80	.65	1.03	80	.75	1.11	80	.69	1.04	80	.85	1.35	80	.68	.97
85	.63	1.00	85	.73	1.07	85	.67	1.01	85	.82	1.31	85	.66	.94
SLOPE = .530			SLOPE = .550			SLOPE = .500			SLOPE = .580			SLOPE = .490		

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HYDROLOGY MANUAL

STANDARD INTENSITY-DURATION CURVES DATA

PLATE D-4.1 (4 of 6)

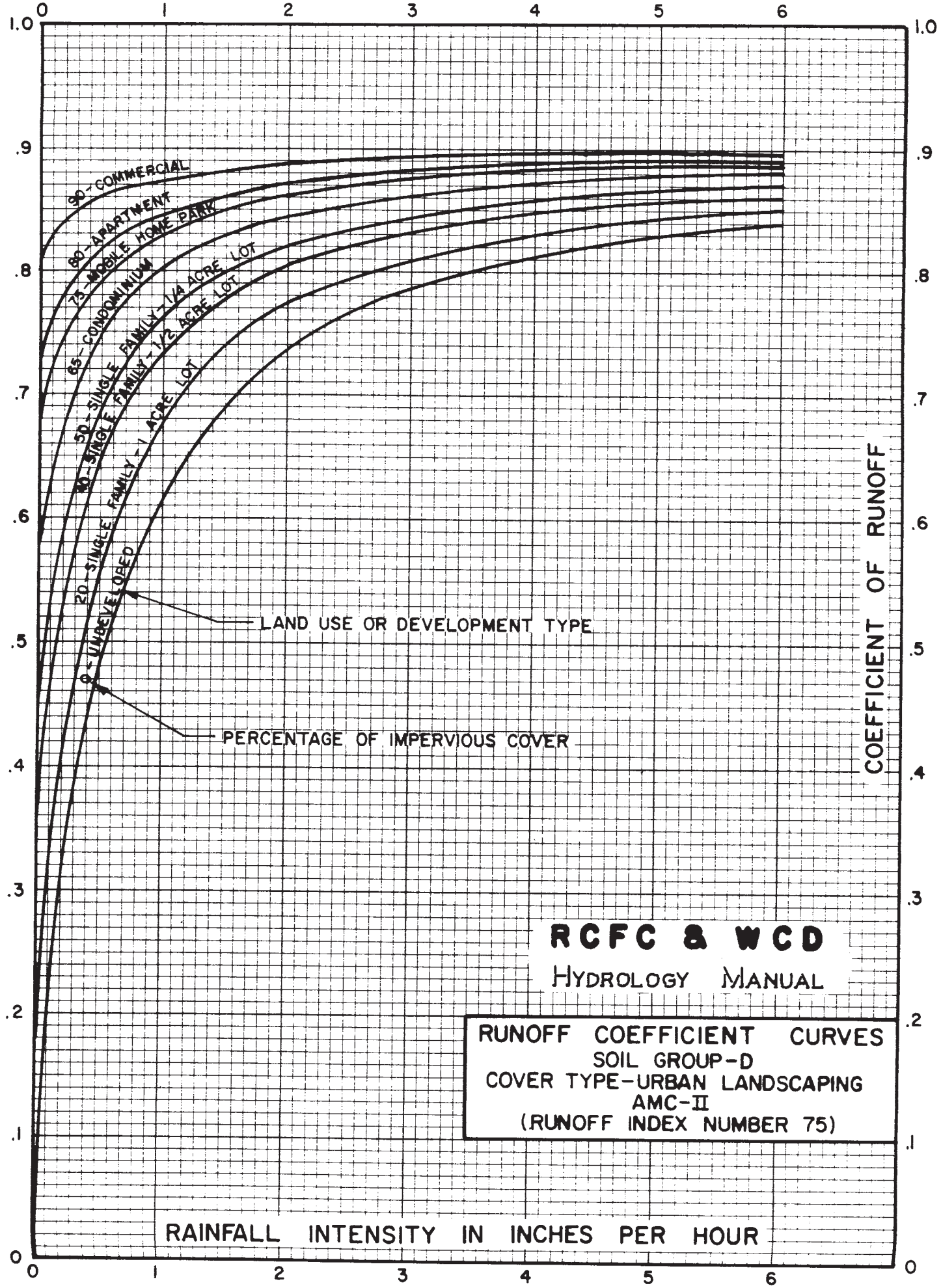


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HYDROLOGY MANUAL

RUNOFF COEFFICIENT CURVES
SOIL GROUP - C
COVER TYPE - URBAN LANDSCAPING
AMC - II
(RUNOFF INDEX NUMBER 69)

PLATE D-5.3

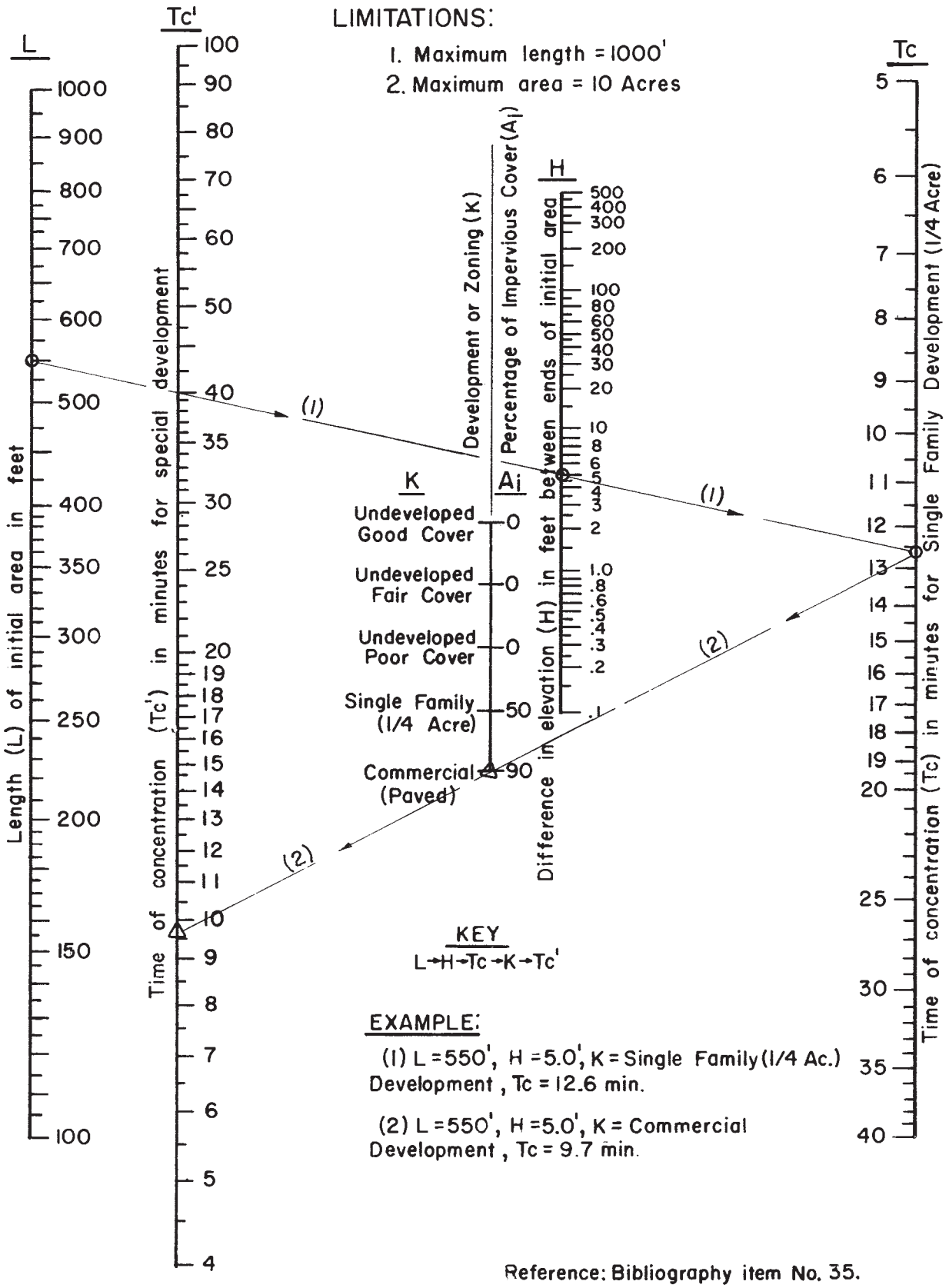


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HYDROLOGY MANUAL

RUNOFF COEFFICIENT CURVES
SOIL GROUP-D
COVER TYPE-URBAN LANDSCAPING
AMC-II
(RUNOFF INDEX NUMBER 75)

PLATE D-5.4

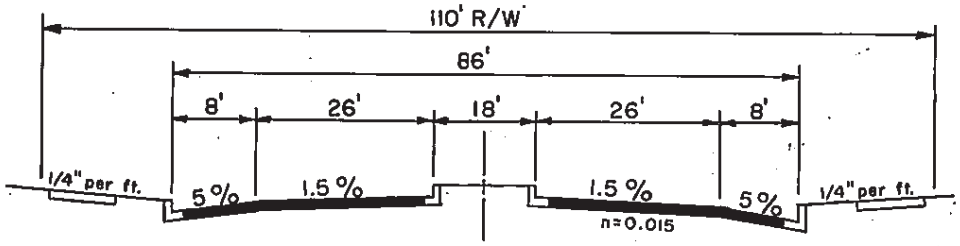


Reference: Bibliography item No. 35.

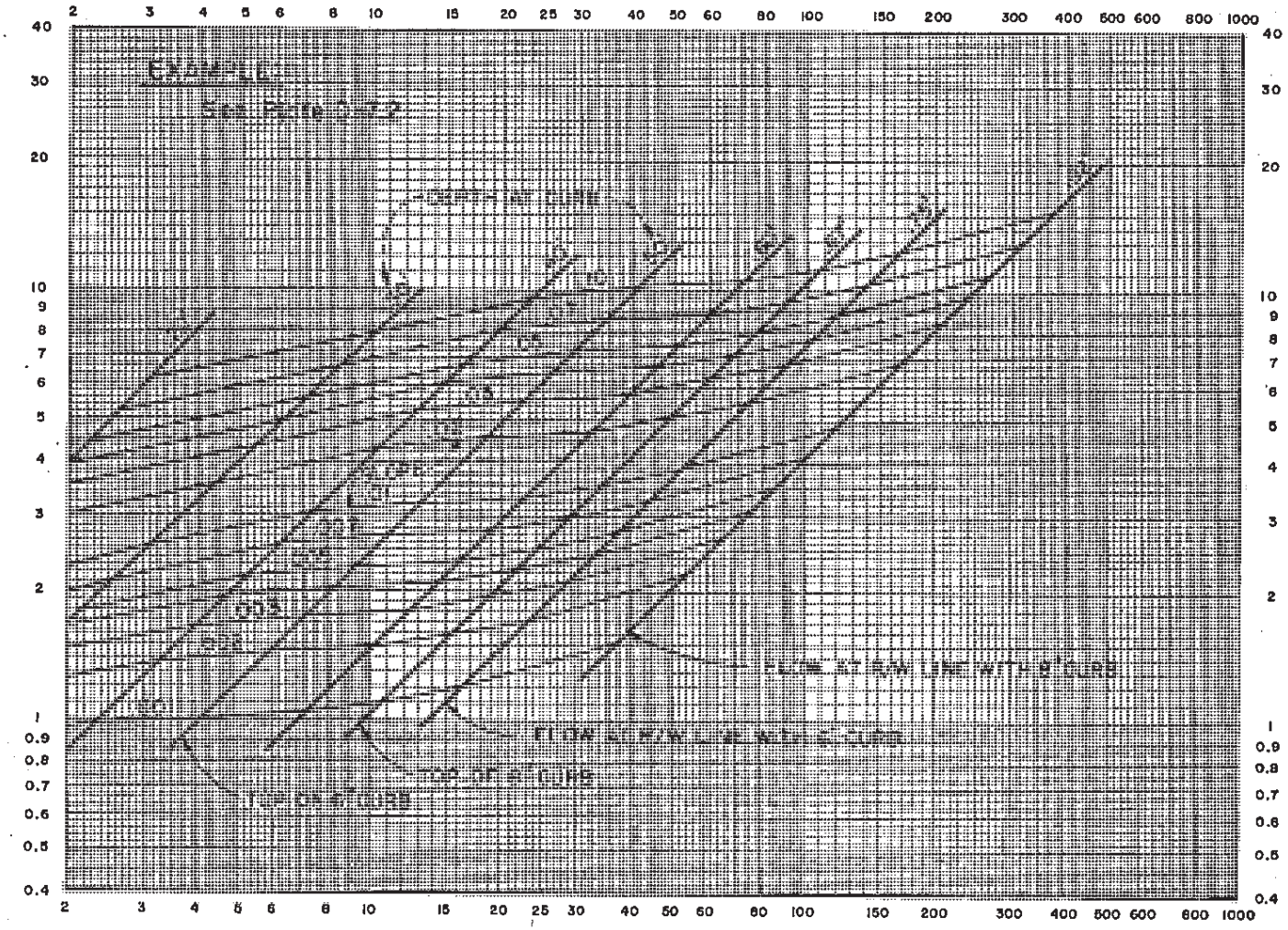
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HYDROLOGY MANUAL

TIME OF CONCENTRATION FOR INITIAL SUBAREA

PLATE D-3



TYPICAL SECTION



DISCHARGE – C.F.S.
(TOTAL FLOW IN STREET)

NOTE:

Flow does not top the crown of this section until d_w = 1.45 feet (6 inch curb).

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HYDROLOGY MANUAL

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

VELOCITY DISCHARGE CURVES
COUNTY STANDARD No. 100
86' ROADWAY 6" & 8" CURBS

REVISED	DRAWN BY: R.A.S.	SHEET No.
APPROVED: CHIEF ENGINEER R.E. NO. 6855	CHECKED BY: R.V.A.-R.A.N.	
DATE	DATE DRAWN: JAN. 77	DR. No

PLATE D-7.1

RUNOFF INDEX NUMBERS OF HYDROLOGIC SOIL-COVER COMPLEXES FOR PERVIOUS AREAS-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group A	B	C	D
NATURAL COVERS -					
Barren (Rockland, eroded and graded land)		78	86	91	93
Chaparrel, Broadleaf (Manzonita, ceanothus and scrub oak)	Poor	53	70	80	85
	Fair	40	63	75	81
	Good	31	57	71	78
Chaparrel, Narrowleaf (Chamise and redshank)	Poor	71	82	88	91
	Fair	55	72	81	86
Grass, Annual or Perennial	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Meadows or Cienegas (Areas with seasonally high water table, principal vegetation is sod forming grass)	Poor	63	77	85	88
	Fair	51	70	80	84
	Good	30	58	72	78
Open Brush (Soft wood shrubs - buckwheat, sage, etc.)	Poor	62	76	84	88
	Fair	46	66	77	83
	Good	41	63	75	81
Woodland (Coniferous or broadleaf trees predominate. Canopy density is at least 50 percent)	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	28	55	70	77
Woodland, Grass (Coniferous or broadleaf trees with canopy density from 20 to 50 percent)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
URBAN COVERS -					
Residential or Commercial Landscaping (Lawn, shrubs, etc.)	Good	32	56	69	75
Turf (Irrigated and mowed grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
AGRICULTURAL COVERS -					
Fallow (Land plowed but not tilled or seeded)		76	85	90	92

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HYDROLOGY MANUAL

RUNOFF INDEX NUMBERS FOR PERVIOUS AREA

RUNOFF INDEX NUMBERS OF HYDROLOGIC SOIL-COVER COMPLEXES FOR PERVIOUS AREAS-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group A	B	C	D
AGRICULTURAL COVERS (cont.) -					
Legumes, Close Seeded (Alfalfa, sweetclover, timothy, etc.)	Poor	66	77	85	89
	Good	58	72	81	85
Orchards, Deciduous (Apples, apricots, pears, walnuts, etc.)		See Note 4			
Orchards, Evergreen (Citrus, avocados, etc.)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
Pasture, Dryland (Annual grasses)	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Pasture, Irrigated (Legumes and perennial grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
Row Crops (Field crops - tomatoes, sugar beets, etc.)	Poor	72	81	88	91
	Good	67	78	85	89
Small Grain (Wheat, oats, barley, etc.)	Poor	65	76	84	88
	Good	63	75	83	87
Vineyard		See Note 4			

Notes:

1. All runoff index (RI) numbers are for Antecedent Moisture Condition (AMC) II.

2. Quality of cover definitions:
   Poor-Heavily grazed or regularly burned areas. Less than 50 percent of the ground surface is protected by plant cover or brush and tree canopy.
   Fair-Moderate cover with 50 percent to 75 percent of the ground surface protected.
   Good-Heavy or dense cover with more than 75 percent of the ground surface protected.

3. See Plate C-2 for a detailed description of cover types.

4. Use runoff index numbers based on ground cover type. See discussion under "Cover Type Descriptions" on Plate C-2.

5. Reference Bibliography item 17.

ACTUAL IMPERVIOUS COVER

Land Use (1)	Range-Percent	Recommended Value For Average Conditions-Percent(2)
Natural or Agriculture	0 - 10	0
Single Family Residential: (3)		
40,000 S. F. (1 Acre) Lots	10 - 25	20
20,000 S. F. (½ Acre) Lots	30 - 45	40
7,200 - 10,000 S. F. Lots	45 - 55	50
Multiple Family Residential:		
Condominiums	45 - 70	65
Apartments	65 - 90	80
Mobile Home Park	60 - 85	75
Commercial, Downtown Business or Industrial	80 -100	90

Notes:

1. Land use should be based on ultimate development of the watershed. Long range master plans for the County and incorporated cities should be reviewed to insure reasonable land use assumptions.

2. Recommended values are based on average conditions which may not apply to a particular study area. The percentage impervious may vary greatly even on comparable sized lots due to differences in dwelling size, improvements, etc. Landscape practices should also be considered as it is common in some areas to use ornamental gravels underlain by impervious plastic materials in place of lawns and shrubs. A field investigation of a study area should always be made, and a review of aerial photos, where available may assist in estimating the percentage of impervious cover in developed areas.

3. For typical horse ranch subdivisions increase impervious area 5 percent over the values recommended in the table above.

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IMPERVIOUS COVER FOR DEVELOPED AREAS

RUNOFF COEFFICIENT CURVE DATA

The data in the following tables may be used to develop runoff coefficient (C) curves for any combination of runoff index (RI) number and antecedent mositure condition (AMC). For an RI number with an AMC of II (from Plate D-5.5) enter the tables on the following pages and plot the "C" curve data directly on Plate D-5.8. "C" curve data is given for even RI numbers only, but values may easily be interpolated for odd RI numbers.

For an AMC of I or III enter the tabulation on this page with the RI for AMC II, and read the appropriate RI for AMC I or III. Use this revised RI to enter the tables on the following pages to determine "C". For example if RI = 40 for AMC II, then RI = 22 for AMC I and RI = 60 for AMC III.

AMC ADJUSTMENT RELATIONSHIPS

RI FOR AMC II	RI FOR OTHER AMC CONDITIONS: AMC I	AMC III	RI FOR AMC II	RI FOR OTHER AMC CONDITIONS: AMC I	AMC III
10	--	22	55	35	74
11	--	24	56	36	75
12	--	25	57	37	75
13	--	27	58	38	76
14	--	28	59	39	77
15	--	30	60	40	78
16	--	31	61	41	78
17	--	33	62	42	79
18	--	34	63	43	80
19	--	36	64	44	81
20	--	37	65	45	82
21	10	38	66	46	82
22	10	39	67	47	83
23	11	41	68	48	84
24	11	42	69	50	84
25	12	43	70	51	85
26	12	44	71	52	86
27	13	46	72	53	86
28	14	47	73	54	87
29	14	49	74	55	88
30	15	50	75	57	88
31	16	51	76	58	89
32	16	52	77	59	89
33	17	53	78	60	90
34	18	54	79	62	91
35	18	55	80	63	91
36	19	56	81	64	92
37	20	57	82	66	92
38	21	58	83	67	93
39	21	59	84	68	93
40	22	60	85	70	94
41	23	61	86	72	94
42	24	62	87	73	95
43	25	63	88	75	95
44	25	64	89	76	96
45	26	65	90	78	96
46	27	66	91	80	97
47	28	67	92	81	97
48	29	68	93	83	98
49	30	69	94	85	98
50	31	70	95	87	98
51	31	70	96	89	99
52	32	71	97	91	99
53	33	72	98	94	99
54	34	73	99	97	--

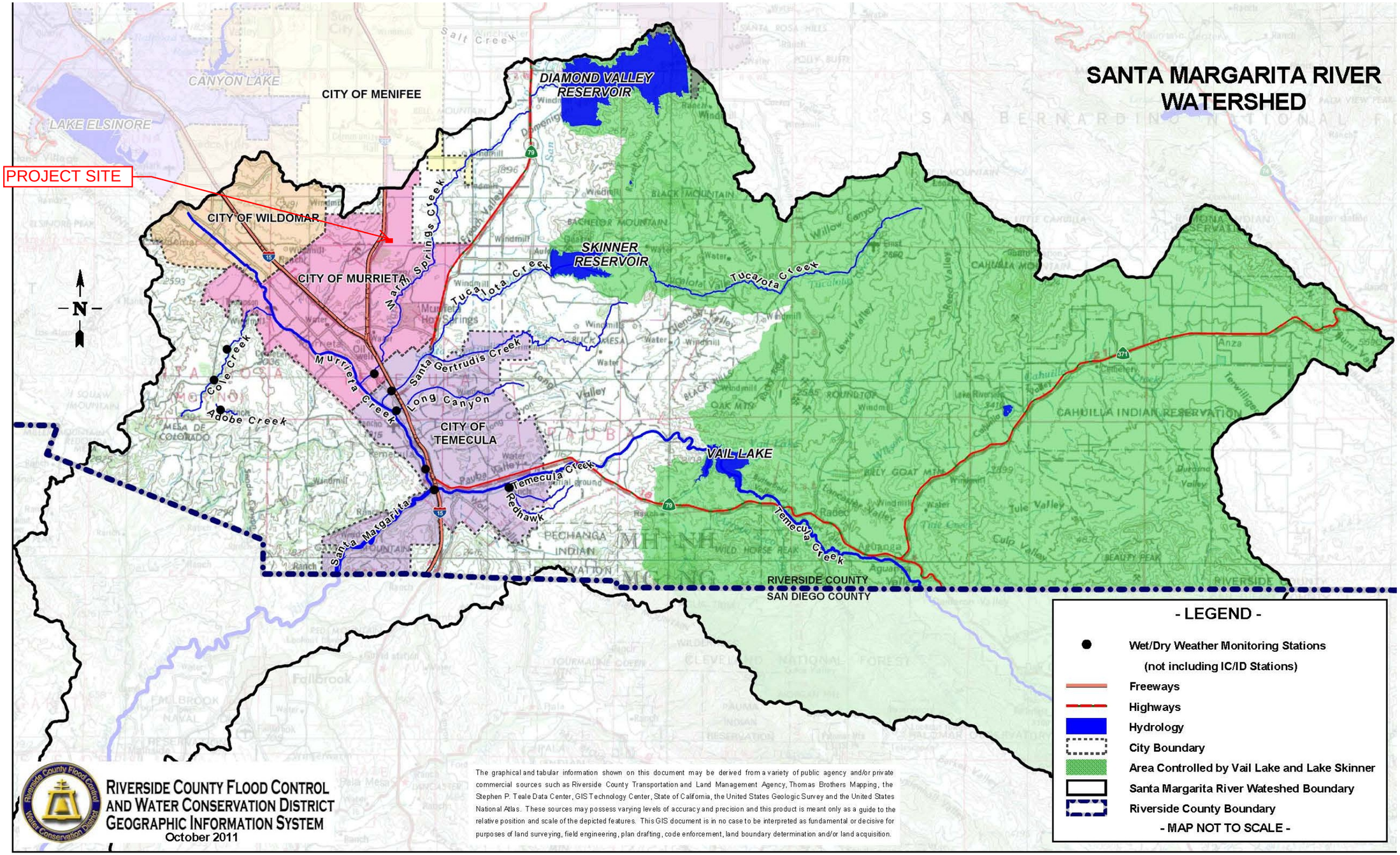
RCFC & WCD
HYDROLOGY MANUAL

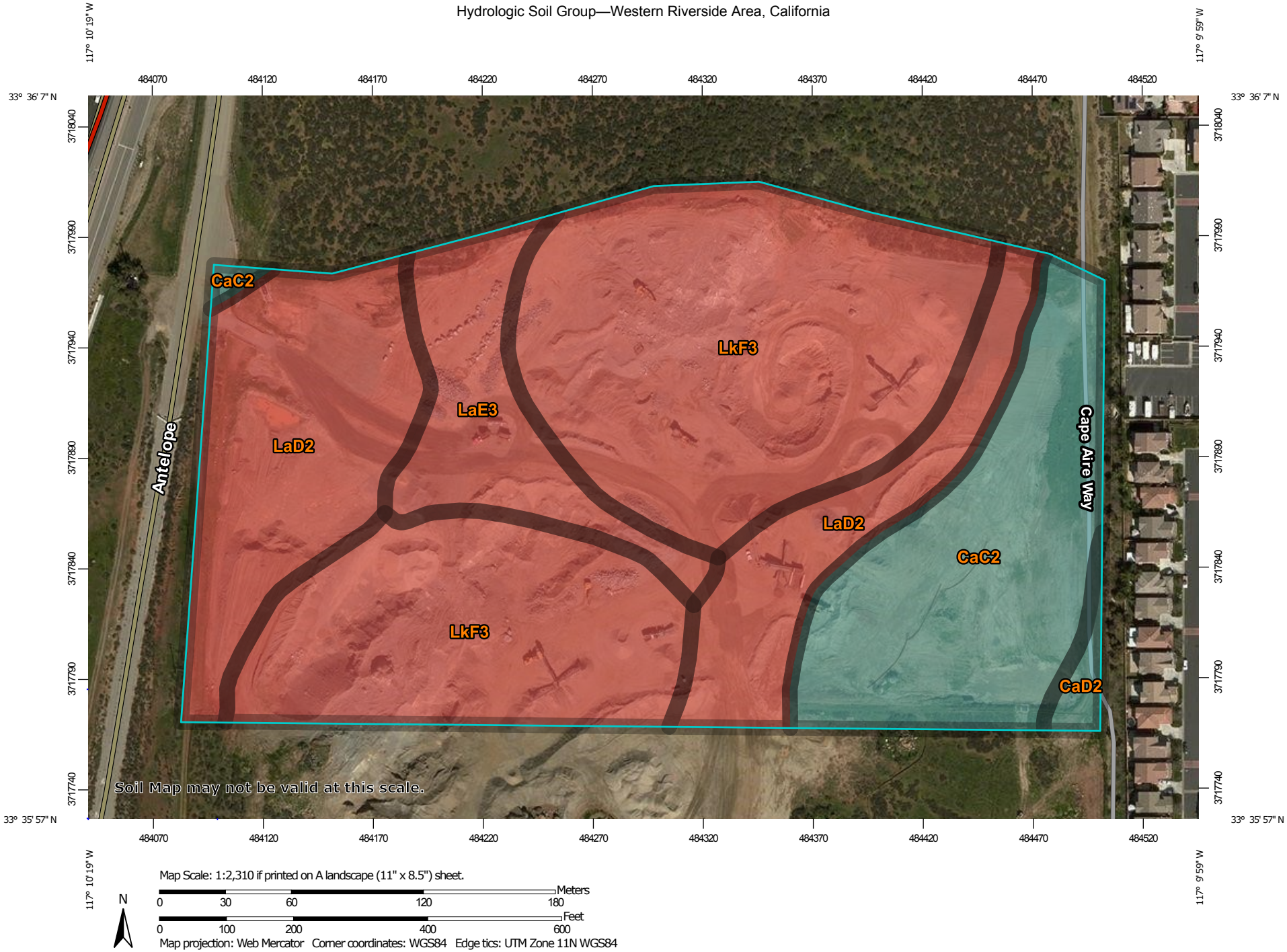
RUNOFF COEFFICIENT CURVE DATA

ATTACHMENT D

WATERSHED INFORMATION- TOPOGRAPHIC MAPS

Figure 2. Watershed Map of Upper Santa Margarita River





Map Scale: 1:2,310 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 30 60 120 180

Feet
0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this 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 do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Western Riverside Area, California
Survey Area Data: Version 10, Sep 12, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Feb 24, 2015—Feb 26, 2015

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CaC2	Cajalco fine sandy loam, 2 to 8 percent slopes, eroded	C	4.3	18.6%
CaD2	Cajalco fine sandy loam, 8 to 15 percent slopes, eroded	C	0.2	1.1%
LaD2	Las Posas loam, 8 to 15 percent slopes, eroded	D	5.6	24.5%
LaE3	Las Posas loam, 8 to 25 percent slopes, severely eroded	D	2.1	9.1%
LkF3	Las Posas rocky loam, 15 to 50 percent slopes, severely eroded	D	10.8	46.8%
Totals for Area of Interest			**23.0**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

ATTACHMENT E

RATIONAL METHOD PRE & POST DEVELOPED 100 YEAR, I HOUR STORM ANALYSIS FOR STORM DRAIN AND PEAK FLOWS



LEGEND

WATERSHED BOUNDARY	
DMA BOUNDARY	
NODE	(X)
NODE ELEVATION	EL=XXXX.XX
FLOWLINE	···→···→···→···
FLOWLINE LENGTH	L=XXX'
BASIN AREA	X.XXX AC

BACKGROUND TOPOGRAPHY NOTE:
THE BACKGROUND TOPOGRAPHY IS FROM THE AERIAL MAPPING PROVIDED BY ANALYTICAL PHOTOGRAMMETRIC SURVEYS, INC. (FLOWN ON AUGUST 28, 2008). THIS REPRESENTS THE EXISTING LAY OF THE LAND BEFORE THE MINING GRADING OPERATION ALTERED THE LANDSCAPE. SAID MINING OPERATION IS CURRENTLY ON-GOING.

SCALE 1":50'

TPM 37511 UNIT 2
PRE-DEVELOPMENT HYDROLOGY BASIN MAP

K:\17\17065\engineering\TM\CURRENT\STORM\HYD\rational\pre-dev hydrology map.dwg 4/2/2018 3:25 PM ORIGINAL PLOT SIZE: ----

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 04/02/18 File:candeepredev.out

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TPM 37511 UNIT 2
PRE-DEVELOPMENT Q100
POC 1

********* Hydrology Study Control Information **********

English (in-lb) Units used in input data file

Program License Serial Number 6332

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Murrieta,Tmc,Rnch CaNorco] area used.
10 year storm 10 minute intensity = 2.360(In/Hr)
10 year storm 60 minute intensity = 0.880(In/Hr)
100 year storm 10 minute intensity = 3.480(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5500

++
Process from Point/Station 1.000 to Point/Station 2.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 691.000(Ft.)
Top (of initial area) elevation = 1635.000(Ft.)
Bottom (of initial area) elevation = 1509.000(Ft.)
Difference in elevation = 126.000(Ft.)
Slope = 0.18234 s(percent)= 18.23
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.183 min.
Rainfall intensity = 3.448(In/Hr) for a 100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.856
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.260
Decimal fraction soil group D = 0.740
RI index for soil(AMC 2) = 88.22
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 19.299(CFS)
Total initial stream area = 6.540(Ac.)
Pervious area fraction = 1.000
End of computations, total study area = 6.54 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number = 88.2

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 04/02/18 File:CANDEEPREDEVPOC2.out

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TPM 37511 UNIT 2
PRE-DEVELOPMENT Q100
POC 2

********* Hydrology Study Control Information **********

English (in-lb) Units used in input data file

Program License Serial Number 6332

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Murrieta,Tmc,Rnch CaNorco] area used.
10 year storm 10 minute intensity = 2.360(In/Hr)
10 year storm 60 minute intensity = 0.880(In/Hr)
100 year storm 10 minute intensity = 3.480(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5500

++
Process from Point/Station 1.000 to Point/Station 3.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 562.000(Ft.)
Top (of initial area) elevation = 1635.000(Ft.)
Bottom (of initial area) elevation = 1530.000(Ft.)
Difference in elevation = 105.000(Ft.)
Slope = 0.18683 s(percent)= 18.68
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.330 min.
Rainfall intensity = 3.618(In/Hr) for a 100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.861
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 89.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 8.624(CFS)
Total initial stream area = 2.769(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station 3.000 to Point/Station 4.000

```
**** IMPROVED CHANNEL TRAVEL TIME ****
____________________________________________________________________
Upstream point elevation =  1530.000(Ft.)
Downstream point elevation =  1508.000(Ft.)
Channel length thru subarea  =   631.000(Ft.)
Channel base width     =    5.000(Ft.)
Slope or 'Z' of left channel bank =  50.000
Slope or 'Z' of right channel bank =  50.000
Estimated mean flow rate at midpoint of channel =     15.678(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     15.678(CFS)
Depth of flow =   0.327(Ft.), Average velocity =   2.251(Ft/s)
Channel flow top width =   37.652(Ft.)
Flow Velocity =    2.25(Ft/s)
Travel time  =    4.67 min.
Time of concentration =   14.00 min.

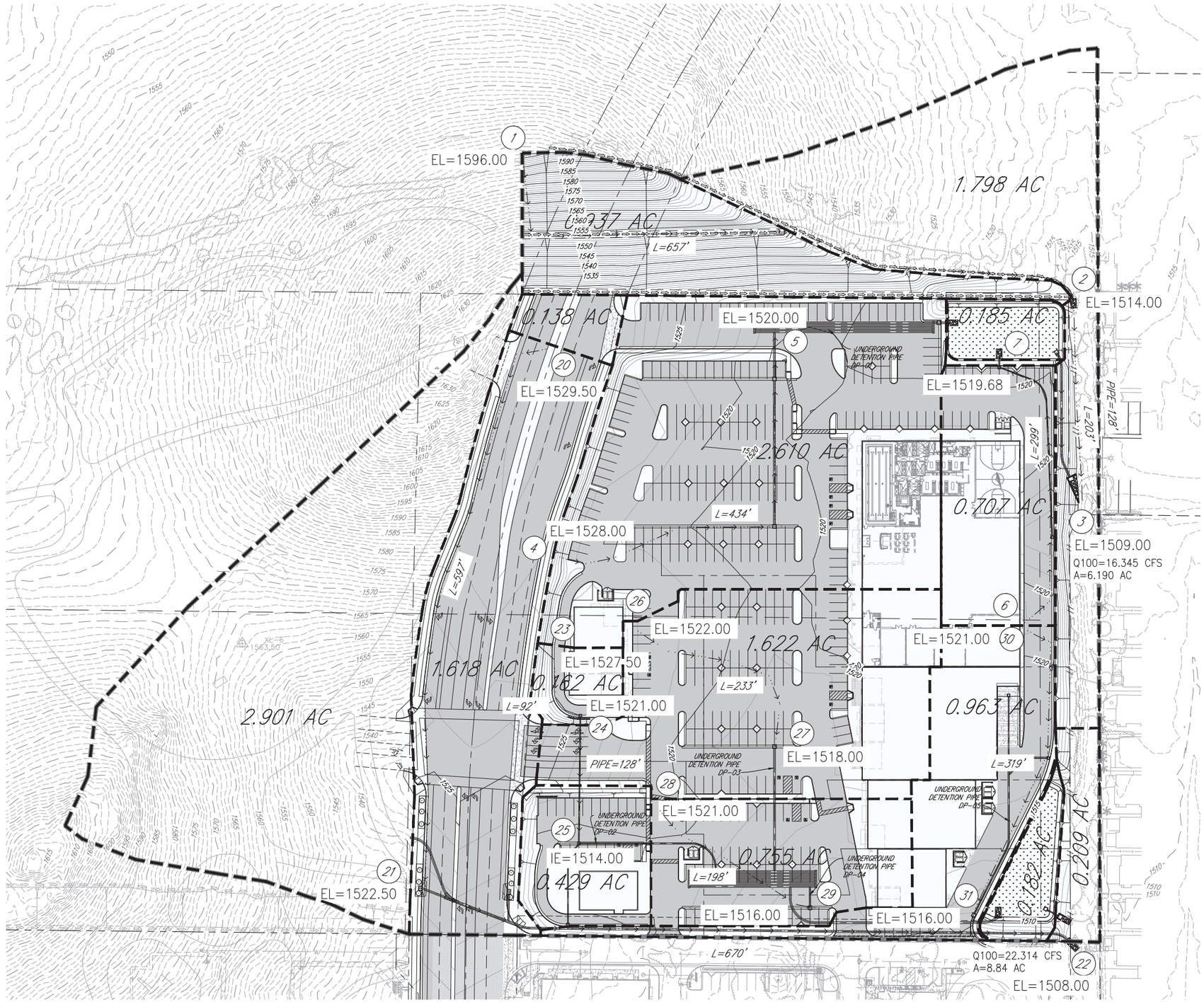
Sub-Channel No. 1 Critical depth =      0.314(Ft.)
  '     '       '     Critical flow top width =     36.445(Ft.)
  '     '       '     Critical flow velocity=    2.406(Ft/s)
  '     '       '     Critical flow area =      6.516(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.849
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.150
Decimal fraction soil group D = 0.850
RI index for soil(AMC 2)  =  88.55
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.894(In/Hr) for a   100.0 year storm
Subarea runoff =     14.042(CFS) for      5.712(Ac.)
Total runoff =     22.666(CFS)       Total area =       8.481(Ac.)
Depth of flow =   0.381(Ft.), Average velocity =   2.471(Ft/s)

Sub-Channel No. 1 Critical depth =      0.371(Ft.)
  '     '       '     Critical flow top width =     42.109(Ft.)
  '     '       '     Critical flow velocity=    2.593(Ft/s)
  '     '       '     Critical flow area =      8.741(Sq.Ft)

End of computations, total study area =            8.48 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number =  88.7
```



LEGEND

WATERSHED BOUNDARY	
DMA BOUNDARY	
NODE	(X)
NODE ELEVATION	EL=XXXX.XX
FLOWLINE	···→···→···→···
FLOWLINE LENGTH	L=XXX'
BASIN AREA	X.XXX AC

BACKGROUND TOPOGRAPHY NOTE:
THE BACKGROUND TOPOGRAPHY IS FROM THE AERIAL MAPPING PROVIDED BY ANALYTICAL PHOTOGRAMMETRIC SURVEYS, INC. (FLOWN ON AUGUST 28, 2008). THIS REPRESENTS THE EXISTING LAY OF THE LAND BEFORE THE MINING GRADING OPERATION ALTERED THE LANDSCAPE. SAID MINING OPERATION IS CURRENTLY ON-GOING.

TPM 37511 UNIT 2
POST-DEVELOPMENT HYDROLOGY BASIN MAP

K:\17\17065\engineering\TM\CURRENT\STORM\HYD\rational\post-dev hydrology map.dwg 4/2/2018 3:20 PM ORIGINAL PLOT SIZE: ----

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                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
       Rational Hydrology Study        Date: 04/02/18  File:CANDEEPOSTDEVPOC1SUB1.out
------------------------------------------------------------------------
TPM 37511 UNIT 2
POST-DEVELOPMENT Q100
SUB-BASIN OF POC 1 ONSITE
USE FOR ROUTING INTO DETENTION PIPE
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

 English (in-lb) Units used in input data file

------------------------------------------------------------------------


Program License Serial Number 6332

------------------------------------------------------------------------
Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) =  100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Murrieta,Tmc,Rnch CaNorco ] area used.
10 year storm 10 minute intensity =  2.360(In/Hr)
10 year storm 60 minute intensity =  0.880(In/Hr)
100 year storm 10 minute intensity =  3.480(In/Hr)
100 year storm 60 minute intensity =  1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity =  1.300(In/Hr)
Slope of intensity duration curve = 0.5500

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        5.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   434.000(Ft.)
Top (of initial area) elevation =  1528.000(Ft.)
Bottom (of initial area) elevation =  1520.000(Ft.)
Difference in elevation =     8.000(Ft.)
Slope =    0.01843  s(percent)=       1.84
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.568 min.
Rainfall intensity =      4.060(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.891
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2)  =  75.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      9.442(CFS)
Total initial stream area =        2.610(Ac.)
Pervious area fraction = 0.100
End of computations, total study area =            2.61 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  75.0
```

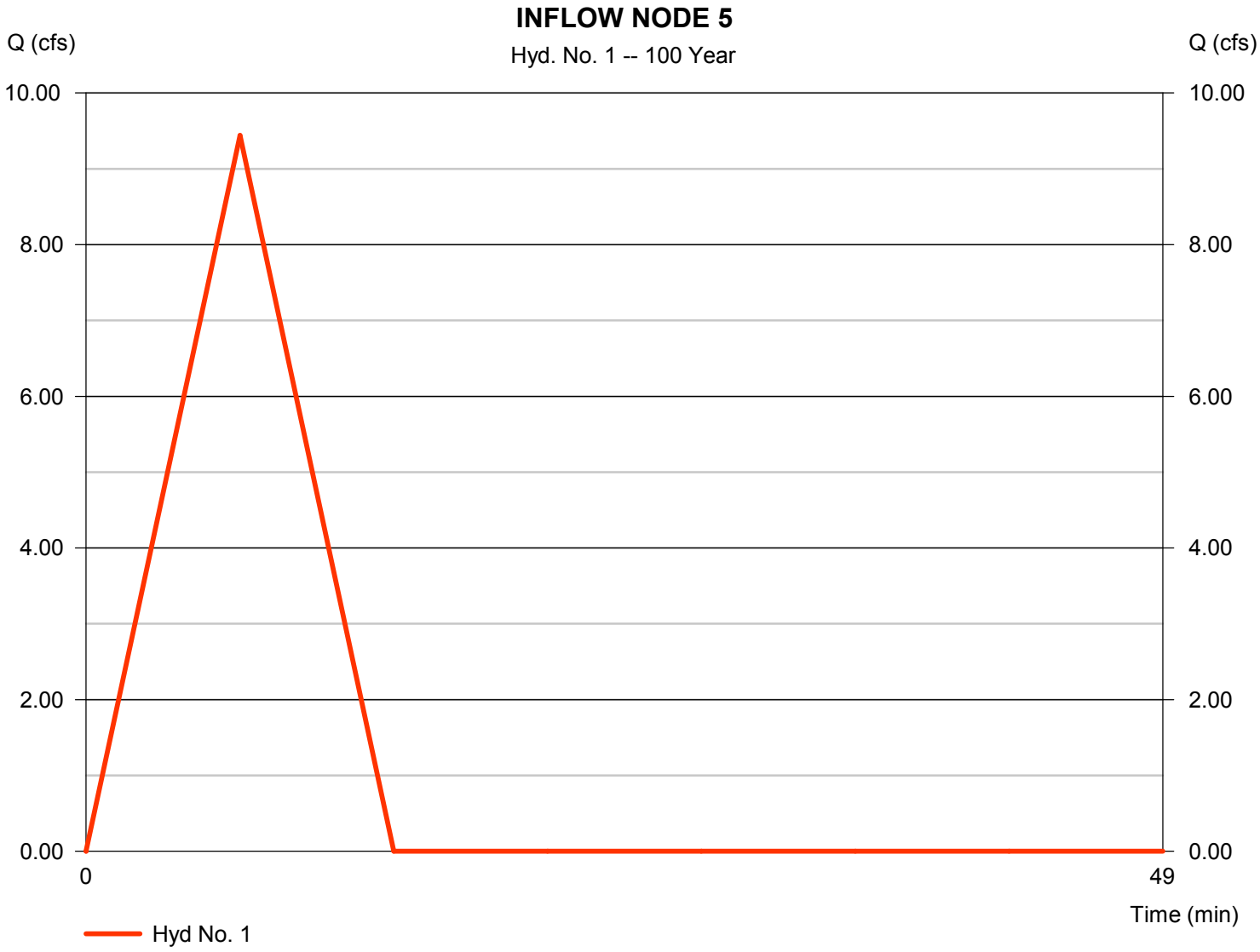
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 04 / 3 / 2018

Hyd. No. 1

INFLOW NODE 5

Hydrograph type	= Manual	Peak discharge	= 9.440 cfs
Storm frequency	= 100 yrs	Time to peak	= 7 min
Time interval	= 7 min	Hyd. volume	= 3,965 cuft



Hydrograph Report

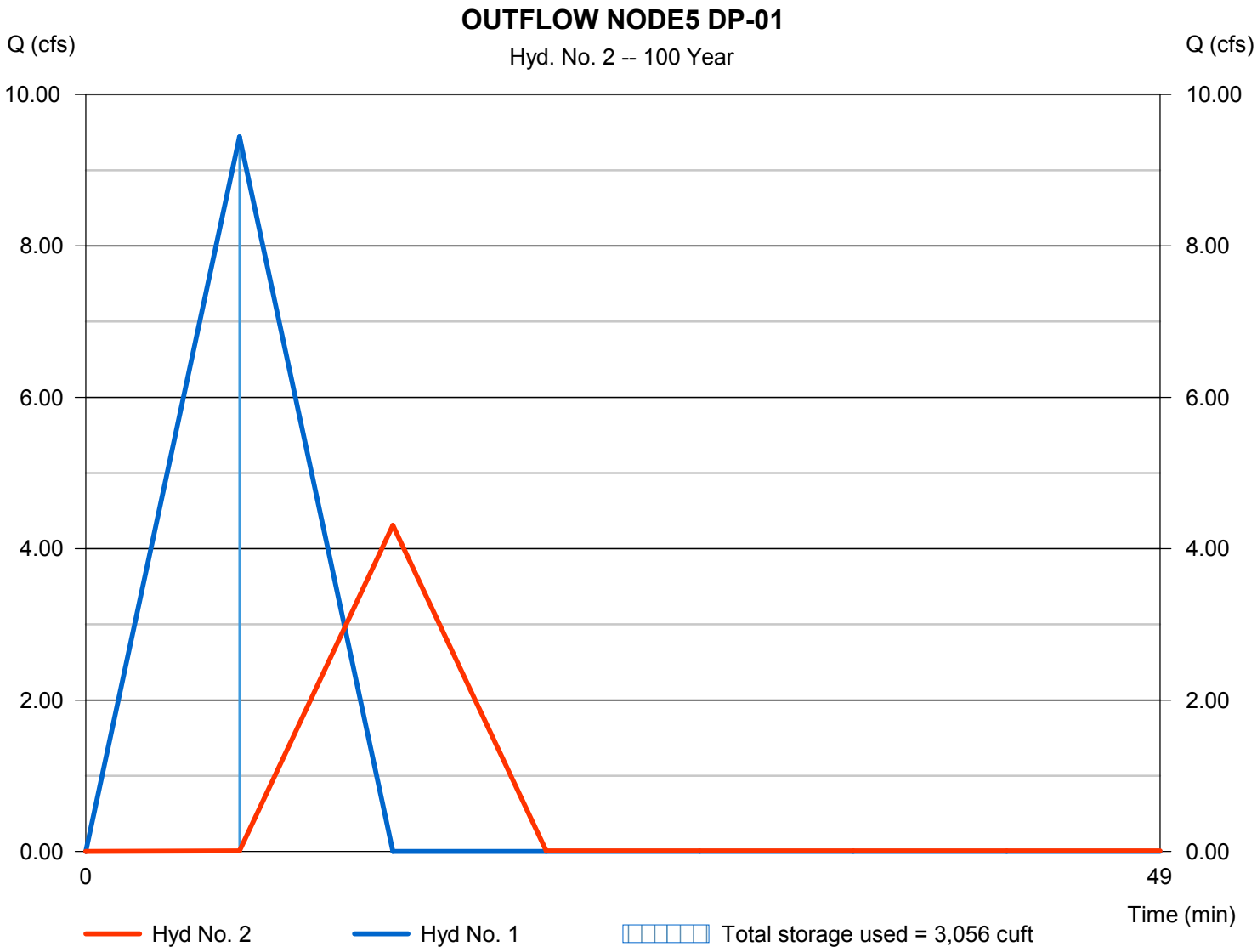
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 04 / 3 / 2018

Hyd. No. 2

OUTFLOW NODE5 DP-01

Hydrograph type	=	Reservoir	Peak discharge	=	4.310 cfs
Storm frequency	=	100 yrs	Time to peak	=	14 min
Time interval	=	7 min	Hyd. volume	=	3,930 cuft
Inflow hyd. No.	=	1 - INFLOW NODE 5	Max. Elevation	=	102.50 ft
Reservoir name	=	DP-01	Max. Storage	=	3,056 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 04 / 3 / 2018

Pond No. 2 - DP-01

Pond Data

UG Chambers -Invert elev. = 100.00 ft, Rise x Span = 2.50 x 2.50 ft, Barrel Len = 180.00 ft, No. Barrels = 4, Slope = 0.00%, Headers = Yes

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	n/a	0	0
0.25	100.25	n/a	191	191
0.50	100.50	n/a	332	523
0.75	100.75	n/a	404	926
1.00	101.00	n/a	445	1,371
1.25	101.25	n/a	464	1,835
1.50	101.50	n/a	464	2,300
1.75	101.75	n/a	444	2,744
2.00	102.00	n/a	403	3,148
2.25	102.25	n/a	332	3,479
2.50	102.50	n/a	191	3,670

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	0.50	0.00	0.00
Span (in)	= 12.00	0.50	0.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 100.00	100.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

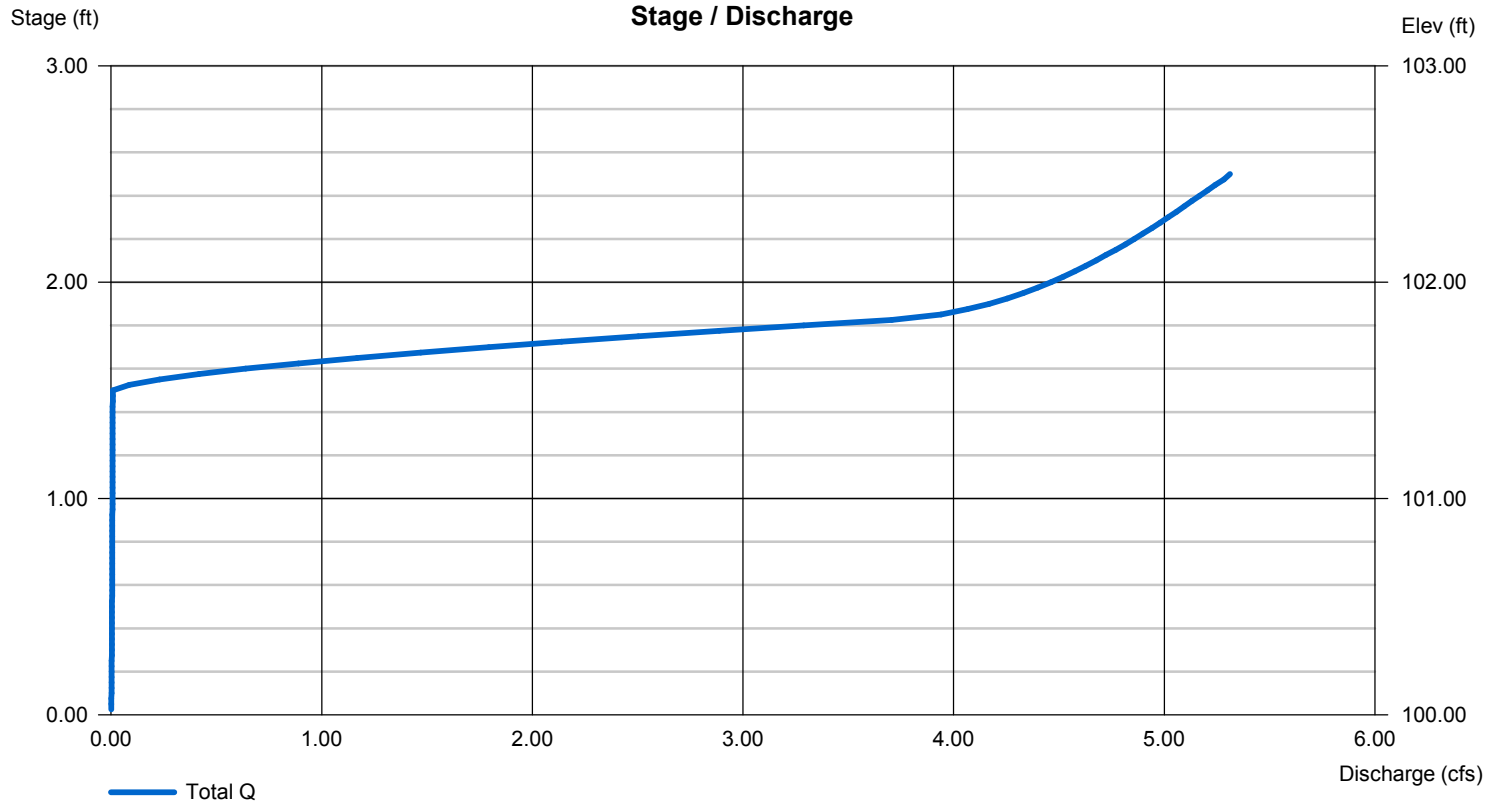
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.00	0.00	0.00	0.00
Crest El. (ft)	= 101.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	Rect	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



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                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
       Rational Hydrology Study        Date: 04/02/18  File:CANDEEPOSTDEVPOC1.out
------------------------------------------------------------------------
TPM 37511 UNIT 2
POST-DEVELOPMENT Q100
POC 1 MAIN RUN

------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

 English (in-lb) Units used in input data file

------------------------------------------------------------------------


Program License Serial Number 6332

------------------------------------------------------------------------
Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) =  100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Murrieta,Tmc,Rnch CaNorco ] area used.
10 year storm 10 minute intensity =  2.360(In/Hr)
10 year storm 60 minute intensity =  0.880(In/Hr)
100 year storm 10 minute intensity =  3.480(In/Hr)
100 year storm 60 minute intensity =  1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity =  1.300(In/Hr)
Slope of intensity duration curve = 0.5500




++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   657.000(Ft.)
Top (of initial area) elevation =  1596.000(Ft.)
Bottom (of initial area) elevation =  1514.000(Ft.)
Difference in elevation =    82.000(Ft.)
Slope =    0.12481  s(percent)=      12.48
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.766 min.
Rainfall intensity =      3.344(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.855
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.260
Decimal fraction soil group D = 0.740
RI index for soil(AMC 2)  =  88.22
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      2.678(CFS)
Total initial stream area =        0.937(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        2.000
```

```
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
COMMERCIAL subarea type
Runoff Coefficient = 0.889
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2)  =  75.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    10.77 min.
Rainfall intensity =      3.344(In/Hr) for a   100.0 year storm
Subarea runoff =      0.410(CFS) for      0.138(Ac.)
Total runoff =      3.088(CFS)       Total area =       1.075(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1514.000(Ft.)
Downstream point elevation =  1509.000(Ft.)
Channel length thru subarea  =   203.000(Ft.)
Channel base width     =    5.000(Ft.)
Slope or 'Z' of left channel bank =  25.000
Slope or 'Z' of right channel bank =  25.000
Estimated mean flow rate at midpoint of channel =      5.449(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =      5.449(CFS)
Depth of flow =   0.264(Ft.), Average velocity =   1.777(Ft/s)
Channel flow top width =   18.211(Ft.)
Flow Velocity =    1.78(Ft/s)
Travel time  =    1.90 min.
Time of concentration =   12.67 min.

Sub-Channel No. 1 Critical depth =      0.230(Ft.)
  '     '       '     Critical flow top width =     16.523(Ft.)
  '     '       '     Critical flow velocity=    2.197(Ft/s)
  '     '       '     Critical flow area =      2.480(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.847
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.500
RI index for soil(AMC 2)  =  87.50
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      3.058(In/Hr) for a   100.0 year storm
Subarea runoff =      4.658(CFS) for      1.798(Ac.)
Total runoff =      7.746(CFS)       Total area =       2.873(Ac.)
Depth of flow =   0.311(Ft.), Average velocity =   1.949(Ft/s)

Sub-Channel No. 1 Critical depth =      0.275(Ft.)
  '     '       '     Critical flow top width =     18.770(Ft.)
  '     '       '     Critical flow velocity=    2.367(Ft/s)
  '     '       '     Critical flow area =      3.273(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        3.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      2.873(Ac.)
Runoff from this stream =      7.746(CFS)
```

```
Time of concentration =   12.67 min.
Rainfall intensity =     3.058(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.000 to Point/Station        7.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Initial area flow distance =   299.000(Ft.)
Top (of initial area) elevation =  1521.000(Ft.)
Bottom (of initial area) elevation =  1519.680(Ft.)
Difference in elevation =     1.320(Ft.)
Slope =    0.00441  s(percent)=       0.44
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.678 min.
Rainfall intensity =      3.765(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.888
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.100
RI index for soil(AMC 2)  =  69.60
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.364(CFS)
Total initial stream area =        0.707(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.000 to Point/Station        7.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      0.707(Ac.)
Runoff from this stream =      2.364(CFS)
Time of concentration =    8.68 min.
Rainfall intensity =     3.765(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.000 to Point/Station        7.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
------------------------------------------------------------------------------
Rainfall intensity =      4.060(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.891
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2)  =  75.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
User specified values are as follows:
TC =   7.57 min.  Rain intensity =       4.06(In/Hr)
Total area =         2.61(Ac.)  Total runoff =      9.44(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.000 to Point/Station        7.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      2.610(Ac.)
Runoff from this stream =      9.442(CFS)
Time of concentration =    7.57 min.
Rainfall intensity =     4.060(In/Hr)
Summary of stream data:
```

```
Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                (In/Hr)


1        2.364      8.68                3.765
2        9.442      7.57                4.060
Largest stream flow has longer or shorter time of concentration
Qp =      9.442 + sum of
          Qa          Tb/Ta
           2.364 *    0.872 =      2.061
Qp =     11.503

Total of 2 streams to confluence:
Flow rates before confluence point:
       2.364       9.442
Area of streams before confluence:
        0.707        2.610
Results of confluence:
Total flow rate =     11.503(CFS)
Time of concentration =     7.568 min.
Effective stream area after confluence =      3.317(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.000 to Point/Station        3.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1510.850(Ft.)
Downstream point/station elevation =  1510.000(Ft.)
Pipe length  =   128.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.503(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    11.503(CFS)
Normal flow depth in pipe =   15.45(In.)
Flow top width inside pipe =   18.52(In.)
Critical Depth =   15.18(In.)
Pipe flow velocity =      6.07(Ft/s)
Travel time through pipe =    0.35 min.
Time of concentration (TC) =     7.92 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        3.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      3.317(Ac.)
Runoff from this stream =     11.503(CFS)
Time of concentration =    7.92 min.
Rainfall intensity =     3.959(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                (In/Hr)


1        7.746     12.67               3.058
2       11.503      7.92               3.959
Largest stream flow has longer or shorter time of concentration
Qp =     11.503 + sum of
          Qa          Tb/Ta
           7.746 *    0.625 =      4.842
Qp =     16.345

Total of 2 main streams to confluence:
Flow rates before confluence point:
       7.746      11.503
Area of streams before confluence:
        2.873        3.317
```

```
Results of confluence:
Total flow rate =     16.345(CFS)
Time of concentration =     7.920 min.
Effective stream area after confluence  =      6.190(Ac.)
End of computations, total study area =            6.19 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.498
Area averaged RI index number =  80.0
```

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                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
       Rational Hydrology Study        Date: 04/02/18  File:CANDEEPOSTDEVPOC2SUB01.out
------------------------------------------------------------------------
TPM 37511 UNIT 2
POST-DEVELOPMENT Q100
SUB-BASIN OF POC 2 ONSITE
USE FOR ROUTING INTO DETENTION PIPE 02
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

 English (in-lb) Units used in input data file

------------------------------------------------------------------------


Program License Serial Number 6332

------------------------------------------------------------------------
Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) =  100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Murrieta,Tmc,Rnch CaNorco ] area used.
10 year storm 10 minute intensity =  2.360(In/Hr)
10 year storm 60 minute intensity =  0.880(In/Hr)
100 year storm 10 minute intensity =  3.480(In/Hr)
100 year storm 60 minute intensity =  1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity =  1.300(In/Hr)
Slope of intensity duration curve = 0.5500




++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       24.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =    92.000(Ft.)
Top (of initial area) elevation =  1527.500(Ft.)
Bottom (of initial area) elevation =  1521.000(Ft.)
Difference in elevation =     6.500(Ft.)
Slope =    0.07065  s(percent)=       7.07
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
TC computed to be less than 5 min.; program is assuming the
time of concentration is 5 minutes.
Initial area time of concentration =    5.000 min.
Rainfall intensity =      5.099(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.893
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2)  =  75.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      0.737(CFS)
Total initial stream area =        0.162(Ac.)
Pervious area fraction = 0.100
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       24.000 to Point/Station       25.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________________
Upstream point/station elevation =  1516.000(Ft.)
Downstream point/station elevation =  1514.000(Ft.)
Pipe length  =   128.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.737(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.737(CFS)
Normal flow depth in pipe =    3.71(In.)
Flow top width inside pipe =    8.86(In.)
Critical Depth =    4.69(In.)
Pipe flow velocity =      4.29(Ft/s)
Travel time through pipe =    0.50 min.
Time of concentration (TC) =     5.50 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       25.000 to Point/Station       25.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.892
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2)  =  75.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =     5.50 min.
Rainfall intensity =      4.840(In/Hr) for a   100.0 year storm
Subarea runoff =      1.853(CFS) for      0.429(Ac.)
Total runoff =      2.590(CFS)        Total area =       0.591(Ac.)
End of computations, total study area =            0.59 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  75.0
```

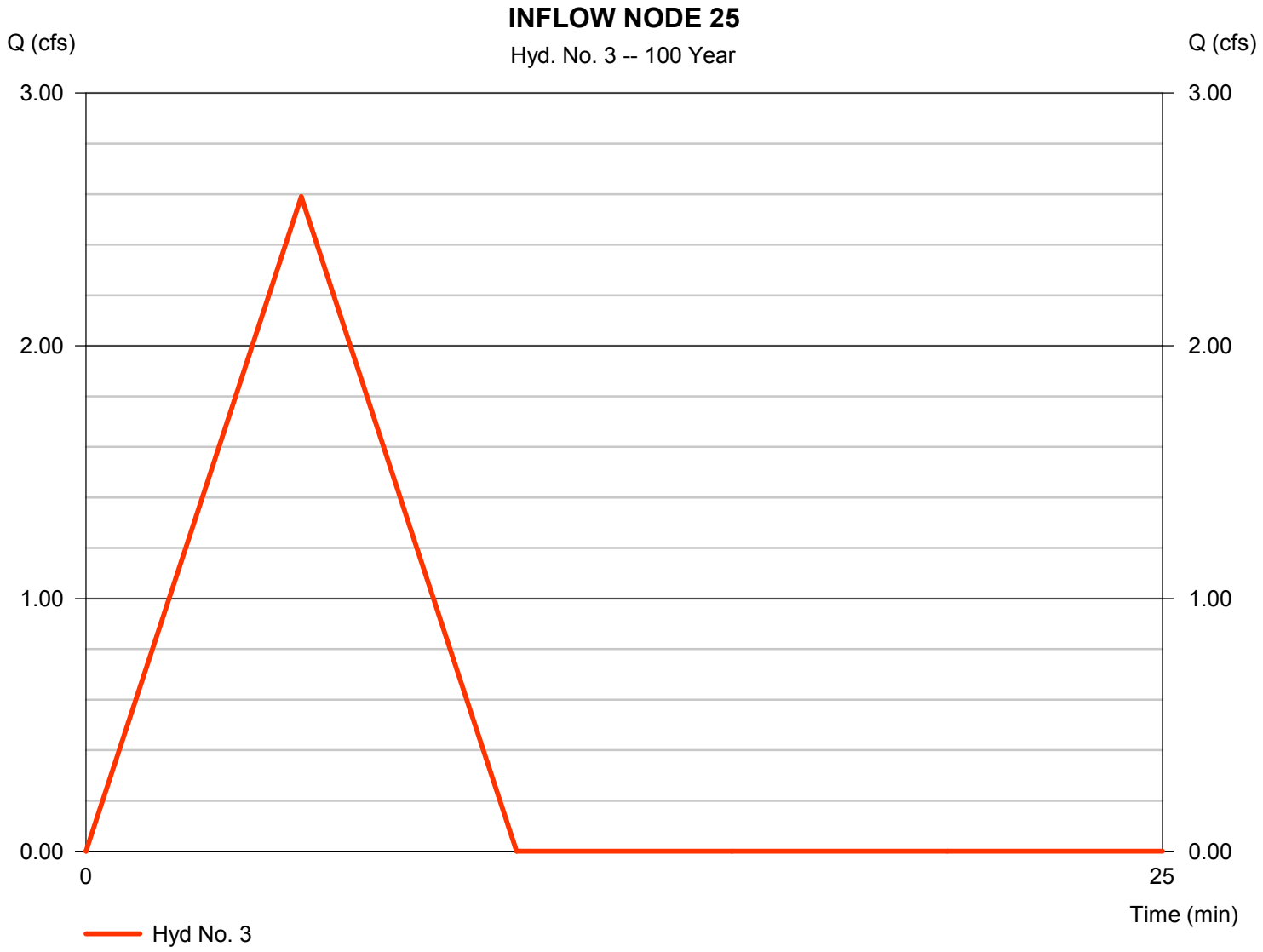
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 04 / 3 / 2018

Hyd. No. 3

INFLOW NODE 25

Hydrograph type	= Manual	Peak discharge	= 2.590 cfs
Storm frequency	= 100 yrs	Time to peak	= 5 min
Time interval	= 5 min	Hyd. volume	= 777 cuft



Hydrograph Report

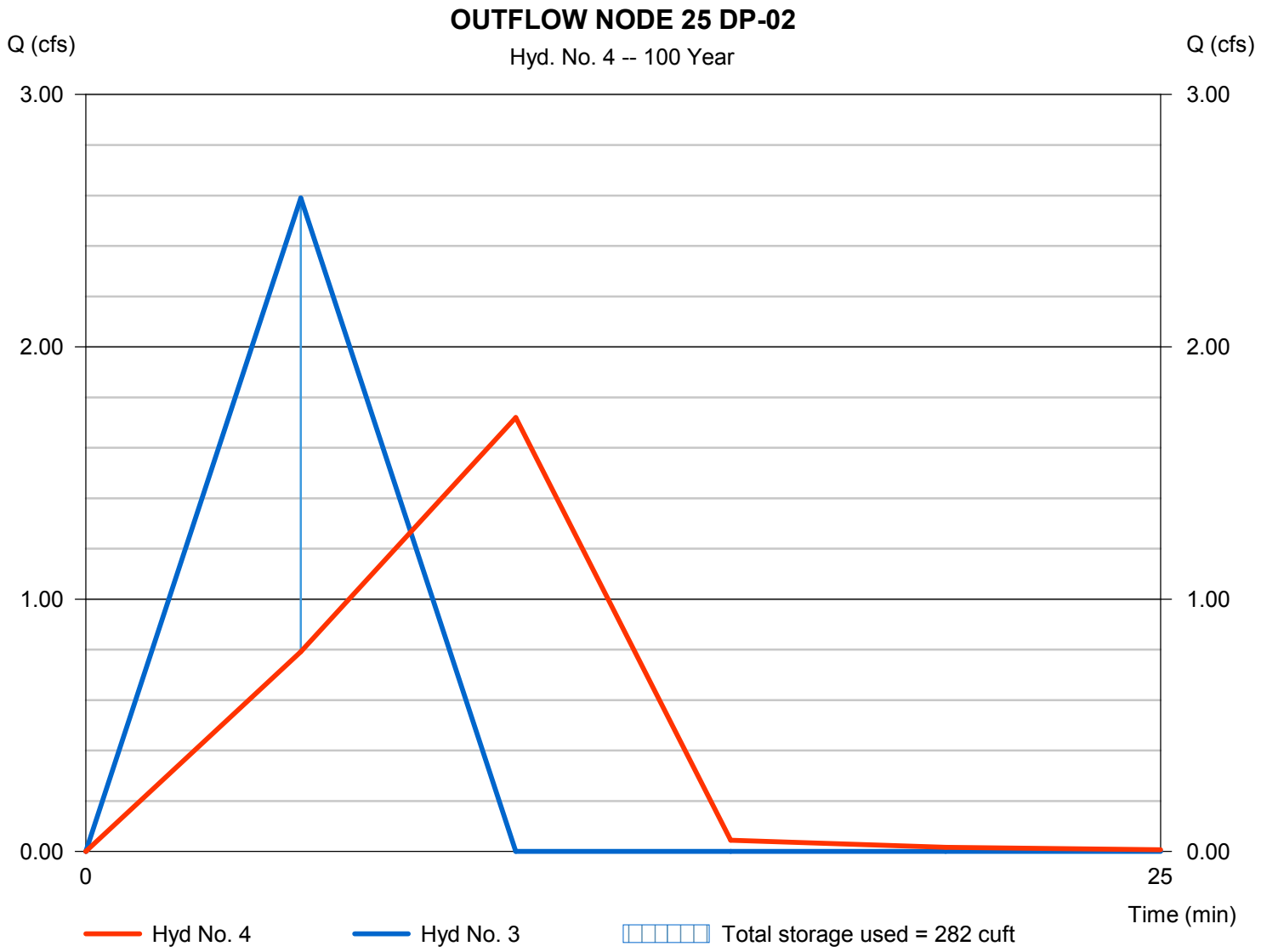
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 04 / 3 / 2018

Hyd. No. 4

OUTFLOW NODE 25 DP-02

Hydrograph type	= Reservoir	Peak discharge	= 1.720 cfs
Storm frequency	= 100 yrs	Time to peak	= 10 min
Time interval	= 5 min	Hyd. volume	= 775 cuft
Inflow hyd. No.	= 3 - INFLOW NODE 25	Max. Elevation	= 102.00 ft
Reservoir name	= DP-02	Max. Storage	= 282 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 04 / 3 / 2018

Pond No. 3 - DP-02

Pond Data

UG Chambers -Invert elev. = 100.00 ft, Rise x Span = 2.00 x 2.00 ft, Barrel Len = 100.00 ft, No. Barrels = 1, Slope = 0.00%, Headers = No

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	n/a	0	0
0.20	100.20	n/a	16	16
0.40	100.40	n/a	28	45
0.60	100.60	n/a	35	79
0.80	100.80	n/a	38	117
1.00	101.00	n/a	40	157
1.20	101.20	n/a	40	197
1.40	101.40	n/a	38	235
1.60	101.60	n/a	35	270
1.80	101.80	n/a	28	298
2.00	102.00	n/a	16	314

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	0.00	0.00
Span (in)	= 12.00	2.01	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 100.00	100.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

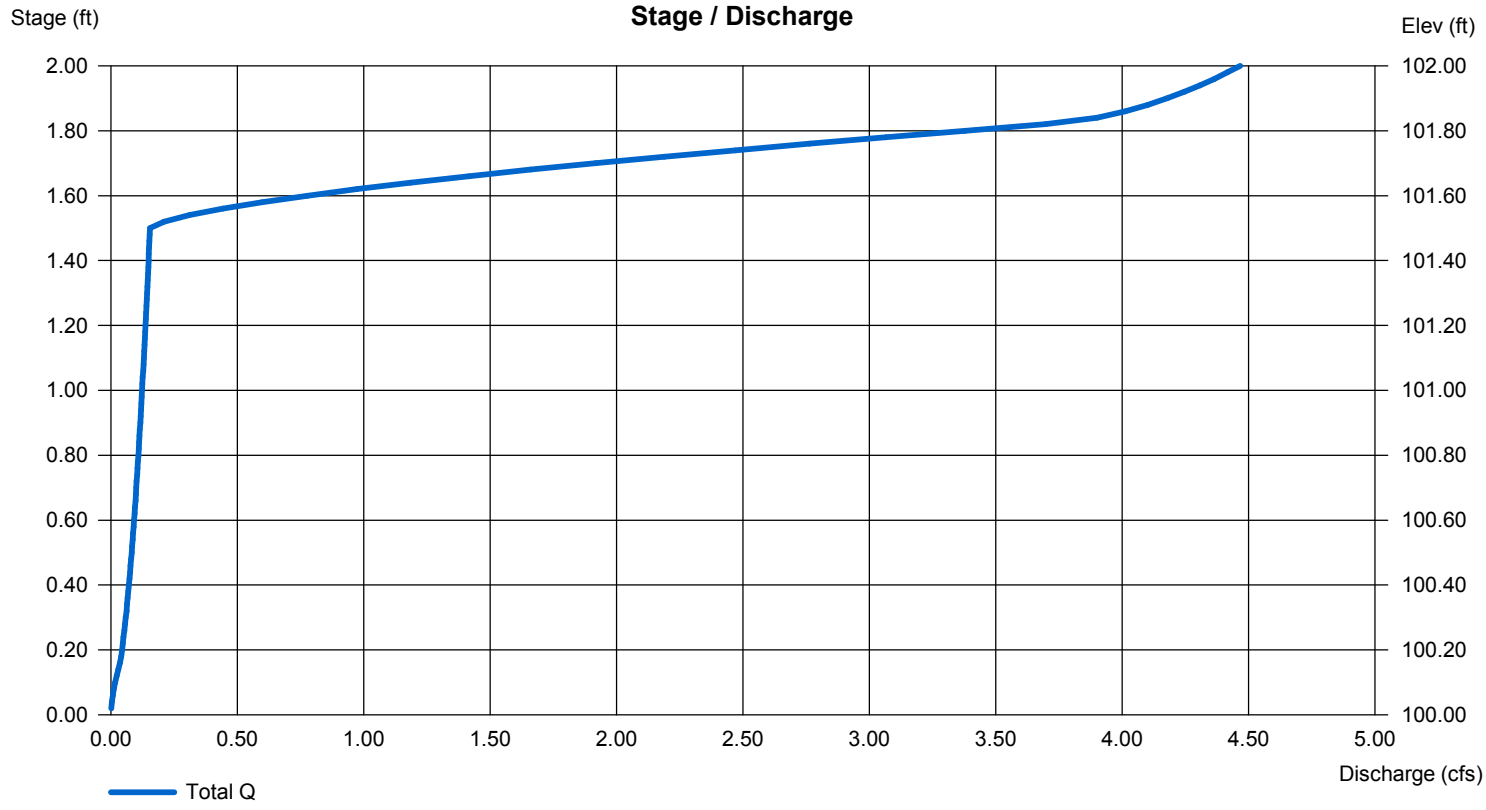
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.00	0.00	0.00	0.00
Crest El. (ft)	= 101.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



```
                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
       Rational Hydrology Study        Date: 04/02/18  File:CANDEEPOSTDEVPOC2SUB02.out
------------------------------------------------------------------------
TPM 37511 UNIT 2
POST-DEVELOPMENT Q100
SUB-BASIN OF POC 2 ONSITE
USE FOR ROUTING INTO DETENTION PIPE 03
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

 English (in-lb) Units used in input data file

------------------------------------------------------------------------


Program License Serial Number 6332

------------------------------------------------------------------------
Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) =  100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Murrieta,Tmc,Rnch CaNorco ] area used.
10 year storm 10 minute intensity =  2.360(In/Hr)
10 year storm 60 minute intensity =  0.880(In/Hr)
100 year storm 10 minute intensity =  3.480(In/Hr)
100 year storm 60 minute intensity =  1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity =  1.300(In/Hr)
Slope of intensity duration curve = 0.5500

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.000 to Point/Station       27.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   233.000(Ft.)
Top (of initial area) elevation =  1522.000(Ft.)
Bottom (of initial area) elevation =  1518.000(Ft.)
Difference in elevation =     4.000(Ft.)
Slope =    0.01717  s(percent)=       1.72
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    5.986 min.
Rainfall intensity =      4.619(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.892
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2)  =  75.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      6.683(CFS)
Total initial stream area =        1.622(Ac.)
Pervious area fraction = 0.100
End of computations, total study area =            1.62 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  75.0
```

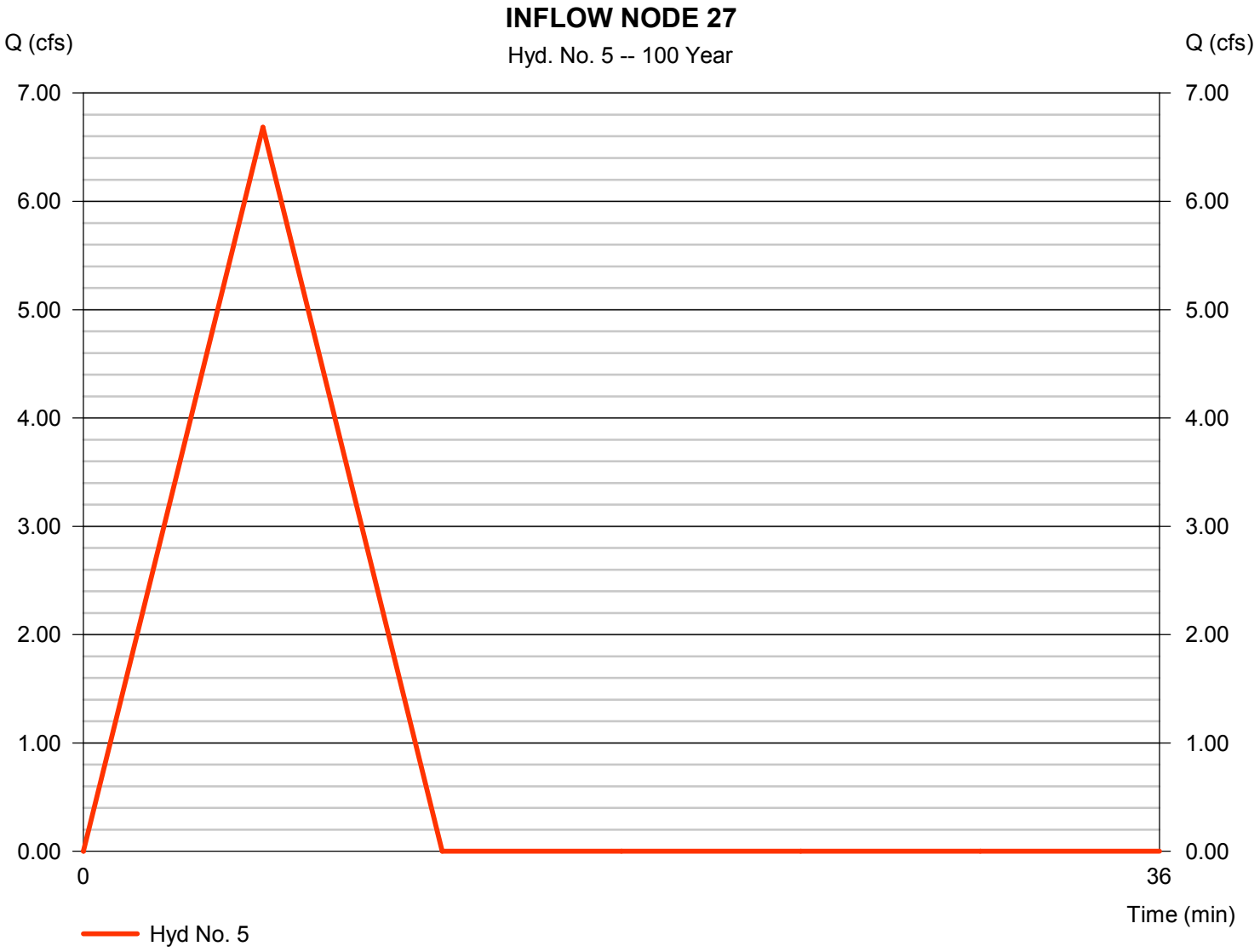
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 04 / 3 / 2018

Hyd. No. 5

INFLOW NODE 27

Hydrograph type	= Manual	Peak discharge	= 6.683 cfs
Storm frequency	= 100 yrs	Time to peak	= 6 min
Time interval	= 6 min	Hyd. volume	= 2,406 cuft



Hydrograph Report

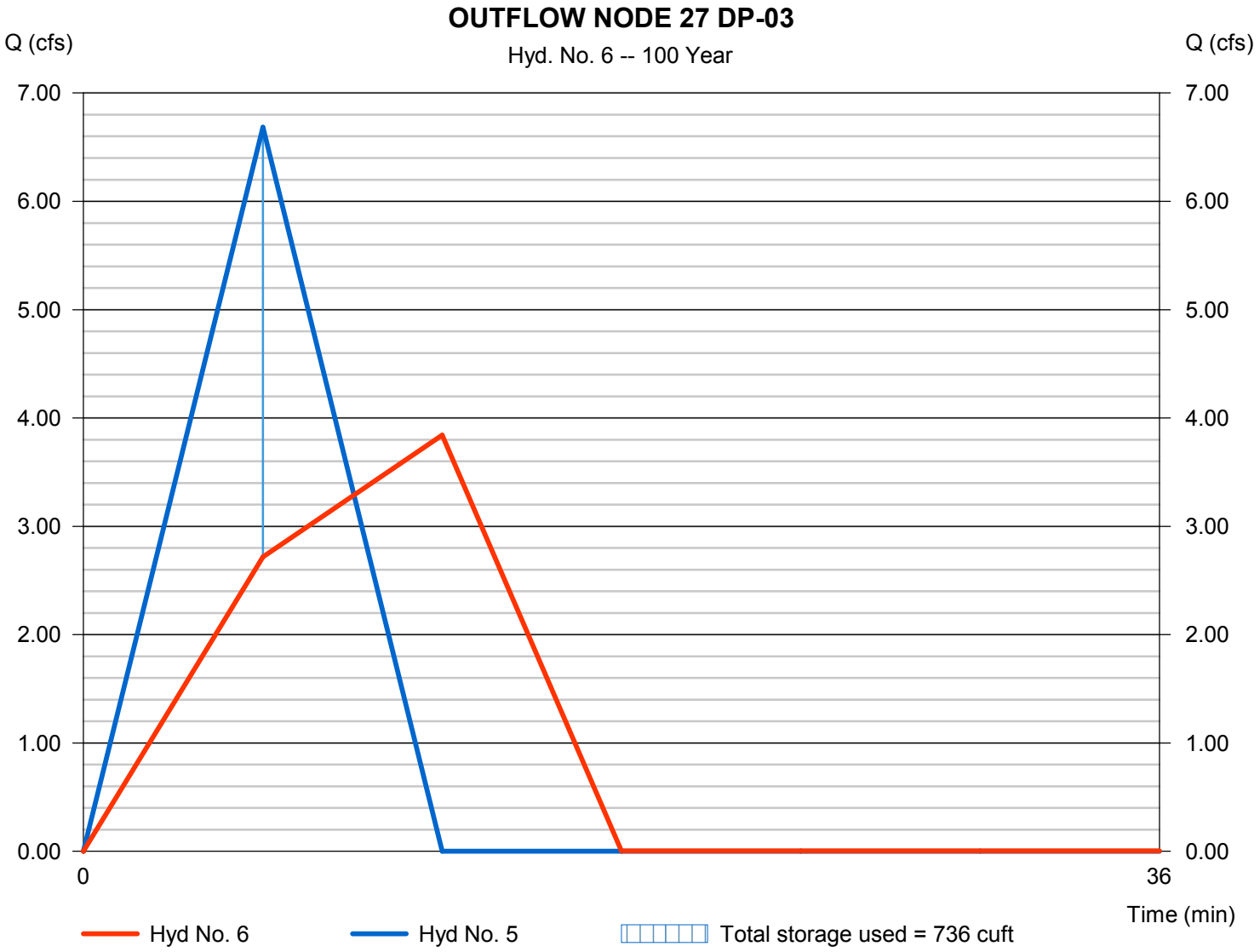
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 04 / 3 / 2018

Hyd. No. 6

OUTFLOW NODE 27 DP-03

Hydrograph type	= Reservoir	Peak discharge	= 3.841 cfs
Storm frequency	= 100 yrs	Time to peak	= 12 min
Time interval	= 6 min	Hyd. volume	= 2,399 cuft
Inflow hyd. No.	= 5 - INFLOW NODE 27	Max. Elevation	= 103.00 ft
Reservoir name	= DP-03	Max. Storage	= 736 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 04 / 3 / 2018

Pond No. 4 - DP-03

Pond Data

UG Chambers -Invert elev. = 100.00 ft, Rise x Span = 3.00 x 3.00 ft, Barrel Len = 125.00 ft, No. Barrels = 1, Slope = 0.00%, Headers = No

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	n/a	0	0
0.30	100.30	n/a	46	46
0.60	100.60	n/a	80	126
0.90	100.90	n/a	97	223
1.20	101.20	n/a	107	330
1.50	101.50	n/a	112	442
1.80	101.80	n/a	112	554
2.10	102.10	n/a	107	661
2.40	102.40	n/a	97	758
2.70	102.70	n/a	80	838
3.00	103.00	n/a	46	884

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	0.50	0.25	Inactive
Span (in)	= 12.00	0.50	0.75	0.00
No. Barrels	= 1	1	1	1
Invert El. (ft)	= 100.00	100.00	101.25	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	Yes

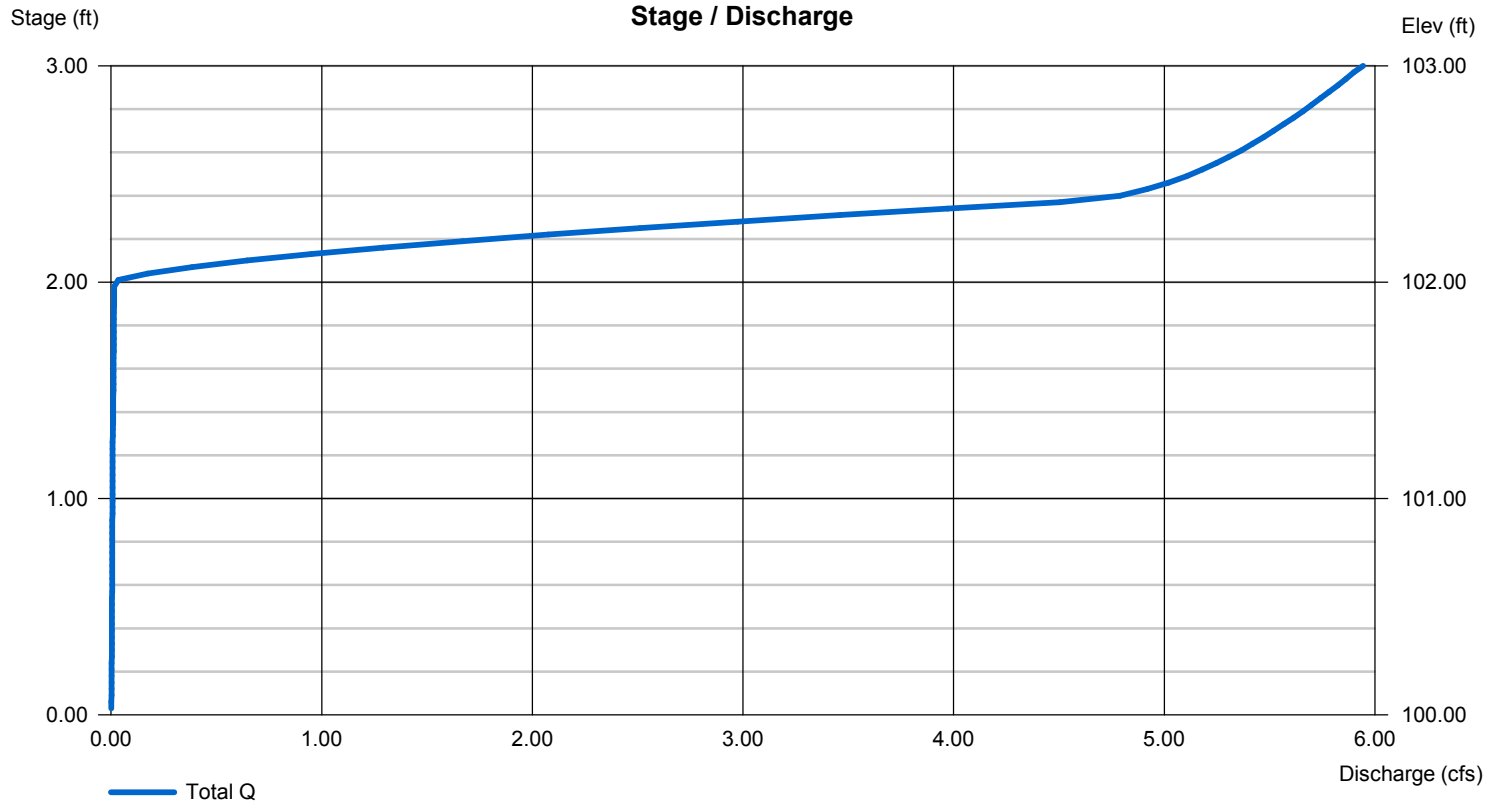
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.00	0.00	0.00	0.00
Crest El. (ft)	= 102.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 04/02/18 File:CANDEEPOSTDEVPOC2SUB03.out

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TPM 37511 UNIT 2
POST-DEVELOPMENT Q100
SUB-BASIN OF POC 2 ONSITE
USE FOR ROUTING INTO DETENTION PIPE 04

********* Hydrology Study Control Information **********

English (in-lb) Units used in input data file

Program License Serial Number 6332

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Murrieta,Tmc,Rnch CaNorco] area used.
10 year storm 10 minute intensity = 2.360(In/Hr)
10 year storm 60 minute intensity = 0.880(In/Hr)
100 year storm 10 minute intensity = 3.480(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5500

++
Process from Point/Station 28.000 to Point/Station 29.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 198.000(Ft.)
Top (of initial area) elevation = 1521.000(Ft.)
Bottom (of initial area) elevation = 1516.000(Ft.)
Difference in elevation = 5.000(Ft.)
Slope = 0.02525 s(percent)= 2.53
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 5.192 min.
Rainfall intensity = 4.995(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.893
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 3.366(CFS)
Total initial stream area = 0.755(Ac.)
Pervious area fraction = 0.100
End of computations, total study area = 0.76 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number = 75.0

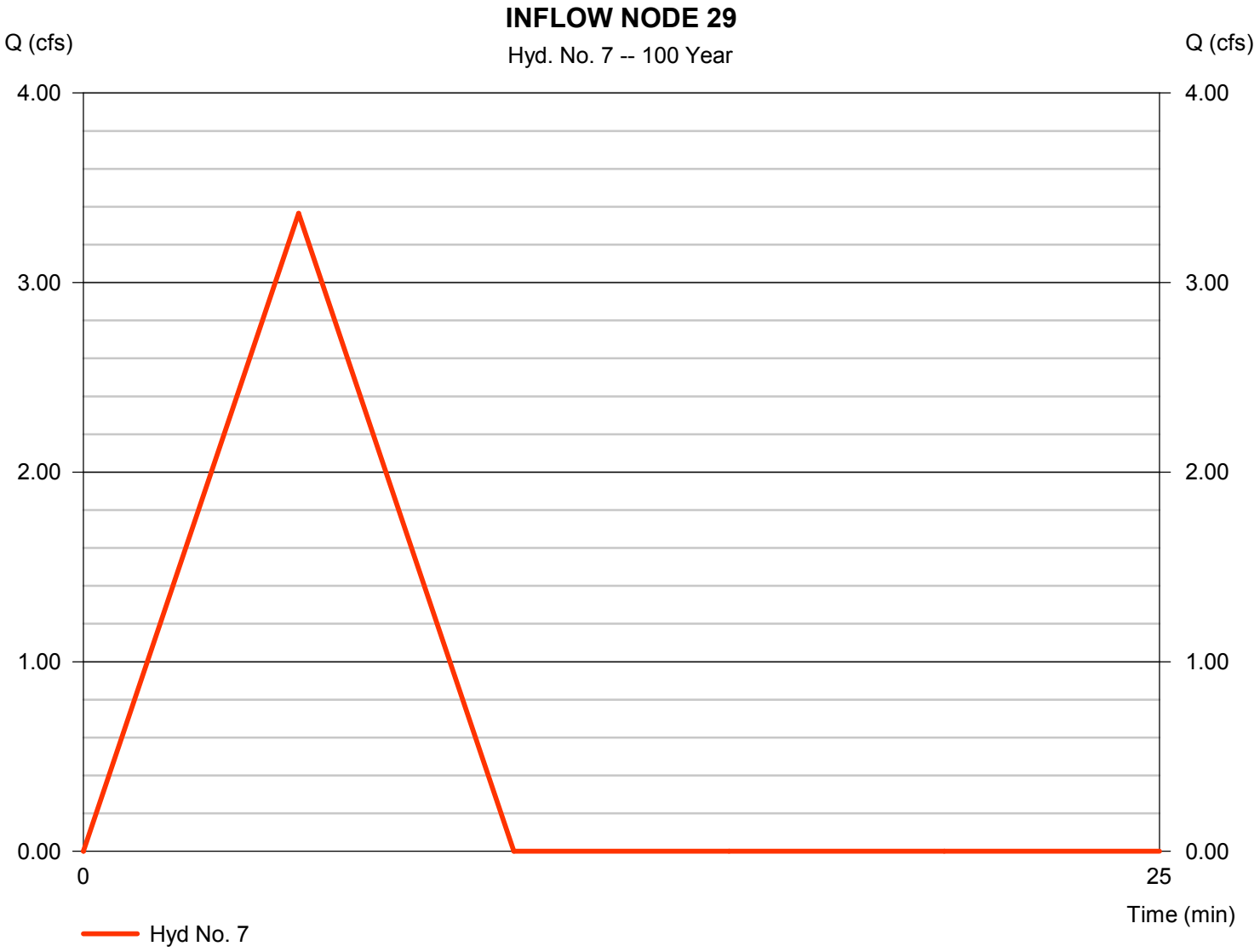
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 04 / 3 / 2018

Hyd. No. 7

INFLOW NODE 29

Hydrograph type	= Manual	Peak discharge	= 3.366 cfs
Storm frequency	= 100 yrs	Time to peak	= 5 min
Time interval	= 5 min	Hyd. volume	= 1,010 cuft



Hydrograph Report

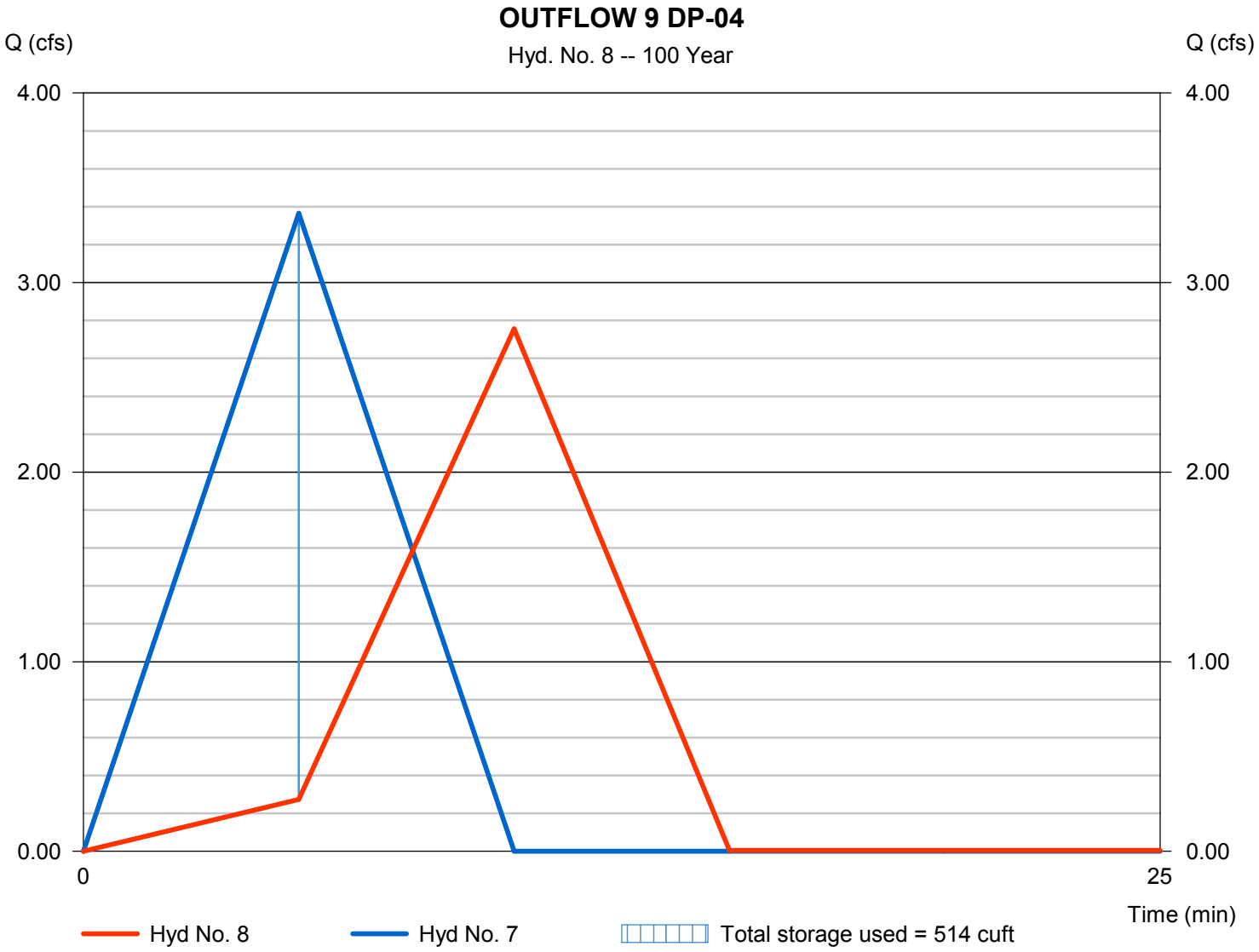
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 04 / 3 / 2018

Hyd. No. 8

OUTFLOW 9 DP-04

Hydrograph type	= Reservoir	Peak discharge	= 2.755 cfs
Storm frequency	= 100 yrs	Time to peak	= 10 min
Time interval	= 5 min	Hyd. volume	= 1,005 cuft
Inflow hyd. No.	= 7 - INFLOW NODE 29	Max. Elevation	= 103.00 ft
Reservoir name	= DP-04	Max. Storage	= 514 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 04 / 3 / 2018

Pond No. 5 - DP-04

Pond Data

UG Chambers -Invert elev. = 100.00 ft, Rise x Span = 3.00 x 3.00 ft, Barrel Len = 90.00 ft, No. Barrels = 1, Slope = 0.00%, Headers = No

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	n/a	0	0
0.30	100.30	n/a	33	33
0.60	100.60	n/a	57	91
0.90	100.90	n/a	70	161
1.20	101.20	n/a	77	238
1.50	101.50	n/a	81	318
1.80	101.80	n/a	81	399
2.10	102.10	n/a	77	476
2.40	102.40	n/a	70	546
2.70	102.70	n/a	57	603
3.00	103.00	n/a	33	636

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	0.25	0.50	Inactive
Span (in)	= 12.00	0.75	0.75	0.00
No. Barrels	= 1	1	1	1
Invert El. (ft)	= 100.00	100.00	101.25	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	Yes

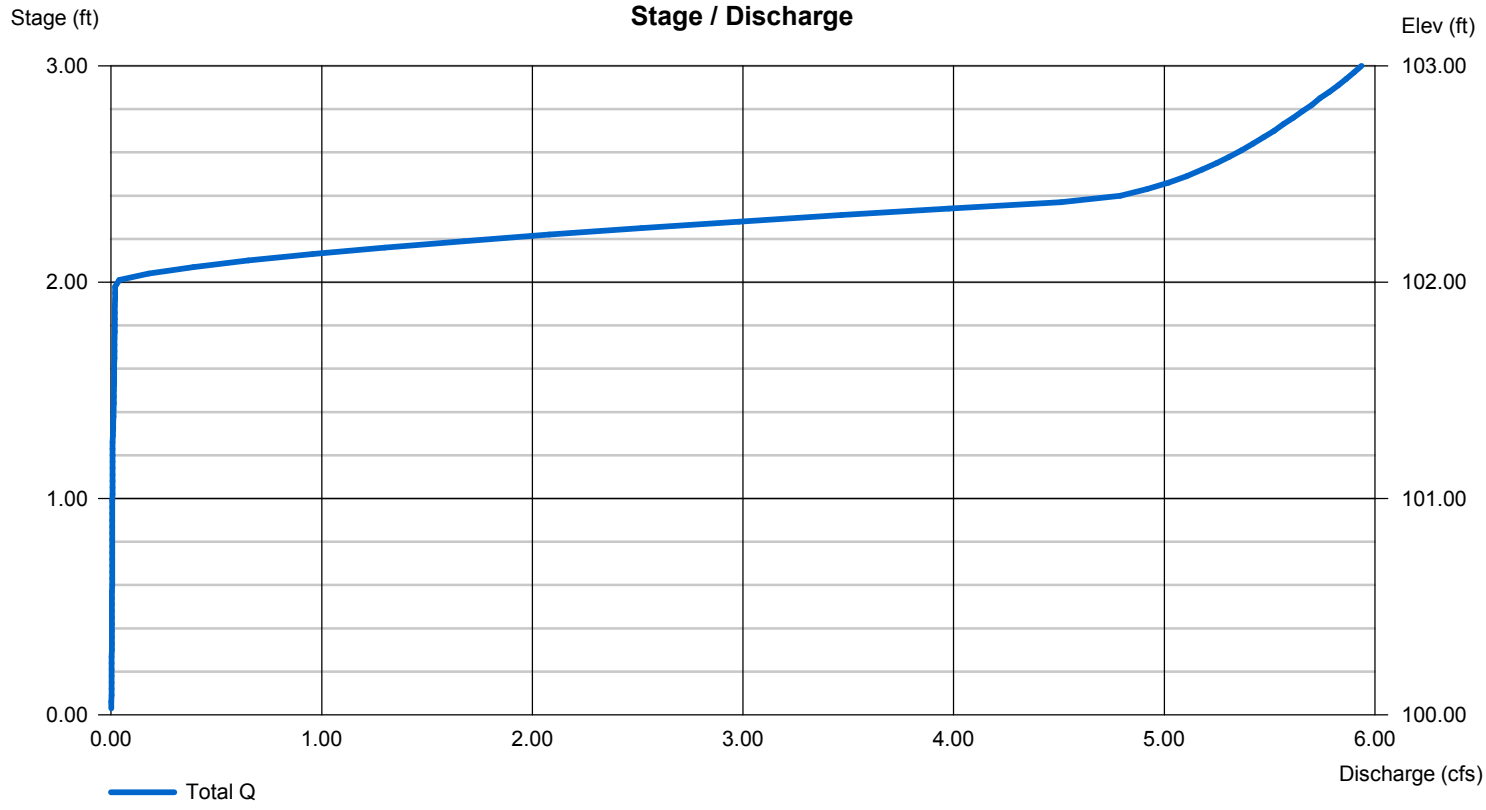
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.00	0.00	0.00	0.00
Crest El. (ft)	= 102.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



```
              Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
       Rational Hydrology Study        Date: 04/02/18  File:CANDEEPOSTDEVPOC2SUB04.out
------------------------------------------------------------------------
TPM 37511 UNIT 2
POST-DEVELOPMENT Q100
SUB-BASIN OF POC 2 ONSITE
USE FOR ROUTING INTO DETENTION PIPE 05
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

 English (in-lb) Units used in input data file

------------------------------------------------------------------------


Program License Serial Number 6332

------------------------------------------------------------------------
Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) =  100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Murrieta,Tmc,Rnch CaNorco ] area used.
10 year storm 10 minute intensity =  2.360(In/Hr)
10 year storm 60 minute intensity =  0.880(In/Hr)
100 year storm 10 minute intensity =  3.480(In/Hr)
100 year storm 60 minute intensity =  1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity =  1.300(In/Hr)
Slope of intensity duration curve = 0.5500

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.000 to Point/Station       31.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   319.000(Ft.)
Top (of initial area) elevation =  1521.000(Ft.)
Bottom (of initial area) elevation =  1516.000(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.01567  s(percent)=       1.57
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.912 min.
Rainfall intensity =      4.267(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.892
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2)  =  75.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      3.664(CFS)
Total initial stream area =        0.963(Ac.)
Pervious area fraction = 0.100
End of computations, total study area =            0.96 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  75.0
```

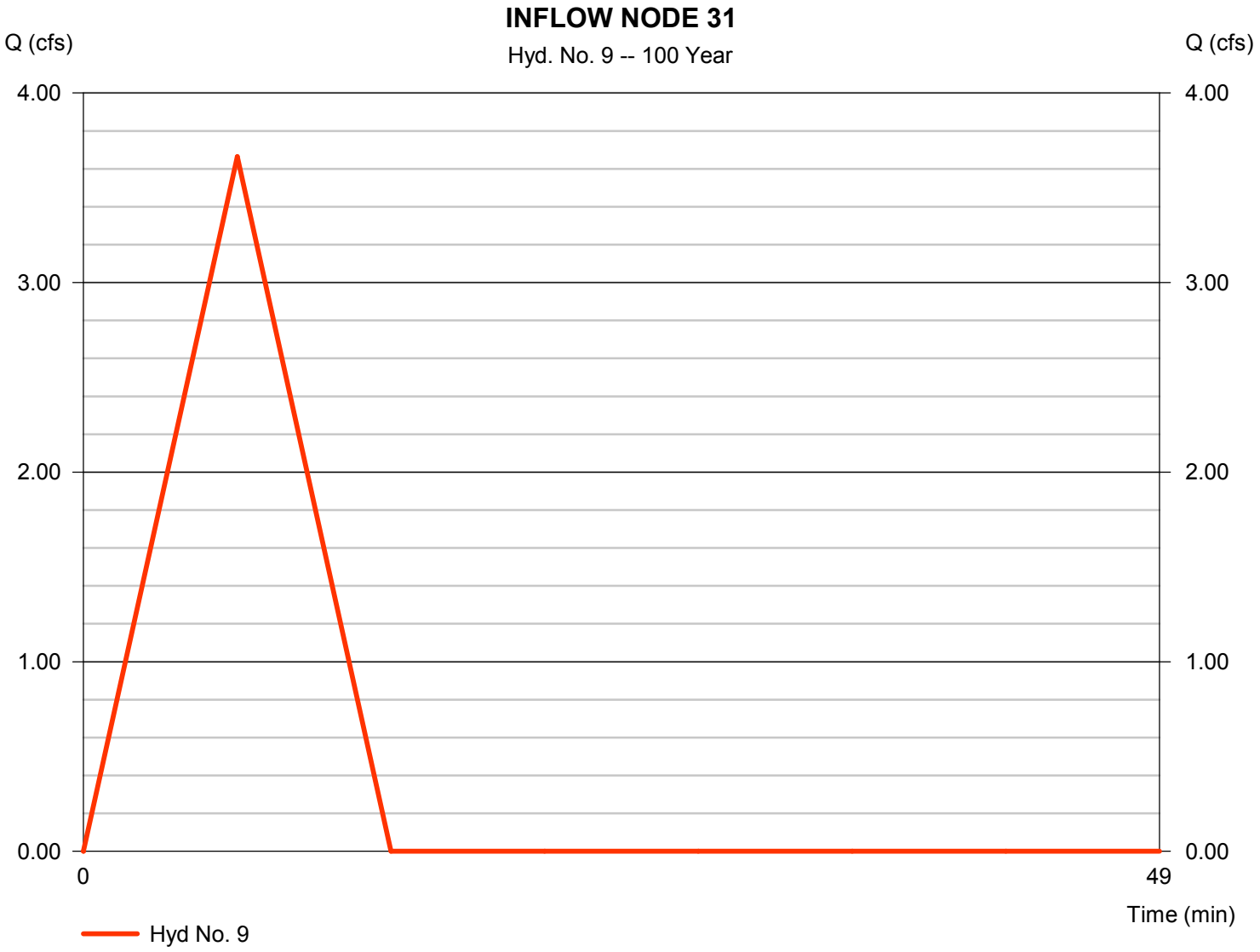
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 04 / 3 / 2018

Hyd. No. 9

INFLOW NODE 31

Hydrograph type	= Manual	Peak discharge	= 3.664 cfs
Storm frequency	= 100 yrs	Time to peak	= 7 min
Time interval	= 7 min	Hyd. volume	= 1,539 cuft



Hydrograph Report

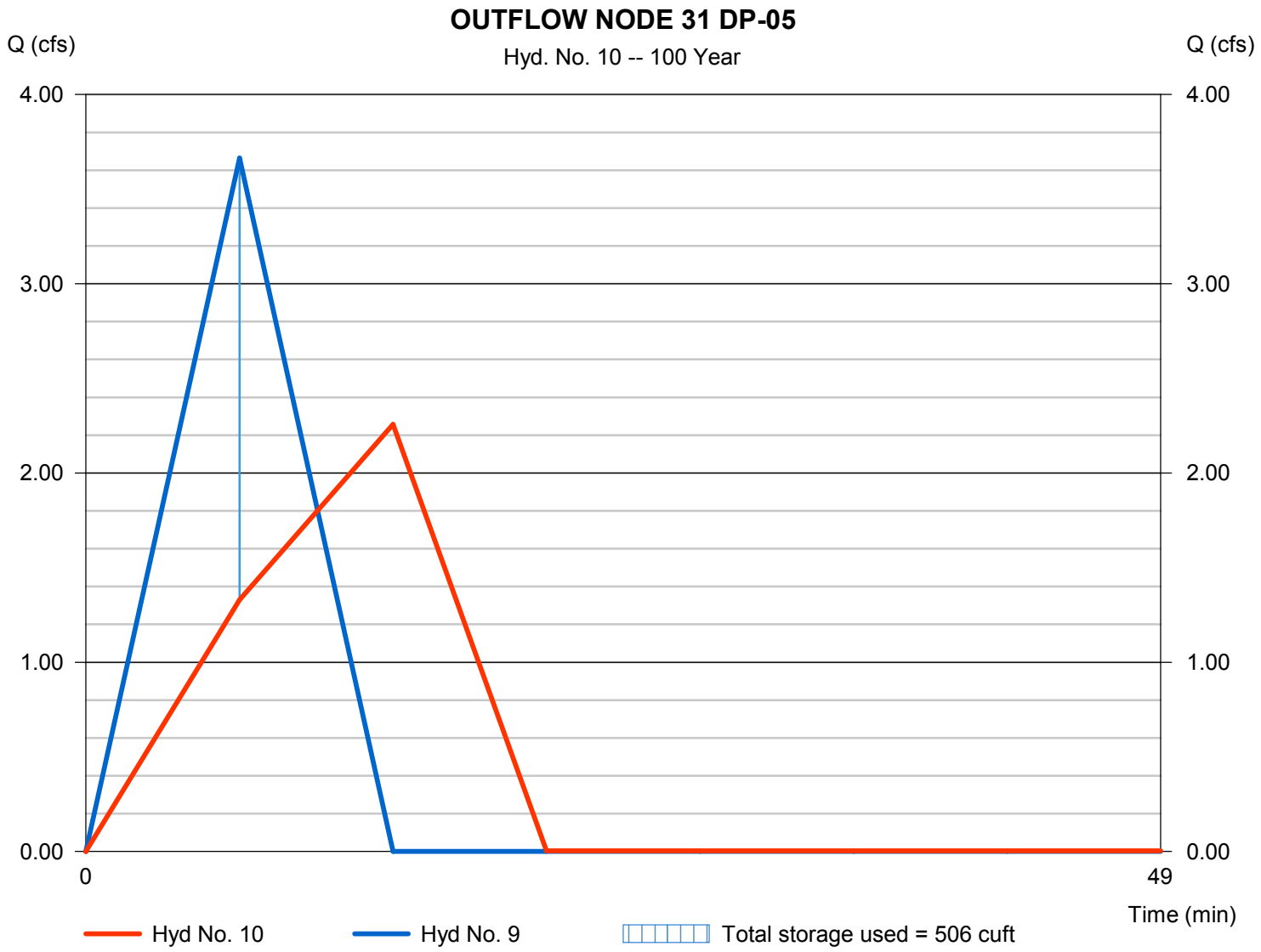
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 04 / 3 / 2018

Hyd. No. 10

OUTFLOW NODE 31 DP-05

Hydrograph type	= Reservoir	Peak discharge	= 2.257 cfs
Storm frequency	= 100 yrs	Time to peak	= 14 min
Time interval	= 7 min	Hyd. volume	= 1,535 cuft
Inflow hyd. No.	= 9 - INFLOW NODE 31	Max. Elevation	= 103.00 ft
Reservoir name	= DP-05	Max. Storage	= 506 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 04 / 3 / 2018

Pond No. 6 - DP-05

Pond Data

UG Chambers -Invert elev. = 100.00 ft, Rise x Span = 3.00 x 3.00 ft, Barrel Len = 90.00 ft, No. Barrels = 1, Slope = 0.00%, Headers = No

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	n/a	0	0
0.30	100.30	n/a	33	33
0.60	100.60	n/a	57	91
0.90	100.90	n/a	70	161
1.20	101.20	n/a	77	238
1.50	101.50	n/a	81	318
1.80	101.80	n/a	81	399
2.10	102.10	n/a	77	476
2.40	102.40	n/a	70	546
2.70	102.70	n/a	57	603
3.00	103.00	n/a	33	636

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	0.25	0.50	Inactive
Span (in)	= 12.00	0.75	1.00	0.00
No. Barrels	= 1	1	1	1
Invert El. (ft)	= 100.00	100.00	100.75	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	Yes

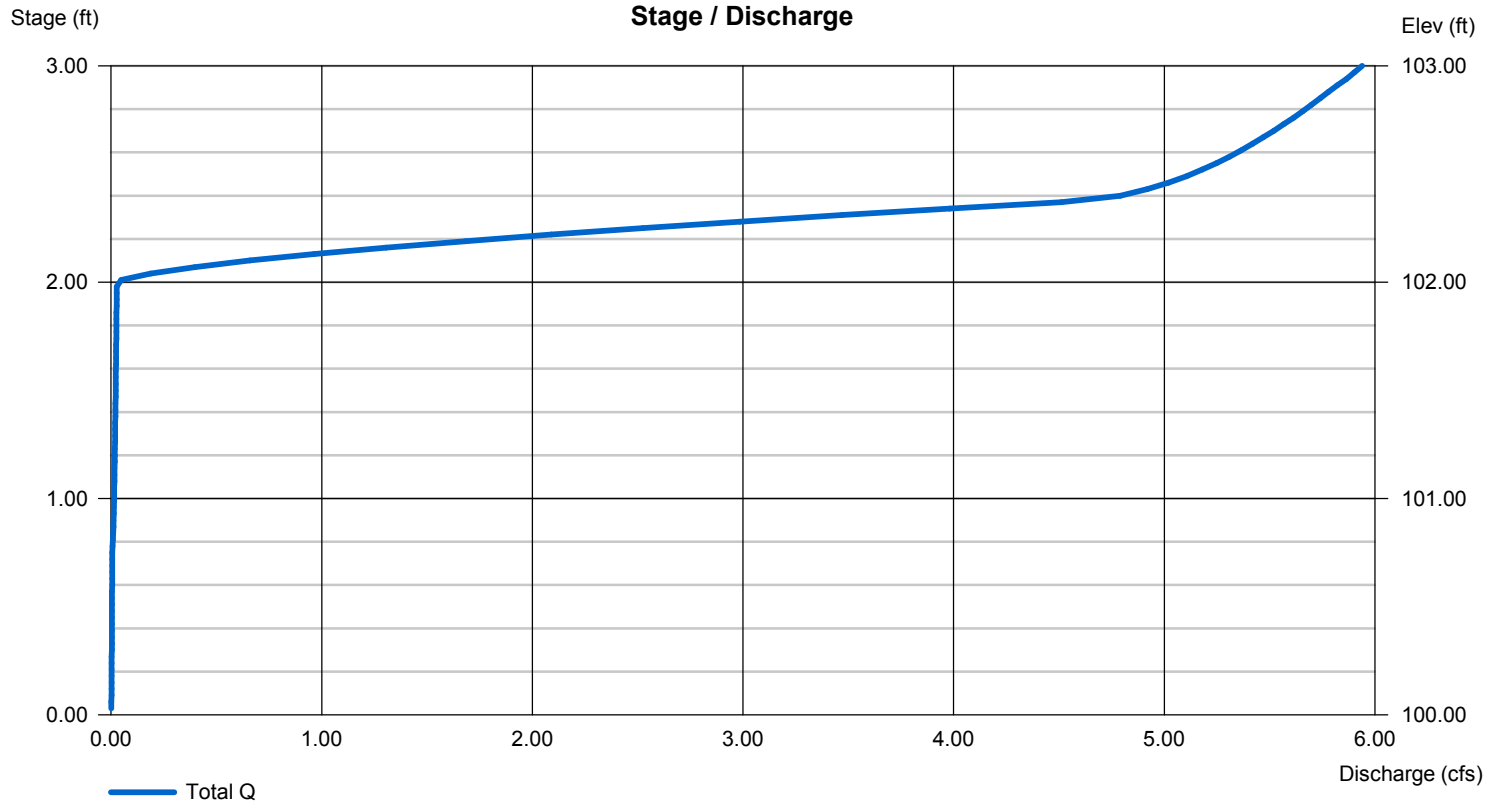
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.00	0.00	0.00	0.00
Crest El. (ft)	= 102.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



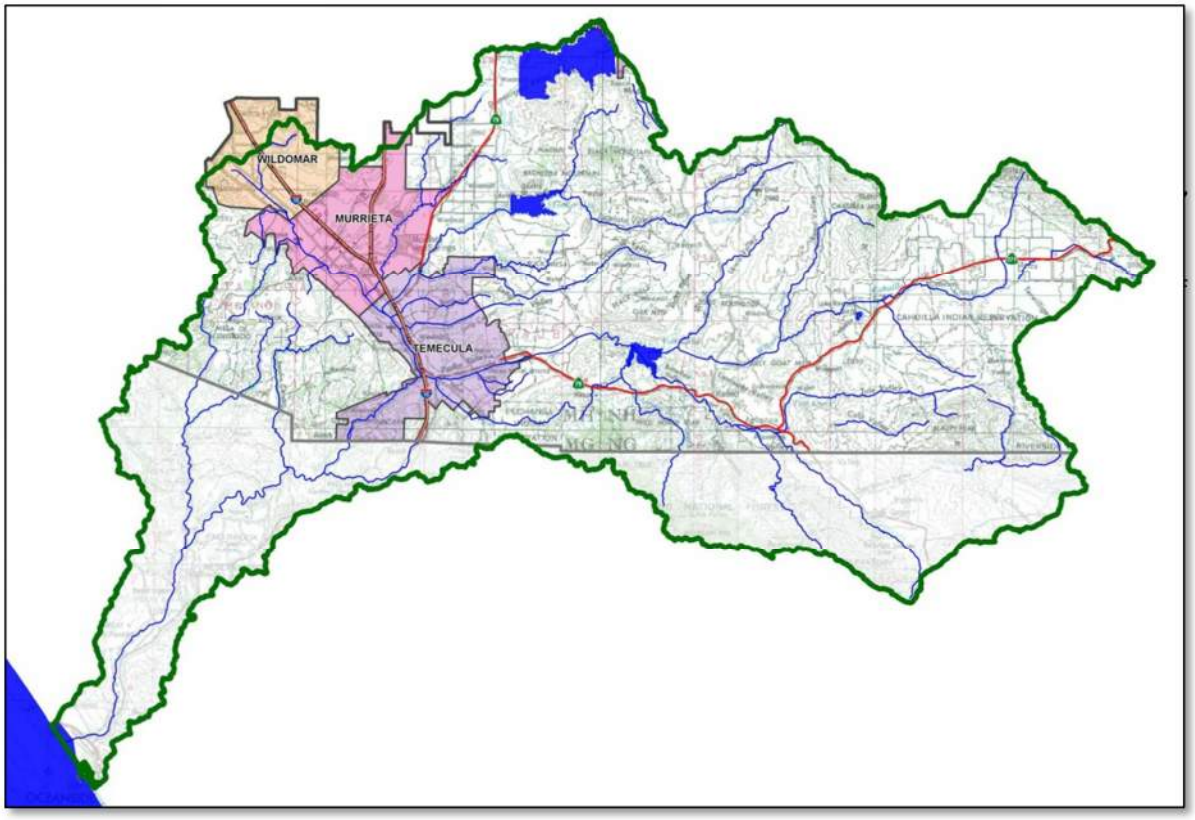
Project Specific Water Quality Management Plan

*A Template for preparing Project Specific WQMPs for Priority Development Projects located within the **Santa Margarita Region** of Riverside County*

Project Title: Costco Wholesale, Murrieta CA

Development No: DP0-018-165, TPM-018-1654

Design Review/Case No: TPM No. 37511



☒ **Preliminary**
☐ **Final**

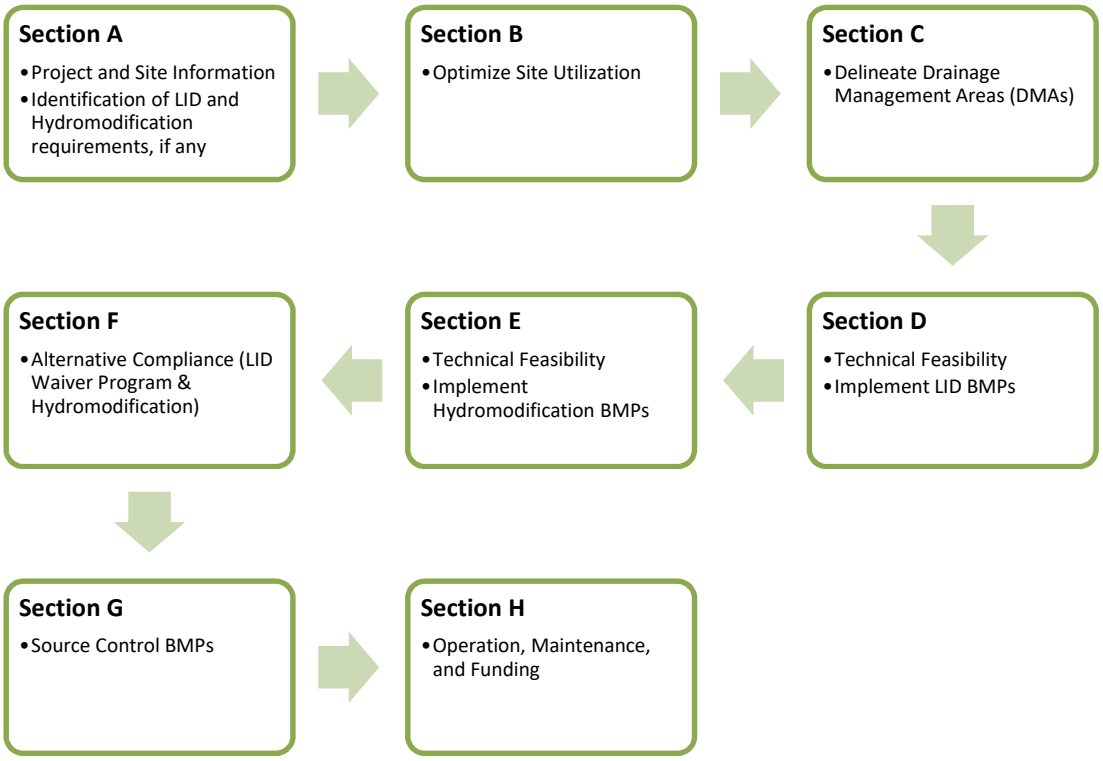
Original Date Prepared: March 30th, 2018

Revision Date(s): February 27th, 2019

Prepared for Compliance with
Regional Board Order No. **R9-2010-0016**

A Brief Introduction

The Municipal Separate Stormwater Sewer System (MS4) Permit[1] for the **Santa Margarita Region** (SMR) requires preparation of a Project-Specific Water Quality Management Plan (WQMP) for all Development Projects as defined in section F.1.d.(1) of the Permit. This Project-Specific WQMP Template for Development Projects in the **Santa Margarita Region** has been prepared to help document compliance and prepare a WQMP submittal. Below is a flowchart for the layout of this Template that will provide the steps required to document compliance.



[1] Order No. R9-2010-0016, NPDES No. CAS0108766, Waste Discharge Requirements for Discharges from the MS4 Draining the County of Riverside, the Incorporated Cities of Riverside County, and the Riverside County Flood Control and Water Conservation District within the San Diego Region, California Regional Water Quality Control Board, November 10, 2010.

OWNER'S CERTIFICATION

This Project-Specific WQMP has been prepared for Costco Wholesale by Fuscoe Engineering for the Costco Wholesale Murrieta project.

This WQMP is intended to comply with the requirements of City of Murrieta for R9-2010-0016 which includes the requirement for the preparation and implementation of a Project-Specific WQMP.

The undersigned, while owning the property/project described in the preceding paragraph, shall be responsible for the implementation and funding of this WQMP and will ensure that this WQMP is amended as appropriate to reflect up-to-date conditions on the site. In addition, the property owner accepts responsibility for interim operation and maintenance of Stormwater Best Management Practices until such time as this responsibility is formally transferred to a subsequent owner. This WQMP will be reviewed with the facility operator, facility supervisors, employees, tenants, maintenance and service contractors, or any other party (or parties) having responsibility for implementing portions of this WQMP. At least one copy of this WQMP will be maintained at the project site or project office in perpetuity. The undersigned is authorized to certify and to approve implementation of this WQMP. The undersigned is aware that implementation of this WQMP is enforceable under City of Murrieta Water Quality Ordinance (Municipal Code Section8.36).

"I, the undersigned, certify under penalty of law that the provisions of this WQMP have been reviewed and accepted and that the WQMP will be transferred to future successors in interest."

Owner's Signature	Date
Owner's Printed Name	Owner's Title/Position

PREPARER'S CERTIFICATION

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control Best Management Practices in this plan meet the requirements of Regional Water Quality Control Board Order No. **R9-2010-0016** and any subsequent amendments thereto."

Preparer's Signature	10/8/19 Date
Bryan D. Smith, P.E Preparer's Printed Name	Sr. PM Preparer's Title/Position

Preparer's Licensure:



Table of Contents

Section A: Project and Site Information 6
A.1 Maps and Site Plans 6
A.2 Identify Receiving Waters 7
A.3 Drainage System Susceptibility to Hydromodification 7
A.4 Additional Permits/Approvals required for the Project: 8
Section B: Optimize Site Utilization (LID Principles) 11
Section C: Delineate Drainage Management Areas (DMAs) 13
Section D: Implement LID BMPs 16
D.1 Infiltration Applicability 16
D.2 Harvest and Use Assessment 18
D.3 Bioretention and Biotreatment Assessment 20
D.4 Other Limiting Geotechnical Conditions 21
D.5 Feasibility Assessment Summaries 21
D.6 LID BMP Sizing 22
Section E: Implement Hydrologic Control BMPs and Sediment Supply BMPs 25
E.1 Onsite Feasibility of Hydrologic Control BMPs 25
E.2 Meeting the HMP Performance Standard for Small Project Sites 25
E.3 Hydrologic Control BMP Selection 27
E.4 Hydrologic Control BMP Sizing 30
E.5 Implement Sediment Supply BMPs 31
Section F: Alternative Compliance 34
F.1 Identify Pollutants of Concern 36
F.2 Stormwater Credits 37
F.3 Sizing Criteria 37
F.4 Treatment Control BMP Selection 38
F.5 Hydrologic Performance Standard – Alternative Compliance Approach 38
F.6 Sediment Supply Performance Standard - Alternative Compliance 39
Section G: Source Control BMPs 41
Section H: Construction Plan Checklist 43
Section I: Operation, Maintenance and Funding 45
Acronyms, Abbreviations and Definitions 46

List of Tables

Table A.1 Identification of Receiving Waters 7
Table A.2 Identification of Susceptibility to Hydromodification 7
Table A.3 Other Applicable Permits 8
Table C.1 DMA Classifications 13
Table C.2 Type 'A', Self-Treating Areas 14
Table C.3 Type 'B', Self-Retaining Areas 14
Table C.4 Type 'C', Areas that Drain to Self-Retaining Areas 14
Table C.5 Type 'D', Areas Draining to BMPs 15
Table D.1 Infiltration Feasibility 16
Table D.2 Geotechnical Concerns for Onsite Retention Table 21
Table D.3 LID Prioritization Summary Matrix 21
Table D.4 DCV Calculations for LID BMPs 23
Table D.5 LID BMP Sizing 24
Table E.1 LID & Hydromodification BMP Location 27
Table E.2 Hydrologic Control BMP Sizing 30
Table F.1 Potential Pollutants by Land Use Type 36
Table F.2 Stormwater Credits 37
Table F.3 Treatment Control BMP Sizing 37
Table F.4 Treatment Control BMP Selection 38
Table F.5 Offsite Hydrologic Control BMP Sizing 39
Table G.1 Structural and Operational Source Control BMP 41
Table H.1 Construction Plan Cross-reference 44

p

List of Appendices

Appendix 1: Maps and Site Plans 53
Appendix 2: Construction Plans 54
Appendix 3: Soils Information 55
Appendix 4: Historical Site Conditions 56
Appendix 5: LID Infeasibility 57
Appendix 6: BMP Design Details 58
Appendix 7: Hydromodification 59
Appendix 8: Source Control 60
Appendix 9: O&M 61
Appendix 10: Educational Materials 43

Section A: Project and Site Information

PROJECT INFORMATION	
Type of Project:	Commercial
Planning Area:	Community Commercial (CC)
Community Name:	Community Commercial (CC)
Development Name:	Costco Wholesale
PROJECT LOCATION	
Latitude & Longitude (DMS): 33°35'58.2"N 117°10'08.8"W	
Project Watershed and Sub-Watershed: Santa Margarita, Murrieta (HAS 902.32)	
APN(s): 392-029-025, 392-029-026, 392-029-28,392-029-029, 392-029-51, 392-270-033, 392-270-030	
Map Book and Page No.: Page 898 Grid C7	
PROJECT CHARACTERISTICS	
Proposed or potential land use(s)	Commercial
Proposed or Potential SIC Code(s)	Division G & I
Area of Impervious Project Footprint (SF)	601,560 SF
Total area of proposed Impervious Surfaces within the Project Limits (SF)/or Replacement	601,560 SF
Total Project Area (ac)	17.77 ac
Does the project consist of offsite road improvements?	☐ Y ☒ N
Does the project propose to construct unpaved roads?	☐ Y ☒ N
Is the project part of a larger common plan of development (phased project)?	☐ Y ☒ N
Is the project exempt from HMP Performance Standards?	☐ Y ☒ N
EXISTING SITE CHARACTERISTICS	
Total area of existing Impervious Surfaces within the project limits (SF)	0 sf
Is the project located within any Multi-Species Habitat Conservation Plan (MSHCP Criteria Cell?	☐ Y ☒ N
If so, identify the Cell number:	N/A
Are there any natural hydrologic features on the project site?	☐ Y ☒ N
Is a Geotechnical Report attached?	☐ Y ☒ N
If no Geotech. Report, list the Natural Resources Conservation Service (NRCS) soils type(s) present on the site (A, B, C and/or D)	Soil Group D
What is the Water Quality Design Storm Depth for the project?	0.60"

A.1 Maps and Site Plans

When completing your Project-Specific WQMP, include a map of the Project vicinity and existing site. In addition, include all grading, drainage, landscape/plant palette and other pertinent construction plans in Appendix 2. At a **minimum**, your WQMP Site Plan should include the following:

- Drainage Management Areas (DMAs)
- Proposed Structural Best Management Practices (BMPs)
- Drainage Path
- Source Control BMPs
- Buildings, Roof Lines, Downspouts
- Impervious Surfaces
- Standard Labeling

- Drainage infrastructure, inlets, overflows

Use your discretion on whether or not you may need to create multiple sheets or can appropriately accommodate these features on one or two sheets. Keep in mind that the Copermittee plan reviewer must be able to easily analyze your Project utilizing this template and its associated site plans and maps.

A.2 Identify Receiving Waters

Using Table A.1 below, list in order of upstream to downstream, the Receiving Waters that the Project site is tributary to. Continue to fill each row with the Receiving Water's 303(d) listed impairments (if any), designated Beneficial Uses, and proximity, if any, to a RARE Beneficial Use. Include a map of the Receiving Waters in Appendix 1. *(http://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/)*

Table A.1 Identification of Receiving Waters

Receiving Waters	USEPA Approved 303(d) List Impairments	Designated Beneficial Uses	Proximity to RARE Beneficial Use
Warm Springs Creek 902.32	Chlorpyrifos, Escherichia coli (E. coli), Fecal Coliform, Iron, Manganese, Phosphorous, Total Nitrogen as N	Municipal & Domestic Supply, Agricultural, Industrial service, Industrial process, Ground Water Recharge, non-contact water recreation, Warm Freshwater habitat, wildlife habitat.	None

A.3 Drainage System Susceptibility to Hydromodification

Using Table A.2 below, list in order of the point of discharge at the project site down to the Santa Margarita River, each drainage system or receiving water that the project site is tributary to. Continue to fill each row with the material of the drainage system, the storm drain susceptibility using the SWCT2 (Stormwater & Water Conservation Tracking Tool - http://rivco.permitrack.com/) or Map 2 of the Hydromodification Susceptibility Documentation Report and Mapping: Santa Margarita Region (Appendix D of the SMR HMP), and the condition for exempting the drainage system, if applicable. If the exemption includes receiving waters that were not evaluated in Appendix D, provide supporting documentation in Appendix 7 to demonstrate that they classify as Engineered, Fully Hardened and Maintained (EFHM) channels, consistent with the definition provided in Appendix D. Include a map exhibiting each drainage system and the associated susceptibility in Appendix 1.

Table A.2 Identification of Susceptibility to Hydromodification

Drainage System	Drainage System Material	Susceptibility of Drainage System	Hydromodification Exemption
0.31 miles of 42" HDPE Storm Drain	42" HDPE Storm Drain	Low Susceptibility	NONE
0.96 miles of Open Channel	Natural Open Channel	High Susceptibility	NONE.
1.29 miles of city storm drain	Public Storm Drain RCP Pipes	Low Susceptibility	NONE

Drainage System	Drainage System Material	Susceptibility of Drainage System	Hydromodification Exemption
0.5 miles of engineered channel	EFHM Channel	Not Susceptible	NONE
0.15 miles of open channel	Natural Open Channel	High Susceptibility	NONE
0.41 miles of city storm drain	Public Storm Drain, RCP	Low Susceptibility	NONE
0.64 miles of open channel	Natural Open Channel	High Susceptibility	NONE
1.52 miles of city storm drain	Public Storm Drain, RCP	Low Susceptibility	NONE
3.22 miles of open channel	Natural Open Channel (Warm Springs Creek)	High Susceptibility	NONE
7.83 miles of open channel	Natural Open Channel (Murrieta Creek)	Not susceptible (over 200,000cfs)	NONE
21.69 miles of open channel	Natural Open Channel (Santa Margarita River)	High Susceptibility	NONE

A.4 Additional Permits/Approvals required for the Project:

Table A.3 Other Applicable Permits

Agency	Permit Required	
State Department of Fish and Game, 1602 Streambed Alteration Agreement	☐ Y	☒ N
State Water Resources Control Board, Clean Water Act Section 401 Water Quality Certification	☐ Y	☒ N
US Army Corps of Engineers, Clean Water Act Section 404 Permit	☐ Y	☒ N
US Fish and Wildlife, Endangered Species Act Section 7 Biological Opinion	☐ Y	☒ N
Statewide Construction General Permit Coverage	☒ Y	☐ N
Statewide Industrial General Permit Coverage	☐ Y	☒ N
Western Riverside MSHCP Consistency Approval (e.g., JPR, DBESP)	☒ Y	☐ N
Other *(please list in the space below as required)*	☐ Y	☒ N

If yes is answered to any of the questions above, the Copermittee may require proof of approval/coverage from those agencies as applicable including documentation of any associated requirements that may affect this Project-Specific WQMP.

WQMP Description 041718

Briefly descrive the following items:

1. How the post project will drain, treatment, hydromod, LID BMP's.

   The site design utilizes biofiltration and self-mitigating DMAs where feasible. Self-mitigation DMA consist of cut slopes and landscaped perimeter slopes that will be isolated and planted per the requirements of self-mitigation. For pavement impervious the project proposes to grade these areas into landscaped BMPS consisting of bio-retention areas located around the perimeter of the parking lot and BMP bioretention planters located within the parking lot. The larger perimeter bio-retention BMP basin will treat and meet hydromodification requirements. Within the parking lot, areas are graded to flow into parking lot bio-retention planter islands to the located thought the project. For planter islands and other areas where bioretention is too small to meet hydromodification requirements alone, underground stormwater tanks are utilized to supplement storage and serve as LID BMP's for HMP.

   The strategy for roof areas is to convey to proprietary biofiltation units (Modular Wetlands Units) for treatment and collected to underground tanks for hydromodification. This strategy is implemented because roof drains tie in 3 feet below ground and are too deep to daylight to surface biofiltration planters.

2. Owner is responsible for implementing and maintaining the WQMP

   Owner understands and will comply.

3. A copy of the Final WQMP must be Kept onsite

   Owner will comply

4. Refer one back to the Inspection and Maintenance Checklist in Appendix 9.

   Will reference.

5. Copies of Inspection and Maintenance records must be kept and make available to the City and Regional Board upon request.

   Noted.

6. Refer one to the Appendix 10 for helpful Education material.

   Will reference

7. Discuss how runoff on Warm Springs Parkway is being treated.

   The street runoff in WSP is treated using tree wells similar to the San Diego Regional Standards for green streets. Treatment for WSP runoff is designed per separate project's WQMP being The Vineyards II development plan number DPO-2018-1656, Unit 2 of TPM 37511. This includes WSP's frontage for both Costco and Vineyards II project.

8. Discuss how runoff on the proposed Cul-De-San in Antelope Road is being treated.

   For Antelope Rd, a new intersection will utilize the existing ac pavement area. The added pavement is de-minimus and does not require treatment.

9. Discuss how runoff from the Gas Station is being treated.

   The gas station is covered and roof runoff is collected and conveyed into bio-retention areas for treatment and hydrodification. Under the canopy, the area is isolated by concrete ditches that, in case of an accidental spill, collects and conveys spills into an oil water separator. Gas spill kits will be included in the gas dispensing area for personnel to utilize as necessary.

10. Discuss how runoff from the outside food court is being treated.

    The food court will have a canopy to capture and route storm precipitation and collected with the rest of the roof area and convey to proprietary biofiltation units (Modular Wetlands Units) for treatment and collected to underground tanks for hydromodification. Refuse Trash area will be covered. Onsite storm drain facilities will include stenciling or signage.

Section B: Optimize Site Utilization (LID Principles)

Review of the information collected in Section 'A' will aid in identifying the principal constraints on site design and selection of LID BMPs as well as opportunities to reduce imperviousness and incorporate LID Principles into the site and landscape design. For example, **constraints** might include impermeable soils, high groundwater, groundwater pollution or contaminated soils, steep slopes, geotechnical instability, high-intensity land use, heavy pedestrian or vehicular traffic, utility locations or safety concerns. **Opportunities** might include existing natural areas, low areas, oddly configured or otherwise unbuildable parcels, easements and landscape amenities including open space and buffers (which can double as locations for LID Bioretention BMPs), and differences in elevation (which can provide hydraulic head). Prepare a brief narrative for each of the site optimization strategies described below. This narrative will help you as you proceed with your Low Impact Development (LID) design and explain your design decisions to others.

The 2010 SMR MS4 Permit further requires that LID Retention BMPs (Infiltration Only or Harvest and Use) be used unless it can be shown that those BMPs are infeasible. Therefore, it is important that your narrative identify and justify if there are any constraints that would prevent the use of those categories of LID BMPs. Similarly, you should also note opportunities that exist which will be utilized during project design. Upon completion of identifying Constraints and Opportunities, include these on your WQMP Site plan in Appendix 1.

Site Optimization

The following questions are based upon Section 3.2 of the WQMP Guidance Document. Review of the WQMP Guidance Document will help you determine how best to optimize your site and subsequently identify opportunities and/or constraints, and document compliance.

Did you identify and preserve existing drainage patterns? If so, how? If not, why?

The three proposed discharge points coincide with the 3 existing discharge points identified as Points-Of-Comparison (POC) POC-A, POC-B, and POC-C in this report and illustrated in the DMA Exhibit. Acreage diversion between these points is less than 0.5 acres combined being ~1% of the tributary area of POC-B

Did you identify and protect existing vegetation? If so, how? If not, why?

The entirety of the site will be graded and developed as Costco Wholesale commercial site. There are no existing areas onsite with a dense vegetative community.

Did you identify and preserve natural infiltration capacity? If so, how? If not, why?

Per the geotech report of the adjacent property VTTM 36493, the site contains dense bedrock with negligible infiltration capacity. Per the NRCS web soil survey the site is located on hydrologic soil group D.

Did you identify and minimize impervious area? If so, how? If not, why?

The project adheres to a typical commercial development site typically about 80% impervious. The proposed development onsite will be slightly less than 80% impervious. Landscape will meet planning requirements

Did you identify and disperse runoff to adjacent pervious areas? If so, how? If not, why?

Yes, the parking lot and roof drainage areas are conveyed trough bioretention basin BMPs throughout the site via curb cuts and shallow roof drains are placed onsite to drain runoff to onsite BMP's. Hillside drainage on the north is collected with drainage ditches and conveyed to the offsite POC-C.

Section C: Delineate Drainage Management Areas (DMAs)

Utilizing the procedure in Section 3.3 of the WQMP Guidance Document which discusses the methods of delineating and mapping your project site into individual DMAs, complete Table C.1 below to appropriately categorize the types of classification (e.g., Type A, Type B, etc.) per DMA for your Project site. Upon completion of this table, this information will then be used to populate and tabulate the corresponding tables for their respective DMA classifications.

Table C.1 DMA Classifications

DMA Name or Identification	Surface Type(s)[1]	Area (Sq. Ft.)	DMA Type
PD-A1-2	Mixed	20,822	Type D
PD-A1-1	Mixed	43,560	Type D
PD-A1-3A	Mixed	21,649	Type D
PD-A1-3B	Mixed	17,642	Type D
PD-A1-3C	Mixed	17,511	Type D
PD-A1-3D	Mixed	10,585	Type D
PD-A1-3E	Mixed	20,604	Type D
PD-B2-6	Mixed	27,966	Type D
PD-B2-4A	Mixed	12,807	Type D
PD-B2-4B	Mixed	28,270	Type D
PD-B2-4C	Mixed	16,858	Type D
PD-B2-4D	Mixed	13,939	Type D
PD-B2-4E	Mixed	14,026	Type D
PD-B2-A	Landscape Slope	4,138	Type A
PD-B2-B	Landscape Slope	16,858	Type D
PD-B2-C	Landscape Slope	4,095	Type D
PD-B2-5A	Mixed	12,240	Type D
PD-B2-5B	Mixed	13,460	Type D
PD-B2-5C	Mixed	18,992	Type D
PD-B2-5D	Mixed	18,687	Type D
PD-B2-7	Roof	85,029	Type D
PD-C1-8	Roof	116,392	Type D
PD-C1-9	Mixed	36,590	Type D
PD-C1-10A	Mixed	25,570	Type D
PD-C1-10B	Mixed	14,157	Type D
PD-C1-11	Mixed	33,062	Type D
PD-C1-12A	Mixed	31,886	Type D
PD-C1-12B	Mixed	9,627	Type D
PD-C1-13	Mixed	10,367	Type D
PD-C2-D	Cut Slope	65,950	Type A

[1]*Reference Table 2-1 in the WQMP Guidance Document to populate this column*

Table C.2 Type 'A', Self-Treating Areas

DMA Name or Identification	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)
PD-B2-A	4,138	Native Low Water Use	Drip Irrigation
PD-B2-B	16,858	Native Low Water Use	Drip Irrigation
PD-B2-C	4,095	Native Low Water Use	Drip Irrigation
PD-C2-D	65,950	Native Low Water Use	Drip Irrigation

Table C.3 Type 'B', Self-Retaining Areas

Self-Retaining Area				**Type 'C' DMAs that are draining to the Self-Retaining Area**		
DMA Name/ ID	Post-project surface type	Area (square feet) [A]	Storm Depth (inches) [B]	DMA Name / ID	[C] from Table C.4 = [C]	Required Retention Depth (inches) [D]
N/A						

$$[D] = [B] + \frac{[B] \cdot [C]}{[A]}$$

Table C.4 Type 'C', Areas that Drain to Self-Retaining Areas

DMA					**Receiving Self-Retaining DMA**		
DMA Name/ ID	Area (square feet) [A]	Post-project surface type	Runoff factor [B]	Product [C] = [A] x [B]	DMA name /ID	Area (square feet) [D]	Ratio [C]/[D]
N/A							

<u>Note:</u> (See Section 3.3 of WQMP Guidance Document) Ensure that partially pervious areas draining to a Self-Retaining area do not exceed the following ratio:

$$\left(\frac{\mathbf{2}}{\boldsymbol{Impervious\ Fraction}}\right) : \mathbf{1}$$

(Tributary Area**:** Self-Retaining Area)

Table C.5 Type 'D', Areas Draining to BMPs

DMA Name or ID	BMP Name or ID
PD-A1-2	BMP 02
PD-A1-1	BMP 01
PD-A1-3A	BMP 03A
PD-A1-3B	BMP 03B
PD-A1-3C	BMP 03C
PD-A1-3D	BMP 03D
PD-A1-3E	BMP 03E
PD-B2-6	BMP-06
PD-B2-4A	BMP-04A
PD-B2-4B	BMP-04B
PD-B2-4C	BMP-04C
PD-B2-4D	BMP-04D
PD-B2-4E	BMP-04E
PD-B2-A	N/A
PD-B2-B	N/A
PD-B2-C	N/A
PD-B2-5A	BMP-05A
PD-B2-5B	BMP-05B
PD-B2-5C	BMP-05C
PD-B2-5D	BMP-05D
PD-B2-7	BMP-07
PD-C1-8	BMP 08
PD-C1-9	BMP 09
PD-C1-10A	BMP 10A
PD-C1-10B	BMP 10B
PD-C1-11	BMP 11
PD-C1-12A	BMP 12A
PD-C1-12B	BMP 12B
PD-C1-13	BMP 13
PD-C2-D	N/A

Note: More than one DMA may drain to a single LID BMP; however, one DMA may not drain to more than one BMP.

Implement LID BMPs

C.1 Infiltration Applicability

An assessment of the feasibility of utilizing Infiltration BMPs is required for all projects, *except in the following case:*

☐ Harvest and Use BMPs will be implemented to address the Design Capture Volume (see the Harvest and Use Assessment below) for all Drainage Management Areas AND the project is exempt from HMP Performance Standards (*Proceed to Section D.2 and Section E*).

If the above box remains unchecked, perform a site-specific evaluation of the feasibility of Infiltration BMPs using each of the applicable criteria identified in Chapter 3.4.1 of the WQMP Guidance Document and complete the remainder of Section D.1.

Is there an infiltration concern (see discussion in Chapter 2.3.4 of the WQMP Guidance Document for further details)? ☐ Y ☒ N

If yes has been checked, both Infiltration BMPs and Hydrologic Control BMPs that include an infiltration functionalities may not be feasible for the site. It is recommended that you contact your Copermittee to verify whether or not infiltration within the Project is infeasible.

Geotechnical Report

A Geotechnical Report or Phase I Environmental Site Assessment may be required by the Copermittee to confirm present and past site characteristics that may affect the use of Infiltration BMPs. In addition, the Copermittee, at their discretion, may not require a geotechnical report for small projects as described in Chapter 2 of the WQMP Guidance Document. If a geotechnical report has been prepared, include it in Appendix 3. In addition, if a Phase I Environmental Site Assessment has been prepared, include it in Appendix 4.

Is this project classified as a small project consistent with the requirements of Chapter 2 of the WQMP Guidance Document? ☐ Y ☒ N

Infiltration Feasibility

Table D.1 below is meant to provide a simple means of assessing which DMAs on your site support Infiltration BMPs and is discussed in the WQMP Guidance Document in Chapter 2.3.4. Check the appropriate box for each question and then list affected DMAs as applicable. If additional space is needed, add a row below the corresponding answer.

Table C.6 Infiltration Feasibility

Does the project site…	YES	NO
…have any DMAs with a seasonal high groundwater mark shallower than 10 feet?		X
If Yes, list affected DMAs:		
…have any DMAs located within 100 feet of a water supply well?		X
If Yes, list affected DMAs:		
…have any areas identified by the geotechnical report as posing a public safety risk where infiltration of stormwater could have a negative impact?		X

If Yes, list affected DMAs:		
…have measured in-situ infiltration rates of less than 1.6 inches / hour?		X
If Yes, list affected DMAs:		
…have significant cut and/or fill conditions that would preclude in-situ testing of infiltration rates at the final infiltration surface?	X	
If Yes, list affected DMAs: ALL		ALL
…have any contaminated groundwater plume in the vicinity of the site?		X
If Yes, list affected DMAs:		
…geotechnical report identifies other site-specific factors that would preclude effective and safe infiltration?	X	
Describe here: The geotechnical report for TPM 36493 specifies the site consists of dense bedrock with makes infiltration infeasible for the project. A site specific report for this project is not available, therefore the predominant design of current BMPs are for bio-filtration with partial infiltration.		

If you answered "Yes" to any of the questions above for any DMA, Infiltration BMPs should not be used for those DMAs and you should proceed to the assessment for Harvest and Use below.

C.2 Harvest and Use Assessment

Please check what applies*:*

☐ Reclaimed water will be used for the non-potable water demands for the Project.

☐Downstream water rights may be impacted by Harvest and Use as approved by the Regional Board (verify with the Copermittee).

☐The Design Capture Volume (DCV) will be addressed using Infiltration Only BMPs. In such a case, Harvest and Use BMPs are still encouraged, but it would not be required if the DCV will be infiltrated or evapotranspired.

If any of the above boxes have been checked, Harvest and Use BMPs need not be assessed for the site. If neither of the above criteria applies, follow the steps below to assess the feasibility of irrigation use, toilet use and other non-potable uses (e.g., industrial use).

Irrigation Use Feasibility

Complete the following steps to determine the feasibility of harvesting stormwater runoff for Irrigation Use BMPs on your site:

Step 1: Identify the total area of irrigated landscape on the site, and the type of landscaping used.

Total Area of Irrigated Landscape: 4.18 acres

Type of Landscaping (Conservation Design or Active Turf): Conservation Design

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for irrigation use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: 13.81 acres

Step 3: Cross reference the Design Storm depth for the project site (see Exhibit A of the WQMP Guidance Document) with the left column of Table 2-4 in Chapter 2 to determine the minimum area of Effective Irrigated Area per Tributary Impervious Area (EIATIA).

Enter your EIATIA factor: 1.08

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum irrigated area that would be required.

Minimum required irrigated area: 14.91 acres acres

Step 5: Determine if harvesting stormwater runoff for irrigation use is feasible for the project by comparing the total area of irrigated landscape (Step 1) to the minimum required irrigated area (Step 4).

Minimum required irrigated area (Step 4)	Available Irrigated Landscape (Step 1)
14.91 Acres	4.18 Acres

Toilet Use Feasibility

Complete the following steps to determine the feasibility of harvesting stormwater runoff for toilet flushing uses on your site:

Step 1: Identify the projected total number of daily toilet users during the wet season, and account for any periodic shut downs or other lapses in occupancy:

Projected Number of Daily Toilet Users: 400

Project Type: Commercial

Step 2: Identify the planned total of all impervious areas on the proposed Project from which runoff might be feasibly captured and stored for toilet use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the Project site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: 13.81 ac

Step 3: Enter the Design Storm depth for the project site (see Exhibit A) into the left column of Table 2-3 in Chapter 2 to determine the minimum number or toilet users per tributary impervious acre (TUTIA).

Enter your TUTIA factor: 133

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum number of toilet users that would be required.

Minimum number of toilet users: 1,837

Step 5: Determine if harvesting stormwater runoff for toilet flushing use is feasible for the Project by comparing the Number of Daily Toilet Users (Step 1) to the minimum required number of toilet users (Step 4).

Minimum required Toilet Users (Step 4)	Projected number of toilet users (Step 1)
1,837	400

Other Non-Potable Use Feasibility

Are there other non-potable uses for stormwater runoff on the site (e.g. industrial use)? See Chapter 2 of the Guidance for further information. If yes, describe below. If no, write N/A.

N/A

Step 1: Identify the projected average daily non-potable demand, in gallons per day, during the Wet Season and accounting for any periodic shut downs or other lapses in occupancy or operation.

Average Daily Demand: Projected Average Daily Use (gpd)

Step 2: Identify the planned total of all impervious areas on the proposed Project from which runoff might be feasibly captured and stored for the identified non-potable use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the Project

site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: Insert Area (Acres)

Step 3: Enter the Design Storm Depth for the Project site (see Exhibit A) into the left column of Table 2-5 in Chapter 2 to determine the minimum demand for non-potable uses of stormwater runoff per tributary impervious acre.

Enter the factor from Table 2-3: Enter Value

Step 4: Multiply the unit value obtained from Step 4 by the total of impervious areas from Step 3 to develop the minimum gpd of non-potable use that would be required.

Minimum required use: Minimum use required (gpd)

Step 5: Determine if harvesting stormwater runoff for other non-potable use is feasible for the Project by comparing the Number of Daily Toilet Users (Step 1) to the minimum required number of toilet users (Step 4).

Minimum required non-potable use (Step 4)	**Projected average daily use (Step 1)**
Minimum use required (gpd)	Projected Average Daily Use (gpd)

If Irrigation, Toilet and Other Use feasibility anticipated demands are less than the applicable minimum values, Harvest and Use BMPs are not required and you should proceed to utilize LID Bioretention and Biotreatment BMPs, unless a site-specific analysis has been completed that demonstrates technical infeasibility as noted in D.3 below.

C.3 Bioretention and Biotreatment Assessment

Other LID Bioretention and Biotreatment BMPs as described in Chapter 2.3 of the WQMP Guidance Document are feasible on nearly all development sites with sufficient advance planning.

Select one of the following:

X LID Bioretention/Biotreatment BMPs will be used for some or all DMAs of the Project as noted below in Section D.4

☐ A site-specific analysis demonstrating the technical infeasibility of all LID BMPs has been performed and is included in Appendix 5. If you plan to submit an analysis demonstrating the technical infeasibility of LID BMPs, request a pre-submittal meeting with the Copermittee with jurisdiction over the Project site to discuss this option. Proceed to Section E to document your alternative compliance measures.

C.4 Other Limiting Geotechnical Conditions

Onsite retention may not be feasible due to specific geotechnical concerns identified in the Geotechnical Report. If any, describe below. If no, write N/A: **N/A**

Table C.7 Geotechnical Concerns for Onsite Retention Table

Type of Geotechnical Concern	DMAs Feasible (By Name or ID)	DMAs Infeasible (By Name or ID)
Collapsible Soil		
Expansive Soil		
Slopes		
Liquefaction		

C.5 Feasibility Assessment Summaries

From the Infiltration, Harvest and Use, Bioretention and Biotreatment Sections above, complete Table D.3 below to summarize which LID BMPs are technically feasible, and which are not, based upon the established hierarchy.

Table C.8 LID Prioritization Summary Matrix

DMA Name/ID	LID BMP Hierarchy				No LID (Alternative Compliance)
	1. Infiltration	2. Harvest and use	3. Bioretention	4. Biotreatment	
PD-A1-2	☐	☐	☒	☐	☐
PD-A1-1	☐	☐	☒	☐	☐
PD-A1-3A	☐	☐	☒	☐	☐
PD-A1-3B	☐	☐	☒	☐	☐
PD-A1-3C	☐	☐	☒	☐	☐
PD-A1-3D	☐	☐	☒	☐	☐
PD-A1-3E	☐	☐	☒	☐	☐
PD-B2-6	☐	☐	☒	☐	☐
PD-B2-4A	☐	☐	☒	☐	☐
PD-B2-4B	☐	☐	☒	☐	☐
PD-B2-4C	☐	☐	☒	☐	☐
PD-B2-4D	☐	☐	☒	☐	☐
PD-B2-4E	☐	☐	☒	☐	☐
PD-B2-5A	☐	☐	☒	☐	☐
PD-B2-5B	☐	☐	☒	☐	☐
PD-B2-5C	☐	☐	☐	☒	☐
PD-B2-5D	☐	☐	☒	☐	☐
PD-B2-7	☐	☐	☐	☒	☐
PD-C1-8	☐	☐	☒	☐	☐
PD-C1-9	☐	☐	☒	☐	☐
PD-C1-10A	☐	☐	☒	☐	☐
PD-C1-10B	☐	☐	☒	☐	☐
PD-C1-11	☐	☐	☒	☐	☐
PD-C1-12A	☐	☐	☒	☐	☐
PD-C1-12B	☐	☐	☒	☐	☐
PD-C1-13			☒		

For those DMAs where LID BMPs are not feasible, provide a brief narrative below summarizing why they are not feasible, include your technical infeasibility criteria in Appendix 5, and proceed to Section E below to document Alternative Compliance measures for those DMAs. Recall that each proposed DMA must pass through the LID BMP hierarchy before alternative compliance measures may be considered.

For DMA-07, being the part of the roof for building, a bioretention basin is not feasible since roof drains for this construction type are required to be about 3.5' below grade and surface conveyance to such bmp's is not practical. For the small DMA-5C bioretention basin is not practical since it is located at the low point of the drive aisle and is adjacent to a 2:1 slope. Therefore biofiltration BMPs have been selected for both of these DMAs.

C.6 LID BMP Sizing

Each LID BMP must be designed to ensure that the DCV will be addressed by the selected BMPs. First**,** calculate the DCV for each LID BMP using the V_{BMP} worksheet in Appendix F of the LID BMP Design Handbook. Second**,** design the LID BMP to meet the required V_{BMP} using a method approved by the Copermittee with jurisdiction over the Project site. Utilize the worksheets found in the LID BMP Design Handbook or consult with the Copermittee to assist you in correctly sizing your LID BMPs. Complete Table D.4 below to document the DCV and the Proposed Volume for each LID BMP. Provide the completed design procedure sheets for each LID BMP in Appendix 6. You may add additional rows to the table below as needed.

Table C.9 DCV Calculations for LID BMPs

DMA Type/ID	DMA (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Enter BMP Name / Identifier Here*		
	[A]		[B]	[C]	[A] x [C]			
						Design Storm Depth (in)	*DCV, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]

[B], [C] is obtained as described in Section 2.5 of the WQMP Guidance Document
[E] is obtained from Exhibit A in the WQMP Guidance Document
[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Each LID BMP must be designed to ensure that the Design Capture Volume (DCV) will be addressed by the selected BMPs. First**,** calculate the Design Capture Volume for each LID BMP using the 'V_{BMP}' worksheet in Appendix F of the LID BMP Design Handbook. Second**,** design the LID BMP to meet the required V_{BMP} using a method approved by the Copermittee. Utilize the worksheets found in the LID BMP Design Handbook or consult with your Copermittee. Complete Table D.5 below to document the Design Capture Volume and the Proposed Volume for each LID BMP. You can add rows to the table as needed. Alternatively, the Santa Margarita Hydrology Model (SMRHM) can be used to size LID BMPs to address the DCV and, if applicable, to size Hydrologic Control BMPs to meet the Hydrologic Performance Standard of the SMR HMP, as identified in Section E.

Table C.10 LID BMP Sizing

BMP Name / ID	DMA No.	BMP Type / Description	Design Capture Volume (ft^3)	Proposed Volume (ft^3)
BMP 02	PD-A1-2	Bioret w/ part infilt.	573	6,599
BMP 01	PD-A1-1	Bioret w/ part infilt.	1,307	17,550
BMP 03A	PD-A1-3A	Bioret w/ part infilt.	794	8,584
BMP 03B	PD-A1-3B	Bioret w/ part infilt.	647	7,032
BMP 03C	PD-A1-3C	Bioret w/ part infilt.	642	7,258
BMP 03D	PD-A1-3D	Bioret w/ part infilt.	388	5,692
BMP 03E	PD-A1-3E	Bioret w/ part infilt.	755	8,303
BMP-06	PD-B2-6	Bioret w/ part infilt.	1,119	7,338
BMP-04A	PD-B2-4A	Bioret w/ part infilt.	470	6,608
BMP-04B	PD-B2-4B	Bioret w/ part infilt.	942	9,255
BMP-04C	PD-B2-4C	Bioret w/ part infilt.	562	3,978
BMP-04D	PD-B2-4D	Bioret w/ part infilt.	511	3,978
BMP-04E	PD-B2-4E	Bioret w/ part infilt.	468	4,745
BMP-05A	PD-B2-5A	Bioret w/ part infilt.	449	2,316
BMP-05B	PD-B2-5B	Bioret w/ part infilt.	494	2,346
BMP-05C	PD-B2-5C	Biofiltration	760	(MWS)
BMP-05D	PD-B2-5D	Bioret w/ part infilt.	685	5,014
BMP-07	PD-B2-7	Biofiltration	3,826	(MWS)
BMP 08	PD-C1-8	Bioret w/ part infilt.	3,880	18,696
BMP 09	PD-C1-9	Bioret w/ part infilt.	1,098	7,142
BMP 10A	PD-C1-10A	Bioret w/ part infilt.	938	5,254
BMP 10B	PD-C1-10B	Bioret w/ part infilt.	566	2,827
BMP 11	PD-C1-11	Bioret w/ part infilt.	992	9,937
BMP 12A	PD-C1-12A	Bioret w/ part infilt.	877	14,561
BMP 12B	PD-C1-12B	Bioret w/ part infilt.	289	6,651
BMP 13	PD-C1-13	Bioret w/ part infilt.	259	3,389

Section D: Implement Hydrologic Control BMPs and Sediment Supply BMPs

If a completed Table A.2 demonstrates that the project is exempt from HMP Performance Standards, specify N/A of proceed to Section F, if applicable, and Section G.

D.1 Onsite Feasibility of Hydrologic Control BMPs

An assessment of the feasibility of implementing onsite Hydrologic Control BMPs is required for all projects.

Select one of the following:

XX Yes – The implementation of Hydrologic Control BMPs is feasible onsite. *(Proceed to Step E.3 and Step E.4)*

- *Or* -

☐ No – The project site is larger than one acre and the implementation of Hydrologic Control BMPs is not feasible onsite. *(Proceed to Step E.5 and Step F for Alternative Compliance upon approval of the Technical Feasibility Assessment by the Copermittee)*

☐ No – The project site is smaller than one acre and the implementation of Hydrologic Control BMPs is not feasible onsite. *(Proceed to Step E.2)*

If the reasons for infeasibility are different from those listed in Section D.1, describe the technical or spatial reasons that preclude the implementation of onsite Hydrologic Control BMPs. If none, write N/A:

Insert narrative description here.

Approval of the condition for infeasibility, if any, is required by the Copermittee. Has the condition for infeasibility been approved by the Copermittee?

☐ Y ☐ N ☒ N/A

D.2 Meeting the HMP Performance Standard for Small Project Sites

Select one of the following:

☐ **XX** Yes – The project site is equal to or larger than one acre. *(Proceed to Step E.3, Step E.4, and Step E.5)*

- *Or* -

☐ No – The project site is less than one acre. *(Follow the remainder of Step E.2)*

Only a Simplified Technical Feasibility Study is required from the applicant. Complete the Simplified Technical Feasibility Study in Appendix 7, which must include, at a minimum, the soil conditions at the PDP, a demonstration of the lack of available space for onsite Hydrologic Control BMPs, an explanation of prohibitive costs to implement Hydrologic Control BMPs, and a written opinion from a Registered Geotechnical Engineer identifying the infeasibility due to geotechnical concerns.

Select one of the following:

☐ **XX** Yes – Onsite Hydrologic Control BMPs are feasible. *(Proceed to Step E., Step E.4, and Step E.5)*

- Or -

☐ No – Onsite Hydrologic Control BMPs are not feasible per the Simplified Technical Feasibility Study. *(Proceed to Section E.5 for Sediment Supply Performance Standard and Section F for Alternative Compliance)*

D.3 Hydrologic Control BMP Selection

Capture of the DCV and achievement of the Hydrologic Performance Standard may be met by combined and/or separate structural BMPs. Similarly, compliance with the two identified requirements may be fully or partially achieved onsite.

For each DMA, identify in Table E.1 if the DCV is fully or partially captured onsite, if the Hydrologic Performance Standard is fully or partially met onsite (by using the SMRHM identified in Step E.4), and if structural BMPs for compliance with the LID requirement and the Hydrologic Performance Standard are combined.

Table E.1 LID & Hydromodification BMP Location

DMA	LID BMP	Hydrologic Control BMP	Combined BMP	BMP type and ID
1	☒ Onsite ☐ Partially Onsite ☐ Offsite ☐ None Required	☒ Onsite ☐ Partially Onsite ☐ Offsite ☐ None Required	☒ Yes ☐ No	BMP-1, Bio-filtration w/ Partial Infiltration
2	Onsite, BMP-2	Onsite, BMP-2	Yes	BMP-2, Bio-filtration w/ Partial Infiltration
3A	Onsite, BMP-3A	Onsite, HMP-3	No	HMP-3, Storm Drain Pipe Storage Tank
3B	Onsite, BMP-3B	Onsite, HMP-3	No	HMP-3, Storm Drain Pipe Storage Tank
3C	Onsite, BMP-3C	Onsite, HMP-3	No	HMP-3, Storm Drain Pipe Storage Tank
3D	Onsite, BMP-3D	Onsite, HMP-3	No	HMP-3, Storm Drain Pipe Storage Tank
4A	Onsite, BMP-4A	Onsite, HMP-4	No	HMP-4, Storm Drain Pipe Storage Tank
4B	Onsite, BMP-4B	Onsite, HMP-4	No	HMP-4, Storm Drain Pipe Storage Tank
4C	Onsite, BMP-4C	Onsite, HMP-4	No	HMP-4, Storm Drain Pipe Storage Tank
4D	Onsite, BMP-4D	Onsite, HMP-4	No	HMP-4, Storm Drain Pipe Storage Tank
4E	Onsite, BMP-4E	Onsite, HMP-4	No	HMP-4, Storm Drain Pipe Storage Tank
5A	Onsite, BMP-5A	Onsite, HMP-5&7	No	HMP-5 & 7, Storm Drain Storage Tanks
5B	Onsite, BMP-5B	Onsite, HMP-5&7	No	HMP-5 & 7, Storm Drain Storage Tanks
5C	Onsite, BMP-5C	Onsite, HMP-5&7	No	HMP-5 & 7, Storm Drain Storage Tanks
5D	Onsite, BMP-5A	Onsite, HMP-5&7	No	HMP-5 & 7, Storm Drain Storage Tanks
6	Onsite, BMP-6	Onsite, BMP-6	Yes	BMP-6, Bio-filtration w/ Partial Infiltration
7	Onsite, BMP-7	Onsite, HMP-5 & 7	No	HMP-5 & 7, Storm Drain Storage Tanks
8	Onsite, BMP-8	Onsite, HMP-8 &10	No	HMP-8 & 10, Storm Drain Storage Tanks
9	Onsite, BMP-9	Onsite, BMP-9	Yes	BMP-9, Bio-filtration w/ Partial Infiltration
10A	Onsite, BMP-10A	Onsite, HMP-8 &10	No	HMP-8 & 10, Storm Drain Storage Tanks
10B	Onsite, BMP-10B	Onsite, HMP-8 &10	No	HMP-8 & 10, Storm Drain Storage Tanks
11	Onsite, BMP-11	Onsite, BMP-11	Yes	BMP-11, Bio-filtration w/ Partial Infiltration
12A	Onsite, BMP-12A	Onsite, BMP-12A	Yes	BMP-12A, Bio-filtration w/ Partial Infiltration
12B	Onsite, BMP-12B	Onsite, BMP-12B	Yes	BMP-12B, Bio-filtration w/ Partial Infiltration
13	Onsite, BMP-13	Onsite, BMP-13	Yes	BMP-13, Bio-filtration w/ Partial Infiltration

For each DMA provide a narrative describing if the DCV and the Hydrologic Performance Standard are to be fully managed onsite. If not, the narrative should detail how and where offsite structural BMPs will achieve management of the DCV and the Hydrologic Performance Standard.

DMA-1 – the DCV and the Hydrologic performance standard are fully met onsite. BMP-1's provided Ratio of static bio-filtered Volume to the DCV volume not reliably retained is larger than 75%. BMP-1, Bio-filtration w/ partial infiltration basin serves dual purpose to meet the Hydrologic Performance Standard.

DMA-2 – the DCV and the Hydrologic performance standard are fully met onsite. BMP-2's provided Ratio of static bio-filtered Volume to the DCV volume not reliably retained is larger than 75%. BMP-2, Bio-filtration w/ partial infiltration basin serves dual purpose to meet the Hydrologic Performance Standard.

DMA-3A – the DCV and the Hydrologic performance standard are fully met onsite. BMP-3A's provided Ratio of static bio-filtered Volume to the DCV volume not reliably retained is larger than 75%. HMP-3, Hydromodification pipe storage tank, serves to meet the Hydrologic Performance Standard.

DMA-3B – the DCV and the Hydrologic performance standard are fully met onsite. BMP-3B's provided Ratio of static bio-filtered Volume to the DCV volume not reliably retained is larger than 75%. HMP-3, Hydromodification pipe storage tank, serves to meet the Hydrologic Performance Standard.

DMA-3C – the DCV and the Hydrologic performance standard are fully met onsite. BMP-3C's provided Ratio of static bio-filtered Volume to the DCV volume not reliably retained is larger than 75%. HMP-3, Hydromodification pipe storage tank, serves to meet the Hydrologic Performance Standard.

DMA-3D – the DCV and the Hydrologic performance standard are fully met onsite. BMP-3D's provided Ratio of static bio-filtered Volume to the DCV volume not reliably retained is larger than 75%. HMP-3, Hydromodification pipe storage tank, serves to meet the Hydrologic Performance Standard.

DMA-3E – the DCV and the Hydrologic performance standard are fully met onsite. BMP-3E's provided Ratio of static bio-filtered Volume to the DCV volume not reliably retained is larger than 75%. HMP-3, Hydromodification pipe storage tank, serves to meet the Hydrologic Performance Standard.

DMA-4A – the DCV and the Hydrologic performance standard are fully met onsite. BMP-4A's provided Ratio of static bio-filtered Volume to the DCV volume not reliably retained is larger than 75%. HMP-4, Hydromodification pipe storage tank, serves to meet the Hydrologic Performance Standard.

DMA-4B – the DCV and the Hydrologic performance standard are fully met onsite. BMP-4B's provided Ratio of static bio-filtered Volume to the DCV volume not reliably retained is larger than 75%. HMP-4, Hydromodification pipe storage tank, serves to meet the Hydrologic Performance Standard.

DMA-4C – the DCV and the Hydrologic performance standard are fully met onsite. BMP-4C's provided Ratio of static bio-filtered Volume to the DCV volume not reliably retained is larger than 75%. HMP-4, Hydromodification pipe storage tank, serves to meet the Hydrologic Performance Standard.

DMA-4D – the DCV and the Hydrologic performance standard are fully met onsite. BMP-4D's provided Ratio of static bio-filtered Volume to the DCV volume not reliably retained is larger than 75%. HMP-4, Hydromodification pipe storage tank, serves to meet the Hydrologic Performance Standard.

DMA-4E – the DCV and the Hydrologic performance standard are fully met onsite. BMP-4E's provided Ratio of static bio-filtered Volume to the DCV volume not reliably retained is larger than 75%. HMP-4, Hydromodification pipe storage tank, serves to meet the Hydrologic Performance Standard.

DMA-5A – the DCV and the Hydrologic performance standard are fully met onsite. BMP-5A's provided Ratio of static bio-filtered Volume to the DCV volume not reliably retained is larger than 75%. HMP-5&7, Hydromodification pipe storage tanks, serve to meet the Hydrologic Performance Standard.

DMA-5B – the DCV and the Hydrologic performance standard are fully met onsite. BMP-5B's provided Ratio of static bio-filtered Volume to the DCV volume not reliably retained is larger than 75%. HMP-5&7, Hydromodification pipe storage tanks, serve to meet the Hydrologic Performance Standard.

DMA-5C – the DCV and the Hydrologic performance standard are fully met onsite. BMP-5A's (Biofiltration Unit) provides double the required equivalent DCV Treatment flowrate as determined by the 2018 WQMP section 2.2. HMP-5&7, Hydromodification pipe storage tanks, serve to meet the Hydrologic Performance Standard.

DMA-5D – the DCV and the Hydrologic performance standard are fully met onsite. BMP-5A's provided Ratio of static bio-filtered Volume to the DCV volume not reliably retained is larger than 75%. HMP-5&7, Hydromodification pipe storage tanks, serve to meet the Hydrologic Performance Standard.

DMA-6 – the DCV and the Hydrologic performance standard are fully met onsite. BMP-6's provided Ratio of static bio-filtered Volume to the DCV volume not reliably retained is larger than 75%. BMP-6, Bio-filtration w/ partial infiltration basin serves dual purpose to meet the Hydrologic Performance Standard.

DMA-7 – the DCV and the Hydrologic performance standard are fully met onsite. BMP-7's (Biofiltration Unit) provides double the required equivalent DCV Treatment flowrate as determined by the 2018 WQMP section 2.2. HMP-5&7, Hydromodification pipe storage tanks, serve to meet the Hydrologic Perf Std.

DMA-8 – the DCV and the Hydrologic performance standard are fully met onsite. BMP-8's provided Ratio of static bio-filtered Volume to the DCV volume not reliably retained is larger than 75%. HMP-8&10, Hydromodification pipe storage tanks, serve to meet the Hydrologic Performance Standard.

DMA-9 – the DCV and the Hydrologic performance standard are fully met onsite. BMP-9's provided Ratio of static bio-filtered Volume to the DCV volume not reliably retained is larger than 75%. BMP-9, Bio-filtration w/ partial infiltration basin serves dual purpose to meet the Hydrologic Performance Standard.

DMA-10A – the DCV and the Hydrologic performance standard are fully met onsite. BMP-10A's provided Ratio of static bio-filtered Volume to the DCV volume not reliably retained is larger than 75%. HMP-8&10, Hydromodification pipe storage tanks, serve to meet the Hydrologic Performance Standard.

DMA-10B – the DCV and the Hydrologic performance standard are fully met onsite. BMP-10B's provided Ratio of static bio-filtered Volume to the DCV volume not reliably retained is larger than 75%. HMP-8&10, Hydromodification pipe storage tanks, serve to meet the Hydrologic Performance Standard.

DMA-11 – the DCV and the Hydrologic performance standard are fully met onsite. BMP-11's provided Ratio of static bio-filtered Volume to the DCV volume not reliably retained is larger than 75%. BMP-11, Bio-filtration w/ partial infiltration basin serves dual purpose to meet the Hydro Performance Std.

DMA-12A – the DCV and the Hydrologic performance standard are fully met onsite. BMP-12's provided Ratio of static bio-filtered Volume to the DCV volume not reliably retained is larger than 75%. BMP-12, Bio-filtration w/ partial infiltration basin serves dual purpose to meet the Hydro Performance Standard.

DMA-12B – the DCV and the Hydrologic performance standard are fully met onsite. BMP-12's provided Ratio of static bio-filtered Volume to the DCV volume not reliably retained is larger than 75%. BMP-12, Bio-filtration w/ partial infiltration basin serves dual purpose to meet the Hydro Performance Standard.

DMA-13 – the DCV and the Hydrologic performance standard are fully met onsite. BMP-13's provided Ratio of static bio-filtered Volume to the DCV volume not reliably retained is larger than 75%. BMP-13, Bio-filtration w /partial infiltration basin serves dual purpose to meet the Hydrologic Performance Std.

D.4 Hydrologic Control BMP Sizing

Each Hydrologic Control BMP must be designed to ensure that the flow duration curve of the post-development DMA will not exceed that of the pre-existing, naturally occurring, DMA by more than ten percent over a one-year period. Using SMRHM, the applicant shall demonstrate that the performance of each designed Hydrologic Control BMP complies with the Hydrologic Performance Standard. Complete Table E.2 below and identify, for each DMA, the type of Hydrologic Control BMP, if the SMRHM model confirmed the management (Identified as "passed" in SMRHM), the total volume capacity of the Hydrologic Control BMP, the Hydrologic Control BMP footprint at top floor elevation, and the drawdown time of the Hydrologic Control BMP. SMRHM summary reports should be documented in Appendix 7. Refer to the SMRHM Guidance Document for additional information on SMRHM. You can add rows to the table as needed.

Table E.2 Hydrologic Control BMP Sizing

BMP Name / ID	DMA No.	BMP Type / Description	SMRHM Passed	BMP Vol (ac-ft)	BMP Footprint (ac)	Drawdown time (hr)
1	1	Biofilt. w/partial infilt.	☒	0.238	0.046	< 72hrs
2	2	Biofilt. w/partial infilt.	☒	0.120	0.018	< 72hrs
TANK-3	3A	HMP storage pipe tank	☒	0.059	0.028	< 72hrs
TANK-3	3B	HMP storage pipe tank	☒	0.059	0.028	< 72hrs
TANK-3	3C	HMP storage pipe tank	☒	0.059	0.028	< 72hrs
TANK-3	3D	HMP storage pipe tank	☒	0.059	0.028	< 72hrs
TANK-3	3E	HMP storage pipe tank	☒	0.059	0.028	< 72hrs
TANK-4	4A	HMP storage pipe tank	☒	0.063	0.029	< 72hrs
TANK-4	4B	HMP storage pipe tank	☒	0.063	0.029	< 72hrs
TANK-4	4C	HMP storage pipe tank	☒	0.063	0.029	< 72hrs
TANK-4	4D	HMP storage pipe tank	☒	0.063	0.029	< 72hrs
TANK-4	4E	HMP storage pipe tank	☒	0.063	0.029	< 72hrs
TANK-5&7	5A	HMP storage pipe tank	☒	0.463	0.220	< 72hrs
TANK-5&7	5B	HMP storage pipe tank	☒	0.463	0.220	< 72hrs
TANK-5&7	5C	HMP storage pipe tank	☒	0.463	0.220	< 72hrs
TANK-5&7	5D	HMP storage pipe tank	☒	0.463	0.220	< 72hrs
6	6	Biofilt. w/partial infilt.	☒	0.048	0.025	< 72hrs
TANK-5&7	7	HMP storage pipe tank	☒	0.463	0.220	< 72hrs
TANK-8&10	8	HMP storage pipe tank	☒	0.469	0.200	< 72hrs
9	9	Biofilt. w/partial infilt.	☒	0.286	0.096	< 72hrs
TANK-8&10	10A	HMP storage pipe tank	☒	0.469	0.200	< 72hrs
TANK-8&10	10B	HMP storage pipe tank	☒	0.469	0.200	< 72hrs
11	11	Biofilt. w/partial infilt.	☒	0.260	0.028	< 72hrs
12A	12A	Biofilt. w/partial infilt.	☒	0.206	0.021	< 72hrs
12B	12B	Biofilt. w/partial infilt.	☒	0.112	0.041	< 72hrs
13	13	Biofilt. w/partial infilt.	☒	0.012	0.005	< 72hrs

D.5 Implement Sediment Supply BMPs

The applicant may refer to Section 2.3 of the SMR HMP for a comprehensive description of the methodology to meet the Sediment Supply Performance Standard. Complete the following steps to determine compliance with the Sediment Supply Performance Standard:

Step 1: Identify if the site is a Significant Source of Bed Sediment Supply to the receiving channel

☐ Step 1.A – Is the Bed Sediment of onsite streams similar to that of receiving streams?

Rate the similarity:
☐ High
☒ Medium
☐ Low

Results from the geotechnical and sieve analysis to be performed both onsite and in the receiving channel should be documented in Appendix 7. Of particular interest, the results of the sieve analysis, the soil erodibility factor, a description of the topographic relief of the project area, and the lithology of onsite soils should be reported in Appendix 7.

☐ Step 1.B – Are onsite streams capable of delivering Bed Sediment Supply from the site, if any, to the receiving channel?

Rate the potential:
☐ High
☐ Medium
☒ Low

Results from the analyses of the sediment delivery potential to the receiving channel should be documented in Appendix 7 and identify, at a minimum, the Sediment Source, the distance to the receiving channel, the onsite channel density, the project watershed area, the slope, length, land use, and rainfall intensity.

☐ Step 1.C – Will the receiving channel adversely respond to a change in Bed Sediment Load?

Rate the need for bed sediment supply:
☐ High
☐ Medium
☒ Low

Results from the in-stream analysis to be performed both onsite should be documented in Appendix 7. The analysis should, at a minimum, quantify the bank stability and the degree of incision, provide a gradation of the Bed Sediment within the receiving channel, and identify if the channel is sediment supply-limited.

☐ Step 1.D – Summary of Step 1

Summarize in Table E.3 the findings of Step 1 and associate a score (in parenthesis) to each step. The sum of the three individual scores determines if a stream is a significant contributor to the receiving stream.

- Sum is equal to or greater than eight - Site is a significant source of sediment bed material – all on-site streams must be preserved or by-passed within the site plan. The applicant shall proceed to Step 2 for all onsite streams.
- Sum is greater than five but lower than eight. Site is a source of sediment bed material – some of the on-site streams must be preserved (with identified streams noted). The applicant shall proceed to Step 2 for the identified streams only.
- Sum is equal to or lower than five. Site is not a significant source of sediment bed material. The applicant may advance to Section F.

Table E.3 Triad Assessment Summary

Step	**Rating**			**Total Score**
1.A	☐ High (3)	☒ Medium (2)	☐ Low (1)	2
1.B	☐ High (3)	☐ Medium (2)	☒ Low (1)	1
1.C	☐ High (3)	☐ Medium (2)	☒ Low (1)	1
Significant Source Rating of Bed Sediment to the receiving channel(s)				4

Step 2: Preservation of Identified Onsite Channels

Onsite streams identified as a Significant Source of Bed Sediment should be avoided in the site design.

Check one of the following:

☒ The site design does avoid all onsite channels identified as a Significant Source of Bed Sediment *(The applicant may disregard subsequent steps of Section E.5 and directly advance directly to Section F.*)

- *Or* -

☐ The site design **does NOT avoid** all onsite channels identified as a Significant Source of Bed Sediment *(The applicant may proceed with the subsequent steps of Section E.5).*

Provide in Appendix 7 a site map that identifies all onsite channels and highlights those onsite channels that were identified as a Significant Source of Bed Sediment. The site map shall demonstrate, if feasible, that the site design avoids those onsite channels identified as a Significant Source of Bed Sediment. In addition, the applicant shall describe the characteristics of each onsite channel identified as a Significant Source of Bed Sediment. If the design plan cannot avoid the onsite channels, please provide a rationale for each channel individually.

Identified Channel #1 - Insert narrative description here

Identified Channel #2 - Insert narrative description here

Identified Channel #3 - Insert narrative description here

Step 3: By-Pass of Upstream Drainage(s) to Preserve the discharge of Bed Sediment Supply to the receiving channel(s)

Onsite channels identified as a Significant Source of Bed Sediment Supply should be by-passed the discharge of Bed Sediment Supply to the receiving channel(s).

Check one of the following:

☒ The site design does avoid and/or bypass all onsite channels identified as a source of Bed Sediment Supply *(The applicant may directly advance to Section F.*)

- Or -

☐ The site design **does NOT avoid or by-pass** all onsite channels identified as a source of Bed Sediment Supply *(The applicant may proceed to an Alternative Approach, as defined in Section F).*

Provide in Appendix 7 a site map that identifies all onsite channels and highlights those onsite channels that were identified as a Significant Source of Bed Sediment Supply. The site map shall demonstrate, if feasible, that the site design avoids or by-passes those onsite channels of significant Bed Sediment Supply to the receiving channel(s). In addition, the applicant shall describe the characteristics of each onsite channel identified as a Significant Source of Bed Sediment Supply. If the design plan cannot avoid or by-pass the onsite channels, please provide a rationale for each channel individually.

Identified Channel #1 - Insert narrative description here

Identified Channel #2 - Insert narrative description here

Identified Channel #3 - Insert narrative description here

Section E: Alternative Compliance

LID BMPs and Hydrologic Control BMPs are expected to be feasible on virtually all projects. Where LID BMPs and/or Hydrologic Control BMPs have been demonstrated to be infeasible as documented in Section D and/or Section E, respectively, other Treatment Control BMPs or alternative compliance approaches must be used (subject LID waiver and/or HMP alternative compliance approval by the Copermittee).

In addition, if supporting documentation demonstrates the infeasibility to implement Sediment Supply BMPs onsite (See Section E.5), the applicant may refer to Section F.5.

Check one of the following boxes:

☒ LID Principles, LID BMPs, Hydrologic Control BMPs, and Sediment Supply BMPs have been incorporated into the site design to fully address all Drainage Management Areas. No alternative compliance measures are required for this project and thus this Section is not required to be completed.

- *Or* -

☐ LID Principles and LID BMPs have NOT been incorporated into the site design to fully address the LID requirements for all Drainage Management Areas AND HMP Performance Standards are not fully addressed in the following Drainage Management Areas.

- The following Drainage Management Areas are unable to be addressed using LID BMPs. A site specific analysis demonstrating technical infeasibility of LID BMPs has been approved by the Copermittee and included in Appendix 5. The following alternative compliance measures on the following pages are being implemented to ensure that any pollutant loads expected to be discharged by not incorporating LID BMPs, are fully mitigated. The applicant should complete Section F.1, Section F.2, and Section F.3, as applicable.
- A site specific analysis demonstrating technical infeasibility of Hydrologic Control BMPs and Sediment Supply BMPs has been approved by the Copermittee and included in Appendix 7. Projects less than one acre have completed the Simplified Technical Feasibility Study. The applicant should complete Section F.5 and/or Section F.6, as applicable.

List DMAs Here.

- *Or* -

☐ LID Principles and LID BMPs have been incorporated into the site design to fully address the DCV for all Drainage Management Areas. However, HMP Performance Standards are not fully addressed in the following Drainage Management Areas. A site specific analysis demonstrating technical infeasibility of Hydrologic Control BMPs and Sediment Supply BMPs has been approved by the Copermittee and included in Appendix 7. Projects less than one acre have

completed the Simplified Technical Feasibility. The applicant should complete Section F.5 and/or Section F.6, as applicable.

List DMAs Here.

E.1 Identify Pollutants of Concern

Utilizing Table A.1 from Section A above which noted your project's Receiving Waters and their associated USEPA approved 303(d) listed impairments, cross reference this information with that of your selected Priority Development Project Category in Table F.1 below. If the identified General Pollutant Categories are the same as those listed for your Receiving Waters, then these will be your Pollutants of Concern and the appropriate box or boxes will be checked on the last row. The purpose of this is to document compliance and to help you appropriately plan for mitigating your Pollutants of Concern in lieu of implementing LID BMPs.

Table E.1 Potential Pollutants by Land Use Type

Priority Development Project Categories and/or Project Features (check those that apply)	General Pollutant Categories							
	Bacterial Indicators	Metals	Nutrients	Pesticides	Toxic Organic Compounds	Sediments	Trash & Debris	Oil & Grease
☐ Detached Residential Development	P	N	P	P	N	P	P	P
☐ Attached Residential Development	P	N	P	P	N	P	P	P(2)
☒ Commercial/Industrial Development	P(3)	P	P(1)	P(1)	P(5)	P(1)	P	P
☐ Automotive Repair Shops	N	P	N	N	P(4, 5)	N	P	P
☐ Restaurants (>5,000 ft^2)	P	N	N	N	N	N	P	P
☐ Hillside Development (>5,000 ft^2)	P	N	P	P	N	P	P	P
☐ Parking Lots (>5,000 ft^2)	P(6)	P	P(1)	P(1)	P(4)	P(1)	P	P
☐ Retail Gasoline Outlets	N	P	N	N	P	N	P	P
Project Priority Pollutant(s) of Concern	☒	☒	☐	☐	☒	☒	☒	☒

P = Potential

N = Not Potential

(1) A potential Pollutant if non-native landscaping exists or is proposed onsite; otherwise not expected

(2) A potential Pollutant if the project includes uncovered parking areas; otherwise not expected

(3) A potential Pollutant is land use involving animal waste

(4) Specifically petroleum hydrocarbons

(5) Specifically solvents

(6) Bacterial indicators are routinely detected in pavement runoff

E.2 Stormwater Credits

Projects that cannot implement LID BMPs but nevertheless implement Smart Growth Principles are potentially eligible for Stormwater Credits. Utilize Table 3-7 within the WQMP Guidance Document to identify your Project Category and its associated Water Quality Credit. If not applicable, write N/A.

Table E.2 Stormwater Credits

Qualifying Project Categories	Credit Percentage[2]
Total Credit Percentage[1]	

[1]Cannot Exceed 50%
[2]Obtain corresponding data from Table 3-7 in the WQMP Guidance Document

E.3 Sizing Criteria

After you appropriately considered Stormwater Credits for your Project, utilize Table F.3 below to appropriately size them to the DCV, or Design Flow Rate, as applicable. Please reference Chapter 3.5.5 of the WQMP Guidance Document for further information.

Table E.3 Treatment Control BMP Sizing

DMA Type/ID	**DMA (square feet)**	**Post-Project Surface Type**	**Effective Impervious Fraction, I_f**	**DMA Runoff Factor**	**DMA x Runoff Factor**		***Enter BMP Name / Identifier Here***		
	[A]		[B]	[C]	[A] x [C]				
						Design Storm Depth (in)	*Minimum DCV or Design Flow Rate (cubic feet or cfs)*	*Total Storm Water Credit % Reduction*	*Proposed Volume or Flow on Plans (cubic feet or cfs)*
	A_T = Σ[A]				Σ= [D]	[E]	$[F] = \frac{[D]x[E]}{[G]}$	[F] X (1-[H])	[I]

[B], [C] is obtained as described in Section 2.5 from the WQMP Guidance Document
[E] is obtained from Exhibit A in the WQMP Guidance Document
[G] is for Flow-Based Treatment Control BMPs [G] = 43,560, for Volume-Based Control Treatment BMPs, [G] = 12
[H] is from the Total Stormwater Credit Percentage as Calculated from Table E.2 above
[I] as obtained from a design procedure sheet from the BMP manufacturer and should be included in Appendix 6

E.4 Treatment Control BMP Selection

Treatment Control BMPs typically provide proprietary treatment mechanisms to treat potential Pollutants in runoff, but do not sustain significant biological processes. Treatment Control BMPs must have a removal efficiency of a medium or high effectiveness as quantified below:

- **High**: equal to or greater than 80% removal efficiency
- **Medium**: between 40% and 80% removal efficiency

Such removal efficiency documentation (e.g., studies, reports, etc.) as further discussed in Chapter 3.5.2 of the WQMP Guidance Document, must be included in Appendix 6. In addition, ensure that proposed Treatment Control BMPs are properly identified on the WQMP Site Plan in Appendix 1.

Table E.4 Treatment Control BMP Selection

Selected Treatment Control BMP Name or ID[1]	Priority Pollutant(s) of Concern to Mitigate[2]	Removal Efficiency Percentage[3]
BMP-1	Bacterial, Metals, Organic, Sediment, Trash, oil & grease	>80%
BMP-2	Bacterial, Metals, Organic, Sediment, Trash, oil & grease	>80%
BMP-3a,b,c,d	Bacterial, Metals, Organic, Sediment, Trash, oil & grease	>80%
BMP-4a,b,c,d,e	Bacterial, Metals, Organic, Sediment, Trash, oil & grease	>80%
BMP-5a,b,c,d	Bacterial, Metals, Organic, Sediment, Trash, oil & grease	>80%
BMP-6	Bacterial, Metals, Organic, Sediment, Trash, oil & grease	>80%
BMP-7	Bacterial, Metals, Organic, Sediment, Trash, oil & grease	>80%
BMP-8	Bacterial, Metals, Organic, Sediment, Trash, oil & grease	>80%
BMP-9	Bacterial, Metals, Organic, Sediment, Trash, oil & grease	>80%
BMP-10a,b	Bacterial, Metals, Organic, Sediment, Trash, oil & grease	>80%
BMP-11	Bacterial, Metals, Organic, Sediment, Trash, oil & grease	>80%
BMP-12Ap	Bacterial, Metals, Organic, Sediment, Trash, oil & grease	>80%
BMP-12B	Bacterial, Metals, Organic, Sediment, Trash, oil & grease	>80%
BMP-13	Bacterial, Metals, Organic, Sediment, Trash, oil & grease	>80%

[1] Treatment Control BMPs must not be constructed within Receiving Waters. In addition, a proposed Treatment Control BMP may be listed more than once if they possess more than one qualifying pollutant removal efficiency.
[2] Cross Reference Table E.1 above to populate this column.
[3] As documented in a Copermittee Approved Study and provided in Appendix 6.

E.5 Hydrologic Performance Standard – Alternative Compliance Approach

Alternative compliance options are only available if the governing Copermittee has acknowledged the infeasibility of onsite Hydrologic Control BMPs and approved an alternative compliance approach. Attach to Appendix 7 the Technical Feasibility Study (Projects equal or greater than one acre) or Simplified Technical Feasibility Study (Projects less than one acre) along with a written approval from the Copermittee. The applicant may refer to Section 2.2.iv of the SMR HMP for extensive guidelines on the alternative compliance approach.

Select the pursued alternative and describe the specifics of the alternative:

☐ Offsite Hydrologic Control Management within the same channel system

Insert narrative description here

☐ In-Stream Restoration Project

Insert narrative description here

For Offsite Hydrologic Control BMP Option

Each Hydrologic Control BMP must be designed to ensure that the flow duration curve of the post-development DMA will not exceed that of the pre-existing, naturally occurring, DMA by more than ten percent over a one-year period. Using SMRHM, the applicant shall demonstrate that the performance of each designed Hydrologic Control BMP is equivalent with the Hydrologic Performance Standard for onsite conditions. Complete Table F.4 below and identify, for each Hydrologic Control BMP, the equivalent DMA the Hydrologic Control BMP mitigates, that the SMRHM model passed, the total volume capacity of the BMP, the BMP footprint at top floor elevation, and the drawdown time of the BMP. SMRHM summary reports for the alternative approach should be documented in Appendix 7. Refer to the SMRHM Guidance Document for additional information on SMRHM. You can add rows to the table as needed.

Table F.5 Offsite Hydrologic Control BMP Sizing

BMP Name / Type	Equivalent DMA (ac)	SMRHM Passed	BMP Volume (ac-ft)	BMP Footprint (ac)	Drawdown time (hr)
		☐			
		☐			
		☐			
		☐			

For Instream Restoration Option

Attach to Appendix 7 the technical report detailing the condition of the receiving channel subject to the proposed hydrologic and sediment regimes. Provide the full design plans for the in-stream restoration project that have been approved by the Copermittee.

E.6 Sediment Supply Performance Standard - Alternative Compliance

The alternative compliance option to the Sediment Supply Performance Standard is only available if the governing Copermittee has approved the investigation of alternative Bed Sediment Supply options. Attach to Appendix 7 the Technical Feasibility Study, along with the modeling analysis, the long-term monitoring program, and the potential corrective actions, that demonstrate the performance of the overall alternative compliance program. The applicant may refer to Section 2.3.ii of the SMR HMP for extensive guidelines on the alternative compliance approach.

Provide a narrative describing the alternative Bed Sediment Supply approach, including the long-term monitoring program and the findings of the numerical modeling.

Insert narrative description here

Section F: Source Control BMPs

Source Control BMPs include permanent, structural features that may be required in your Project plans — such as roofs over and berms around trash and recycling areas — and Operational BMPs, such as regular sweeping and "housekeeping", that must be implemented by the site's occupant or user. The Maximum Extent Practicable (MEP) standard typically requires both types of BMPs. In general, Operational BMPs cannot be substituted for a feasible and effective structural BMP. Using the Pollutant Sources/Source Control Checklist in Appendix 8, review the following procedure to specify Source Control BMPs for your site:

1. ***Identify Pollutant Sources*:** Review Column 1 in the Pollutant Sources/Source Control Checklist. Check off the potential sources of Pollutants that apply to your site.

2. ***Note Locations on Project-Specific WQMP Exhibit*:** Note the corresponding requirements listed in Column 2 of the Pollutant Sources/Source Control Checklist. Show the location of each Pollutant source and each permanent Source Control BMP in your Project-Specific WQMP Exhibit located in Appendix 1.

3. ***Prepare a Table and Narrative*:** Check off the corresponding requirements listed in Column 3 in the Pollutant Sources/Source Control Checklist. In the left column of Table G.1 below, list each potential source of Pollutants on your site (from those that you checked in the Pollutant Sources/Source Control Checklist). In the middle column, list the corresponding permanent, Structural Source Control BMPs (from Columns 2 and 3 of the Pollutant Sources/Source Control Checklist) used to prevent Pollutants from entering runoff. **Add additional narrative** in this column that explains any special features, materials or methods of construction that will be used to implement these permanent, Structural Source Control BMPs.

4. ***Identify Operational Source Control BMPs:*** To complete your table, refer once again to the Pollutant Sources/Source Control Checklist. List in the right column of your table the Operational BMPs that should be implemented as long as the anticipated activities continue at the site. Copermittee stormwater ordinances require that applicable Source Control BMPs be implemented; the same BMPs may also be required as a condition of a use permit or other revocable Discretionary Approval for use of the site.

Table F.1 Structural and Operational Source Control BMP

Potential Sources of Runoff Pollutants	Structural Source Control BMPs	Operational Source Control BMPs
On-site drain inlets	Signage of all inlets with language such as "No Dumping/only rain down the drain"	Maintain and periodically repaint or replace inlet marking Provide stormwater pollution prevention information to new site owners, lessees and operators

		Provide storm drain inlet protedction per se-10 of the bmp handbook Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create potential discharge to storm drains
Interior floor drains	Interior floor drains will be plumbed to sewer	Inspect and maintain drains to prevent blockage
Landscape/outdoor persticide use	• Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides the can contribute to stormwater pollution. • Where landscape areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. Preserve existing native trees, vegetation, ground cover to the maximum extent possible	Maintain landscaping using minimum or no pesticides. • Provide Imp information to new owners, lessees, and operators.
Food service	Owner shall provide information on the items to be cleaned.	Provide "The Food Service Industry Best Management Practices for: Restaurants, Grocery Stores, Delicatessens and Bakeries" brochure to new site owners, lessees, and operators.
Refuse areas	Signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar · Trash areas are protected from rainfall,	· All trash storage areas shall be inspected daily to insure that they are clean from trash. Also the following shall be inspected annually 30 days prior to October lst of each year: · Pavement is in good repair.

	run-on, runoff, and wind dispersal by roofed, walled enclosure located away from storm drains.	· Drainage will not run-off onto adjacent areas. · That they remain screened or walled to prevent off-site transport of trash. · That all lids are closed and/or awnings are in good repair to minimize direct precipitation
Fuel dispensing areas		The property owner shall dry sweep to fueling area routinely · See the Fact Sheet SD-30, "Fueling Areas" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
Roofing, gutter, and trim	Avoid roofing, gutters, and trim made of coper or other unprotected metals that may leach into runoff	
Plazas, sidewalks, and parking lots		Sweep plazas, sidewalks, and parking lots regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect washwater containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain

Section G: Construction Plan Checklist

Populate Table H.1 below to assist the plan checker in an expeditious review of your project. The first two columns will contain information that was prepared in previous steps, while the last column will be populated with the corresponding plan sheets. This table is to be completed with the submittal of your final Project-Specific WQMP.

Table G.1 Construction Plan Cross-reference

BMP No. or ID	BMP Identifier and Description	Corresponding Plan Sheet(s)
BMP-1	Biofiltration w/partial infiltration; 36" Soil Depth, 12" Gravel Depth	
BMP-2	Biofiltration w/partial infiltration; 36" Soil Depth, 12" Gravel Depth	
BMP-3a	Biofiltration w/partial infiltration; 36" Soil Depth, 18" Gravel Depth	
BMP-3b	Biofiltration w/partial infiltration; 36" Soil Depth, 18" Gravel Depth	
BMP-3c	Biofiltration w/partial infiltration; 36" Soil Depth, 18" Gravel Depth	
BMP-3d	Biofiltration w/partial infiltration; 36" Soil Depth, 18" Gravel Depth	
BMP-3e	Biofiltration w/partial infiltration; 36" Soil Depth, 18" Gravel Depth	
BMP-4a	Biofiltration w/partial infiltration; 36" Soil Depth, 18" Gravel Depth	
BMP-4b	Biofiltration w/partial infiltration; 36" Soil Depth, 18" Gravel Depth	
BMP-4c	Biofiltration w/partial infiltration; 36" Soil Depth, 18" Gravel Depth	
BMP-4d	Biofiltration w/partial infiltration; 36" Soil Depth, 18" Gravel Depth	
BMP-4e	Biofiltration w/partial infiltration; 36" Soil Depth, 18" Gravel Depth	
BMP-5a	Biofiltration w/partial infiltration; 36" Soil Depth, 18" Gravel Depth	
BMP-5b	Biofiltration w/partial infiltration; 36" Soil Depth, 18" Gravel Depth	
BMP-5c	Biofiltration unit – Modular Wetland System	
BMP-5d	Biofiltration w/partial infiltration; 36" Soil Depth, 18" Gravel Depth	
BMP-6	Biofiltration w/partial infiltration; 36" Soil Depth, 24" Gravel Depth	
BMP-7	Biofiltration unit – Modular Wetland System	
BMP-8	Biofiltration w/partial infiltration; 36" Soil Depth, 18" Gravel Depth	
BMP-9	Biofiltration w/partial infiltration; 36" Soil Depth, 12" Gravel Depth	
BMP-10a	Biofiltration w/partial infiltration; 36" Soil Depth, 18" Gravel Depth	
BMP-10b	Biofiltration w/partial infiltration; 36" Soil Depth, 18" Gravel Depth	
BMP-11	Biofiltration w/partial infiltration; 36" Soil Depth, 18" Gravel Depth	
BMP-12A	Biofiltration w/partial infiltration; 36" Soil Depth, 24" Gravel Depth	
BMP-12B	Biofiltration w/partial infiltration; 36" Soil Depth, 18" Gravel Depth	
BMP-13	Biofiltration w/partial infiltration; 36" Soil Depth, 18" Gravel Depth	

Note that the updated table — or Construction Plan WQMP Checklist — is **only a reference tool** to facilitate an easy comparison of the construction plans to your Project-Specific WQMP. The Copermittee with jurisdiction over the Project site can advise you regarding the process required to propose changes to the approved Project-Specific WQMP.

Operation, Maintenance and Funding

The Copermittee with jurisdiction over the Project site will periodically verify that BMPs on your Project are maintained and continue to operate as designed. To make this possible, the Copermittee will require that you include in Appendix 9 of this Project-Specific WQMP:

1. A means to finance and implement maintenance of BMPs in perpetuity, including replacement cost.
2. Acceptance of responsibility for maintenance from the time the BMPs are constructed until responsibility for operation and maintenance is legally transferred. A warranty covering a period following construction may also be required.
3. An outline of general maintenance requirements for the Stormwater BMPs you have selected.
4. Figures delineating and designating pervious and impervious areas, location, and type of Stormwater BMP, and tables of pervious and impervious areas served by each facility. Geo-locating the BMPs using a coordinate system of latitude and longitude is recommended to help facilitate a future statewide database system.
5. A separate list and location of self-retaining areas or areas addressed by LID Principles that do not require specialized Operations and Maintenance or inspections but will require typical landscape maintenance as noted in Chapter 5, in the WQMP Guidance. Include a brief description of typical landscape maintenance for these areas.

The Copermittee with jurisdiction over the Project site will also require that you prepare and submit a detailed BMP Operation and Maintenance Plan that sets forth a maintenance schedule for each of the BMPs built on your site. An agreement assigning responsibility for maintenance and providing for inspections and certification may also be required.

Details of these requirements and instructions for preparing a BMP Operation and Maintenance Plan are in Chapter 5 of the WQMP Guidance Document.

Maintenance Mechanism: A maintenance agreement

Will the proposed BMPs be maintained by a Homeowners' Association (HOA) or Property Owners Association (POA)?

☐ Y ☒ N

Include your Operation and Maintenance Plan and Maintenance Mechanism in Appendix 9. Additionally, include all pertinent forms of educational materials for those personnel that will be maintaining the proposed BMPs within this Project-Specific WQMP in Appendix 10.

Acronyms, Abbreviations and Definitions

2010 SMR MS4 Permit	Order No. R9-2010-0016, an NPDES Permit issued by the San Diego Regional Water Quality Control Board.
Applicant	Public or private entity seeking the discretionary approval of new or replaced improvements from the Copermittee with jurisdiction over the project site. The Applicant has overall responsibility for the implementation and the approval of a Priority Development Project. The WQMP uses consistently the term "user" to refer to the applicant such as developer or project proponent. The WQMP employs also the designation "user" to identify the Registered Professional Civil Engineer responsible for submitting the Project-Specific WQMP, and designing the required BMPs.
Best Management Practice (BMP)	Defined in 40 CFR 122.2 as schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the United States. BMPs also include treatment requirements, operating procedures and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. In the case of municipal storm water permits, BMPs are typically used in place of numeric effluent limits.
BMP Fact Sheets	BMP Fact Sheets are available in the LID BMP Design Handbook. Individual BMP Fact Sheets include sitting considerations, and design and sizing guidelines for seven types of structural BMPs (infiltration basin, infiltration trench, permeable pavement, harvest-and-use, bioretention, extended detention basin, and sand filter).
California Stormwater Quality Association (CASQA)	Publisher of the California Stormwater Best Management Practices Handbooks, available at www.cabmphandbooks.com.
Conventional Treatment Control BMP	A type of BMP that provides treatment of stormwater runoff. Conventional treatment control BMPs, while designed to treat particular Pollutants, typically do not provide the same level of volume reduction as LID BMPs, and commonly require more specialized maintenance than LID BMPs. As such, the 2010 SMR MS4 Permit and this WQMP require the use of LID BMPs wherever feasible, before Conventional Treatment BMPs can be considered or implemented.
Copermittees	The 2010 SMR MS4 Permit identifies the Cities of Murrieta, Temecula, and Wildomar, the County, and the District, as Copermittees for the SMR.
County	The abbreviation refers to the County of Riverside in this document.

CEQA	California Environmental Quality Act - a statute that requires state and local agencies to identify the significant environmental impacts of their actions and to avoid or mitigate those impacts, if feasible.
CIMIS	California Irrigation Management Information System - an integrated network of 118 automated active weather stations all over California managed by the California Department of Water Resources.
CWA	Clean Water Act - is the primary federal law governing water pollution. Passed in 1972, the CWA established the goals of eliminating releases of high amounts of toxic substances into water, eliminating additional water pollution by 1985, and ensuring that surface waters would meet standards necessary for human sports and recreation by 1983. CWA Section 402(p) is the federal statute requiring NPDES permits for discharges from MS4s.
CWA Section 303(d) Waterbody	Impaired water in which water quality does not meet applicable water quality standards and/or is not expected to meet water quality standards, even after the application of technology based pollution controls required by the CWA. The discharge of urban runoff to these water bodies by the Copermittees is significant because these discharges can cause or contribute to violations of applicable water quality standards.
Design Storm	The 2010 SMR MS4 Permit has established the 85th percentile, 24-hour storm event as the "Design Storm". The applicant may refer to Exhibit A to identify the applicable Design Storm Depth (D85) to the project.
DCV	Design Capture Volume (DCV) is the volume of runoff produced from the Design Storm to be mitigated through LID Retention BMPs, Other LID BMPs and Volume Based Conventional Treatment BMPs, as appropriate.
Design Flow Rate	The design flow rate represents the minimum flow rate capacity that flow-based conventional treatment control BMPs should treat to the MEP, when considered.
DCIA	Directly Connected Impervious Areas - those impervious areas that are hydraulically connected to the MS4 (i.e. street curbs, catch basins, storm drains, etc.) and thence to the structural BMP without flowing over pervious areas.
Discretionary Approval	A decision in which a Copermittee uses its judgment in deciding whether and how to carry out or approve a project.
District	Riverside County Flood Control and Water Conservation District.
DMA	A Drainage Management Area - a delineated portion of a project site that is hydraulically connected to a common structural BMP or conveyance point. The Applicant may refer to Section 3.3 for further guidelines on how to delineate DMAs.

Drawdown Time	Refers to the amount of time the design volume takes to pass through the BMP. The specified or incorporated drawdown times are to ensure that adequate contact or detention time has occurred for treatment, while not creating vector or other nuisance issues. It is important to abide by the drawdown time requirements stated in the fact sheet for each specific BMP.
Effective Area	Area which 1) is suitable for a BMP (for example, if infiltration is potentially feasible for the site based on infeasibility criteria, infiltration must be allowed over this area) and 2) receives runoff from impervious areas.
ESA	An Environmental Sensitive Area (ESA) designates an area "in which plants or animals life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which would be easily disturbed or degraded by human activities and developments". (Reference: California Public Resources Code § 30107.5).
ET	Evapotranspiration (ET) is the loss of water to the atmosphere by the combined processes of evaporation (from soil and plant surfaces) and transpiration (from plant tissues). It is also an indicator of how much water crops, lawn, garden, and trees need for healthy growth and productivity
FAR	The Floor Area Ratio (FAR) is the total square feet of a building divided by the total square feet of the lot the building is located on.
Flow-Based BMP	Flow-based BMPs are conventional treatment control BMPs that are sized to treat the design flow rate.
FPPP	Facility Pollution Prevention Plan
HCOC	Hydrologic Condition of Concern - Exists when the alteration of a site's hydrologic regime caused by development would cause significant impacts on downstream channels and aquatic habitats, alone or in conjunction with impacts of other projects.
HMP	Hydromodification Management Plan – Plan defining Performance Standards for PDPs to manage increases in runoff discharge rates and durations.
Hydrologic Control BMP	BMP to mitigate the increases in runoff discharge rates and durations and meet the Performance Standards set forth in the HMP.
HSG	Hydrologic Soil Groups – soil classification to indicate the minimum rate of infiltration obtained for bare soil after prolonged wetting. The HSGs are A (very low runoff potential/high infiltration rate), B, C, and D (high runoff potential/very low infiltration rate)

Hydromodification	The 2010 SMR MS4 Permit identifies that increased volume, velocity, frequency and discharge duration of storm water runoff from developed areas has the potential to greatly accelerate downstream erosion, impair stream habitat in natural drainages, and negatively impact beneficial uses.
JRMP	A separate Jurisdictional Runoff Management Plan (JRMP) has been developed by each Copermittee and identifies the local programs and activities that the Copermittee is implementing to meet the 2010 SMR MS4 Permit requirements.
LID	Low Impact Development (LID) is a site design strategy with a goal of maintaining or replicating the pre-development hydrologic regime through the use of design techniques. LID site design BMPs help preserve and restore the natural hydrologic cycle of the site, allowing for filtration and infiltration which can greatly reduce the volume, peak flow rate, velocity, and pollutant loads of storm water runoff.
LID BMP	A type of stormwater BMP that is based upon Low Impact Development concepts. LID BMPs not only provide highly effective treatment of stormwater runoff, but also yield potentially significant reductions in runoff volume – helping to mimic the pre-project hydrologic regime, and also require less ongoing maintenance than Treatment Control BMPs. The applicant may refer to Chapter 2.
LID BMP Design Handbook	The LID BMP Design Handbook was developed by the Copermittees to provide guidance for the planning, design and maintenance of LID BMPs which may be used to mitigate the water quality impacts of PDPs within the County.
LID Bioretention BMP	LID Bioretention BMPs are bioretention areas are vegetated (i.e., landscaped) shallow depressions that provide storage, infiltration, and evapotranspiration, and provide for pollutant removal (e.g., filtration, adsorption, nutrient uptake) by filtering stormwater through the vegetation and soils. In bioretention areas, pore spaces and organic material in the soils help to retain water in the form of soil moisture and to promote the adsorption of pollutants (e.g., dissolved metals and petroleum hydrocarbons) into the soil matrix. Plants use soil moisture and promote the drying of the soil through transpiration. The 2010 SMR MS4 Permit defines "retain" as to keep or hold in a particular place, condition, or position without discharge to surface waters.
LID Biotreatment BMP	BMPs that reduce stormwater pollutant discharges by intercepting rainfall on vegetative canopy, and through incidental infiltration and/or evapotranspiration, and filtration, and other biological and chemical processes. As stormwater passes down through the planting soil, pollutants are filtered, adsorbed, biodegraded, and sequestered by the soil and plants, and collected through an underdrain.

LID Harvest and Reuse BMP	BMPs used to facilitate capturing Stormwater Runoff for later use without negatively impacting downstream water rights or other Beneficial Uses.
LID Infiltration BMP	BMPs to reduce stormwater runoff by capturing and infiltrating the runoff into in-situ soils or amended onsite soils. Typical LID Infiltration BMPs include infiltration basins, infiltration trenches and pervious pavements.
LID Retention BMP	BMPs to ensure full onsite retention without runoff of the DCV such as infiltration basins, bioretention, chambers, trenches, permeable pavement and pavers, harvest and reuse.
LID Principles	Site design concepts that prevent or minimize the causes (or drivers) of post-construction impacts, and help mimic the pre-development hydrologic regime.
MEP	Maximum Extent Practicable - standard established by the 1987 amendments to the CWA for the reduction of Pollutant discharges from MS4s. Refer to Attachment C of the 2010 SMR MS4 Permit for a complete definition of MEP.
MF	Multi-family – zoning classification for parcels having 2 or more living residential units.
MS4	Municipal Separate Storm Sewer System (MS4) is a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains): (i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or designated and approved management agency under section 208 of the CWA that discharges to waters of the United States; (ii) Designated or used for collecting or conveying storm water; (iii) Which is not a combined sewer; (iv) Which is not part of the Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.26.
New Development Project	Defined by the 2010 MS4 permit as 'Priority Development Projects' if the project, or a component of the project meets the categories and thresholds described in Section 1.1.1.
NPDES	National Pollution Discharge Elimination System - Federal program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under Sections 307, 318, 402, and 405 of the CWA.
NRCS	Natural Resources Conservation Service

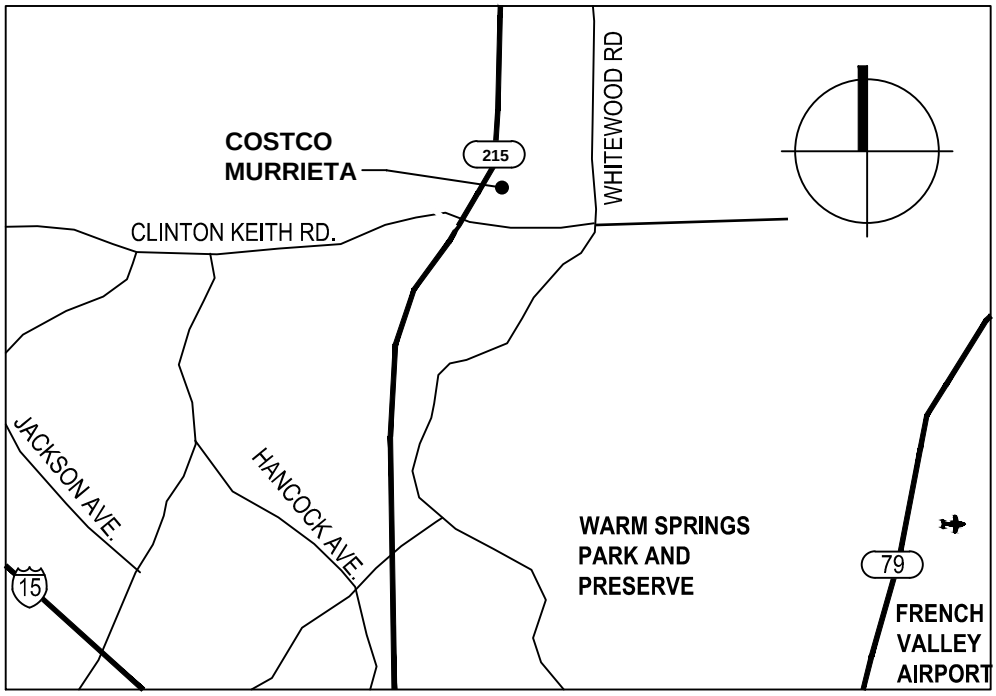
PDP	Priority Development Project - Includes New Development and Redevelopment project categories listed in Section F.1.d(2) of Order No. R9-2009-0002.
Priority Pollutants of Concern	Pollutants expected to be present on the project site and for which a downstream water body is also listed as Impaired under the CWA Section 303(d) list or by a TMDL.
Project-Specific WQMP	A plan specifying and documenting permanent LID Principles and Stormwater BMPs to control post-construction Pollutants and stormwater runoff for the life of the PDP, and the plans for operation and maintenance of those BMPs for the life of the project.
Receiving Waters	Waters of the United States.
Redevelopment Project	The creation, addition, and or replacement of impervious surface on an already developed site. Examples include the expansion of a building footprint, road widening, the addition to or replacement of a structure, and creation or addition of impervious surfaces. Replacement of impervious surfaces includes any activity that is not part of a routine maintenance activity where impervious material(s) are removed, exposing underlying soil during construction. Redevelopment does not include trenching and resurfacing associated with utility work; resurfacing existing roadways; new sidewalk construction, pedestrian ramps, or bike lane on existing roads; and routine replacement of damaged pavement, such as pothole repair. Project that meets the criteria described in Section 1.
Runoff Fund	Runoff Funds have not been established by the Copermittees and are not available to the Applicant. If established, a Runoff Fund will develop regional mitigation projects where PDPs will be able to buy mitigation credits if it is determined that implementing onsite controls is infeasible.
San Diego Regional Board	San Diego Regional Water Quality Control Board - The term "Regional Board", as defined in Water Code section 13050(b), is intended to refer to the California Regional Water Quality Control Board for the San Diego Region as specified in Water Code Section 13200. State agency responsible for managing and regulating water quality in the SMR.
SCCWRP	Southern California Coastal Water Research Project
Site Design BMP	Site design BMPs prevent or minimize the causes (or drivers) of post-construction impacts, and help mimic the pre-development hydrologic regime.
SF	Parcels with a zoning classification for a single residential unit.
SMC	Southern California Stormwater Monitoring Coalition
SMR	The Santa Margarita Region (SMR) represents the portion of the Santa Margarita Watershed that is included within the County of Riverside.

Source Control BMP	Source Control BMPs land use or site planning practices, or structural or nonstructural measures that aim to prevent runoff pollution by reducing the potential for contamination at the source of pollution. Source control BMPs minimize the contact between Pollutants and runoff.
Stormwater Credit	Stormwater Credit can be claimed by an Applicant if certain development practices that provide broad-scale environmental benefits to communities are incorporated into the project design. Refer to Section 3.5.4 for additional information on Stormwater Credits.
Structural BMP	Structures designed to remove pollutants from stormwater runoff and mitigate hydromodification impacts.
SWPPP	Storm Water Pollution Prevention Plan
Tentative Tract Map	Tentative Tract Maps are required for all subdivision creating five (5) or more parcels, five (5) or more condominiums as defined in Section 783 of the California Civil Code, a community apartment project containing five (5) or more parcels, or for the conversion of a dwelling to a stock cooperative containing five (5) or more dwelling units.
TMDL	Total Maximum Daily Load - the maximum amount of a Pollutant that can be discharged into a waterbody from all sources (point and non-point) and still maintain Water Quality Standards. Under CWA Section 303(d), TMDLs must be developed for all waterbodies that do not meet Water Quality Standards after application of technology-based controls.
USEPA	United States Environmental Protection Agency
Volume-Based BMP	Volume-Based BMPs applies to BMPs where the primary mode of pollutant removal depends upon the volumetric capacity such as detention, retention, and infiltration systems.
WQMP	Water Quality Management Plan
Wet Season	The 2010 SMR MS4 Permit defines the wet season from October 1 through April 30.

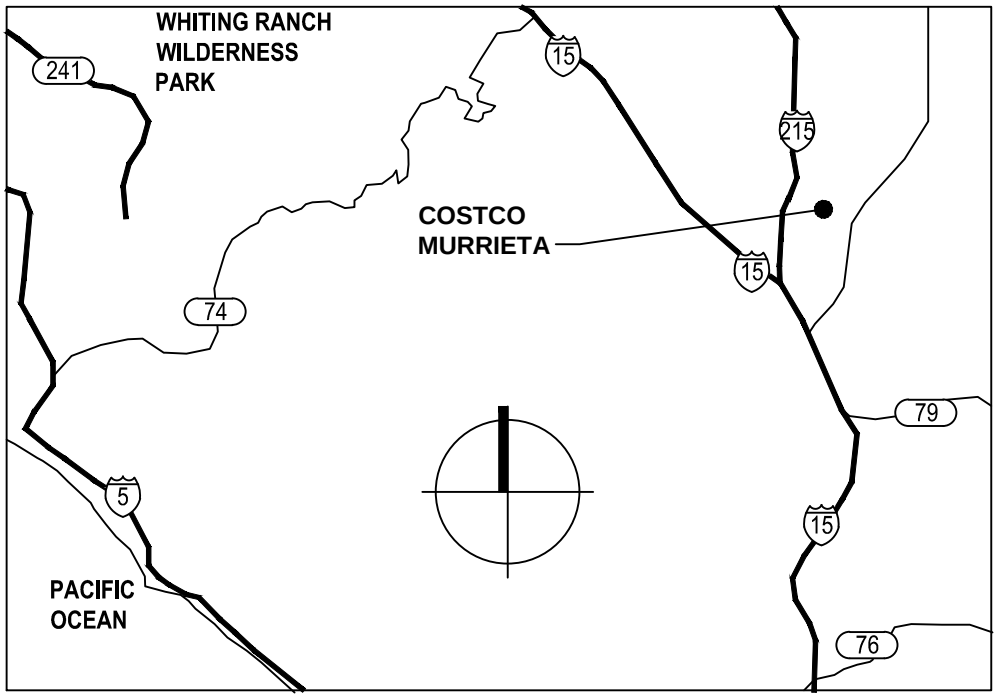
Appendix 1: Maps and Site Plans

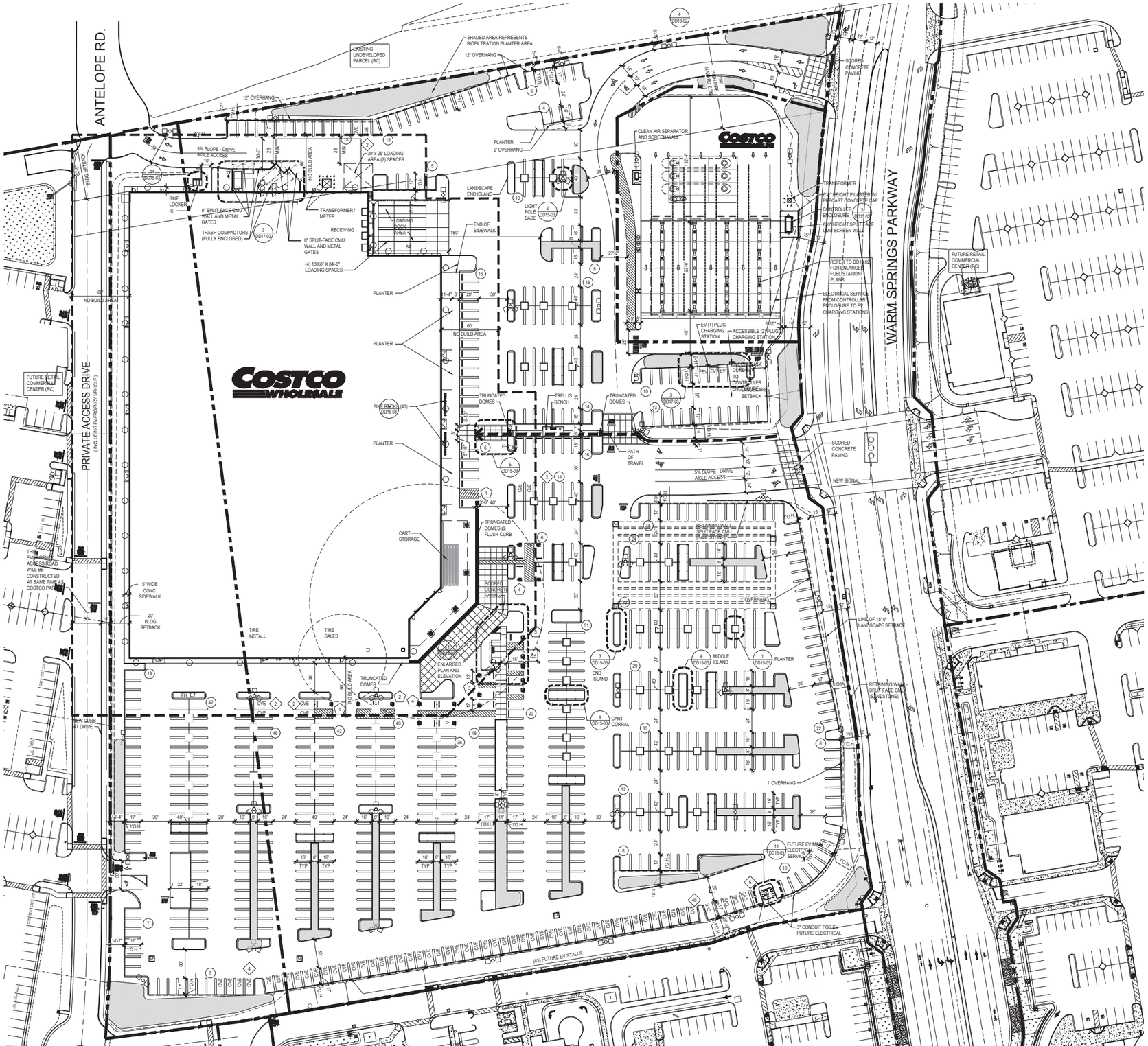
Location Map, WQMP Site Plan and Receiving Waters Map

VICINITY MAP



REGIONAL MAP





COSTCO WHOLESALE

MURRIETA, CA

PRELIMINARY ENLARGED SITE PLAN

AUGUST 21, 2019

PROJECT DATA

APPLICANT:	COSTCO WHOLESALE 999 LAKE DRIVE ISSAQUAH, WA 98027
PROJECT ADDRESS:	NEC OF I-215 & CLINTON KEITH RD. MURRIETA, CA
APN'S:	NOTE, THESE DESCRIBE THE EFFECTS ON THE EXISTING PARCEL MAP 392-290-025-4 (AFFECTS PARCEL 1 OF PARCEL A) 392-290-026-5 (AFFECTS PARCEL 2 OF PARCEL A) 392-290-028-7(AFFECTS PARCEL 3 OF PARCEL A) 392-290-029-8 (AFFECTS PARCEL 4 OF PARCEL A) 392-290-051 (PARCEL B) 392-270-030 392-270-033 (PARCEL C)
LEGAL DESCRIPTION:	THE LAND REFERRED TO IN THIS SURVEY IS IN THE STATE OF CALIFORNIA, COUNTY OF RIVERSIDE, CITY OF MURRIETA, AND IS DESCRIBED AS FOLLOWS: ALL OF PARCELS 1,2,3 AND 4 OF PARCEL MAP NO. 16499, FILED ON BOOK 96, PAGE 17, OR PARCEL RECORDS OF RIVERSIDE COUNTY, TOGETHER WITH THE REVERSIONARY RIGHTS TO LOTS A,B,C AND D ON SAID PARCEL MAP, DEDICATED AND ACCEPTED FOR PUBLIC ROAD PURPOSES. PARCEL B OF THAT CERTAIN LOT LINE ADJUSTMENT, LLA - 17-3851, RECORDED BY THE CITY OF MURRIETA FEBRUARY 22, 2018, AS DOCUMENT NO. 2018-0066471, OF OFFICIAL RECORDS. PARCEL 5, 6, 7, 8 AND 9 OF TPM NO. 36493
ZONING:	REGIONAL COMMERCIAL
SETBACKS:	FRONT: 25' BLDG / 15' LANDSC. REAR: 5' BLDG / 5' LANDSC. SIDE: 5' BLDG / 5' LANDSC.
FAR:	NUMBER OF FUEL PUMPS : 32 PUMPS BLDG/ GAS CANOPY/ CONTROL ENCLOSURE : 166,165 SF TOTAL COSTCO SITE AREA : 715,448 SF FAR = 166,166 / 715,448 = .232 LOT COVERAGE = 23.2% COSTCO WAREHOUSE IS AN M OCCUPANCY 1-STORY FIRE SPRINKLERS AND 60' CLEAR AREA AT ALL SIDES OF STRUCTURE, THEREFORE THE BUILDING FALLS UNDER THE CBC BUILDING CODE SECTION FOR ALLOWED UNLIMITED AREA STRUCTURES

SITE DATA:

PARCEL 1 & 2 OF TPM 37511

NUMBER OF FUEL PUMPS:	32 PUMPS
COSTCO SITE AREA:	15.21 ACRES (662,538 SF.)
COSTCO FUEL FACILITY AREA:	1.21 ACRES (52,910 SF)
TOTAL COSTCO SITE	16.42 ACRES (715,448 SF.)

BUILDING DATA:

NET BUILDING AREA	149,856 SF
NET FIRE DEPT. ROOM	430 SF
NET MACHINE ROOM	1,488 SF
ENVELOPE/EXTERIOR WALLS	1,588 SF
TOTAL COSTCO WAREHOUSE	153,362 SF
FUEL STATION CANOPY	12,678 SF
FUEL CONTROLLER ENCLOSURE	125 SF

CODE ANALYSIS:

OCCUPANCY CLASSIFICATION:
NON-SEPARATED USES - GROUP 'M' (MERCANTILE)
NO OCCUPANCY SEPARATIONS REQUIRED

ALLOWABLE FLOOR AREA (CBC SECTION 507):
- UNLIMITED AREA
- AUTOMATIC SPRINKLER SYSTEM
- ENTIRELY SURROUNDED & ADJOINED BY PUBLIC WAYS OR YARDS NOT LESS THAN 60 FEET
- YARDS USED FOR UNLIMITED BUILDING AREA SHALL BE PERMANENTLY MAINTAINED

BUILDING HEIGHT AND NUMBER OF STORIES:
ALLOWABLE: 40 FEET - 1 STORY
ACTUAL: 32'-8" FEET - 1 STORY

TYPE OF CONSTRUCTION: TYPE V-B

PARKING DATA:

TOTAL PARKING:	799 STALLS
INCLUDES:	
10' WIDE STALLS	706 STALLS
9' WIDE STALLS	10 STALLS
ACCESSIBLE STALLS (1 IN 6 VAN = 4 VAN REQUIRED)	19 STALLS
10' WIDE CLEAN AIR/ VAN POOL/ EV STALLS (8% OF PARKING)	64 STALLS

NOTE: (2) CHARGING STATIONS AND (1) ACCESSIBLE CHARGING STATION WILL BE INSTALLED - INDICATED AS EV ON PLAN

FUTURE EV CHARGING STALLS (FEV) LESS (3) ACTUAL CHARGING STATIONS (6% OF PARKING) - NOT PART OF PARKING COUNT 45 STALLS

NUMBER OF STALLS PER 1000 SF OF BUILDING AREA:	5.21 STALLS
JURISDICTION REQUIRED PARKING INSTALL / 200 S.F. (5/1000):	767 STALLS

LEGEND
FEV - FUTURE ELECTRICAL VEHICLE PARKING
CVE - CLEAN AIR/VAN POOL PARKING (12 / 2015-02)

REQ'D BICYCLE RACKS (5% OF TOTAL PARKING) = 40 BIKES
PROVIDE BICYCLE RACKS = 40 BIKES
REQ'D LONG TERM BICYCLES
STORAGE/ LOCKER (5% OF EMPLOYEE) = 120 EMPLOYEES/ SHIFT X 5% = 6 LOCKERS
PROVIDED BIKE LOCKERS = 6 LOCKERS

LOADING SPACES REQUIRED: 153,362 SF/10,000 SF	(15) SPACES - 15' X 35' SPACES
LOADING SPACES PROVIDED:	(2) SPACES - 15' X 35' SPACES (4) SPACES - 13'-0" X 84' SPACES FOR SEMIS (6) TOTAL SPACES

LANDSCAPE DATA:

PERCENTAGE OF LANDSCAPE AREA:	20% MINIMUM REQUIRED
OVERALL SITE AREA	715,448 SF
REQUIRED LANDSCAPE AREA (20%)	143,309 SF
SQUARE FOOTAGE LANDSCAPE AREA PROVIDED	105,790 SF
PERCENTAGE OF LANDSCAPE AREA	14.8 %
PARKING AREA	387,090 SF
REQUIRED LANDSCAPE AREA (10%)	38,709 SF
SQUARE FOOTAGE LANDSCAPE AREA PROVIDED	61,780 SF
PERCENTAGE OF LANDSCAPE AREA	15.96 %
SQUARE FOOTAGE OF LANDSCAPING:	
RIGHT-OF-WAY:	4,991 SF
PARKING OVERHANG:	12,875 SF
ON-SITE:	87,924 SF
TOTAL LANDSCAPE AREA:	105,790 SF

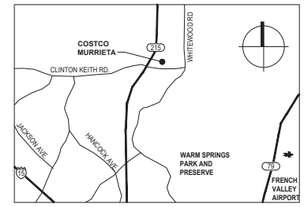
CURRENT OWNERS

1. CANDEE FAMILY LLC
2. CK 17, A CALIFORNIA LIMITED PARTNERSHIP
3. SCOTT-215, LP, A CALIFORNIA LIMITED PARTNERSHIP
4. LAMBDA INVESTMENTS, LLC, A DELAWARE LIMITED LIABILITY COMPANY

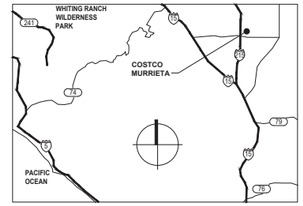
UTILITY COMPANIES:

ELECTRIC:	SOUTHERN CALIFORNIA EDISON (SCE) 2244 WALNUT GROVE AVENUE ROSEMEAD, CA 91770 (951) 249-8356	PHONE:	VERIZON 24520 VILLAGE WALK PL., STE A MURRIETA, CA 92562 (951) 672-9490
GAS:	SOUTHERN CALIFORNIA GAS COMPANY 1981 WEST LUGONIA AVENUE REDLANDS, CA 92374 800-427-2200	CABLE:	FRONTIER COMMUNICATIONS 9 S. 4TH STREET REDLANDS, CA 92373 (951) 7779567
SEWER/ WATER:	EASTER MUNICIPAL WATER DISTRICT (EMWD) 2270 TRUMBLE ROAD PERRIS, CA 92570 (951) 928-3777	SCHOOL DISTRICT:	MENIFEE UNION SCHOOL DISTRICT 29775 HAUN ROAD MENIFEE, CA 92586 (951) 672-1851

VICINITY MAP



REGIONAL MAP



DEVELOPMENT PLAN
DP-2018-1652
CUP-2018-1653
TPM-2018-1654

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△	DATE	DESCRIPTION
1	07/02/18	RESPOND TO CITY COMMENTS

0 20' 40' 80'
1" = 40'-0"

COSTCO WHOLESALE
MURRIETA, CA

NEC OF I-215 &
CLINTON KEITH RD.
MURRIETTA, CA

MG2

17-0091-01
AUGUST 21, 2019

PRELIMINARY ENLARGED SITE PLAN W/O CARWASH

DD12-03

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LEGEND

- PROPERTY LOT LINE
- EXISTING MAJOR CONTOUR — 260
- EXISTING MINOR CONTOUR — 259
- PROPOSED MAJOR CONTOUR — 260
- PROPOSED MINOR CONTOUR — 259
- STORM DRAIN — SD
- FLOW PATH
- DIRECTION OF PIPE FLOW
- AC PAVEMENT
- DMA ID / DMA TOTAL AREA — PD-A1-1 3.48 AC
- EXISTING BASIN LIMITS
- POC-A BASIN LIMITS
- POC-A SUB-DMA LIMITS
- PCO-B BASIN LIMITS
- POC-B SUD-DMA LIMITS
- POC-C BASIN LIMITS
- POC-C BASIN LIMITS
- BMP ID / BIORETENTION BASIN — BMP-1
- MODULAR WETLAND (BIOFILTRATION BMP) — MWS

PERMANENT STORM WATER BMP NOTES

1. POLLUTANT CONTROL BMP, BIOFILTRATION W/PARTIAL INFILTRATION (BF/PI)
2. POLLUTANT CONTROL BMP, PROPRIETARY BIOFILTRATION (BF)
3. HYDROMODIFICATION CISTERN
4. SELF-MITIGATING (SM) DMA
5. LANDSCAPING WITH NATIVE OR DROUGHT TOLERANT SPECIES

SOURCE CONTROL BMPs

SC-1 PREVENTION OF ILLICIT DISCHARGES INTO THE MS4
SC-2 STORM DRAIN STENCILING OR SIGNAGE
SC-3 PROTECT OUTDOOR MATERIALS STORAGE AREAS FROM RAINFALL, RUN-ON, RUNOFF AND WIND DISPERSAL
SC-4 PROTECT MATERIALS STORED IN OUTDOOR WORK AREAS FROM RAINFALL, RUN-ON, RUNOFF AND WIND DISPERSAL
SC-5 PROTECT TRASH STORAGE AREAS FROM RAINFALL, RUN-ON, RUNOFF AND WIND DISPERSAL

DMA SUMMARY TABLE

DMA ID	DMA TYPE	DRAINS TO BMP	POC OUTLET	TOTAL (AC)	TOTAL (SF)	Design WQ DCV Vol (cf)	BMP MIN AREA (SF)	LANDSC (AC)	IMPERV AREA (AC)	IMPERV (%)
PD-A1-2	DRAINS TO BMP	BMP 02	POC-1	0.478	20,822	573	780	0.12	0.36	75
PD-A1-1	DRAINS TO BMP	BMP 01	POC-1	1.000	43,560	1,307	2,000	0.20	0.80	80
PD-A1-3A	DRAINS TO BMP	BMP 03A	POC-1	0.497	21,649	794	929	0.05	0.45	90
PD-A1-3B	DRAINS TO BMP	BMP 03B	POC-1	0.405	17,642	647	760	0.04	0.36	90
PD-A1-3C	DRAINS TO BMP	BMP 03C	POC-1	0.402	17,511	642	785	0.04	0.36	90
PD-A1-3D	DRAINS TO BMP	BMP 03D	POC-1	0.243	10,585	388	615	0.02	0.22	90
PD-A1-3E	DRAINS TO BMP	BMP 03E	POC-1	0.473	20,604	755	824	0.05	0.43	90
PD-B2-6	DRAINS TO BMP	BMP-06	POC-2	0.642	27,966	1,119	212	0.03	0.61	95
PD-B2-4A	DRAINS TO BMP	BMP-04A	POC-2	0.294	12,807	470	613	0.03	0.26	90
PD-B2-4B	DRAINS TO BMP	BMP-04B	POC-2	0.649	28,270	942	1,001	0.10	0.55	85
PD-B2-4C	DRAINS TO BMP	BMP-04C	POC-2	0.387	16,858	562	430	0.06	0.33	85
PD-B2-4D	DRAINS TO BMP	BMP-04D	POC-2	0.320	13,939	511	430	0.03	0.29	90
PD-B2-4E	DRAINS TO BMP	BMP-04E	POC-2	0.322	14,026	468	513	0.05	0.27	85
PD-B2-A	SELF MITIGATING	N/A	POC-2	0.095	4,138	7	0	0.10	0.00	0
PD-B2-B	SELF MITIGATING	N/A	POC-2	0.387	16,858	28	0	0.39	0.00	0
PD-B2-C	SELF MITIGATING	N/A	POC-2	0.094	4,095	7	0	0.09	0.00	0
PD-B2-5A	DRAINS TO BMP	BMP-05A	POC-2	0.281	12,240	449	284	0.03	0.25	90
PD-B2-5B	DRAINS TO BMP	BMP-05B	POC-2	0.309	13,460	494	281	0.03	0.28	90
PD-B2-5C	DRAINS TO MWS	BMP-05C	POC-2	0.436	18,992	760	0	0.02	0.41	95
PD-B2-5D	DRAINS TO BMP	BMP-05D	POC-2	0.429	18,687	685	542	0.04	0.39	90
PD-B2-7	DRAINS TO MWS	BMP-07	POC-2	1.952	85,029	3,826	0	0.00	1.95	100
PD-C1-8	DRAINS TO BMP	BMP 08	POC-3	2.672	116,392	3,880	900	0.40	2.27	85
PD-C1-9	DRAINS TO BMP	BMP 09	POC-3	0.840	36,590	1,098	977	0.17	0.67	80
PD-C1-10A	DRAINS TO BMP	BMP 10A	POC-3	0.587	25,570	938	710	0.06	0.53	90
PD-C1-10B	DRAINS TO BMP	BMP 10B	POC-3	0.325	14,157	566	382	0.02	0.31	95
PD-C1-11	DRAINS TO BMP	BMP 11	POC-3	0.759	33,062	992	1,200	0.15	0.61	80
PD-C1-12A	DRAINS TO BMP	BMP 12A	POC-3	0.732	31,886	877	908	0.18	0.55	75
PD-C1-12B	DRAINS TO BMP	BMP 12B	POC-3	0.221	9,627	289	300	0.04	0.18	80
PD-C1-13	DRAINS TO BMP	BMP 13	POC-3	0.238	10,367	259	220	0.07	0.17	70
PD-C2-D	SELF MITIGATING	N/A	POC-3	1.514	65,950	110	0	1.51	0.00	0
TOTALS				17.983				4.13	13.86	77%

BMP SUMMARY TABLE

BMP ID	LID TYPE	SHOWN BMP BOTTOM AREA (SF)	MIN BMP AREA (SF)	AVG LENGTH (FT)	AVG WIDTH (FT)	SIDE SLOPES (H/V)	F.B. (IN)	POND DEPTH (IN)	SOIL LAYER DEPTH (IN)	GRAVEL LAYER DEPTH (IN)	DRAIN ORIFICE (IN)	RISER SIZE
BMP 02	BF/PI	980	780	78.0	10	4	6	6	36	12	0.65	CB24X24
BMP 01	BF/PI	2,865	2,000	100.0	20	4	6	6	36	12	0.92	CB36X36
BMP 03A	BF/PI	1,160	929	132.7	7	0	6	6	36	18	6	CB24X24
BMP 03B	BF/PI	950	760	108.6	7	0	6	6	36	18	6	CB24X24
BMP 03C	BF/PI	981	785	112.1	7	0	6	6	36	18	6	CB24X24
BMP 03D	BF/PI	769	615	87.9	7	0	6	6	36	18	6	CB24X24
BMP 03E	BF/PI	1,122	824	82.4	10	0	6	6	36	18	6	CB24X24
BMP-06	BF/PI	386	212	21.2	10	4	5	19	36	24	4.25	CB36X36
BMP-04A	BF/PI	893	613	122.5	5	0	6	6	36	18	4	CB24X24
BMP-04B	BF/PI	1,251	1,001	66.7	15	0	6	6	36	18	4	CB24X24
BMP-04C	BF/PI	538	430	86.0	5	0	6	6	36	18	4	CB24X24
BMP-04D	BF/PI	538	430	86.0	5	0	6	6	36	18	4	CB24X24
BMP-04E	BF/PI	641	513	102.6	5	0	6	6	36	18	4	CB24X24
SM-A	SM	0	0				0	0	0	0	N/A	N/A
SM-B	SM	0	0				0	0	0	0	N/A	N/A
SM-C	SM	0	0				0	0	0	0	N/A	N/A
BMP-05A	BF/PI	313	284	28.4	10	0	6	6	36	18	4	CB24X24
BMP-05B	BF/PI	317	281	28.1	10	0	6	6	36	18	4	CB24X24
BMP-05C	BF	0	0	13.0	4	N/A	0	0	0	0	N/A	MWS
BMP-05D	BF/PI	678	542	108.4	5	0	6	6	36	18	4	CB24X24
BMP-07	BF	0	0	20.0	8	N/A	0	0	0	0	N/A	MWS
BMP 08	BF/PI	1,230	900	90.0	10	4	3	15	36	18	6	CB36X36
BMP 09	BF/PI	992	977	65.1	15	4	4	18	36	12	0.5	CB36X36
BMP 10A	BF/PI	710	710	71.0	10	0	6	6	36	18	6	CB24X24
BMP 10B	BF/PI	382	382	76.4	5	0	6	6	36	18	6	CB24X24
BMP 11	BF/PI	1,286	1,200	80.0	15	4	2	10	36	18	0.6	CB36X36
BMP 12A	BF/PI	908	908	60.5	15	4	2	10	36	24	0.625	CB36X36
BMP 12B	BF/PI	448	300	60.0	5	4	2	10	36	18	0.333	CB24X24
BMP 13	BF/PI	275	220	44.0	5	4	3	9	36	18	0.4	CB24X24
SM-D	SM	0	0				0	0	0	0	N/A	N/A

PROJECT SITE INFO

UNDERLYING HYDROLOGIC SOIL: D
APPROXIMATE DEPTH TO GROUNDWATER: >21 FT
EXISTING NATURAL HYDROLOGIC FEATURES: NONE
CRITICAL COARSE SEDIMENT YEILD AREAS TO BE PROTECTED: NONE
AREA OF UNIT 1 (PARCEL 1, 2 AND LOT B): 16.45 AC
EXISTING IMPERVIOUS AREA: 0 AC
DISTURBED AREA: 17.98 AC
PROPOSED IMPERVIOUS AREA: 13.81 AC
PROPOSED PERVIOUS AREA (INCLUDES LANDSCAPING): 4.18 AC

COSTCO MURRIETA

WQMP SITE PLAN EXHIBIT

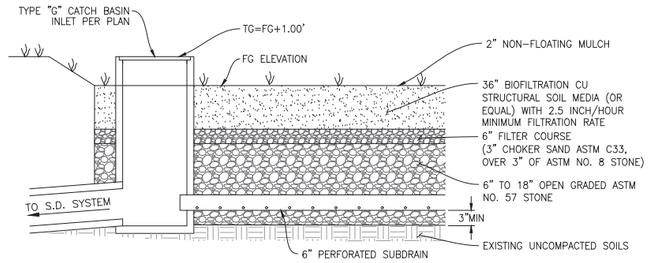
FUSCOE ENGINEERING
6390 Greenwich Dr., Suite 170
San Diego, California 92122
tel 858.554.1500 ∘ fax 858.597.0335
www.fuscoe.com

JOB NO. 756-055

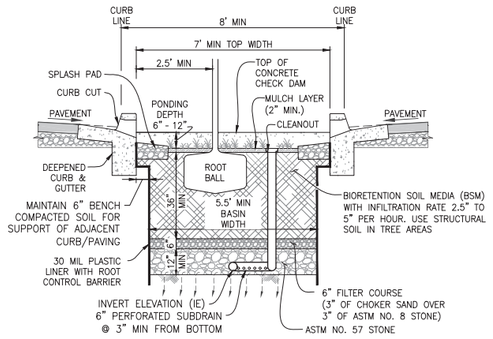
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SHEET 1 of 2

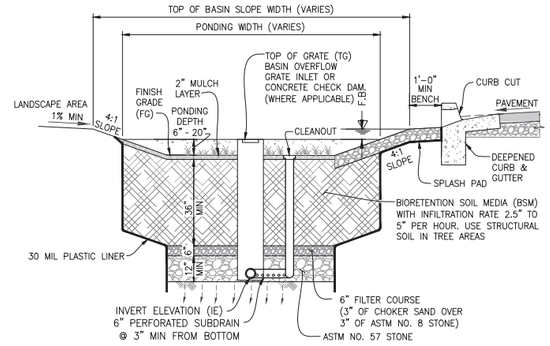
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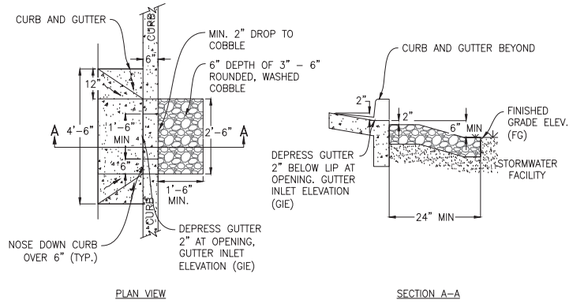
BIORETENTION TYPICAL LONGITUDINAL SECTION
N.T.S.



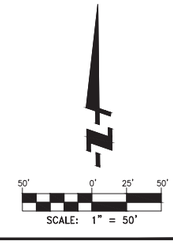
TYPICAL BIORETENTION PARKING PLANTER SECTION
NOT TO SCALE



TYPICAL BIORETENTION BASIN SECTION
NOT TO SCALE



CURB OPENING DETAIL
N.T.S.



COSTCO MURRIETA

WQMP
DETAILS

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ENGINEERING
6390 Greenwich Dr., Suite 170
San Diego, California 92122
tel 858.554.1500 • fax 858.597.0335
www.fuscoe.com

JOB NO. 756-055

DRAWN BY: J.G.

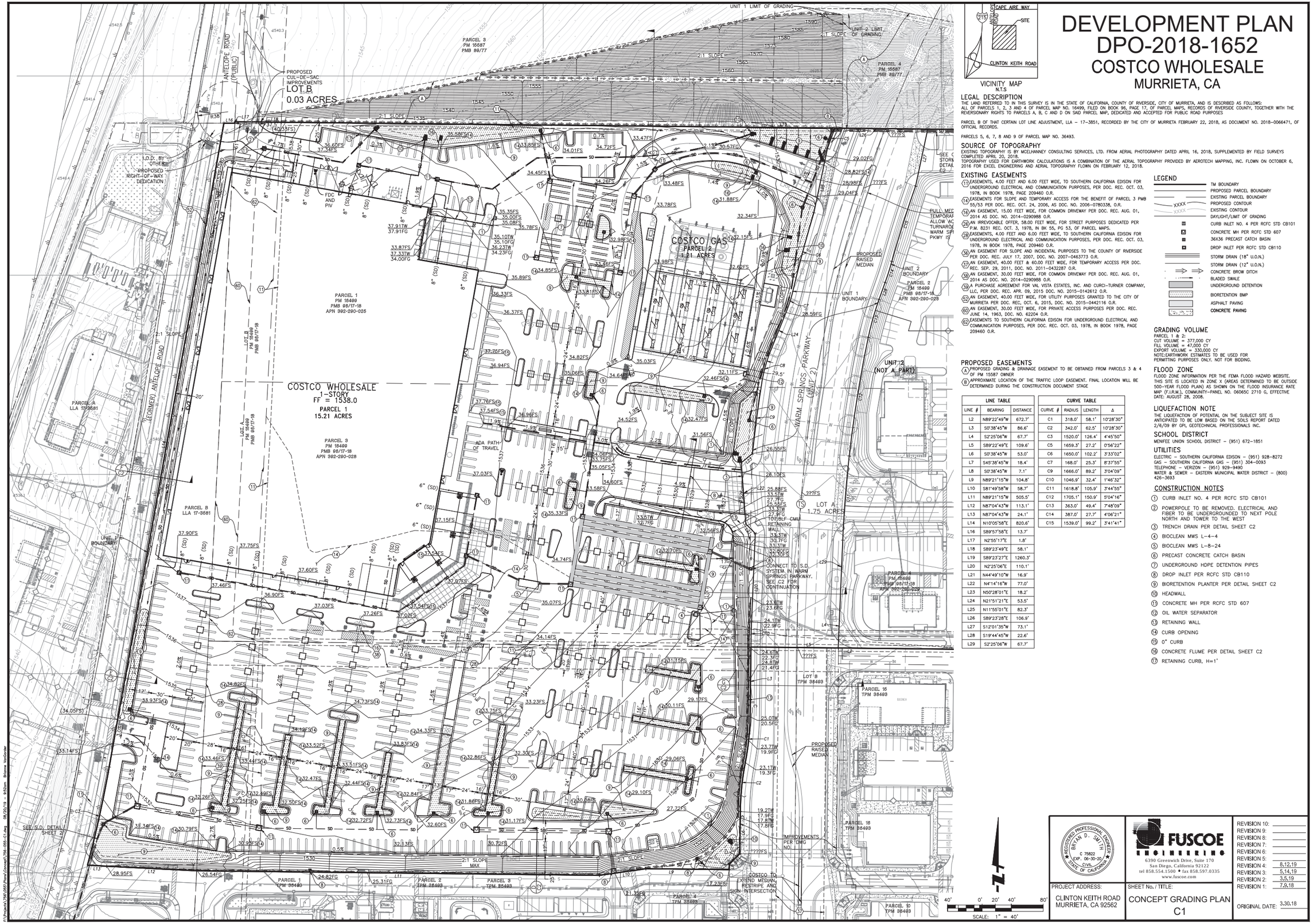
SHEET 2 of 2

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Appendix 2: Construction Plans

Grading and Drainage Plans

DEVELOPMENT PLAN
DPO-2018-1652
COSTCO WHOLESALE
MURRIETA, CA



VICINITY MAP
N.T.S

LEGAL DESCRIPTION

THE LAND REFERRED TO IN THIS SURVEY IS IN THE STATE OF CALIFORNIA, COUNTY OF RIVERSIDE, CITY OF MURRIETA, AND IS DESCRIBED AS FOLLOWS:
ALL OF PARCELS 1, 2, 3 AND 4 OF PARCEL MAP NO. 16499, FILED ON BOOK 96, PAGE 17, OF PARCEL MAPS, RECORDS OF RIVERSIDE COUNTY, TOGETHER WITH THE REVERSIONARY RIGHTS TO PARCELS A, B, C AND D ON SAID PARCEL MAP, DEDICATED AND ACCEPTED FOR PUBLIC ROAD PURPOSES

PARCEL B OF THAT CERTAIN LOT LINE ADJUSTMENT, LLA – 17–3851, RECORDED BY THE CITY OF MURRIETA FEBRUARY 22, 2018, AS DOCUMENT NO. 2018–0066471, OF OFFICIAL RECORDS.

PARCELS 5, 6, 7, 8 AND 9 OF PARCEL MAP NO. 36493.

SOURCE OF TOPOGRAPHY

EXISTING TOPOGRAPHY IS BY MCELHANNEY CONSULTING SERVICES, LTD. FROM AERIAL PHOTOGRAPHY DATED APRIL 16, 2018, SUPPLEMENTED BY FIELD SURVEYS COMPLETED APRIL 20, 2018.
TOPOGRAPHY USED FOR EARTHWORK CALCULATIONS IS A COMBINATION OF THE AERIAL TOPOGRAPHY PROVIDED BY AEROTECH MAPPING, INC. FLOWN ON OCTOBER 6, 2016 FOR EXCEL ENGINEERING AND AERIAL TOPOGRAPHY FLOWN ON FEBRUARY 12, 2018.

EXISTING EASEMENTS

(11) EASEMENTS, 4.00 FEET AND 6.00 FEET WIDE, TO SOUTHERN CALIFORNIA EDISON FOR UNDERGROUND ELECTRICAL AND COMMUNICATION PURPOSES, PER DOC. REC. OCT. 03, 1978, IN BOOK 1978, PAGE 209460 O.R.
(14) EASEMENTS FOR SLOPE AND TEMPORARY ACCESS FOR THE BENEFIT OF PARCEL 3 PMB 55/53 PER DOC. REC. OCT. 24, 2006, AS DOC. NO. 2006–0780338, O.R.
(16) AN EASEMENT, 15.00 FEET WIDE, FOR COMMON DRIVEWAY PER DOC. REC. AUG. 01, 2014 AS DOC. NO. 2014–0290988 O.R.
(26) AN IRREVOCABLE OFFER, 58.00 FEET WIDE, FOR STREET PURPOSES DEDICATED PER P.M. 8231 REC. OCT. 3, 1978, IN BK 55, PG 53, OF PARCEL MAPS.
(28) EASEMENTS, 4.00 FEET AND 6.00 FEET WIDE, TO SOUTHERN CALIFORNIA EDISON FOR UNDERGROUND ELECTRICAL AND COMMUNICATION PURPOSES, PER DOC. REC. OCT. 03, 1978, IN BOOK 1978, PAGE 209460 O.R.
(56) AN EASEMENT FOR SLOPE AND INCIDENTAL PURPOSES TO THE COUNTY OF RIVERSIDE PER DOC. REC. JULY 17, 2007, DOC. NO. 2007–0463773 O.R.
(57) AN EASEMENT, 40.00 FEET & 60.00 FEET WIDE, FOR TEMPORARY ACCESS PER DOC. REC. SEP. 29, 2011, DOC. NO. 2011–0432287 O.R.
(58) AN EASEMENT, 30.00 FEET WIDE, FOR COMMON DRIVEWAY PER DOC. REC. AUG. 01, 2014 AS DOC. NO. 2014–0290988 O.R.
(59) A PURCHASE AGREEMENT FOR VAL VISTA ESTATES, INC. AND CURCI–TURNER COMPANY, LLC, PER DOC. REC. APR. 09, 2015 DOC. NO. 2015–0142612 O.R.
(52) AN EASEMENT, 40.00 FEET WIDE, FOR UTILITY PURPOSES GRANTED TO THE CITY OF MURRIETA PER DOC. REC, OCT. 6, 2015, DOC. NO. 2015–0442116 O.R.
(60) AN EASEMENT, 30.00 FEET WIDE, FOR PRIVATE ACCESS PURPOSES PER DOC. REC. JUNE 14, 1963, DOC. NO. 62204 O.R.
(62) EASEMENTS TO SOUTHERN CALIFORNIA EDISON FOR UNDERGROUND ELECTRICAL AND COMMUNICATION PURPOSES, PER DOC. REC. OCT. 03, 1978, IN BOOK 1978, PAGE 209460 O.R.

PROPOSED EASEMENTS

(A) PROPOSED GRADING & DRAINAGE EASEMENT TO BE OBTAINED FROM PARCELS 3 & 4 OF PM 15587 OWNER
(B) APPROXIMATE LOCATION OF THE TRAFFIC LOOP EASEMENT. FINAL LOCATION WILL BE DETERMINED DURING THE CONSTRUCTION DOCUMENT STAGE

LINE TABLE		
LINE #	BEARING	DISTANCE
L2	N89°22'49"W	672.7'
L3	S0°38'45"W	86.6'
L4	S2°25'06"W	67.7'
L5	S89°22'49"E	109.6'
L6	S0°38'45"W	53.0'
L7	S45°38'45"W	18.4'
L8	S0°38'45"W	7.1'
L9	N89°21'15"W	104.8'
L10	S81°49'58"W	58.7'
L11	N89°21'15"W	505.5'
L12	N87°04'43"W	113.1'
L13	N87°04'43"W	24.1'
L14	N10°05'58"E	820.6'
L16	S89°57'58"E	13.7'
L17	N2°55'17"E	1.8'
L18	S89°23'49"E	58.1'
L19	S89°23'27"E	1260.3'
L20	N2°25'06"E	110.1'
L21	N44°49'10"W	16.9'
L22	N4°14'16"W	77.0'
L23	N50°28'01"E	18.2'
L24	N21°51'21"E	53.5'
L25	N11°55'01"E	82.3'
L26	S89°23'28"E	106.9'
L27	S12°01'35"W	73.1'
L28	S19°44'45"W	22.6'
L29	S2°25'06"W	67.7'

CURVE TABLE			
CURVE #	RADIUS	LENGTH	Δ
C1	318.0'	58.1'	10°28'30"
C2	342.0'	62.5'	10°28'30"
C3	1520.0'	126.4'	4°45'50"
C5	1659.3'	27.2'	0°56'22"
C6	1650.0'	102.2'	3°33'02"
C7	168.0'	25.3'	8°37'55"
C8	1666.0'	89.2'	3°04'09"
C9	1666.0'	89.2'	3°04'09"
C10	1046.9'	32.4'	1°46'32"
C11	1618.8'	105.9'	3°44'55"
C12	1705.1'	150.9'	5°04'16"
C13	363.0'	49.4'	7°48'09"
C14	387.0'	27.7'	4°06'21"
C15	1539.0'	99.2'	3°41'41"

LEGEND

- TM BOUNDARY
- PROPOSED PARCEL BOUNDARY
- EXISTING PARCEL BOUNDARY
- PROPOSED CONTOUR
- EXISTING CONTOUR
- DAYLIGHT/LIMIT OF GRADING
- CURB INLET NO. 4 PER RCFC STD CB101
- CONCRETE MH PER RCFC STD 607
- 36X36 PRECAST CATCH BASIN
- DROP INLET PER RCFC STD CB110
- STORM DRAIN (18" U.O.N.)
- STORM DRAIN (12" U.O.N.)
- CONCRETE BROW DITCH
- BLADED SWALE
- UNDERGROUND DETENTION
- BIORETENTION BMP
- ASPHALT PAVING
- CONCRETE PAVING

GRADING VOLUME

PARCEL 1 & 2:
CUT VOLUME = 377,000 CY
FILL VOLUME = 47,000 CY
EXPORT VOLUME = 330,000 CY
NOTE:EARTHWORK ESTIMATES TO BE USED FOR PERMITTING PURPOSES ONLY. NOT FOR BIDDING.

FLOOD ZONE

FLOOD ZONE INFORMATION PER THE FEMA FLOOD HAZARD WEBSITE. THIS SITE IS LOCATED IN ZONE X (AREAS DETERMINED TO BE OUTSIDE 500–YEAR FLOOD PLAIN) AS SHOWN ON THE FLOOD INSURANCE RATE MAP (F.I.R.M.), COMMUNITY–PANEL NO. 06065C 2710 G, EFFECTIVE DATE: AUGUST 28, 2008.

LIQUEFACTION NOTE

THE LIQUEFACTION OF POTENTIAL ON THE SUBJECT SITE IS ANTICIPATED TO BE LOW BASED ON THE SOILS REPORT DATED 2/6/09 BY GPI, GEOTECHNICAL PROFESSIONALS INC.

SCHOOL DISTRICT

MENIFEE UNION SCHOOL DISTRICT – (951) 672–1851

UTILITIES

ELECTRIC – SOUTHERN CALIFORNIA EDISON – (951) 928–8272
GAS – SOUTHERN CALIFORNIA GAS – (951) 304–0093
TELEPHONE – VERIZON – (951) 929–9490
WATER & SEWER – EASTERN MUNICIPAL WATER DISTRICT – (800) 426–3693

CONSTRUCTION NOTES

(1) CURB INLET NO. 4 PER RCFC STD CB101
(2) POWERPOLE TO BE REMOVED. ELECTRICAL AND FIBER TO BE UNDERGROUNDED TO NEXT POLE NORTH AND TOWER TO THE WEST
(3) TRENCH DRAIN PER DETAIL SHEET C2
(4) BIOCLEAN MWS L–4–4
(5) BIOCLEAN MWS L–8–24
(6) PRECAST CONCRETE CATCH BASIN
(7) UNDERGROUND HDPE DETENTION PIPES
(8) DROP INLET PER RCFC STD CB110
(9) BIORETENTION PLANTER PER DETAIL SHEET C2
(10) HEADWALL
(11) CONCRETE MH PER RCFC STD 607
(12) OIL WATER SEPARATOR
(13) RETAINING WALL
(14) CURB OPENING
(15) 0" CURB
(16) CONCRETE FLUME PER DETAIL SHEET C2
(17) RETAINING CURB, H=1'

REGISTERED PROFESSIONAL ENGINEER BRYAN D. SMITH C 75822 EXP. 06-30-20 CIVIL STATE OF CALIFORNIA

FUSCOE ENGINEERING
6390 Greenwich Drive, Suite 170
San Diego, California 92122
tel 858.554.1500 • fax 858.597.0335
www.fuscoe.com

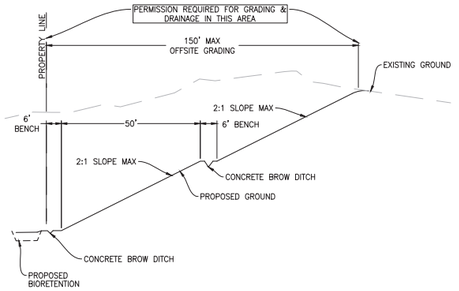
PROJECT ADDRESS:
CLINTON KEITH ROAD
MURRIETA, CA 92562

SHEET No. / TITLE:
CONCEPT GRADING PLAN
C1

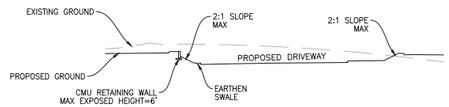
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REVISION 9:	
REVISION 8:	
REVISION 7:	
REVISION 6:	
REVISION 5:	
REVISION 4:	8.12.19
REVISION 3:	5.14.19
REVISION 2:	3.5.19
REVISION 1:	7.9.18
ORIGINAL DATE:	3.30.18

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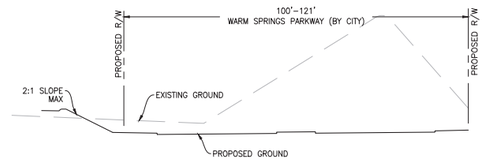
DEVELOPMENT PLAN
DPO-2018-1652
COSTCO WHOLESALE
MURRIETA, CA



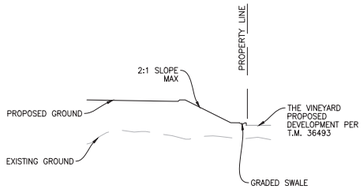
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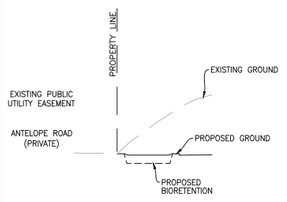
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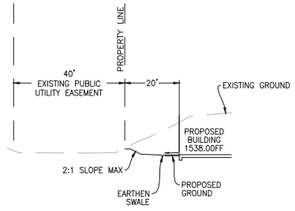
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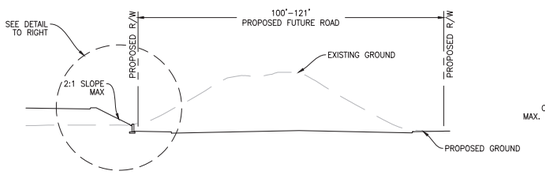
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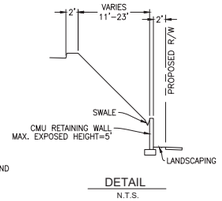
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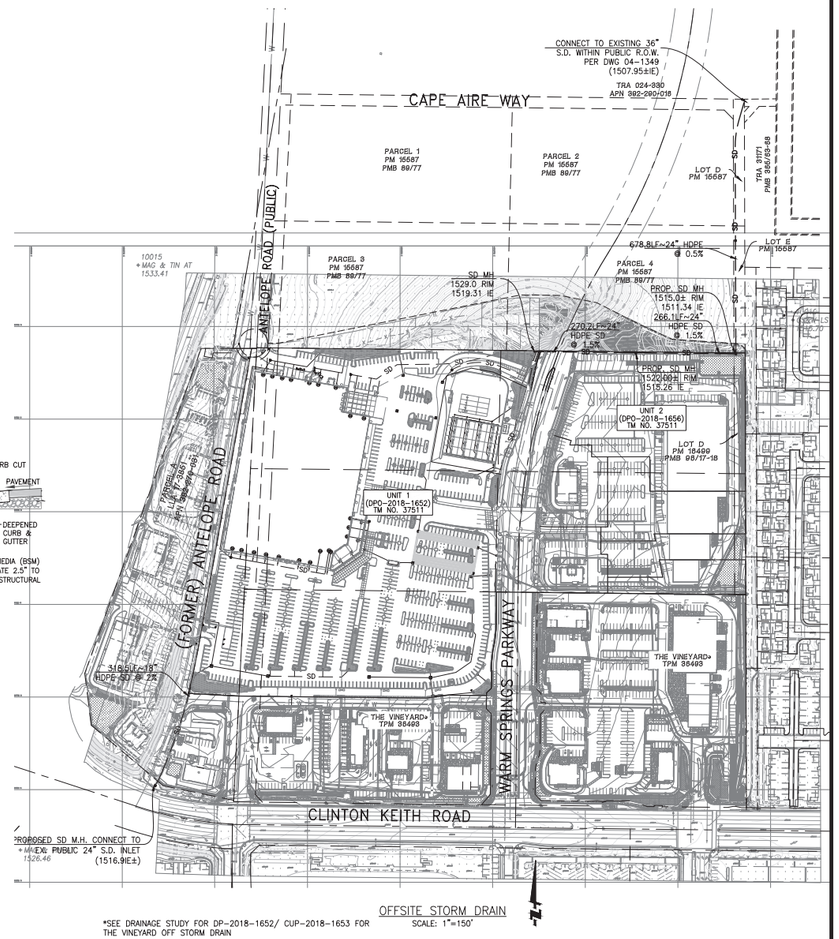
SECTION F C2
1"=20'



SECTION G C2
1"=20'

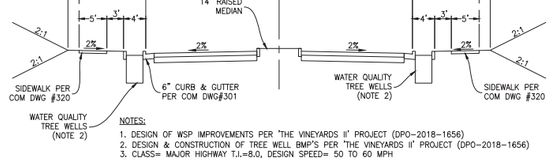


DETAIL
N.T.S.



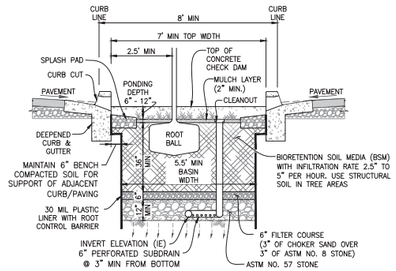
OFFSITE STORM DRAIN
SCALE: 1"=150'

*SEE DRAINAGE STUDY FOR DP-2018-1652/ CUP-2018-1653 FOR THE VINEYARD OFF STORM DRAIN

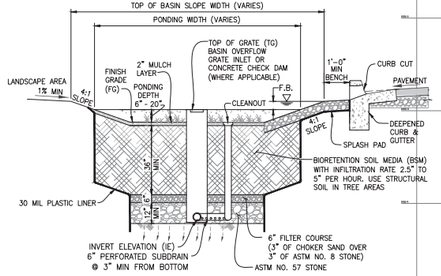


NOTES:
1. DESIGN OF WSP IMPROVEMENTS PER "THE VINEYARDS II" PROJECT (DPO-2018-1656)
2. DESIGN & CONSTRUCTION OF TREE WELL BMP'S PER "THE VINEYARDS II" PROJECT (DPO-2018-1656)
3. CLASS= MAJOR HIGHWAY T.I.=8.0, DESIGN SPEED= 50 TO 60 MPH

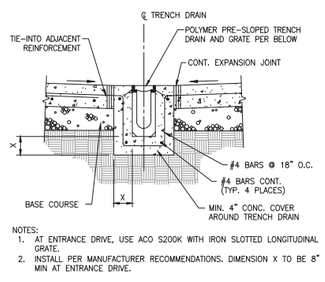
TYPICAL WARM SPRINGS PARKWAY SECTION*
NOT TO SCALE
*BY CITY



TYPICAL BIORETENTION PARKING PLANTER SECTION
NOT TO SCALE

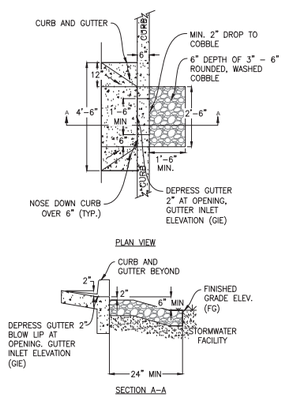


TYPICAL BIORETENTION BASIN SECTION
NOT TO SCALE

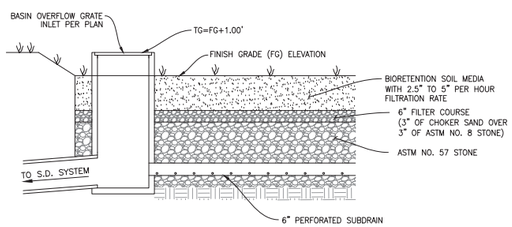


NOTES:
1. AT ENTRANCE DRIVE, USE ACO S200K WITH IRON SLOTTED LONGITUDINAL GRATE.
2. INSTALL PER MANUFACTURER RECOMMENDATIONS. DIMENSION X TO BE 8" MIN AT ENTRANCE DRIVE.

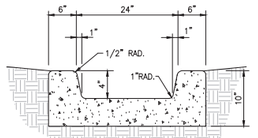
TRENCH DRAIN DETAIL
N.T.S.



CURB OPENING DETAIL
N.T.S.



BIORETENTION TYPICAL LONGITUDINAL SECTION
N.T.S.



CONCRETE FLUME DETAIL
N.T.S.

REGISTERED PROFESSIONAL ENGINEER BRYAN D. SMITH C 75822 EXP. 06-30-20 CIVIL STATE OF CALIFORNIA

FUSCOE ENGINEERING
6390 Greenwich Drive, Suite 170
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tel 858.554.1500 ● fax 858.597.0335
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REVISION 10:	
REVISION 9:	
REVISION 8:	
REVISION 7:	
REVISION 6:	
REVISION 5:	
REVISION 4:	8.12.19
REVISION 3:	5.14.19
REVISION 2:	3.5.19
REVISION 1:	7.9.18
ORIGINAL DATE:	3.30.18

PROJECT ADDRESS:
CLINTON KEITH ROAD
MURRIETA, CA 92562

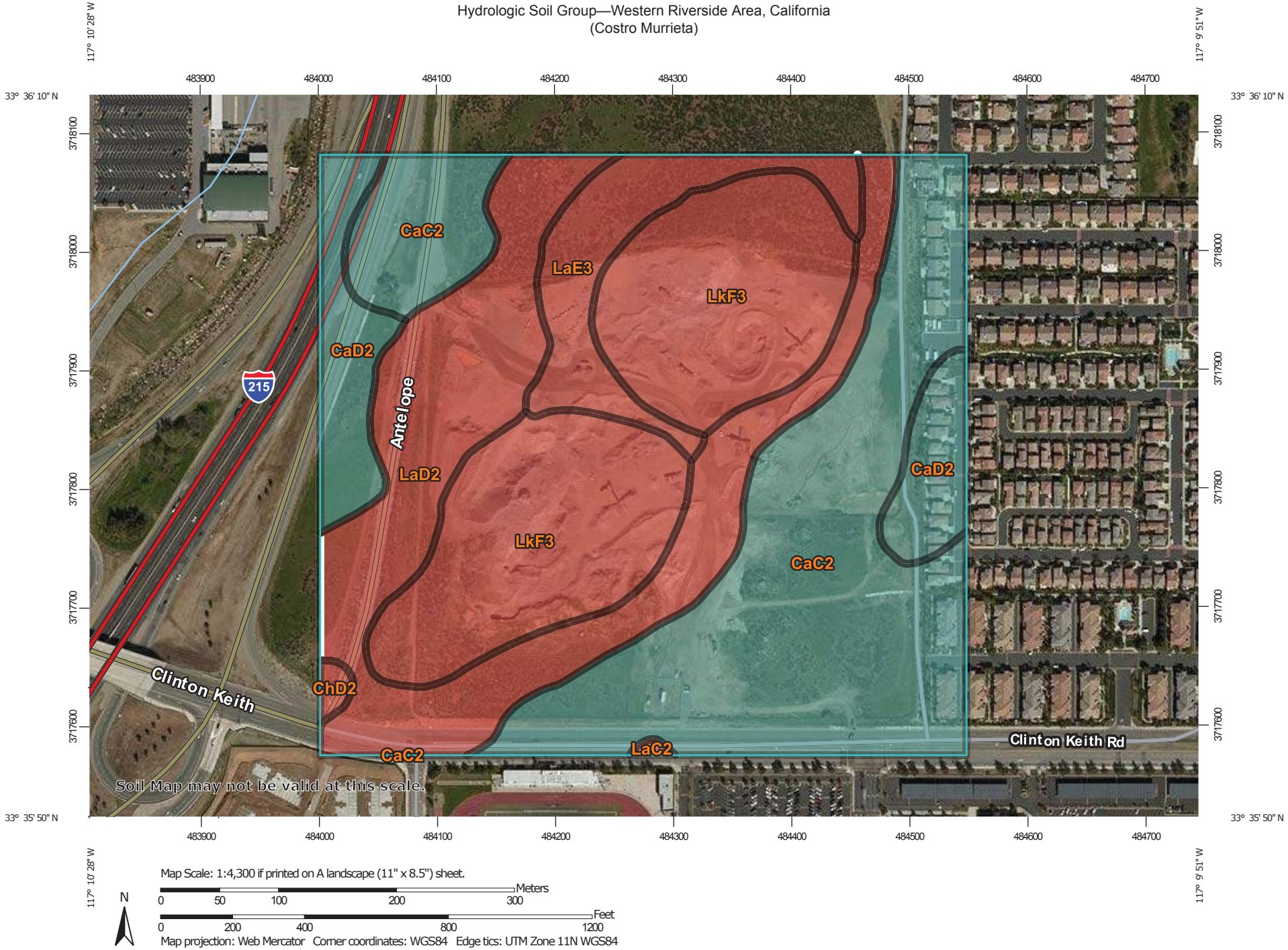
SHEET No. / TITLE:
SECTIONS AND DETAILS
C2

F:\Projects\7765\005\Plans\Concept\7765-055-C2.dwg 08/20/19 - 9:52am Briana VanSoelen

Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

Hydrologic Soil Group—Western Riverside Area, California
(Costro Murrieta)



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Lines

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Points

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Water Features

Streams and Canals

Transportation

Rails
Interstate Highways
US Routes
Major Roads
Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this 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 do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Western Riverside Area, California
Survey Area Data: Version 9, Sep 12, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Feb 24, 2015—Feb 26, 2015

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CaC2	Cajalco fine sandy loam, 2 to 8 percent slopes, eroded	C	23.6	34.3%
CaD2	Cajalco fine sandy loam, 8 to 15 percent slopes, eroded	C	5.5	7.9%
ChD2	Cieneba sandy loam, 8 to 15 percent slopes, eroded	D	0.3	0.4%
LaC2	Las Posas loam, 5 to 8 percent slopes, eroded	D	0.1	0.1%
LaD2	Las Posas loam, 8 to 15 percent slopes, eroded	D	16.3	23.7%
LaE3	Las Posas loam, 8 to 25 percent slopes, severely eroded	D	4.8	7.0%
LkF3	Las Posas rocky loam, 15 to 50 percent slopes, severely eroded	D	18.3	26.6%
Totals for Area of Interest			**68.8**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

October 11, 2017
Kleinfelder Project No.: 20181587.001A

Costco Wholesale
9 Corporate Park, Suite 230
Irvine, California 92606

Attention: Ms. Jenifer Murillo
Director of Real Estate Development

Subject: Geotechnical Review
Proposed Costco Wholesale Warehouse
Northeast of Interstate 215 and Clinton Keith Road
Murrieta, California
CW# 17-0237

Dear Ms. Murillo:

This letter presents the results of Kleinfelder's geotechnical review for the proposed Costco Wholesale Warehouse (CW#17-0237) in Murrieta, California. We understand Costco plans to purchase an approximately 16.97-acre site located at the northeast corner of the Interstate 215 (I-215) and Clinton Keith Road interchange for a new approximately 151,340-square-foot warehouse and fuel facility. We further understand that one of the current property owners is mass grading (cutting down) the site and selling the excavated soil/bedrock off site. Also, part of the mass grading activities at the site will be to over-excavate 5 feet below Costco's finished pad grade and then backfill with imported soils to bring the site to finished pad elevation(s). The purpose of our services was to readily-available geotechnical and geologic information for the project site and the development plans to apprise Costco of potential geotechnical-related risks that may affect the cost and long-term performance of the proposed Costco development. A review of the environmental-related risks is currently being performed by Kleinfelder and the results will be in a Phase I Environmental Site Assessment (ESA) report.

PROJECT INFORMATION

Based on a preliminary site plan (P11-13) prepared by MG2, dated October 10, 2017, we understand that the project will consist of an approximately 151,340-square-foot Costco Wholesale warehouse and a fuel facility. The warehouse will be a single-story, steel-framed structure (approximately 30 feet in height) with concrete-masonry-unit (CMU) and metal walls. The fuel facility will contain three underground storage tanks (UST), a fuel additive UST, fueling stations, and a pre-manufactured metal canopy. The building surroundings will consist mainly of surface parking with some landscape areas. Parking and drive areas will be paved with either Portland cement concrete or asphalt concrete pavements.

Based on surface elevations interpreted from mass grading plans, provided by Excel Engineering (2016), dated October 6, 2016, existing surface elevations vary from a high of approximately 1,603 feet above sea level near the central part of the Costco site to a low of approximately 1,515

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feet along the eastern boundary of the site. The site also slopes towards Antelope Road on the west to an elevation ranging from approximately 1,540 to 1,530 feet along the road.

According to the Concept Grading Exhibit, dated September 1, 2017, prepared by Fuscoe Engineering (2017), precise grading plan dated August 29, 2013, prepared by CRC Enterprises (2013), we understand that the finished floor elevation (FFE) for the warehouse will be established at approximately elevation 1,536 feet. Therefore, current mass grading operations are anticipated to excavate to an elevation of approximately 1,531 feet. We understand that fill material generated offsite will be imported to bring finished pad elevation to 1,536 feet. Currently, we do not know if any retaining walls or slopes are planned for the site. However, a new road, Warm Springs Parkway, is planned along the eastern project site boundary extending northward from Clinton Keith Road, and will be constructed by the City of Murrieta.

EXISTING SITE CONDITIONS

The Costco site comprises approximately 16.97 acres within an undeveloped parcel located northeast of the Antelope and Clinton Keith Roads intersection in the northern part of the City of Murrieta, California. A residential neighborhood and I-215 are to the east and west of the site, respectively. The Vista Murrieta High School is to the south of the Costco site and the land bordering the north is undeveloped. Access constraints due to current mass grading operations made a site visit not possible. A review of historical topographic maps and aerial photographs show that prior to about 2009 the site was undisturbed and appeared to be used for farming. The site's ground surface generally sloped gently to the south from an elevation of approximately 1,550 feet to 1,520 feet. However, this southerly slope was interrupted by two prominent hills which rose up above the site about 100-130 feet, or to elevations of about 1,602 and 1,637 feet, south to north respectively. After 2009, it appears that the site has been used as a soil borrow-site with excavation generally limited at the two hills. However, a review of recent aerial photography, provided by Google Earth, dated October 21, 2016, and grading plans (Excel Engineering, 2016) show that most of the project site's ground surface has now been disturbed by the excavation activities. The hills have been heavily excavated, with approximately 55 feet (elevation 1,582 feet) being removed from the northernmost hill by 2016. In addition to excavation activities, there is rock crushing equipment present, as well as stockpiles of rock, gravel and soil. Erosional control fencing appears to be present around the perimeter of the site.

GEOTECHNICAL/GEOLOGICAL CONDITIONS

The Costco site is located within the Perris Block, a structural subdivision of the Peninsular Range Geomorphic Province, which is characterized by steep, elongated ranges and valleys that generally trend northwestward [California Geological Survey (CGS), 2002]. The Perris Block is underlain by pre-Cretaceous age (greater than 144 million years old) metasedimentary rocks and Cretaceous age (66 to 144 million years old) plutonic rocks of the Southern California batholith (Larsen, 1948; and Woodford et al., 1971). Within the southern part of the Perris Block, including the project site, plutonic rocks (i.e., granite, granodiorite and gabbro) intruded into the existing, country metamorphic rock (i.e., metasedimentary rocks). Subsequent to the plutonic intrusion was the emplacement of short-arced igneous ring-dikes into the granite and gabbro rock, producing an elliptical shaped deposit known as the Paloma Valley ring complex (Morton and Baird, 1976). As the rocks of Paloma Valley ring complex weather, the gabbro is more resistant than the granite, granodiorite and igneous ring-dikes, therefore, they generally produce the remnant hills seen in the area, including the two hills onsite.

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The project site is underlain by Cretaceous-age gabbro (Kennedy and Morton, 2003; and Geosoils Inc., 2005), or more specifically it is known as the San Marcos gabbro (Miller, 1937). The San Marcos gabbro is medium- to very coarse-grained, with a mineral composition of abundant hornblende, and minor amounts of quartz, biotite and plagioclase (Larsen, 1948; Kennedy and Morton, 2003). An onsite geophysical investigation by Geosoils, Inc. (2005) found that the gabbro to be weathered to varying depths of about 30 to 86 feet across the site from south to north, respectively.

The project site, like the rest of southern California, is located within a seismically active region. Based on published data (Bryant and Hart, 2007), the most significant known active fault zones that are capable of seismic ground shaking and can impact the site include, the Elsinore Fault Zone, to the southwest and the San Jacinto Fault Zone to the east. The Wildomar fault splay of the Elsinore Fault Zone is closest to the site at about 3.5 miles to the southwest (CGS, 2017), and is capable of generating an earthquake of M6.8. No faults are known to exist on the Costco site and no known faults are mapped trending towards the site (Kennedy and Morton, 2003; and CGS, 2017).

The site is expected to experience strong ground shaking within the life of the Costco building. Liquefaction is not a hazard at the site and the site is not in a CGS-designated liquefaction zone (CGS, 2017; Silva et al., 2017). Groundwater is not reported present onsite (Silva et al., 2017; and Geosoils, Inc., 2005) and the San Marcos gabbro is composed of interlocking minerals with little to no permeability.

FINDINGS

Based on the results of our geotechnical review and the assumption that the current mass grading operations will excavate bedrock to an elevation of approximately 1,531 feet (this includes a 5-foot overexcavation) and place a 5-foot fill blanket, it is our professional opinion that the proposed project is geotechnically feasible. The primary geotechnical consideration is the presence of extremely hard bedrock conditions. Based on onsite geophysical investigation by Geosoils, Inc. (2005), the bedrock beneath the building pad, the fuel facility and most of the parking area will most likely be unrippable and may need to be blasted to aid excavations into it. The Geosoils investigation indicated the parking area to the east of the warehouse may be rippable down to an elevation of 1,502 feet.

The following present comments need to be addressed or require clarification.

- The developer needs to clarify whether the 5-foot overexcavation includes the entire site or just the Costco building pad. Furthermore, clarification is needed whether the 5-foot overexcavation extends below the Costco warehouse finished floor slab elevation (FFE) or the finished pad grade, which is one foot lower.
- The developer needs to provide information on soil materials they plan to use to backfill the overexcavation. At this time, we recommend that the materials meet and be placed in accordance with the criteria outlined in the Costco Wholesale Development Requirements (CWDRs) manual, dated September 19, 2016.

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- At the completion of the current mass grading operations, it would be beneficial to acquire any reports the grading contractor or developer's geotechnical engineer produces. These reports may provide helpful information on bedrock condition in the excavated areas. In addition, it is recommended that a seismic refraction study be performed as well to assess the excavatability of the bedrock once mass grading is complete.
- Numerous excavations within the warehouse building pad and fuel facility will extend deeper than 5 feet below the finished grades, such the loading dock area foundations, UST excavations, and canopy footing excavations. Will the developer be overexcavating deeper in these areas?
- It is not known if slopes or retaining walls will be used to achieve changes in pad elevations or grades. However, whichever is used, excavations into hard bedrock will be required to construct slopes or retaining walls.
- It is anticipated that some utilities, such as storm drains and sewer lines, will extend deeper than 5 feet below the finished grades. It is recommended that a conceptual utility plan be developed to identify areas where excavation in hard bedrock will occur.
- Where blasting is utilized, large blocks of rock will be produced and, therefore, spoil removal should include the handling of oversized bedrock materials. Furthermore, the bedrock spoils may not be suitable for backfill. The project budget should include provisions for import fill or sand-cement slurry backfill and the disposal of oversized materials.
- The onsite bedrock has very little to no infiltration capacity, and, therefore, will not absorb rainfall or storm water. Surface drainage should be designed to effectively transmit storm water offsite. Due to poor draining subgrade, it is recommended that radial finger drains that extend out from catch basins/drainage inlets be installed below the pavement sections. In addition, infiltration Best Management Practices (BMPs) are not considered a viable option for use at the site.

CLOSING

This work was performed in a manner consistent with that level of care and skill ordinarily exercised by other members of Kleinfelder's profession practicing in the same locality, under similar conditions, and at the date the services are provided. Our conclusions, opinions, and recommendations are based on a limited number of observations and data. It is possible that conditions could vary between or beyond the data evaluated. Kleinfelder makes no other representation, guarantee, or warranty, express or implied, regarding the services, communication (oral or written), report, opinion, or instrument of service provided.

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We appreciate the opportunity to be of professional service to you on this project. If you have any questions or require additional information, please do not hesitate to contact the undersigned.

Respectfully submitted,

KLEINFLDER, INC.



Robert Lemmer, PG, CEG
Principal Engineering Geologist

Brian E. Crystal, PE, GE
Senior Project Manager

Attachment: References

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Bryant, W.A. and Hart, E.W., 2007, Fault-Rupture Hazard Zones in California, Alquist-Priolo Earthquake Fault Zoning Act with Index to Earthquake Fault Zones Maps: California Geologic Survey Special Publication 42, 42p.

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GPI GEOTECHNICAL PROFESSIONALS INC

November 13, 2017

CK 17, L.P.
c/o Retail Development Advisors
27890 Clinton Keith Road, Suite D-490
Murrieta, California 92562

Attention: Mr. Allan Davis

Subject: Report of Percolation Testing/Infiltration Rates
and Opinion Regarding USDA Soil Type
Proposed The Vineyards Retail Development
NEC Clinton Keith Road and 215 Freeway
Murrieta, California
GPI Project No. 2833.1I

Dear Mr. Davis:

As requested, this report presents the results of percolation testing performed by Geotechnical Professionals Inc. (GPI) for the design of storm water management systems for the subject project. We previously performed a preliminary geotechnical investigation for the project that included subsurface explorations and laboratory testing in the vicinity of the testing (GPI, 2017).

The testing was performed to provide an estimate of infiltration of water for disposal of storm water runoff. We also performed our work to better define the appropriate soil type for USDA National Resources Conservation Service (USDA, 2017) classification. The location of the site is shown on the attached Site Location Map, Figure 1.

Based on information provided by Excel Engineering, the Project Civil Engineer, we understand that stormwater basins are planned at the southeast portion of the site. Excel provided us with the planned bottom elevations of the basins, and staked the locations and ground surface elevations in the field prior to our testing. The location of the proposed infiltration system is shown on the attached Site Plan, Figure 2.

SCOPE OF SERVICES

Our scope of work consisted of excavating four percolation test pits with an excavator, field percolation testing, and preparation of this report. We previously performed exploratory borings in the vicinity of the percolation test pits and provided the results in our preliminary geotechnical investigation report. We performed our scope of services in general accordance with the County of Riverside Guidelines (County, 2011). We established the depths of the test pits based on information provided by the Project Civil Engineer.

We previously investigated the subsurface conditions at the percolation test locations by drilling four borings to depths of 11 to 16 feet below the existing ground surface. The

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explorations were advanced to depths about 10 to 12 feet below the bottom of the test pits. The locations of the prior explorations and new test pits are shown on Figure 2.

The exploratory borings were drilled using hollow-stem auger drill equipment. Relatively undisturbed samples were obtained using a brass-ring lined sampler (ASTM D 3550). At selected locations, disturbed samples were obtained using a split-spoon sampler by means of the Standard Penetration Test (SPT, ASTM D 6066).

SUBSURFACE CONDIONS

Our field investigation disclosed a subsurface profile consisting of weathered granitic bedrock over moderately weathered granitic bedrock. Detailed descriptions of the subsurface conditions encountered by GPI are shown on the Logs of Borings 3.1 to 3.4.

We did not encounter groundwater within the 16-foot depth recently explored.

RESULTS OF LABORATORY TESTING

Selected soil samples were dried, weighed, soaked in water until individual soil particles were separated, and then washed on the No. 200 sieve in accordance with ASTM D 422. That portion of the material retained on the No. 200 sieve was oven-dried and weighed to determine the percentage of the material passing the No. 200 sieve by weight (silt and clay particles). A summary of the test results is presented below.

BORING NO.	DEPTH (ft)	SOIL DESCRIPTION	PERCENT PASSING No. 200 SIEVE
B-14	0 – 5	Weathered – Granitic Bedrock/Silty Sand (SM)	38
B-17	0 – 5	Weathered – Granitic Bedrock/Silty Sand (SM)	35

We determined moisture content and dry density from selected samples. The samples were first trimmed to obtain volume and wet weight and then were dried in accordance with ASTM 2216-71. After drying, we measured the weight of each sample, and moisture content and dry density were calculated. Moisture content and dry density values are presented on the boring logs.

PERCOLATION TEST PITS AND TESTING

We constructed the excavator test pits in general accordance with the guidelines provided by the County. The test pits extended approximately 2 to 3 feet below existing grades and varied between 4 feet by 5 feet and 4 feet by 6 feet in plan. Specifically:

- Test Pit P-1 (BMP-14), Test Elevation – 1,501 feet, Test Pit Area 4 by 6 feet
- Test Pit P-2 (BMP-12A), Test Elevation – 1,503 feet, Test Pit Area 4 by 5 feet
- Test Pit P-3 (BMP-12B East), Test Elevation – 1,503 feet, Test Pit Area 4 by 6 feet
- Test Pit P-4 (BMP-12B West), Test Elevation – 1,505 feet, Test Pit Area 4 by 6 feet

Prior to performing the percolation tests, we introduced water into the test pits to pre-soak the soils. We pre-soaked and tested the subsurface soils in accordance with the County guidelines (County, 2011). Water was allowed to stand in the test pits for approximately

22 hours prior to testing. Subsequent to the prescribed presoaking in the County guidelines, at least five percolation tests were performed in each test pit over a period of 1 hour (5 hours of testing for each test pit), measuring the drop in water levels for each test period (open-pit falling head procedure). We measured the infiltration rate during the saturation period (October 12, 2017) in addition to the infiltration testing on the following day (October 13, 2017).

The infiltration rates were calculated using the drop in water level over the last two test increments after confirming stabilized readings. The results of the calculated infiltration rate for each test are presented Table 1, Open Pit Infiltration Test Results.

FINDINGS AND RECOMMENDATIONS

FIELD INFILTRATION RATES

The results of the percolation tests indicate infiltration rates ranging from 0.13 to 0.38 inches per hour (in/hr). These results are both above and below the generally accepted minimum infiltration rate of 0.3 in/hr. As required in the guidelines, the infiltration rate for the last test at each test pit location and depth should be used for design of the storm water infiltration system corresponding to that depth.

The storm water infiltration system should be designed by the Project Civil Engineer using the pertinent County guidelines. The designer should incorporate adequate factors of safety that consider the long-term performance of the system. We also recommend that the design allow for overflow into appropriate traditional storm drain systems that would transport the storm water off-site.

It should be noted that these infiltration rates are for clean, clear water and do not include effects of sediment, fines, dissolved solids or any other debris as the materials will significantly reduce the infiltration rates of the subsurface soils. Prior to infiltration, water should be cleaned of sediment or other deleterious materials to help reduce the potential for clogging and reduced infiltration rates.

It is possible that the long-term rate infiltration may be lower than the values obtained by the relatively short-term testing prescribed in the guidelines. Infiltration may be influenced by a combination of factors including but not limited to variable vertical soil conditions and limited lateral extent of permeable soil layers. Accordingly, the possibility of future surface ponding of water as well as groundwater impacts on subterranean structures, pavements, and utilities should be anticipated as possible future conditions in the design aspects of the project site.

Infiltrating storm water on-site creates an increased risk of adverse, water-related conditions. Increasing the moisture content of some soils can change their engineering characteristics, including shear strength and compressibility. Improvements supported over areas of storm water infiltration could be adversely affected by the soil saturation. As such, we recommend the County guidelines for locating the infiltration system away from structures be followed. If subterranean structures are planned that would be adversely affected by water, considerations should be given to increasing the lateral off-set distances.

From a geotechnical standpoint, we recommend that open graded materials, such as gravel or crushed rock, used in construction of infiltration facilities be completely encapsulated in a non-woven filter fabric such as Mirafi 140N or equivalent.

GPI should be provided with the storm water infiltration system plans to review for conformance with our report. Also, a representative of GPI should be on-site during the construction of the storm water infiltration system to confirm that the soils exposed are consistent with those encountered in our explorations.

USDA SOIL TYPE

The shallow subsurface materials at the subject site consist of weathered granitic bedrock. Although localized areas of loose, highly weathered materials were encountered to depths of up to about 5 feet, the clear majority of our explorations across the site encountered dense to very dense, moderately weathered granitic materials at the ground surface. These findings are consistent with the prior findings by others at the site.

Based on our findings, the infiltration rate of the near-surface materials was found to be as low as 0.13 in/hr and as high as 0.38 in/hr. The infiltration rate is anticipated to approach zero in the less weathered materials at depth. The USDA Natural Resources Conservation Service guidelines define Soil Types C and D as follows:

- Soil Type C – If the measured saturated hydraulic conductivity is between 0.06 and 1.42 in/hr, and the depth to any water impermeable layer is greater than 20 inches. Alternatively, if the depth to any water impermeable layer is greater than 40 inches, and the saturated hydraulic conductivity within a depth of 40 inches is between 0.06 and 0.57 in/hr.

- Soil Type D – If the measured saturated hydraulic conductivity is 0.14 in/hr or less and the depth to any water impermeable layer is 20 to 40 inches. Alternatively, if the depth to any water impermeable layer is greater than 40 inches, and the saturated hydraulic conductivity within a depth of 40 inches is less than or equal to 0.06 in/hr.

Based on our on-site findings, the surficial soils can be categorized as Group C in three of the four test pits (P-1, 2, and 3) and Group D in Test Pit P-4.

LIMITATIONS

The role of GPI is limited to determination of infiltration rates only. This report, exploration logs, and other materials resulting from GPI's efforts were prepared exclusively for use by CK 17, L.P., Felicita, Inc. and their consultants in designing the proposed development. The report is not intended to be suitable for reuse on extensions or modifications of the project or for use on a project other than the currently proposed development, as it may not contain sufficient or appropriate information for such uses. If this report or portions of this report are provided to contractors or included in specifications, it should be understood that they are provided for information only. This report cannot be utilized by another entity without the express written permission of GPI. This report is an instrument of our services and remains the property of GPI.

Soil deposits may vary in type, strength, and many other important properties between points of exploration due to non-uniformity of the geologic formations or to man-made cut and fill operations. While we cannot evaluate the consistency of the properties of materials in areas not explored, the conclusions drawn in this report are based on the assumption that the data obtained in the field and laboratory are reasonably representative of field conditions and are conducive to interpolation and extrapolation.

Furthermore, our recommendations were developed with the assumption that a proper level of field observation and construction review will be provided during grading, excavation, and foundation construction by GPI. If field conditions during construction appear to be different than what is indicated in this report, we should be notified immediately so that we may assess the impact of such conditions on our recommendations. If construction phase services are performed by others, they must accept full responsibility for the geotechnical aspects of the project, including this report.

Our investigation and evaluations were performed using generally accepted engineering approaches and principles available at this time and the degree of care and skill ordinarily exercised under similar circumstances by reputable Geotechnical Engineers practicing in this area. No other representation, expressed or implied, is included or intended in our report.

Respectfully submitted,
Geotechnical Professionals Inc.





Dylan J. Boyle, P.E.
Project Engineer

Paul R. Schade, G.E.
Principal

PS:sph

Enclosures: References
Table 1 - Open Pit Infiltration Test Results
Figure 1 - Site Location Map
Figure 2 - Site Plan
Figure 3 - Logs of Borings

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REFERENCES

County of Riverside (2011), Technical Guidance Document Appendix VII, Infiltration Rate Evaluation Protocol and Factor of Safety Recommendations, May 19, 2011

Geotechnical Professionals Inc. (2017), Preliminary Geotechnical Investigation, Proposed Vineyard/Val Vista Center, NEC Clinton Keith Road and 215 Freeway, Murrieta, California, Project No. 2833.I, dated September 7, 2017

United States Department of Agriculture, Natural Resources Conservation Service (2017), Part 630 Hydrology National Engineering Handbook, Chapter 7, dated May 2007

Table 1 - Open Pit Infiltration Test Results
The Vineyards, Murrieta
GPI Project No. 2833.I

Open Pit Falling Head Test Results

Test Pit No.	Date	Elapsed Time (minutes)	Depth Start (inches)	Depth Finish (inches)	Drop in Level (Inches)	Measured Rate (in/hr)
P-1	10/12/17	60	24.000	18.500	5.500	5.5
P-1	10/12/17	60	18.500	15.250	3.250	3.25
P-1	10/12/17	60	15.250	13.000	2.250	2.25
P-1	10/12/17	60	24.000	20.500	3.500	3.5
P-1	10/13/17	60	18.000	17.500	0.500	0.5
P-1	10/13/17	60	18.000	17.500	0.500	0.5
P-1	10/13/17	60	17.500	17.000	0.500	0.5
P-1	10/13/17	60	17.000	16.625	0.375	0.375
P-1	10/13/17	60	16.625	16.250	0.375	0.375
				Stabilized Infiltration (last 3 trials) =		**0.38**

Test Pit No.	Date	Elapsed Time (minutes)	Depth Start (inches)	Depth Finish (inches)	Drop in Level (Inches)	Measured Rate (in/hr)
P-2	10/12/17	60	24.000	17.000	7.000	7
P-2	10/12/17	60	17.000	15.625	1.375	1.375
P-2	10/12/17	60	24.000	22.375	1.625	1.625
P-2	10/12/17	60	22.375	20.625	1.750	1.75
P-2	10/13/17	60	18.000	17.375	0.625	0.625
P-2	10/13/17	60	17.375	16.875	0.500	0.5
P-2	10/13/17	60	16.875	16.500	0.375	0.375
P-2	10/13/17	60	16.500	16.125	0.375	0.375
P-2	10/13/17	60	16.125	15.750	0.375	0.375
				Stabilized Infiltration (last 3 trials) =		**0.38**

Test Pit No.	Date	Elapsed Time (minutes)	Depth Start (inches)	Depth Finish (inches)	Drop in Level (Inches)	Measured Rate (in/hr)
P-3	10/12/17	60	24.000	18.000	6.000	6
P-3	10/12/17	60	18.000	16.000	2.000	2
P-3	10/12/17	60	24.000	22.500	1.500	1.5
P-3	10/12/17	60	22.500	21.000	1.500	1.5
P-3	10/13/17	60	18.000	17.000	1.000	1
P-3	10/13/17	60	18.000	17.250	0.750	0.75
P-3	10/13/17	60	17.250	16.750	0.500	0.5
P-3	10/13/17	60	16.750	16.375	0.375	0.375
P-3	10/13/17	60	16.375	16.000	0.375	0.375
				Stabilized Infiltration (last 3 trials) =		**0.38**

Test Pit No.	Date	Elapsed Time (minutes)	Depth Start (inches)	Depth Finish (inches)	Drop in Level (Inches)	Measured Rate (in/hr)
P-4	10/12/17	60	24.000	20.250	3.750	3.75
P-4	10/12/17	60	20.250	19.500	0.750	0.75
P-4	10/12/17	60	24.000	22.000	2.000	2
P-4	10/12/17	60	22.000	20.000	2.000	2
P-4	10/13/17	60	18.000	17.750	0.250	0.25
P-4	10/13/17	60	17.750	17.500	0.250	0.25
P-4	10/13/17	60	17.500	17.250	0.250	0.25
P-4	10/13/17	60	17.250	17.125	0.125	0.125
P-4	10/13/17	60	17.125	17.000	0.125	0.125
				Stabilized Infiltration (last 3 trials) =		**0.13**



BASE MAP REPRODUCED FROM MICROSOFT STREETS AND TRIPS © 2008

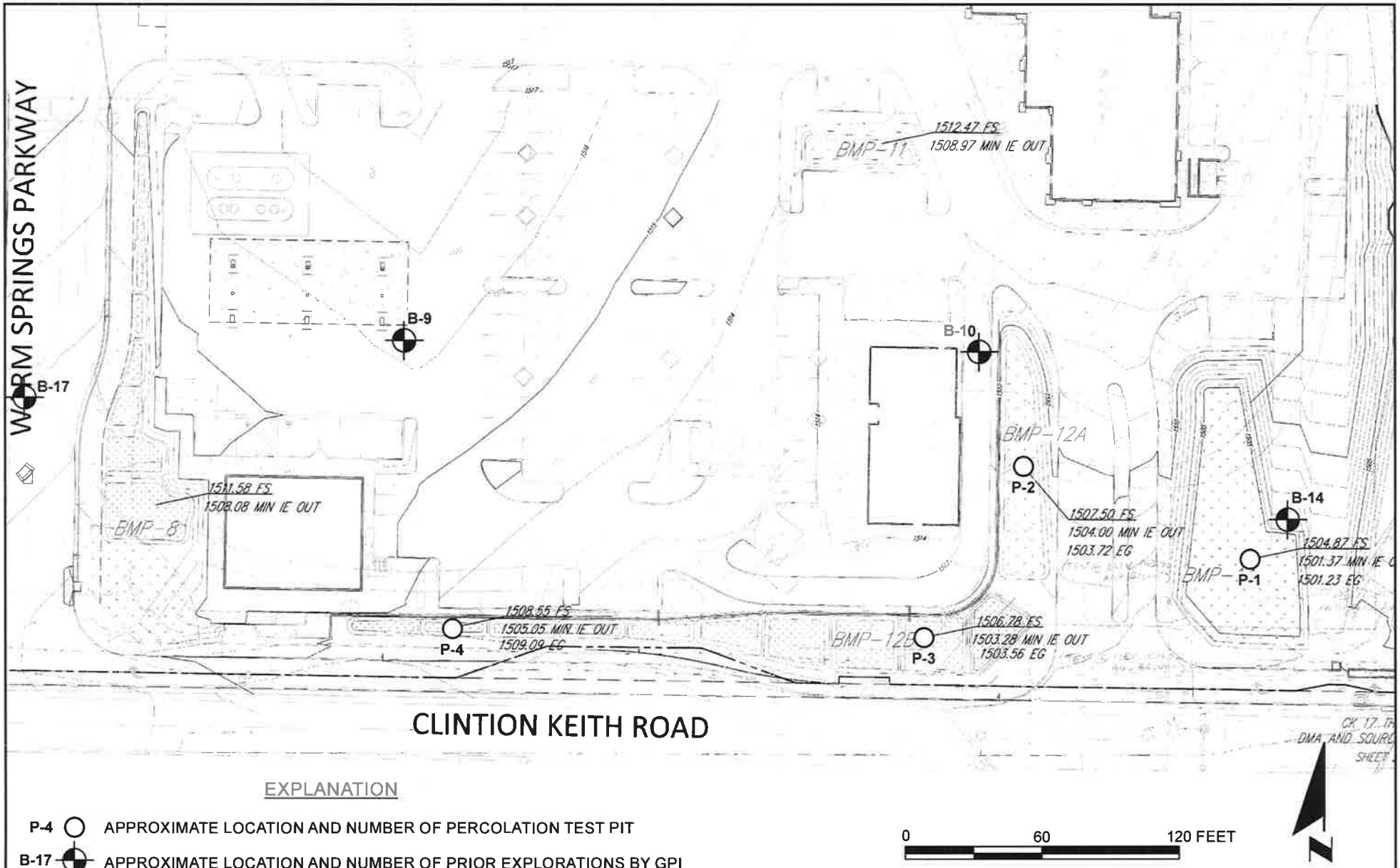
GPI GEOTECHNICAL PROFESSIONALS, INC.

VINEYARDS RETAIL DEVELOPMENT

GPI PROJECT NO.: 2833.1I | SCALE: 1" = 2000'

SITE LOCATION MAP

FIGURE 1



BASE MAP REPRODUCED FROM SOIL INFILTRATION EXHIBIT PROVIDED BY CK-17, LP: DATED 10-02-2017

GPI GEOTECHNICAL PROFESSIONALS, INC.

VINEYARDS RETAIL DEVELOPMENT

GPI PROJECT NO.: 2833.1I | SCALE: 1" = 60'

SITE PLAN

FIGURE 2

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
				0	This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
					Weathered Granitic Bedrock: **SILTY SAND (SM)** brown, moist	1515
10.1	125	58	D		@ 2 ft, dense, with gravel	
2.9		50/5"	D	5	Moderately Weathered Granitic Bedrock: **SAND WITH SILT(SP-SM)** light brown, dry, very dense, with gravel	1510
1.6		50/4"	S		**SILTY SAND (SM)** light brown, dry, with trace of gravel	
1.4		50/3"	S	10	**SAND WITH SILT (SP-SM)** light brown, dry, very dense, with gravel	1505
1.7		50/3"	S	15		
					Total Depth 16 ft	1500

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 1-19-09

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2833.I

VINEYARD/VAL VISTA

LOG OF BORING NO. B-9

FIGURE 3.1

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
				0	Weathered Granitic Bedrock: **SILTY SAND (SM)** brown, moist	1505
6.2	136	80/10"	D		Moderately Weathered Granitic Bedrock: **SILTY SAND (SM)** brown, slightly moist, very dense, with gravel	
1.3		50/3"	D	5	**SAND WITH SILT (SP-SM)** with gravel, brown, dry, very dense	1500
4.6		50/1"	D		**SILTY SAND (SM)** with gravel, light brown, slightly moist, very dense	
		50/5"	D	10	@ 10 ft, no sample recovery	1495
1.0		50/4"	D	15	**SAND WITH SILT (SP-SM)** grey, dry, very dense, with gravel	
					Total Depth 16 ft	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 1-19-09

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2833.I
VINEYARD/VAL VISTA

LOG OF BORING NO. B-10

FIGURE 3.2

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
			B	0	Natural Soil: **SANDY SILT (ML)** brown, moist, trace of clay	
12.0	125	34	D		Weathered Granitic Bedrock: **SILTY SAND (SM)** light brown, moist, medium dense	1500
1.9		50/4"	D	5	Moderately Weathered Granitic Bedrock: **SAND WITH SILT (SP-SM)** brown, dry, very dense, with gravel	
2.2		50/4"	S			1495
2.2		50/3"	S	10		
						1490
7.0		73	S	15	**SILTY SAND (SM)** grey to brown, slightly moist, very dense, with gravel	
					Total Depth 16 ft	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 1-19-09

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not encountered

GPI

PROJECT NO.: 2833.I

VINEYARD/VAL VISTA

LOG OF BORING NO. B-14

FIGURE 3.3

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	ELEVATION (FEET)
			B	0	Natural Soil: **SILTY SAND (SM)** brown, moist	
5.5	92	11	D		**SANDY SILT (ML)** light brown, slightly moist, firm, with gravel	1515
1.9	133	80/11"	D	5	Moderately Weathered Granitic Bedrock: **SILTY SAND (SM)** light brown, dry, very dense	
		50/5"	S		@ 7 ft, no sample recovery	
						1510
2.4		50/1"	S	10	@ 10 ft, grey, with gravel	
					Total Depth 11 ft	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 1-20-09

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not encountered

GPI

PROJECT NO.: 2833.I
VINEYARD/VAL VISTA

LOG OF BORING NO. B-17

FIGURE 3.4

Appendix 4: Historical Site Conditions

Phase I Environmental Site Assessment or Other Information on Past Site Use

Appendix 5: LID Infeasibility

LID Technical Infeasibility Analysis

Appendix 6: BMP Design Details

BMP Sizing, Design Details and other Supporting Documentation

Santa Margarita Watershed

BMP Design Volume, V_{BMP} (Rev. 03-2012)

Legend: Required Entries / Calculated Cells

(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)

Company Name	Costco Wholesale	Date	6/21/2018
Designed by	Fuscoe Engineering	County/City Case No	TPM 37511
Company Project Number/Name	0756-055 / Costco Murrieta		
Drainage Area Number/Name	PD-A1-3B		

Enter the Area Tributary to this Feature A_T = 0.405 acres

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

Site Location

Township 07S

Range 03W

Section 35

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.60

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Mixed Surface Types

Effective Impervious Fraction I_f = 0.90

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$ C = 0.73

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$ V_u = 0.44 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 647 ft^3

Notes:

Biofiltration with No Infiltration Facility - Design Procedure	BMP ID PD-A1-3B	Legend:	Required Entries / Calculated Cells
Company Name:	Fuscoe Engineering	Date:	7/6/2018
Designed by:	J. Garcia	County/City Case No.:	TPM 37511

Design Volume

Enter the area tributary to this feature	A_T =	0.405	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP} =	647	ft^3
Estimated footprint of BMP, $Area_{BMP}$ (available space or 3% imp. area)	$Area_{BMP}$ =	950	ft^2

Note: This area shall be measured at the mid-ponding depth of the BMP. For systems with side-slopes, this should be the contour that is midway between the floor of the basin and the maximum water quality ponding elevation of the basin. The underlying gravel layer for drain pipes should extend to this contour. For systems with vertical walls, the effective area is the full footprint.

Biofiltration with No Infiltration Facility Surface Area

Depth of Surface Ponding Layer (6" minimum, 12" maximum)	d_P =	6.0	inches
Depth of Engineered Soil Media (24" to 36"; 18" if vertically constrained)	d_S =	36.0	inches
Design Media Filtration Rate (2.5 in/hr)	I_{design} =	2.5	in/hr
Allowable Routing Period, $T_{routing}$ (5 hrs)	$T_{routing}$ =	5.0	hr
Effective Biofiltration Depth, d_{E_bio} d_{E_bio} (ft) = (d_P + (0.3 x d_S) + (I_{design} * $T_{routing}$)) (ft)	d_{E_bio} =	2.4	ft
Effective Static Depth, $d_{E\_bio\_static}$ $d_{E\_bio\_static}$ = (d_P + (0.3 * d_S)) (ft)	$d_{E\_bio\_static}$ =	1.4	ft
$V_{biofiltered}$ = d_{E_bio} * $Area_{BMP}$	$V_{biofiltered}$ =	2319.6	ft^3
$V_{biofiltered\_static}$ = $d_{E\_bio\_static}$ * $Area_{BMP}$	$V_{biofiltered\_static}$ =	1330.0	ft^3

Sizing Option 1 Result

Criteria 1: $V_{biofiltered\ (with\ routing)} \geq 150\%$ of V_{BMP} — Results: PASS

Sizing Option 2 Result

Criteria 2: $V_{biofiltered\_static} \geq 0.75$ x V_{BMP} — Results: PASS

Note

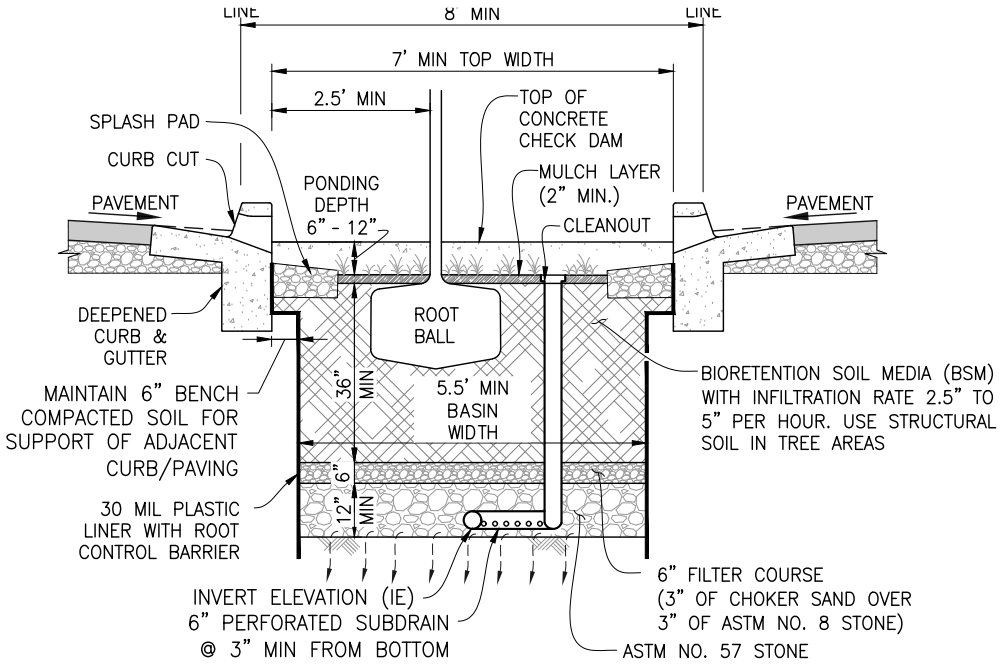
If neither of these criteria are met increase the footprint and rerun calculations. This calculation is inherently iterative.

Biofiltration with No Retention Facility Properties		
Side Slopes in Partial Retention with Biofiltration Facility	z = 4	:1
Diameter of Underdrain	6	inches
Longitudinal Slope of Site (3% maximum)	0	%
Check Dam Spacing	0	feet
Describe Vegetation:	Shrubs	

Notes:

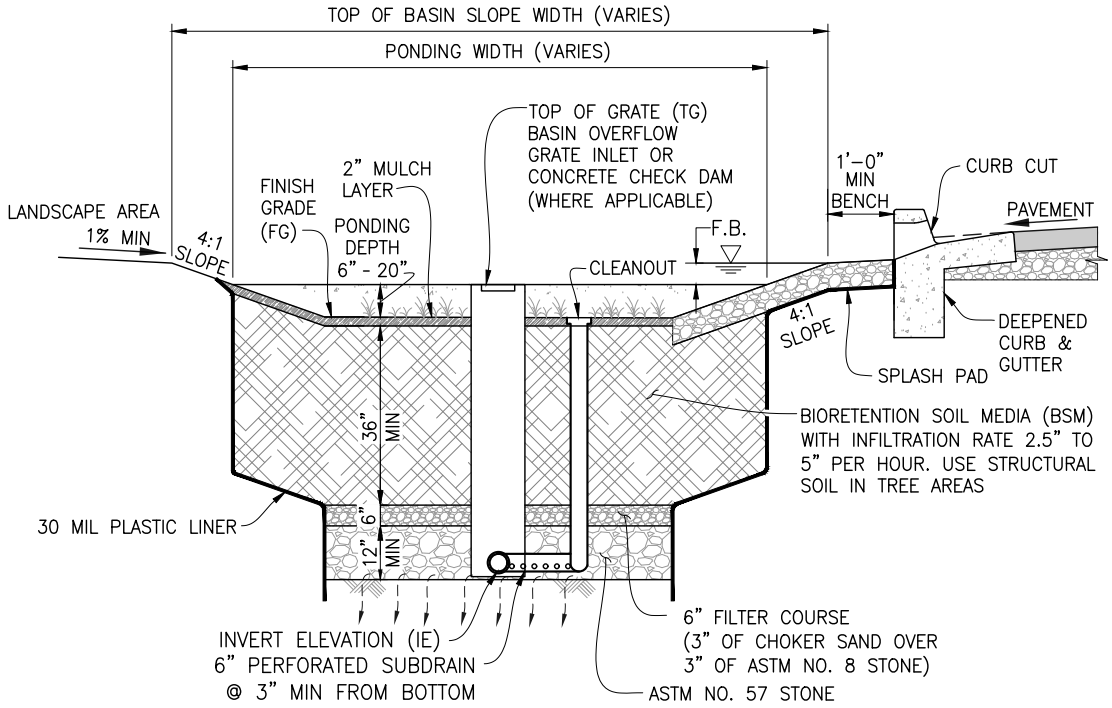
DMA ID	DMA TYPE	DRAINS TO BMP	POC OUTLET	TOTAL (AC)	TOTAL (SF)	Design WQ DCV Vol (cf)	BMP MIN AREA (SF)	LANDSC (AC)	IMPERV AREA (AC)	IMPERV (%)
PD-A1-2	DRAINS TO BMP	BMP 02	POC-1	0.478	20,822	573	780	0.12	0.36	75
PD-A1-1	DRAINS TO BMP	BMP 01	POC-1	1.000	43,560	1,307	2,000	0.20	0.80	80
PD-A1-3A	DRAINS TO BMP	BMP 03A	POC-1	0.497	21,649	794	929	0.05	0.45	90
PD-A1-3B	DRAINS TO BMP	BMP 03B	POC-1	0.405	17,642	647	760	0.04	0.36	90
PD-A1-3C	DRAINS TO BMP	BMP 03C	POC-1	0.402	17,511	642	785	0.04	0.36	90
PD-A1-3D	DRAINS TO BMP	BMP 03D	POC-1	0.243	10,585	388	615	0.02	0.22	90
PD-A1-3E	DRAINS TO BMP	BMP 03E	POC-1	0.473	20,604	755	824	0.05	0.43	90
PD-B2-6	DRAINS TO BMP	BMP-06	POC-2	0.642	27,966	1,119	212	0.03	0.61	95
PD-B2-4A	DRAINS TO BMP	BMP-04A	POC-2	0.294	12,807	470	613	0.03	0.26	90
PD-B2-4B	DRAINS TO BMP	BMP-04B	POC-2	0.649	28,270	942	1,001	0.10	0.55	85
PD-B2-4C	DRAINS TO BMP	BMP-04C	POC-2	0.387	16,858	562	430	0.06	0.33	85
PD-B2-4D	DRAINS TO BMP	BMP-04D	POC-2	0.320	13,939	511	430	0.03	0.29	90
PD-B2-4E	DRAINS TO BMP	BMP-04E	POC-2	0.322	14,026	468	513	0.05	0.27	85
PD-B2-A	SELF MITIGATING	N/A	POC-2	0.095	4,138	7	-	0.10	0.00	0
PD-B2-B	SELF MITIGATING	N/A	POC-2	0.387	16,858	28	-	0.39	0.00	0
PD-B2-C	SELF MITIGATING	N/A	POC-2	0.094	4,095	7	-	0.09	0.00	0
PD-B2-5A	DRAINS TO BMP	BMP-05A	POC-2	0.281	12,240	449	284	0.03	0.25	90
PD-B2-5B	DRAINS TO BMP	BMP-05B	POC-2	0.309	13,460	494	281	0.03	0.28	90
PD-B2-5C	DRAINS TO MWS	BMP-05C	POC-2	0.436	18,992	760	-	0.02	0.41	95
PD-B2-5D	DRAINS TO BMP	BMP-05D	POC-2	0.429	18,687	685	542	0.04	0.39	90
PD-B2-7	DRAINS TO MWS	BMP-07	POC-2	1.952	85,029	3,826	-	0.00	1.95	100
PD-C1-8	DRAINS TO BMP	BMP 08	POC-3	2.672	116,392	3,880	900	0.40	2.27	85
PD-C1-9	DRAINS TO BMP	BMP 09	POC-3	0.840	36,590	1,098	977	0.17	0.67	80
PD-C1-10A	DRAINS TO BMP	BMP 10A	POC-3	0.587	25,570	938	710	0.06	0.53	90
PD-C1-10B	DRAINS TO BMP	BMP 10B	POC-3	0.325	14,157	566	382	0.02	0.31	95
PD-C1-11	DRAINS TO BMP	BMP 11	POC-3	0.759	33,062	992	1,200	0.15	0.61	80
PD-C1-12A	DRAINS TO BMP	BMP 12A	POC-3	0.732	31,886	877	908	0.18	0.55	75
PD-C1-12B	DRAINS TO BMP	BMP 12B	POC-3	0.221	9,627	289	300	0.04	0.18	80
PD-C1-13	DRAINS TO BMP	BMP 13	POC-3	0.238	10,367	259	220	0.07	0.17	70
PD-C2-D	SELF MITIGATING	N/A	POC-3	1.514	65,950	110	-	1.51	0.00	0
TOTALS				17.983				4.13	13.86	77%

BMP ID	LID TYPE	SHOWN BMP BOTTOM AREA (SF)	MIN BMP AREA (SF)	AVG LENGTH (FT)	AVG WIDTH (FT)	SIDE SLOPES (H/V)	F.B. (IN)	POND DEPTH (IN)	SOIL LAYER DEPTH (IN)	GRAVEL LAYER DEPTH (IN)	DRAIN ORIFICE (IN)	RISER SIZE
BMP 02	BF/PI	980	780	78.0	10	4	6	6	36	12	0.65	CB24X24
BMP 01	BF/PI	2,865	2,000	100.0	20	4	6	6	36	12	0.92	CB36X36
BMP 03A	BF/PI	1,160	929	132.7	7	0	6	6	36	18	6	CB24X24
BMP 03B	BF/PI	950	760	108.6	7	0	6	6	36	18	6	CB24X24
BMP 03C	BF/PI	981	785	112.1	7	0	6	6	36	18	6	CB24X24
BMP 03D	BF/PI	769	615	87.9	7	0	6	6	36	18	6	CB24X24
BMP 03E	BF/PI	1,122	824	82.4	10	0	6	6	36	18	6	CB24X24
BMP-06	BF/PI	386	212	21.2	10	4	5	19	36	24	4.25	CB36X36
BMP-04A	BF/PI	893	613	122.5	5	0	6	6	36	18	4	CB24X24
BMP-04B	BF/PI	1,251	1,001	66.7	15	0	6	6	36	18	4	CB24X24
BMP-04C	BF/PI	538	430	86.0	5	0	6	6	36	18	4	CB24X24
BMP-04D	BF/PI	538	430	86.0	5	0	6	6	36	18	4	CB24X24
BMP-04E	BF/PI	641	513	102.6	5	0	6	6	36	18	4	CB24X24
SM-A	SM	0	-				0	0	0	0	N/A	N/A
SM-B	SM	0	-				0	0	0	0	N/A	N/A
SM-C	SM	0	-				0	0	0	0	N/A	N/A
BMP-05A	BF/PI	313	284	28.4	10	0	6	6	36	18	4	CB24X24
BMP-05B	BF/PI	317	281	28.1	10	0	6	6	36	18	4	CB24X24
BMP-05C	BF	0	-	13.0	4	N/A	0	0	0	0	N/A	MWS
BMP-05D	BF/PI	678	542	108.4	5	0	6	6	36	18	4	CB24X24
BMP-07	BF	0	-	20.0	8	N/A	0	0	0	0	N/A	MWS
BMP 08	BF/PI	1,230	900	90.0	10	4	3	15	36	18	6	CB36X36
BMP 09	BF/PI	977	977	65.1	15	4	6	18	36	12	0.5	CB36X36
BMP 10A	BF/PI	710	710	71.0	10	0	6	6	36	18	6	CB24X24
BMP 10B	BF/PI	382	382	76.4	5	0	6	6	36	18	6	CB24X24
BMP 11	BF/PI	1,286	1,200	80.0	15	4	2	10	36	18	0.6	CB36X36
BMP 12A	BF/PI	908	908	60.5	15	4	2	10	36	24	0.625	CB36X36
BMP 12B	BF/PI	448	300	60.0	5	4	2	10	36	18	0.333	CB24X24
BMP 13	BF/PI	275	220	44.0	5	4	3	9	36	18	0.4	CB24X24
SM-D	SM	0	-				0	0	0	0	N/A	N/A



TYPICAL BIORETENTION PARKING PLANTER SECTION

NOT TO SCALE

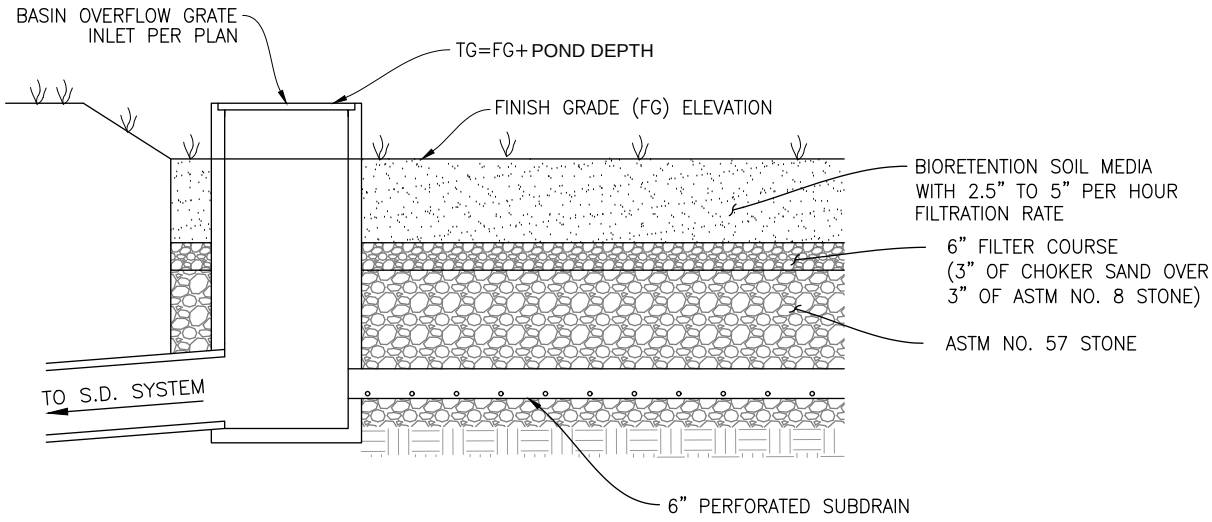


TYPICAL BIORETENTION BASIN SECTION

NOT TO SCALE

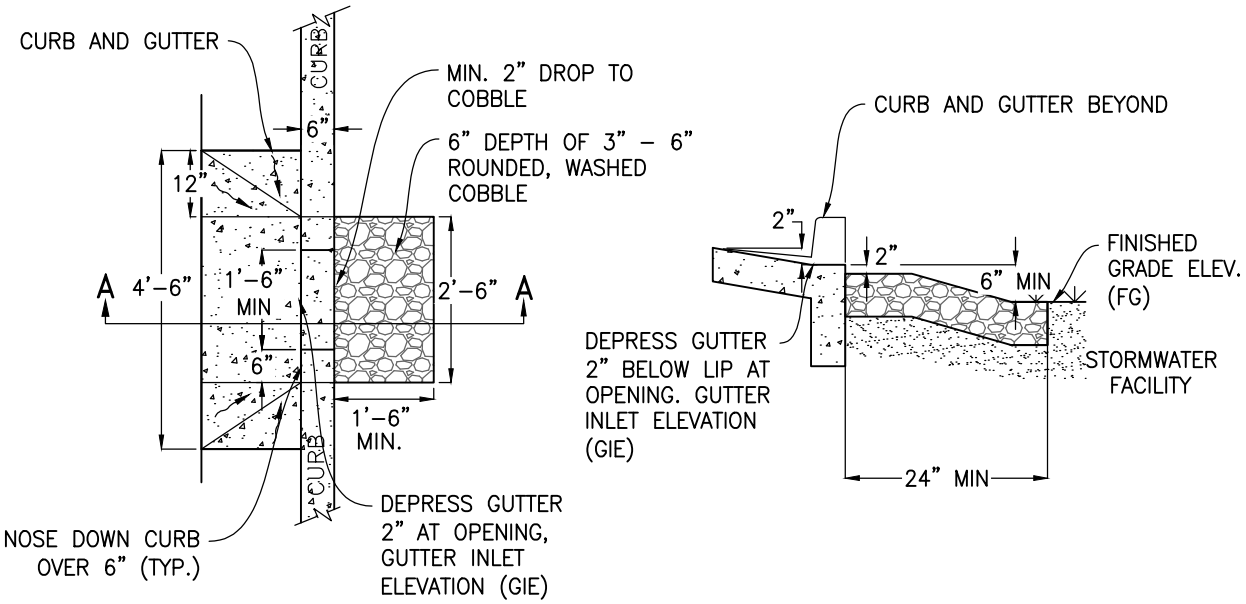
BMP DETAILS

COSTCO MURRIETA
MURRIETA, CA
9/11/2018



BIORETENTION TYPICAL LONGITUDINAL SECTION

N.T.S.



PLAN VIEW

SECTION A–A

CURB OPENING DETAIL

N.T.S.

BMP DETAILS

COSTCO MURRIETA

MURRIETA, CA

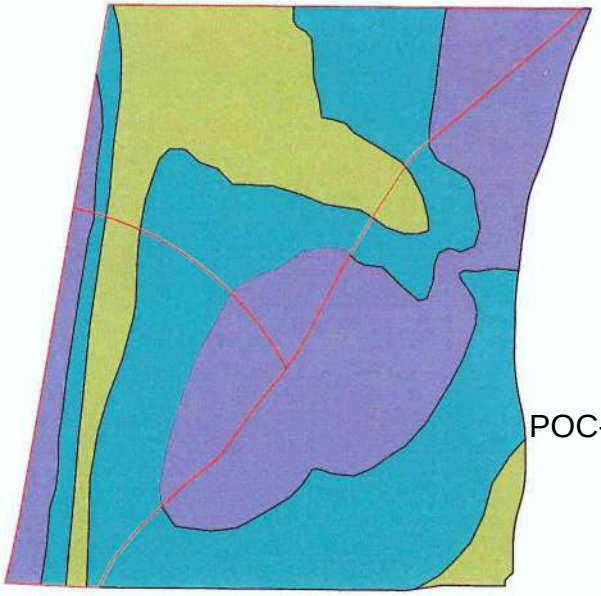
9/11/2018

Appendix 7: Hydromodification

Supporting Detail Relating to compliance with the HMP Performance Standards

Slopes Table			
lumber	Minimum Slope	Maximum Slope	Color
1	0.00%	5.00%	
2	5.00%	10.00%	
3	10.00%	20.00%	
4	20.00%	33351.79%	

POC-C

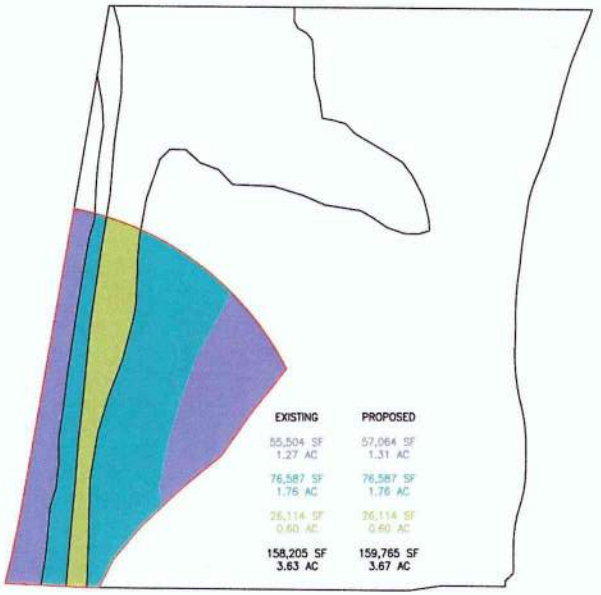


POC-B

POC-A

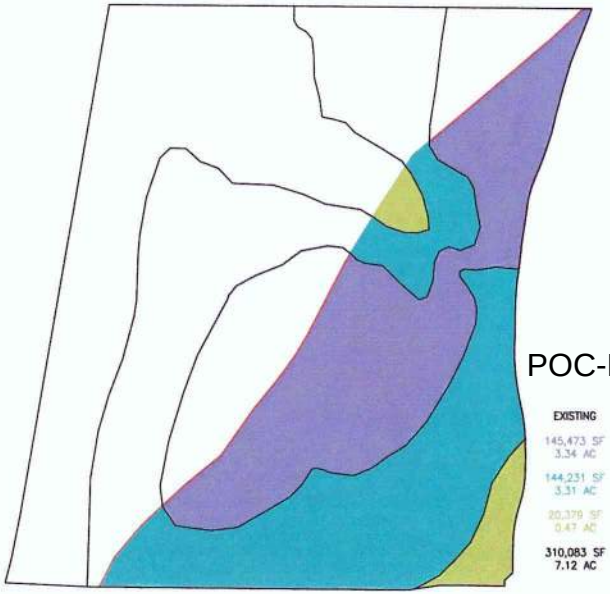
POC-C





POC-A

POC-B



SLOPE EXHIBIT

COSTCO MURRIETA
FUSCOE 2/23/2018

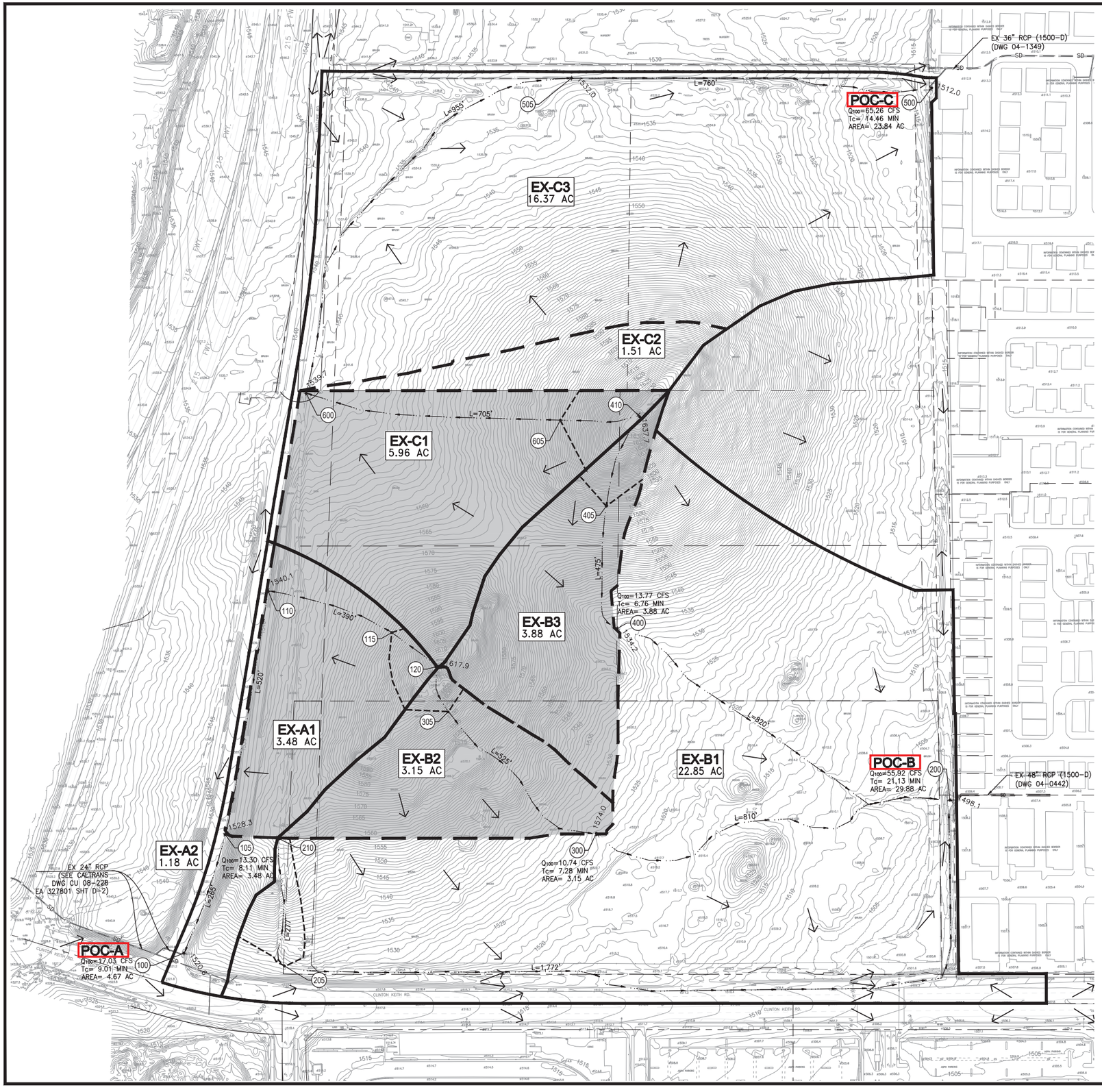
POC-C

POC-B

POC-A

Slopes Table			
Number	Minimum Slope	Maximum Slope	Color
1	0.00%	5.00%	
2	5.00%	10.00%	
3	10.00%	20.00%	
4	20.00%	33351.79%	

60'
SCALE



LEGEND

- PROPERTY LIMITS
- RIGHT-OF-WAY
- STREET CENTERLINE
- EXISTING STORM DRAIN — SD —
- EXISTING MAJOR CONTOUR — 260 —
- EXISTING MINOR CONTOUR — 259 —
- BASIN LIMITS
- SUB-BASIN LIMITS
- INITIAL SUB-AREA
- FLOW PATH
- DIRECTION OF FLOW
- HYDROLOGY NODE (100)
- BASIN DESIGNATION / BASIN AREA: EX-A1 / 3.48 AC

N

100' 0' 50' 100'

SCALE: 1" = 100'

COSTCO MURRIETA

EXISTING CONDITIONS HYDROLOGY MAP FOR REFERENCE

FUSCOE ENGINEERING
6390 Greenwich Dr., Suite 170
San Diego, California 92122
tel 858.554.1500 • fax 858.597.0335
www.fuscoe.com

JOB NO. 756-055

DRAWN BY: J.G.

SHEET 1 of 1

F:\Projects\756\055_Support Files\Reports\Hydrology\756-055HYD-EX.dwg (6/22/2018 9:01 AM) Plotted by: Jesus Garcia



LEGEND

PROPERTY LINE	
RIGHT-OF-WAY	
STREET CENTERLINE	
EXISTING STORM DRAIN	SD
EXISTING MAJOR CONTOUR	260
EXISTING MINOR CONTOUR	259
PROPOSED MAJOR CONTOUR	260
PROPOSED MINOR CONTOUR	259
BASIN LIMITS	
SUB-BASIN LIMITS	
INITIAL SUB-AREA	
FLOW PATH	
DIRECTION OF FLOW	→
HYDROLOGY NODE	(100)
BASIN DESIGNATION / BASIN AREA	PD-A1-1 3.48 AC

100' 0' 50' 100'

SCALE: 1" = 100'

COSTCO MURRIETA

PROPOSED CONDITIONS
HYDROLOGY MAP
FOR REFERENCE

FUSCOE
ENGINEERING
6390 Greenwich Dr., Suite 170
San Diego, California 92122
tel 858.554.1500 ∘ fax 858.597.0335
www.fuscoe.com

JOB NO. 756–055

DRAWN BY: J.G.

SHEET 1 of 1

F:\Projects\756\055_Support Files\Reports\Hydrology\756-055HYD-PR.dwg (6/22/2018 8:53 AM) Plotted by: Jesus Garcia

TABLE - DMA EXISTING SLOPE SUMMARY

POC	Area Total	Moderate	Steep	Very Steep	
POC-1	3.498	15%	46%	39%	
POC-2	6.597	7%	46%	47%	
POC-3	7.888	42%	39%	19%	
Totals	17.983	24%	43%	33%	100%

DMA	DMA TYPE	DRAINS TO BMP	POC OUTLET	% Imperv	Area Pervious (ac)	Area Impervious (ac)	DMA Area Total (ac)	Ex Area in Moderate Slope (ac)	Ex Area in Steep Slope (ac)	Ex Area in Very Steep Slope (ac)	Ex Area Subtotal (ac)	Ex Area in Moderate Slope Subtotal (ac)	Ex Area in Steep Slope Subtotal (ac)	Ex Area in Very Steep Slope Subtotal (ac)
PD-A1-2	DRAINS TO BMP	BMP 02	POC-1	75	0.120	0.358	0.478	0.072	0.220	0.186				
PD-A1-1	DRAINS TO BMP	BMP 01	POC-1	80	0.200	0.800	1.000	0.150	0.460	0.390				
PD-A1-3A	DRAINS TO BMP	BMP 03A	POC-1	90	0.050	0.447	0.497	0.075	0.229	0.194				
PD-A1-3B	DRAINS TO BMP	BMP 03B	POC-1	90	0.041	0.365	0.405	0.061	0.186	0.158				
PD-A1-3C	DRAINS TO BMP	BMP 03C	POC-1	90	0.040	0.362	0.402	0.060	0.185	0.157				
PD-A1-3D	DRAINS TO BMP	BMP 03D	POC-1	90	0.024	0.219	0.243	0.036	0.112	0.095				
PD-A1-3E	DRAINS TO BMP	BMP 03E	POC-1	90	0.047	0.426	0.473	0.071	0.218	0.184	2.020	0.303	0.929	0.788
PD-B2-6	DRAINS TO BMP	BMP-06	POC-2	95	0.032	0.610	0.642	0.045	0.295	0.302				
PD-B2-4A	DRAINS TO BMP	BMP-04A	POC-2	90	0.029	0.265	0.294	0.021	0.135	0.138				
PD-B2-4B	DRAINS TO BMP	BMP-04B	POC-2	85	0.097	0.552	0.649	0.045	0.299	0.305				
PD-B2-4C	DRAINS TO BMP	BMP-04C	POC-2	85	0.058	0.329	0.387	0.027	0.178	0.182				
PD-B2-4D	DRAINS TO BMP	BMP-04D	POC-2	90	0.032	0.288	0.32	0.022	0.147	0.150				
PD-B2-4E	DRAINS TO BMP	BMP-04E	POC-2	85	0.048	0.274	0.322	0.023	0.148	0.151	1.972	0.138	0.907	0.927
PD-B2-A	SELF MITIGATING	N/A	POC-2	0	0.095	0.000	0.095	0.007	0.044	0.045				
PD-B2-B	SELF MITIGATING	N/A	POC-2	0	0.387	0.000	0.387	0.027	0.178	0.182				
PD-B2-C	SELF MITIGATING	N/A	POC-2	0	0.094	0.000	0.094	0.007	0.043	0.044				
PD-B2-5A	DRAINS TO BMP	BMP-05A	POC-2	90	0.028	0.253	0.281	0.020	0.129	0.132				
PD-B2-5B	DRAINS TO BMP	BMP-05B	POC-2	90	0.031	0.278	0.309	0.022	0.142	0.145				
PD-B2-5C	DRAINS TO MWS	BMP-05C	POC-2	95	0.022	0.414	0.436	0.031	0.201	0.205				
PD-B2-5D	DRAINS TO BMP	BMP-05D	POC-2	90	0.043	0.386	0.429	0.030	0.197	0.202	1.455	0.102	0.669	0.684
PD-B2-7	DRAINS TO MWS	BMP-07	POC-2	100	0.000	1.952	1.952	0.137	0.898	0.917				
PD-C1-8	DRAINS TO BMP	BMP 08	POC-3	85	0.401	2.271	2.672	1.122	1.042	0.508				
PD-C1-9	DRAINS TO BMP	BMP 09	POC-3	80	0.168	0.672	0.84	0.353	0.328	0.160				
PD-C1-10A	DRAINS TO BMP	BMP 10A	POC-3	90	0.059	0.528	0.587	0.247	0.229	0.112				
PD-C1-10B	DRAINS TO BMP	BMP 10B	POC-3	95	0.016	0.309	0.325	0.137	0.127	0.062	0.912	0.383	0.356	0.173
PD-C1-11	DRAINS TO BMP	BMP 11	POC-3	80	0.152	0.607	0.759	0.319	0.296	0.144				
PD-C1-12A	DRAINS TO BMP	BMP 12A	POC-3	75	0.183	0.549	0.732	0.307	0.285	0.139				
PD-C1-12B	DRAINS TO BMP	BMP 12B	POC-3	80	0.044	0.177	0.221	0.093	0.086	0.042				
PD-C1-13	DRAINS TO BMP	BMP 13	POC-3	70	0.071	0.167	0.238	0.100	0.093	0.045				
PD-C2-D	SELF MITIGATING	N/A	POC-3	0	1.514	0.000	1.514	0.636	0.590	0.288				

DMA ID	DMA TYPE	DRAINS TO BMP	POC OUTLET	TOTAL (AC)	TOTAL (SF)	Design WQ DCV Vol (cf)	BMP MIN AREA (SF)	LANDSC (AC)	IMPERV AREA (AC)	IMPERV (%)
PD-A1-2	DRAINS TO BMP	BMP 02	POC-1	0.478	20,822	573	780	0.12	0.36	75
PD-A1-1	DRAINS TO BMP	BMP 01	POC-1	1.000	43,560	1,307	2,000	0.20	0.80	80
PD-A1-3A	DRAINS TO BMP	BMP 03A	POC-1	0.497	21,649	794	929	0.05	0.45	90
PD-A1-3B	DRAINS TO BMP	BMP 03B	POC-1	0.405	17,642	647	760	0.04	0.36	90
PD-A1-3C	DRAINS TO BMP	BMP 03C	POC-1	0.402	17,511	642	785	0.04	0.36	90
PD-A1-3D	DRAINS TO BMP	BMP 03D	POC-1	0.243	10,585	388	615	0.02	0.22	90
PD-A1-3E	DRAINS TO BMP	BMP 03E	POC-1	0.473	20,604	755	824	0.05	0.43	90
PD-B2-6	DRAINS TO BMP	BMP-06	POC-2	0.642	27,966	1,119	212	0.03	0.61	95
PD-B2-4A	DRAINS TO BMP	BMP-04A	POC-2	0.294	12,807	470	613	0.03	0.26	90
PD-B2-4B	DRAINS TO BMP	BMP-04B	POC-2	0.649	28,270	942	1,001	0.10	0.55	85
PD-B2-4C	DRAINS TO BMP	BMP-04C	POC-2	0.387	16,858	562	430	0.06	0.33	85
PD-B2-4D	DRAINS TO BMP	BMP-04D	POC-2	0.320	13,939	511	430	0.03	0.29	90
PD-B2-4E	DRAINS TO BMP	BMP-04E	POC-2	0.322	14,026	468	513	0.05	0.27	85
PD-B2-A	SELF MITIGATING	N/A	POC-2	0.095	4,138	7	-	0.10	0.00	0
PD-B2-B	SELF MITIGATING	N/A	POC-2	0.387	16,858	28	-	0.39	0.00	0
PD-B2-C	SELF MITIGATING	N/A	POC-2	0.094	4,095	7	-	0.09	0.00	0
PD-B2-5A	DRAINS TO BMP	BMP-05A	POC-2	0.281	12,240	449	284	0.03	0.25	90
PD-B2-5B	DRAINS TO BMP	BMP-05B	POC-2	0.309	13,460	494	281	0.03	0.28	90
PD-B2-5C	DRAINS TO MWS	BMP-05C	POC-2	0.436	18,992	760	-	0.02	0.41	95
PD-B2-5D	DRAINS TO BMP	BMP-05D	POC-2	0.429	18,687	685	542	0.04	0.39	90
PD-B2-7	DRAINS TO MWS	BMP-07	POC-2	1.952	85,029	3,826	-	0.00	1.95	100
PD-C1-8	DRAINS TO BMP	BMP 08	POC-3	2.672	116,392	3,880	900	0.40	2.27	85
PD-C1-9	DRAINS TO BMP	BMP 09	POC-3	0.840	36,590	1,098	977	0.17	0.67	80
PD-C1-10A	DRAINS TO BMP	BMP 10A	POC-3	0.587	25,570	938	710	0.06	0.53	90
PD-C1-10B	DRAINS TO BMP	BMP 10B	POC-3	0.325	14,157	566	382	0.02	0.31	95
PD-C1-11	DRAINS TO BMP	BMP 11	POC-3	0.759	33,062	992	1,200	0.15	0.61	80
PD-C1-12A	DRAINS TO BMP	BMP 12A	POC-3	0.732	31,886	877	908	0.18	0.55	75
PD-C1-12B	DRAINS TO BMP	BMP 12B	POC-3	0.221	9,627	289	300	0.04	0.18	80
PD-C1-13	DRAINS TO BMP	BMP 13	POC-3	0.238	10,367	259	220	0.07	0.17	70
PD-C2-D	SELF MITIGATING	N/A	POC-3	1.514	65,950	110	-	1.51	0.00	0
TOTALS				17.983				4.13	13.86	77%

BMP ID	LID TYPE	SHOWN BMP BOTTOM AREA (SF)	MIN BMP AREA (SF)	AVG LENGTH (FT)	AVG WIDTH (FT)	SIDE SLOPES (H/V)	F.B. (IN)	POND DEPTH (IN)	SOIL LAYER DEPTH (IN)	GRAVEL LAYER DEPTH (IN)	DRAIN ORIFICE (IN)	RISER SIZE
BMP 02	BF/PI	980	780	78.0	10	4	6	6	36	12	0.65	CB24X24
BMP 01	BF/PI	2,865	2,000	100.0	20	4	6	6	36	12	0.92	CB36X36
BMP 03A	BF/PI	1,160	929	132.7	7	0	6	6	36	18	6	CB24X24
BMP 03B	BF/PI	950	760	108.6	7	0	6	6	36	18	6	CB24X24
BMP 03C	BF/PI	981	785	112.1	7	0	6	6	36	18	6	CB24X24
BMP 03D	BF/PI	769	615	87.9	7	0	6	6	36	18	6	CB24X24
BMP 03E	BF/PI	1,122	824	82.4	10	0	6	6	36	18	6	CB24X24
BMP-06	BF/PI	386	212	21.2	10	4	5	19	36	24	4.25	CB36X36
BMP-04A	BF/PI	893	613	122.5	5	0	6	6	36	18	4	CB24X24
BMP-04B	BF/PI	1,251	1,001	66.7	15	0	6	6	36	18	4	CB24X24
BMP-04C	BF/PI	538	430	86.0	5	0	6	6	36	18	4	CB24X24
BMP-04D	BF/PI	538	430	86.0	5	0	6	6	36	18	4	CB24X24
BMP-04E	BF/PI	641	513	102.6	5	0	6	6	36	18	4	CB24X24
SM-A	SM	0	-				0	0	0	0	N/A	N/A
SM-B	SM	0	-				0	0	0	0	N/A	N/A
SM-C	SM	0	-				0	0	0	0	N/A	N/A
BMP-05A	BF/PI	313	284	28.4	10	0	6	6	36	18	4	CB24X24
BMP-05B	BF/PI	317	281	28.1	10	0	6	6	36	18	4	CB24X24
BMP-05C	BF	0	-	13.0	4	N/A	0	0	0	0	N/A	MWS
BMP-05D	BF/PI	678	542	108.4	5	0	6	6	36	18	4	CB24X24
BMP-07	BF	0	-	20.0	8	N/A	0	0	0	0	N/A	MWS
BMP 08	BF/PI	1,230	900	90.0	10	4	3	15	36	18	6	CB36X36
BMP 09	BF/PI	977	977	65.1	15	4	6	18	36	12	0.5	CB36X36
BMP 10A	BF/PI	710	710	71.0	10	0	6	6	36	18	6	CB24X24
BMP 10B	BF/PI	382	382	76.4	5	0	6	6	36	18	6	CB24X24
BMP 11	BF/PI	1,286	1,200	80.0	15	4	2	10	36	18	0.6	CB36X36
BMP 12A	BF/PI	908	908	60.5	15	4	2	10	36	24	0.625	CB36X36
BMP 12B	BF/PI	448	300	60.0	5	4	2	10	36	18	0.333	CB24X24
BMP 13	BF/PI	275	220	44.0	5	4	3	9	36	18	0.4	CB24X24
SM-D	SM	0	-				0	0	0	0	N/A	N/A

HMP ID	TYPE	DIA. (FT)	LENGTH (FT)	F.B. (IN)	PONDING DEPTH (FT)	RISER SIZE	DRAIN ORIFICE (IN)	ORIFICE HEIGHT (FT)	NOTCH HEIGHT (FT)	NOTCH WIDTH (FT)	VOLUME REQ @ RISER (CF)	
TANK-3	TANK	5	150	12	48	24	1.25	0	-	-	2,570	
TANK-4	TANK	5	160	12	48	24	1.25	0	-	-	2,744	
TANK-5,7	TANK	5	1,200	12	48	24	1.333	0	0	0	20,473	
TANK-8,10	TANK	5	1,113	12	48	36	1.26	0	6	14	20,735	(note 1)

Note 1: Includes gravel storage volume (void ratio = 0.4)

SMRHM

PROJECT REPORT

General Model Information

Project Name:	2018-09-10 BMP-1-2-3 POC-A
Site Name:	Costco Murrietta
Site Address:	215 & Clinton Keith Rd
City:	Murrieta
Report Date:	9/10/2018
Gage:	Wildomar / North Murrieta
Data Start:	1949/10/01
Data End:	2011/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2018/01/19

POC Thresholds

Low Flow Threshold for POC2:	10 Percent of the 2 Year
High Flow Threshold for POC2:	10 Year
Low Flow Threshold for POC3:	10 Percent of the 2 Year
High Flow Threshold for POC3:	10 Year
Low Flow Threshold for POC4:	10 Percent of the 2 Year
High Flow Threshold for POC4:	10 Year

Landuse Basin Data
Predeveloped Land Use

EX-A1-2

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Shrub,Mod(5-10%)	0.072
C D,Shrub,St(10-20%)	0.22
C D,Shrub,Very(>20%)	0.186
Pervious Total	0.478

Impervious Land Use	acre
Impervious Total	0
Basin Total	0.478

Element Flows To:

Surface	Interflow	Groundwater

EX-A1-1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Shrub,St(10-20%)	0.46
C D,Shrub,Mod(5-10%)	0.15
C D,Shrub,Very(>20%)	0.39
Pervious Total	1

Impervious Land Use	acre
Impervious Total	0
Basin Total	1

Element Flows To:

Surface	Interflow	Groundwater

EX-A1-3ABCDE

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Shrub,St(10-20%)	0.929
C D,Shrub,Mod(5-10%)	0.303
C D,Shrub,Very(>20%)	0.788
Pervious Total	2.02

Impervious Land Use	acre
Impervious Total	0
Basin Total	2.02

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

PD-A1-2

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	0.12
Pervious Total	0.12

Impervious Land Use	acre
Parking,Flat(0-5%)	0.358
Impervious Total	0.358
Basin Total	0.478

Element Flows To:

Surface	Interflow	Groundwater
Surface BMP-2	Surface BMP-2	

PD-A1-1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	0.2
Pervious Total	0.2

Impervious Land Use	acre
Parking,Flat(0-5%)	0.8
Impervious Total	0.8
Basin Total	1

Element Flows To:

Surface	Interflow	Groundwater
Surface BMP-1	Surface BMP-1	

PD-A1-3A

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	0.05
Pervious Total	0.05

Impervious Land Use	acre
Parking,Flat(0-5%)	0.447
Impervious Total	0.447
Basin Total	0.497

Element Flows To:

Surface	Interflow	Groundwater
Surface BMP-3A	Surface BMP-3A	

PD-A1-3B

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	0.041
Pervious Total	0.041

Impervious Land Use	acre
Parking,Flat(0-5%)	0.364
Impervious Total	0.364
Basin Total	0.405

Element Flows To:

Surface	Interflow	Groundwater
Surface BMP-3B	Surface BMP-3B	

PD-A1-3C

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	0.04
Pervious Total	0.04

Impervious Land Use	acre
Parking,Flat(0-5%)	0.362
Impervious Total	0.362
Basin Total	0.402

Element Flows To:

Surface	Interflow	Groundwater
Surface BMP-3C	Surface BMP-3C	

PD-A1-3D

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	0.024
Pervious Total	0.024

Impervious Land Use	acre
Parking,Flat(0-5%)	0.219
Impervious Total	0.219
Basin Total	0.243

Element Flows To:

Surface	Interflow	Groundwater
Surface BMP-3D	Surface BMP-3D	

PD-A1-3E

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	0.047
Pervious Total	0.047

Impervious Land Use	acre
Parking,Flat(0-5%)	0.426
Impervious Total	0.426
Basin Total	0.473

Element Flows To:

Surface	Interflow	Groundwater
Surface BMP-3E	Surface BMP-3E	

Routing Elements
Predeveloped Routing

Mitigated Routing

BMP-3A

Bottom Length:	132.70 ft.
Bottom Width:	7.00 ft.
Material thickness of first layer:	3
Material type for first layer:	Amended 2.5 in/hr
Material thickness of second layer:	1.5
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	6
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	20.052
Total Outflow (ac-ft.):	21.997
Percent Through Underdrain:	91.16
Discharge Structure	
Riser Height:	0.5 ft.
Riser Diameter:	8 in.
Element Flows To:	
Outlet 1	Outlet 2
HMP-TANK3	

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0213	0.0000	0.0000	0.0000
0.0604	0.0213	0.0005	0.0000	0.0000
0.1209	0.0213	0.0010	0.0000	0.0000
0.1813	0.0213	0.0015	0.0000	0.0000
0.2418	0.0213	0.0020	0.0000	0.0000
0.3022	0.0213	0.0025	0.0000	0.0000
0.3626	0.0213	0.0030	0.0000	0.0000
0.4231	0.0213	0.0035	0.0000	0.0000
0.4835	0.0213	0.0040	0.0000	0.0000
0.5440	0.0213	0.0045	0.0000	0.0000
0.6044	0.0213	0.0050	0.0000	0.0000
0.6648	0.0213	0.0055	0.0000	0.0000
0.7253	0.0213	0.0060	0.0000	0.0000
0.7857	0.0213	0.0065	0.0000	0.0000
0.8462	0.0213	0.0070	0.0000	0.0000
0.9066	0.0213	0.0075	0.0013	0.0000
0.9670	0.0213	0.0080	0.0014	0.0000
1.0275	0.0213	0.0085	0.0017	0.0000
1.0879	0.0213	0.0090	0.0021	0.0000
1.1484	0.0213	0.0096	0.0025	0.0000
1.2088	0.0213	0.0101	0.0029	0.0000
1.2692	0.0213	0.0106	0.0034	0.0000
1.3297	0.0213	0.0111	0.0039	0.0000
1.3901	0.0213	0.0116	0.0045	0.0000
1.4505	0.0213	0.0121	0.0051	0.0000
1.5110	0.0213	0.0126	0.0058	0.0000
1.5714	0.0213	0.0131	0.0065	0.0000
1.6319	0.0213	0.0136	0.0073	0.0000
1.6923	0.0213	0.0141	0.0082	0.0000

1.7527	0.0213	0.0146	0.0091	0.0000
1.8132	0.0213	0.0151	0.0100	0.0000
1.8736	0.0213	0.0156	0.0110	0.0000
1.9341	0.0213	0.0161	0.0121	0.0000
1.9945	0.0213	0.0166	0.0132	0.0000
2.0549	0.0213	0.0171	0.0145	0.0000
2.1154	0.0213	0.0176	0.0157	0.0000
2.1758	0.0213	0.0181	0.0170	0.0000
2.2363	0.0213	0.0186	0.0184	0.0000
2.2967	0.0213	0.0191	0.0199	0.0000
2.3571	0.0213	0.0196	0.0214	0.0000
2.4176	0.0213	0.0201	0.0230	0.0000
2.4780	0.0213	0.0206	0.0247	0.0000
2.5385	0.0213	0.0211	0.0265	0.0000
2.5989	0.0213	0.0216	0.0283	0.0000
2.6593	0.0213	0.0221	0.0302	0.0000
2.7198	0.0213	0.0226	0.0321	0.0000
2.7802	0.0213	0.0231	0.0342	0.0000
2.8407	0.0213	0.0236	0.0363	0.0000
2.9011	0.0213	0.0241	0.0385	0.0000
2.9615	0.0213	0.0246	0.0407	0.0000
3.0220	0.0213	0.0252	0.0431	0.0000
3.0824	0.0213	0.0257	0.0455	0.0000
3.1429	0.0213	0.0262	0.0480	0.0000
3.2033	0.0213	0.0268	0.0506	0.0000
3.2637	0.0213	0.0273	0.0533	0.0000
3.3242	0.0213	0.0278	0.0550	0.0000
3.3846	0.0213	0.0284	0.0550	0.0000
3.4451	0.0213	0.0289	0.0550	0.0000
3.5055	0.0213	0.0294	0.0550	0.0000
3.5659	0.0213	0.0300	0.0550	0.0000
3.6264	0.0213	0.0305	0.0550	0.0000
3.6868	0.0213	0.0310	0.0550	0.0000
3.7473	0.0213	0.0316	0.0550	0.0000
3.8077	0.0213	0.0321	0.0550	0.0000
3.8681	0.0213	0.0327	0.0550	0.0000
3.9286	0.0213	0.0332	0.0550	0.0000
3.9890	0.0213	0.0337	0.0550	0.0000
4.0495	0.0213	0.0343	0.0550	0.0000
4.1099	0.0213	0.0348	0.0550	0.0000
4.1703	0.0213	0.0353	0.0550	0.0000
4.2308	0.0213	0.0359	0.0550	0.0000
4.2912	0.0213	0.0364	0.0550	0.0000
4.3516	0.0213	0.0369	0.0550	0.0000
4.4121	0.0213	0.0375	0.0550	0.0000
4.4725	0.0213	0.0380	0.0550	0.0000
4.5000	0.0213	0.0382	0.0550	0.0000

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.5000	0.0213	0.0382	0.0000	0.0561	0.0000
4.5604	0.0213	0.0395	0.0000	0.0561	0.0000
4.6209	0.0213	0.0408	0.0000	0.0572	0.0000
4.6813	0.0213	0.0421	0.0000	0.0584	0.0000
4.7418	0.0213	0.0434	0.0000	0.0595	0.0000
4.8022	0.0213	0.0447	0.0000	0.0606	0.0000
4.8626	0.0213	0.0460	0.0000	0.0617	0.0000
4.9231	0.0213	0.0473	0.0000	0.0628	0.0000

4.9835	0.0213	0.0486	0.0000	0.0639	0.0000
5.0440	0.0213	0.0498	0.0650	0.0650	0.0000
5.1044	0.0213	0.0511	0.2335	0.0661	0.0000
5.1648	0.0213	0.0524	0.4357	0.0672	0.0000
5.2253	0.0213	0.0537	0.6190	0.0683	0.0000
5.2857	0.0213	0.0550	0.7429	0.0694	0.0000
5.3462	0.0213	0.0563	0.8236	0.0705	0.0000
5.4066	0.0213	0.0576	0.8926	0.0717	0.0000
5.4670	0.0213	0.0589	0.9566	0.0728	0.0000
5.5000	0.0213	0.0596	1.0167	0.0734	0.0000

Surface BMP-3A

Element Flows To:

Outlet 1	Outlet 2
HMP-TANK3	BMP-3A

BMP-3B

Bottom Length:	108.60 ft.
Bottom Width:	7.00 ft.
Material thickness of first layer:	3
Material type for first layer:	Amended 2.5 in/hr
Material thickness of second layer:	1.5
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	6
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	16.336
Total Outflow (ac-ft.):	17.914
Percent Through Underdrain:	91.19
Discharge Structure	
Riser Height:	0.5 ft.
Riser Diameter:	8 in.
Element Flows To:	
Outlet 1	Outlet 2
HMP-TANK3	

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0175	0.0000	0.0000	0.0000
0.0604	0.0175	0.0004	0.0000	0.0000
0.1209	0.0175	0.0008	0.0000	0.0000
0.1813	0.0175	0.0012	0.0000	0.0000
0.2418	0.0175	0.0016	0.0000	0.0000
0.3022	0.0175	0.0021	0.0000	0.0000
0.3626	0.0175	0.0025	0.0000	0.0000
0.4231	0.0175	0.0029	0.0000	0.0000
0.4835	0.0175	0.0033	0.0000	0.0000
0.5440	0.0175	0.0037	0.0000	0.0000
0.6044	0.0175	0.0041	0.0000	0.0000
0.6648	0.0175	0.0045	0.0000	0.0000
0.7253	0.0175	0.0049	0.0000	0.0000
0.7857	0.0175	0.0053	0.0000	0.0000
0.8462	0.0175	0.0058	0.0000	0.0000
0.9066	0.0175	0.0062	0.0011	0.0000
0.9670	0.0175	0.0066	0.0012	0.0000
1.0275	0.0175	0.0070	0.0014	0.0000
1.0879	0.0175	0.0074	0.0017	0.0000
1.1484	0.0175	0.0078	0.0020	0.0000
1.2088	0.0175	0.0082	0.0024	0.0000
1.2692	0.0175	0.0086	0.0028	0.0000
1.3297	0.0175	0.0091	0.0032	0.0000
1.3901	0.0175	0.0095	0.0037	0.0000
1.4505	0.0175	0.0099	0.0042	0.0000
1.5110	0.0175	0.0103	0.0047	0.0000
1.5714	0.0175	0.0107	0.0053	0.0000
1.6319	0.0175	0.0111	0.0060	0.0000
1.6923	0.0175	0.0115	0.0067	0.0000
1.7527	0.0175	0.0119	0.0074	0.0000
1.8132	0.0175	0.0123	0.0082	0.0000

1.8736	0.0175	0.0128	0.0090	0.0000
1.9341	0.0175	0.0132	0.0099	0.0000
1.9945	0.0175	0.0136	0.0108	0.0000
2.0549	0.0175	0.0140	0.0118	0.0000
2.1154	0.0175	0.0144	0.0129	0.0000
2.1758	0.0175	0.0148	0.0140	0.0000
2.2363	0.0175	0.0152	0.0151	0.0000
2.2967	0.0175	0.0156	0.0163	0.0000
2.3571	0.0175	0.0160	0.0176	0.0000
2.4176	0.0175	0.0165	0.0189	0.0000
2.4780	0.0175	0.0169	0.0202	0.0000
2.5385	0.0175	0.0173	0.0217	0.0000
2.5989	0.0175	0.0177	0.0231	0.0000
2.6593	0.0175	0.0181	0.0247	0.0000
2.7198	0.0175	0.0185	0.0263	0.0000
2.7802	0.0175	0.0189	0.0280	0.0000
2.8407	0.0175	0.0193	0.0297	0.0000
2.9011	0.0175	0.0197	0.0315	0.0000
2.9615	0.0175	0.0202	0.0333	0.0000
3.0220	0.0175	0.0206	0.0353	0.0000
3.0824	0.0175	0.0210	0.0373	0.0000
3.1429	0.0175	0.0215	0.0393	0.0000
3.2033	0.0175	0.0219	0.0414	0.0000
3.2637	0.0175	0.0223	0.0436	0.0000
3.3242	0.0175	0.0228	0.0450	0.0000
3.3846	0.0175	0.0232	0.0450	0.0000
3.4451	0.0175	0.0237	0.0450	0.0000
3.5055	0.0175	0.0241	0.0450	0.0000
3.5659	0.0175	0.0245	0.0450	0.0000
3.6264	0.0175	0.0250	0.0450	0.0000
3.6868	0.0175	0.0254	0.0450	0.0000
3.7473	0.0175	0.0258	0.0450	0.0000
3.8077	0.0175	0.0263	0.0450	0.0000
3.8681	0.0175	0.0267	0.0450	0.0000
3.9286	0.0175	0.0272	0.0450	0.0000
3.9890	0.0175	0.0276	0.0450	0.0000
4.0495	0.0175	0.0280	0.0450	0.0000
4.1099	0.0175	0.0285	0.0450	0.0000
4.1703	0.0175	0.0289	0.0450	0.0000
4.2308	0.0175	0.0293	0.0450	0.0000
4.2912	0.0175	0.0298	0.0450	0.0000
4.3516	0.0175	0.0302	0.0450	0.0000
4.4121	0.0175	0.0307	0.0450	0.0000
4.4725	0.0175	0.0311	0.0450	0.0000
4.5000	0.0175	0.0313	0.0450	0.0000

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.5000	0.0175	0.0313	0.0000	0.0459	0.0000
4.5604	0.0175	0.0324	0.0000	0.0459	0.0000
4.6209	0.0175	0.0334	0.0000	0.0468	0.0000
4.6813	0.0175	0.0345	0.0000	0.0478	0.0000
4.7418	0.0175	0.0355	0.0000	0.0487	0.0000
4.8022	0.0175	0.0366	0.0000	0.0496	0.0000
4.8626	0.0175	0.0376	0.0000	0.0505	0.0000
4.9231	0.0175	0.0387	0.0000	0.0514	0.0000
4.9835	0.0175	0.0397	0.0000	0.0523	0.0000
5.0440	0.0175	0.0408	0.0650	0.0532	0.0000

5.1044	0.0175	0.0418	0.2335	0.0541	0.0000
5.1648	0.0175	0.0429	0.4357	0.0550	0.0000
5.2253	0.0175	0.0440	0.6190	0.0559	0.0000
5.2857	0.0175	0.0450	0.7429	0.0568	0.0000
5.3462	0.0175	0.0461	0.8236	0.0577	0.0000
5.4066	0.0175	0.0471	0.8926	0.0586	0.0000
5.4670	0.0175	0.0482	0.9566	0.0595	0.0000
5.5000	0.0175	0.0488	1.0167	0.0600	0.0000

Surface BMP-3B

Element Flows To:

Outlet 1	Outlet 2
HMP-TANK3	BMP-3B

BMP-3C

Bottom Length:	112.10 ft.
Bottom Width:	7.00 ft.
Material thickness of first layer:	3
Material type for first layer:	Amended 2.5 in/hr
Material thickness of second layer:	1.5
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	6
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	16.367
Total Outflow (ac-ft.):	17.805
Percent Through Underdrain:	91.92
Discharge Structure	
Riser Height:	0.5 ft.
Riser Diameter:	8 in.
Element Flows To:	
Outlet 1	Outlet 2
HMP-TANK3	

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0180	0.0000	0.0000	0.0000
0.0604	0.0180	0.0004	0.0000	0.0000
0.1209	0.0180	0.0008	0.0000	0.0000
0.1813	0.0180	0.0013	0.0000	0.0000
0.2418	0.0180	0.0017	0.0000	0.0000
0.3022	0.0180	0.0021	0.0000	0.0000
0.3626	0.0180	0.0025	0.0000	0.0000
0.4231	0.0180	0.0030	0.0000	0.0000
0.4835	0.0180	0.0034	0.0000	0.0000
0.5440	0.0180	0.0038	0.0000	0.0000
0.6044	0.0180	0.0042	0.0000	0.0000
0.6648	0.0180	0.0047	0.0000	0.0000
0.7253	0.0180	0.0051	0.0000	0.0000
0.7857	0.0180	0.0055	0.0000	0.0000
0.8462	0.0180	0.0059	0.0000	0.0000
0.9066	0.0180	0.0064	0.0000	0.0000
0.9670	0.0180	0.0068	0.0000	0.0000
1.0275	0.0180	0.0072	0.0000	0.0000
1.0879	0.0180	0.0076	0.0000	0.0000
1.1484	0.0180	0.0081	0.0000	0.0000
1.2088	0.0180	0.0085	0.0000	0.0000
1.2692	0.0180	0.0089	0.0000	0.0000
1.3297	0.0180	0.0093	0.0000	0.0000
1.3901	0.0180	0.0098	0.0000	0.0000
1.4505	0.0180	0.0102	0.0000	0.0000
1.5110	0.0180	0.0106	0.0000	0.0000
1.5714	0.0180	0.0110	0.0000	0.0000
1.6319	0.0180	0.0115	0.0000	0.0000
1.6923	0.0180	0.0119	0.0000	0.0000
1.7527	0.0180	0.0123	0.0000	0.0000
1.8132	0.0180	0.0127	0.0000	0.0000

1.8736	0.0180	0.0132	0.0000	0.0000
1.9341	0.0180	0.0136	0.0000	0.0000
1.9945	0.0180	0.0140	0.0000	0.0000
2.0549	0.0180	0.0144	0.0000	0.0000
2.1154	0.0180	0.0149	0.0000	0.0000
2.1758	0.0180	0.0153	0.0000	0.0000
2.2363	0.0180	0.0157	0.0000	0.0000
2.2967	0.0180	0.0161	0.0000	0.0000
2.3571	0.0180	0.0166	0.0000	0.0000
2.4176	0.0180	0.0170	0.0000	0.0000
2.4780	0.0180	0.0174	0.0000	0.0000
2.5385	0.0180	0.0178	0.0000	0.0000
2.5989	0.0180	0.0183	0.0000	0.0000
2.6593	0.0180	0.0187	0.0000	0.0000
2.7198	0.0180	0.0191	0.0000	0.0000
2.7802	0.0180	0.0195	0.0000	0.0000
2.8407	0.0180	0.0200	0.0000	0.0000
2.9011	0.0180	0.0204	0.0000	0.0000
2.9615	0.0180	0.0208	0.0000	0.0000
3.0220	0.0180	0.0213	0.0000	0.0000
3.0824	0.0180	0.0217	0.0000	0.0000
3.1429	0.0180	0.0222	0.0000	0.0000
3.2033	0.0180	0.0226	0.0000	0.0000
3.2637	0.0180	0.0231	0.0000	0.0000
3.3242	0.0180	0.0235	0.0000	0.0000
3.3846	0.0180	0.0240	0.0000	0.0000
3.4451	0.0180	0.0244	0.0000	0.0000
3.5055	0.0180	0.0249	0.0000	0.0000
3.5659	0.0180	0.0253	0.0000	0.0000
3.6264	0.0180	0.0258	0.0000	0.0000
3.6868	0.0180	0.0262	0.0000	0.0000
3.7473	0.0180	0.0267	0.0000	0.0000
3.8077	0.0180	0.0271	0.0000	0.0000
3.8681	0.0180	0.0276	0.0000	0.0000
3.9286	0.0180	0.0280	0.0000	0.0000
3.9890	0.0180	0.0285	0.0000	0.0000
4.0495	0.0180	0.0289	0.0000	0.0000
4.1099	0.0180	0.0294	0.0000	0.0000
4.1703	0.0180	0.0298	0.0000	0.0000
4.2308	0.0180	0.0303	0.0000	0.0000
4.2912	0.0180	0.0307	0.0000	0.0000
4.3516	0.0180	0.0312	0.0000	0.0000
4.4121	0.0180	0.0317	0.0000	0.0000
4.4725	0.0180	0.0321	0.0000	0.0000
4.5000	0.0180	0.0323	0.0000	0.0000

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.5000	0.0180	0.0323	0.0000	0.0474	0.0000
4.5604	0.0180	0.0334	0.0000	0.0474	0.0000
4.6209	0.0180	0.0345	0.0000	0.0484	0.0000
4.6813	0.0180	0.0356	0.0000	0.0493	0.0000
4.7418	0.0180	0.0367	0.0000	0.0502	0.0000
4.8022	0.0180	0.0378	0.0000	0.0512	0.0000
4.8626	0.0180	0.0388	0.0000	0.0521	0.0000
4.9231	0.0180	0.0399	0.0000	0.0530	0.0000
4.9835	0.0180	0.0410	0.0000	0.0540	0.0000
5.0440	0.0180	0.0421	0.0000	0.0549	0.0000

5.1044	0.0180	0.0432	0.0000	0.0558	0.0000
5.1648	0.0180	0.0443	0.0000	0.0568	0.0000
5.2253	0.0180	0.0454	0.0000	0.0577	0.0000
5.2857	0.0180	0.0465	0.0000	0.0587	0.0000
5.3462	0.0180	0.0476	0.0000	0.0596	0.0000
5.4066	0.0180	0.0486	0.0011	0.0605	0.0000
5.4670	0.0180	0.0497	0.0012	0.0615	0.0000
5.5000	0.0180	0.0503	0.0015	0.0620	0.0000

Surface BMP-3C

Element Flows To:

Outlet 1	Outlet 2
HMP-TANK3	BMP-3C

BMP-3D

Bottom Length:	87.90 ft.
Bottom Width:	7.00 ft.
Material thickness of first layer:	3
Material type for first layer:	Amended 2.5 in/hr
Material thickness of second layer:	1.5
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	6
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	10.29
Total Outflow (ac-ft.):	10.75
Percent Through Underdrain:	95.72
Discharge Structure	
Riser Height:	0.5 ft.
Riser Diameter:	8 in.
Element Flows To:	
Outlet 1	Outlet 2
HMP-TANK3	

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0141	0.0000	0.0000	0.0000
0.0604	0.0141	0.0003	0.0000	0.0000
0.1209	0.0141	0.0007	0.0000	0.0000
0.1813	0.0141	0.0010	0.0000	0.0000
0.2418	0.0141	0.0013	0.0000	0.0000
0.3022	0.0141	0.0017	0.0000	0.0000
0.3626	0.0141	0.0020	0.0000	0.0000
0.4231	0.0141	0.0023	0.0000	0.0000
0.4835	0.0141	0.0027	0.0000	0.0000
0.5440	0.0141	0.0030	0.0000	0.0000
0.6044	0.0141	0.0033	0.0000	0.0000
0.6648	0.0141	0.0037	0.0000	0.0000
0.7253	0.0141	0.0040	0.0000	0.0000
0.7857	0.0141	0.0043	0.0000	0.0000
0.8462	0.0141	0.0047	0.0000	0.0000
0.9066	0.0141	0.0050	0.0000	0.0000
0.9670	0.0141	0.0053	0.0000	0.0000
1.0275	0.0141	0.0057	0.0000	0.0000
1.0879	0.0141	0.0060	0.0000	0.0000
1.1484	0.0141	0.0063	0.0000	0.0000
1.2088	0.0141	0.0067	0.0000	0.0000
1.2692	0.0141	0.0070	0.0000	0.0000
1.3297	0.0141	0.0073	0.0000	0.0000
1.3901	0.0141	0.0077	0.0000	0.0000
1.4505	0.0141	0.0080	0.0000	0.0000
1.5110	0.0141	0.0083	0.0000	0.0000
1.5714	0.0141	0.0087	0.0000	0.0000
1.6319	0.0141	0.0090	0.0000	0.0000
1.6923	0.0141	0.0093	0.0000	0.0000
1.7527	0.0141	0.0097	0.0000	0.0000
1.8132	0.0141	0.0100	0.0000	0.0000

1.8736	0.0141	0.0103	0.0000	0.0000
1.9341	0.0141	0.0107	0.0000	0.0000
1.9945	0.0141	0.0110	0.0000	0.0000
2.0549	0.0141	0.0113	0.0000	0.0000
2.1154	0.0141	0.0117	0.0000	0.0000
2.1758	0.0141	0.0120	0.0000	0.0000
2.2363	0.0141	0.0123	0.0000	0.0000
2.2967	0.0141	0.0127	0.0000	0.0000
2.3571	0.0141	0.0130	0.0000	0.0000
2.4176	0.0141	0.0133	0.0000	0.0000
2.4780	0.0141	0.0137	0.0000	0.0000
2.5385	0.0141	0.0140	0.0000	0.0000
2.5989	0.0141	0.0143	0.0000	0.0000
2.6593	0.0141	0.0147	0.0000	0.0000
2.7198	0.0141	0.0150	0.0000	0.0000
2.7802	0.0141	0.0153	0.0000	0.0000
2.8407	0.0141	0.0156	0.0000	0.0000
2.9011	0.0141	0.0160	0.0000	0.0000
2.9615	0.0141	0.0163	0.0000	0.0000
3.0220	0.0141	0.0167	0.0000	0.0000
3.0824	0.0141	0.0170	0.0000	0.0000
3.1429	0.0141	0.0174	0.0000	0.0000
3.2033	0.0141	0.0177	0.0000	0.0000
3.2637	0.0141	0.0181	0.0000	0.0000
3.3242	0.0141	0.0184	0.0000	0.0000
3.3846	0.0141	0.0188	0.0000	0.0000
3.4451	0.0141	0.0191	0.0000	0.0000
3.5055	0.0141	0.0195	0.0000	0.0000
3.5659	0.0141	0.0199	0.0000	0.0000
3.6264	0.0141	0.0202	0.0000	0.0000
3.6868	0.0141	0.0206	0.0000	0.0000
3.7473	0.0141	0.0209	0.0000	0.0000
3.8077	0.0141	0.0213	0.0000	0.0000
3.8681	0.0141	0.0216	0.0000	0.0000
3.9286	0.0141	0.0220	0.0000	0.0000
3.9890	0.0141	0.0223	0.0000	0.0000
4.0495	0.0141	0.0227	0.0000	0.0000
4.1099	0.0141	0.0230	0.0000	0.0000
4.1703	0.0141	0.0234	0.0000	0.0000
4.2308	0.0141	0.0238	0.0000	0.0000
4.2912	0.0141	0.0241	0.0000	0.0000
4.3516	0.0141	0.0245	0.0000	0.0000
4.4121	0.0141	0.0248	0.0000	0.0000
4.4725	0.0141	0.0252	0.0000	0.0000
4.5000	0.0141	0.0253	0.0000	0.0000

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.5000	0.0141	0.0253	0.0000	0.0372	0.0000
4.5604	0.0141	0.0262	0.0000	0.0372	0.0000
4.6209	0.0141	0.0270	0.0000	0.0379	0.0000
4.6813	0.0141	0.0279	0.0000	0.0387	0.0000
4.7418	0.0141	0.0287	0.0000	0.0394	0.0000
4.8022	0.0141	0.0296	0.0000	0.0401	0.0000
4.8626	0.0141	0.0305	0.0000	0.0409	0.0000
4.9231	0.0141	0.0313	0.0000	0.0416	0.0000
4.9835	0.0141	0.0322	0.0000	0.0423	0.0000
5.0440	0.0141	0.0330	0.0000	0.0431	0.0000

5.1044	0.0141	0.0339	0.0000	0.0438	0.0000
5.1648	0.0141	0.0347	0.0000	0.0445	0.0000
5.2253	0.0141	0.0356	0.0000	0.0453	0.0000
5.2857	0.0141	0.0364	0.0000	0.0460	0.0000
5.3462	0.0141	0.0373	0.0000	0.0467	0.0000
5.4066	0.0141	0.0381	0.0009	0.0475	0.0000
5.4670	0.0141	0.0390	0.0010	0.0482	0.0000
5.5000	0.0141	0.0395	0.0012	0.0486	0.0000

Surface BMP-3D

Element Flows To:

Outlet 1	Outlet 2
HMP-TANK3	BMP-3D

BMP-3E

Bottom Length:	82.40 ft.
Bottom Width:	10.00 ft.
Material thickness of first layer:	3
Material type for first layer:	Amended 2.5 in/hr
Material thickness of second layer:	1.5
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	6
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	18.797
Total Outflow (ac-ft.):	20.97
Percent Through Underdrain:	89.64
Discharge Structure	
Riser Height:	0.5 ft.
Riser Diameter:	8 in.
Element Flows To:	
Outlet 1	Outlet 2
HMP-TANK3	

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0189	0.0000	0.0000	0.0000
0.0604	0.0189	0.0004	0.0000	0.0000
0.1209	0.0189	0.0009	0.0000	0.0000
0.1813	0.0189	0.0013	0.0000	0.0000
0.2418	0.0189	0.0018	0.0000	0.0000
0.3022	0.0189	0.0022	0.0000	0.0000
0.3626	0.0189	0.0027	0.0000	0.0000
0.4231	0.0189	0.0031	0.0000	0.0000
0.4835	0.0189	0.0036	0.0000	0.0000
0.5440	0.0189	0.0040	0.0000	0.0000
0.6044	0.0189	0.0045	0.0000	0.0000
0.6648	0.0189	0.0049	0.0000	0.0000
0.7253	0.0189	0.0054	0.0000	0.0000
0.7857	0.0189	0.0058	0.0000	0.0000
0.8462	0.0189	0.0062	0.0000	0.0000
0.9066	0.0189	0.0067	0.0000	0.0000
0.9670	0.0189	0.0071	0.0000	0.0000
1.0275	0.0189	0.0076	0.0000	0.0000
1.0879	0.0189	0.0080	0.0000	0.0000
1.1484	0.0189	0.0085	0.0000	0.0000
1.2088	0.0189	0.0089	0.0000	0.0000
1.2692	0.0189	0.0094	0.0000	0.0000
1.3297	0.0189	0.0098	0.0000	0.0000
1.3901	0.0189	0.0103	0.0000	0.0000
1.4505	0.0189	0.0107	0.0000	0.0000
1.5110	0.0189	0.0111	0.0000	0.0000
1.5714	0.0189	0.0116	0.0000	0.0000
1.6319	0.0189	0.0120	0.0000	0.0000
1.6923	0.0189	0.0125	0.0000	0.0000
1.7527	0.0189	0.0129	0.0000	0.0000
1.8132	0.0189	0.0134	0.0000	0.0000

1.8736	0.0189	0.0138	0.0000	0.0000
1.9341	0.0189	0.0143	0.0000	0.0000
1.9945	0.0189	0.0147	0.0000	0.0000
2.0549	0.0189	0.0152	0.0000	0.0000
2.1154	0.0189	0.0156	0.0000	0.0000
2.1758	0.0189	0.0161	0.0000	0.0000
2.2363	0.0189	0.0165	0.0000	0.0000
2.2967	0.0189	0.0169	0.0000	0.0000
2.3571	0.0189	0.0174	0.0000	0.0000
2.4176	0.0189	0.0178	0.0000	0.0000
2.4780	0.0189	0.0183	0.0000	0.0000
2.5385	0.0189	0.0187	0.0000	0.0000
2.5989	0.0189	0.0192	0.0000	0.0000
2.6593	0.0189	0.0196	0.0000	0.0000
2.7198	0.0189	0.0201	0.0000	0.0000
2.7802	0.0189	0.0205	0.0000	0.0000
2.8407	0.0189	0.0210	0.0000	0.0000
2.9011	0.0189	0.0214	0.0000	0.0000
2.9615	0.0189	0.0218	0.0000	0.0000
3.0220	0.0189	0.0223	0.0000	0.0000
3.0824	0.0189	0.0228	0.0000	0.0000
3.1429	0.0189	0.0233	0.0000	0.0000
3.2033	0.0189	0.0237	0.0000	0.0000
3.2637	0.0189	0.0242	0.0000	0.0000
3.3242	0.0189	0.0247	0.0000	0.0000
3.3846	0.0189	0.0252	0.0000	0.0000
3.4451	0.0189	0.0256	0.0000	0.0000
3.5055	0.0189	0.0261	0.0000	0.0000
3.5659	0.0189	0.0266	0.0000	0.0000
3.6264	0.0189	0.0271	0.0000	0.0000
3.6868	0.0189	0.0275	0.0000	0.0000
3.7473	0.0189	0.0280	0.0000	0.0000
3.8077	0.0189	0.0285	0.0000	0.0000
3.8681	0.0189	0.0290	0.0000	0.0000
3.9286	0.0189	0.0294	0.0000	0.0000
3.9890	0.0189	0.0299	0.0000	0.0000
4.0495	0.0189	0.0304	0.0000	0.0000
4.1099	0.0189	0.0309	0.0000	0.0000
4.1703	0.0189	0.0313	0.0000	0.0000
4.2308	0.0189	0.0318	0.0000	0.0000
4.2912	0.0189	0.0323	0.0000	0.0000
4.3516	0.0189	0.0328	0.0000	0.0000
4.4121	0.0189	0.0332	0.0000	0.0000
4.4725	0.0189	0.0337	0.0000	0.0000
4.5000	0.0189	0.0339	0.0000	0.0000

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.5000	0.0189	0.0339	0.0000	0.0498	0.0000
4.5604	0.0189	0.0351	0.0000	0.0498	0.0000
4.6209	0.0189	0.0362	0.0000	0.0508	0.0000
4.6813	0.0189	0.0374	0.0000	0.0518	0.0000
4.7418	0.0189	0.0385	0.0000	0.0527	0.0000
4.8022	0.0189	0.0396	0.0000	0.0537	0.0000
4.8626	0.0189	0.0408	0.0000	0.0547	0.0000
4.9231	0.0189	0.0419	0.0000	0.0557	0.0000
4.9835	0.0189	0.0431	0.0000	0.0567	0.0000
5.0440	0.0189	0.0442	0.0000	0.0577	0.0000

5.1044	0.0189	0.0454	0.0000	0.0586	0.0000
5.1648	0.0189	0.0465	0.0000	0.0596	0.0000
5.2253	0.0189	0.0476	0.0000	0.0606	0.0000
5.2857	0.0189	0.0488	0.0000	0.0616	0.0000
5.3462	0.0189	0.0499	0.0000	0.0626	0.0000
5.4066	0.0189	0.0511	0.0012	0.0636	0.0000
5.4670	0.0189	0.0522	0.0013	0.0645	0.0000
5.5000	0.0189	0.0528	0.0016	0.0651	0.0000

Surface BMP-3E

Element Flows To:

Outlet 1	Outlet 2
HMP-TANK3	BMP-3E

BMP-1

Bottom Length:	100.00 ft.
Bottom Width:	20.00 ft.
Material thickness of first layer:	3
Material type for first layer:	Amended 2.5 in/hr
Material thickness of second layer:	1
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	0.92
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	38.775
Total Outflow (ac-ft.):	41.741
Percent Through Underdrain:	92.89
Discharge Structure	
Riser Height:	0.5 ft.
Riser Diameter:	18 in.
Element Flows To:	
Outlet 1	Outlet 2

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.1576	0.0000	0.0000	0.0000
0.0549	0.1561	0.0010	0.0000	0.0000
0.1099	0.1542	0.0020	0.0000	0.0000
0.1648	0.1524	0.0031	0.0000	0.0000
0.2198	0.1506	0.0041	0.0000	0.0000
0.2747	0.1488	0.0052	0.0000	0.0000
0.3297	0.1470	0.0064	0.0000	0.0000
0.3846	0.1452	0.0075	0.0000	0.0000
0.4396	0.1434	0.0087	0.0000	0.0000
0.4945	0.1416	0.0099	0.0000	0.0000
0.5495	0.1398	0.0112	0.0000	0.0000
0.6044	0.1380	0.0124	0.0000	0.0000
0.6593	0.1363	0.0137	0.0000	0.0000
0.7143	0.1345	0.0151	0.0000	0.0000
0.7692	0.1328	0.0164	0.0000	0.0000
0.8242	0.1311	0.0178	0.0000	0.0000
0.8791	0.1293	0.0192	0.0019	0.0000
0.9341	0.1276	0.0206	0.0028	0.0000
0.9890	0.1259	0.0221	0.0031	0.0000
1.0440	0.1242	0.0236	0.0036	0.0000
1.0989	0.1226	0.0251	0.0043	0.0000
1.1538	0.1209	0.0267	0.0050	0.0000
1.2088	0.1192	0.0283	0.0054	0.0000
1.2637	0.1175	0.0299	0.0058	0.0000
1.3187	0.1159	0.0315	0.0069	0.0000
1.3736	0.1143	0.0332	0.0077	0.0000
1.4286	0.1126	0.0349	0.0079	0.0000
1.4835	0.1110	0.0366	0.0088	0.0000
1.5385	0.1094	0.0384	0.0096	0.0000
1.5934	0.1078	0.0402	0.0103	0.0000
1.6484	0.1062	0.0420	0.0110	0.0000

1.7033	0.1046	0.0439	0.0117	0.0000
1.7582	0.1030	0.0458	0.0123	0.0000
1.8132	0.1014	0.0477	0.0129	0.0000
1.8681	0.0999	0.0497	0.0134	0.0000
1.9231	0.0983	0.0517	0.0140	0.0000
1.9780	0.0968	0.0537	0.0145	0.0000
2.0330	0.0953	0.0558	0.0150	0.0000
2.0879	0.0937	0.0579	0.0155	0.0000
2.1429	0.0922	0.0600	0.0160	0.0000
2.1978	0.0907	0.0621	0.0164	0.0000
2.2527	0.0892	0.0643	0.0169	0.0000
2.3077	0.0877	0.0666	0.0173	0.0000
2.3626	0.0862	0.0688	0.0177	0.0000
2.4176	0.0848	0.0711	0.0181	0.0000
2.4725	0.0833	0.0734	0.0186	0.0000
2.5275	0.0818	0.0758	0.0190	0.0000
2.5824	0.0804	0.0782	0.0194	0.0000
2.6374	0.0790	0.0806	0.0201	0.0000
2.6923	0.0775	0.0831	0.0205	0.0000
2.7473	0.0761	0.0856	0.0208	0.0000
2.8022	0.0747	0.0881	0.0212	0.0000
2.8571	0.0733	0.0907	0.0215	0.0000
2.9121	0.0719	0.0933	0.0218	0.0000
2.9670	0.0705	0.0960	0.0222	0.0000
3.0220	0.0691	0.0988	0.0225	0.0000
3.0769	0.0678	0.1017	0.0228	0.0000
3.1319	0.0664	0.1046	0.0231	0.0000
3.1868	0.0651	0.1076	0.0234	0.0000
3.2418	0.0637	0.1106	0.0237	0.0000
3.2967	0.0624	0.1136	0.0240	0.0000
3.3516	0.0611	0.1167	0.0243	0.0000
3.4066	0.0598	0.1199	0.0246	0.0000
3.4615	0.0585	0.1230	0.0249	0.0000
3.5165	0.0572	0.1262	0.0252	0.0000
3.5714	0.0559	0.1295	0.0255	0.0000
3.6264	0.0546	0.1328	0.0258	0.0000
3.6813	0.0533	0.1361	0.0261	0.0000
3.7363	0.0521	0.1395	0.0263	0.0000
3.7912	0.0508	0.1429	0.0266	0.0000
3.8462	0.0496	0.1463	0.0269	0.0000
3.9011	0.0484	0.1498	0.0272	0.0000
3.9560	0.0471	0.1534	0.0274	0.0000
4.0000	0.0459	0.1562	0.0276	0.0000

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.0000	0.1576	0.1562	0.0000	0.1206	0.0000
4.0549	0.1594	0.1650	0.0000	0.1206	0.0000
4.1099	0.1613	0.1738	0.0000	0.1228	0.0000
4.1648	0.1632	0.1827	0.0000	0.1250	0.0000
4.2198	0.1651	0.1917	0.0000	0.1272	0.0000
4.2747	0.1670	0.2008	0.0000	0.1293	0.0000
4.3297	0.1689	0.2100	0.0000	0.1315	0.0000
4.3846	0.1708	0.2194	0.0000	0.1337	0.0000
4.4396	0.1727	0.2288	0.0000	0.1358	0.0000
4.4945	0.1746	0.2384	0.0000	0.1380	0.0000
4.5495	0.1766	0.2480	0.1749	0.1402	0.0000
4.6044	0.1785	0.2578	0.5355	0.1423	0.0000

4.6593	0.1805	0.2676	1.0052	0.1445	0.0000
4.7143	0.1825	0.2776	1.5529	0.1467	0.0000
4.7692	0.1844	0.2877	2.1526	0.1489	0.0000
4.8242	0.1864	0.2979	2.7777	0.1510	0.0000
4.8791	0.1884	0.3082	3.4013	0.1532	0.0000
4.9341	0.1904	0.3186	3.9965	0.1554	0.0000
4.9890	0.1924	0.3291	4.5388	0.1575	0.0000
5.0000	0.1928	0.3312	5.0087	0.1580	0.0000

Surface BMP-1

Element Flows To:

Outlet 1	Outlet 2
	BMP-1

BMP-2

Bottom Length:	78.00 ft.
Bottom Width:	10.00 ft.
Material thickness of first layer:	3
Material type for first layer:	Amended 2.5 in/hr
Material thickness of second layer:	1
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	0.65
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	18.734
Total Outflow (ac-ft.):	19.796
Percent Through Underdrain:	94.64
Discharge Structure	
Riser Height:	0.5 ft.
Riser Diameter:	18 in.
Element Flows To:	
Outlet 1	Outlet 2

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.1061	0.0000	0.0000	0.0000
0.0549	0.1048	0.0004	0.0000	0.0000
0.1099	0.1033	0.0008	0.0000	0.0000
0.1648	0.1018	0.0012	0.0000	0.0000
0.2198	0.1003	0.0017	0.0000	0.0000
0.2747	0.0988	0.0022	0.0000	0.0000
0.3297	0.0973	0.0027	0.0000	0.0000
0.3846	0.0958	0.0032	0.0000	0.0000
0.4396	0.0944	0.0037	0.0000	0.0000
0.4945	0.0929	0.0042	0.0000	0.0000
0.5495	0.0915	0.0048	0.0000	0.0000
0.6044	0.0900	0.0054	0.0000	0.0000
0.6593	0.0886	0.0060	0.0000	0.0000
0.7143	0.0872	0.0067	0.0000	0.0000
0.7692	0.0857	0.0073	0.0000	0.0000
0.8242	0.0843	0.0080	0.0000	0.0000
0.8791	0.0829	0.0087	0.0009	0.0000
0.9341	0.0815	0.0094	0.0011	0.0000
0.9890	0.0802	0.0102	0.0012	0.0000
1.0440	0.0788	0.0109	0.0014	0.0000
1.0989	0.0774	0.0117	0.0017	0.0000
1.1538	0.0761	0.0125	0.0020	0.0000
1.2088	0.0747	0.0134	0.0021	0.0000
1.2637	0.0734	0.0142	0.0026	0.0000
1.3187	0.0721	0.0151	0.0028	0.0000
1.3736	0.0707	0.0160	0.0029	0.0000
1.4286	0.0694	0.0170	0.0035	0.0000
1.4835	0.0681	0.0179	0.0039	0.0000
1.5385	0.0668	0.0189	0.0040	0.0000
1.5934	0.0656	0.0199	0.0044	0.0000
1.6484	0.0643	0.0209	0.0048	0.0000

1.7033	0.0630	0.0220	0.0051	0.0000
1.7582	0.0618	0.0231	0.0052	0.0000
1.8132	0.0605	0.0242	0.0055	0.0000
1.8681	0.0593	0.0253	0.0058	0.0000
1.9231	0.0581	0.0264	0.0061	0.0000
1.9780	0.0568	0.0276	0.0064	0.0000
2.0330	0.0556	0.0288	0.0067	0.0000
2.0879	0.0544	0.0301	0.0070	0.0000
2.1429	0.0532	0.0313	0.0072	0.0000
2.1978	0.0520	0.0326	0.0075	0.0000
2.2527	0.0509	0.0339	0.0077	0.0000
2.3077	0.0497	0.0352	0.0080	0.0000
2.3626	0.0485	0.0366	0.0082	0.0000
2.4176	0.0474	0.0380	0.0084	0.0000
2.4725	0.0462	0.0394	0.0086	0.0000
2.5275	0.0451	0.0409	0.0088	0.0000
2.5824	0.0440	0.0423	0.0091	0.0000
2.6374	0.0429	0.0438	0.0093	0.0000
2.6923	0.0418	0.0454	0.0095	0.0000
2.7473	0.0407	0.0469	0.0097	0.0000
2.8022	0.0396	0.0485	0.0100	0.0000
2.8571	0.0385	0.0501	0.0102	0.0000
2.9121	0.0374	0.0518	0.0104	0.0000
2.9670	0.0364	0.0535	0.0106	0.0000
3.0220	0.0353	0.0553	0.0107	0.0000
3.0769	0.0343	0.0571	0.0109	0.0000
3.1319	0.0332	0.0590	0.0111	0.0000
3.1868	0.0322	0.0609	0.0112	0.0000
3.2418	0.0312	0.0628	0.0114	0.0000
3.2967	0.0302	0.0648	0.0115	0.0000
3.3516	0.0292	0.0668	0.0117	0.0000
3.4066	0.0282	0.0688	0.0119	0.0000
3.4615	0.0272	0.0709	0.0120	0.0000
3.5165	0.0263	0.0730	0.0122	0.0000
3.5714	0.0253	0.0751	0.0123	0.0000
3.6264	0.0243	0.0773	0.0124	0.0000
3.6813	0.0234	0.0795	0.0126	0.0000
3.7363	0.0225	0.0818	0.0127	0.0000
3.7912	0.0215	0.0840	0.0129	0.0000
3.8462	0.0206	0.0863	0.0130	0.0000
3.9011	0.0197	0.0887	0.0132	0.0000
3.9560	0.0188	0.0910	0.0133	0.0000
4.0000	0.0179	0.0930	0.0134	0.0000

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.0000	0.1061	0.0930	0.0000	0.0471	0.0000
4.0549	0.1076	0.0988	0.0000	0.0471	0.0000
4.1099	0.1091	0.1048	0.0000	0.0479	0.0000
4.1648	0.1107	0.1108	0.0000	0.0487	0.0000
4.2198	0.1123	0.1170	0.0000	0.0496	0.0000
4.2747	0.1138	0.1232	0.0000	0.0504	0.0000
4.3297	0.1154	0.1295	0.0000	0.0513	0.0000
4.3846	0.1170	0.1358	0.0000	0.0521	0.0000
4.4396	0.1186	0.1423	0.0000	0.0530	0.0000
4.4945	0.1202	0.1489	0.0000	0.0538	0.0000
4.5495	0.1218	0.1555	0.1749	0.0547	0.0000
4.6044	0.1235	0.1623	0.5355	0.0555	0.0000

4.6593	0.1251	0.1691	1.0052	0.0564	0.0000
4.7143	0.1267	0.1760	1.5529	0.0572	0.0000
4.7692	0.1284	0.1830	2.1526	0.0581	0.0000
4.8242	0.1301	0.1901	2.7777	0.0589	0.0000
4.8791	0.1317	0.1973	3.4013	0.0597	0.0000
4.9341	0.1334	0.2046	3.9965	0.0606	0.0000
4.9890	0.1351	0.2120	4.5388	0.0614	0.0000
5.0000	0.1354	0.2135	5.0087	0.0616	0.0000

Surface BMP-2

Element Flows To:

Outlet 1	Outlet 2
	BMP-2

HMP-TANK3

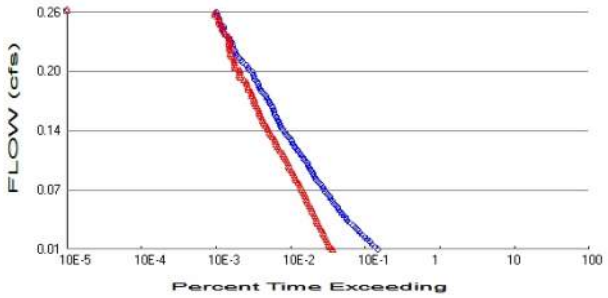
Dimensions
Depth: 5 ft.
Tank Type: Circular
Diameter: 5 ft.
Length: 150 ft.
Discharge Structure
Riser Height: 4 ft.
Riser Diameter: 24 in.
Orifice 1 Diameter: 1.25 in. Elevation:0 ft.
Element Flows To:
Outlet 1 Outlet 2

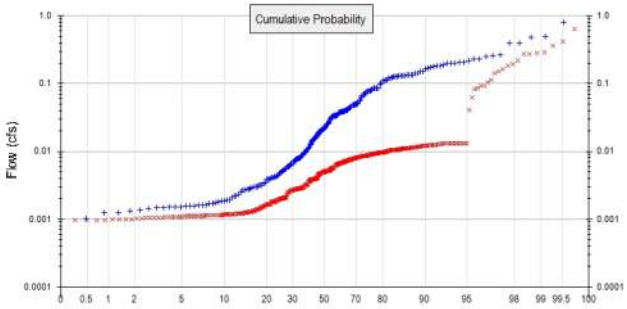
Tank Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.000	0.000	0.000	0.000
0.0556	0.003	0.000	0.010	0.000
0.1111	0.005	0.000	0.014	0.000
0.1667	0.006	0.000	0.017	0.000
0.2222	0.007	0.001	0.020	0.000
0.2778	0.007	0.001	0.022	0.000
0.3333	0.008	0.001	0.024	0.000
0.3889	0.009	0.002	0.026	0.000
0.4444	0.009	0.003	0.028	0.000
0.5000	0.010	0.003	0.030	0.000
0.5556	0.010	0.004	0.031	0.000
0.6111	0.011	0.004	0.033	0.000
0.6667	0.011	0.005	0.034	0.000
0.7222	0.012	0.006	0.036	0.000
0.7778	0.012	0.006	0.037	0.000
0.8333	0.012	0.007	0.038	0.000
0.8889	0.013	0.008	0.040	0.000
0.9444	0.013	0.008	0.041	0.000
1.0000	0.013	0.009	0.042	0.000
1.0556	0.014	0.010	0.043	0.000
1.1111	0.014	0.011	0.044	0.000
1.1667	0.014	0.012	0.045	0.000
1.2222	0.014	0.012	0.046	0.000
1.2778	0.015	0.013	0.047	0.000
1.3333	0.015	0.014	0.049	0.000
1.3889	0.015	0.015	0.050	0.000
1.4444	0.015	0.016	0.051	0.000
1.5000	0.015	0.017	0.051	0.000
1.5556	0.015	0.017	0.052	0.000
1.6111	0.016	0.018	0.053	0.000
1.6667	0.016	0.019	0.054	0.000
1.7222	0.016	0.020	0.055	0.000
1.7778	0.016	0.021	0.056	0.000
1.8333	0.016	0.022	0.057	0.000
1.8889	0.016	0.023	0.058	0.000
1.9444	0.016	0.024	0.059	0.000
2.0000	0.016	0.025	0.060	0.000
2.0556	0.016	0.026	0.060	0.000
2.1111	0.017	0.027	0.061	0.000
2.1667	0.017	0.028	0.062	0.000

2.2222	0.017	0.029	0.063	0.000
2.2778	0.017	0.030	0.064	0.000
2.3333	0.017	0.030	0.064	0.000
2.3889	0.017	0.031	0.065	0.000
2.4444	0.017	0.032	0.066	0.000
2.5000	0.017	0.033	0.067	0.000
2.5556	0.017	0.034	0.067	0.000
2.6111	0.017	0.035	0.068	0.000
2.6667	0.017	0.036	0.069	0.000
2.7222	0.017	0.037	0.070	0.000
2.7778	0.017	0.038	0.070	0.000
2.8333	0.017	0.039	0.071	0.000
2.8889	0.017	0.040	0.072	0.000
2.9444	0.016	0.041	0.072	0.000
3.0000	0.016	0.042	0.073	0.000
3.0556	0.016	0.043	0.074	0.000
3.1111	0.016	0.044	0.074	0.000
3.1667	0.016	0.045	0.075	0.000
3.2222	0.016	0.046	0.076	0.000
3.2778	0.016	0.047	0.076	0.000
3.3333	0.016	0.047	0.077	0.000
3.3889	0.016	0.048	0.078	0.000
3.4444	0.015	0.049	0.078	0.000
3.5000	0.015	0.050	0.079	0.000
3.5556	0.015	0.051	0.080	0.000
3.6111	0.015	0.052	0.080	0.000
3.6667	0.015	0.053	0.081	0.000
3.7222	0.015	0.054	0.081	0.000
3.7778	0.014	0.054	0.082	0.000
3.8333	0.014	0.055	0.083	0.000
3.8889	0.014	0.056	0.083	0.000
3.9444	0.014	0.057	0.084	0.000
4.0000	0.013	0.058	0.084	0.000
4.0556	0.013	0.058	0.363	0.000
4.1111	0.013	0.059	0.870	0.000
4.1667	0.012	0.060	1.525	0.000
4.2222	0.012	0.060	2.292	0.000
4.2778	0.012	0.061	3.147	0.000
4.3333	0.011	0.062	4.067	0.000
4.3889	0.011	0.062	5.028	0.000
4.4444	0.010	0.063	6.006	0.000
4.5000	0.010	0.064	6.977	0.000
4.5556	0.009	0.064	7.917	0.000
4.6111	0.009	0.065	8.802	0.000
4.6667	0.008	0.065	9.614	0.000
4.7222	0.007	0.066	10.33	0.000
4.7778	0.007	0.066	10.96	0.000
4.8333	0.006	0.066	11.48	0.000
4.8889	0.005	0.067	11.90	0.000
4.9444	0.003	0.067	12.25	0.000
5.0000	0.000	0.067	12.55	0.000
5.0556	0.000	0.000	13.03	0.000

POC 2





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #2
Total Pervious Area: 0.478
Total Impervious Area: 0

Mitigated Landuse Totals for POC #2
Total Pervious Area: 0.12
Total Impervious Area: 0.358

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #2

Return Period	**Flow(cfs)**
2 year	0.132947
5 year	0.204126
10 year	0.259161
25 year	0.477763

Flow Frequency Return Periods for Mitigated. POC #2

Return Period	**Flow(cfs)**
2 year	0.013016
5 year	0.14382
10 year	0.271824
25 year	0.367939

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0133	3187	793	24	Pass
0.0158	2928	738	25	Pass
0.0183	2685	711	26	Pass
0.0207	2493	683	27	Pass
0.0232	2315	655	28	Pass
0.0257	2160	634	29	Pass
0.0282	1975	611	30	Pass
0.0307	1837	589	32	Pass
0.0332	1726	566	32	Pass
0.0356	1588	543	34	Pass
0.0381	1479	525	35	Pass
0.0406	1352	505	37	Pass
0.0431	1270	487	38	Pass
0.0456	1189	476	40	Pass
0.0481	1113	461	41	Pass
0.0505	1044	443	42	Pass
0.0530	987	423	42	Pass
0.0555	941	408	43	Pass
0.0580	887	392	44	Pass
0.0605	839	376	44	Pass
0.0630	789	367	46	Pass
0.0654	755	351	46	Pass
0.0679	718	339	47	Pass
0.0704	676	334	49	Pass
0.0729	630	319	50	Pass
0.0754	607	311	51	Pass
0.0779	586	301	51	Pass
0.0803	548	287	52	Pass
0.0828	513	273	53	Pass
0.0853	480	256	53	Pass
0.0878	459	251	54	Pass
0.0903	441	242	54	Pass
0.0928	422	230	54	Pass
0.0953	405	223	55	Pass
0.0977	393	211	53	Pass
0.1002	370	206	55	Pass
0.1027	359	200	55	Pass
0.1052	339	194	57	Pass
0.1077	322	186	57	Pass
0.1102	303	178	58	Pass
0.1126	289	170	58	Pass
0.1151	272	158	58	Pass
0.1176	258	153	59	Pass
0.1201	244	146	59	Pass
0.1226	233	139	59	Pass
0.1251	224	136	60	Pass
0.1275	214	132	61	Pass
0.1300	200	123	61	Pass
0.1325	189	118	62	Pass
0.1350	181	113	62	Pass
0.1375	169	108	63	Pass
0.1400	161	105	65	Pass
0.1424	155	99	63	Pass

0.1449	151	95	62	Pass
0.1474	148	91	61	Pass
0.1499	141	89	63	Pass
0.1524	134	85	63	Pass
0.1549	131	82	62	Pass
0.1573	129	82	63	Pass
0.1598	125	79	63	Pass
0.1623	119	75	63	Pass
0.1648	114	73	64	Pass
0.1673	110	70	63	Pass
0.1698	104	70	67	Pass
0.1722	102	66	64	Pass
0.1747	95	65	68	Pass
0.1772	88	64	72	Pass
0.1797	85	59	69	Pass
0.1822	81	58	71	Pass
0.1847	79	56	70	Pass
0.1871	76	55	72	Pass
0.1896	71	51	71	Pass
0.1921	70	46	65	Pass
0.1946	68	45	66	Pass
0.1971	67	45	67	Pass
0.1996	59	45	76	Pass
0.2020	58	39	67	Pass
0.2045	55	38	69	Pass
0.2070	49	38	77	Pass
0.2095	47	38	80	Pass
0.2120	44	37	84	Pass
0.2145	41	35	85	Pass
0.2169	40	34	85	Pass
0.2194	38	34	89	Pass
0.2219	36	33	91	Pass
0.2244	36	33	91	Pass
0.2269	36	33	91	Pass
0.2294	35	33	94	Pass
0.2318	33	32	96	Pass
0.2343	30	32	106	Pass
0.2368	28	29	103	Pass
0.2393	27	28	103	Pass
0.2418	27	26	96	Pass
0.2443	27	26	96	Pass
0.2467	25	25	100	Pass
0.2492	24	24	100	Pass
0.2517	24	24	100	Pass
0.2542	23	23	100	Pass
0.2567	22	21	95	Pass
0.2592	22	21	95	Pass

Water Quality

Drawdown Time Results

Pond: HMP-TANK3

Days	Stage(feet)	Percent of Total Run Time
1	0.000	N/A
2	0.000	N/A
3	0.000	N/A
4	0.000	N/A
5	0.000	N/A

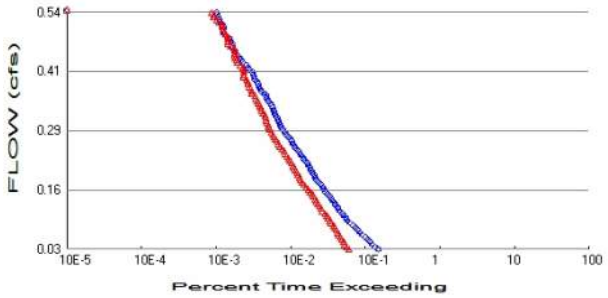
Maximum Stage: 5.000 Drawdown Time: 00 11:12:10

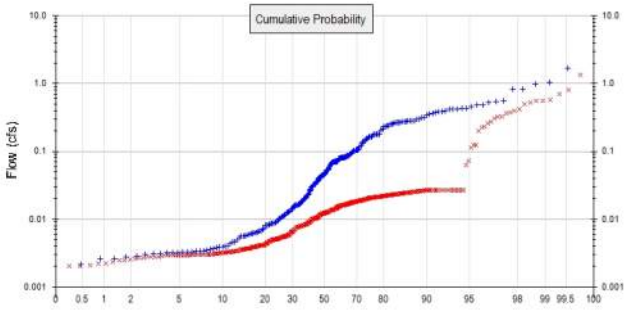
Pond: Surface BMP-2

Days	Stage(feet)	Percent of Total Run Time
1	0.934	N/A
2	0.934	N/A
3	0.934	N/A
4	0.934	N/A
5	0.934	N/A

Maximum Stage: 0.934 Drawdown Time: Less than 1 day

POC 3





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #3
Total Pervious Area: 1
Total Impervious Area: 0

Mitigated Landuse Totals for POC #3
Total Pervious Area: 0.2
Total Impervious Area: 0.8

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #3

Return Period	**Flow(cfs)**
2 year	0.278398
5 year	0.427213
10 year	0.542427
25 year	0.999823

Flow Frequency Return Periods for Mitigated. POC #3

Return Period	**Flow(cfs)**
2 year	0.02686
5 year	0.333927
10 year	0.533381
25 year	0.712755

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0278	3237	1311	40	Pass
0.0330	2928	1212	41	Pass
0.0382	2700	1149	42	Pass
0.0434	2513	1111	44	Pass
0.0486	2328	1056	45	Pass
0.0538	2185	1012	46	Pass
0.0590	1975	964	48	Pass
0.0642	1842	918	49	Pass
0.0694	1735	885	51	Pass
0.0746	1600	850	53	Pass
0.0798	1500	815	54	Pass
0.0850	1353	763	56	Pass
0.0902	1272	729	57	Pass
0.0954	1198	691	57	Pass
0.1006	1121	662	59	Pass
0.1058	1055	626	59	Pass
0.1110	987	576	58	Pass
0.1162	943	551	58	Pass
0.1214	889	528	59	Pass
0.1266	845	504	59	Pass
0.1318	798	480	60	Pass
0.1370	761	462	60	Pass
0.1422	719	441	61	Pass
0.1474	679	424	62	Pass
0.1526	633	396	62	Pass
0.1578	611	372	60	Pass
0.1630	592	350	59	Pass
0.1682	551	325	58	Pass
0.1734	514	306	59	Pass
0.1786	480	294	61	Pass
0.1838	461	285	61	Pass
0.1890	444	269	60	Pass
0.1942	422	264	62	Pass
0.1994	406	253	62	Pass
0.2046	395	240	60	Pass
0.2098	372	229	61	Pass
0.2150	360	223	61	Pass
0.2202	338	213	63	Pass
0.2254	323	202	62	Pass
0.2306	304	194	63	Pass
0.2358	291	184	63	Pass
0.2410	275	177	64	Pass
0.2461	259	165	63	Pass
0.2513	244	155	63	Pass
0.2565	233	149	63	Pass
0.2617	226	142	62	Pass
0.2669	217	136	62	Pass
0.2721	200	130	65	Pass
0.2773	189	125	66	Pass
0.2825	182	119	65	Pass
0.2877	169	113	66	Pass
0.2929	162	110	67	Pass
0.2981	155	109	70	Pass

0.3033	151	105	69	Pass
0.3085	148	102	68	Pass
0.3137	143	100	69	Pass
0.3189	135	98	72	Pass
0.3241	131	93	70	Pass
0.3293	130	88	67	Pass
0.3345	125	86	68	Pass
0.3397	120	84	70	Pass
0.3449	115	80	69	Pass
0.3501	109	77	70	Pass
0.3553	104	75	72	Pass
0.3605	103	72	69	Pass
0.3657	96	66	68	Pass
0.3709	88	66	75	Pass
0.3761	85	64	75	Pass
0.3813	81	61	75	Pass
0.3865	79	58	73	Pass
0.3917	76	58	76	Pass
0.3969	71	56	78	Pass
0.4021	70	51	72	Pass
0.4073	68	51	75	Pass
0.4125	67	51	76	Pass
0.4177	60	51	85	Pass
0.4229	58	49	84	Pass
0.4281	55	46	83	Pass
0.4333	49	42	85	Pass
0.4385	47	41	87	Pass
0.4437	45	39	86	Pass
0.4489	42	39	92	Pass
0.4541	40	39	97	Pass
0.4593	38	38	100	Pass
0.4645	36	38	105	Pass
0.4697	36	34	94	Pass
0.4749	36	31	86	Pass
0.4801	34	31	91	Pass
0.4853	33	31	93	Pass
0.4904	30	31	103	Pass
0.4956	28	29	103	Pass
0.5008	27	27	100	Pass
0.5060	27	27	100	Pass
0.5112	27	26	96	Pass
0.5164	26	26	100	Pass
0.5216	24	24	100	Pass
0.5268	24	22	91	Pass
0.5320	23	20	86	Pass
0.5372	22	20	90	Pass
0.5424	22	19	86	Pass

Water Quality

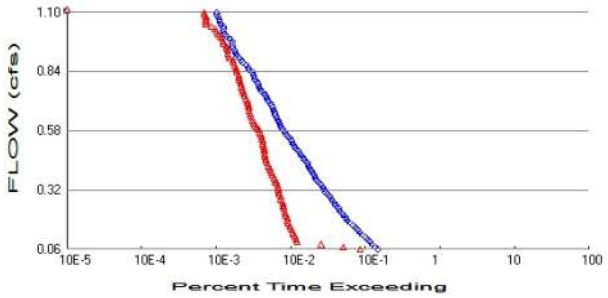
Drawdown Time Results

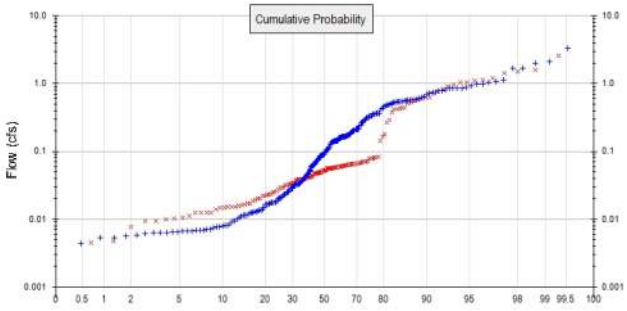
Pond: Surface BMP-1

Days	Stage(feet)	Percent of Total Run Time
1	0.934	N/A
2	0.934	N/A
3	0.934	N/A
4	0.934	N/A
5	0.934	N/A

Maximum Stage: 0.934 Drawdown Time: Less than 1 day

POC 4





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #4
Total Pervious Area: 2.02
Total Impervious Area: 0

Mitigated Landuse Totals for POC #4
Total Pervious Area: 0.202
Total Impervious Area: 1.818

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #4

Return Period	**Flow(cfs)**
2 year	0.562398
5 year	0.862994
10 year	1.095733
25 year	2.019692

Flow Frequency Return Periods for Mitigated. POC #4

Return Period	**Flow(cfs)**
2 year	0.152551
5 year	0.77176
10 year	1.10693
25 year	1.501734

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0562	3196	1855	58	Pass
0.0667	2941	1104	37	Pass
0.0772	2689	561	20	Pass
0.0877	2511	263	10	Pass
0.0982	2317	257	11	Pass
0.1087	2169	251	11	Pass
0.1192	1978	245	12	Pass
0.1297	1846	231	12	Pass
0.1402	1730	224	12	Pass
0.1507	1594	214	13	Pass
0.1612	1480	209	14	Pass
0.1717	1360	204	15	Pass
0.1822	1271	196	15	Pass
0.1927	1197	195	16	Pass
0.2032	1115	187	16	Pass
0.2137	1048	186	17	Pass
0.2242	987	180	18	Pass
0.2347	944	175	18	Pass
0.2452	888	173	19	Pass
0.2557	844	171	20	Pass
0.2662	790	168	21	Pass
0.2767	759	162	21	Pass
0.2872	719	159	22	Pass
0.2977	678	153	22	Pass
0.3082	633	149	23	Pass
0.3187	608	148	24	Pass
0.3292	586	148	25	Pass
0.3397	551	144	26	Pass
0.3502	513	136	26	Pass
0.3607	480	135	28	Pass
0.3712	459	131	28	Pass
0.3817	443	121	27	Pass
0.3922	422	119	28	Pass
0.4027	406	116	28	Pass
0.4132	393	114	29	Pass
0.4237	371	109	29	Pass
0.4342	359	105	29	Pass
0.4447	340	101	29	Pass
0.4552	322	100	31	Pass
0.4657	303	98	32	Pass
0.4762	289	97	33	Pass
0.4867	273	96	35	Pass
0.4972	258	96	37	Pass
0.5077	244	94	38	Pass
0.5182	233	93	39	Pass
0.5287	224	92	41	Pass
0.5392	214	90	42	Pass
0.5497	201	89	44	Pass
0.5602	189	87	46	Pass
0.5707	181	84	46	Pass
0.5812	169	81	47	Pass
0.5917	161	75	46	Pass
0.6022	155	70	45	Pass

0.6127	151	70	46	Pass
0.6232	148	68	45	Pass
0.6337	141	65	46	Pass
0.6442	134	63	47	Pass
0.6547	132	62	46	Pass
0.6652	129	60	46	Pass
0.6757	125	60	48	Pass
0.6862	119	59	49	Pass
0.6967	115	58	50	Pass
0.7072	109	57	52	Pass
0.7177	105	55	52	Pass
0.7282	102	52	50	Pass
0.7387	96	51	53	Pass
0.7492	88	50	56	Pass
0.7597	85	49	57	Pass
0.7702	81	47	58	Pass
0.7807	79	47	59	Pass
0.7912	76	46	60	Pass
0.8017	71	44	61	Pass
0.8122	70	44	62	Pass
0.8227	68	44	64	Pass
0.8332	67	41	61	Pass
0.8437	59	41	69	Pass
0.8542	58	40	68	Pass
0.8647	55	38	69	Pass
0.8752	49	37	75	Pass
0.8857	47	37	78	Pass
0.8962	44	33	75	Pass
0.9067	41	32	78	Pass
0.9172	40	31	77	Pass
0.9277	38	31	81	Pass
0.9382	36	30	83	Pass
0.9487	36	30	83	Pass
0.9592	36	27	75	Pass
0.9697	36	27	75	Pass
0.9802	33	26	78	Pass
0.9907	30	25	83	Pass
1.0012	28	23	82	Pass
1.0117	27	22	81	Pass
1.0222	27	21	77	Pass
1.0327	27	19	70	Pass
1.0432	25	16	64	Pass
1.0537	24	16	66	Pass
1.0642	24	16	66	Pass
1.0747	23	16	69	Pass
1.0852	22	15	68	Pass
1.0957	22	15	68	Pass

Water Quality

Drawdown Time Results

Pond: HMP-TANK3

Days	Stage(feet)	Percent of Total Run Time
1	0.000	N/A
2	0.000	N/A
3	0.000	N/A
4	0.000	N/A
5	0.000	N/A

Maximum Stage: 5.000 Drawdown Time: 00 11:12:10

Rational Method

Data for Rational Method is not available.

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

No PERLND changes have been made.

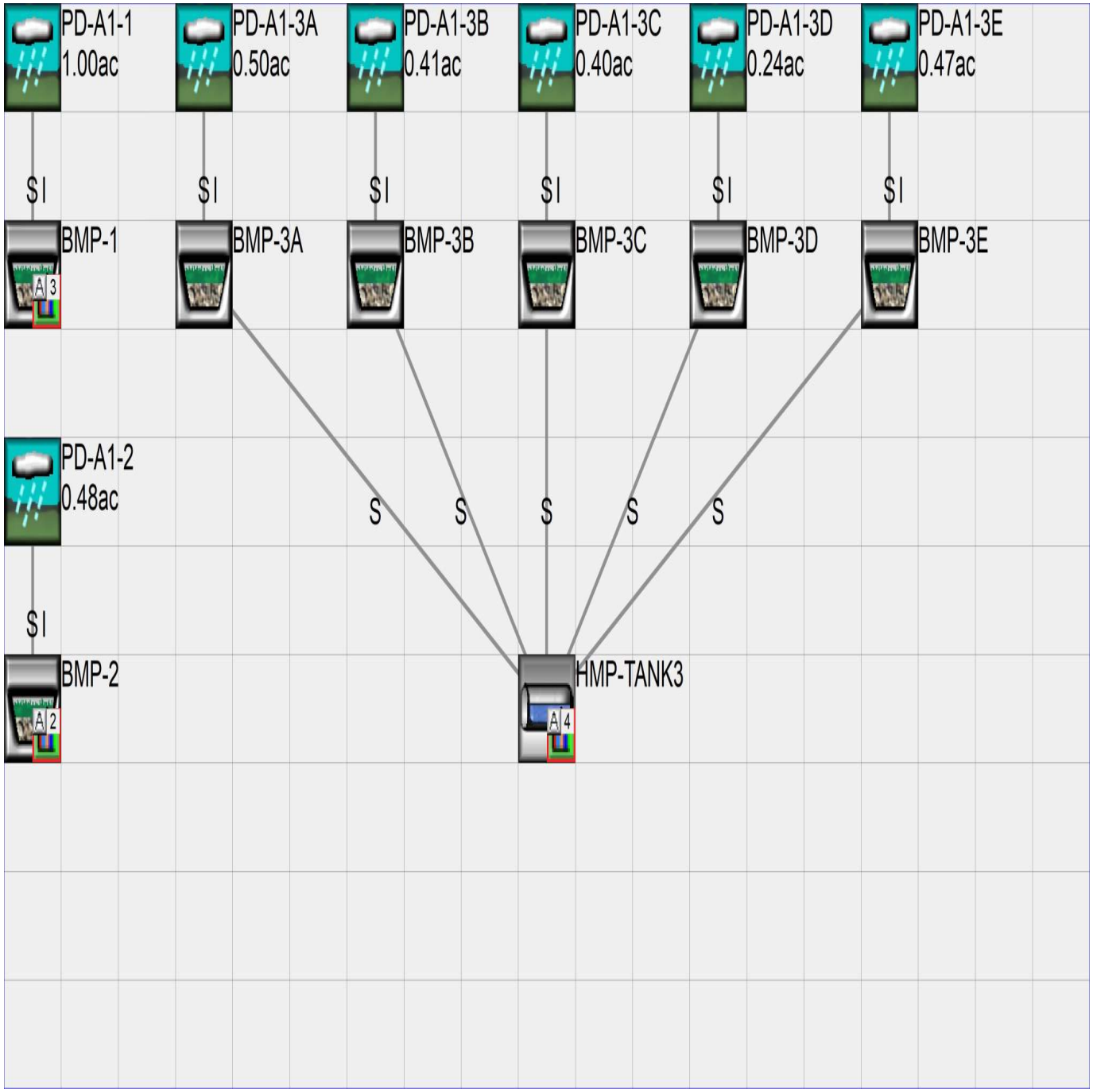
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1949 10 01        END    2011 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   2018-09-10 BMP-1-2-3 POC-A.wdm
MESSU       25   Pre2018-09-10 BMP-1-2-3 POC-A.MES
            27   Pre2018-09-10 BMP-1-2-3 POC-A.L61
            28   Pre2018-09-10 BMP-1-2-3 POC-A.L62
            31   POC2018-09-10 BMP-1-2-3 POC-A2.dat
            32   POC2018-09-10 BMP-1-2-3 POC-A3.dat
            33   POC2018-09-10 BMP-1-2-3 POC-A4.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      PERLND      38
      PERLND      39
      PERLND      40
      COPY       502
      COPY       503
      COPY       504
      DISPLY       2
      DISPLY       3
      DISPLY       4
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    2        EX-A1-2                    MAX                    1    2   31    9
    3        EX-A1-1                    MAX                    1    2   32    9
    4        EX-A1-3ABCDE               MAX                    1    2   33    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  502         1    1
  503         1    1
  504         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   38     C/D,Shrub,Mod(5-10%)    1    1    1    1   27    0
   39     C/D,Shrub,St(10-20%)    1    1    1    1   27    0
   40     C/D,Shrub,Very(>20%)    1    1    1    1   27    0
  END GEN-INFO
```

```
*** Section PWATER***

ACTIVITY
  <PLS > ************* Active Sections ****************************
  # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
 38         0    0    1    0    0    0    0    0    0    0    0    0
 39         0    0    1    0    0    0    0    0    0    0    0    0
 40         0    0    1    0    0    0    0    0    0    0    0    0
END ACTIVITY

PRINT-INFO
  <PLS > ***************** Print-flags **************************** PIVL  PYR
  # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
 38         0    0    4    0    0    0    0    0    0    0    0    0    1    9
 39         0    0    4    0    0    0    0    0    0    0    0    0    1    9
 40         0    0    4    0    0    0    0    0    0    0    0    0    1    9
END PRINT-INFO

PWAT-PARM1
  <PLS >  PWATER variable monthly parameter value flags  ***
  # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
 38         0    0    0    1    0    0    0    0    1    0    0
 39         0    0    0    1    0    0    0    0    1    0    0
 40         0    0    0    1    0    0    0    0    1    0    0
END PWAT-PARM1

PWAT-PARM2
  <PLS >      PWATER input info: Part 2         ***
  # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY      AGWRC
 38              0       4.5      0.04       350       0.1         2       0.95
 39              0       4.2      0.03       300      0.15         2       0.95
 40              0         4     0.025       200      0.25         2       0.95
END PWAT-PARM2

PWAT-PARM3
  <PLS >      PWATER input info: Part 3         ***
  # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
 38            40        35         3         2      0.15      0.15         0
 39            40        35         3         2      0.15      0.15         0
 40            40        35         3         2      0.15      0.15         0
END PWAT-PARM3
PWAT-PARM4
  <PLS >     PWATER input info: Part 4                              ***
  # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
 38             0       0.7       0.3       1.2      0.45         0
 39             0       0.5       0.3       0.8       0.4         0
 40             0       0.4       0.3       0.4      0.35         0
END PWAT-PARM4
MON-LZETPARM
  <PLS >      PWATER input info: Part 3         ***
  # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 38       0.5  0.5  0.5  0.6 0.65 0.65 0.65 0.65 0.65 0.65 0.55  0.5
 39       0.5  0.5  0.5  0.6 0.65 0.65 0.65 0.65 0.65 0.65 0.55  0.5
 40       0.5  0.5  0.5  0.6 0.65 0.65 0.65 0.65 0.65 0.65 0.55  0.5
END MON-LZETPARM
MON-INTERCEP
  <PLS >      PWATER input info: Part 3         ***
  # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 38      0.13 0.13 0.13 0.14 0.15 0.15 0.15 0.15 0.15 0.15 0.14 0.13
 39      0.13 0.13 0.13 0.14 0.15 0.15 0.15 0.15 0.15 0.15 0.14 0.13
 40      0.13 0.13 0.13 0.14 0.15 0.15 0.15 0.15 0.15 0.15 0.14 0.13
END MON-INTERCEP

PWAT-STATE1
  <PLS > *** Initial conditions at start of simulation
           ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
  # -  # ***  CEPS      SURS       UZS      IFWS       LZS       AGWS      GWVS
 38             0         0      0.01         0       0.5        0.3      0.01
 39             0         0      0.01         0       0.5        0.3      0.01
 40             0         0      0.01         0       0.5        0.3      0.01
```

```
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
EX-A1-2***
PERLND  38                       0.072     COPY   502     12
PERLND  38                       0.072     COPY   502     13
PERLND  39                        0.22     COPY   502     12
PERLND  39                        0.22     COPY   502     13
PERLND  40                       0.186     COPY   502     12
PERLND  40                       0.186     COPY   502     13
EX-A1-1***
PERLND  39                        0.46     COPY   503     12
PERLND  39                        0.46     COPY   503     13
PERLND  38                        0.15     COPY   503     12
PERLND  38                        0.15     COPY   503     13
PERLND  40                        0.39     COPY   503     12
PERLND  40                        0.39     COPY   503     13
EX-A1-3ABCDE***
PERLND  39                       0.929     COPY   504     12
PERLND  39                       0.929     COPY   504     13
PERLND  38                       0.303     COPY   504     12
PERLND  38                       0.303     COPY   504     13
PERLND  40                       0.788     COPY   504     12
PERLND  40                       0.788     COPY   504     13

******Routing******
```

```
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   502 OUTPUT MEAN   1 1   48.4        DISPLY   2     INPUT  TIMSER 1
COPY   503 OUTPUT MEAN   1 1   48.4        DISPLY   3     INPUT  TIMSER 1
COPY   504 OUTPUT MEAN   1 1   48.4        DISPLY   4     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                 ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG            ***
                                          in  out                             ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                      ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                         ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
```

```
COPY    502 OUTPUT MEAN    1 1     48.4       WDM     502 FLOW     ENGL      REPL
COPY    503 OUTPUT MEAN    1 1     48.4       WDM     503 FLOW     ENGL      REPL
COPY    504 OUTPUT MEAN    1 1     48.4       WDM     504 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1949 10 01        END    2011 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   2018-09-10 BMP-1-2-3 POC-A.wdm
MESSU       25   Mit2018-09-10 BMP-1-2-3 POC-A.MES
            27   Mit2018-09-10 BMP-1-2-3 POC-A.L61
            28   Mit2018-09-10 BMP-1-2-3 POC-A.L62
            32   POC2018-09-10 BMP-1-2-3 POC-A3.dat
            31   POC2018-09-10 BMP-1-2-3 POC-A2.dat
            33   POC2018-09-10 BMP-1-2-3 POC-A4.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      PERLND      45
      IMPLND      14
      GENER        2
      RCHRES       1
      RCHRES       2
      GENER        4
      RCHRES       3
      RCHRES       4
      GENER        6
      RCHRES       5
      RCHRES       6
      GENER        8
      RCHRES       7
      RCHRES       8
      GENER       10
      RCHRES       9
      RCHRES      10
      GENER       12
      RCHRES      11
      RCHRES      12
      GENER       14
      RCHRES      13
      RCHRES      14
      RCHRES      15
      COPY         3
      COPY       503
      COPY         2
      COPY       502
      COPY         4
      COPY       504
      DISPLY       3
      DISPLY       2
      DISPLY       4
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    3        Surface BMP-1              MAX                    1    2   32    9
    2        Surface BMP-2              MAX                    1    2   31    9
    4        HMP-TANK3                  MAX                    1    2   33    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
```

```
    # -  #  NPT  NMN ***
    1         1    1
    3         1    1
  503         1    1
    2         1    1
  502         1    1
    4         1    1
  504         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
    2        24
    4        24
    6        24
    8        24
   10        24
   12        24
   14        24
  END OPCODE
  PARM
    #    #         K ***
    2             0.
    4             0.
    6             0.
    8             0.
   10             0.
   12             0.
   14             0.
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   45     C/D,Urban,Flat(0-5%)    1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   45         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   45         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   45         0    0    0    1    0    0    0    0    1    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   45              0       4.6      0.04       400      0.05         3     0.995
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   45             40        35         3         2      0.45      0.15         0
  END PWAT-PARM3
```

```
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                  ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   45              0       0.7      0.25         1       0.4         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   45       0.5  0.5  0.5  0.6 0.65 0.65 0.65 0.65 0.65 0.65 0.55  0.5
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   45      0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   45              0         0      0.01         0       3.5       1.7       0.1
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
   14     Parking,Flat(0-5%)      1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
   14         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
   14         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
   14         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
   14            100      0.05       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
   14              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
   14              0         0
  END IWAT-STATE1
```

```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
PD-A1-2***
PERLND  45                       0.12     RCHRES  13      2
PERLND  45                       0.12     RCHRES  13      3
IMPLND  14                      0.358     RCHRES  13      5
PD-A1-1***
PERLND  45                        0.2     RCHRES  11      2
PERLND  45                        0.2     RCHRES  11      3
IMPLND  14                        0.8     RCHRES  11      5
PD-A1-3A***
PERLND  45                       0.05     RCHRES   1      2
PERLND  45                       0.05     RCHRES   1      3
IMPLND  14                      0.447     RCHRES   1      5
PD-A1-3B***
PERLND  45                      0.041     RCHRES   3      2
PERLND  45                      0.041     RCHRES   3      3
IMPLND  14                      0.364     RCHRES   3      5
PD-A1-3C***
PERLND  45                       0.04     RCHRES   5      2
PERLND  45                       0.04     RCHRES   5      3
IMPLND  14                      0.362     RCHRES   5      5
PD-A1-3D***
PERLND  45                      0.024     RCHRES   7      2
PERLND  45                      0.024     RCHRES   7      3
IMPLND  14                      0.219     RCHRES   7      5
PD-A1-3E***
PERLND  45                      0.047     RCHRES   9      2
PERLND  45                      0.047     RCHRES   9      3
IMPLND  14                      0.426     RCHRES   9      5

******Routing******
PERLND  45                       0.12     COPY     2     12
IMPLND  14                      0.358     COPY     2     15
PERLND  45                       0.12     COPY     2     13
PERLND  45                        0.2     COPY     3     12
IMPLND  14                        0.8     COPY     3     15
PERLND  45                        0.2     COPY     3     13
RCHRES   1                          1     RCHRES  15      7
RCHRES   1                                COPY     4     17
RCHRES   1                          1     RCHRES   2      8
RCHRES   3                          1     RCHRES  15      7
RCHRES   3                                COPY     4     17
RCHRES   3                          1     RCHRES   4      8
RCHRES   5                          1     RCHRES  15      7
RCHRES   5                                COPY     4     17
RCHRES   5                          1     RCHRES   6      8
RCHRES   7                          1     RCHRES  15      7
RCHRES   7                                COPY     4     17
RCHRES   7                          1     RCHRES   8      8
RCHRES   9                          1     RCHRES  15      7
RCHRES   9                                COPY     4     17
RCHRES   9                          1     RCHRES  10      8
RCHRES  11                          1     RCHRES  12      8
RCHRES  13                          1     RCHRES  14      8
RCHRES  12                          1     COPY   503     16
RCHRES  11                          1     COPY   503     17
RCHRES  14                          1     COPY   502     16
RCHRES  13                          1     COPY   502     17
RCHRES  15                          1     COPY   504     16
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   503 OUTPUT MEAN   1 1   48.4        DISPLY   3     INPUT  TIMSER 1
COPY   502 OUTPUT MEAN   1 1   48.4        DISPLY   2     INPUT  TIMSER 1
```

```
COPY   504 OUTPUT MEAN   1 1   48.4        DISPLY   4     INPUT  TIMSER 1
GENER    2 OUTPUT TIMSER      .0011111     RCHRES   1     EXTNL  OUTDGT 1
GENER    4 OUTPUT TIMSER      .0011111     RCHRES   3     EXTNL  OUTDGT 1
GENER    6 OUTPUT TIMSER      .0011111     RCHRES   5     EXTNL  OUTDGT 1
GENER    8 OUTPUT TIMSER      .0011111     RCHRES   7     EXTNL  OUTDGT 1
GENER   10 OUTPUT TIMSER      .0011111     RCHRES   9     EXTNL  OUTDGT 1
GENER   12 OUTPUT TIMSER      .0011111     RCHRES  11     EXTNL  OUTDGT 1
GENER   14 OUTPUT TIMSER      .0011111     RCHRES  13     EXTNL  OUTDGT 1


<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<----------------><---> User T-series  Engl Metr LKFG             ***
                                       in  out                              ***
    1     Surface BMP-3A          3    1    1    1   28    0    1
    2     BMP-3A                  1    1    1    1   28    0    1
    3     Surface BMP-3B          3    1    1    1   28    0    1
    4     BMP-3B                  1    1    1    1   28    0    1
    5     Surface BMP-3C          3    1    1    1   28    0    1
    6     BMP-3C                  1    1    1    1   28    0    1
    7     Surface BMP-3D          3    1    1    1   28    0    1
    8     BMP-3D                  1    1    1    1   28    0    1
    9     Surface BMP-3E          3    1    1    1   28    0    1
   10     BMP-3E                  1    1    1    1   28    0    1
   11     Surface BMP-1           3    1    1    1   28    0    1
   12     BMP-1                   1    1    1    1   28    0    1
   13     Surface BMP-2           3    1    1    1   28    0    1
   14     BMP-2                   1    1    1    1   28    0    1
   15     HMP-TANK3               1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
    2         1    0    0    0    0    0    0    0    0    0
    3         1    0    0    0    0    0    0    0    0    0
    4         1    0    0    0    0    0    0    0    0    0
    5         1    0    0    0    0    0    0    0    0    0
    6         1    0    0    0    0    0    0    0    0    0
    7         1    0    0    0    0    0    0    0    0    0
    8         1    0    0    0    0    0    0    0    0    0
    9         1    0    0    0    0    0    0    0    0    0
   10         1    0    0    0    0    0    0    0    0    0
   11         1    0    0    0    0    0    0    0    0    0
   12         1    0    0    0    0    0    0    0    0    0
   13         1    0    0    0    0    0    0    0    0    0
   14         1    0    0    0    0    0    0    0    0    0
   15         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
    2         4    0    0    0    0    0    0    0    0    0    1    9
    3         4    0    0    0    0    0    0    0    0    0    1    9
    4         4    0    0    0    0    0    0    0    0    0    1    9
    5         4    0    0    0    0    0    0    0    0    0    1    9
    6         4    0    0    0    0    0    0    0    0    0    1    9
    7         4    0    0    0    0    0    0    0    0    0    1    9
    8         4    0    0    0    0    0    0    0    0    0    1    9
    9         4    0    0    0    0    0    0    0    0    0    1    9
```

```
 10         4    0    0    0    0    0    0    0    0    0    1    9
 11         4    0    0    0    0    0    0    0    0    0    1    9
 12         4    0    0    0    0    0    0    0    0    0    1    9
 13         4    0    0    0    0    0    0    0    0    0    1    9
 14         4    0    0    0    0    0    0    0    0    0    1    9
 15         4    0    0    0    0    0    0    0    0    0    1    9
END PRINT-INFO

HYDR-PARM1
  RCHRES  Flags for each HYDR Section                                    ***
  # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
         FG FG FG FG  possible  exit  *** possible  exit      possible  exit
          *  *  *  *    *  *  *  *  *      *  *  *  *  *        ***
  1        0  1  0  0    4  5  6  0  0       0  1  0  0  0       2  1  2  2  2
  2        0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
  3        0  1  0  0    4  5  6  0  0       0  1  0  0  0       2  1  2  2  2
  4        0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
  5        0  1  0  0    4  5  6  0  0       0  1  0  0  0       2  1  2  2  2
  6        0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
  7        0  1  0  0    4  5  6  0  0       0  1  0  0  0       2  1  2  2  2
  8        0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
  9        0  1  0  0    4  5  6  0  0       0  1  0  0  0       2  1  2  2  2
 10        0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
 11        0  1  0  0    4  5  6  0  0       0  1  0  0  0       2  1  2  2  2
 12        0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
 13        0  1  0  0    4  5  6  0  0       0  1  0  0  0       2  1  2  2  2
 14        0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
 15        0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
END HYDR-PARM1

HYDR-PARM2
  # -  #    FTABNO       LEN      DELTH     STCOR        KS      DB50        ***
<------><--------><--------><--------><--------><--------><--------><        ***
  1              1      0.01       0.0       0.0       0.5       0.0
  2              2      0.03       0.0       0.0       0.5       0.0
  3              3      0.01       0.0       0.0       0.5       0.0
  4              4      0.02       0.0       0.0       0.5       0.0
  5              5      0.01       0.0       0.0       0.5       0.0
  6              6      0.02       0.0       0.0       0.5       0.0
  7              7      0.01       0.0       0.0       0.5       0.0
  8              8      0.02       0.0       0.0       0.5       0.0
  9              9      0.01       0.0       0.0       0.5       0.0
 10             10      0.02       0.0       0.0       0.5       0.0
 11             11      0.01       0.0       0.0       0.5       0.0
 12             12      0.02       0.0       0.0       0.5       0.0
 13             13      0.01       0.0       0.0       0.5       0.0
 14             14      0.01       0.0       0.0       0.5       0.0
 15             15      0.03       0.0       0.0       0.5       0.0
END HYDR-PARM2
HYDR-INIT
  RCHRES  Initial conditions for each HYDR section                       ***
  # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
        *** ac-ft     for each possible exit        for each possible exit
<------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  1             0        4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  2             0        4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  3             0        4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  4             0        4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  5             0        4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  6             0        4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  7             0        4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  8             0        4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  9             0        4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
 10         0            4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
 11         0            4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
 12         0            4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
 13         0            4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
 14         0            4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
 15         0            4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
END HYDR-INIT
```

```
END RCHRES

SPEC-ACTIONS
*** User-Defined Variable Quantity Lines
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol2   RCHRES   2 VOL              4
  UVQUAN v2m2   GLOBAL     WORKSP  1        3
  UVQUAN vpo2   GLOBAL     WORKSP  2        3
  UVQUAN v2d2   GENER    2 K       1        3
*** User-Defined Variable Quantity Lines
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol4   RCHRES   4 VOL              4
  UVQUAN v2m4   GLOBAL     WORKSP  3        3
  UVQUAN vpo4   GLOBAL     WORKSP  4        3
  UVQUAN v2d4   GENER    4 K       1        3
*** User-Defined Variable Quantity Lines
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol6   RCHRES   6 VOL              4
  UVQUAN v2m6   GLOBAL     WORKSP  5        3
  UVQUAN vpo6   GLOBAL     WORKSP  6        3
  UVQUAN v2d6   GENER    6 K       1        3
*** User-Defined Variable Quantity Lines
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol8   RCHRES   8 VOL              4
  UVQUAN v2m8   GLOBAL     WORKSP  7        3
  UVQUAN vpo8   GLOBAL     WORKSP  8        3
  UVQUAN v2d8   GENER    8 K       1        3
*** User-Defined Variable Quantity Lines
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol10  RCHRES  10 VOL              4
  UVQUAN v2m10  GLOBAL     WORKSP  9        3
  UVQUAN vpo10  GLOBAL     WORKSP 10        3
  UVQUAN v2d10  GENER   10 K       1        3
*** User-Defined Variable Quantity Lines
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol12  RCHRES  12 VOL              4
  UVQUAN v2m12  GLOBAL     WORKSP 11        3
  UVQUAN vpo12  GLOBAL     WORKSP 12        3
  UVQUAN v2d12  GENER   12 K       1        3
*** User-Defined Variable Quantity Lines
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol14  RCHRES  14 VOL              4
  UVQUAN v2m14  GLOBAL     WORKSP 13        3
  UVQUAN vpo14  GLOBAL     WORKSP 14        3
  UVQUAN v2d14  GENER   14 K       1        3
*** User-Defined Target Variable Names
***                  addr or                        addr or
***                 <------>                       <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
```

```
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m2    1 WORKSP  1         1.0 QUAN
  UVNAME  vpo2    1 WORKSP  2         1.0 QUAN
  UVNAME  v2d2    1 K       1         1.0 QUAN
*** User-Defined Target Variable Names
***                  addr or                        addr or
***                 <------>                       <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m4    1 WORKSP  3         1.0 QUAN
  UVNAME  vpo4    1 WORKSP  4         1.0 QUAN
  UVNAME  v2d4    1 K       1         1.0 QUAN
*** User-Defined Target Variable Names
***                  addr or                        addr or
***                 <------>                       <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m6    1 WORKSP  5         1.0 QUAN
  UVNAME  vpo6    1 WORKSP  6         1.0 QUAN
  UVNAME  v2d6    1 K       1         1.0 QUAN
*** User-Defined Target Variable Names
***                  addr or                        addr or
***                 <------>                       <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m8    1 WORKSP  7         1.0 QUAN
  UVNAME  vpo8    1 WORKSP  8         1.0 QUAN
  UVNAME  v2d8    1 K       1         1.0 QUAN
*** User-Defined Target Variable Names
***                  addr or                        addr or
***                 <------>                       <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m10   1 WORKSP  9         1.0 QUAN
  UVNAME  vpo10   1 WORKSP 10         1.0 QUAN
  UVNAME  v2d10   1 K       1         1.0 QUAN
*** User-Defined Target Variable Names
***                  addr or                        addr or
***                 <------>                       <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m12   1 WORKSP 11         1.0 QUAN
  UVNAME  vpo12   1 WORKSP 12         1.0 QUAN
  UVNAME  v2d12   1 K       1         1.0 QUAN
*** User-Defined Target Variable Names
***                  addr or                        addr or
***                 <------>                       <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m14   1 WORKSP 13         1.0 QUAN
  UVNAME  vpo14   1 WORKSP 14         1.0 QUAN
  UVNAME  v2d14   1 K       1         1.0 QUAN
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER   2                               v2m2           =  1572.
*** Compute remaining available pore space
  GENER   2                               vpo2           =  v2m2
  GENER   2                               vpo2          -=  vol2
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo2 < 0.0) THEN
  GENER   2                               vpo2           =  0.0
END IF
*** Infiltration volume
  GENER   2                               v2d2           =  vpo2
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER   4                               v2m4           =  1286.
*** Compute remaining available pore space
  GENER   4                               vpo4           =  v2m4
  GENER   4                               vpo4          -=  vol4
```

```
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo4 < 0.0) THEN
  GENER   4                                vpo4            =  0.0
END IF
*** Infiltration volume
  GENER   4                                v2d4            =  vpo4
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER   6                                v2m6            =  1328.
*** Compute remaining available pore space
  GENER   6                                vpo6            =  v2m6
  GENER   6                                vpo6           -=  vol6
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo6 < 0.0) THEN
  GENER   6                                vpo6            =  0.0
END IF
*** Infiltration volume
  GENER   6                                v2d6            =  vpo6
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER   8                                v2m8            =  1041.
*** Compute remaining available pore space
  GENER   8                                vpo8            =  v2m8
  GENER   8                                vpo8           -=  vol8
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo8 < 0.0) THEN
  GENER   8                                vpo8            =  0.0
END IF
*** Infiltration volume
  GENER   8                                v2d8            =  vpo8
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER  10                                v2m10           =  1395.
*** Compute remaining available pore space
  GENER  10                                vpo10           =  v2m10
  GENER  10                                vpo10          -=  vol10
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo10 < 0.0) THEN
  GENER  10                                vpo10           =  0.0
END IF
*** Infiltration volume
  GENER  10                                v2d10           =  vpo10
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER  12                                v2m12           =  6347.
*** Compute remaining available pore space
  GENER  12                                vpo12           =  v2m12
  GENER  12                                vpo12          -=  vol12
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo12 < 0.0) THEN
  GENER  12                                vpo12           =  0.0
END IF
*** Infiltration volume
  GENER  12                                v2d12           =  vpo12
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER  14                                v2m14           =  3767.
*** Compute remaining available pore space
  GENER  14                                vpo14           =  v2m14
  GENER  14                                vpo14          -=  vol14
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo14 < 0.0) THEN
  GENER  14                                vpo14           =  0.0
END IF
*** Infiltration volume
  GENER  14                                v2d14           =  vpo14
END SPEC-ACTIONS
FTABLES
  FTABLE      2
   76    4
```

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.021325	0.000000	0.000000		
0.060440	0.021325	0.000503	0.000000		
0.120879	0.021325	0.001005	0.000000		
0.181319	0.021325	0.001508	0.000000		
0.241758	0.021325	0.002011	0.000000		
0.302198	0.021325	0.002513	0.000000		
0.362637	0.021325	0.003016	0.000000		
0.423077	0.021325	0.003519	0.000000		
0.483516	0.021325	0.004021	0.000000		
0.543956	0.021325	0.004524	0.000000		
0.604396	0.021325	0.005027	0.000000		
0.664835	0.021325	0.005529	0.000000		
0.725275	0.021325	0.006032	0.000000		
0.785714	0.021325	0.006534	0.000000		
0.846154	0.021325	0.007037	0.000000		
0.906593	0.021325	0.007540	0.001313		
0.967033	0.021325	0.008042	0.001448		
1.027473	0.021325	0.008545	0.001750		
1.087912	0.021325	0.009048	0.002093		
1.148352	0.021325	0.009550	0.002480		
1.208791	0.021325	0.010053	0.002912		
1.269231	0.021325	0.010556	0.003390		
1.329670	0.021325	0.011058	0.003916		
1.390110	0.021325	0.011561	0.004492		
1.450549	0.021325	0.012064	0.005118		
1.510989	0.021325	0.012566	0.005797		
1.571429	0.021325	0.013069	0.006528		
1.631868	0.021325	0.013572	0.007315		
1.692308	0.021325	0.014074	0.008157		
1.752747	0.021325	0.014577	0.009056		
1.813187	0.021325	0.015080	0.010014		
1.873626	0.021325	0.015582	0.011031		
1.934066	0.021325	0.016085	0.012109		
1.994505	0.021325	0.016588	0.013249		
2.054945	0.021325	0.017090	0.014451		
2.115385	0.021325	0.017593	0.015718		
2.175824	0.021325	0.018095	0.017049		
2.236264	0.021325	0.018598	0.018447		
2.296703	0.021325	0.019101	0.019913		
2.357143	0.021325	0.019603	0.021446		
2.417582	0.021325	0.020106	0.023049		
2.478022	0.021325	0.020609	0.024721		
2.538462	0.021325	0.021111	0.026466		
2.598901	0.021325	0.021614	0.028282		
2.659341	0.021325	0.022117	0.030172		
2.719780	0.021325	0.022619	0.032135		
2.780220	0.021325	0.023122	0.034174		
2.840659	0.021325	0.023625	0.036289		
2.901099	0.021325	0.024127	0.038480		
2.961538	0.021325	0.024630	0.040750		
3.021978	0.021325	0.025165	0.043097		
3.082418	0.021325	0.025700	0.045525		
3.142857	0.021325	0.026235	0.048032		
3.203297	0.021325	0.026769	0.050620		
3.263736	0.021325	0.027304	0.053288		
3.324176	0.021325	0.027839	0.055026		
3.384615	0.021325	0.028374	0.055026		
3.445055	0.021325	0.028909	0.055026		
3.505495	0.021325	0.029444	0.055026		
3.565934	0.021325	0.029979	0.055026		
3.626374	0.021325	0.030514	0.055026		
3.686813	0.021325	0.031048	0.055026		
3.747253	0.021325	0.031583	0.055026		
3.807692	0.021325	0.032118	0.055026		
3.868132	0.021325	0.032653	0.055026		
3.928571	0.021325	0.033188	0.055026		
3.989011	0.021325	0.033723	0.055026		
4.049451	0.021325	0.034258	0.055026		

```
  4.109890  0.021325  0.034793  0.055026
  4.170330  0.021325  0.035327  0.055026
  4.230769  0.021325  0.035862  0.055026
  4.291209  0.021325  0.036397  0.055026
  4.351648  0.021325  0.036932  0.055026
  4.412088  0.021325  0.037467  0.055026
  4.472527  0.021325  0.038002  0.055026
  4.500000  0.021325  0.080314  0.055026
  END FTABLE  2
  FTABLE      1
   18    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.021325  0.000000  0.000000  0.000000  0.000000
  0.060440  0.021325  0.001289  0.000000  0.056134  0.000000
  0.120879  0.021325  0.002578  0.000000  0.057243  0.000000
  0.181319  0.021325  0.003867  0.000000  0.058351  0.000000
  0.241758  0.021325  0.005155  0.000000  0.059460  0.000000
  0.302198  0.021325  0.006444  0.000000  0.060569  0.000000
  0.362637  0.021325  0.007733  0.000000  0.061677  0.000000
  0.423077  0.021325  0.009022  0.000000  0.062786  0.000000
  0.483516  0.021325  0.010311  0.000000  0.063894  0.000000
  0.543956  0.021325  0.011600  0.065047  0.065003  0.000000
  0.604396  0.021325  0.012889  0.233496  0.066111  0.000000
  0.664835  0.021325  0.014177  0.435744  0.067220  0.000000
  0.725275  0.021325  0.015466  0.618960  0.068329  0.000000
  0.785714  0.021325  0.016755  0.742908  0.069437  0.000000
  0.846154  0.021325  0.018044  0.823591  0.070546  0.000000
  0.906593  0.021325  0.019333  0.892601  0.071654  0.000000
  0.967033  0.021325  0.020622  0.956645  0.072763  0.000000
  1.000000  0.021325  0.021325  1.016663  0.073368  0.000000
  END FTABLE  1
  FTABLE      4
   76    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.017452  0.000000  0.000000
  0.060440  0.017452  0.000411  0.000000
  0.120879  0.017452  0.000823  0.000000
  0.181319  0.017452  0.001234  0.000000
  0.241758  0.017452  0.001645  0.000000
  0.302198  0.017452  0.002057  0.000000
  0.362637  0.017452  0.002468  0.000000
  0.423077  0.017452  0.002880  0.000000
  0.483516  0.017452  0.003291  0.000000
  0.543956  0.017452  0.003702  0.000000
  0.604396  0.017452  0.004114  0.000000
  0.664835  0.017452  0.004525  0.000000
  0.725275  0.017452  0.004936  0.000000
  0.785714  0.017452  0.005348  0.000000
  0.846154  0.017452  0.005759  0.000000
  0.906593  0.017452  0.006170  0.001075
  0.967033  0.017452  0.006582  0.001185
  1.027473  0.017452  0.006993  0.001432
  1.087912  0.017452  0.007405  0.001713
  1.148352  0.017452  0.007816  0.002029
  1.208791  0.017452  0.008227  0.002383
  1.269231  0.017452  0.008639  0.002774
  1.329670  0.017452  0.009050  0.003205
  1.390110  0.017452  0.009461  0.003676
  1.450549  0.017452  0.009873  0.004189
  1.510989  0.017452  0.010284  0.004744
  1.571429  0.017452  0.010695  0.005343
  1.631868  0.017452  0.011107  0.005986
  1.692308  0.017452  0.011518  0.006675
  1.752747  0.017452  0.011930  0.007411
  1.813187  0.017452  0.012341  0.008195
  1.873626  0.017452  0.012752  0.009028
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  1.934066  0.017452  0.013164  0.009910
  1.994505  0.017452  0.013575  0.010842
  2.054945  0.017452  0.013986  0.011827
  2.115385  0.017452  0.014398  0.012863
  2.175824  0.017452  0.014809  0.013953
  2.236264  0.017452  0.015220  0.015097
  2.296703  0.017452  0.015632  0.016296
  2.357143  0.017452  0.016043  0.017551
  2.417582  0.017452  0.016455  0.018863
  2.478022  0.017452  0.016866  0.020232
  2.538462  0.017452  0.017277  0.021659
  2.598901  0.017452  0.017689  0.023146
  2.659341  0.017452  0.018100  0.024692
  2.719780  0.017452  0.018511  0.026299
  2.780220  0.017452  0.018923  0.027968
  2.840659  0.017452  0.019334  0.029698
  2.901099  0.017452  0.019745  0.031492
  2.961538  0.017452  0.020157  0.033349
  3.021978  0.017452  0.020595  0.035270
  3.082418  0.017452  0.021032  0.037257
  3.142857  0.017452  0.021470  0.039309
  3.203297  0.017452  0.021908  0.041427
  3.263736  0.017452  0.022345  0.043611
  3.324176  0.017452  0.022783  0.045032
  3.384615  0.017452  0.023221  0.045032
  3.445055  0.017452  0.023659  0.045032
  3.505495  0.017452  0.024096  0.045032
  3.565934  0.017452  0.024534  0.045032
  3.626374  0.017452  0.024972  0.045032
  3.686813  0.017452  0.025410  0.045032
  3.747253  0.017452  0.025847  0.045032
  3.807692  0.017452  0.026285  0.045032
  3.868132  0.017452  0.026723  0.045032
  3.928571  0.017452  0.027161  0.045032
  3.989011  0.017452  0.027598  0.045032
  4.049451  0.017452  0.028036  0.045032
  4.109890  0.017452  0.028474  0.045032
  4.170330  0.017452  0.028911  0.045032
  4.230769  0.017452  0.029349  0.045032
  4.291209  0.017452  0.029787  0.045032
  4.351648  0.017452  0.030225  0.045032
  4.412088  0.017452  0.030662  0.045032
  4.472527  0.017452  0.031100  0.045032
  4.500000  0.017452  0.065728  0.045032
  END FTABLE  4
  FTABLE      3
   18    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.017452  0.000000  0.000000  0.000000  0.000000
  0.060440  0.017452  0.001055  0.000000  0.045940  0.000000
  0.120879  0.017452  0.002110  0.000000  0.046847  0.000000
  0.181319  0.017452  0.003164  0.000000  0.047754  0.000000
  0.241758  0.017452  0.004219  0.000000  0.048661  0.000000
  0.302198  0.017452  0.005274  0.000000  0.049569  0.000000
  0.362637  0.017452  0.006329  0.000000  0.050476  0.000000
  0.423077  0.017452  0.007383  0.000000  0.051383  0.000000
  0.483516  0.017452  0.008438  0.000000  0.052290  0.000000
  0.543956  0.017452  0.009493  0.065047  0.053197  0.000000
  0.604396  0.017452  0.010548  0.233496  0.054105  0.000000
  0.664835  0.017452  0.011603  0.435744  0.055012  0.000000
  0.725275  0.017452  0.012657  0.618960  0.055919  0.000000
  0.785714  0.017452  0.013712  0.742908  0.056826  0.000000
  0.846154  0.017452  0.014767  0.823591  0.057734  0.000000
  0.906593  0.017452  0.015822  0.892601  0.058641  0.000000
  0.967033  0.017452  0.016876  0.956645  0.059548  0.000000
  1.000000  0.017452  0.017452  1.016663  0.060043  0.000000
  END FTABLE  3
```

FTABLE 6
76 4

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.018014	0.000000	0.000000		
0.060440	0.018014	0.000425	0.000000		
0.120879	0.018014	0.000849	0.000000		
0.181319	0.018014	0.001274	0.000000		
0.241758	0.018014	0.001698	0.000000		
0.302198	0.018014	0.002123	0.000000		
0.362637	0.018014	0.002548	0.000000		
0.423077	0.018014	0.002972	0.000000		
0.483516	0.018014	0.003397	0.000000		
0.543956	0.018014	0.003822	0.000000		
0.604396	0.018014	0.004246	0.000000		
0.664835	0.018014	0.004671	0.000000		
0.725275	0.018014	0.005095	0.000000		
0.785714	0.018014	0.005520	0.000000		
0.846154	0.018014	0.005945	0.000000		
0.906593	0.018014	0.006369	0.001109		
0.967033	0.018014	0.006794	0.001224		
1.027473	0.018014	0.007219	0.001478		
1.087912	0.018014	0.007643	0.001768		
1.148352	0.018014	0.008068	0.002095		
1.208791	0.018014	0.008492	0.002460		
1.269231	0.018014	0.008917	0.002864		
1.329670	0.018014	0.009342	0.003308		
1.390110	0.018014	0.009766	0.003795		
1.450549	0.018014	0.010191	0.004324		
1.510989	0.018014	0.010616	0.004897		
1.571429	0.018014	0.011040	0.005515		
1.631868	0.018014	0.011465	0.006179		
1.692308	0.018014	0.011889	0.006891		
1.752747	0.018014	0.012314	0.007650		
1.813187	0.018014	0.012739	0.008459		
1.873626	0.018014	0.013163	0.009319		
1.934066	0.018014	0.013588	0.010229		
1.994505	0.018014	0.014013	0.011192		
2.054945	0.018014	0.014437	0.012208		
2.115385	0.018014	0.014862	0.013278		
2.175824	0.018014	0.015286	0.014403		
2.236264	0.018014	0.015711	0.015584		
2.296703	0.018014	0.016136	0.016821		
2.357143	0.018014	0.016560	0.018117		
2.417582	0.018014	0.016985	0.019471		
2.478022	0.018014	0.017409	0.020884		
2.538462	0.018014	0.017834	0.022357		
2.598901	0.018014	0.018259	0.023892		
2.659341	0.018014	0.018683	0.025488		
2.719780	0.018014	0.019108	0.027147		
2.780220	0.018014	0.019533	0.028869		
2.840659	0.018014	0.019957	0.030655		
2.901099	0.018014	0.020382	0.032507		
2.961538	0.018014	0.020806	0.034424		
3.021978	0.018014	0.021258	0.036407		
3.082418	0.018014	0.021710	0.038458		
3.142857	0.018014	0.022162	0.040576		
3.203297	0.018014	0.022614	0.042762		
3.263736	0.018014	0.023066	0.045016		
3.324176	0.018014	0.023517	0.046484		
3.384615	0.018014	0.023969	0.046484		
3.445055	0.018014	0.024421	0.046484		
3.505495	0.018014	0.024873	0.046484		
3.565934	0.018014	0.025325	0.046484		
3.626374	0.018014	0.025777	0.046484		
3.686813	0.018014	0.026229	0.046484		
3.747253	0.018014	0.026680	0.046484		
3.807692	0.018014	0.027132	0.046484		
3.868132	0.018014	0.027584	0.046484		
3.928571	0.018014	0.028036	0.046484		

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  3.989011  0.018014  0.028488  0.046484
  4.049451  0.018014  0.028940  0.046484
  4.109890  0.018014  0.029391  0.046484
  4.170330  0.018014  0.029843  0.046484
  4.230769  0.018014  0.030295  0.046484
  4.291209  0.018014  0.030747  0.046484
  4.351648  0.018014  0.031199  0.046484
  4.412088  0.018014  0.031651  0.046484
  4.472527  0.018014  0.032102  0.046484
  4.500000  0.018014  0.067846  0.046484
  END FTABLE  6
  FTABLE      5
   18    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.018014  0.000000  0.000000  0.000000  0.000000
  0.060440  0.018014  0.001089  0.000000  0.047420  0.000000
  0.120879  0.018014  0.002178  0.000000  0.048357  0.000000
  0.181319  0.018014  0.003266  0.000000  0.049293  0.000000
  0.241758  0.018014  0.004355  0.000000  0.050230  0.000000
  0.302198  0.018014  0.005444  0.000000  0.051166  0.000000
  0.362637  0.018014  0.006533  0.000000  0.052103  0.000000
  0.423077  0.018014  0.007621  0.000000  0.053039  0.000000
  0.483516  0.018014  0.008710  0.000000  0.053975  0.000000
  0.543956  0.018014  0.009799  0.065047  0.054912  0.000000
  0.604396  0.018014  0.010888  0.233496  0.055848  0.000000
  0.664835  0.018014  0.011976  0.435744  0.056785  0.000000
  0.725275  0.018014  0.013065  0.618960  0.057721  0.000000
  0.785714  0.018014  0.014154  0.742908  0.058658  0.000000
  0.846154  0.018014  0.015243  0.823591  0.059594  0.000000
  0.906593  0.018014  0.016332  0.892601  0.060531  0.000000
  0.967033  0.018014  0.017420  0.956645  0.061467  0.000000
  1.000000  0.018014  0.018014  1.016663  0.061978  0.000000
  END FTABLE  5
  FTABLE      8
   76    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.014125  0.000000  0.000000
  0.060440  0.014125  0.000333  0.000000
  0.120879  0.014125  0.000666  0.000000
  0.181319  0.014125  0.000999  0.000000
  0.241758  0.014125  0.001332  0.000000
  0.302198  0.014125  0.001665  0.000000
  0.362637  0.014125  0.001998  0.000000
  0.423077  0.014125  0.002331  0.000000
  0.483516  0.014125  0.002664  0.000000
  0.543956  0.014125  0.002997  0.000000
  0.604396  0.014125  0.003330  0.000000
  0.664835  0.014125  0.003663  0.000000
  0.725275  0.014125  0.003995  0.000000
  0.785714  0.014125  0.004328  0.000000
  0.846154  0.014125  0.004661  0.000000
  0.906593  0.014125  0.004994  0.000870
  0.967033  0.014125  0.005327  0.000959
  1.027473  0.014125  0.005660  0.001159
  1.087912  0.014125  0.005993  0.001386
  1.148352  0.014125  0.006326  0.001643
  1.208791  0.014125  0.006659  0.001929
  1.269231  0.014125  0.006992  0.002246
  1.329670  0.014125  0.007325  0.002594
  1.390110  0.014125  0.007658  0.002975
  1.450549  0.014125  0.007991  0.003390
  1.510989  0.014125  0.008324  0.003840
  1.571429  0.014125  0.008657  0.004324
  1.631868  0.014125  0.008990  0.004845
  1.692308  0.014125  0.009323  0.005403
  1.752747  0.014125  0.009656  0.005999
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  1.813187  0.014125  0.009989  0.006633
  1.873626  0.014125  0.010322  0.007307
  1.934066  0.014125  0.010655  0.008021
  1.994505  0.014125  0.010988  0.008776
  2.054945  0.014125  0.011320  0.009572
  2.115385  0.014125  0.011653  0.010411
  2.175824  0.014125  0.011986  0.011294
  2.236264  0.014125  0.012319  0.012219
  2.296703  0.014125  0.012652  0.013190
  2.357143  0.014125  0.012985  0.014206
  2.417582  0.014125  0.013318  0.015267
  2.478022  0.014125  0.013651  0.016375
  2.538462  0.014125  0.013984  0.017531
  2.598901  0.014125  0.014317  0.018734
  2.659341  0.014125  0.014650  0.019986
  2.719780  0.014125  0.014983  0.021286
  2.780220  0.014125  0.015316  0.022637
  2.840659  0.014125  0.015649  0.024038
  2.901099  0.014125  0.015982  0.025489
  2.961538  0.014125  0.016315  0.026992
  3.021978  0.014125  0.016669  0.028548
  3.082418  0.014125  0.017023  0.030155
  3.142857  0.014125  0.017378  0.031816
  3.203297  0.014125  0.017732  0.033530
  3.263736  0.014125  0.018086  0.035298
  3.324176  0.014125  0.018441  0.036449
  3.384615  0.014125  0.018795  0.036449
  3.445055  0.014125  0.019149  0.036449
  3.505495  0.014125  0.019503  0.036449
  3.565934  0.014125  0.019858  0.036449
  3.626374  0.014125  0.020212  0.036449
  3.686813  0.014125  0.020566  0.036449
  3.747253  0.014125  0.020921  0.036449
  3.807692  0.014125  0.021275  0.036449
  3.868132  0.014125  0.021629  0.036449
  3.928571  0.014125  0.021984  0.036449
  3.989011  0.014125  0.022338  0.036449
  4.049451  0.014125  0.022692  0.036449
  4.109890  0.014125  0.023046  0.036449
  4.170330  0.014125  0.023401  0.036449
  4.230769  0.014125  0.023755  0.036449
  4.291209  0.014125  0.024109  0.036449
  4.351648  0.014125  0.024464  0.036449
  4.412088  0.014125  0.024818  0.036449
  4.472527  0.014125  0.025172  0.036449
  4.500000  0.014125  0.053200  0.036449
  END FTABLE  8
  FTABLE      7
   18    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.014125  0.000000  0.000000  0.000000  0.000000
  0.060440  0.014125  0.000854  0.000000  0.037183  0.000000
  0.120879  0.014125  0.001707  0.000000  0.037917  0.000000
  0.181319  0.014125  0.002561  0.000000  0.038652  0.000000
  0.241758  0.014125  0.003415  0.000000  0.039386  0.000000
  0.302198  0.014125  0.004269  0.000000  0.040120  0.000000
  0.362637  0.014125  0.005122  0.000000  0.040855  0.000000
  0.423077  0.014125  0.005976  0.000000  0.041589  0.000000
  0.483516  0.014125  0.006830  0.000000  0.042323  0.000000
  0.543956  0.014125  0.007684  0.065047  0.043058  0.000000
  0.604396  0.014125  0.008537  0.233496  0.043792  0.000000
  0.664835  0.014125  0.009391  0.435744  0.044526  0.000000
  0.725275  0.014125  0.010245  0.618960  0.045261  0.000000
  0.785714  0.014125  0.011098  0.742908  0.045995  0.000000
  0.846154  0.014125  0.011952  0.823591  0.046729  0.000000
  0.906593  0.014125  0.012806  0.892601  0.047464  0.000000
  0.967033  0.014125  0.013660  0.956645  0.048198  0.000000
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1.000000  0.014125  0.014125  1.016663  0.048598  0.000000
END FTABLE  7
FTABLE     10
 76    4
   Depth      Area    Volume  Outflow1 Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
0.000000  0.018916  0.000000  0.000000
0.060440  0.018916  0.000446  0.000000
0.120879  0.018916  0.000892  0.000000
0.181319  0.018916  0.001338  0.000000
0.241758  0.018916  0.001784  0.000000
0.302198  0.018916  0.002229  0.000000
0.362637  0.018916  0.002675  0.000000
0.423077  0.018916  0.003121  0.000000
0.483516  0.018916  0.003567  0.000000
0.543956  0.018916  0.004013  0.000000
0.604396  0.018916  0.004459  0.000000
0.664835  0.018916  0.004905  0.000000
0.725275  0.018916  0.005351  0.000000
0.785714  0.018916  0.005797  0.000000
0.846154  0.018916  0.006242  0.000000
0.906593  0.018916  0.006688  0.001165
0.967033  0.018916  0.007134  0.001285
1.027473  0.018916  0.007580  0.001552
1.087912  0.018916  0.008026  0.001857
1.148352  0.018916  0.008472  0.002200
1.208791  0.018916  0.008918  0.002583
1.269231  0.018916  0.009364  0.003007
1.329670  0.018916  0.009810  0.003474
1.390110  0.018916  0.010255  0.003985
1.450549  0.018916  0.010701  0.004540
1.510989  0.018916  0.011147  0.005142
1.571429  0.018916  0.011593  0.005791
1.631868  0.018916  0.012039  0.006489
1.692308  0.018916  0.012485  0.007236
1.752747  0.018916  0.012931  0.008034
1.813187  0.018916  0.013377  0.008883
1.873626  0.018916  0.013823  0.009785
1.934066  0.018916  0.014268  0.010741
1.994505  0.018916  0.014714  0.011752
2.054945  0.018916  0.015160  0.012819
2.115385  0.018916  0.015606  0.013943
2.175824  0.018916  0.016052  0.015124
2.236264  0.018916  0.016498  0.016364
2.296703  0.018916  0.016944  0.017664
2.357143  0.018916  0.017390  0.019024
2.417582  0.018916  0.017835  0.020446
2.478022  0.018916  0.018281  0.021930
2.538462  0.018916  0.018727  0.023477
2.598901  0.018916  0.019173  0.025088
2.659341  0.018916  0.019619  0.026764
2.719780  0.018916  0.020065  0.028506
2.780220  0.018916  0.020511  0.030315
2.840659  0.018916  0.020957  0.032191
2.901099  0.018916  0.021403  0.034135
2.961538  0.018916  0.021848  0.036148
3.021978  0.018916  0.022323  0.038231
3.082418  0.018916  0.022797  0.040384
3.142857  0.018916  0.023272  0.042608
3.203297  0.018916  0.023746  0.044903
3.263736  0.018916  0.024221  0.047271
3.324176  0.018916  0.024695  0.048812
3.384615  0.018916  0.025170  0.048812
3.445055  0.018916  0.025644  0.048812
3.505495  0.018916  0.026119  0.048812
3.565934  0.018916  0.026593  0.048812
3.626374  0.018916  0.027068  0.048812
3.686813  0.018916  0.027542  0.048812
3.747253  0.018916  0.028017  0.048812
3.807692  0.018916  0.028491  0.048812
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  3.868132  0.018916  0.028966  0.048812
  3.928571  0.018916  0.029440  0.048812
  3.989011  0.018916  0.029914  0.048812
  4.049451  0.018916  0.030389  0.048812
  4.109890  0.018916  0.030863  0.048812
  4.170330  0.018916  0.031338  0.048812
  4.230769  0.018916  0.031812  0.048812
  4.291209  0.018916  0.032287  0.048812
  4.351648  0.018916  0.032761  0.048812
  4.412088  0.018916  0.033236  0.048812
  4.472527  0.018916  0.033710  0.048812
  4.500000  0.018916  0.071244  0.048812
  END FTABLE 10
  FTABLE      9
   18    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.018916  0.000000  0.000000  0.000000  0.000000
  0.060440  0.018916  0.001143  0.000000  0.049795  0.000000
  0.120879  0.018916  0.002287  0.000000  0.050778  0.000000
  0.181319  0.018916  0.003430  0.000000  0.051762  0.000000
  0.241758  0.018916  0.004573  0.000000  0.052745  0.000000
  0.302198  0.018916  0.005717  0.000000  0.053729  0.000000
  0.362637  0.018916  0.006860  0.000000  0.054712  0.000000
  0.423077  0.018916  0.008003  0.000000  0.055695  0.000000
  0.483516  0.018916  0.009146  0.000000  0.056679  0.000000
  0.543956  0.018916  0.010290  0.065047  0.057662  0.000000
  0.604396  0.018916  0.011433  0.233496  0.058645  0.000000
  0.664835  0.018916  0.012576  0.435744  0.059629  0.000000
  0.725275  0.018916  0.013720  0.618960  0.060612  0.000000
  0.785714  0.018916  0.014863  0.742908  0.061596  0.000000
  0.846154  0.018916  0.016006  0.823591  0.062579  0.000000
  0.906593  0.018916  0.017150  0.892601  0.063562  0.000000
  0.967033  0.018916  0.018293  0.956645  0.064546  0.000000
  1.000000  0.018916  0.018916  1.016663  0.065082  0.000000
  END FTABLE  9
  FTABLE     12
   74    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.157576  0.000000  0.000000
  0.054945  0.156093  0.000997  0.000000
  0.109890  0.154248  0.002020  0.000000
  0.164835  0.152412  0.003069  0.000000
  0.219780  0.150584  0.004145  0.000000
  0.274725  0.148766  0.005248  0.000000
  0.329670  0.146956  0.006377  0.000000
  0.384615  0.145155  0.007534  0.000000
  0.439560  0.143363  0.008718  0.000000
  0.494505  0.141580  0.009929  0.000000
  0.549451  0.139806  0.011168  0.000000
  0.604396  0.138040  0.012435  0.000000
  0.659341  0.136284  0.013730  0.000000
  0.714286  0.134536  0.015053  0.000000
  0.769231  0.132798  0.016404  0.000000
  0.824176  0.131068  0.017784  0.000000
  0.879121  0.129347  0.019193  0.001890
  0.934066  0.127635  0.020631  0.002802
  0.989011  0.125931  0.022098  0.003064
  1.043956  0.124237  0.023595  0.003643
  1.098901  0.122551  0.025121  0.004288
  1.153846  0.120875  0.026676  0.005025
  1.208791  0.119207  0.028262  0.005420
  1.263736  0.117548  0.029878  0.005760
  1.318681  0.115898  0.031524  0.006925
  1.373626  0.114257  0.033201  0.007699
  1.428571  0.112625  0.034908  0.007920
  1.483516  0.111001  0.036646  0.008803
```

```
  1.538462  0.109387  0.038416  0.009604
  1.593407  0.107781  0.040216  0.010343
  1.648352  0.106184  0.042048  0.011033
  1.703297  0.104596  0.043912  0.011682
  1.758242  0.103017  0.045808  0.012296
  1.813187  0.101447  0.047735  0.012882
  1.868132  0.099886  0.049695  0.013442
  1.923077  0.098333  0.051687  0.013980
  1.978022  0.096790  0.053712  0.014498
  2.032967  0.095255  0.055770  0.014998
  2.087912  0.093729  0.057860  0.015483
  2.142857  0.092212  0.059984  0.015953
  2.197802  0.090704  0.062141  0.016411
  2.252747  0.089205  0.064332  0.016857
  2.307692  0.087714  0.066556  0.017292
  2.362637  0.086233  0.068815  0.017719
  2.417582  0.084760  0.071107  0.018137
  2.472527  0.083297  0.073434  0.018550
  2.527473  0.081842  0.075795  0.018961
  2.582418  0.080396  0.078191  0.019389
  2.637363  0.078959  0.080622  0.020109
  2.692308  0.077530  0.083088  0.020466
  2.747253  0.076111  0.085589  0.020817
  2.802198  0.074701  0.088126  0.021162
  2.857143  0.073299  0.090698  0.021502
  2.912088  0.071906  0.093307  0.021836
  2.967033  0.070522  0.095951  0.022166
  3.021978  0.069147  0.098803  0.022490
  3.076923  0.067781  0.101694  0.022810
  3.131868  0.066424  0.104624  0.023126
  3.186813  0.065075  0.107593  0.023437
  3.241758  0.063736  0.110601  0.023744
  3.296703  0.062405  0.113649  0.024048
  3.351648  0.061083  0.116737  0.024347
  3.406593  0.059770  0.119864  0.024643
  3.461538  0.058466  0.123032  0.024935
  3.516484  0.057171  0.126240  0.025224
  3.571429  0.055885  0.129489  0.025510
  3.626374  0.054607  0.132778  0.025792
  3.681319  0.053339  0.136109  0.026072
  3.736264  0.052079  0.139480  0.026348
  3.791209  0.050828  0.142893  0.026622
  3.846154  0.049586  0.146348  0.026893
  3.901099  0.048353  0.149844  0.027161
  3.956044  0.047129  0.153382  0.027426
  4.000000  0.045914  0.328110  0.027637
  END FTABLE 12
  FTABLE     11
   20    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.045914  0.000000  0.000000  0.000000  0.000000
  0.054945  0.159437  0.008709  0.000000  0.120645  0.000000
  0.109890  0.161307  0.017521  0.000000  0.122815  0.000000
  0.164835  0.163186  0.026435  0.000000  0.124984  0.000000
  0.219780  0.165074  0.035454  0.000000  0.127154  0.000000
  0.274725  0.166970  0.044576  0.000000  0.129324  0.000000
  0.329670  0.168876  0.053802  0.000000  0.131494  0.000000
  0.384615  0.170790  0.063134  0.000000  0.133664  0.000000
  0.439560  0.172713  0.072571  0.000000  0.135834  0.000000
  0.494505  0.174646  0.082113  0.000000  0.138004  0.000000
  0.549451  0.176587  0.091763  0.174930  0.140174  0.000000
  0.604396  0.178536  0.101519  0.535530  0.142343  0.000000
  0.659341  0.180495  0.111382  1.005166  0.144513  0.000000
  0.714286  0.182463  0.121354  1.552922  0.146683  0.000000
  0.769231  0.184439  0.131433  2.152583  0.148853  0.000000
  0.824176  0.186425  0.141622  2.777747  0.151023  0.000000
  0.879121  0.188419  0.151920  3.401294  0.153193  0.000000
```

```
0.934066  0.190422  0.162328  3.996465  0.155363  0.000000
0.989011  0.192434  0.172846  4.538807  0.157533  0.000000
1.000000  0.192837  0.174962  5.008707  0.157966  0.000000
END FTABLE 11
FTABLE     14
 74    4
    Depth      Area    Volume  Outflow1 Velocity  Travel Time***
     (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
0.000000  0.106061  0.000000  0.000000
0.054945  0.104836  0.000393  0.000000
0.109890  0.103314  0.000806  0.000000
0.164835  0.101801  0.001238  0.000000
0.219780  0.100296  0.001689  0.000000
0.274725  0.098800  0.002160  0.000000
0.329670  0.097314  0.002652  0.000000
0.384615  0.095836  0.003163  0.000000
0.439560  0.094367  0.003695  0.000000
0.494505  0.092906  0.004247  0.000000
0.549451  0.091455  0.004820  0.000000
0.604396  0.090013  0.005414  0.000000
0.659341  0.088579  0.006029  0.000000
0.714286  0.087154  0.006666  0.000000
0.769231  0.085739  0.007324  0.000000
0.824176  0.084332  0.008003  0.000000
0.879121  0.082934  0.008705  0.000944
0.934066  0.081544  0.009429  0.001093
0.989011  0.080164  0.010174  0.001195
1.043956  0.078793  0.010943  0.001421
1.098901  0.077430  0.011734  0.001675
1.153846  0.076076  0.012547  0.001960
1.208791  0.074731  0.013384  0.002140
1.263736  0.073395  0.014244  0.002623
1.318681  0.072068  0.015128  0.002808
1.373626  0.070750  0.016035  0.002875
1.428571  0.069441  0.016965  0.003457
1.483516  0.068140  0.017920  0.003864
1.538462  0.066848  0.018899  0.003953
1.593407  0.065566  0.019902  0.004394
1.648352  0.064292  0.020930  0.004794
1.703297  0.063027  0.021983  0.005141
1.758242  0.061771  0.023060  0.005163
1.813187  0.060523  0.024163  0.005507
1.868132  0.059285  0.025290  0.005831
1.923077  0.058055  0.026444  0.006138
1.978022  0.056835  0.027623  0.006430
2.032967  0.055623  0.028828  0.006710
2.087912  0.054420  0.030059  0.006978
2.142857  0.053226  0.031316  0.007237
2.197802  0.052041  0.032599  0.007487
2.252747  0.050864  0.033910  0.007729
2.307692  0.049697  0.035247  0.007963
2.362637  0.048538  0.036611  0.008192
2.417582  0.047389  0.038002  0.008415
2.472527  0.046248  0.039421  0.008632
2.527473  0.045116  0.040867  0.008845
2.582418  0.043993  0.042341  0.009054
2.637363  0.042879  0.043843  0.009260
2.692308  0.041773  0.045374  0.009465
2.747253  0.040677  0.046932  0.009678
2.802198  0.039589  0.048519  0.010038
2.857143  0.038510  0.050135  0.010216
2.912088  0.037441  0.051780  0.010391
2.967033  0.036380  0.053454  0.010564
3.021978  0.035327  0.055266  0.010733
3.076923  0.034284  0.057110  0.010900
3.131868  0.033250  0.058985  0.011065
3.186813  0.032224  0.060892  0.011227
3.241758  0.031208  0.062831  0.011386
3.296703  0.030200  0.064802  0.011544
3.351648  0.029201  0.066805  0.011699
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```
  3.406593  0.028211  0.068842  0.011852
  3.461538  0.027230  0.070911  0.012004
  3.516484  0.026258  0.073012  0.012153
  3.571429  0.025294  0.075148  0.012301
  3.626374  0.024340  0.077316  0.012447
  3.681319  0.023394  0.079518  0.012591
  3.736264  0.022457  0.081754  0.012734
  3.791209  0.021529  0.084024  0.012875
  3.846154  0.020610  0.086328  0.013014
  3.901099  0.019700  0.088667  0.013152
  3.956044  0.018799  0.091040  0.013289
  4.000000  0.017906  0.195223  0.013397
  END FTABLE 14
  FTABLE     13
   20    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.017906  0.000000  0.000000  0.000000  0.000000
  0.054945  0.107599  0.005870  0.000000  0.047051  0.000000
  0.109890  0.109146  0.011824  0.000000  0.047898  0.000000
  0.164835  0.110702  0.017864  0.000000  0.048744  0.000000
  0.219780  0.112267  0.023990  0.000000  0.049590  0.000000
  0.274725  0.113841  0.030201  0.000000  0.050436  0.000000
  0.329670  0.115423  0.036500  0.000000  0.051283  0.000000
  0.384615  0.117015  0.042885  0.000000  0.052129  0.000000
  0.439560  0.118615  0.049359  0.000000  0.052975  0.000000
  0.494505  0.120224  0.055920  0.000000  0.053821  0.000000
  0.549451  0.121842  0.062570  0.174930  0.054668  0.000000
  0.604396  0.123469  0.069310  0.535530  0.055514  0.000000
  0.659341  0.125105  0.076139  1.005166  0.056360  0.000000
  0.714286  0.126750  0.083058  1.552922  0.057206  0.000000
  0.769231  0.128403  0.090068  2.152583  0.058053  0.000000
  0.824176  0.130066  0.097168  2.777747  0.058899  0.000000
  0.879121  0.131737  0.104361  3.401294  0.059745  0.000000
  0.934066  0.133417  0.111645  3.996465  0.060591  0.000000
  0.989011  0.135106  0.119022  4.538807  0.061438  0.000000
  1.000000  0.135445  0.120509  5.008707  0.061607  0.000000
  END FTABLE 13
  FTABLE     15
   91    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.000000  0.000000  0.000000
  0.055556  0.003610  0.000134  0.009994
  0.111111  0.005076  0.000378  0.014134
  0.166667  0.006181  0.000692  0.017310
  0.222222  0.007096  0.001061  0.019988
  0.277778  0.007888  0.001478  0.022347
  0.333333  0.008590  0.001936  0.024480
  0.388889  0.009223  0.002431  0.026442
  0.444444  0.009800  0.002960  0.028268
  0.500000  0.010331  0.003519  0.029982
  0.555556  0.010822  0.004107  0.031604
  0.611111  0.011279  0.004721  0.033147
  0.666667  0.011706  0.005359  0.034620
  0.722222  0.012105  0.006021  0.036034
  0.777778  0.012480  0.006704  0.037394
  0.833333  0.012833  0.007407  0.038707
  0.888889  0.013165  0.008129  0.039976
  0.944444  0.013479  0.008870  0.041207
  1.000000  0.013774  0.009627  0.042401
  1.055556  0.014053  0.010400  0.043563
  1.111111  0.014316  0.011188  0.044695
  1.166667  0.014564  0.011990  0.045799
  1.222222  0.014799  0.012806  0.046876
  1.277778  0.015020  0.013634  0.047930
  1.333333  0.015228  0.014474  0.048961
  1.388889  0.015424  0.015326  0.049970
```

```
  1.444444  0.015608  0.016188  0.050960
  1.500000  0.015780  0.017060  0.051931
  1.555556  0.015942  0.017941  0.052884
  1.611111  0.016093  0.018831  0.053820
  1.666667  0.016233  0.019729  0.054740
  1.722222  0.016363  0.020635  0.055645
  1.777778  0.016484  0.021547  0.056535
  1.833333  0.016594  0.022466  0.057412
  1.888889  0.016695  0.023391  0.058275
  1.944444  0.016787  0.024321  0.059126
  2.000000  0.016870  0.025256  0.059964
  2.055556  0.016943  0.026195  0.060792
  2.111111  0.017008  0.027138  0.061608
  2.166667  0.017064  0.028085  0.062413
  2.222222  0.017111  0.029034  0.063208
  2.277778  0.017149  0.029986  0.063993
  2.333333  0.017179  0.030939  0.064769
  2.388889  0.017201  0.031894  0.065536
  2.444444  0.017213  0.032850  0.066293
  2.500000  0.017218  0.033807  0.067042
  2.555556  0.017213  0.034763  0.067783
  2.611111  0.017201  0.035719  0.068516
  2.666667  0.017179  0.036674  0.069241
  2.722222  0.017149  0.037628  0.069959
  2.777778  0.017111  0.038580  0.070669
  2.833333  0.017064  0.039529  0.071372
  2.888889  0.017008  0.040475  0.072068
  2.944444  0.016943  0.041419  0.072758
  3.000000  0.016870  0.042358  0.073441
  3.055556  0.016787  0.043293  0.074118
  3.111111  0.016695  0.044223  0.074789
  3.166667  0.016594  0.045148  0.075454
  3.222222  0.016484  0.046066  0.076113
  3.277778  0.016363  0.046979  0.076766
  3.333333  0.016233  0.047884  0.077414
  3.388889  0.016093  0.048782  0.078056
  3.444444  0.015942  0.049672  0.078693
  3.500000  0.015780  0.050554  0.079325
  3.555556  0.015608  0.051425  0.079953
  3.611111  0.015424  0.052288  0.080575
  3.666667  0.015228  0.053139  0.081192
  3.722222  0.015020  0.053979  0.081805
  3.777778  0.014799  0.054808  0.082413
  3.833333  0.014564  0.055623  0.083017
  3.888889  0.014316  0.056426  0.083616
  3.944444  0.014053  0.057214  0.084212
  4.000000  0.013774  0.057987  0.084803
  4.055556  0.013479  0.058744  0.363185
  4.111111  0.013165  0.059484  0.870741
  4.166667  0.012833  0.060206  1.525043
  4.222222  0.012480  0.060910  2.292388
  4.277778  0.012105  0.061593  3.147626
  4.333333  0.011706  0.062254  4.067476
  4.388889  0.011279  0.062893  5.028497
  4.444444  0.010822  0.063507  6.006628
  4.500000  0.010331  0.064095  6.977478
  4.555556  0.009800  0.064654  7.917049
  4.611111  0.009223  0.065183  8.802765
  4.666667  0.008590  0.065678  9.614730
  4.722222  0.007888  0.066136  10.33718
  4.777778  0.007096  0.066552  10.96009
  4.833333  0.006181  0.066922  11.48094
  4.888889  0.005076  0.067236  11.90658
  4.944444  0.003610  0.067479  12.25527
  5.000000  0.001000  0.067613  12.55876
  END FTABLE 15
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
```

```
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP
WDM     22 IRRG     ENGL    0.7       SAME PERLND  45     EXTNL  SURLI
WDM      2 PREC     ENGL    1              RCHRES   1     EXTNL  PREC
WDM      2 PREC     ENGL    1              RCHRES   3     EXTNL  PREC
WDM      2 PREC     ENGL    1              RCHRES   5     EXTNL  PREC
WDM      2 PREC     ENGL    1              RCHRES   7     EXTNL  PREC
WDM      2 PREC     ENGL    1              RCHRES   9     EXTNL  PREC
WDM      2 PREC     ENGL    1              RCHRES  11     EXTNL  PREC
WDM      2 PREC     ENGL    1              RCHRES  13     EXTNL  PREC
WDM      1 EVAP     ENGL    0.5            RCHRES   1     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   2     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES   3     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   4     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES   5     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   6     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES   7     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   8     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES   9     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES  10     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES  11     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES  12     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES  13     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES  14     EXTNL  POTEV

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES  12 HYDR   RO     1 1        1      WDM   1014 FLOW     ENGL       REPL
RCHRES  12 HYDR   STAGE  1 1        1      WDM   1017 STAG     ENGL       REPL
RCHRES  11 HYDR   STAGE  1 1        1      WDM   1018 STAG     ENGL       REPL
RCHRES  11 HYDR   O      1 1        1      WDM   1019 FLOW     ENGL       REPL
COPY     3 OUTPUT MEAN   1 1     48.4      WDM    703 FLOW     ENGL       REPL
COPY   503 OUTPUT MEAN   1 1     48.4      WDM    803 FLOW     ENGL       REPL
RCHRES  14 HYDR   RO     1 1        1      WDM   1020 FLOW     ENGL       REPL
RCHRES  14 HYDR   STAGE  1 1        1      WDM   1023 STAG     ENGL       REPL
RCHRES  13 HYDR   STAGE  1 1        1      WDM   1024 STAG     ENGL       REPL
RCHRES  13 HYDR   O      1 1        1      WDM   1025 FLOW     ENGL       REPL
COPY     2 OUTPUT MEAN   1 1     48.4      WDM    702 FLOW     ENGL       REPL
COPY   502 OUTPUT MEAN   1 1     48.4      WDM    802 FLOW     ENGL       REPL
RCHRES  15 HYDR   RO     1 1        1      WDM   1026 FLOW     ENGL       REPL
RCHRES  15 HYDR   STAGE  1 1        1      WDM   1027 STAG     ENGL       REPL
COPY     4 OUTPUT MEAN   1 1     48.4      WDM    704 FLOW     ENGL       REPL
COPY   504 OUTPUT MEAN   1 1     48.4      WDM    804 FLOW     ENGL       REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>             <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK        7
RCHRES     OFLOW  OVOL   1                 RCHRES         INFLOW IVOL
  END MASS-LINK    7
```

```
  MASS-LINK        8
RCHRES     OFLOW  OVOL   2                RCHRES         INFLOW IVOL
  END MASS-LINK    8

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

```
ERROR/WARNING ID:   341   6

DATE/TIME: 1980/ 2/14  7:45

RCHRES:     1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB().  To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows.  This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS         V1         V2        VOL
18 8.9829E+02  928.92     940.30
```

```
ERROR/WARNING ID:   341   5

DATE/TIME: 1980/ 2/14  7:45

RCHRES:     1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated.  If extrapolation was small, no problem.
Remedy; extend ftable.  Relevant data are:

A          B          C      RDEP1      RDEP2  COUNT
0.0000E+00 1857.8     -2.548E+03    1.3717  1.3716E+00      2
```

```
ERROR/WARNING ID:   341   6

DATE/TIME: 1980/ 2/14  7:45

RCHRES:     9

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB().  To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows.  This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS         V1         V2        VOL
18 7.9684E+02  823.98     841.61
```

```
ERROR/WARNING ID:   341   5

DATE/TIME: 1980/ 2/14  7:45

RCHRES:     9

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated.  If extrapolation was small, no problem.
Remedy; extend ftable.  Relevant data are:

A          B          C      RDEP1      RDEP2  COUNT
0.0000E+00 1648.0     -2.718E+03    1.6495  1.6495E+00      2
```

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SMRHM

PROJECT REPORT

General Model Information

Project Name:	2018-09-11 BMP4-5-6-7 POC-B
Site Name:	Costco Murrietta
Site Address:	215 & Clinton Keith Rd
City:	Murrieta
Report Date:	9/11/2018
Gage:	Wildomar / North Murrieta
Data Start:	1949/10/01
Data End:	2011/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2018/01/19

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year
Low Flow Threshold for POC2:	10 Percent of the 2 Year
High Flow Threshold for POC2:	10 Year
Low Flow Threshold for POC3:	10 Percent of the 2 Year
High Flow Threshold for POC3:	10 Year

Landuse Basin Data
Predeveloped Land Use

EX-B2-6

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Shrub,St(10-20%)	0.295
C D,Shrub,Mod(5-10%)	0.045
C D,Shrub,Very(>20%)	0.302
Pervious Total	0.642

Impervious Land Use	acre
Impervious Total	0
Basin Total	0.642

Element Flows To:

Surface	Interflow	Groundwater

EX-B2-4A-4E

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Shrub,Mod(5-10%)	0.138
C D,Shrub,St(10-20%)	0.907
C D,Shrub,Very(>20%)	0.927
Pervious Total	1.972
Impervious Land Use	acre
Impervious Total	0
Basin Total	1.972

Element Flows To:

Surface	Interflow	Groundwater

EX-B2-5

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Shrub,Mod(5-10%)	0.102
C D,Shrub,St(10-20%)	0.669
C D,Shrub,Very(>20%)	0.684
Pervious Total	1.455

Impervious Land Use	acre
Impervious Total	0
Basin Total	1.455

Element Flows To:

Surface	Interflow	Groundwater

EX-B2-7

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Shrub,St(10-20%)	0.898
C D,Shrub,Very(>20%)	0.917
C D,Shrub,Mod(5-10%)	0.137
Pervious Total	1.952

Impervious Land Use	acre
Impervious Total	0
Basin Total	1.952

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

PD-B2-6

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	0.032
Pervious Total	0.032

Impervious Land Use	acre
Parking,Flat(0-5%)	0.61
Impervious Total	0.61
Basin Total	0.642

Element Flows To:

Surface	Interflow	Groundwater
Surface BMP-6	Surface BMP-6	

PD-B2-4A

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	0.029
Pervious Total	0.029

Impervious Land Use	acre
Parking,Flat(0-5%)	0.265
Impervious Total	0.265
Basin Total	0.294

Element Flows To:

Surface	Interflow	Groundwater
Surface BMP-4A	Surface BMP-4A	

PD-B2-4B

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	0.097
Pervious Total	0.097

Impervious Land Use	acre
Parking,Flat(0-5%)	0.552
Impervious Total	0.552
Basin Total	0.649

Element Flows To:

Surface	Interflow	Groundwater
Surface BMP-4B	Surface BMP-4B	

PD-B2-4C

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	0.058
Pervious Total	0.058

Impervious Land Use	acre
Parking,Flat(0-5%)	0.329
Impervious Total	0.329
Basin Total	0.387

Element Flows To:

Surface	Interflow	Groundwater
Surface BMP-4C	Surface BMP-4C	

PD-B2-4D

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	0.032
Pervious Total	0.032

Impervious Land Use	acre
Parking,Flat(0-5%)	0.288
Impervious Total	0.288
Basin Total	0.32

Element Flows To:

Surface	Interflow	Groundwater
Surface BMP-4D	Surface BMP-4D	

PD-B2-4E

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	0.048
Pervious Total	0.048

Impervious Land Use	acre
Parking,Flat(0-5%)	0.274
Impervious Total	0.274
Basin Total	0.322

Element Flows To:

Surface	Interflow	Groundwater
Surface BMP-4E	Surface BMP-4E	

PD-B2-5A

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	0.028
Pervious Total	0.028

Impervious Land Use	acre
Parking,Flat(0-5%)	0.253
Impervious Total	0.253
Basin Total	0.281

Element Flows To:

Surface	Interflow	Groundwater
Surface BMP-5A	Surface BMP-5A	

PD-B2-5B

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	0.031
Pervious Total	0.031

Impervious Land Use	acre
Parking,Flat(0-5%)	0.278
Impervious Total	0.278
Basin Total	0.309

Element Flows To:

Surface	Interflow	Groundwater
Surface BMP-5B	Surface BMP-5B	

PD-B2-5C

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	0.022
Pervious Total	0.022

Impervious Land Use	acre
Parking,Flat(0-5%)	0.414
Impervious Total	0.414
Basin Total	0.436

Element Flows To:

Surface	Interflow	Groundwater
BMP-5C MWS	BMP-5C MWS	

PD-B2-5D

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	0.043
Pervious Total	0.043

Impervious Land Use	acre
Parking,Flat(0-5%)	0.386
Impervious Total	0.386
Basin Total	0.429

Element Flows To:

Surface	Interflow	Groundwater
Surface BMP-5D	Surface BMP-5D	

PD-B2-7

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
Parking,Flat(0-5%)	1.952
Impervious Total	1.952
Basin Total	1.952

Element Flows To:

Surface	Interflow	Groundwater
BMP-7 MWS	BMP-7 MWS	

Routing Elements
Predeveloped Routing

Mitigated Routing

BMP-4B

Bottom Length:	66.70 ft.
Bottom Width:	15.00 ft.
Material thickness of first layer:	3
Material type for first layer:	Amended 2.5 in/hr
Material thickness of second layer:	1.5
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	4
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	24.202
Total Outflow (ac-ft.):	27.555
Percent Through Underdrain:	87.83
Discharge Structure	
Riser Height:	0.5 ft.
Riser Diameter:	8 in.
Element Flows To:	
Outlet 1	Outlet 2
HMP-TANK-4	

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0230	0.0000	0.0000	0.0000
0.0604	0.0230	0.0005	0.0000	0.0000
0.1209	0.0230	0.0011	0.0000	0.0000
0.1813	0.0230	0.0016	0.0000	0.0000
0.2418	0.0230	0.0022	0.0000	0.0000
0.3022	0.0230	0.0027	0.0000	0.0000
0.3626	0.0230	0.0032	0.0000	0.0000
0.4231	0.0230	0.0038	0.0000	0.0000
0.4835	0.0230	0.0043	0.0000	0.0000
0.5440	0.0230	0.0049	0.0000	0.0000
0.6044	0.0230	0.0054	0.0000	0.0000
0.6648	0.0230	0.0060	0.0000	0.0000
0.7253	0.0230	0.0065	0.0000	0.0000
0.7857	0.0230	0.0070	0.0000	0.0000
0.8462	0.0230	0.0076	0.0000	0.0000
0.9066	0.0230	0.0081	0.0000	0.0000
0.9670	0.0230	0.0087	0.0000	0.0000
1.0275	0.0230	0.0092	0.0000	0.0000
1.0879	0.0230	0.0097	0.0000	0.0000
1.1484	0.0230	0.0103	0.0000	0.0000
1.2088	0.0230	0.0108	0.0000	0.0000
1.2692	0.0230	0.0114	0.0000	0.0000
1.3297	0.0230	0.0119	0.0000	0.0000
1.3901	0.0230	0.0125	0.0000	0.0000
1.4505	0.0230	0.0130	0.0000	0.0000
1.5110	0.0230	0.0135	0.0000	0.0000
1.5714	0.0230	0.0141	0.0000	0.0000
1.6319	0.0230	0.0146	0.0000	0.0000
1.6923	0.0230	0.0152	0.0000	0.0000

1.7527	0.0230	0.0157	0.0000	0.0000
1.8132	0.0230	0.0162	0.0000	0.0000
1.8736	0.0230	0.0168	0.0000	0.0000
1.9341	0.0230	0.0173	0.0000	0.0000
1.9945	0.0230	0.0179	0.0000	0.0000
2.0549	0.0230	0.0184	0.0000	0.0000
2.1154	0.0230	0.0189	0.0000	0.0000
2.1758	0.0230	0.0195	0.0000	0.0000
2.2363	0.0230	0.0200	0.0000	0.0000
2.2967	0.0230	0.0206	0.0000	0.0000
2.3571	0.0230	0.0211	0.0000	0.0000
2.4176	0.0230	0.0217	0.0000	0.0000
2.4780	0.0230	0.0222	0.0000	0.0000
2.5385	0.0230	0.0227	0.0000	0.0000
2.5989	0.0230	0.0233	0.0000	0.0000
2.6593	0.0230	0.0238	0.0000	0.0000
2.7198	0.0230	0.0244	0.0000	0.0000
2.7802	0.0230	0.0249	0.0000	0.0000
2.8407	0.0230	0.0254	0.0000	0.0000
2.9011	0.0230	0.0260	0.0000	0.0000
2.9615	0.0230	0.0265	0.0000	0.0000
3.0220	0.0230	0.0271	0.0000	0.0000
3.0824	0.0230	0.0277	0.0000	0.0000
3.1429	0.0230	0.0283	0.0000	0.0000
3.2033	0.0230	0.0288	0.0000	0.0000
3.2637	0.0230	0.0294	0.0000	0.0000
3.3242	0.0230	0.0300	0.0000	0.0000
3.3846	0.0230	0.0306	0.0000	0.0000
3.4451	0.0230	0.0311	0.0000	0.0000
3.5055	0.0230	0.0317	0.0000	0.0000
3.5659	0.0230	0.0323	0.0000	0.0000
3.6264	0.0230	0.0329	0.0000	0.0000
3.6868	0.0230	0.0334	0.0000	0.0000
3.7473	0.0230	0.0340	0.0000	0.0000
3.8077	0.0230	0.0346	0.0000	0.0000
3.8681	0.0230	0.0352	0.0000	0.0000
3.9286	0.0230	0.0357	0.0000	0.0000
3.9890	0.0230	0.0363	0.0000	0.0000
4.0495	0.0230	0.0369	0.0000	0.0000
4.1099	0.0230	0.0375	0.0000	0.0000
4.1703	0.0230	0.0381	0.0000	0.0000
4.2308	0.0230	0.0386	0.0000	0.0000
4.2912	0.0230	0.0392	0.0000	0.0000
4.3516	0.0230	0.0398	0.0000	0.0000
4.4121	0.0230	0.0404	0.0000	0.0000
4.4725	0.0230	0.0409	0.0000	0.0000
4.5000	0.0230	0.0412	0.0000	0.0000

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.5000	0.0230	0.0412	0.0000	0.0605	0.0000
4.5604	0.0230	0.0426	0.0000	0.0605	0.0000
4.6209	0.0230	0.0440	0.0000	0.0617	0.0000
4.6813	0.0230	0.0454	0.0000	0.0628	0.0000
4.7418	0.0230	0.0467	0.0000	0.0640	0.0000
4.8022	0.0230	0.0481	0.0000	0.0652	0.0000
4.8626	0.0230	0.0495	0.0000	0.0664	0.0000
4.9231	0.0230	0.0509	0.0000	0.0676	0.0000

4.9835	0.0230	0.0523	0.0000	0.0688	0.0000
5.0440	0.0230	0.0537	0.0000	0.0700	0.0000
5.1044	0.0230	0.0551	0.0000	0.0712	0.0000
5.1648	0.0230	0.0565	0.0000	0.0724	0.0000
5.2253	0.0230	0.0579	0.0000	0.0736	0.0000
5.2857	0.0230	0.0592	0.0000	0.0748	0.0000
5.3462	0.0230	0.0606	0.0000	0.0760	0.0000
5.4066	0.0230	0.0620	0.0014	0.0772	0.0000
5.4670	0.0230	0.0634	0.0016	0.0784	0.0000
5.5000	0.0230	0.0642	0.0019	0.0790	0.0000

Surface BMP-4B

Element Flows To:

Outlet 1	Outlet 2
HMP-TANK-4	BMP-4B

BMP-4C

Bottom Length:	86.00 ft.
Bottom Width:	5.00 ft.
Material thickness of first layer:	3
Material type for first layer:	Amended 2.5 in/hr
Material thickness of second layer:	1.5
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	4
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	12.916
Total Outflow (ac-ft.):	16.46
Percent Through Underdrain:	78.47
Discharge Structure	
Riser Height:	0.5 ft.
Riser Diameter:	8 in.
Element Flows To:	
Outlet 1	Outlet 2
HMP-TANK-4	

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0099	0.0000	0.0000	0.0000
0.0604	0.0099	0.0002	0.0000	0.0000
0.1209	0.0099	0.0005	0.0000	0.0000
0.1813	0.0099	0.0007	0.0000	0.0000
0.2418	0.0099	0.0009	0.0000	0.0000
0.3022	0.0099	0.0012	0.0000	0.0000
0.3626	0.0099	0.0014	0.0000	0.0000
0.4231	0.0099	0.0016	0.0000	0.0000
0.4835	0.0099	0.0019	0.0000	0.0000
0.5440	0.0099	0.0021	0.0000	0.0000
0.6044	0.0099	0.0023	0.0000	0.0000
0.6648	0.0099	0.0026	0.0000	0.0000
0.7253	0.0099	0.0028	0.0000	0.0000
0.7857	0.0099	0.0030	0.0000	0.0000
0.8462	0.0099	0.0033	0.0000	0.0000
0.9066	0.0099	0.0035	0.0000	0.0000
0.9670	0.0099	0.0037	0.0000	0.0000
1.0275	0.0099	0.0040	0.0000	0.0000
1.0879	0.0099	0.0042	0.0000	0.0000
1.1484	0.0099	0.0044	0.0000	0.0000
1.2088	0.0099	0.0047	0.0000	0.0000
1.2692	0.0099	0.0049	0.0000	0.0000
1.3297	0.0099	0.0051	0.0000	0.0000
1.3901	0.0099	0.0054	0.0000	0.0000
1.4505	0.0099	0.0056	0.0000	0.0000
1.5110	0.0099	0.0058	0.0000	0.0000
1.5714	0.0099	0.0060	0.0000	0.0000
1.6319	0.0099	0.0063	0.0000	0.0000
1.6923	0.0099	0.0065	0.0000	0.0000
1.7527	0.0099	0.0067	0.0000	0.0000
1.8132	0.0099	0.0070	0.0000	0.0000

1.8736	0.0099	0.0072	0.0000	0.0000
1.9341	0.0099	0.0074	0.0000	0.0000
1.9945	0.0099	0.0077	0.0000	0.0000
2.0549	0.0099	0.0079	0.0000	0.0000
2.1154	0.0099	0.0081	0.0000	0.0000
2.1758	0.0099	0.0084	0.0000	0.0000
2.2363	0.0099	0.0086	0.0000	0.0000
2.2967	0.0099	0.0088	0.0000	0.0000
2.3571	0.0099	0.0091	0.0000	0.0000
2.4176	0.0099	0.0093	0.0000	0.0000
2.4780	0.0099	0.0095	0.0000	0.0000
2.5385	0.0099	0.0098	0.0000	0.0000
2.5989	0.0099	0.0100	0.0000	0.0000
2.6593	0.0099	0.0102	0.0000	0.0000
2.7198	0.0099	0.0105	0.0000	0.0000
2.7802	0.0099	0.0107	0.0000	0.0000
2.8407	0.0099	0.0109	0.0000	0.0000
2.9011	0.0099	0.0112	0.0000	0.0000
2.9615	0.0099	0.0114	0.0000	0.0000
3.0220	0.0099	0.0116	0.0000	0.0000
3.0824	0.0099	0.0119	0.0000	0.0000
3.1429	0.0099	0.0121	0.0000	0.0000
3.2033	0.0099	0.0124	0.0000	0.0000
3.2637	0.0099	0.0126	0.0000	0.0000
3.3242	0.0099	0.0129	0.0000	0.0000
3.3846	0.0099	0.0131	0.0000	0.0000
3.4451	0.0099	0.0134	0.0000	0.0000
3.5055	0.0099	0.0136	0.0000	0.0000
3.5659	0.0099	0.0139	0.0000	0.0000
3.6264	0.0099	0.0141	0.0000	0.0000
3.6868	0.0099	0.0144	0.0000	0.0000
3.7473	0.0099	0.0146	0.0000	0.0000
3.8077	0.0099	0.0149	0.0000	0.0000
3.8681	0.0099	0.0151	0.0000	0.0000
3.9286	0.0099	0.0154	0.0000	0.0000
3.9890	0.0099	0.0156	0.0000	0.0000
4.0495	0.0099	0.0159	0.0000	0.0000
4.1099	0.0099	0.0161	0.0000	0.0000
4.1703	0.0099	0.0164	0.0000	0.0000
4.2308	0.0099	0.0166	0.0000	0.0000
4.2912	0.0099	0.0168	0.0000	0.0000
4.3516	0.0099	0.0171	0.0000	0.0000
4.4121	0.0099	0.0173	0.0000	0.0000
4.4725	0.0099	0.0176	0.0000	0.0000
4.5000	0.0099	0.0177	0.0000	0.0000

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.5000	0.0099	0.0177	0.0000	0.0260	0.0000
4.5604	0.0099	0.0183	0.0000	0.0260	0.0000
4.6209	0.0099	0.0189	0.0000	0.0265	0.0000
4.6813	0.0099	0.0195	0.0000	0.0270	0.0000
4.7418	0.0099	0.0201	0.0000	0.0275	0.0000
4.8022	0.0099	0.0207	0.0000	0.0280	0.0000
4.8626	0.0099	0.0213	0.0000	0.0286	0.0000
4.9231	0.0099	0.0219	0.0000	0.0291	0.0000
4.9835	0.0099	0.0225	0.0000	0.0296	0.0000
5.0440	0.0099	0.0231	0.0000	0.0301	0.0000

5.1044	0.0099	0.0237	0.0000	0.0306	0.0000
5.1648	0.0099	0.0243	0.0000	0.0311	0.0000
5.2253	0.0099	0.0249	0.0000	0.0316	0.0000
5.2857	0.0099	0.0255	0.0000	0.0321	0.0000
5.3462	0.0099	0.0261	0.0000	0.0327	0.0000
5.4066	0.0099	0.0267	0.0006	0.0332	0.0000
5.4670	0.0099	0.0273	0.0007	0.0337	0.0000
5.5000	0.0099	0.0276	0.0008	0.0340	0.0000

Surface BMP-4C

Element Flows To:

Outlet 1	Outlet 2
HMP-TANK-4	BMP-4C

BMP-4D

Bottom Length:	86.00 ft.
Bottom Width:	5.00 ft.
Material thickness of first layer:	3
Material type for first layer:	Amended 2.5 in/hr
Material thickness of second layer:	1.5
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	4
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	11.768
Total Outflow (ac-ft.):	14.205
Percent Through Underdrain:	82.85
Discharge Structure	
Riser Height:	0.5 ft.
Riser Diameter:	8 in.
Element Flows To:	
Outlet 1	Outlet 2
HMP-TANK-4	

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0099	0.0000	0.0000	0.0000
0.0604	0.0099	0.0002	0.0000	0.0000
0.1209	0.0099	0.0005	0.0000	0.0000
0.1813	0.0099	0.0007	0.0000	0.0000
0.2418	0.0099	0.0009	0.0000	0.0000
0.3022	0.0099	0.0012	0.0000	0.0000
0.3626	0.0099	0.0014	0.0000	0.0000
0.4231	0.0099	0.0016	0.0000	0.0000
0.4835	0.0099	0.0019	0.0000	0.0000
0.5440	0.0099	0.0021	0.0000	0.0000
0.6044	0.0099	0.0023	0.0000	0.0000
0.6648	0.0099	0.0026	0.0000	0.0000
0.7253	0.0099	0.0028	0.0000	0.0000
0.7857	0.0099	0.0030	0.0000	0.0000
0.8462	0.0099	0.0033	0.0000	0.0000
0.9066	0.0099	0.0035	0.0000	0.0000
0.9670	0.0099	0.0037	0.0000	0.0000
1.0275	0.0099	0.0040	0.0000	0.0000
1.0879	0.0099	0.0042	0.0000	0.0000
1.1484	0.0099	0.0044	0.0000	0.0000
1.2088	0.0099	0.0047	0.0000	0.0000
1.2692	0.0099	0.0049	0.0000	0.0000
1.3297	0.0099	0.0051	0.0000	0.0000
1.3901	0.0099	0.0054	0.0000	0.0000
1.4505	0.0099	0.0056	0.0000	0.0000
1.5110	0.0099	0.0058	0.0000	0.0000
1.5714	0.0099	0.0060	0.0000	0.0000
1.6319	0.0099	0.0063	0.0000	0.0000
1.6923	0.0099	0.0065	0.0000	0.0000
1.7527	0.0099	0.0067	0.0000	0.0000
1.8132	0.0099	0.0070	0.0000	0.0000

1.8736	0.0099	0.0072	0.0000	0.0000
1.9341	0.0099	0.0074	0.0000	0.0000
1.9945	0.0099	0.0077	0.0000	0.0000
2.0549	0.0099	0.0079	0.0000	0.0000
2.1154	0.0099	0.0081	0.0000	0.0000
2.1758	0.0099	0.0084	0.0000	0.0000
2.2363	0.0099	0.0086	0.0000	0.0000
2.2967	0.0099	0.0088	0.0000	0.0000
2.3571	0.0099	0.0091	0.0000	0.0000
2.4176	0.0099	0.0093	0.0000	0.0000
2.4780	0.0099	0.0095	0.0000	0.0000
2.5385	0.0099	0.0098	0.0000	0.0000
2.5989	0.0099	0.0100	0.0000	0.0000
2.6593	0.0099	0.0102	0.0000	0.0000
2.7198	0.0099	0.0105	0.0000	0.0000
2.7802	0.0099	0.0107	0.0000	0.0000
2.8407	0.0099	0.0109	0.0000	0.0000
2.9011	0.0099	0.0112	0.0000	0.0000
2.9615	0.0099	0.0114	0.0000	0.0000
3.0220	0.0099	0.0116	0.0000	0.0000
3.0824	0.0099	0.0119	0.0000	0.0000
3.1429	0.0099	0.0121	0.0000	0.0000
3.2033	0.0099	0.0124	0.0000	0.0000
3.2637	0.0099	0.0126	0.0000	0.0000
3.3242	0.0099	0.0129	0.0000	0.0000
3.3846	0.0099	0.0131	0.0000	0.0000
3.4451	0.0099	0.0134	0.0000	0.0000
3.5055	0.0099	0.0136	0.0000	0.0000
3.5659	0.0099	0.0139	0.0000	0.0000
3.6264	0.0099	0.0141	0.0000	0.0000
3.6868	0.0099	0.0144	0.0000	0.0000
3.7473	0.0099	0.0146	0.0000	0.0000
3.8077	0.0099	0.0149	0.0000	0.0000
3.8681	0.0099	0.0151	0.0000	0.0000
3.9286	0.0099	0.0154	0.0000	0.0000
3.9890	0.0099	0.0156	0.0000	0.0000
4.0495	0.0099	0.0159	0.0000	0.0000
4.1099	0.0099	0.0161	0.0000	0.0000
4.1703	0.0099	0.0164	0.0000	0.0000
4.2308	0.0099	0.0166	0.0000	0.0000
4.2912	0.0099	0.0168	0.0000	0.0000
4.3516	0.0099	0.0171	0.0000	0.0000
4.4121	0.0099	0.0173	0.0000	0.0000
4.4725	0.0099	0.0176	0.0000	0.0000
4.5000	0.0099	0.0177	0.0000	0.0000

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.5000	0.0099	0.0177	0.0000	0.0260	0.0000
4.5604	0.0099	0.0183	0.0000	0.0260	0.0000
4.6209	0.0099	0.0189	0.0000	0.0265	0.0000
4.6813	0.0099	0.0195	0.0000	0.0270	0.0000
4.7418	0.0099	0.0201	0.0000	0.0275	0.0000
4.8022	0.0099	0.0207	0.0000	0.0280	0.0000
4.8626	0.0099	0.0213	0.0000	0.0286	0.0000
4.9231	0.0099	0.0219	0.0000	0.0291	0.0000
4.9835	0.0099	0.0225	0.0000	0.0296	0.0000
5.0440	0.0099	0.0231	0.0000	0.0301	0.0000

5.1044	0.0099	0.0237	0.0000	0.0306	0.0000
5.1648	0.0099	0.0243	0.0000	0.0311	0.0000
5.2253	0.0099	0.0249	0.0000	0.0316	0.0000
5.2857	0.0099	0.0255	0.0000	0.0321	0.0000
5.3462	0.0099	0.0261	0.0000	0.0327	0.0000
5.4066	0.0099	0.0267	0.0006	0.0332	0.0000
5.4670	0.0099	0.0273	0.0007	0.0337	0.0000
5.5000	0.0099	0.0276	0.0008	0.0340	0.0000

Surface BMP-4D

Element Flows To:

Outlet 1	Outlet 2
HMP-TANK-4	BMP-4D

BMP-4E

Bottom Length:	102.60 ft.
Bottom Width:	5.00 ft.
Material thickness of first layer:	3
Material type for first layer:	Amended 2.5 in/hr
Material thickness of second layer:	1.5
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	4
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	12.073
Total Outflow (ac-ft.):	13.671
Percent Through Underdrain:	88.31
Discharge Structure	
Riser Height:	0.5 ft.
Riser Diameter:	8 in.
Element Flows To:	
Outlet 1	Outlet 2
HMP-TANK-4	

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0118	0.0000	0.0000	0.0000
0.0604	0.0118	0.0003	0.0000	0.0000
0.1209	0.0118	0.0006	0.0000	0.0000
0.1813	0.0118	0.0008	0.0000	0.0000
0.2418	0.0118	0.0011	0.0000	0.0000
0.3022	0.0118	0.0014	0.0000	0.0000
0.3626	0.0118	0.0017	0.0000	0.0000
0.4231	0.0118	0.0019	0.0000	0.0000
0.4835	0.0118	0.0022	0.0000	0.0000
0.5440	0.0118	0.0025	0.0000	0.0000
0.6044	0.0118	0.0028	0.0000	0.0000
0.6648	0.0118	0.0031	0.0000	0.0000
0.7253	0.0118	0.0033	0.0000	0.0000
0.7857	0.0118	0.0036	0.0000	0.0000
0.8462	0.0118	0.0039	0.0000	0.0000
0.9066	0.0118	0.0042	0.0000	0.0000
0.9670	0.0118	0.0044	0.0000	0.0000
1.0275	0.0118	0.0047	0.0000	0.0000
1.0879	0.0118	0.0050	0.0000	0.0000
1.1484	0.0118	0.0053	0.0000	0.0000
1.2088	0.0118	0.0056	0.0000	0.0000
1.2692	0.0118	0.0058	0.0000	0.0000
1.3297	0.0118	0.0061	0.0000	0.0000
1.3901	0.0118	0.0064	0.0000	0.0000
1.4505	0.0118	0.0067	0.0000	0.0000
1.5110	0.0118	0.0069	0.0000	0.0000
1.5714	0.0118	0.0072	0.0000	0.0000
1.6319	0.0118	0.0075	0.0000	0.0000
1.6923	0.0118	0.0078	0.0000	0.0000
1.7527	0.0118	0.0081	0.0000	0.0000
1.8132	0.0118	0.0083	0.0000	0.0000

1.8736	0.0118	0.0086	0.0000	0.0000
1.9341	0.0118	0.0089	0.0000	0.0000
1.9945	0.0118	0.0092	0.0000	0.0000
2.0549	0.0118	0.0094	0.0000	0.0000
2.1154	0.0118	0.0097	0.0000	0.0000
2.1758	0.0118	0.0100	0.0000	0.0000
2.2363	0.0118	0.0103	0.0000	0.0000
2.2967	0.0118	0.0105	0.0000	0.0000
2.3571	0.0118	0.0108	0.0000	0.0000
2.4176	0.0118	0.0111	0.0000	0.0000
2.4780	0.0118	0.0114	0.0000	0.0000
2.5385	0.0118	0.0117	0.0000	0.0000
2.5989	0.0118	0.0119	0.0000	0.0000
2.6593	0.0118	0.0122	0.0000	0.0000
2.7198	0.0118	0.0125	0.0000	0.0000
2.7802	0.0118	0.0128	0.0000	0.0000
2.8407	0.0118	0.0130	0.0000	0.0000
2.9011	0.0118	0.0133	0.0000	0.0000
2.9615	0.0118	0.0136	0.0000	0.0000
3.0220	0.0118	0.0139	0.0000	0.0000
3.0824	0.0118	0.0142	0.0000	0.0000
3.1429	0.0118	0.0145	0.0000	0.0000
3.2033	0.0118	0.0148	0.0000	0.0000
3.2637	0.0118	0.0151	0.0000	0.0000
3.3242	0.0118	0.0154	0.0000	0.0000
3.3846	0.0118	0.0157	0.0000	0.0000
3.4451	0.0118	0.0160	0.0000	0.0000
3.5055	0.0118	0.0163	0.0000	0.0000
3.5659	0.0118	0.0166	0.0000	0.0000
3.6264	0.0118	0.0169	0.0000	0.0000
3.6868	0.0118	0.0171	0.0000	0.0000
3.7473	0.0118	0.0174	0.0000	0.0000
3.8077	0.0118	0.0177	0.0000	0.0000
3.8681	0.0118	0.0180	0.0000	0.0000
3.9286	0.0118	0.0183	0.0000	0.0000
3.9890	0.0118	0.0186	0.0000	0.0000
4.0495	0.0118	0.0189	0.0000	0.0000
4.1099	0.0118	0.0192	0.0000	0.0000
4.1703	0.0118	0.0195	0.0000	0.0000
4.2308	0.0118	0.0198	0.0000	0.0000
4.2912	0.0118	0.0201	0.0000	0.0000
4.3516	0.0118	0.0204	0.0000	0.0000
4.4121	0.0118	0.0207	0.0000	0.0000
4.4725	0.0118	0.0210	0.0000	0.0000
4.5000	0.0118	0.0211	0.0000	0.0000

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.5000	0.0118	0.0211	0.0000	0.0310	0.0000
4.5604	0.0118	0.0218	0.0000	0.0310	0.0000
4.6209	0.0118	0.0225	0.0000	0.0316	0.0000
4.6813	0.0118	0.0233	0.0000	0.0322	0.0000
4.7418	0.0118	0.0240	0.0000	0.0328	0.0000
4.8022	0.0118	0.0247	0.0000	0.0334	0.0000
4.8626	0.0118	0.0254	0.0000	0.0341	0.0000
4.9231	0.0118	0.0261	0.0000	0.0347	0.0000
4.9835	0.0118	0.0268	0.0000	0.0353	0.0000
5.0440	0.0118	0.0275	0.0000	0.0359	0.0000

5.1044	0.0118	0.0282	0.0000	0.0365	0.0000
5.1648	0.0118	0.0290	0.0000	0.0371	0.0000
5.2253	0.0118	0.0297	0.0000	0.0377	0.0000
5.2857	0.0118	0.0304	0.0000	0.0383	0.0000
5.3462	0.0118	0.0311	0.0000	0.0390	0.0000
5.4066	0.0118	0.0318	0.0007	0.0396	0.0000
5.4670	0.0118	0.0325	0.0008	0.0402	0.0000
5.5000	0.0118	0.0329	0.0010	0.0405	0.0000

Surface BMP-4E

Element Flows To:

Outlet 1	Outlet 2
HMP-TANK-4	BMP-4E

BMP-4A

Bottom Length:	122.50 ft.
Bottom Width:	5.00 ft.
Material thickness of first layer:	3
Material type for first layer:	Amended 2.5 in/hr
Material thickness of second layer:	1.5
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	4
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	12.112
Total Outflow (ac-ft.):	13.025
Percent Through Underdrain:	92.99
Discharge Structure	
Riser Height:	0.5 ft.
Riser Diameter:	8 in.
Element Flows To:	
Outlet 1	Outlet 2
HMP-TANK-4	

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0141	0.0000	0.0000	0.0000
0.0604	0.0141	0.0003	0.0000	0.0000
0.1209	0.0141	0.0007	0.0000	0.0000
0.1813	0.0141	0.0010	0.0000	0.0000
0.2418	0.0141	0.0013	0.0000	0.0000
0.3022	0.0141	0.0017	0.0000	0.0000
0.3626	0.0141	0.0020	0.0000	0.0000
0.4231	0.0141	0.0023	0.0000	0.0000
0.4835	0.0141	0.0027	0.0000	0.0000
0.5440	0.0141	0.0030	0.0000	0.0000
0.6044	0.0141	0.0033	0.0000	0.0000
0.6648	0.0141	0.0036	0.0000	0.0000
0.7253	0.0141	0.0040	0.0000	0.0000
0.7857	0.0141	0.0043	0.0000	0.0000
0.8462	0.0141	0.0046	0.0000	0.0000
0.9066	0.0141	0.0050	0.0000	0.0000
0.9670	0.0141	0.0053	0.0000	0.0000
1.0275	0.0141	0.0056	0.0000	0.0000
1.0879	0.0141	0.0060	0.0000	0.0000
1.1484	0.0141	0.0063	0.0000	0.0000
1.2088	0.0141	0.0066	0.0000	0.0000
1.2692	0.0141	0.0070	0.0000	0.0000
1.3297	0.0141	0.0073	0.0000	0.0000
1.3901	0.0141	0.0076	0.0000	0.0000
1.4505	0.0141	0.0080	0.0000	0.0000
1.5110	0.0141	0.0083	0.0000	0.0000
1.5714	0.0141	0.0086	0.0000	0.0000
1.6319	0.0141	0.0089	0.0000	0.0000
1.6923	0.0141	0.0093	0.0000	0.0000
1.7527	0.0141	0.0096	0.0000	0.0000
1.8132	0.0141	0.0099	0.0000	0.0000

1.8736	0.0141	0.0103	0.0000	0.0000
1.9341	0.0141	0.0106	0.0000	0.0000
1.9945	0.0141	0.0109	0.0000	0.0000
2.0549	0.0141	0.0113	0.0000	0.0000
2.1154	0.0141	0.0116	0.0000	0.0000
2.1758	0.0141	0.0119	0.0000	0.0000
2.2363	0.0141	0.0123	0.0000	0.0000
2.2967	0.0141	0.0126	0.0000	0.0000
2.3571	0.0141	0.0129	0.0000	0.0000
2.4176	0.0141	0.0133	0.0000	0.0000
2.4780	0.0141	0.0136	0.0000	0.0000
2.5385	0.0141	0.0139	0.0000	0.0000
2.5989	0.0141	0.0143	0.0000	0.0000
2.6593	0.0141	0.0146	0.0000	0.0000
2.7198	0.0141	0.0149	0.0000	0.0000
2.7802	0.0141	0.0152	0.0000	0.0000
2.8407	0.0141	0.0156	0.0000	0.0000
2.9011	0.0141	0.0159	0.0000	0.0000
2.9615	0.0141	0.0162	0.0000	0.0000
3.0220	0.0141	0.0166	0.0000	0.0000
3.0824	0.0141	0.0169	0.0000	0.0000
3.1429	0.0141	0.0173	0.0000	0.0000
3.2033	0.0141	0.0177	0.0000	0.0000
3.2637	0.0141	0.0180	0.0000	0.0000
3.3242	0.0141	0.0184	0.0000	0.0000
3.3846	0.0141	0.0187	0.0000	0.0000
3.4451	0.0141	0.0191	0.0000	0.0000
3.5055	0.0141	0.0194	0.0000	0.0000
3.5659	0.0141	0.0198	0.0000	0.0000
3.6264	0.0141	0.0201	0.0000	0.0000
3.6868	0.0141	0.0205	0.0000	0.0000
3.7473	0.0141	0.0208	0.0000	0.0000
3.8077	0.0141	0.0212	0.0000	0.0000
3.8681	0.0141	0.0215	0.0000	0.0000
3.9286	0.0141	0.0219	0.0000	0.0000
3.9890	0.0141	0.0222	0.0000	0.0000
4.0495	0.0141	0.0226	0.0000	0.0000
4.1099	0.0141	0.0229	0.0000	0.0000
4.1703	0.0141	0.0233	0.0000	0.0000
4.2308	0.0141	0.0236	0.0000	0.0000
4.2912	0.0141	0.0240	0.0000	0.0000
4.3516	0.0141	0.0244	0.0000	0.0000
4.4121	0.0141	0.0247	0.0000	0.0000
4.4725	0.0141	0.0251	0.0000	0.0000
4.5000	0.0141	0.0252	0.0000	0.0000

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.5000	0.0141	0.0252	0.0000	0.0370	0.0000
4.5604	0.0141	0.0261	0.0000	0.0370	0.0000
4.6209	0.0141	0.0269	0.0000	0.0377	0.0000
4.6813	0.0141	0.0278	0.0000	0.0385	0.0000
4.7418	0.0141	0.0286	0.0000	0.0392	0.0000
4.8022	0.0141	0.0295	0.0000	0.0399	0.0000
4.8626	0.0141	0.0303	0.0000	0.0407	0.0000
4.9231	0.0141	0.0312	0.0000	0.0414	0.0000
4.9835	0.0141	0.0320	0.0000	0.0421	0.0000
5.0440	0.0141	0.0329	0.0000	0.0429	0.0000

5.1044	0.0141	0.0337	0.0000	0.0436	0.0000
5.1648	0.0141	0.0346	0.0000	0.0443	0.0000
5.2253	0.0141	0.0354	0.0000	0.0451	0.0000
5.2857	0.0141	0.0363	0.0000	0.0458	0.0000
5.3462	0.0141	0.0371	0.0000	0.0465	0.0000
5.4066	0.0141	0.0380	0.0009	0.0472	0.0000
5.4670	0.0141	0.0388	0.0010	0.0480	0.0000
5.5000	0.0141	0.0393	0.0012	0.0484	0.0000

Surface BMP-4A

Element Flows To:

Outlet 1	Outlet 2
HMP-TANK-4	BMP-4A

BMP-6

Bottom Length:	21.20 ft.
Bottom Width:	10.00 ft.
Material thickness of first layer:	3
Material type for first layer:	Amended 2.5 in/hr
Material thickness of second layer:	2
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	4.25
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	30.015
Total Outflow (ac-ft.):	32.083
Percent Through Underdrain:	93.55
Discharge Structure	
Riser Height:	1.58 ft.
Riser Diameter:	18 in.
Element Flows To:	
Outlet 1	Outlet 2

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0702	0.0000	0.0000	0.0000
0.0773	0.0691	0.0002	0.0000	0.0000
0.1545	0.0676	0.0003	0.0000	0.0000
0.2318	0.0660	0.0005	0.0000	0.0000
0.3090	0.0645	0.0007	0.0000	0.0000
0.3863	0.0630	0.0009	0.0000	0.0000
0.4635	0.0615	0.0011	0.0000	0.0000
0.5408	0.0600	0.0014	0.0000	0.0000
0.6180	0.0586	0.0016	0.0000	0.0000
0.6953	0.0572	0.0019	0.0000	0.0000
0.7725	0.0557	0.0022	0.0000	0.0000
0.8498	0.0543	0.0025	0.0000	0.0000
0.9270	0.0530	0.0029	0.0003	0.0000
1.0043	0.0516	0.0032	0.0004	0.0000
1.0815	0.0502	0.0036	0.0005	0.0000
1.1588	0.0489	0.0040	0.0006	0.0000
1.2360	0.0476	0.0044	0.0007	0.0000
1.3133	0.0463	0.0049	0.0008	0.0000
1.3905	0.0450	0.0053	0.0010	0.0000
1.4678	0.0438	0.0058	0.0012	0.0000
1.5451	0.0425	0.0063	0.0014	0.0000
1.6223	0.0413	0.0068	0.0016	0.0000
1.6996	0.0401	0.0074	0.0019	0.0000
1.7768	0.0389	0.0080	0.0021	0.0000
1.8541	0.0378	0.0086	0.0024	0.0000
1.9313	0.0366	0.0092	0.0027	0.0000
2.0086	0.0355	0.0099	0.0031	0.0000
2.0858	0.0343	0.0106	0.0034	0.0000
2.1631	0.0332	0.0113	0.0038	0.0000
2.2403	0.0322	0.0120	0.0042	0.0000
2.3176	0.0311	0.0128	0.0046	0.0000

2.3948	0.0301	0.0136	0.0051	0.0000
2.4721	0.0290	0.0144	0.0056	0.0000
2.5493	0.0280	0.0153	0.0061	0.0000
2.6266	0.0270	0.0162	0.0066	0.0000
2.7038	0.0260	0.0171	0.0072	0.0000
2.7811	0.0251	0.0180	0.0078	0.0000
2.8584	0.0241	0.0190	0.0084	0.0000
2.9356	0.0232	0.0200	0.0090	0.0000
3.0129	0.0223	0.0212	0.0097	0.0000
3.0901	0.0214	0.0223	0.0104	0.0000
3.1674	0.0205	0.0235	0.0111	0.0000
3.2446	0.0197	0.0247	0.0119	0.0000
3.3219	0.0188	0.0260	0.0126	0.0000
3.3991	0.0180	0.0273	0.0126	0.0000
3.4764	0.0172	0.0286	0.0126	0.0000
3.5536	0.0164	0.0300	0.0126	0.0000
3.6309	0.0157	0.0315	0.0126	0.0000
3.7081	0.0149	0.0329	0.0126	0.0000
3.7854	0.0142	0.0344	0.0126	0.0000
3.8626	0.0135	0.0360	0.0126	0.0000
3.9399	0.0128	0.0376	0.0126	0.0000
4.0171	0.0121	0.0392	0.0126	0.0000
4.0944	0.0114	0.0409	0.0126	0.0000
4.1716	0.0108	0.0426	0.0126	0.0000
4.2489	0.0102	0.0444	0.0126	0.0000
4.3262	0.0096	0.0462	0.0126	0.0000
4.4034	0.0090	0.0480	0.0126	0.0000
4.4807	0.0084	0.0499	0.0126	0.0000
4.5579	0.0078	0.0519	0.0126	0.0000
4.6352	0.0073	0.0539	0.0126	0.0000
4.7124	0.0068	0.0559	0.0126	0.0000
4.7897	0.0063	0.0580	0.0126	0.0000
4.8669	0.0058	0.0601	0.0126	0.0000
4.9442	0.0053	0.0623	0.0126	0.0000
5.0000	0.0049	0.0639	0.0126	0.0000

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
5.0000	0.0702	0.0639	0.0000	0.0129	0.0000
5.0773	0.0718	0.0694	0.0000	0.0129	0.0000
5.1545	0.0734	0.0750	0.0000	0.0132	0.0000
5.2318	0.0751	0.0808	0.0000	0.0135	0.0000
5.3090	0.0767	0.0866	0.0000	0.0139	0.0000
5.3863	0.0784	0.0926	0.0000	0.0142	0.0000
5.4635	0.0800	0.0988	0.0000	0.0145	0.0000
5.5408	0.0817	0.1050	0.0000	0.0148	0.0000
5.6180	0.0834	0.1114	0.0000	0.0151	0.0000
5.6953	0.0852	0.1179	0.0000	0.0155	0.0000
5.7725	0.0869	0.1245	0.0000	0.0158	0.0000
5.8498	0.0887	0.1313	0.0000	0.0161	0.0000
5.9270	0.0904	0.1382	0.0000	0.0164	0.0000
6.0043	0.0922	0.1453	0.0000	0.0168	0.0000
6.0815	0.0941	0.1525	0.0000	0.0171	0.0000
6.1588	0.0959	0.1598	0.0000	0.0174	0.0000
6.2360	0.0977	0.1673	0.0000	0.0177	0.0000
6.3133	0.0996	0.1749	0.0000	0.0181	0.0000
6.3905	0.1015	0.1827	0.0000	0.0184	0.0000
6.4678	0.1034	0.1906	0.0000	0.0187	0.0000

6.5451	0.1053	0.1987	0.0000	0.0190	0.0000
6.6223	0.1072	0.2069	0.1385	0.0193	0.0000
6.6996	0.1092	0.2152	0.6558	0.0197	0.0000
6.7768	0.1112	0.2238	1.3719	0.0200	0.0000
6.8541	0.1132	0.2324	2.2070	0.0203	0.0000
6.9313	0.1152	0.2412	3.0877	0.0206	0.0000
7.0000	0.1170	0.2492	3.9390	0.0209	0.0000
7.0100	0.1172	0.2504	4.6910	0.0210	0.0000

Surface BMP-6

Element Flows To:

Outlet 1	Outlet 2
	BMP-6

HMP-TANK-4

Dimensions
Depth: 5 ft.
Tank Type: Circular
Diameter: 5 ft.
Length: 160 ft.
Discharge Structure
Riser Height: 4 ft.
Riser Diameter: 24 in.
Orifice 1 Diameter: 1.25 in. Elevation:0 ft.
Element Flows To:
Outlet 1 Outlet 2

Tank Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.000	0.000	0.000	0.000
0.0556	0.003	0.000	0.010	0.000
0.1111	0.005	0.000	0.014	0.000
0.1667	0.006	0.000	0.017	0.000
0.2222	0.007	0.001	0.020	0.000
0.2778	0.008	0.001	0.022	0.000
0.3333	0.009	0.002	0.024	0.000
0.3889	0.009	0.002	0.026	0.000
0.4444	0.010	0.003	0.028	0.000
0.5000	0.011	0.003	0.030	0.000
0.5556	0.011	0.004	0.031	0.000
0.6111	0.012	0.005	0.033	0.000
0.6667	0.012	0.005	0.034	0.000
0.7222	0.012	0.006	0.036	0.000
0.7778	0.013	0.007	0.037	0.000
0.8333	0.013	0.007	0.038	0.000
0.8889	0.014	0.008	0.040	0.000
0.9444	0.014	0.009	0.041	0.000
1.0000	0.014	0.010	0.042	0.000
1.0556	0.015	0.011	0.043	0.000
1.1111	0.015	0.011	0.044	0.000
1.1667	0.015	0.012	0.045	0.000
1.2222	0.015	0.013	0.046	0.000
1.2778	0.016	0.014	0.047	0.000
1.3333	0.016	0.015	0.049	0.000
1.3889	0.016	0.016	0.050	0.000
1.4444	0.016	0.017	0.051	0.000
1.5000	0.016	0.018	0.051	0.000
1.5556	0.017	0.019	0.052	0.000
1.6111	0.017	0.020	0.053	0.000
1.6667	0.017	0.021	0.054	0.000
1.7222	0.017	0.022	0.055	0.000
1.7778	0.017	0.023	0.056	0.000
1.8333	0.017	0.024	0.057	0.000
1.8889	0.017	0.024	0.058	0.000
1.9444	0.017	0.025	0.059	0.000
2.0000	0.018	0.026	0.060	0.000
2.0556	0.018	0.027	0.060	0.000
2.1111	0.018	0.028	0.061	0.000
2.1667	0.018	0.030	0.062	0.000

2.2222	0.018	0.031	0.063	0.000
2.2778	0.018	0.032	0.064	0.000
2.3333	0.018	0.033	0.064	0.000
2.3889	0.018	0.034	0.065	0.000
2.4444	0.018	0.035	0.066	0.000
2.5000	0.018	0.036	0.067	0.000
2.5556	0.018	0.037	0.067	0.000
2.6111	0.018	0.038	0.068	0.000
2.6667	0.018	0.039	0.069	0.000
2.7222	0.018	0.040	0.070	0.000
2.7778	0.018	0.041	0.070	0.000
2.8333	0.018	0.042	0.071	0.000
2.8889	0.018	0.043	0.072	0.000
2.9444	0.018	0.044	0.072	0.000
3.0000	0.018	0.045	0.073	0.000
3.0556	0.017	0.046	0.074	0.000
3.1111	0.017	0.047	0.074	0.000
3.1667	0.017	0.048	0.075	0.000
3.2222	0.017	0.049	0.076	0.000
3.2778	0.017	0.050	0.076	0.000
3.3333	0.017	0.051	0.077	0.000
3.3889	0.017	0.052	0.078	0.000
3.4444	0.017	0.053	0.078	0.000
3.5000	0.016	0.053	0.079	0.000
3.5556	0.016	0.054	0.080	0.000
3.6111	0.016	0.055	0.080	0.000
3.6667	0.016	0.056	0.081	0.000
3.7222	0.016	0.057	0.081	0.000
3.7778	0.015	0.058	0.082	0.000
3.8333	0.015	0.059	0.083	0.000
3.8889	0.015	0.060	0.083	0.000
3.9444	0.015	0.061	0.084	0.000
4.0000	0.014	0.061	0.084	0.000
4.0556	0.014	0.062	0.363	0.000
4.1111	0.014	0.063	0.870	0.000
4.1667	0.013	0.064	1.525	0.000
4.2222	0.013	0.065	2.292	0.000
4.2778	0.012	0.065	3.147	0.000
4.3333	0.012	0.066	4.067	0.000
4.3889	0.012	0.067	5.028	0.000
4.4444	0.011	0.067	6.006	0.000
4.5000	0.011	0.068	6.977	0.000
4.5556	0.010	0.069	7.917	0.000
4.6111	0.009	0.069	8.802	0.000
4.6667	0.009	0.070	9.614	0.000
4.7222	0.008	0.070	10.33	0.000
4.7778	0.007	0.071	10.96	0.000
4.8333	0.006	0.071	11.48	0.000
4.8889	0.005	0.071	11.90	0.000
4.9444	0.003	0.072	12.25	0.000
5.0000	0.000	0.072	12.55	0.000
5.0556	0.000	0.000	13.03	0.000

HMP-TANK-5,7

Dimensions
Depth: 5 ft.
Tank Type: Circular
Diameter: 5 ft.
Length: 1200 ft.
Discharge Structure
Riser Height: 4 ft.
Riser Diameter: 24 in.
Orifice 1 Diameter: 1.333 in. Elevation:0 ft.
Element Flows To:
Outlet 1 Outlet 2

Tank Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.000	0.000	0.000	0.000
0.0556	0.028	0.001	0.011	0.000
0.1111	0.040	0.003	0.016	0.000
0.1667	0.049	0.005	0.019	0.000
0.2222	0.056	0.008	0.022	0.000
0.2778	0.063	0.011	0.025	0.000
0.3333	0.068	0.015	0.027	0.000
0.3889	0.073	0.019	0.030	0.000
0.4444	0.078	0.023	0.032	0.000
0.5000	0.082	0.028	0.034	0.000
0.5556	0.086	0.032	0.035	0.000
0.6111	0.090	0.037	0.037	0.000
0.6667	0.093	0.042	0.039	0.000
0.7222	0.096	0.048	0.041	0.000
0.7778	0.099	0.053	0.042	0.000
0.8333	0.102	0.059	0.044	0.000
0.8889	0.105	0.065	0.045	0.000
0.9444	0.107	0.071	0.046	0.000
1.0000	0.110	0.077	0.048	0.000
1.0556	0.112	0.083	0.049	0.000
1.1111	0.114	0.089	0.050	0.000
1.1667	0.116	0.095	0.052	0.000
1.2222	0.118	0.102	0.053	0.000
1.2778	0.120	0.109	0.054	0.000
1.3333	0.121	0.115	0.055	0.000
1.3889	0.123	0.122	0.056	0.000
1.4444	0.124	0.129	0.058	0.000
1.5000	0.126	0.136	0.059	0.000
1.5556	0.127	0.143	0.060	0.000
1.6111	0.128	0.150	0.061	0.000
1.6667	0.129	0.157	0.062	0.000
1.7222	0.130	0.165	0.063	0.000
1.7778	0.131	0.172	0.064	0.000
1.8333	0.132	0.179	0.065	0.000
1.8889	0.133	0.187	0.066	0.000
1.9444	0.134	0.194	0.067	0.000
2.0000	0.135	0.202	0.068	0.000
2.0556	0.135	0.209	0.069	0.000
2.1111	0.136	0.217	0.070	0.000
2.1667	0.136	0.224	0.071	0.000

2.2222	0.136	0.232	0.071	0.000
2.2778	0.137	0.239	0.072	0.000
2.3333	0.137	0.247	0.073	0.000
2.3889	0.137	0.255	0.074	0.000
2.4444	0.137	0.262	0.075	0.000
2.5000	0.137	0.270	0.076	0.000
2.5556	0.137	0.278	0.077	0.000
2.6111	0.137	0.285	0.077	0.000
2.6667	0.137	0.293	0.078	0.000
2.7222	0.137	0.301	0.079	0.000
2.7778	0.136	0.308	0.080	0.000
2.8333	0.136	0.316	0.081	0.000
2.8889	0.136	0.323	0.082	0.000
2.9444	0.135	0.331	0.082	0.000
3.0000	0.135	0.338	0.083	0.000
3.0556	0.134	0.346	0.084	0.000
3.1111	0.133	0.353	0.085	0.000
3.1667	0.132	0.361	0.085	0.000
3.2222	0.131	0.368	0.086	0.000
3.2778	0.130	0.375	0.087	0.000
3.3333	0.129	0.383	0.088	0.000
3.3889	0.128	0.390	0.088	0.000
3.4444	0.127	0.397	0.089	0.000
3.5000	0.126	0.404	0.090	0.000
3.5556	0.124	0.411	0.090	0.000
3.6111	0.123	0.418	0.091	0.000
3.6667	0.121	0.425	0.092	0.000
3.7222	0.120	0.431	0.093	0.000
3.7778	0.118	0.438	0.093	0.000
3.8333	0.116	0.445	0.094	0.000
3.8889	0.114	0.451	0.095	0.000
3.9444	0.112	0.457	0.095	0.000
4.0000	0.110	0.463	0.096	0.000
4.0556	0.107	0.470	0.374	0.000
4.1111	0.105	0.475	0.882	0.000
4.1667	0.102	0.481	1.536	0.000
4.2222	0.099	0.487	2.304	0.000
4.2778	0.096	0.492	3.159	0.000
4.3333	0.093	0.498	4.079	0.000
4.3889	0.090	0.503	5.040	0.000
4.4444	0.086	0.508	6.018	0.000
4.5000	0.082	0.512	6.989	0.000
4.5556	0.078	0.517	7.929	0.000
4.6111	0.073	0.521	8.815	0.000
4.6667	0.068	0.525	9.627	0.000
4.7222	0.063	0.529	10.35	0.000
4.7778	0.056	0.532	10.97	0.000
4.8333	0.049	0.535	11.49	0.000
4.8889	0.040	0.537	11.91	0.000
4.9444	0.028	0.539	12.26	0.000
5.0000	0.000	0.540	12.57	0.000
5.0556	0.000	0.000	13.05	0.000

BMP-5A

Bottom Length:	28.40 ft.
Bottom Width:	10.00 ft.
Material thickness of first layer:	3
Material type for first layer:	Amended 2.5 in/hr
Material thickness of second layer:	1.5
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	4
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	9.227
Total Outflow (ac-ft.):	12.501
Percent Through Underdrain:	73.81
Discharge Structure	
Riser Height:	0.5 ft.
Riser Diameter:	8 in.
Element Flows To:	
Outlet 1	Outlet 2
HMP-TANK-5,7	

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0065	0.0000	0.0000	0.0000
0.0604	0.0065	0.0002	0.0000	0.0000
0.1209	0.0065	0.0003	0.0000	0.0000
0.1813	0.0065	0.0005	0.0000	0.0000
0.2418	0.0065	0.0006	0.0000	0.0000
0.3022	0.0065	0.0008	0.0000	0.0000
0.3626	0.0065	0.0009	0.0000	0.0000
0.4231	0.0065	0.0011	0.0000	0.0000
0.4835	0.0065	0.0012	0.0000	0.0000
0.5440	0.0065	0.0014	0.0000	0.0000
0.6044	0.0065	0.0015	0.0000	0.0000
0.6648	0.0065	0.0017	0.0000	0.0000
0.7253	0.0065	0.0018	0.0000	0.0000
0.7857	0.0065	0.0020	0.0000	0.0000
0.8462	0.0065	0.0022	0.0000	0.0000
0.9066	0.0065	0.0023	0.0000	0.0000
0.9670	0.0065	0.0025	0.0000	0.0000
1.0275	0.0065	0.0026	0.0000	0.0000
1.0879	0.0065	0.0028	0.0000	0.0000
1.1484	0.0065	0.0029	0.0000	0.0000
1.2088	0.0065	0.0031	0.0000	0.0000
1.2692	0.0065	0.0032	0.0000	0.0000
1.3297	0.0065	0.0034	0.0000	0.0000
1.3901	0.0065	0.0035	0.0000	0.0000
1.4505	0.0065	0.0037	0.0000	0.0000
1.5110	0.0065	0.0038	0.0000	0.0000
1.5714	0.0065	0.0040	0.0000	0.0000
1.6319	0.0065	0.0041	0.0000	0.0000
1.6923	0.0065	0.0043	0.0000	0.0000
1.7527	0.0065	0.0045	0.0000	0.0000
1.8132	0.0065	0.0046	0.0000	0.0000

1.8736	0.0065	0.0048	0.0000	0.0000
1.9341	0.0065	0.0049	0.0000	0.0000
1.9945	0.0065	0.0051	0.0000	0.0000
2.0549	0.0065	0.0052	0.0000	0.0000
2.1154	0.0065	0.0054	0.0000	0.0000
2.1758	0.0065	0.0055	0.0000	0.0000
2.2363	0.0065	0.0057	0.0000	0.0000
2.2967	0.0065	0.0058	0.0000	0.0000
2.3571	0.0065	0.0060	0.0000	0.0000
2.4176	0.0065	0.0061	0.0000	0.0000
2.4780	0.0065	0.0063	0.0000	0.0000
2.5385	0.0065	0.0065	0.0000	0.0000
2.5989	0.0065	0.0066	0.0000	0.0000
2.6593	0.0065	0.0068	0.0000	0.0000
2.7198	0.0065	0.0069	0.0000	0.0000
2.7802	0.0065	0.0071	0.0000	0.0000
2.8407	0.0065	0.0072	0.0000	0.0000
2.9011	0.0065	0.0074	0.0000	0.0000
2.9615	0.0065	0.0075	0.0000	0.0000
3.0220	0.0065	0.0077	0.0000	0.0000
3.0824	0.0065	0.0079	0.0000	0.0000
3.1429	0.0065	0.0080	0.0000	0.0000
3.2033	0.0065	0.0082	0.0000	0.0000
3.2637	0.0065	0.0083	0.0000	0.0000
3.3242	0.0065	0.0085	0.0000	0.0000
3.3846	0.0065	0.0087	0.0000	0.0000
3.4451	0.0065	0.0088	0.0000	0.0000
3.5055	0.0065	0.0090	0.0000	0.0000
3.5659	0.0065	0.0092	0.0000	0.0000
3.6264	0.0065	0.0093	0.0000	0.0000
3.6868	0.0065	0.0095	0.0000	0.0000
3.7473	0.0065	0.0097	0.0000	0.0000
3.8077	0.0065	0.0098	0.0000	0.0000
3.8681	0.0065	0.0100	0.0000	0.0000
3.9286	0.0065	0.0101	0.0000	0.0000
3.9890	0.0065	0.0103	0.0000	0.0000
4.0495	0.0065	0.0105	0.0000	0.0000
4.1099	0.0065	0.0106	0.0000	0.0000
4.1703	0.0065	0.0108	0.0000	0.0000
4.2308	0.0065	0.0110	0.0000	0.0000
4.2912	0.0065	0.0111	0.0000	0.0000
4.3516	0.0065	0.0113	0.0000	0.0000
4.4121	0.0065	0.0115	0.0000	0.0000
4.4725	0.0065	0.0116	0.0000	0.0000
4.5000	0.0065	0.0117	0.0000	0.0000

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.5000	0.0065	0.0117	0.0000	0.0172	0.0000
4.5604	0.0065	0.0121	0.0000	0.0172	0.0000
4.6209	0.0065	0.0125	0.0000	0.0175	0.0000
4.6813	0.0065	0.0129	0.0000	0.0178	0.0000
4.7418	0.0065	0.0133	0.0000	0.0182	0.0000
4.8022	0.0065	0.0137	0.0000	0.0185	0.0000
4.8626	0.0065	0.0141	0.0000	0.0189	0.0000
4.9231	0.0065	0.0145	0.0000	0.0192	0.0000
4.9835	0.0065	0.0148	0.0000	0.0195	0.0000
5.0440	0.0065	0.0152	0.0000	0.0199	0.0000

5.1044	0.0065	0.0156	0.0000	0.0202	0.0000
5.1648	0.0065	0.0160	0.0000	0.0206	0.0000
5.2253	0.0065	0.0164	0.0000	0.0209	0.0000
5.2857	0.0065	0.0168	0.0000	0.0212	0.0000
5.3462	0.0065	0.0172	0.0000	0.0216	0.0000
5.4066	0.0065	0.0176	0.0004	0.0219	0.0000
5.4670	0.0065	0.0180	0.0004	0.0222	0.0000
5.5000	0.0065	0.0182	0.0005	0.0224	0.0000

Surface BMP-5A

Element Flows To:

Outlet 1	Outlet 2
HMP-TANK-5,7	BMP-5A

BMP-5B

Bottom Length:	28.10 ft.
Bottom Width:	10.00 ft.
Material thickness of first layer:	3
Material type for first layer:	Amended 2.5 in/hr
Material thickness of second layer:	1.5
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	4
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	9.669
Total Outflow (ac-ft.):	13.746
Percent Through Underdrain:	70.34
Discharge Structure	
Riser Height:	0.5 ft.
Riser Diameter:	8 in.
Element Flows To:	
Outlet 1	Outlet 2
HMP-TANK-5,7	

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0065	0.0000	0.0000	0.0000
0.0604	0.0065	0.0002	0.0000	0.0000
0.1209	0.0065	0.0003	0.0000	0.0000
0.1813	0.0065	0.0005	0.0000	0.0000
0.2418	0.0065	0.0006	0.0000	0.0000
0.3022	0.0065	0.0008	0.0000	0.0000
0.3626	0.0065	0.0009	0.0000	0.0000
0.4231	0.0065	0.0011	0.0000	0.0000
0.4835	0.0065	0.0012	0.0000	0.0000
0.5440	0.0065	0.0014	0.0000	0.0000
0.6044	0.0065	0.0015	0.0000	0.0000
0.6648	0.0065	0.0017	0.0000	0.0000
0.7253	0.0065	0.0018	0.0000	0.0000
0.7857	0.0065	0.0020	0.0000	0.0000
0.8462	0.0065	0.0021	0.0000	0.0000
0.9066	0.0065	0.0023	0.0000	0.0000
0.9670	0.0065	0.0024	0.0000	0.0000
1.0275	0.0065	0.0026	0.0000	0.0000
1.0879	0.0065	0.0027	0.0000	0.0000
1.1484	0.0065	0.0029	0.0000	0.0000
1.2088	0.0065	0.0030	0.0000	0.0000
1.2692	0.0065	0.0032	0.0000	0.0000
1.3297	0.0065	0.0033	0.0000	0.0000
1.3901	0.0065	0.0035	0.0000	0.0000
1.4505	0.0065	0.0036	0.0000	0.0000
1.5110	0.0065	0.0038	0.0000	0.0000
1.5714	0.0065	0.0040	0.0000	0.0000
1.6319	0.0065	0.0041	0.0000	0.0000
1.6923	0.0065	0.0043	0.0000	0.0000
1.7527	0.0065	0.0044	0.0000	0.0000
1.8132	0.0065	0.0046	0.0000	0.0000

1.8736	0.0065	0.0047	0.0000	0.0000
1.9341	0.0065	0.0049	0.0000	0.0000
1.9945	0.0065	0.0050	0.0000	0.0000
2.0549	0.0065	0.0052	0.0000	0.0000
2.1154	0.0065	0.0053	0.0000	0.0000
2.1758	0.0065	0.0055	0.0000	0.0000
2.2363	0.0065	0.0056	0.0000	0.0000
2.2967	0.0065	0.0058	0.0000	0.0000
2.3571	0.0065	0.0059	0.0000	0.0000
2.4176	0.0065	0.0061	0.0000	0.0000
2.4780	0.0065	0.0062	0.0000	0.0000
2.5385	0.0065	0.0064	0.0000	0.0000
2.5989	0.0065	0.0065	0.0000	0.0000
2.6593	0.0065	0.0067	0.0000	0.0000
2.7198	0.0065	0.0068	0.0000	0.0000
2.7802	0.0065	0.0070	0.0000	0.0000
2.8407	0.0065	0.0071	0.0000	0.0000
2.9011	0.0065	0.0073	0.0000	0.0000
2.9615	0.0065	0.0075	0.0000	0.0000
3.0220	0.0065	0.0076	0.0000	0.0000
3.0824	0.0065	0.0078	0.0000	0.0000
3.1429	0.0065	0.0079	0.0000	0.0000
3.2033	0.0065	0.0081	0.0000	0.0000
3.2637	0.0065	0.0083	0.0000	0.0000
3.3242	0.0065	0.0084	0.0000	0.0000
3.3846	0.0065	0.0086	0.0000	0.0000
3.4451	0.0065	0.0087	0.0000	0.0000
3.5055	0.0065	0.0089	0.0000	0.0000
3.5659	0.0065	0.0091	0.0000	0.0000
3.6264	0.0065	0.0092	0.0000	0.0000
3.6868	0.0065	0.0094	0.0000	0.0000
3.7473	0.0065	0.0096	0.0000	0.0000
3.8077	0.0065	0.0097	0.0000	0.0000
3.8681	0.0065	0.0099	0.0000	0.0000
3.9286	0.0065	0.0100	0.0000	0.0000
3.9890	0.0065	0.0102	0.0000	0.0000
4.0495	0.0065	0.0104	0.0000	0.0000
4.1099	0.0065	0.0105	0.0000	0.0000
4.1703	0.0065	0.0107	0.0000	0.0000
4.2308	0.0065	0.0108	0.0000	0.0000
4.2912	0.0065	0.0110	0.0000	0.0000
4.3516	0.0065	0.0112	0.0000	0.0000
4.4121	0.0065	0.0113	0.0000	0.0000
4.4725	0.0065	0.0115	0.0000	0.0000
4.5000	0.0065	0.0116	0.0000	0.0000

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.5000	0.0065	0.0116	0.0000	0.0170	0.0000
4.5604	0.0065	0.0120	0.0000	0.0170	0.0000
4.6209	0.0065	0.0123	0.0000	0.0173	0.0000
4.6813	0.0065	0.0127	0.0000	0.0177	0.0000
4.7418	0.0065	0.0131	0.0000	0.0180	0.0000
4.8022	0.0065	0.0135	0.0000	0.0183	0.0000
4.8626	0.0065	0.0139	0.0000	0.0187	0.0000
4.9231	0.0065	0.0143	0.0000	0.0190	0.0000
4.9835	0.0065	0.0147	0.0000	0.0193	0.0000
5.0440	0.0065	0.0151	0.0000	0.0197	0.0000

5.1044	0.0065	0.0155	0.0000	0.0200	0.0000
5.1648	0.0065	0.0159	0.0000	0.0203	0.0000
5.2253	0.0065	0.0162	0.0000	0.0207	0.0000
5.2857	0.0065	0.0166	0.0000	0.0210	0.0000
5.3462	0.0065	0.0170	0.0000	0.0213	0.0000
5.4066	0.0065	0.0174	0.0004	0.0217	0.0000
5.4670	0.0065	0.0178	0.0004	0.0220	0.0000
5.5000	0.0065	0.0180	0.0005	0.0222	0.0000

Surface BMP-5B

Element Flows To:

Outlet 1	Outlet 2
HMP-TANK-5,7	BMP-5B

BMP-5D

Bottom Length:	108.40 ft.
Bottom Width:	5.00 ft.
Material thickness of first layer:	3
Material type for first layer:	Amended 2.5 in/hr
Material thickness of second layer:	1.5
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	4
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	15.459
Total Outflow (ac-ft.):	19.046
Percent Through Underdrain:	81.17
Discharge Structure	
Riser Height:	0.5 ft.
Riser Diameter:	8 in.
Element Flows To:	
Outlet 1	Outlet 2
HMP-TANK-5,7	

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0124	0.0000	0.0000	0.0000
0.0604	0.0124	0.0003	0.0000	0.0000
0.1209	0.0124	0.0006	0.0000	0.0000
0.1813	0.0124	0.0009	0.0000	0.0000
0.2418	0.0124	0.0012	0.0000	0.0000
0.3022	0.0124	0.0015	0.0000	0.0000
0.3626	0.0124	0.0018	0.0000	0.0000
0.4231	0.0124	0.0021	0.0000	0.0000
0.4835	0.0124	0.0023	0.0000	0.0000
0.5440	0.0124	0.0026	0.0000	0.0000
0.6044	0.0124	0.0029	0.0000	0.0000
0.6648	0.0124	0.0032	0.0000	0.0000
0.7253	0.0124	0.0035	0.0000	0.0000
0.7857	0.0124	0.0038	0.0000	0.0000
0.8462	0.0124	0.0041	0.0000	0.0000
0.9066	0.0124	0.0044	0.0000	0.0000
0.9670	0.0124	0.0047	0.0000	0.0000
1.0275	0.0124	0.0050	0.0000	0.0000
1.0879	0.0124	0.0053	0.0000	0.0000
1.1484	0.0124	0.0056	0.0000	0.0000
1.2088	0.0124	0.0059	0.0000	0.0000
1.2692	0.0124	0.0062	0.0000	0.0000
1.3297	0.0124	0.0065	0.0000	0.0000
1.3901	0.0124	0.0067	0.0000	0.0000
1.4505	0.0124	0.0070	0.0000	0.0000
1.5110	0.0124	0.0073	0.0000	0.0000
1.5714	0.0124	0.0076	0.0000	0.0000
1.6319	0.0124	0.0079	0.0000	0.0000
1.6923	0.0124	0.0082	0.0000	0.0000
1.7527	0.0124	0.0085	0.0000	0.0000
1.8132	0.0124	0.0088	0.0000	0.0000

1.8736	0.0124	0.0091	0.0000	0.0000
1.9341	0.0124	0.0094	0.0000	0.0000
1.9945	0.0124	0.0097	0.0000	0.0000
2.0549	0.0124	0.0100	0.0000	0.0000
2.1154	0.0124	0.0103	0.0000	0.0000
2.1758	0.0124	0.0106	0.0000	0.0000
2.2363	0.0124	0.0109	0.0000	0.0000
2.2967	0.0124	0.0111	0.0000	0.0000
2.3571	0.0124	0.0114	0.0000	0.0000
2.4176	0.0124	0.0117	0.0000	0.0000
2.4780	0.0124	0.0120	0.0000	0.0000
2.5385	0.0124	0.0123	0.0000	0.0000
2.5989	0.0124	0.0126	0.0000	0.0000
2.6593	0.0124	0.0129	0.0000	0.0000
2.7198	0.0124	0.0132	0.0000	0.0000
2.7802	0.0124	0.0135	0.0000	0.0000
2.8407	0.0124	0.0138	0.0000	0.0000
2.9011	0.0124	0.0141	0.0000	0.0000
2.9615	0.0124	0.0144	0.0000	0.0000
3.0220	0.0124	0.0147	0.0000	0.0000
3.0824	0.0124	0.0150	0.0000	0.0000
3.1429	0.0124	0.0153	0.0000	0.0000
3.2033	0.0124	0.0156	0.0000	0.0000
3.2637	0.0124	0.0159	0.0000	0.0000
3.3242	0.0124	0.0162	0.0000	0.0000
3.3846	0.0124	0.0166	0.0000	0.0000
3.4451	0.0124	0.0169	0.0000	0.0000
3.5055	0.0124	0.0172	0.0000	0.0000
3.5659	0.0124	0.0175	0.0000	0.0000
3.6264	0.0124	0.0178	0.0000	0.0000
3.6868	0.0124	0.0181	0.0000	0.0000
3.7473	0.0124	0.0184	0.0000	0.0000
3.8077	0.0124	0.0187	0.0000	0.0000
3.8681	0.0124	0.0191	0.0000	0.0000
3.9286	0.0124	0.0194	0.0000	0.0000
3.9890	0.0124	0.0197	0.0000	0.0000
4.0495	0.0124	0.0200	0.0000	0.0000
4.1099	0.0124	0.0203	0.0000	0.0000
4.1703	0.0124	0.0206	0.0000	0.0000
4.2308	0.0124	0.0209	0.0000	0.0000
4.2912	0.0124	0.0212	0.0000	0.0000
4.3516	0.0124	0.0215	0.0000	0.0000
4.4121	0.0124	0.0219	0.0000	0.0000
4.4725	0.0124	0.0222	0.0000	0.0000
4.5000	0.0124	0.0223	0.0000	0.0000

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.5000	0.0124	0.0223	0.0000	0.0328	0.0000
4.5604	0.0124	0.0231	0.0000	0.0328	0.0000
4.6209	0.0124	0.0238	0.0000	0.0334	0.0000
4.6813	0.0124	0.0246	0.0000	0.0340	0.0000
4.7418	0.0124	0.0253	0.0000	0.0347	0.0000
4.8022	0.0124	0.0261	0.0000	0.0353	0.0000
4.8626	0.0124	0.0268	0.0000	0.0360	0.0000
4.9231	0.0124	0.0276	0.0000	0.0366	0.0000
4.9835	0.0124	0.0283	0.0000	0.0373	0.0000
5.0440	0.0124	0.0291	0.0000	0.0379	0.0000

5.1044	0.0124	0.0298	0.0000	0.0386	0.0000
5.1648	0.0124	0.0306	0.0000	0.0392	0.0000
5.2253	0.0124	0.0313	0.0000	0.0399	0.0000
5.2857	0.0124	0.0321	0.0000	0.0405	0.0000
5.3462	0.0124	0.0328	0.0000	0.0412	0.0000
5.4066	0.0124	0.0336	0.0008	0.0418	0.0000
5.4670	0.0124	0.0343	0.0008	0.0425	0.0000
5.5000	0.0124	0.0348	0.0010	0.0428	0.0000

Surface BMP-5D

Element Flows To:

Outlet 1	Outlet 2
HMP-TANK-5,7	BMP-5D

BMP-5C MWS

MWS Model Number: MWS-L-4-13
Media Filter Rate (in/hr): 12

Element Flows To:

Outlet 1	Outlet 2
HMP-TANK-5,7	HMP-TANK-5,7

MWS Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
4.0000	0.000	0.000	0.000	0.000
4.0000	0.000	0.000	0.000	0.004
4.0000	0.000	0.000	0.000	0.008
4.0000	0.000	0.000	0.000	0.012
4.0000	0.000	0.000	0.000	0.016
4.0000	0.000	0.001	0.000	0.020
4.0000	0.000	0.001	0.000	0.025
4.0000	0.000	0.001	0.000	0.029
4.0000	0.000	0.002	0.000	0.033
4.0000	0.000	0.003	0.000	0.037
4.0000	0.000	0.003	0.000	0.041
4.0000	0.000	0.004	0.000	0.045
4.0000	0.000	0.005	0.000	0.049
4.0000	0.000	0.006	0.000	0.054
4.0000	0.000	0.007	0.000	0.058
4.0000	0.000	0.008	0.000	0.062
4.0000	0.000	0.009	0.000	0.066
4.0000	0.000	0.010	0.000	0.070
4.0000	0.000	0.011	0.000	0.074
4.0000	0.000	0.012	0.000	0.079
4.0000	0.000	0.014	0.000	0.083
4.0000	0.000	0.015	0.000	0.087
4.0000	0.000	0.017	0.000	0.091
4.0000	0.000	0.018	0.000	0.095
4.0000	0.000	0.020	0.000	0.099
4.0000	0.000	0.021	0.000	0.104
4.0000	0.000	0.023	0.000	0.108
4.0000	0.000	0.025	0.000	0.112
4.0000	0.000	0.027	0.000	0.116
4.0000	0.000	0.029	0.000	0.120
4.0000	0.000	0.031	0.000	0.124
4.0000	0.000	0.033	0.000	0.129
4.0000	0.000	0.035	0.000	0.133
4.0000	0.000	0.037	0.000	0.137
4.0000	0.000	0.040	0.000	0.141
4.0000	0.000	0.042	6.000	0.141

BMP-7 MWS

MWS Model Number: MWS-L-8-20
Media Filter Rate (in/hr): 13

Element Flows To:

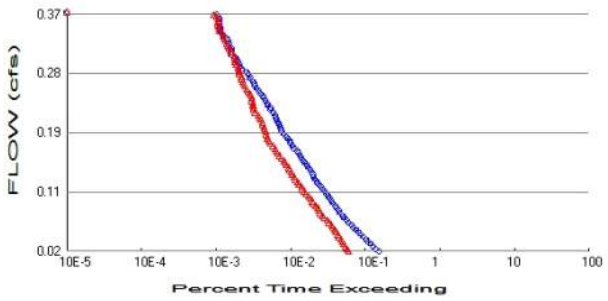
Outlet 1	Outlet 2
HMP-TANK-5,7	HMP-TANK-5,7

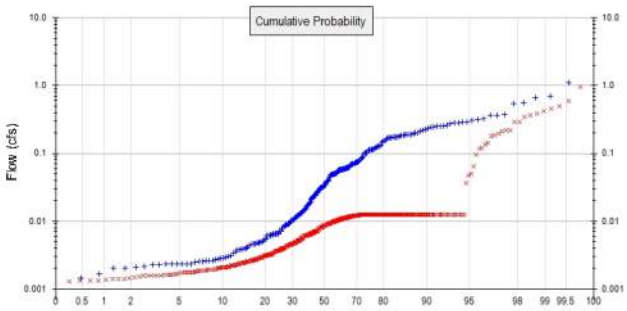
MWS Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
13.000	0.001	0.000	0.000	0.000
13.000	0.001	0.000	0.000	0.016
13.000	0.001	0.000	0.000	0.032
13.000	0.001	0.001	0.000	0.049
13.000	0.001	0.002	0.000	0.065
13.000	0.001	0.003	0.000	0.081
13.000	0.001	0.004	0.000	0.098
13.000	0.001	0.006	0.000	0.114
13.000	0.001	0.007	0.000	0.130
13.000	0.001	0.009	0.000	0.147
13.000	0.001	0.012	0.000	0.163
13.000	0.001	0.014	0.000	0.179
13.000	0.001	0.017	0.000	0.196
13.000	0.001	0.019	0.000	0.212
13.000	0.001	0.022	0.000	0.228
13.000	0.001	0.026	0.000	0.245
13.000	0.001	0.029	0.000	0.261
13.000	0.001	0.033	0.000	0.278
13.000	0.001	0.037	0.000	0.294
13.000	0.001	0.041	0.000	0.310
13.000	0.001	0.045	0.000	0.327
13.000	0.001	0.050	0.000	0.343
13.000	0.001	0.055	0.000	0.359
13.000	0.001	0.060	0.000	0.376
13.000	0.001	0.065	0.000	0.392
13.000	0.001	0.070	0.000	0.408
13.000	0.001	0.076	0.000	0.425
13.000	0.001	0.082	0.000	0.441
13.000	0.001	0.088	0.000	0.457
13.000	0.001	0.094	0.000	0.474
13.000	0.001	0.101	0.000	0.490
13.000	0.001	0.107	0.000	0.507
13.000	0.001	0.114	0.000	0.523
13.000	0.001	0.122	0.000	0.539
13.000	0.001	0.129	0.000	0.556
13.000	0.001	0.137	6.000	0.556

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.642
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.032
Total Impervious Area: 0.61

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.189732
5 year	0.287847
10 year	0.366979
25 year	0.663126

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.012558
5 year	0.212272
10 year	0.373662
25 year	0.501053

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0190	3313	1295	39	Pass
0.0225	3004	1230	40	Pass
0.0260	2748	1164	42	Pass
0.0295	2561	1109	43	Pass
0.0330	2359	1069	45	Pass
0.0365	2224	1029	46	Pass
0.0401	2022	967	47	Pass
0.0436	1895	930	49	Pass
0.0471	1749	874	49	Pass
0.0506	1622	841	51	Pass
0.0541	1509	800	53	Pass
0.0576	1413	767	54	Pass
0.0612	1283	709	55	Pass
0.0647	1216	673	55	Pass
0.0682	1120	609	54	Pass
0.0717	1072	580	54	Pass
0.0752	998	542	54	Pass
0.0787	952	524	55	Pass
0.0822	896	502	56	Pass
0.0858	856	471	55	Pass
0.0893	799	439	54	Pass
0.0928	766	426	55	Pass
0.0963	727	399	54	Pass
0.0998	689	378	54	Pass
0.1033	646	348	53	Pass
0.1069	619	330	53	Pass
0.1104	581	311	53	Pass
0.1139	547	304	55	Pass
0.1174	515	280	54	Pass
0.1209	489	269	55	Pass
0.1244	461	252	54	Pass
0.1279	439	242	55	Pass
0.1315	427	228	53	Pass
0.1350	418	222	53	Pass
0.1385	394	209	53	Pass
0.1420	372	202	54	Pass
0.1455	357	189	52	Pass
0.1490	333	181	54	Pass
0.1526	319	176	55	Pass
0.1561	301	163	54	Pass
0.1596	291	155	53	Pass
0.1631	275	143	52	Pass
0.1666	264	139	52	Pass
0.1701	241	134	55	Pass
0.1736	232	127	54	Pass
0.1772	218	116	53	Pass
0.1807	212	112	52	Pass
0.1842	199	106	53	Pass
0.1877	190	105	55	Pass
0.1912	176	102	57	Pass
0.1947	165	101	61	Pass
0.1982	161	97	60	Pass
0.2018	155	95	61	Pass

0.2053	150	92	61	Pass
0.2088	147	91	61	Pass
0.2123	140	87	62	Pass
0.2158	136	83	61	Pass
0.2193	132	80	60	Pass
0.2229	126	72	57	Pass
0.2264	117	69	58	Pass
0.2299	115	69	60	Pass
0.2334	107	68	63	Pass
0.2369	104	67	64	Pass
0.2404	99	66	66	Pass
0.2439	95	65	68	Pass
0.2475	92	64	69	Pass
0.2510	86	61	70	Pass
0.2545	81	58	71	Pass
0.2580	76	56	73	Pass
0.2615	72	53	73	Pass
0.2650	70	51	72	Pass
0.2686	68	49	72	Pass
0.2721	63	48	76	Pass
0.2756	62	48	77	Pass
0.2791	58	44	75	Pass
0.2826	55	44	80	Pass
0.2861	48	44	91	Pass
0.2896	46	43	93	Pass
0.2932	44	40	90	Pass
0.2967	43	39	90	Pass
0.3002	41	39	95	Pass
0.3037	40	38	95	Pass
0.3072	35	38	108	Pass
0.3107	35	35	100	Pass
0.3143	35	34	97	Pass
0.3178	35	32	91	Pass
0.3213	32	31	96	Pass
0.3248	32	30	93	Pass
0.3283	31	29	93	Pass
0.3318	30	28	93	Pass
0.3353	27	27	100	Pass
0.3389	26	27	103	Pass
0.3424	25	24	96	Pass
0.3459	25	24	96	Pass
0.3494	24	23	95	Pass
0.3529	24	23	95	Pass
0.3564	24	23	95	Pass
0.3599	24	23	95	Pass
0.3635	23	22	95	Pass
0.3670	22	20	90	Pass

Water Quality

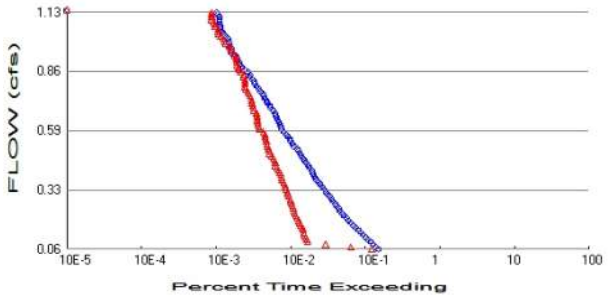
Drawdown Time Results

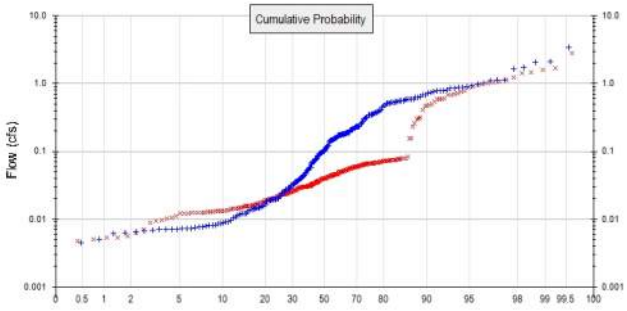
Pond: Surface BMP-6

Days	Stage(feet)	Percent of Total Run Time
1	1.931	N/A
2	1.931	N/A
3	1.931	N/A
4	1.931	N/A
5	1.931	N/A

Maximum Stage: 1.931 Drawdown Time: Less than 1 day

POC 2





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #2
Total Pervious Area: 1.972
Total Impervious Area: 0

Mitigated Landuse Totals for POC #2
Total Pervious Area: 0.264
Total Impervious Area: 1.708

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #2

Return Period	**Flow(cfs)**
2 year	0.582802
5 year	0.884058
10 year	1.127159
25 year	2.036773

Flow Frequency Return Periods for Mitigated. POC #2

Return Period	**Flow(cfs)**
2 year	0.313408
5 year	0.906776
10 year	1.165506
25 year	1.607122

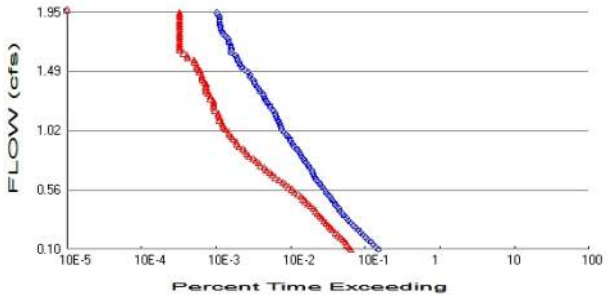
Duration Flows

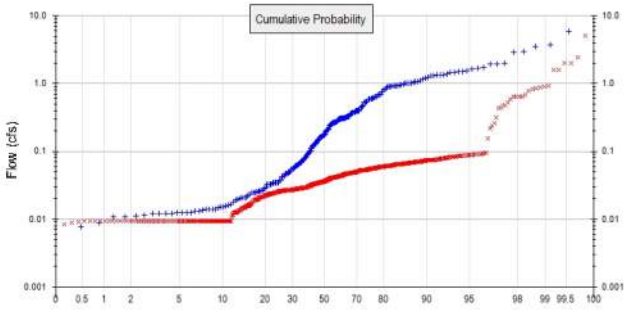
The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0583	3235	2633	81	Pass
0.0691	2972	1387	46	Pass
0.0799	2765	638	23	Pass
0.0907	2548	366	14	Pass
0.1015	2363	356	15	Pass
0.1123	2200	346	15	Pass
0.1231	2020	333	16	Pass
0.1339	1885	326	17	Pass
0.1447	1751	319	18	Pass
0.1555	1610	309	19	Pass
0.1662	1509	294	19	Pass
0.1770	1386	286	20	Pass
0.1878	1284	277	21	Pass
0.1986	1209	265	21	Pass
0.2094	1120	254	22	Pass
0.2202	1064	246	23	Pass
0.2310	995	241	24	Pass
0.2418	947	236	24	Pass
0.2526	896	231	25	Pass
0.2634	852	222	26	Pass
0.2742	797	220	27	Pass
0.2850	761	216	28	Pass
0.2958	726	202	27	Pass
0.3066	682	199	29	Pass
0.3174	644	195	30	Pass
0.3282	607	188	30	Pass
0.3390	581	185	31	Pass
0.3498	540	181	33	Pass
0.3606	515	174	33	Pass
0.3714	483	167	34	Pass
0.3822	459	165	35	Pass
0.3930	439	159	36	Pass
0.4038	426	156	36	Pass
0.4146	412	148	35	Pass
0.4254	393	142	36	Pass
0.4362	372	136	36	Pass
0.4470	354	135	38	Pass
0.4578	333	133	39	Pass
0.4686	317	128	40	Pass
0.4794	301	122	40	Pass
0.4902	289	114	39	Pass
0.5009	276	112	40	Pass
0.5117	263	109	41	Pass
0.5225	241	106	43	Pass
0.5333	231	104	45	Pass
0.5441	218	103	47	Pass
0.5549	212	101	47	Pass
0.5657	199	98	49	Pass
0.5765	189	98	51	Pass
0.5873	175	94	53	Pass
0.5981	164	84	51	Pass
0.6089	161	82	50	Pass
0.6197	155	79	50	Pass

0.6305	150	79	52	Pass
0.6413	146	78	53	Pass
0.6521	140	77	55	Pass
0.6629	136	76	55	Pass
0.6737	132	75	56	Pass
0.6845	126	70	55	Pass
0.6953	116	69	59	Pass
0.7061	114	67	58	Pass
0.7169	107	66	61	Pass
0.7277	103	65	63	Pass
0.7385	98	64	65	Pass
0.7493	95	62	65	Pass
0.7601	91	60	65	Pass
0.7709	86	58	67	Pass
0.7817	81	54	66	Pass
0.7925	77	53	68	Pass
0.8033	72	53	73	Pass
0.8141	70	53	75	Pass
0.8248	67	53	79	Pass
0.8356	63	51	80	Pass
0.8464	62	51	82	Pass
0.8572	58	46	79	Pass
0.8680	53	44	83	Pass
0.8788	48	43	89	Pass
0.8896	46	42	91	Pass
0.9004	44	41	93	Pass
0.9112	42	41	97	Pass
0.9220	41	40	97	Pass
0.9328	40	39	97	Pass
0.9436	35	37	105	Pass
0.9544	35	35	100	Pass
0.9652	35	34	97	Pass
0.9760	33	32	96	Pass
0.9868	32	29	90	Pass
0.9976	32	28	87	Pass
1.0084	31	27	87	Pass
1.0192	29	25	86	Pass
1.0300	27	23	85	Pass
1.0408	26	23	88	Pass
1.0516	25	23	92	Pass
1.0624	25	21	84	Pass
1.0732	24	21	87	Pass
1.0840	24	20	83	Pass
1.0948	24	19	79	Pass
1.1056	24	19	79	Pass
1.1164	23	19	82	Pass
1.1272	22	19	86	Pass

POC 3





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #3
Total Pervious Area: 3.407
Total Impervious Area: 0

Mitigated Landuse Totals for POC #3
Total Pervious Area: 0.124
Total Impervious Area: 3.283

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #3

Return Period	**Flow(cfs)**
2 year	1.006767
5 year	1.527169
10 year	1.947103
25 year	3.518672

Flow Frequency Return Periods for Mitigated. POC #3

Return Period	**Flow(cfs)**
2 year	0.092153
5 year	0.701762
10 year	1.151316
25 year	2.037823

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1007	3235	1386	42	Pass
0.1193	2974	1295	43	Pass
0.1380	2761	1234	44	Pass
0.1566	2543	1161	45	Pass
0.1753	2361	1087	46	Pass
0.1939	2207	1009	45	Pass
0.2126	2026	925	45	Pass
0.2312	1875	856	45	Pass
0.2499	1750	777	44	Pass
0.2685	1609	735	45	Pass
0.2872	1507	693	45	Pass
0.3058	1395	646	46	Pass
0.3245	1281	609	47	Pass
0.3431	1206	566	46	Pass
0.3618	1120	527	47	Pass
0.3804	1064	493	46	Pass
0.3991	995	463	46	Pass
0.4177	947	432	45	Pass
0.4364	892	402	45	Pass
0.4550	849	368	43	Pass
0.4737	798	341	42	Pass
0.4923	761	323	42	Pass
0.5110	726	296	40	Pass
0.5296	680	271	39	Pass
0.5483	642	241	37	Pass
0.5669	609	224	36	Pass
0.5856	579	204	35	Pass
0.6042	538	185	34	Pass
0.6229	515	171	33	Pass
0.6415	482	152	31	Pass
0.6602	459	136	29	Pass
0.6789	439	122	27	Pass
0.6975	425	114	26	Pass
0.7162	412	103	25	Pass
0.7348	393	97	24	Pass
0.7535	373	85	22	Pass
0.7721	352	81	23	Pass
0.7908	333	74	22	Pass
0.8094	317	68	21	Pass
0.8281	301	60	19	Pass
0.8467	289	56	19	Pass
0.8654	274	53	19	Pass
0.8840	262	50	19	Pass
0.9027	241	44	18	Pass
0.9213	231	41	17	Pass
0.9400	218	40	18	Pass
0.9586	212	37	17	Pass
0.9773	199	35	17	Pass
0.9959	189	33	17	Pass
1.0146	175	32	18	Pass
1.0332	164	29	17	Pass
1.0519	161	27	16	Pass
1.0705	155	27	17	Pass

1.0892	150	26	17	Pass
1.1078	147	24	16	Pass
1.1265	140	24	17	Pass
1.1451	136	23	16	Pass
1.1638	132	23	17	Pass
1.1824	126	21	16	Pass
1.2011	116	20	17	Pass
1.2197	114	20	17	Pass
1.2384	107	20	18	Pass
1.2570	102	20	19	Pass
1.2757	98	18	18	Pass
1.2943	95	18	18	Pass
1.3130	92	17	18	Pass
1.3316	84	16	19	Pass
1.3503	81	16	19	Pass
1.3689	77	16	20	Pass
1.3876	72	16	22	Pass
1.4062	70	15	21	Pass
1.4249	67	14	20	Pass
1.4435	63	14	22	Pass
1.4622	62	14	22	Pass
1.4808	58	13	22	Pass
1.4995	53	13	24	Pass
1.5181	48	12	25	Pass
1.5368	46	12	26	Pass
1.5554	44	11	25	Pass
1.5741	42	11	26	Pass
1.5927	41	9	21	Pass
1.6114	40	9	22	Pass
1.6300	35	8	22	Pass
1.6487	35	7	20	Pass
1.6673	35	7	20	Pass
1.6860	34	7	20	Pass
1.7046	32	7	21	Pass
1.7233	32	7	21	Pass
1.7419	31	7	22	Pass
1.7606	29	7	24	Pass
1.7792	27	7	25	Pass
1.7979	26	7	26	Pass
1.8165	25	7	28	Pass
1.8352	25	7	28	Pass
1.8538	24	7	29	Pass
1.8725	24	7	29	Pass
1.8912	24	7	29	Pass
1.9098	24	7	29	Pass
1.9285	23	7	30	Pass
1.9471	22	7	31	Pass

Water Quality

Drawdown Time Results

Rational Method

Data for Rational Method is not available.

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

No PERLND changes have been made.

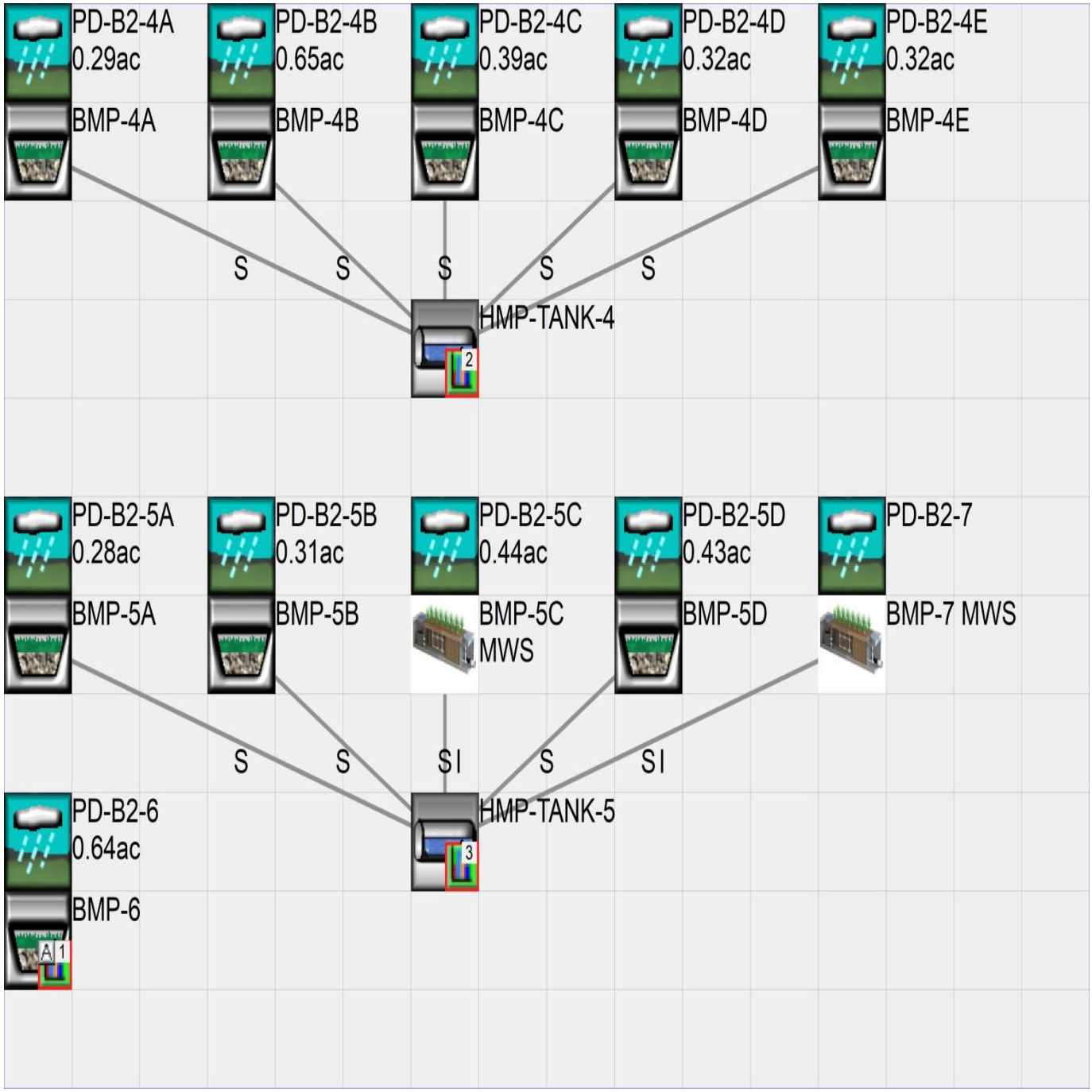
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1949 10 01        END    2011 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   2018-09-11 BMP4-5-6-7 POC-B.wdm
MESSU       25   Mit2018-09-11 BMP4-5-6-7 POC-B.MES
            27   Mit2018-09-11 BMP4-5-6-7 POC-B.L61
            28   Mit2018-09-11 BMP4-5-6-7 POC-B.L62
            30   POC2018-09-11 BMP4-5-6-7 POC-B1.dat
            32   POC2018-09-11 BMP4-5-6-7 POC-B3.dat
            31   POC2018-09-11 BMP4-5-6-7 POC-B2.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      PERLND      45
      IMPLND      14
      GENER        2
      RCHRES       1
      RCHRES       2
      GENER        4
      RCHRES       3
      RCHRES       4
      GENER        6
      RCHRES       5
      RCHRES       6
      GENER        8
      RCHRES       7
      RCHRES       8
      GENER       10
      RCHRES       9
      RCHRES      10
      GENER       12
      RCHRES      11
      RCHRES      12
      GENER       14
      RCHRES      13
      RCHRES      14
      GENER       16
      RCHRES      15
      RCHRES      16
      GENER       18
      RCHRES      17
      RCHRES      18
      RCHRES      19
      RCHRES      20
      RCHRES      21
      RCHRES      22
      COPY         1
      COPY       501
      COPY         3
      COPY       503
      COPY         2
      COPY       502
      DISPLY       1
      DISPLY       3
      DISPLY       2
    END INGRP
END OPN SEQUENCE
DISPLY
```

```
  DISPLY-INFO1
    # -  #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Surface BMP-6              MAX                   1    2   30    9
    3        HMP-TANK-5,7               MAX                   1    2   32    9
    2        HMP-TANK-4                 MAX                   1    2   31    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
    3         1    1
  503         1    1
    2         1    1
  502         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
    2        24
    4        24
    6        24
    8        24
   10        24
   12        24
   14        24
   16        24
   18        24
  END OPCODE
  PARM
    #    #         K ***
    2             0.
    4             0.
    6             0.
    8             0.
   10             0.
   12             0.
   14             0.
   16             0.
   18             0.
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                         User  t-series Engl Metr ***
                                       in  out           ***
   45     C/D,Urban,Flat(0-5%)    1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   45         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   45         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   45         0    0    0    1    0    0    0    0    1    0    0
  END PWAT-PARM1
```

```
  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR      KVARY      AGWRC
   45             0       4.6      0.04       400      0.05          3      0.995
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   45            40        35         3         2      0.45      0.15         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   45              0       0.7      0.25         1       0.4         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   45       0.5  0.5  0.5  0.6 0.65 0.65 0.65 0.65 0.65 0.65 0.55  0.5
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   45      0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS       AGWS       GWVS
   45              0         0      0.01         0       3.5        1.7        0.1
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
   14     Parking,Flat(0-5%)      1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
   14         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
   14         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
   14         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
   14            100      0.05       0.1       0.1
  END IWAT-PARM2
```

```
  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
   14              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
   14              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
PD-B2-6***
PERLND  45                       0.032     RCHRES  11      2
PERLND  45                       0.032     RCHRES  11      3
IMPLND  14                        0.61     RCHRES  11      5
PD-B2-5C***
PERLND  45                       0.022     RCHRES  19      2
PERLND  45                       0.022     RCHRES  19      3
IMPLND  14                       0.414     RCHRES  19      5
PD-B2-4A***
PERLND  45                       0.029     RCHRES   9      2
PERLND  45                       0.029     RCHRES   9      3
IMPLND  14                       0.265     RCHRES   9      5
PD-B2-4B***
PERLND  45                       0.097     RCHRES   1      2
PERLND  45                       0.097     RCHRES   1      3
IMPLND  14                       0.552     RCHRES   1      5
PD-B2-4C***
PERLND  45                       0.058     RCHRES   3      2
PERLND  45                       0.058     RCHRES   3      3
IMPLND  14                       0.329     RCHRES   3      5
PD-B2-4D***
PERLND  45                       0.032     RCHRES   5      2
PERLND  45                       0.032     RCHRES   5      3
IMPLND  14                       0.288     RCHRES   5      5
PD-B2-4E***
PERLND  45                       0.048     RCHRES   7      2
PERLND  45                       0.048     RCHRES   7      3
IMPLND  14                       0.274     RCHRES   7      5
PD-B2-5A***
PERLND  45                       0.028     RCHRES  13      2
PERLND  45                       0.028     RCHRES  13      3
IMPLND  14                       0.253     RCHRES  13      5
PD-B2-5B***
PERLND  45                       0.031     RCHRES  15      2
PERLND  45                       0.031     RCHRES  15      3
IMPLND  14                       0.278     RCHRES  15      5
PD-B2-5D***
PERLND  45                       0.043     RCHRES  17      2
PERLND  45                       0.043     RCHRES  17      3
IMPLND  14                       0.386     RCHRES  17      5
PD-B2-7***
IMPLND  14                       1.952     RCHRES  20      5

******Routing******
PERLND  45                       0.032     COPY     1     12
IMPLND  14                        0.61     COPY     1     15
PERLND  45                       0.032     COPY     1     13
RCHRES   1                           1     RCHRES  22      7
RCHRES   1                             1   COPY     2     17
RCHRES   1                           1     RCHRES   2      8
RCHRES   3                           1     RCHRES  22      7
RCHRES   3                             1   COPY     2     17
RCHRES   3                           1     RCHRES   4      8
```

```
RCHRES   5                              1     RCHRES  22      7
RCHRES   5                                    COPY     2     17
RCHRES   5                              1     RCHRES   6      8
RCHRES   7                              1     RCHRES  22      7
RCHRES   7                                    COPY     2     17
RCHRES   7                              1     RCHRES   8      8
RCHRES   9                              1     RCHRES  22      7
RCHRES   9                                    COPY     2     17
RCHRES   9                              1     RCHRES  10      8
RCHRES  11                              1     RCHRES  12      8
RCHRES  13                              1     RCHRES  21      7
RCHRES  13                                    COPY     3     17
RCHRES  13                              1     RCHRES  14      8
RCHRES  15                              1     RCHRES  21      7
RCHRES  15                                    COPY     3     17
RCHRES  15                              1     RCHRES  16      8
RCHRES  17                              1     RCHRES  21      7
RCHRES  17                                    COPY     3     17
RCHRES  17                              1     RCHRES  18      8
RCHRES  19                              1     RCHRES  21      7
RCHRES  19                                    COPY     3     17
RCHRES  19                              1     RCHRES  21      8
RCHRES  19                                    COPY     3     18
RCHRES  20                              1     RCHRES  21      7
RCHRES  20                                    COPY     3     17
RCHRES  20                              1     RCHRES  21      8
RCHRES  20                                    COPY     3     18
RCHRES  12                              1     COPY   501     16
RCHRES  11                              1     COPY   501     17
RCHRES  22                              1     COPY   502     16
RCHRES  21                              1     COPY   503     16
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1
COPY   503 OUTPUT MEAN   1 1   48.4        DISPLY   3     INPUT  TIMSER 1
COPY   502 OUTPUT MEAN   1 1   48.4        DISPLY   2     INPUT  TIMSER 1
GENER    2 OUTPUT TIMSER      .0011111     RCHRES   1     EXTNL  OUTDGT 1
GENER    4 OUTPUT TIMSER      .0011111     RCHRES   3     EXTNL  OUTDGT 1
GENER    6 OUTPUT TIMSER      .0011111     RCHRES   5     EXTNL  OUTDGT 1
GENER    8 OUTPUT TIMSER      .0011111     RCHRES   7     EXTNL  OUTDGT 1
GENER   10 OUTPUT TIMSER      .0011111     RCHRES   9     EXTNL  OUTDGT 1
GENER   12 OUTPUT TIMSER      .0011111     RCHRES  11     EXTNL  OUTDGT 1
GENER   14 OUTPUT TIMSER      .0011111     RCHRES  13     EXTNL  OUTDGT 1
GENER   16 OUTPUT TIMSER      .0011111     RCHRES  15     EXTNL  OUTDGT 1
GENER   18 OUTPUT TIMSER      .0011111     RCHRES  17     EXTNL  OUTDGT 1


<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<-----------------><---> User T-series  Engl Metr LKFG            ***
                                      in  out                                ***
    1     Surface BMP-4B          3    1    1    1   28    0    1
    2     BMP-4B                  1    1    1    1   28    0    1
    3     Surface BMP-4C          3    1    1    1   28    0    1
    4     BMP-4C                  1    1    1    1   28    0    1
    5     Surface BMP-4D          3    1    1    1   28    0    1
    6     BMP-4D                  1    1    1    1   28    0    1
    7     Surface BMP-4E          3    1    1    1   28    0    1
    8     BMP-4E                  1    1    1    1   28    0    1
    9     Surface BMP-4A          3    1    1    1   28    0    1
   10     BMP-4A                  1    1    1    1   28    0    1
```

```
 11     Surface BMP-6           3    1    1    1   28    0    1
 12     BMP-6                   1    1    1    1   28    0    1
 13     Surface BMP-5A          3    1    1    1   28    0    1
 14     BMP-5A                  1    1    1    1   28    0    1
 15     Surface BMP-5B          3    1    1    1   28    0    1
 16     BMP-5B                  1    1    1    1   28    0    1
 17     Surface BMP-5D          3    1    1    1   28    0    1
 18     BMP-5D                  1    1    1    1   28    0    1
 19     BMP-5C MWS              2    1    1    1   28    0    1
 20     BMP-7 MWS               2    1    1    1   28    0    1
 21     HMP-TANK-5,7            1    1    1    1   28    0    1
 22     HMP-TANK-4              1    1    1    1   28    0    1
END GEN-INFO
*** Section RCHRES***

ACTIVITY
  <PLS > ************ Active Sections ******************************
  # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  1         1    0    0    0    0    0    0    0    0    0
  2         1    0    0    0    0    0    0    0    0    0
  3         1    0    0    0    0    0    0    0    0    0
  4         1    0    0    0    0    0    0    0    0    0
  5         1    0    0    0    0    0    0    0    0    0
  6         1    0    0    0    0    0    0    0    0    0
  7         1    0    0    0    0    0    0    0    0    0
  8         1    0    0    0    0    0    0    0    0    0
  9         1    0    0    0    0    0    0    0    0    0
 10         1    0    0    0    0    0    0    0    0    0
 11         1    0    0    0    0    0    0    0    0    0
 12         1    0    0    0    0    0    0    0    0    0
 13         1    0    0    0    0    0    0    0    0    0
 14         1    0    0    0    0    0    0    0    0    0
 15         1    0    0    0    0    0    0    0    0    0
 16         1    0    0    0    0    0    0    0    0    0
 17         1    0    0    0    0    0    0    0    0    0
 18         1    0    0    0    0    0    0    0    0    0
 19         1    0    0    0    0    0    0    0    0    0
 20         1    0    0    0    0    0    0    0    0    0
 21         1    0    0    0    0    0    0    0    0    0
 22         1    0    0    0    0    0    0    0    0    0
END ACTIVITY

PRINT-INFO
  <PLS > ***************** Print-flags ******************** PIVL  PYR
  # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  1         4    0    0    0    0    0    0    0    0    0    1    9
  2         4    0    0    0    0    0    0    0    0    0    1    9
  3         4    0    0    0    0    0    0    0    0    0    1    9
  4         4    0    0    0    0    0    0    0    0    0    1    9
  5         4    0    0    0    0    0    0    0    0    0    1    9
  6         4    0    0    0    0    0    0    0    0    0    1    9
  7         4    0    0    0    0    0    0    0    0    0    1    9
  8         4    0    0    0    0    0    0    0    0    0    1    9
  9         4    0    0    0    0    0    0    0    0    0    1    9
 10         4    0    0    0    0    0    0    0    0    0    1    9
 11         4    0    0    0    0    0    0    0    0    0    1    9
 12         4    0    0    0    0    0    0    0    0    0    1    9
 13         4    0    0    0    0    0    0    0    0    0    1    9
 14         4    0    0    0    0    0    0    0    0    0    1    9
 15         4    0    0    0    0    0    0    0    0    0    1    9
 16         4    0    0    0    0    0    0    0    0    0    1    9
 17         4    0    0    0    0    0    0    0    0    0    1    9
 18         4    0    0    0    0    0    0    0    0    0    1    9
 19         4    0    0    0    0    0    0    0    0    0    1    9
 20         4    0    0    0    0    0    0    0    0    0    1    9
 21         4    0    0    0    0    0    0    0    0    0    1    9
 22         4    0    0    0    0    0    0    0    0    0    1    9
END PRINT-INFO

HYDR-PARM1
```

```
  RCHRES  Flags for each HYDR Section                                          ***
  # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
         FG FG FG FG  possible  exit   *** possible  exit      possible  exit
          *  *  *  *    *  *  *  *  *       *  *  *  *  *          ***
  1       0  1  0  0    4  5  6  0  0       0  1  0  0  0        2  1  2  2  2
  2       0  1  0  0    4  0  0  0  0       0  0  0  0  0        2  2  2  2  2
  3       0  1  0  0    4  5  6  0  0       0  1  0  0  0        2  1  2  2  2
  4       0  1  0  0    4  0  0  0  0       0  0  0  0  0        2  2  2  2  2
  5       0  1  0  0    4  5  6  0  0       0  1  0  0  0        2  1  2  2  2
  6       0  1  0  0    4  0  0  0  0       0  0  0  0  0        2  2  2  2  2
  7       0  1  0  0    4  5  6  0  0       0  1  0  0  0        2  1  2  2  2
  8       0  1  0  0    4  0  0  0  0       0  0  0  0  0        2  2  2  2  2
  9       0  1  0  0    4  5  6  0  0       0  1  0  0  0        2  1  2  2  2
 10       0  1  0  0    4  0  0  0  0       0  0  0  0  0        2  2  2  2  2
 11       0  1  0  0    4  5  6  0  0       0  1  0  0  0        2  1  2  2  2
 12       0  1  0  0    4  0  0  0  0       0  0  0  0  0        2  2  2  2  2
 13       0  1  0  0    4  5  6  0  0       0  1  0  0  0        2  1  2  2  2
 14       0  1  0  0    4  0  0  0  0       0  0  0  0  0        2  2  2  2  2
 15       0  1  0  0    4  5  6  0  0       0  1  0  0  0        2  1  2  2  2
 16       0  1  0  0    4  0  0  0  0       0  0  0  0  0        2  2  2  2  2
 17       0  1  0  0    4  5  6  0  0       0  1  0  0  0        2  1  2  2  2
 18       0  1  0  0    4  0  0  0  0       0  0  0  0  0        2  2  2  2  2
 19       0  1  0  0    4  5  0  0  0       0  0  0  0  0        2  2  2  2  2
 20       0  1  0  0    4  5  0  0  0       0  0  0  0  0        2  2  2  2  2
 21       0  1  0  0    4  0  0  0  0       0  0  0  0  0        2  2  2  2  2
 22       0  1  0  0    4  0  0  0  0       0  0  0  0  0        2  2  2  2  2
END HYDR-PARM1

HYDR-PARM2
  # -  #    FTABNO       LEN      DELTH     STCOR        KS      DB50        ***
<------><--------><--------><--------><--------><--------><-------->        ***
  1              1      0.01        0.0       0.0       0.5       0.0
  2              2      0.01        0.0       0.0       0.5       0.0
  3              3      0.01        0.0       0.0       0.5       0.0
  4              4      0.02        0.0       0.0       0.5       0.0
  5              5      0.01        0.0       0.0       0.5       0.0
  6              6      0.02        0.0       0.0       0.5       0.0
  7              7      0.01        0.0       0.0       0.5       0.0
  8              8      0.02        0.0       0.0       0.5       0.0
  9              9      0.01        0.0       0.0       0.5       0.0
 10             10      0.02        0.0       0.0       0.5       0.0
 11             11      0.01        0.0       0.0       0.5       0.0
 12             12      0.01        0.0       0.0       0.5       0.0
 13             13      0.01        0.0       0.0       0.5       0.0
 14             14      0.01        0.0       0.0       0.5       0.0
 15             15      0.01        0.0       0.0       0.5       0.0
 16             16      0.01        0.0       0.0       0.5       0.0
 17             17      0.01        0.0       0.0       0.5       0.0
 18             18      0.02        0.0       0.0       0.5       0.0
 19             19      0.22        0.0       4.0       0.5       0.0
 20             20      1.16        0.0      13.0       0.5       0.0
 21             21      0.23        0.0       0.0       0.5       0.0
 22             22      0.03        0.0       0.0       0.5       0.0
END HYDR-PARM2
HYDR-INIT
  RCHRES  Initial conditions for each HYDR section                             ***
  # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
        *** ac-ft     for each possible exit        for each possible exit
<------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  1            0        4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  2            0        4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  3            0        4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  4            0        4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  5            0        4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  6            0        4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  7            0        4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  8            0        4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  9            0        4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
 10         0           4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
 11         0           4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
```

```
   12         0            4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
   13         0            4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
   14         0            4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
   15         0            4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
   16         0            4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
   17         0            4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
   18         0            4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
   19         0            4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
   20         0            4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
   21         0            4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
   22         0            4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
*** User-Defined Variable Quantity Lines
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol2   RCHRES   2 VOL              4
  UVQUAN v2m2   GLOBAL     WORKSP  1        3
  UVQUAN vpo2   GLOBAL     WORKSP  2        3
  UVQUAN v2d2   GENER    2 K       1        3
*** User-Defined Variable Quantity Lines
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol4   RCHRES   4 VOL              4
  UVQUAN v2m4   GLOBAL     WORKSP  3        3
  UVQUAN vpo4   GLOBAL     WORKSP  4        3
  UVQUAN v2d4   GENER    4 K       1        3
*** User-Defined Variable Quantity Lines
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol6   RCHRES   6 VOL              4
  UVQUAN v2m6   GLOBAL     WORKSP  5        3
  UVQUAN vpo6   GLOBAL     WORKSP  6        3
  UVQUAN v2d6   GENER    6 K       1        3
*** User-Defined Variable Quantity Lines
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol8   RCHRES   8 VOL              4
  UVQUAN v2m8   GLOBAL     WORKSP  7        3
  UVQUAN vpo8   GLOBAL     WORKSP  8        3
  UVQUAN v2d8   GENER    8 K       1        3
*** User-Defined Variable Quantity Lines
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol10  RCHRES  10 VOL              4
  UVQUAN v2m10  GLOBAL     WORKSP  9        3
  UVQUAN vpo10  GLOBAL     WORKSP 10        3
  UVQUAN v2d10  GENER   10 K       1        3
*** User-Defined Variable Quantity Lines
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol12  RCHRES  12 VOL              4
  UVQUAN v2m12  GLOBAL     WORKSP 11        3
  UVQUAN vpo12  GLOBAL     WORKSP 12        3
  UVQUAN v2d12  GENER   12 K       1        3
*** User-Defined Variable Quantity Lines
```

```
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol14  RCHRES  14 VOL              4
  UVQUAN v2m14  GLOBAL     WORKSP 13        3
  UVQUAN vpo14  GLOBAL     WORKSP 14        3
  UVQUAN v2d14  GENER   14 K       1        3
*** User-Defined Variable Quantity Lines
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol16  RCHRES  16 VOL              4
  UVQUAN v2m16  GLOBAL     WORKSP 15        3
  UVQUAN vpo16  GLOBAL     WORKSP 16        3
  UVQUAN v2d16  GENER   16 K       1        3
*** User-Defined Variable Quantity Lines
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol18  RCHRES  18 VOL              4
  UVQUAN v2m18  GLOBAL     WORKSP 17        3
  UVQUAN vpo18  GLOBAL     WORKSP 18        3
  UVQUAN v2d18  GENER   18 K       1        3
*** User-Defined Target Variable Names
***                   addr or                         addr or
***                  <------>                        <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m2    1 WORKSP  1         1.0 QUAN
  UVNAME  vpo2    1 WORKSP  2         1.0 QUAN
  UVNAME  v2d2    1 K       1         1.0 QUAN
*** User-Defined Target Variable Names
***                   addr or                         addr or
***                  <------>                        <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m4    1 WORKSP  3         1.0 QUAN
  UVNAME  vpo4    1 WORKSP  4         1.0 QUAN
  UVNAME  v2d4    1 K       1         1.0 QUAN
*** User-Defined Target Variable Names
***                   addr or                         addr or
***                  <------>                        <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m6    1 WORKSP  5         1.0 QUAN
  UVNAME  vpo6    1 WORKSP  6         1.0 QUAN
  UVNAME  v2d6    1 K       1         1.0 QUAN
*** User-Defined Target Variable Names
***                   addr or                         addr or
***                  <------>                        <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m8    1 WORKSP  7         1.0 QUAN
  UVNAME  vpo8    1 WORKSP  8         1.0 QUAN
  UVNAME  v2d8    1 K       1         1.0 QUAN
*** User-Defined Target Variable Names
***                   addr or                         addr or
***                  <------>                        <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m10   1 WORKSP  9         1.0 QUAN
  UVNAME  vpo10   1 WORKSP 10         1.0 QUAN
  UVNAME  v2d10   1 K       1         1.0 QUAN
*** User-Defined Target Variable Names
***                   addr or                         addr or
***                  <------>                        <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
```

```
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m12   1 WORKSP 11         1.0 QUAN
  UVNAME  vpo12   1 WORKSP 12         1.0 QUAN
  UVNAME  v2d12   1 K       1         1.0 QUAN
*** User-Defined Target Variable Names
***                  addr or                        addr or
***                 <------>                       <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m14   1 WORKSP 13         1.0 QUAN
  UVNAME  vpo14   1 WORKSP 14         1.0 QUAN
  UVNAME  v2d14   1 K       1         1.0 QUAN
*** User-Defined Target Variable Names
***                  addr or                        addr or
***                 <------>                       <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m16   1 WORKSP 15         1.0 QUAN
  UVNAME  vpo16   1 WORKSP 16         1.0 QUAN
  UVNAME  v2d16   1 K       1         1.0 QUAN
*** User-Defined Target Variable Names
***                  addr or                        addr or
***                 <------>                       <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m18   1 WORKSP 17         1.0 QUAN
  UVNAME  vpo18   1 WORKSP 18         1.0 QUAN
  UVNAME  v2d18   1 K       1         1.0 QUAN
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER   2                               v2m2            =  1693.
*** Compute remaining available pore space
  GENER   2                               vpo2            =  v2m2
  GENER   2                               vpo2           -=  vol2
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo2 < 0.0) THEN
  GENER   2                               vpo2            =  0.0
END IF
*** Infiltration volume
  GENER   2                               v2d2            =  vpo2
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER   4                               v2m4            =  728.
*** Compute remaining available pore space
  GENER   4                               vpo4            =  v2m4
  GENER   4                               vpo4           -=  vol4
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo4 < 0.0) THEN
  GENER   4                               vpo4            =  0.0
END IF
*** Infiltration volume
  GENER   4                               v2d4            =  vpo4
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER   6                               v2m6            =  728.
*** Compute remaining available pore space
  GENER   6                               vpo6            =  v2m6
  GENER   6                               vpo6           -=  vol6
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo6 < 0.0) THEN
  GENER   6                               vpo6            =  0.0
END IF
*** Infiltration volume
  GENER   6                               v2d6            =  vpo6
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER   8                               v2m8            =  868.
*** Compute remaining available pore space
  GENER   8                               vpo8            =  v2m8
  GENER   8                               vpo8           -=  vol8
```

```
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo8 < 0.0) THEN
  GENER   8                                vpo8            =  0.0
END IF
*** Infiltration volume
  GENER   8                                v2d8            =  vpo8
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER  10                                v2m10           =  1036.
*** Compute remaining available pore space
  GENER  10                                vpo10           =  v2m10
  GENER  10                                vpo10          -=  vol10
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo10 < 0.0) THEN
  GENER  10                                vpo10           =  0.0
END IF
*** Infiltration volume
  GENER  10                                v2d10           =  vpo10
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER  12                                v2m12           =  2579.
*** Compute remaining available pore space
  GENER  12                                vpo12           =  v2m12
  GENER  12                                vpo12          -=  vol12
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo12 < 0.0) THEN
  GENER  12                                vpo12           =  0.0
END IF
*** Infiltration volume
  GENER  12                                v2d12           =  vpo12
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER  14                                v2m14           =  481.
*** Compute remaining available pore space
  GENER  14                                vpo14           =  v2m14
  GENER  14                                vpo14          -=  vol14
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo14 < 0.0) THEN
  GENER  14                                vpo14           =  0.0
END IF
*** Infiltration volume
  GENER  14                                v2d14           =  vpo14
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER  16                                v2m16           =  475.
*** Compute remaining available pore space
  GENER  16                                vpo16           =  v2m16
  GENER  16                                vpo16          -=  vol16
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo16 < 0.0) THEN
  GENER  16                                vpo16           =  0.0
END IF
*** Infiltration volume
  GENER  16                                v2d16           =  vpo16
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER  18                                v2m18           =  917.
*** Compute remaining available pore space
  GENER  18                                vpo18           =  v2m18
  GENER  18                                vpo18          -=  vol18
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo18 < 0.0) THEN
  GENER  18                                vpo18           =  0.0
END IF
*** Infiltration volume
  GENER  18                                v2d18           =  vpo18
END SPEC-ACTIONS
FTABLES
  FTABLE      2
   76    4
```

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.022968	0.000000	0.000000		
0.060440	0.022968	0.000541	0.000000		
0.120879	0.022968	0.001083	0.000000		
0.181319	0.022968	0.001624	0.000000		
0.241758	0.022968	0.002166	0.000000		
0.302198	0.022968	0.002707	0.000000		
0.362637	0.022968	0.003248	0.000000		
0.423077	0.022968	0.003790	0.000000		
0.483516	0.022968	0.004331	0.000000		
0.543956	0.022968	0.004873	0.000000		
0.604396	0.022968	0.005414	0.000000		
0.664835	0.022968	0.005955	0.000000		
0.725275	0.022968	0.006497	0.000000		
0.785714	0.022968	0.007038	0.000000		
0.846154	0.022968	0.007580	0.000000		
0.906593	0.022968	0.008121	0.001414		
0.967033	0.022968	0.008662	0.001560		
1.027473	0.022968	0.009204	0.001885		
1.087912	0.022968	0.009745	0.002254		
1.148352	0.022968	0.010287	0.002671		
1.208791	0.022968	0.010828	0.003136		
1.269231	0.022968	0.011369	0.003651		
1.329670	0.022968	0.011911	0.004218		
1.390110	0.022968	0.012452	0.004838		
1.450549	0.022968	0.012994	0.005513		
1.510989	0.022968	0.013535	0.006243		
1.571429	0.022968	0.014076	0.007032		
1.631868	0.022968	0.014618	0.007878		
1.692308	0.022968	0.015159	0.008786		
1.752747	0.022968	0.015700	0.009754		
1.813187	0.022968	0.016242	0.010786		
1.873626	0.022968	0.016783	0.011881		
1.934066	0.022968	0.017325	0.013042		
1.994505	0.022968	0.017866	0.014270		
2.054945	0.022968	0.018407	0.015565		
2.115385	0.022968	0.018949	0.016929		
2.175824	0.022968	0.019490	0.018364		
2.236264	0.022968	0.020032	0.019869		
2.296703	0.022968	0.020573	0.021447		
2.357143	0.022968	0.021114	0.023099		
2.417582	0.022968	0.021656	0.024825		
2.478022	0.022968	0.022197	0.026627		
2.538462	0.022968	0.022739	0.027779		
2.598901	0.022968	0.023280	0.030462		
2.659341	0.022968	0.023821	0.031470		
2.719780	0.022968	0.024363	0.033545		
2.780220	0.022968	0.024904	0.035700		
2.840659	0.022968	0.025446	0.037937		
2.901099	0.022968	0.025987	0.040256		
2.961538	0.022968	0.026528	0.042658		
3.021978	0.022968	0.027105	0.045144		
3.082418	0.022968	0.027681	0.047716		
3.142857	0.022968	0.028257	0.050373		
3.203297	0.022968	0.028833	0.053117		
3.263736	0.022968	0.029409	0.055948		
3.324176	0.022968	0.029985	0.058864		
3.384615	0.022968	0.030561	0.059267		
3.445055	0.022968	0.031137	0.059267		
3.505495	0.022968	0.031713	0.059267		
3.565934	0.022968	0.032289	0.059267		
3.626374	0.022968	0.032866	0.059267		
3.686813	0.022968	0.033442	0.059267		
3.747253	0.022968	0.034018	0.059267		
3.807692	0.022968	0.034594	0.059267		
3.868132	0.022968	0.035170	0.059267		
3.928571	0.022968	0.035746	0.059267		
3.989011	0.022968	0.036322	0.059267		
4.049451	0.022968	0.036898	0.059267		

```
  4.109890  0.022968  0.037474  0.059267
  4.170330  0.022968  0.038050  0.059267
  4.230769  0.022968  0.038627  0.059267
  4.291209  0.022968  0.039203  0.059267
  4.351648  0.022968  0.039779  0.059267
  4.412088  0.022968  0.040355  0.059267
  4.472527  0.022968  0.040931  0.059267
  4.500000  0.022968  0.086505  0.059267
  END FTABLE  2
  FTABLE      1
   18    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.022968  0.000000  0.000000  0.000000  0.000000
  0.060440  0.022968  0.001388  0.000000  0.060461  0.000000
  0.120879  0.022968  0.002776  0.000000  0.061655  0.000000
  0.181319  0.022968  0.004165  0.000000  0.062849  0.000000
  0.241758  0.022968  0.005553  0.000000  0.064043  0.000000
  0.302198  0.022968  0.006941  0.000000  0.065237  0.000000
  0.362637  0.022968  0.008329  0.000000  0.066431  0.000000
  0.423077  0.022968  0.009717  0.000000  0.067625  0.000000
  0.483516  0.022968  0.011106  0.000000  0.068819  0.000000
  0.543956  0.022968  0.012494  0.065047  0.070013  0.000000
  0.604396  0.022968  0.013882  0.233496  0.071207  0.000000
  0.664835  0.022968  0.015270  0.435744  0.072401  0.000000
  0.725275  0.022968  0.016658  0.618960  0.073595  0.000000
  0.785714  0.022968  0.018047  0.742908  0.074789  0.000000
  0.846154  0.022968  0.019435  0.823591  0.075983  0.000000
  0.906593  0.022968  0.020823  0.892601  0.077177  0.000000
  0.967033  0.022968  0.022211  0.956645  0.078371  0.000000
  1.000000  0.022968  0.022968  1.016663  0.079023  0.000000
  END FTABLE  1
  FTABLE      4
   76    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.009871  0.000000  0.000000
  0.060440  0.009871  0.000233  0.000000
  0.120879  0.009871  0.000465  0.000000
  0.181319  0.009871  0.000698  0.000000
  0.241758  0.009871  0.000931  0.000000
  0.302198  0.009871  0.001163  0.000000
  0.362637  0.009871  0.001396  0.000000
  0.423077  0.009871  0.001629  0.000000
  0.483516  0.009871  0.001861  0.000000
  0.543956  0.009871  0.002094  0.000000
  0.604396  0.009871  0.002327  0.000000
  0.664835  0.009871  0.002560  0.000000
  0.725275  0.009871  0.002792  0.000000
  0.785714  0.009871  0.003025  0.000000
  0.846154  0.009871  0.003258  0.000000
  0.906593  0.009871  0.003490  0.000608
  0.967033  0.009871  0.003723  0.000670
  1.027473  0.009871  0.003956  0.000810
  1.087912  0.009871  0.004188  0.000969
  1.148352  0.009871  0.004421  0.001148
  1.208791  0.009871  0.004654  0.001348
  1.269231  0.009871  0.004886  0.001569
  1.329670  0.009871  0.005119  0.001813
  1.390110  0.009871  0.005352  0.002079
  1.450549  0.009871  0.005584  0.002369
  1.510989  0.009871  0.005817  0.002683
  1.571429  0.009871  0.006050  0.003022
  1.631868  0.009871  0.006282  0.003386
  1.692308  0.009871  0.006515  0.003776
  1.752747  0.009871  0.006748  0.004192
  1.813187  0.009871  0.006981  0.004636
  1.873626  0.009871  0.007213  0.005106
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  1.934066  0.009871  0.007446  0.005605
  1.994505  0.009871  0.007679  0.006133
  2.054945  0.009871  0.007911  0.006690
  2.115385  0.009871  0.008144  0.007276
  2.175824  0.009871  0.008377  0.007892
  2.236264  0.009871  0.008609  0.008540
  2.296703  0.009871  0.008842  0.009218
  2.357143  0.009871  0.009075  0.009928
  2.417582  0.009871  0.009307  0.010669
  2.478022  0.009871  0.009540  0.011444
  2.538462  0.009871  0.009773  0.012251
  2.598901  0.009871  0.010005  0.013092
  2.659341  0.009871  0.010238  0.013967
  2.719780  0.009871  0.010471  0.014876
  2.780220  0.009871  0.010703  0.015820
  2.840659  0.009871  0.010936  0.016799
  2.901099  0.009871  0.011169  0.017813
  2.961538  0.009871  0.011402  0.018864
  3.021978  0.009871  0.011649  0.019950
  3.082418  0.009871  0.011897  0.021074
  3.142857  0.009871  0.012144  0.022235
  3.203297  0.009871  0.012392  0.023433
  3.263736  0.009871  0.012640  0.024668
  3.324176  0.009871  0.012887  0.025472
  3.384615  0.009871  0.013135  0.025472
  3.445055  0.009871  0.013382  0.025472
  3.505495  0.009871  0.013630  0.025472
  3.565934  0.009871  0.013878  0.025472
  3.626374  0.009871  0.014125  0.025472
  3.686813  0.009871  0.014373  0.025472
  3.747253  0.009871  0.014620  0.025472
  3.807692  0.009871  0.014868  0.025472
  3.868132  0.009871  0.015116  0.025472
  3.928571  0.009871  0.015363  0.025472
  3.989011  0.009871  0.015611  0.025472
  4.049451  0.009871  0.015858  0.025472
  4.109890  0.009871  0.016106  0.025472
  4.170330  0.009871  0.016354  0.025472
  4.230769  0.009871  0.016601  0.025472
  4.291209  0.009871  0.016849  0.025472
  4.351648  0.009871  0.017096  0.025472
  4.412088  0.009871  0.017344  0.025472
  4.472527  0.009871  0.017592  0.025472
  4.500000  0.009871  0.037179  0.025472
  END FTABLE  4
  FTABLE      3
   18    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.009871  0.000000  0.000000  0.000000  0.000000
  0.060440  0.009871  0.000597  0.000000  0.025985  0.000000
  0.120879  0.009871  0.001193  0.000000  0.026498  0.000000
  0.181319  0.009871  0.001790  0.000000  0.027012  0.000000
  0.241758  0.009871  0.002387  0.000000  0.027525  0.000000
  0.302198  0.009871  0.002983  0.000000  0.028038  0.000000
  0.362637  0.009871  0.003580  0.000000  0.028551  0.000000
  0.423077  0.009871  0.004176  0.000000  0.029064  0.000000
  0.483516  0.009871  0.004773  0.000000  0.029577  0.000000
  0.543956  0.009871  0.005370  0.065047  0.030091  0.000000
  0.604396  0.009871  0.005966  0.233496  0.030604  0.000000
  0.664835  0.009871  0.006563  0.435744  0.031117  0.000000
  0.725275  0.009871  0.007160  0.618960  0.031630  0.000000
  0.785714  0.009871  0.007756  0.742908  0.032143  0.000000
  0.846154  0.009871  0.008353  0.823591  0.032657  0.000000
  0.906593  0.009871  0.008949  0.892601  0.033170  0.000000
  0.967033  0.009871  0.009546  0.956645  0.033683  0.000000
  1.000000  0.009871  0.009871  1.016663  0.033963  0.000000
  END FTABLE  3
```

FTABLE 6
76 4

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.009871	0.000000	0.000000		
0.060440	0.009871	0.000233	0.000000		
0.120879	0.009871	0.000465	0.000000		
0.181319	0.009871	0.000698	0.000000		
0.241758	0.009871	0.000931	0.000000		
0.302198	0.009871	0.001163	0.000000		
0.362637	0.009871	0.001396	0.000000		
0.423077	0.009871	0.001629	0.000000		
0.483516	0.009871	0.001861	0.000000		
0.543956	0.009871	0.002094	0.000000		
0.604396	0.009871	0.002327	0.000000		
0.664835	0.009871	0.002560	0.000000		
0.725275	0.009871	0.002792	0.000000		
0.785714	0.009871	0.003025	0.000000		
0.846154	0.009871	0.003258	0.000000		
0.906593	0.009871	0.003490	0.000608		
0.967033	0.009871	0.003723	0.000670		
1.027473	0.009871	0.003956	0.000810		
1.087912	0.009871	0.004188	0.000969		
1.148352	0.009871	0.004421	0.001148		
1.208791	0.009871	0.004654	0.001348		
1.269231	0.009871	0.004886	0.001569		
1.329670	0.009871	0.005119	0.001813		
1.390110	0.009871	0.005352	0.002079		
1.450549	0.009871	0.005584	0.002369		
1.510989	0.009871	0.005817	0.002683		
1.571429	0.009871	0.006050	0.003022		
1.631868	0.009871	0.006282	0.003386		
1.692308	0.009871	0.006515	0.003776		
1.752747	0.009871	0.006748	0.004192		
1.813187	0.009871	0.006981	0.004636		
1.873626	0.009871	0.007213	0.005106		
1.934066	0.009871	0.007446	0.005605		
1.994505	0.009871	0.007679	0.006133		
2.054945	0.009871	0.007911	0.006690		
2.115385	0.009871	0.008144	0.007276		
2.175824	0.009871	0.008377	0.007892		
2.236264	0.009871	0.008609	0.008540		
2.296703	0.009871	0.008842	0.009218		
2.357143	0.009871	0.009075	0.009928		
2.417582	0.009871	0.009307	0.010669		
2.478022	0.009871	0.009540	0.011444		
2.538462	0.009871	0.009773	0.012251		
2.598901	0.009871	0.010005	0.013092		
2.659341	0.009871	0.010238	0.013967		
2.719780	0.009871	0.010471	0.014876		
2.780220	0.009871	0.010703	0.015820		
2.840659	0.009871	0.010936	0.016799		
2.901099	0.009871	0.011169	0.017813		
2.961538	0.009871	0.011402	0.018864		
3.021978	0.009871	0.011649	0.019950		
3.082418	0.009871	0.011897	0.021074		
3.142857	0.009871	0.012144	0.022235		
3.203297	0.009871	0.012392	0.023433		
3.263736	0.009871	0.012640	0.024668		
3.324176	0.009871	0.012887	0.025472		
3.384615	0.009871	0.013135	0.025472		
3.445055	0.009871	0.013382	0.025472		
3.505495	0.009871	0.013630	0.025472		
3.565934	0.009871	0.013878	0.025472		
3.626374	0.009871	0.014125	0.025472		
3.686813	0.009871	0.014373	0.025472		
3.747253	0.009871	0.014620	0.025472		
3.807692	0.009871	0.014868	0.025472		
3.868132	0.009871	0.015116	0.025472		
3.928571	0.009871	0.015363	0.025472		

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  3.989011  0.009871  0.015611  0.025472
  4.049451  0.009871  0.015858  0.025472
  4.109890  0.009871  0.016106  0.025472
  4.170330  0.009871  0.016354  0.025472
  4.230769  0.009871  0.016601  0.025472
  4.291209  0.009871  0.016849  0.025472
  4.351648  0.009871  0.017096  0.025472
  4.412088  0.009871  0.017344  0.025472
  4.472527  0.009871  0.017592  0.025472
  4.500000  0.009871  0.037179  0.025472
  END FTABLE  6
  FTABLE      5
   18    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.009871  0.000000  0.000000  0.000000  0.000000
  0.060440  0.009871  0.000597  0.000000  0.025985  0.000000
  0.120879  0.009871  0.001193  0.000000  0.026498  0.000000
  0.181319  0.009871  0.001790  0.000000  0.027012  0.000000
  0.241758  0.009871  0.002387  0.000000  0.027525  0.000000
  0.302198  0.009871  0.002983  0.000000  0.028038  0.000000
  0.362637  0.009871  0.003580  0.000000  0.028551  0.000000
  0.423077  0.009871  0.004176  0.000000  0.029064  0.000000
  0.483516  0.009871  0.004773  0.000000  0.029577  0.000000
  0.543956  0.009871  0.005370  0.065047  0.030091  0.000000
  0.604396  0.009871  0.005966  0.233496  0.030604  0.000000
  0.664835  0.009871  0.006563  0.435744  0.031117  0.000000
  0.725275  0.009871  0.007160  0.618960  0.031630  0.000000
  0.785714  0.009871  0.007756  0.742908  0.032143  0.000000
  0.846154  0.009871  0.008353  0.823591  0.032657  0.000000
  0.906593  0.009871  0.008949  0.892601  0.033170  0.000000
  0.967033  0.009871  0.009546  0.956645  0.033683  0.000000
  1.000000  0.009871  0.009871  1.016663  0.033963  0.000000
  END FTABLE  5
  FTABLE      8
   76    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.011777  0.000000  0.000000
  0.060440  0.011777  0.000278  0.000000
  0.120879  0.011777  0.000555  0.000000
  0.181319  0.011777  0.000833  0.000000
  0.241758  0.011777  0.001110  0.000000
  0.302198  0.011777  0.001388  0.000000
  0.362637  0.011777  0.001666  0.000000
  0.423077  0.011777  0.001943  0.000000
  0.483516  0.011777  0.002221  0.000000
  0.543956  0.011777  0.002498  0.000000
  0.604396  0.011777  0.002776  0.000000
  0.664835  0.011777  0.003054  0.000000
  0.725275  0.011777  0.003331  0.000000
  0.785714  0.011777  0.003609  0.000000
  0.846154  0.011777  0.003886  0.000000
  0.906593  0.011777  0.004164  0.000725
  0.967033  0.011777  0.004442  0.000800
  1.027473  0.011777  0.004719  0.000966
  1.087912  0.011777  0.004997  0.001156
  1.148352  0.011777  0.005274  0.001370
  1.208791  0.011777  0.005552  0.001608
  1.269231  0.011777  0.005830  0.001872
  1.329670  0.011777  0.006107  0.002163
  1.390110  0.011777  0.006385  0.002481
  1.450549  0.011777  0.006662  0.002827
  1.510989  0.011777  0.006940  0.003201
  1.571429  0.011777  0.007218  0.003605
  1.631868  0.011777  0.007495  0.004040
  1.692308  0.011777  0.007773  0.004505
  1.752747  0.011777  0.008050  0.005001
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  1.813187  0.011777  0.008328  0.005530
  1.873626  0.011777  0.008606  0.006092
  1.934066  0.011777  0.008883  0.006687
  1.994505  0.011777  0.009161  0.007317
  2.054945  0.011777  0.009438  0.007981
  2.115385  0.011777  0.009716  0.008680
  2.175824  0.011777  0.009994  0.009416
  2.236264  0.011777  0.010271  0.010188
  2.296703  0.011777  0.010549  0.010997
  2.357143  0.011777  0.010826  0.011844
  2.417582  0.011777  0.011104  0.012729
  2.478022  0.011777  0.011381  0.013653
  2.538462  0.011777  0.011659  0.014616
  2.598901  0.011777  0.011937  0.015619
  2.659341  0.011777  0.012214  0.016663
  2.719780  0.011777  0.012492  0.017747
  2.780220  0.011777  0.012769  0.018873
  2.840659  0.011777  0.013047  0.020041
  2.901099  0.011777  0.013325  0.021251
  2.961538  0.011777  0.013602  0.022505
  3.021978  0.011777  0.013898  0.023801
  3.082418  0.011777  0.014193  0.025142
  3.142857  0.011777  0.014488  0.026526
  3.203297  0.011777  0.014784  0.027779
  3.263736  0.011777  0.015079  0.029429
  3.324176  0.011777  0.015375  0.030182
  3.384615  0.011777  0.015670  0.030389
  3.445055  0.011777  0.015965  0.030389
  3.505495  0.011777  0.016261  0.030389
  3.565934  0.011777  0.016556  0.030389
  3.626374  0.011777  0.016852  0.030389
  3.686813  0.011777  0.017147  0.030389
  3.747253  0.011777  0.017442  0.030389
  3.807692  0.011777  0.017738  0.030389
  3.868132  0.011777  0.018033  0.030389
  3.928571  0.011777  0.018329  0.030389
  3.989011  0.011777  0.018624  0.030389
  4.049451  0.011777  0.018919  0.030389
  4.109890  0.011777  0.019215  0.030389
  4.170330  0.011777  0.019510  0.030389
  4.230769  0.011777  0.019806  0.030389
  4.291209  0.011777  0.020101  0.030389
  4.351648  0.011777  0.020396  0.030389
  4.412088  0.011777  0.020692  0.030389
  4.472527  0.011777  0.020987  0.030389
  4.500000  0.011777  0.044355  0.030389
  END FTABLE  8
  FTABLE      7
   18    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.011777  0.000000  0.000000  0.000000  0.000000
  0.060440  0.011777  0.000712  0.000000  0.031001  0.000000
  0.120879  0.011777  0.001424  0.000000  0.031613  0.000000
  0.181319  0.011777  0.002135  0.000000  0.032225  0.000000
  0.241758  0.011777  0.002847  0.000000  0.032838  0.000000
  0.302198  0.011777  0.003559  0.000000  0.033450  0.000000
  0.362637  0.011777  0.004271  0.000000  0.034062  0.000000
  0.423077  0.011777  0.004983  0.000000  0.034674  0.000000
  0.483516  0.011777  0.005694  0.000000  0.035287  0.000000
  0.543956  0.011777  0.006406  0.065047  0.035899  0.000000
  0.604396  0.011777  0.007118  0.233496  0.036511  0.000000
  0.664835  0.011777  0.007830  0.435744  0.037123  0.000000
  0.725275  0.011777  0.008541  0.618960  0.037736  0.000000
  0.785714  0.011777  0.009253  0.742908  0.038348  0.000000
  0.846154  0.011777  0.009965  0.823591  0.038960  0.000000
  0.906593  0.011777  0.010677  0.892601  0.039572  0.000000
  0.967033  0.011777  0.011389  0.956645  0.040184  0.000000
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1.000000  0.011777  0.011777  1.016663  0.040518  0.000000
END FTABLE  7
FTABLE     10
 76    4
   Depth      Area    Volume  Outflow1 Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
0.000000  0.014061  0.000000  0.000000
0.060440  0.014061  0.000331  0.000000
0.120879  0.014061  0.000663  0.000000
0.181319  0.014061  0.000994  0.000000
0.241758  0.014061  0.001326  0.000000
0.302198  0.014061  0.001657  0.000000
0.362637  0.014061  0.001989  0.000000
0.423077  0.014061  0.002320  0.000000
0.483516  0.014061  0.002652  0.000000
0.543956  0.014061  0.002983  0.000000
0.604396  0.014061  0.003314  0.000000
0.664835  0.014061  0.003646  0.000000
0.725275  0.014061  0.003977  0.000000
0.785714  0.014061  0.004309  0.000000
0.846154  0.014061  0.004640  0.000000
0.906593  0.014061  0.004972  0.000866
0.967033  0.014061  0.005303  0.000955
1.027473  0.014061  0.005634  0.001154
1.087912  0.014061  0.005966  0.001380
1.148352  0.014061  0.006297  0.001635
1.208791  0.014061  0.006629  0.001920
1.269231  0.014061  0.006960  0.002235
1.329670  0.014061  0.007292  0.002582
1.390110  0.014061  0.007623  0.002962
1.450549  0.014061  0.007955  0.003375
1.510989  0.014061  0.008286  0.003822
1.571429  0.014061  0.008617  0.004305
1.631868  0.014061  0.008949  0.004823
1.692308  0.014061  0.009280  0.005378
1.752747  0.014061  0.009612  0.005972
1.813187  0.014061  0.009943  0.006603
1.873626  0.014061  0.010275  0.007274
1.934066  0.014061  0.010606  0.007984
1.994505  0.014061  0.010938  0.008736
2.054945  0.014061  0.011269  0.009529
2.115385  0.014061  0.011600  0.010364
2.175824  0.014061  0.011932  0.011242
2.236264  0.014061  0.012263  0.012164
2.296703  0.014061  0.012595  0.013130
2.357143  0.014061  0.012926  0.014141
2.417582  0.014061  0.013258  0.015198
2.478022  0.014061  0.013589  0.016301
2.538462  0.014061  0.013920  0.017451
2.598901  0.014061  0.014252  0.018649
2.659341  0.014061  0.014583  0.019895
2.719780  0.014061  0.014915  0.021189
2.780220  0.014061  0.015246  0.022534
2.840659  0.014061  0.015578  0.023928
2.901099  0.014061  0.015909  0.025373
2.961538  0.014061  0.016241  0.026870
3.021978  0.014061  0.016593  0.027779
3.082418  0.014061  0.016946  0.030018
3.142857  0.014061  0.017299  0.030838
3.203297  0.014061  0.017651  0.032518
3.263736  0.014061  0.018004  0.034251
3.324176  0.014061  0.018357  0.036036
3.384615  0.014061  0.018709  0.036283
3.445055  0.014061  0.019062  0.036283
3.505495  0.014061  0.019415  0.036283
3.565934  0.014061  0.019767  0.036283
3.626374  0.014061  0.020120  0.036283
3.686813  0.014061  0.020473  0.036283
3.747253  0.014061  0.020825  0.036283
3.807692  0.014061  0.021178  0.036283
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  3.868132  0.014061  0.021531  0.036283
  3.928571  0.014061  0.021883  0.036283
  3.989011  0.014061  0.022236  0.036283
  4.049451  0.014061  0.022589  0.036283
  4.109890  0.014061  0.022942  0.036283
  4.170330  0.014061  0.023294  0.036283
  4.230769  0.014061  0.023647  0.036283
  4.291209  0.014061  0.024000  0.036283
  4.351648  0.014061  0.024352  0.036283
  4.412088  0.014061  0.024705  0.036283
  4.472527  0.014061  0.025058  0.036283
  4.500000  0.014061  0.052958  0.036283
  END FTABLE 10
  FTABLE      9
   18    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.014061  0.000000  0.000000  0.000000  0.000000
  0.060440  0.014061  0.000850  0.000000  0.037014  0.000000
  0.120879  0.014061  0.001700  0.000000  0.037745  0.000000
  0.181319  0.014061  0.002550  0.000000  0.038476  0.000000
  0.241758  0.014061  0.003399  0.000000  0.039207  0.000000
  0.302198  0.014061  0.004249  0.000000  0.039938  0.000000
  0.362637  0.014061  0.005099  0.000000  0.040669  0.000000
  0.423077  0.014061  0.005949  0.000000  0.041400  0.000000
  0.483516  0.014061  0.006799  0.000000  0.042131  0.000000
  0.543956  0.014061  0.007649  0.065047  0.042862  0.000000
  0.604396  0.014061  0.008498  0.233496  0.043593  0.000000
  0.664835  0.014061  0.009348  0.435744  0.044324  0.000000
  0.725275  0.014061  0.010198  0.618960  0.045055  0.000000
  0.785714  0.014061  0.011048  0.742908  0.045786  0.000000
  0.846154  0.014061  0.011898  0.823591  0.046517  0.000000
  0.906593  0.014061  0.012748  0.892601  0.047248  0.000000
  0.967033  0.014061  0.013598  0.956645  0.047979  0.000000
  1.000000  0.014061  0.014061  1.016663  0.048377  0.000000
  END FTABLE  9
  FTABLE     12
   66    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.070248  0.000000  0.000000
  0.077253  0.069112  0.000153  0.000000
  0.154505  0.067556  0.000321  0.000000
  0.231758  0.066017  0.000502  0.000000
  0.309011  0.064496  0.000699  0.000000
  0.386264  0.062993  0.000911  0.000000
  0.463516  0.061507  0.001139  0.000000
  0.540769  0.060038  0.001384  0.000000
  0.618022  0.058587  0.001645  0.000000
  0.695275  0.057154  0.001924  0.000000
  0.772527  0.055738  0.002222  0.000000
  0.849780  0.054339  0.002538  0.000000
  0.927033  0.052958  0.002873  0.000322
  1.004286  0.051595  0.003227  0.000364
  1.081538  0.050249  0.003602  0.000460
  1.158791  0.048921  0.003998  0.000572
  1.236044  0.047610  0.004415  0.000700
  1.313297  0.046317  0.004853  0.000846
  1.390549  0.045041  0.005314  0.001011
  1.467802  0.043783  0.005798  0.001194
  1.545055  0.042543  0.006305  0.001397
  1.622308  0.041320  0.006836  0.001620
  1.699560  0.040114  0.007392  0.001863
  1.776813  0.038926  0.007973  0.002128
  1.854066  0.037756  0.008579  0.002415
  1.931319  0.036603  0.009211  0.002724
  2.008571  0.035467  0.009869  0.003056
  2.085824  0.034350  0.010555  0.003411
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  2.163077  0.033249  0.011268  0.003791
  2.240330  0.032166  0.012009  0.004195
  2.317582  0.031101  0.012779  0.004625
  2.394835  0.030054  0.013579  0.005079
  2.472088  0.029023  0.014408  0.005560
  2.549341  0.028011  0.015267  0.006068
  2.626593  0.027016  0.016157  0.006602
  2.703846  0.026038  0.017078  0.007163
  2.781099  0.025078  0.018031  0.007753
  2.858352  0.024136  0.019016  0.008371
  2.935604  0.023211  0.020035  0.009017
  3.012857  0.022303  0.021154  0.009693
  3.090110  0.021414  0.022309  0.010398
  3.167363  0.020541  0.023501  0.011133
  3.244615  0.019687  0.024730  0.011898
  3.321868  0.018849  0.025997  0.012558
  3.399121  0.018030  0.027303  0.012558
  3.476374  0.017227  0.028647  0.012558
  3.553626  0.016443  0.030031  0.012558
  3.630879  0.015676  0.031455  0.012558
  3.708132  0.014926  0.032919  0.012558
  3.785385  0.014194  0.034425  0.012558
  3.862637  0.013480  0.035972  0.012558
  3.939890  0.012783  0.037562  0.012558
  4.017143  0.012103  0.039194  0.012558
  4.094396  0.011441  0.040870  0.012558
  4.171648  0.010797  0.042590  0.012558
  4.248901  0.010170  0.044355  0.012558
  4.326154  0.009561  0.046165  0.012558
  4.403407  0.008969  0.048020  0.012558
  4.480659  0.008395  0.049921  0.012558
  4.557912  0.007838  0.051870  0.012558
  4.635165  0.007299  0.053866  0.012558
  4.712418  0.006778  0.055909  0.012558
  4.789670  0.006274  0.058001  0.012558
  4.866923  0.005787  0.060142  0.012558
  4.944176  0.005318  0.062333  0.012558
  5.000000  0.004867  0.134290  0.012558
  END FTABLE 12
  FTABLE     11
   28    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.004867  0.000000  0.000000  0.000000  0.000000
  0.077253  0.071834  0.005488  0.000000  0.012882  0.000000
  0.154505  0.073438  0.011099  0.000000  0.013205  0.000000
  0.231758  0.075060  0.016835  0.000000  0.013529  0.000000
  0.309011  0.076699  0.022697  0.000000  0.013852  0.000000
  0.386264  0.078356  0.028687  0.000000  0.014175  0.000000
  0.463516  0.080030  0.034804  0.000000  0.014499  0.000000
  0.540769  0.081721  0.041052  0.000000  0.014822  0.000000
  0.618022  0.083431  0.047431  0.000000  0.015145  0.000000
  0.695275  0.085157  0.053943  0.000000  0.015469  0.000000
  0.772527  0.086902  0.060589  0.000000  0.015792  0.000000
  0.849780  0.088663  0.067371  0.000000  0.016116  0.000000
  0.927033  0.090443  0.074289  0.000000  0.016439  0.000000
  1.004286  0.092240  0.081345  0.000000  0.016762  0.000000
  1.081538  0.094054  0.088541  0.000000  0.017086  0.000000
  1.158791  0.095886  0.095878  0.000000  0.017409  0.000000
  1.236044  0.097736  0.103357  0.000000  0.017733  0.000000
  1.313297  0.099603  0.110979  0.000000  0.018056  0.000000
  1.390549  0.101487  0.118747  0.000000  0.018379  0.000000
  1.467802  0.103389  0.126660  0.000000  0.018703  0.000000
  1.545055  0.105309  0.134722  0.000000  0.019026  0.000000
  1.622308  0.107246  0.142932  0.138458  0.019349  0.000000
  1.699560  0.109201  0.151292  0.655760  0.019673  0.000000
  1.776813  0.111173  0.159805  1.371872  0.019996  0.000000
  1.854066  0.113163  0.168470  2.206966  0.020320  0.000000
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1.931319  0.115170  0.177290  3.087674  0.020643  0.000000
2.000000  0.116970  0.185262  3.938950  0.020931  0.000000
2.010000  0.117233  0.186433  4.691015  0.020972  0.000000
END FTABLE 11
FTABLE     22
 91    4
   Depth      Area    Volume  Outflow1 Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
0.000000  0.000000  0.000000  0.000000
0.055556  0.003850  0.000143  0.009994
0.111111  0.005414  0.000403  0.014134
0.166667  0.006593  0.000738  0.017310
0.222222  0.007570  0.001132  0.019988
0.277778  0.008414  0.001576  0.022347
0.333333  0.009162  0.002065  0.024480
0.388889  0.009837  0.002593  0.026442
0.444444  0.010453  0.003157  0.028268
0.500000  0.011019  0.003753  0.029982
0.555556  0.011543  0.004380  0.031604
0.611111  0.012031  0.005035  0.033147
0.666667  0.012486  0.005717  0.034620
0.722222  0.012912  0.006422  0.036034
0.777778  0.013313  0.007151  0.037394
0.833333  0.013689  0.007901  0.038707
0.888889  0.014043  0.008671  0.039976
0.944444  0.014377  0.009461  0.041207
1.000000  0.014692  0.010268  0.042401
1.055556  0.014990  0.011093  0.043563
1.111111  0.015271  0.011934  0.044695
1.166667  0.015535  0.012789  0.045799
1.222222  0.015785  0.013660  0.046876
1.277778  0.016021  0.014543  0.047930
1.333333  0.016243  0.015439  0.048961
1.388889  0.016452  0.016348  0.049970
1.444444  0.016648  0.017267  0.050960
1.500000  0.016832  0.018197  0.051931
1.555556  0.017005  0.019137  0.052884
1.611111  0.017165  0.020086  0.053820
1.666667  0.017315  0.021044  0.054740
1.722222  0.017454  0.022010  0.055645
1.777778  0.017582  0.022983  0.056535
1.833333  0.017700  0.023964  0.057412
1.888889  0.017808  0.024950  0.058275
1.944444  0.017906  0.025942  0.059126
2.000000  0.017994  0.026939  0.059964
2.055556  0.018073  0.027941  0.060792
2.111111  0.018142  0.028947  0.061608
2.166667  0.018201  0.029957  0.062413
2.222222  0.018252  0.030970  0.063208
2.277778  0.018293  0.031985  0.063993
2.333333  0.018325  0.033002  0.064769
2.388889  0.018347  0.034021  0.065536
2.444444  0.018361  0.035040  0.066293
2.500000  0.018365  0.036061  0.067042
2.555556  0.018361  0.037081  0.067783
2.611111  0.018347  0.038100  0.068516
2.666667  0.018325  0.039119  0.069241
2.722222  0.018293  0.040136  0.069959
2.777778  0.018252  0.041152  0.070669
2.833333  0.018201  0.042164  0.071372
2.888889  0.018142  0.043174  0.072068
2.944444  0.018073  0.044180  0.072758
3.000000  0.017994  0.045182  0.073441
3.055556  0.017906  0.046179  0.074118
3.111111  0.017808  0.047171  0.074789
3.166667  0.017700  0.048157  0.075454
3.222222  0.017582  0.049138  0.076113
3.277778  0.017454  0.050111  0.076766
3.333333  0.017315  0.051077  0.077414
3.388889  0.017165  0.052035  0.078056
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3.444444  0.017005  0.052984  0.078693
3.500000  0.016832  0.053924  0.079325
3.555556  0.016648  0.054854  0.079953
3.611111  0.016452  0.055773  0.080575
3.666667  0.016243  0.056682  0.081192
3.722222  0.016021  0.057578  0.081805
3.777778  0.015785  0.058461  0.082413
3.833333  0.015535  0.059332  0.083017
3.888889  0.015271  0.060187  0.083616
3.944444  0.014990  0.061028  0.084212
4.000000  0.014692  0.061853  0.084803
4.055556  0.014377  0.062660  0.363185
4.111111  0.014043  0.063450  0.870741
4.166667  0.013689  0.064220  1.525043
4.222222  0.013313  0.064970  2.292388
4.277778  0.012912  0.065699  3.147626
4.333333  0.012486  0.066404  4.067476
4.388889  0.012031  0.067086  5.028497
4.444444  0.011543  0.067741  6.006628
4.500000  0.011019  0.068368  6.977478
4.555556  0.010453  0.068964  7.917049
4.611111  0.009837  0.069528  8.802765
4.666667  0.009162  0.070056  9.614730
4.722222  0.008414  0.070545  10.33718
4.777778  0.007570  0.070989  10.96009
4.833333  0.006593  0.071383  11.48094
4.888889  0.005414  0.071718  11.90658
4.944444  0.003850  0.071978  12.25527
5.000000  0.001000  0.072121  12.55876
END FTABLE 22
FTABLE     21
 91    4
   Depth      Area    Volume  Outflow1 Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
0.000000  0.000000  0.000000  0.000000
0.055556  0.028877  0.001072  0.011365
0.111111  0.040608  0.003022  0.016073
0.166667  0.049451  0.005532  0.019685
0.222222  0.056771  0.008488  0.022731
0.277778  0.063102  0.011822  0.025414
0.333333  0.068717  0.015486  0.027839
0.388889  0.073780  0.019447  0.030070
0.444444  0.078398  0.023676  0.032146
0.500000  0.082645  0.028151  0.034096
0.555556  0.086576  0.032853  0.035940
0.611111  0.090232  0.037765  0.037695
0.666667  0.093646  0.042874  0.039371
0.722222  0.096843  0.048167  0.040978
0.777778  0.099844  0.053631  0.042525
0.833333  0.102666  0.059257  0.044018
0.888889  0.105324  0.065035  0.045461
0.944444  0.107829  0.070957  0.046861
1.000000  0.110193  0.077014  0.048219
1.055556  0.112423  0.083198  0.049540
1.111111  0.114529  0.089503  0.050827
1.166667  0.116516  0.095921  0.052083
1.222222  0.118390  0.102447  0.053308
1.277778  0.120158  0.109074  0.054506
1.333333  0.121823  0.115796  0.055679
1.388889  0.123389  0.122608  0.056827
1.444444  0.124861  0.129504  0.057952
1.500000  0.126242  0.136480  0.059056
1.555556  0.127534  0.143529  0.060140
1.611111  0.128740  0.150648  0.061204
1.666667  0.129864  0.157832  0.062251
1.722222  0.130905  0.165076  0.063280
1.777778  0.131868  0.172376  0.064292
1.833333  0.132753  0.179727  0.065289
1.888889  0.133562  0.187125  0.066271
1.944444  0.134297  0.194566  0.067238
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2.000000  0.134958  0.202045  0.068192
2.055556  0.135547  0.209560  0.069133
2.111111  0.136064  0.217105  0.070061
2.166667  0.136511  0.224677  0.070977
2.222222  0.136888  0.232271  0.071881
2.277778  0.137196  0.239885  0.072774
2.333333  0.137435  0.247514  0.073656
2.388889  0.137605  0.255154  0.074528
2.444444  0.137707  0.262802  0.075389
2.500000  0.137741  0.270454  0.076241
2.555556  0.137707  0.278106  0.077084
2.611111  0.137605  0.285753  0.077917
2.666667  0.137435  0.293394  0.078741
2.722222  0.137196  0.301023  0.079557
2.777778  0.136888  0.308636  0.080365
2.833333  0.136511  0.316231  0.081165
2.888889  0.136064  0.323803  0.081957
2.944444  0.135547  0.331348  0.082741
3.000000  0.134958  0.338862  0.083518
3.055556  0.134297  0.346342  0.084288
3.111111  0.133562  0.353783  0.085050
3.166667  0.132753  0.361181  0.085807
3.222222  0.131868  0.368532  0.086556
3.277778  0.130905  0.375832  0.087299
3.333333  0.129864  0.383076  0.088036
3.388889  0.128740  0.390259  0.088766
3.444444  0.127534  0.397379  0.089491
3.500000  0.126242  0.404428  0.090210
3.555556  0.124861  0.411404  0.090923
3.611111  0.123389  0.418300  0.091630
3.666667  0.121823  0.425112  0.092333
3.722222  0.120158  0.431834  0.093029
3.777778  0.118390  0.438461  0.093721
3.833333  0.116516  0.444987  0.094408
3.888889  0.114529  0.451405  0.095089
3.944444  0.112423  0.457710  0.095766
4.000000  0.110193  0.463894  0.096438
4.055556  0.107829  0.469951  0.374902
4.111111  0.105324  0.475873  0.882537
4.166667  0.102666  0.481651  1.536919
4.222222  0.099844  0.487277  2.304342
4.277778  0.096843  0.492741  3.159659
4.333333  0.093646  0.498034  4.079587
4.388889  0.090232  0.503142  5.040685
4.444444  0.086576  0.508055  6.018893
4.500000  0.082645  0.512757  6.989820
4.555556  0.078398  0.517232  7.929467
4.611111  0.073780  0.521461  8.815258
4.666667  0.068717  0.525421  9.627298
4.722222  0.063102  0.529086  10.34982
4.777778  0.056771  0.532420  10.97281
4.833333  0.049451  0.535376  11.49373
4.888889  0.040608  0.537886  11.91945
4.944444  0.028877  0.539836  12.26821
5.000000  0.001000  0.540908  12.57177
END FTABLE 21
FTABLE     14
 76    4
   Depth      Area    Volume  Outflow1 Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
0.000000  0.006520  0.000000  0.000000
0.060440  0.006520  0.000154  0.000000
0.120879  0.006520  0.000307  0.000000
0.181319  0.006520  0.000461  0.000000
0.241758  0.006520  0.000615  0.000000
0.302198  0.006520  0.000768  0.000000
0.362637  0.006520  0.000922  0.000000
0.423077  0.006520  0.001076  0.000000
0.483516  0.006520  0.001229  0.000000
0.543956  0.006520  0.001383  0.000000
```

```
0.604396  0.006520  0.001537  0.000000
0.664835  0.006520  0.001690  0.000000
0.725275  0.006520  0.001844  0.000000
0.785714  0.006520  0.001998  0.000000
0.846154  0.006520  0.002152  0.000000
0.906593  0.006520  0.002305  0.000401
0.967033  0.006520  0.002459  0.000443
1.027473  0.006520  0.002613  0.000535
1.087912  0.006520  0.002766  0.000640
1.148352  0.006520  0.002920  0.000758
1.208791  0.006520  0.003074  0.000890
1.269231  0.006520  0.003227  0.001036
1.329670  0.006520  0.003381  0.001197
1.390110  0.006520  0.003535  0.001373
1.450549  0.006520  0.003688  0.001565
1.510989  0.006520  0.003842  0.001772
1.571429  0.006520  0.003996  0.001996
1.631868  0.006520  0.004149  0.002236
1.692308  0.006520  0.004303  0.002494
1.752747  0.006520  0.004457  0.002769
1.813187  0.006520  0.004610  0.003062
1.873626  0.006520  0.004764  0.003373
1.934066  0.006520  0.004918  0.003702
1.994505  0.006520  0.005071  0.004051
2.054945  0.006520  0.005225  0.004418
2.115385  0.006520  0.005379  0.004806
2.175824  0.006520  0.005532  0.005213
2.236264  0.006520  0.005686  0.005640
2.296703  0.006520  0.005840  0.006088
2.357143  0.006520  0.005994  0.006557
2.417582  0.006520  0.006147  0.007047
2.478022  0.006520  0.006301  0.007558
2.538462  0.006520  0.006455  0.008092
2.598901  0.006520  0.006608  0.008647
2.659341  0.006520  0.006762  0.009225
2.719780  0.006520  0.006916  0.009825
2.780220  0.006520  0.007069  0.010448
2.840659  0.006520  0.007223  0.011095
2.901099  0.006520  0.007377  0.011765
2.961538  0.006520  0.007530  0.012459
3.021978  0.006520  0.007694  0.013177
3.082418  0.006520  0.007857  0.013919
3.142857  0.006520  0.008021  0.014685
3.203297  0.006520  0.008184  0.015476
3.263736  0.006520  0.008348  0.016292
3.324176  0.006520  0.008511  0.016823
3.384615  0.006520  0.008675  0.016823
3.445055  0.006520  0.008839  0.016823
3.505495  0.006520  0.009002  0.016823
3.565934  0.006520  0.009166  0.016823
3.626374  0.006520  0.009329  0.016823
3.686813  0.006520  0.009493  0.016823
3.747253  0.006520  0.009656  0.016823
3.807692  0.006520  0.009820  0.016823
3.868132  0.006520  0.009983  0.016823
3.928571  0.006520  0.010147  0.016823
3.989011  0.006520  0.010310  0.016823
4.049451  0.006520  0.010474  0.016823
4.109890  0.006520  0.010637  0.016823
4.170330  0.006520  0.010801  0.016823
4.230769  0.006520  0.010964  0.016823
4.291209  0.006520  0.011128  0.016823
4.351648  0.006520  0.011292  0.016823
4.412088  0.006520  0.011455  0.016823
4.472527  0.006520  0.011619  0.016823
4.500000  0.006520  0.024555  0.016823
END FTABLE 14
FTABLE     13
 18    6
   Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
```

```
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.006520  0.000000  0.000000  0.000000  0.000000
  0.060440  0.006520  0.000394  0.000000  0.017162  0.000000
  0.120879  0.006520  0.000788  0.000000  0.017501  0.000000
  0.181319  0.006520  0.001182  0.000000  0.017840  0.000000
  0.241758  0.006520  0.001576  0.000000  0.018179  0.000000
  0.302198  0.006520  0.001970  0.000000  0.018518  0.000000
  0.362637  0.006520  0.002364  0.000000  0.018857  0.000000
  0.423077  0.006520  0.002758  0.000000  0.019196  0.000000
  0.483516  0.006520  0.003152  0.000000  0.019535  0.000000
  0.543956  0.006520  0.003546  0.065047  0.019874  0.000000
  0.604396  0.006520  0.003941  0.233496  0.020213  0.000000
  0.664835  0.006520  0.004335  0.435744  0.020552  0.000000
  0.725275  0.006520  0.004729  0.618960  0.020891  0.000000
  0.785714  0.006520  0.005123  0.742908  0.021230  0.000000
  0.846154  0.006520  0.005517  0.823591  0.021569  0.000000
  0.906593  0.006520  0.005911  0.892601  0.021907  0.000000
  0.967033  0.006520  0.006305  0.956645  0.022246  0.000000
  1.000000  0.006520  0.006520  1.016663  0.022431  0.000000
  END FTABLE 13
  FTABLE     16
   76    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.006451  0.000000  0.000000
  0.060440  0.006451  0.000152  0.000000
  0.120879  0.006451  0.000304  0.000000
  0.181319  0.006451  0.000456  0.000000
  0.241758  0.006451  0.000608  0.000000
  0.302198  0.006451  0.000760  0.000000
  0.362637  0.006451  0.000912  0.000000
  0.423077  0.006451  0.001064  0.000000
  0.483516  0.006451  0.001216  0.000000
  0.543956  0.006451  0.001369  0.000000
  0.604396  0.006451  0.001521  0.000000
  0.664835  0.006451  0.001673  0.000000
  0.725275  0.006451  0.001825  0.000000
  0.785714  0.006451  0.001977  0.000000
  0.846154  0.006451  0.002129  0.000000
  0.906593  0.006451  0.002281  0.000397
  0.967033  0.006451  0.002433  0.000438
  1.027473  0.006451  0.002585  0.000529
  1.087912  0.006451  0.002737  0.000633
  1.148352  0.006451  0.002889  0.000750
  1.208791  0.006451  0.003041  0.000881
  1.269231  0.006451  0.003193  0.001026
  1.329670  0.006451  0.003345  0.001185
  1.390110  0.006451  0.003497  0.001359
  1.450549  0.006451  0.003649  0.001548
  1.510989  0.006451  0.003801  0.001754
  1.571429  0.006451  0.003953  0.001975
  1.631868  0.006451  0.004106  0.002213
  1.692308  0.006451  0.004258  0.002468
  1.752747  0.006451  0.004410  0.002740
  1.813187  0.006451  0.004562  0.003029
  1.873626  0.006451  0.004714  0.003337
  1.934066  0.006451  0.004866  0.003663
  1.994505  0.006451  0.005018  0.004008
  2.054945  0.006451  0.005170  0.004372
  2.115385  0.006451  0.005322  0.004755
  2.175824  0.006451  0.005474  0.005158
  2.236264  0.006451  0.005626  0.005580
  2.296703  0.006451  0.005778  0.006024
  2.357143  0.006451  0.005930  0.006488
  2.417582  0.006451  0.006082  0.006972
  2.478022  0.006451  0.006234  0.007478
  2.538462  0.006451  0.006386  0.008006
  2.598901  0.006451  0.006538  0.008556
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  2.659341  0.006451  0.006690  0.009127
  2.719780  0.006451  0.006843  0.009721
  2.780220  0.006451  0.006995  0.010338
  2.840659  0.006451  0.007147  0.010978
  2.901099  0.006451  0.007299  0.011641
  2.961538  0.006451  0.007451  0.012327
  3.021978  0.006451  0.007613  0.013037
  3.082418  0.006451  0.007774  0.013772
  3.142857  0.006451  0.007936  0.014530
  3.203297  0.006451  0.008098  0.015313
  3.263736  0.006451  0.008260  0.016120
  3.324176  0.006451  0.008422  0.016646
  3.384615  0.006451  0.008583  0.016646
  3.445055  0.006451  0.008745  0.016646
  3.505495  0.006451  0.008907  0.016646
  3.565934  0.006451  0.009069  0.016646
  3.626374  0.006451  0.009231  0.016646
  3.686813  0.006451  0.009392  0.016646
  3.747253  0.006451  0.009554  0.016646
  3.807692  0.006451  0.009716  0.016646
  3.868132  0.006451  0.009878  0.016646
  3.928571  0.006451  0.010040  0.016646
  3.989011  0.006451  0.010201  0.016646
  4.049451  0.006451  0.010363  0.016646
  4.109890  0.006451  0.010525  0.016646
  4.170330  0.006451  0.010687  0.016646
  4.230769  0.006451  0.010849  0.016646
  4.291209  0.006451  0.011010  0.016646
  4.351648  0.006451  0.011172  0.016646
  4.412088  0.006451  0.011334  0.016646
  4.472527  0.006451  0.011496  0.016646
  4.500000  0.006451  0.024296  0.016646
  END FTABLE 16
  FTABLE     15
   18    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.006451  0.000000  0.000000  0.000000  0.000000
  0.060440  0.006451  0.000390  0.000000  0.016981  0.000000
  0.120879  0.006451  0.000780  0.000000  0.017316  0.000000
  0.181319  0.006451  0.001170  0.000000  0.017652  0.000000
  0.241758  0.006451  0.001560  0.000000  0.017987  0.000000
  0.302198  0.006451  0.001949  0.000000  0.018322  0.000000
  0.362637  0.006451  0.002339  0.000000  0.018658  0.000000
  0.423077  0.006451  0.002729  0.000000  0.018993  0.000000
  0.483516  0.006451  0.003119  0.000000  0.019329  0.000000
  0.543956  0.006451  0.003509  0.065047  0.019664  0.000000
  0.604396  0.006451  0.003899  0.233496  0.019999  0.000000
  0.664835  0.006451  0.004289  0.435744  0.020335  0.000000
  0.725275  0.006451  0.004679  0.618960  0.020670  0.000000
  0.785714  0.006451  0.005069  0.742908  0.021005  0.000000
  0.846154  0.006451  0.005458  0.823591  0.021341  0.000000
  0.906593  0.006451  0.005848  0.892601  0.021676  0.000000
  0.967033  0.006451  0.006238  0.956645  0.022011  0.000000
  1.000000  0.006451  0.006451  1.016663  0.022194  0.000000
  END FTABLE 15
  FTABLE     18
   76    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.012443  0.000000  0.000000
  0.060440  0.012443  0.000293  0.000000
  0.120879  0.012443  0.000587  0.000000
  0.181319  0.012443  0.000880  0.000000
  0.241758  0.012443  0.001173  0.000000
  0.302198  0.012443  0.001466  0.000000
  0.362637  0.012443  0.001760  0.000000
  0.423077  0.012443  0.002053  0.000000
```

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0.483516  0.012443  0.002346  0.000000
0.543956  0.012443  0.002640  0.000000
0.604396  0.012443  0.002933  0.000000
0.664835  0.012443  0.003226  0.000000
0.725275  0.012443  0.003519  0.000000
0.785714  0.012443  0.003813  0.000000
0.846154  0.012443  0.004106  0.000000
0.906593  0.012443  0.004399  0.000766
0.967033  0.012443  0.004693  0.000845
1.027473  0.012443  0.004986  0.001021
1.087912  0.012443  0.005279  0.001221
1.148352  0.012443  0.005573  0.001447
1.208791  0.012443  0.005866  0.001699
1.269231  0.012443  0.006159  0.001978
1.329670  0.012443  0.006452  0.002285
1.390110  0.012443  0.006746  0.002621
1.450549  0.012443  0.007039  0.002986
1.510989  0.012443  0.007332  0.003382
1.571429  0.012443  0.007626  0.003809
1.631868  0.012443  0.007919  0.004268
1.692308  0.012443  0.008212  0.004759
1.752747  0.012443  0.008505  0.005284
1.813187  0.012443  0.008799  0.005843
1.873626  0.012443  0.009092  0.006436
1.934066  0.012443  0.009385  0.007065
1.994505  0.012443  0.009679  0.007730
2.054945  0.012443  0.009972  0.008432
2.115385  0.012443  0.010265  0.009171
2.175824  0.012443  0.010558  0.009948
2.236264  0.012443  0.010852  0.010764
2.296703  0.012443  0.011145  0.011619
2.357143  0.012443  0.011438  0.012513
2.417582  0.012443  0.011732  0.013449
2.478022  0.012443  0.012025  0.014425
2.538462  0.012443  0.012318  0.015442
2.598901  0.012443  0.012611  0.016502
2.659341  0.012443  0.012905  0.017605
2.719780  0.012443  0.013198  0.018751
2.780220  0.012443  0.013491  0.019940
2.840659  0.012443  0.013785  0.021174
2.901099  0.012443  0.014078  0.022453
2.961538  0.012443  0.014371  0.023777
3.021978  0.012443  0.014683  0.025147
3.082418  0.012443  0.014995  0.026563
3.142857  0.012443  0.015307  0.027779
3.203297  0.012443  0.015620  0.029536
3.263736  0.012443  0.015932  0.030309
3.324176  0.012443  0.016244  0.031889
3.384615  0.012443  0.016556  0.032107
3.445055  0.012443  0.016868  0.032107
3.505495  0.012443  0.017180  0.032107
3.565934  0.012443  0.017492  0.032107
3.626374  0.012443  0.017804  0.032107
3.686813  0.012443  0.018116  0.032107
3.747253  0.012443  0.018428  0.032107
3.807692  0.012443  0.018740  0.032107
3.868132  0.012443  0.019053  0.032107
3.928571  0.012443  0.019365  0.032107
3.989011  0.012443  0.019677  0.032107
4.049451  0.012443  0.019989  0.032107
4.109890  0.012443  0.020301  0.032107
4.170330  0.012443  0.020613  0.032107
4.230769  0.012443  0.020925  0.032107
4.291209  0.012443  0.021237  0.032107
4.351648  0.012443  0.021549  0.032107
4.412088  0.012443  0.021861  0.032107
4.472527  0.012443  0.022173  0.032107
4.500000  0.012443  0.046862  0.032107
END FTABLE 18
FTABLE     17
```

```
   18    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.012443  0.000000  0.000000  0.000000  0.000000
  0.060440  0.012443  0.000752  0.000000  0.032754  0.000000
  0.120879  0.012443  0.001504  0.000000  0.033400  0.000000
  0.181319  0.012443  0.002256  0.000000  0.034047  0.000000
  0.241758  0.012443  0.003008  0.000000  0.034694  0.000000
  0.302198  0.012443  0.003760  0.000000  0.035341  0.000000
  0.362637  0.012443  0.004512  0.000000  0.035988  0.000000
  0.423077  0.012443  0.005264  0.000000  0.036635  0.000000
  0.483516  0.012443  0.006016  0.000000  0.037281  0.000000
  0.543956  0.012443  0.006768  0.065047  0.037928  0.000000
  0.604396  0.012443  0.007520  0.233496  0.038575  0.000000
  0.664835  0.012443  0.008272  0.435744  0.039222  0.000000
  0.725275  0.012443  0.009024  0.618960  0.039869  0.000000
  0.785714  0.012443  0.009776  0.742908  0.040516  0.000000
  0.846154  0.012443  0.010528  0.823591  0.041162  0.000000
  0.906593  0.012443  0.011280  0.892601  0.041809  0.000000
  0.967033  0.012443  0.012032  0.956645  0.042456  0.000000
  1.000000  0.012443  0.012443  1.016663  0.042809  0.000000
  END FTABLE 17
  FTABLE     19
   36    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.000535  0.000000  0.000000  0.000000
  0.100000  0.000535  0.000067  0.000000  0.004162
  0.200000  0.000535  0.000202  0.000000  0.008324
  0.300000  0.000535  0.000404  0.000000  0.012486
  0.400000  0.000535  0.000673  0.000000  0.016648
  0.500000  0.000535  0.001010  0.000000  0.020810
  0.600000  0.000535  0.001414  0.000000  0.024971
  0.700000  0.000535  0.001885  0.000000  0.029133
  0.800000  0.000535  0.002424  0.000000  0.033295
  0.900000  0.000535  0.003030  0.000000  0.037457
  1.000000  0.000535  0.003703  0.000000  0.041619
  1.100000  0.000535  0.004444  0.000000  0.045781
  1.200000  0.000535  0.005252  0.000000  0.049943
  1.300000  0.000535  0.006128  0.000000  0.054105
  1.400000  0.000535  0.007070  0.000000  0.058267
  1.500000  0.000535  0.008080  0.000000  0.062429
  1.600000  0.000535  0.009158  0.000000  0.066590
  1.700000  0.000535  0.010303  0.000000  0.070752
  1.800000  0.000535  0.011515  0.000000  0.074914
  1.900000  0.000535  0.012794  0.000000  0.079076
  2.000000  0.000535  0.014141  0.000000  0.083238
  2.100000  0.000535  0.015555  0.000000  0.087400
  2.200000  0.000535  0.017036  0.000000  0.091562
  2.300000  0.000535  0.018585  0.000000  0.095724
  2.400000  0.000535  0.020201  0.000000  0.099886
  2.500000  0.000535  0.021884  0.000000  0.104048
  2.600000  0.000535  0.023635  0.000000  0.108210
  2.700000  0.000535  0.025453  0.000000  0.112371
  2.800000  0.000535  0.027339  0.000000  0.116533
  2.900000  0.000535  0.029292  0.000000  0.120695
  3.000000  0.000535  0.031312  0.000000  0.124857
  3.100000  0.000535  0.033399  0.000000  0.129019
  3.200000  0.000535  0.035554  0.000000  0.133181
  3.300000  0.000535  0.037776  0.000000  0.137343
  3.400000  0.000535  0.040065  0.000000  0.141505
  4.400000  0.000535  0.042422  6.000000  0.141505
  END FTABLE 19
  FTABLE     20
   36    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.001837  0.000000  0.000000  0.000000
```

```
  0.100000  0.001837  0.000218  0.000000  0.016354
  0.200000  0.001837  0.000653  0.000000  0.032707
  0.300000  0.001837  0.001305  0.000000  0.049061
  0.400000  0.001837  0.002175  0.000000  0.065414
  0.500000  0.001837  0.003263  0.000000  0.081768
  0.600000  0.001837  0.004568  0.000000  0.098121
  0.700000  0.001837  0.006091  0.000000  0.114475
  0.800000  0.001837  0.007831  0.000000  0.130828
  0.900000  0.001837  0.009789  0.000000  0.147182
  1.000000  0.001837  0.011965  0.000000  0.163535
  1.100000  0.001837  0.014358  0.000000  0.179889
  1.200000  0.001837  0.016968  0.000000  0.196242
  1.300000  0.001837  0.019796  0.000000  0.212596
  1.400000  0.001837  0.022842  0.000000  0.228949
  1.500000  0.001837  0.026105  0.000000  0.245303
  1.600000  0.001837  0.029586  0.000000  0.261656
  1.700000  0.001837  0.033284  0.000000  0.278010
  1.800000  0.001837  0.037200  0.000000  0.294363
  1.900000  0.001837  0.041333  0.000000  0.310717
  2.000000  0.001837  0.045684  0.000000  0.327070
  2.100000  0.001837  0.050252  0.000000  0.343424
  2.200000  0.001837  0.055038  0.000000  0.359777
  2.300000  0.001837  0.060041  0.000000  0.376131
  2.400000  0.001837  0.065262  0.000000  0.392484
  2.500000  0.001837  0.070701  0.000000  0.408838
  2.600000  0.001837  0.076357  0.000000  0.425192
  2.700000  0.001837  0.082231  0.000000  0.441545
  2.800000  0.001837  0.088322  0.000000  0.457899
  2.900000  0.001837  0.094630  0.000000  0.474252
  3.000000  0.001837  0.101157  0.000000  0.490606
  3.100000  0.001837  0.107900  0.000000  0.506959
  3.200000  0.001837  0.114862  0.000000  0.523313
  3.300000  0.001837  0.122041  0.000000  0.539666
  3.400000  0.001837  0.129437  0.000000  0.556020
  4.400000  0.001837  0.137051  6.000000  0.556020
  END FTABLE 20
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP
WDM     22 IRRG     ENGL    0.7       SAME PERLND  45     EXTNL  SURLI
WDM      2 PREC     ENGL    1              RCHRES   1     EXTNL  PREC
WDM      2 PREC     ENGL    1              RCHRES   3     EXTNL  PREC
WDM      2 PREC     ENGL    1              RCHRES   5     EXTNL  PREC
WDM      2 PREC     ENGL    1              RCHRES   7     EXTNL  PREC
WDM      2 PREC     ENGL    1              RCHRES   9     EXTNL  PREC
WDM      2 PREC     ENGL    1              RCHRES  11     EXTNL  PREC
WDM      2 PREC     ENGL    1              RCHRES  13     EXTNL  PREC
WDM      2 PREC     ENGL    1              RCHRES  15     EXTNL  PREC
WDM      2 PREC     ENGL    1              RCHRES  17     EXTNL  PREC
WDM      2 PREC     ENGL    1              RCHRES  20     EXTNL  PREC
WDM      1 EVAP     ENGL    0.5            RCHRES   1     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   2     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES   3     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   4     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES   5     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   6     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES   7     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   8     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES   9     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES  10     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES  11     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES  12     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES  13     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES  14     EXTNL  POTEV
```

```
WDM      1 EVAP     ENGL    0.5             RCHRES  15     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7             RCHRES  16     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5             RCHRES  17     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7             RCHRES  18     EXTNL  POTEV
WDM      1 EVAP     ENGL    1               RCHRES  19     EXTNL  POTEV
WDM      1 EVAP     ENGL    1               RCHRES  20     EXTNL  POTEV

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES  12 HYDR   RO     1 1        1      WDM   1020 FLOW     ENGL       REPL
RCHRES  12 HYDR   STAGE  1 1        1      WDM   1023 STAG     ENGL       REPL
RCHRES  11 HYDR   STAGE  1 1        1      WDM   1024 STAG     ENGL       REPL
RCHRES  11 HYDR   O      1 1        1      WDM   1025 FLOW     ENGL       REPL
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL       REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL       REPL
COPY     2 OUTPUT MEAN   1 1     48.4      WDM    702 FLOW     ENGL       REPL
COPY   502 OUTPUT MEAN   1 1     48.4      WDM    802 FLOW     ENGL       REPL
COPY     3 OUTPUT MEAN   1 1     48.4      WDM    703 FLOW     ENGL       REPL
COPY   503 OUTPUT MEAN   1 1     48.4      WDM    803 FLOW     ENGL       REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>           <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK        7
RCHRES     OFLOW  OVOL   1                 RCHRES         INFLOW IVOL
  END MASS-LINK    7

  MASS-LINK        8
RCHRES     OFLOW  OVOL   2                 RCHRES         INFLOW IVOL
  END MASS-LINK    8

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17

  MASS-LINK       18
RCHRES     OFLOW  OVOL   2                 COPY           INPUT  MEAN
  END MASS-LINK   18
```

```
END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

```
ERROR/WARNING ID:   341   6

DATE/TIME: 1980/ 2/14  7:45

RCHRES:     1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB().  To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows.  This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS         V1         V2        VOL
18 9.6751E+02 1000.5     1151.7
```

```
ERROR/WARNING ID:   341   5

DATE/TIME: 1980/ 2/14  7:45

RCHRES:     1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated.  If extrapolation was small, no problem.
Remedy; extend ftable.  Relevant data are:

A          B          C      RDEP1      RDEP2  COUNT
0.0000E+00 2001.0     -1.117E+04    5.5846     5.5846       2
```

```
ERROR/WARNING ID:   341   6

DATE/TIME: 1980/ 2/14  7:45

RCHRES:     3

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB().  To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows.  This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS         V1         V2        VOL
18  415.82     429.98     457.18
```

```
ERROR/WARNING ID:   341   5

DATE/TIME: 1980/ 2/14  7:45

RCHRES:     3

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated.  If extrapolation was small, no problem.
Remedy; extend ftable.  Relevant data are:

A          B          C      RDEP1      RDEP2  COUNT
0.0000E+00  859.96    -2.512E+03    2.9213  2.9213E+00      2
```

```
ERROR/WARNING ID:   341   6

DATE/TIME: 1980/ 2/14  7:45

RCHRES:    15
```

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS	V1	V2	VOL
18	2.7173E+02	281.01	287.86

ERROR/WARNING ID: 341 5

DATE/TIME: 1980/ 2/14 7:45

RCHRES: 15

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated. If extrapolation was small, no problem.
Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
0.0000E+00	562.01	-977.39	1.7391	1.7391E+00	2

ERROR/WARNING ID: 341 6

DATE/TIME: 1980/ 2/14 7:45

RCHRES: 17

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS	V1	V2	VOL
18	5.2411E+02	542.02	588.76

ERROR/WARNING ID: 341 5

DATE/TIME: 1980/ 2/14 7:45

RCHRES: 17

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated. If extrapolation was small, no problem.
Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
0.0000E+00	1084.0	-3.914E+03	3.6108	3.6108E+00	2

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SMRHM

PROJECT REPORT

General Model Information

Project Name:	2019-02-27 Tank8,10 DMA PD-C1-8,10A,10B POC-C
Site Name:	Costco Murrieta
Site Address:	215 & Clinton Keith Rd
City:	Murrieta
Report Date:	2/27/2019
Gage:	Wildomar / North Murrieta
Data Start:	1949/10/01
Data End:	2011/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2018/01/19

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year

Landuse Basin Data
Predeveloped Land Use

EX-C1-8

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Shrub,Mod(5-10%)	1.122
C D,Shrub,St(10-20%)	1.042
C D,Shrub,Very(>20%)	0.508
Pervious Total	2.672

Impervious Land Use	acre
Impervious Total	0
Basin Total	2.672

Element Flows To:

Surface	Interflow	Groundwater

EX-C1-10

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Shrub,Mod(5-10%)	0.383
C D,Shrub,St(10-20%)	0.356
C D,Shrub,Very(>20%)	0.173
Pervious Total	0.912

Impervious Land Use	acre
Impervious Total	0
Basin Total	0.912

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

PD-C1-8

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	0.401
Pervious Total	0.401

Impervious Land Use	acre
Parking,Flat(0-5%)	2.271
Impervious Total	2.271
Basin Total	2.672

Element Flows To:

Surface	Interflow	Groundwater
Surface BMP-8	Surface BMP-8	

PD-C1-10A

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	0.059
Pervious Total	0.059

Impervious Land Use	acre
Parking,Flat(0-5%)	0.528
Impervious Total	0.528
Basin Total	0.587

Element Flows To:

Surface	Interflow	Groundwater
Surface BMP-10A	Surface BMP-10A	

PD-C1-10B

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	0.016
Pervious Total	0.016

Impervious Land Use	acre
Parking,Flat(0-5%)	0.309
Impervious Total	0.309
Basin Total	0.325

Element Flows To:

Surface	Interflow	Groundwater
Surface BMP-10B	Surface BMP-10B	

Routing Elements
Predeveloped Routing

Mitigated Routing

BMP-8

Bottom Length:	90.00 ft.
Bottom Width:	10.00 ft.
Material thickness of first layer:	3
Material type for first layer:	Amended 3.0 in/hr
Material thickness of second layer:	1.5
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	6
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	98.819
Total Outflow (ac-ft.):	117.282
Percent Through Underdrain:	84.26
Discharge Structure	
Riser Height:	1.25 ft.
Riser Diameter:	18 in.
Element Flows To:	
Outlet 1	Outlet 2
HMP-Tank 8,10	

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.1331	0.0000	0.0000	0.0000
0.0659	0.1325	0.0006	0.0000	0.0000
0.1319	0.1305	0.0012	0.0000	0.0000
0.1978	0.1284	0.0018	0.0000	0.0000
0.2637	0.1264	0.0025	0.0000	0.0000
0.3297	0.1243	0.0032	0.0000	0.0000
0.3956	0.1223	0.0039	0.0000	0.0000
0.4615	0.1203	0.0047	0.0000	0.0000
0.5275	0.1183	0.0055	0.0000	0.0000
0.5934	0.1163	0.0063	0.0000	0.0000
0.6593	0.1143	0.0072	0.0000	0.0000
0.7253	0.1124	0.0081	0.0000	0.0000
0.7912	0.1104	0.0090	0.0000	0.0000
0.8571	0.1085	0.0100	0.0000	0.0000
0.9231	0.1066	0.0110	0.0014	0.0000
0.9890	0.1047	0.0121	0.0015	0.0000
1.0549	0.1028	0.0132	0.0019	0.0000
1.1209	0.1009	0.0143	0.0024	0.0000
1.1868	0.0990	0.0155	0.0028	0.0000
1.2527	0.0972	0.0167	0.0034	0.0000
1.3187	0.0953	0.0180	0.0040	0.0000
1.3846	0.0935	0.0192	0.0047	0.0000
1.4505	0.0917	0.0206	0.0054	0.0000
1.5165	0.0899	0.0219	0.0063	0.0000
1.5824	0.0881	0.0233	0.0071	0.0000
1.6484	0.0863	0.0248	0.0081	0.0000
1.7143	0.0845	0.0263	0.0091	0.0000
1.7802	0.0828	0.0278	0.0103	0.0000
1.8462	0.0810	0.0294	0.0115	0.0000

1.9121	0.0793	0.0310	0.0127	0.0000
1.9780	0.0776	0.0326	0.0141	0.0000
2.0440	0.0759	0.0343	0.0155	0.0000
2.1099	0.0742	0.0361	0.0170	0.0000
2.1758	0.0725	0.0379	0.0187	0.0000
2.2418	0.0709	0.0397	0.0204	0.0000
2.3077	0.0692	0.0416	0.0221	0.0000
2.3736	0.0676	0.0435	0.0240	0.0000
2.4396	0.0660	0.0454	0.0260	0.0000
2.5055	0.0643	0.0474	0.0281	0.0000
2.5714	0.0627	0.0495	0.0302	0.0000
2.6374	0.0611	0.0516	0.0325	0.0000
2.7033	0.0596	0.0537	0.0349	0.0000
2.7692	0.0580	0.0559	0.0373	0.0000
2.8352	0.0565	0.0581	0.0399	0.0000
2.9011	0.0549	0.0604	0.0426	0.0000
2.9670	0.0534	0.0627	0.0453	0.0000
3.0330	0.0519	0.0652	0.0482	0.0000
3.0989	0.0504	0.0677	0.0512	0.0000
3.1648	0.0489	0.0702	0.0543	0.0000
3.2308	0.0474	0.0728	0.0575	0.0000
3.2967	0.0460	0.0754	0.0608	0.0000
3.3626	0.0445	0.0781	0.0625	0.0000
3.4286	0.0431	0.0808	0.0625	0.0000
3.4945	0.0417	0.0836	0.0625	0.0000
3.5604	0.0403	0.0865	0.0625	0.0000
3.6264	0.0389	0.0894	0.0625	0.0000
3.6923	0.0375	0.0923	0.0625	0.0000
3.7582	0.0361	0.0953	0.0625	0.0000
3.8242	0.0348	0.0983	0.0625	0.0000
3.8901	0.0334	0.1014	0.0625	0.0000
3.9560	0.0321	0.1046	0.0625	0.0000
4.0220	0.0308	0.1078	0.0625	0.0000
4.0879	0.0295	0.1111	0.0625	0.0000
4.1538	0.0282	0.1144	0.0625	0.0000
4.2198	0.0269	0.1178	0.0625	0.0000
4.2857	0.0256	0.1212	0.0625	0.0000
4.3516	0.0244	0.1247	0.0625	0.0000
4.4176	0.0231	0.1282	0.0625	0.0000
4.4835	0.0219	0.1318	0.0625	0.0000
4.5000	0.0207	0.1327	0.0625	0.0000

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.5000	0.1331	0.1327	0.0000	0.0639	0.0000
4.5659	0.1351	0.1416	0.0000	0.0639	0.0000
4.6319	0.1372	0.1505	0.0000	0.0652	0.0000
4.6978	0.1394	0.1597	0.0000	0.0666	0.0000
4.7637	0.1415	0.1689	0.0000	0.0680	0.0000
4.8297	0.1436	0.1783	0.0000	0.0694	0.0000
4.8956	0.1458	0.1879	0.0000	0.0707	0.0000
4.9615	0.1480	0.1976	0.0000	0.0721	0.0000
5.0275	0.1501	0.2074	0.0000	0.0735	0.0000
5.0934	0.1523	0.2173	0.0000	0.0749	0.0000
5.1593	0.1545	0.2275	0.0000	0.0762	0.0000
5.2253	0.1567	0.2377	0.0000	0.0776	0.0000
5.2912	0.1590	0.2481	0.0000	0.0790	0.0000
5.3571	0.1612	0.2587	0.0000	0.0804	0.0000

5.4231	0.1635	0.2694	0.0000	0.0817	0.0000
5.4890	0.1657	0.2802	0.0000	0.0831	0.0000
5.5549	0.1680	0.2912	0.0000	0.0845	0.0000
5.6209	0.1703	0.3024	0.0000	0.0859	0.0000
5.6868	0.1726	0.3137	0.0000	0.0872	0.0000
5.7527	0.1749	0.3252	0.0023	0.0886	0.0000
5.8187	0.1773	0.3368	0.2862	0.0900	0.0000
5.8846	0.1796	0.3485	0.7825	0.0913	0.0000
5.9505	0.1820	0.3605	1.4101	0.0927	0.0000
6.0000	0.1837	0.3695	2.1218	0.0938	0.0000

Surface BMP-8

Element Flows To:

Outlet 1	Outlet 2
HMP-Tank 8,10	BMP-8

BMP-10A

Bottom Length:	71.00 ft.
Bottom Width:	10.00 ft.
Material thickness of first layer:	3
Material type for first layer:	Amended 2.5 in/hr
Material thickness of second layer:	1.5
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	6
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	20.742
Total Outflow (ac-ft.):	26.064
Percent Through Underdrain:	79.58
Discharge Structure	
Riser Height:	0.5 ft.
Riser Diameter:	18 in.
Element Flows To:	
Outlet 1	Outlet 2
HMP-Tank 8,10	

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0163	0.0000	0.0000	0.0000
0.0604	0.0163	0.0004	0.0000	0.0000
0.1209	0.0163	0.0008	0.0000	0.0000
0.1813	0.0163	0.0012	0.0000	0.0000
0.2418	0.0163	0.0015	0.0000	0.0000
0.3022	0.0163	0.0019	0.0000	0.0000
0.3626	0.0163	0.0023	0.0000	0.0000
0.4231	0.0163	0.0027	0.0000	0.0000
0.4835	0.0163	0.0031	0.0000	0.0000
0.5440	0.0163	0.0035	0.0000	0.0000
0.6044	0.0163	0.0038	0.0000	0.0000
0.6648	0.0163	0.0042	0.0000	0.0000
0.7253	0.0163	0.0046	0.0000	0.0000
0.7857	0.0163	0.0050	0.0000	0.0000
0.8462	0.0163	0.0054	0.0000	0.0000
0.9066	0.0163	0.0058	0.0010	0.0000
0.9670	0.0163	0.0061	0.0011	0.0000
1.0275	0.0163	0.0065	0.0013	0.0000
1.0879	0.0163	0.0069	0.0016	0.0000
1.1484	0.0163	0.0073	0.0019	0.0000
1.2088	0.0163	0.0077	0.0022	0.0000
1.2692	0.0163	0.0081	0.0026	0.0000
1.3297	0.0163	0.0085	0.0030	0.0000
1.3901	0.0163	0.0088	0.0034	0.0000
1.4505	0.0163	0.0092	0.0039	0.0000
1.5110	0.0163	0.0096	0.0044	0.0000
1.5714	0.0163	0.0100	0.0050	0.0000
1.6319	0.0163	0.0104	0.0056	0.0000
1.6923	0.0163	0.0108	0.0062	0.0000
1.7527	0.0163	0.0111	0.0069	0.0000
1.8132	0.0163	0.0115	0.0077	0.0000

1.8736	0.0163	0.0119	0.0084	0.0000
1.9341	0.0163	0.0123	0.0093	0.0000
1.9945	0.0163	0.0127	0.0101	0.0000
2.0549	0.0163	0.0131	0.0110	0.0000
2.1154	0.0163	0.0134	0.0120	0.0000
2.1758	0.0163	0.0138	0.0130	0.0000
2.2363	0.0163	0.0142	0.0141	0.0000
2.2967	0.0163	0.0146	0.0152	0.0000
2.3571	0.0163	0.0150	0.0164	0.0000
2.4176	0.0163	0.0154	0.0176	0.0000
2.4780	0.0163	0.0158	0.0189	0.0000
2.5385	0.0163	0.0161	0.0202	0.0000
2.5989	0.0163	0.0165	0.0216	0.0000
2.6593	0.0163	0.0169	0.0231	0.0000
2.7198	0.0163	0.0173	0.0246	0.0000
2.7802	0.0163	0.0177	0.0261	0.0000
2.8407	0.0163	0.0181	0.0277	0.0000
2.9011	0.0163	0.0184	0.0294	0.0000
2.9615	0.0163	0.0188	0.0311	0.0000
3.0220	0.0163	0.0192	0.0329	0.0000
3.0824	0.0163	0.0196	0.0348	0.0000
3.1429	0.0163	0.0201	0.0367	0.0000
3.2033	0.0163	0.0205	0.0387	0.0000
3.2637	0.0163	0.0209	0.0407	0.0000
3.3242	0.0163	0.0213	0.0421	0.0000
3.3846	0.0163	0.0217	0.0421	0.0000
3.4451	0.0163	0.0221	0.0421	0.0000
3.5055	0.0163	0.0225	0.0421	0.0000
3.5659	0.0163	0.0229	0.0421	0.0000
3.6264	0.0163	0.0233	0.0421	0.0000
3.6868	0.0163	0.0237	0.0421	0.0000
3.7473	0.0163	0.0241	0.0421	0.0000
3.8077	0.0163	0.0245	0.0421	0.0000
3.8681	0.0163	0.0250	0.0421	0.0000
3.9286	0.0163	0.0254	0.0421	0.0000
3.9890	0.0163	0.0258	0.0421	0.0000
4.0495	0.0163	0.0262	0.0421	0.0000
4.1099	0.0163	0.0266	0.0421	0.0000
4.1703	0.0163	0.0270	0.0421	0.0000
4.2308	0.0163	0.0274	0.0421	0.0000
4.2912	0.0163	0.0278	0.0421	0.0000
4.3516	0.0163	0.0282	0.0421	0.0000
4.4121	0.0163	0.0286	0.0421	0.0000
4.4725	0.0163	0.0290	0.0421	0.0000
4.5000	0.0163	0.0292	0.0421	0.0000

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.5000	0.0163	0.0292	0.0000	0.0429	0.0000
4.5604	0.0163	0.0302	0.0000	0.0429	0.0000
4.6209	0.0163	0.0312	0.0000	0.0438	0.0000
4.6813	0.0163	0.0322	0.0000	0.0446	0.0000
4.7418	0.0163	0.0332	0.0000	0.0454	0.0000
4.8022	0.0163	0.0342	0.0000	0.0463	0.0000
4.8626	0.0163	0.0351	0.0000	0.0471	0.0000
4.9231	0.0163	0.0361	0.0000	0.0480	0.0000
4.9835	0.0163	0.0371	0.0000	0.0488	0.0000
5.0440	0.0163	0.0381	0.1466	0.0497	0.0000

5.1044	0.0163	0.0391	0.5355	0.0505	0.0000
5.1648	0.0163	0.0401	1.0569	0.0514	0.0000
5.2253	0.0163	0.0411	1.6695	0.0522	0.0000
5.2857	0.0163	0.0420	2.3387	0.0531	0.0000
5.3462	0.0163	0.0430	3.0289	0.0539	0.0000
5.4066	0.0163	0.0440	3.7040	0.0548	0.0000
5.4670	0.0163	0.0450	4.3296	0.0556	0.0000
5.5000	0.0163	0.0455	4.8762	0.0561	0.0000

Surface BMP-10A

Element Flows To:

Outlet 1	Outlet 2
HMP-Tank 8,10	BMP-10A

BMP-10B

Bottom Length:	76.40 ft.
Bottom Width:	5.00 ft.
Material thickness of first layer:	3
Material type for first layer:	Amended 2.5 in/hr
Material thickness of second layer:	1.5
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	6
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	11.596
Total Outflow (ac-ft.):	15.072
Percent Through Underdrain:	76.94
Discharge Structure	
Riser Height:	0.5 ft.
Riser Diameter:	18 in.
Element Flows To:	
Outlet 1	Outlet 2
HMP-Tank 8,10	

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0088	0.0000	0.0000	0.0000
0.0604	0.0088	0.0002	0.0000	0.0000
0.1209	0.0088	0.0004	0.0000	0.0000
0.1813	0.0088	0.0006	0.0000	0.0000
0.2418	0.0088	0.0008	0.0000	0.0000
0.3022	0.0088	0.0010	0.0000	0.0000
0.3626	0.0088	0.0012	0.0000	0.0000
0.4231	0.0088	0.0014	0.0000	0.0000
0.4835	0.0088	0.0017	0.0000	0.0000
0.5440	0.0088	0.0019	0.0000	0.0000
0.6044	0.0088	0.0021	0.0000	0.0000
0.6648	0.0088	0.0023	0.0000	0.0000
0.7253	0.0088	0.0025	0.0000	0.0000
0.7857	0.0088	0.0027	0.0000	0.0000
0.8462	0.0088	0.0029	0.0000	0.0000
0.9066	0.0088	0.0031	0.0005	0.0000
0.9670	0.0088	0.0033	0.0006	0.0000
1.0275	0.0088	0.0035	0.0007	0.0000
1.0879	0.0088	0.0037	0.0009	0.0000
1.1484	0.0088	0.0039	0.0010	0.0000
1.2088	0.0088	0.0041	0.0012	0.0000
1.2692	0.0088	0.0043	0.0014	0.0000
1.3297	0.0088	0.0045	0.0016	0.0000
1.3901	0.0088	0.0048	0.0018	0.0000
1.4505	0.0088	0.0050	0.0021	0.0000
1.5110	0.0088	0.0052	0.0024	0.0000
1.5714	0.0088	0.0054	0.0027	0.0000
1.6319	0.0088	0.0056	0.0030	0.0000
1.6923	0.0088	0.0058	0.0034	0.0000
1.7527	0.0088	0.0060	0.0037	0.0000
1.8132	0.0088	0.0062	0.0041	0.0000

1.8736	0.0088	0.0064	0.0045	0.0000
1.9341	0.0088	0.0066	0.0050	0.0000
1.9945	0.0088	0.0068	0.0054	0.0000
2.0549	0.0088	0.0070	0.0059	0.0000
2.1154	0.0088	0.0072	0.0065	0.0000
2.1758	0.0088	0.0074	0.0070	0.0000
2.2363	0.0088	0.0076	0.0076	0.0000
2.2967	0.0088	0.0079	0.0082	0.0000
2.3571	0.0088	0.0081	0.0088	0.0000
2.4176	0.0088	0.0083	0.0095	0.0000
2.4780	0.0088	0.0085	0.0102	0.0000
2.5385	0.0088	0.0087	0.0109	0.0000
2.5989	0.0088	0.0089	0.0116	0.0000
2.6593	0.0088	0.0091	0.0124	0.0000
2.7198	0.0088	0.0093	0.0132	0.0000
2.7802	0.0088	0.0095	0.0141	0.0000
2.8407	0.0088	0.0097	0.0149	0.0000
2.9011	0.0088	0.0099	0.0158	0.0000
2.9615	0.0088	0.0101	0.0168	0.0000
3.0220	0.0088	0.0103	0.0177	0.0000
3.0824	0.0088	0.0106	0.0187	0.0000
3.1429	0.0088	0.0108	0.0198	0.0000
3.2033	0.0088	0.0110	0.0208	0.0000
3.2637	0.0088	0.0112	0.0219	0.0000
3.3242	0.0088	0.0114	0.0226	0.0000
3.3846	0.0088	0.0117	0.0226	0.0000
3.4451	0.0088	0.0119	0.0226	0.0000
3.5055	0.0088	0.0121	0.0226	0.0000
3.5659	0.0088	0.0123	0.0226	0.0000
3.6264	0.0088	0.0125	0.0226	0.0000
3.6868	0.0088	0.0128	0.0226	0.0000
3.7473	0.0088	0.0130	0.0226	0.0000
3.8077	0.0088	0.0132	0.0226	0.0000
3.8681	0.0088	0.0134	0.0226	0.0000
3.9286	0.0088	0.0136	0.0226	0.0000
3.9890	0.0088	0.0139	0.0226	0.0000
4.0495	0.0088	0.0141	0.0226	0.0000
4.1099	0.0088	0.0143	0.0226	0.0000
4.1703	0.0088	0.0145	0.0226	0.0000
4.2308	0.0088	0.0147	0.0226	0.0000
4.2912	0.0088	0.0150	0.0226	0.0000
4.3516	0.0088	0.0152	0.0226	0.0000
4.4121	0.0088	0.0154	0.0226	0.0000
4.4725	0.0088	0.0156	0.0226	0.0000
4.5000	0.0088	0.0157	0.0226	0.0000

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.5000	0.0088	0.0157	0.0000	0.0231	0.0000
4.5604	0.0088	0.0163	0.0000	0.0231	0.0000
4.6209	0.0088	0.0168	0.0000	0.0235	0.0000
4.6813	0.0088	0.0173	0.0000	0.0240	0.0000
4.7418	0.0088	0.0178	0.0000	0.0245	0.0000
4.8022	0.0088	0.0184	0.0000	0.0249	0.0000
4.8626	0.0088	0.0189	0.0000	0.0254	0.0000
4.9231	0.0088	0.0194	0.0000	0.0258	0.0000
4.9835	0.0088	0.0200	0.0000	0.0263	0.0000
5.0440	0.0088	0.0205	0.1466	0.0267	0.0000

5.1044	0.0088	0.0210	0.5355	0.0272	0.0000
5.1648	0.0088	0.0216	1.0569	0.0276	0.0000
5.2253	0.0088	0.0221	1.6695	0.0281	0.0000
5.2857	0.0088	0.0226	2.3387	0.0286	0.0000
5.3462	0.0088	0.0231	3.0289	0.0290	0.0000
5.4066	0.0088	0.0237	3.7040	0.0295	0.0000
5.4670	0.0088	0.0242	4.3296	0.0299	0.0000
5.5000	0.0088	0.0245	4.8762	0.0302	0.0000

Surface BMP-10B

Element Flows To:

Outlet 1	Outlet 2
HMP-Tank 8,10	BMP-10B

HMP-Tank 8,10

Dimensions
Depth: 5 ft.
Tank Type: Circular
Diameter: 5 ft.
Length: 1215 ft.
Discharge Structure
Riser Height: 4 ft.
Riser Diameter: 36 in.
Notch Type: Rectangular
Notch Width: 1.150 ft.
Notch Height: 0.500 ft.
Orifice 1 Diameter: 1.26 in. Elevation:0 ft.
Element Flows To:
Outlet 1 Outlet 2

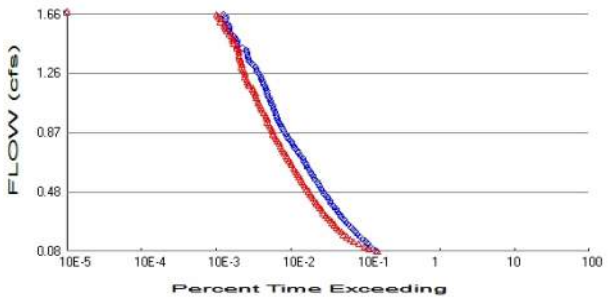
Tank Hydraulic Table

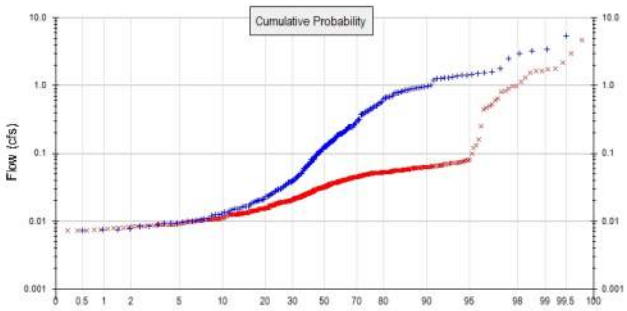
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.000	0.000	0.000	0.000
0.0556	0.029	0.001	0.010	0.000
0.1111	0.041	0.003	0.014	0.000
0.1667	0.050	0.005	0.017	0.000
0.2222	0.057	0.008	0.020	0.000
0.2778	0.063	0.012	0.022	0.000
0.3333	0.069	0.015	0.024	0.000
0.3889	0.074	0.019	0.026	0.000
0.4444	0.079	0.024	0.028	0.000
0.5000	0.083	0.028	0.030	0.000
0.5556	0.087	0.033	0.032	0.000
0.6111	0.091	0.038	0.033	0.000
0.6667	0.094	0.043	0.035	0.000
0.7222	0.098	0.048	0.036	0.000
0.7778	0.101	0.054	0.038	0.000
0.8333	0.103	0.060	0.039	0.000
0.8889	0.106	0.065	0.040	0.000
0.9444	0.109	0.071	0.041	0.000
1.0000	0.111	0.078	0.043	0.000
1.0556	0.113	0.084	0.044	0.000
1.1111	0.116	0.090	0.045	0.000
1.1667	0.118	0.097	0.046	0.000
1.2222	0.119	0.103	0.047	0.000
1.2778	0.121	0.110	0.048	0.000
1.3333	0.123	0.117	0.049	0.000
1.3889	0.124	0.124	0.050	0.000
1.4444	0.126	0.131	0.051	0.000
1.5000	0.127	0.138	0.052	0.000
1.5556	0.129	0.145	0.053	0.000
1.6111	0.130	0.152	0.054	0.000
1.6667	0.131	0.159	0.055	0.000
1.7222	0.132	0.167	0.056	0.000
1.7778	0.133	0.174	0.057	0.000
1.8333	0.134	0.182	0.058	0.000
1.8889	0.135	0.189	0.059	0.000
1.9444	0.136	0.197	0.060	0.000
2.0000	0.136	0.204	0.060	0.000

2.0556	0.137	0.212	0.061	0.000
2.1111	0.137	0.219	0.062	0.000
2.1667	0.138	0.227	0.063	0.000
2.2222	0.138	0.235	0.064	0.000
2.2778	0.138	0.242	0.065	0.000
2.3333	0.139	0.250	0.065	0.000
2.3889	0.139	0.258	0.066	0.000
2.4444	0.139	0.266	0.067	0.000
2.5000	0.139	0.273	0.068	0.000
2.5556	0.139	0.281	0.068	0.000
2.6111	0.139	0.289	0.069	0.000
2.6667	0.139	0.297	0.070	0.000
2.7222	0.138	0.304	0.071	0.000
2.7778	0.138	0.312	0.071	0.000
2.8333	0.138	0.320	0.072	0.000
2.8889	0.137	0.327	0.073	0.000
2.9444	0.137	0.335	0.073	0.000
3.0000	0.136	0.343	0.074	0.000
3.0556	0.136	0.350	0.075	0.000
3.1111	0.135	0.358	0.076	0.000
3.1667	0.134	0.365	0.076	0.000
3.2222	0.133	0.373	0.077	0.000
3.2778	0.132	0.380	0.078	0.000
3.3333	0.131	0.387	0.078	0.000
3.3889	0.130	0.395	0.079	0.000
3.4444	0.129	0.402	0.080	0.000
3.5000	0.127	0.409	0.080	0.000
3.5556	0.126	0.416	0.131	0.000
3.6111	0.124	0.423	0.223	0.000
3.6667	0.123	0.430	0.343	0.000
3.7222	0.121	0.437	0.484	0.000
3.7778	0.119	0.443	0.644	0.000
3.8333	0.118	0.450	0.821	0.000
3.8889	0.116	0.457	1.013	0.000
3.9444	0.113	0.463	1.220	0.000
4.0000	0.111	0.469	1.440	0.000
4.0556	0.109	0.475	1.857	0.000
4.1111	0.106	0.481	2.619	0.000
4.1667	0.103	0.487	3.604	0.000
4.2222	0.101	0.493	4.767	0.000
4.2778	0.098	0.498	6.080	0.000
4.3333	0.094	0.504	7.520	0.000
4.3889	0.091	0.509	9.068	0.000
4.4444	0.087	0.514	10.70	0.000
4.5000	0.083	0.519	12.41	0.000
4.5556	0.079	0.523	14.16	0.000
4.6111	0.074	0.528	15.95	0.000
4.6667	0.069	0.532	17.75	0.000
4.7222	0.063	0.535	19.54	0.000
4.7778	0.057	0.539	21.30	0.000
4.8333	0.050	0.542	23.01	0.000
4.8889	0.041	0.544	24.66	0.000
4.9444	0.029	0.546	26.22	0.000
5.0000	0.000	0.547	27.69	0.000
5.0556	0.000	0.000	29.04	0.000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 3.584
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.476
Total Impervious Area: 3.108

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.811968
5 year	1.378532
10 year	1.656534
25 year	3.245241

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.074182
5 year	0.905857
10 year	1.630459
25 year	2.214373

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0812	3002	3137	104	Pass
0.0971	2735	2465	90	Pass
0.1130	2520	2095	83	Pass
0.1289	2343	1764	75	Pass
0.1448	2169	1501	69	Pass
0.1608	1998	1350	67	Pass
0.1767	1854	1217	65	Pass
0.1926	1721	1117	64	Pass
0.2085	1606	1031	64	Pass
0.2244	1499	953	63	Pass
0.2403	1388	886	63	Pass
0.2562	1289	848	65	Pass
0.2721	1207	792	65	Pass
0.2881	1127	733	65	Pass
0.3040	1066	683	64	Pass
0.3199	1001	637	63	Pass
0.3358	953	601	63	Pass
0.3517	904	570	63	Pass
0.3676	849	537	63	Pass
0.3835	804	511	63	Pass
0.3994	757	482	63	Pass
0.4154	733	462	63	Pass
0.4313	688	434	63	Pass
0.4472	656	415	63	Pass
0.4631	612	397	64	Pass
0.4790	587	378	64	Pass
0.4949	561	358	63	Pass
0.5108	533	337	63	Pass
0.5267	507	326	64	Pass
0.5427	490	311	63	Pass
0.5586	455	295	64	Pass
0.5745	440	279	63	Pass
0.5904	421	269	63	Pass
0.6063	401	259	64	Pass
0.6222	381	248	65	Pass
0.6381	361	238	65	Pass
0.6540	350	223	63	Pass
0.6700	337	218	64	Pass
0.6859	323	206	63	Pass
0.7018	313	197	62	Pass
0.7177	296	190	64	Pass
0.7336	277	179	64	Pass
0.7495	265	170	64	Pass
0.7654	250	165	66	Pass
0.7813	242	159	65	Pass
0.7973	227	153	67	Pass
0.8132	215	146	67	Pass
0.8291	204	139	68	Pass
0.8450	196	133	67	Pass
0.8609	189	127	67	Pass
0.8768	174	125	71	Pass
0.8927	170	121	71	Pass
0.9086	164	116	70	Pass

0.9246	158	112	70	Pass
0.9405	151	106	70	Pass
0.9564	145	105	72	Pass
0.9723	141	103	73	Pass
0.9882	138	101	73	Pass
1.0041	135	94	69	Pass
1.0200	130	89	68	Pass
1.0359	126	87	69	Pass
1.0519	123	85	69	Pass
1.0678	118	80	67	Pass
1.0837	116	79	68	Pass
1.0996	111	75	67	Pass
1.1155	107	74	69	Pass
1.1314	104	73	70	Pass
1.1473	104	69	66	Pass
1.1632	101	68	67	Pass
1.1792	97	60	61	Pass
1.1951	93	59	63	Pass
1.2110	91	57	62	Pass
1.2269	89	56	62	Pass
1.2428	87	53	60	Pass
1.2587	82	53	64	Pass
1.2746	77	52	67	Pass
1.2905	75	50	66	Pass
1.3065	73	48	65	Pass
1.3224	67	48	71	Pass
1.3383	63	47	74	Pass
1.3542	59	46	77	Pass
1.3701	58	45	77	Pass
1.3860	57	44	77	Pass
1.4019	56	44	78	Pass
1.4178	55	44	80	Pass
1.4338	49	41	83	Pass
1.4497	42	41	97	Pass
1.4656	42	37	88	Pass
1.4815	41	36	87	Pass
1.4974	39	36	92	Pass
1.5133	37	35	94	Pass
1.5292	35	33	94	Pass
1.5451	32	30	93	Pass
1.5611	32	29	90	Pass
1.5770	32	28	87	Pass
1.5929	31	28	90	Pass
1.6088	29	25	86	Pass
1.6247	29	25	86	Pass
1.6406	29	23	79	Pass
1.6565	27	22	81	Pass

Water Quality

Drawdown Time Results

Pond: HMP-Tank 8,10

Days	Stage(feet)	Percent of Total Run Time
1	0.956	3.2256
2	1.777	1.5100
3	2.712	0.6820
4	0.000	N/A
5	0.000	N/A

Maximum Stage: 5.000 Drawdown Time: 03 18:13:20

Rational Method

Data for Rational Method is not available.

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

No PERLND changes have been made.

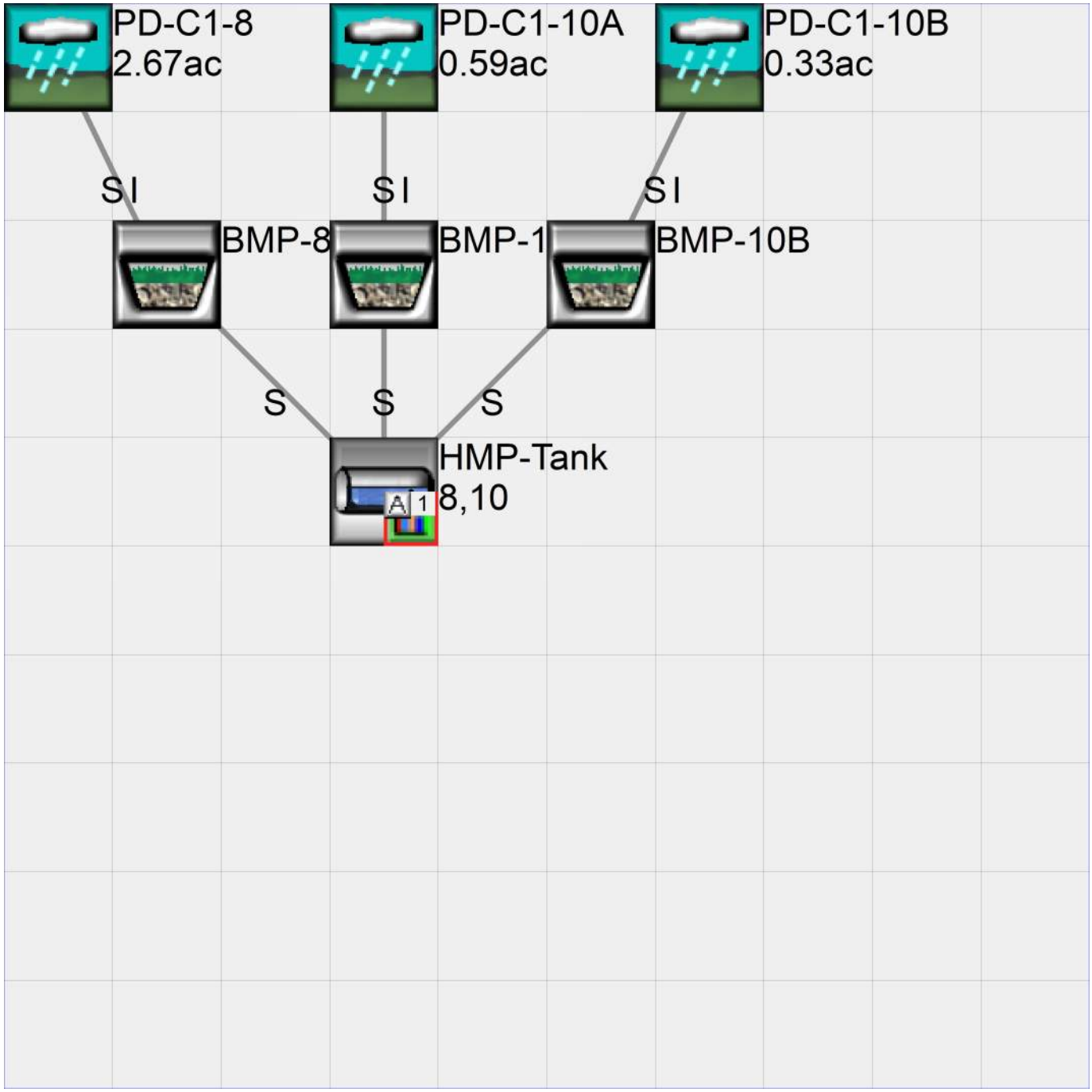
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1949 10 01        END    2011 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   2019-02-27 Tank8,10 DMA PD-C1-8,10A,10B POC-C.wdm
MESSU       25   Pre2019-02-27 Tank8,10 DMA PD-C1-8,10A,10B POC-C.MES
            27   Pre2019-02-27 Tank8,10 DMA PD-C1-8,10A,10B POC-C.L61
            28   Pre2019-02-27 Tank8,10 DMA PD-C1-8,10A,10B POC-C.L62
            30   POC2019-02-27 Tank8,10 DMA PD-C1-8,10A,10B POC-C1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      38
      PERLND      39
      PERLND      40
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        EX-C1-8                    MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                       in  out           ***
   38     C/D,Shrub,Mod(5-10%)    1    1    1    1   27    0
   39     C/D,Shrub,St(10-20%)    1    1    1    1   27    0
   40     C/D,Shrub,Very(>20%)    1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   38         0    0    1    0    0    0    0    0    0    0    0    0
   39         0    0    1    0    0    0    0    0    0    0    0    0
   40         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY
```

```
  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   38         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   39         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   40         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   38         0    0    0    1    0    0    0    0    1    0    0
   39         0    0    0    1    0    0    0    0    1    0    0
   40         0    0    0    1    0    0    0    0    1    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   38              0       4.5      0.04       350       0.1         2      0.95
   39              0       4.2      0.03       300      0.15         2      0.95
   40              0         4     0.025       200      0.25         2      0.95
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3          ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   38             40        35         3         2      0.15      0.15         0
   39             40        35         3         2      0.15      0.15         0
   40             40        35         3         2      0.15      0.15         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   38              0       0.7       0.3       1.2      0.45         0
   39              0       0.5       0.3       0.8       0.4         0
   40              0       0.4       0.3       0.4      0.35         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3          ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   38       0.5  0.5  0.5  0.6 0.65 0.65 0.65 0.65 0.65 0.65 0.55  0.5
   39       0.5  0.5  0.5  0.6 0.65 0.65 0.65 0.65 0.65 0.65 0.55  0.5
   40       0.5  0.5  0.5  0.6 0.65 0.65 0.65 0.65 0.65 0.65 0.55  0.5
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3          ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   38      0.13 0.13 0.13 0.14 0.15 0.15 0.15 0.15 0.15 0.15 0.14 0.13
   39      0.13 0.13 0.13 0.14 0.15 0.15 0.15 0.15 0.15 0.15 0.14 0.13
   40      0.13 0.13 0.13 0.14 0.15 0.15 0.15 0.15 0.15 0.15 0.14 0.13
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   38              0         0      0.01         0       0.5       0.3      0.01
   39              0         0      0.01         0       0.5       0.3      0.01
   40              0         0      0.01         0       0.5       0.3      0.01
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
  END GEN-INFO
```

```
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
EX-C1-8***
PERLND  38                       1.122     COPY   501     12
PERLND  38                       1.122     COPY   501     13
PERLND  39                       1.042     COPY   501     12
PERLND  39                       1.042     COPY   501     13
PERLND  40                       0.508     COPY   501     12
PERLND  40                       0.508     COPY   501     13
EX-C1-10***
PERLND  38                       0.383     COPY   501     12
PERLND  38                       0.383     COPY   501     13
PERLND  39                       0.356     COPY   501     12
PERLND  39                       0.356     COPY   501     13
PERLND  40                       0.173     COPY   501     12
PERLND  40                       0.173     COPY   501     13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<----------------><---> User T-series  Engl Metr LKFG             ***
```

```
                                          in  out                          ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                    ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *        ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                       ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1949 10 01        END    2011 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   2019-02-27 Tank8,10 DMA PD-C1-8,10A,10B POC-C.wdm
MESSU       25   Mit2019-02-27 Tank8,10 DMA PD-C1-8,10A,10B POC-C.MES
            27   Mit2019-02-27 Tank8,10 DMA PD-C1-8,10A,10B POC-C.L61
            28   Mit2019-02-27 Tank8,10 DMA PD-C1-8,10A,10B POC-C.L62
            30   POC2019-02-27 Tank8,10 DMA PD-C1-8,10A,10B POC-C1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      45
      IMPLND      14
      GENER        2
      RCHRES       1
      RCHRES       2
      GENER        4
      RCHRES       3
      RCHRES       4
      GENER        6
      RCHRES       5
      RCHRES       6
      RCHRES       7
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        HMP-Tank 8,10               MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
    2        24
    4        24
    6        24
  END OPCODE
  PARM
    #    #         K ***
    2             0.
    4             0.
    6             0.
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
```

```
    # -  #                          User  t-series Engl Metr ***
                                        in  out           ***
   45     C/D,Urban,Flat(0-5%)    1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   45         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   45         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   45         0    0    0    1    0    0    0    0    1    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   45              0       4.6      0.04       400      0.05         3     0.995
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   45             40        35         3         2      0.45      0.15         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   45              0       0.7      0.25         1       0.4         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   45       0.5  0.5  0.5  0.6 0.65 0.65 0.65 0.65 0.65 0.65 0.55  0.5
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   45      0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   45              0         0      0.01         0       3.5       1.7       0.1
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                      in  out           ***
   14     Parking,Flat(0-5%)      1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
```

```
    <PLS > ************* Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
   14         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
   14         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
   14         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
   14            100      0.05       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
   14              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
   14              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
PD-C1-8***
PERLND  45                       0.401     RCHRES   1      2
PERLND  45                       0.401     RCHRES   1      3
IMPLND  14                       2.271     RCHRES   1      5
PD-C1-10A***
PERLND  45                       0.059     RCHRES   3      2
PERLND  45                       0.059     RCHRES   3      3
IMPLND  14                       0.528     RCHRES   3      5
PD-C1-10B***
PERLND  45                       0.016     RCHRES   5      2
PERLND  45                       0.016     RCHRES   5      3
IMPLND  14                       0.309     RCHRES   5      5

******Routing******
RCHRES   2                           1     RCHRES   7      6
RCHRES   2                                 COPY     1     16
RCHRES   1                           1     RCHRES   7      7
RCHRES   1                                 COPY     1     17
RCHRES   1                           1     RCHRES   2      8
RCHRES   4                           1     RCHRES   7      6
RCHRES   4                                 COPY     1     16
RCHRES   3                           1     RCHRES   7      7
RCHRES   3                                 COPY     1     17
RCHRES   3                           1     RCHRES   4      8
RCHRES   6                           1     RCHRES   7      6
RCHRES   6                                 COPY     1     16
RCHRES   5                           1     RCHRES   7      7
RCHRES   5                                 COPY     1     17
RCHRES   5                           1     RCHRES   6      8
RCHRES   7                           1     COPY   501     16
```

```
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1
GENER    2 OUTPUT TIMSER      .0011111     RCHRES   1     EXTNL  OUTDGT 1
GENER    4 OUTPUT TIMSER      .0011111     RCHRES   3     EXTNL  OUTDGT 1
GENER    6 OUTPUT TIMSER      .0011111     RCHRES   5     EXTNL  OUTDGT 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<----------------><---> User T-series  Engl Metr LKFG             ***
                                       in  out                               ***
    1     Surface BMP-8           3    1    1    1   28    0    1
    2     BMP-8                   1    1    1    1   28    0    1
    3     Surface BMP-10A         3    1    1    1   28    0    1
    4     BMP-10A                 1    1    1    1   28    0    1
    5     Surface BMP-10B         3    1    1    1   28    0    1
    6     BMP-10B                 1    1    1    1   28    0    1
    7     HMP-Tank 8,10           1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
    2         1    0    0    0    0    0    0    0    0    0
    3         1    0    0    0    0    0    0    0    0    0
    4         1    0    0    0    0    0    0    0    0    0
    5         1    0    0    0    0    0    0    0    0    0
    6         1    0    0    0    0    0    0    0    0    0
    7         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
    2         4    0    0    0    0    0    0    0    0    0    1    9
    3         4    0    0    0    0    0    0    0    0    0    1    9
    4         4    0    0    0    0    0    0    0    0    0    1    9
    5         4    0    0    0    0    0    0    0    0    0    1    9
    6         4    0    0    0    0    0    0    0    0    0    1    9
    7         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                   ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
           FG FG FG FG  possible  exit  *** possible  exit      possible  exit
            *  *  *  *    *  *  *  *  *       *  *  *  *  *        ***
    1       0  1  0  0    4  5  6  0  0       0  1  0  0  0       2  1  2  2  2
    2       0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
    3       0  1  0  0    4  5  6  0  0       0  1  0  0  0       2  1  2  2  2
    4       0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
    5       0  1  0  0    4  5  6  0  0       0  1  0  0  0       2  1  2  2  2
    6       0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
    7       0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
```

```
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><--------><-------->       ***
    1              1      0.01       0.0       0.0       0.5       0.0
    2              2      0.02       0.0       0.0       0.5       0.0
    3              3      0.01       0.0       0.0       0.5       0.0
    4              4      0.01       0.0       0.0       0.5       0.0
    5              5      0.01       0.0       0.0       0.5       0.0
    6              6      0.01       0.0       0.0       0.5       0.0
    7              7      0.23       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                          ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1            0         4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2            0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    3            0         4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    4            0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    5            0         4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    6            0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    7            0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
*** User-Defined Variable Quantity Lines
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol2   RCHRES   2 VOL             4
  UVQUAN v2m2   GLOBAL     WORKSP  1        3
  UVQUAN vpo2   GLOBAL     WORKSP  2        3
  UVQUAN v2d2   GENER    2 K       1        3
*** User-Defined Variable Quantity Lines
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol4   RCHRES   4 VOL             4
  UVQUAN v2m4   GLOBAL     WORKSP  3        3
  UVQUAN vpo4   GLOBAL     WORKSP  4        3
  UVQUAN v2d4   GENER    4 K       1        3
*** User-Defined Variable Quantity Lines
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol6   RCHRES   6 VOL             4
  UVQUAN v2m6   GLOBAL     WORKSP  5        3
  UVQUAN vpo6   GLOBAL     WORKSP  6        3
  UVQUAN v2d6   GENER    6 K       1        3
*** User-Defined Target Variable Names
***                  addr or                        addr or
***                 <------>                       <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m2    1 WORKSP  1          1.0 QUAN
  UVNAME  vpo2    1 WORKSP  2          1.0 QUAN
  UVNAME  v2d2    1 K       1          1.0 QUAN
*** User-Defined Target Variable Names
***                  addr or                        addr or
***                 <------>                       <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m4    1 WORKSP  3          1.0 QUAN
  UVNAME  vpo4    1 WORKSP  4          1.0 QUAN
  UVNAME  v2d4    1 K       1          1.0 QUAN
*** User-Defined Target Variable Names
```

```
***                  addr or                       addr or
***                 <------>                      <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m6    1 WORKSP  5         1.0 QUAN
  UVNAME  vpo6    1 WORKSP  6         1.0 QUAN
  UVNAME  v2d6    1 K       1         1.0 QUAN
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER   2                               v2m2            =  5455.
*** Compute remaining available pore space
  GENER   2                               vpo2            =  v2m2
  GENER   2                               vpo2           -=  vol2
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo2 < 0.0) THEN
  GENER   2                               vpo2            =  0.0
END IF
*** Infiltration volume
  GENER   2                               v2d2            =  vpo2
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER   4                               v2m4            =  1202.
*** Compute remaining available pore space
  GENER   4                               vpo4            =  v2m4
  GENER   4                               vpo4           -=  vol4
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo4 < 0.0) THEN
  GENER   4                               vpo4            =  0.0
END IF
*** Infiltration volume
  GENER   4                               v2d4            =  vpo4
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER   6                               v2m6            =  646.
*** Compute remaining available pore space
  GENER   6                               vpo6            =  v2m6
  GENER   6                               vpo6           -=  vol6
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo6 < 0.0) THEN
  GENER   6                               vpo6            =  0.0
END IF
*** Infiltration volume
  GENER   6                               v2d6            =  vpo6
END SPEC-ACTIONS
FTABLES
  FTABLE      2
   70    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.133058  0.000000  0.000000
  0.065934  0.132538  0.000568  0.000000
  0.131868  0.130464  0.001169  0.000000
  0.197802  0.128404  0.001802  0.000000
  0.263736  0.126356  0.002469  0.000000
  0.329670  0.124321  0.003170  0.000000
  0.395604  0.122299  0.003905  0.000000
  0.461538  0.120290  0.004674  0.000000
  0.527473  0.118294  0.005478  0.000000
  0.593407  0.116310  0.006317  0.000000
  0.659341  0.114339  0.007191  0.000000
  0.725275  0.112381  0.008101  0.000000
  0.791209  0.110435  0.009047  0.000000
  0.857143  0.108502  0.010030  0.000000
  0.923077  0.106583  0.011049  0.001369
  0.989011  0.104675  0.012106  0.001538
  1.054945  0.102781  0.013200  0.001916
  1.120879  0.100900  0.014332  0.002351
  1.186813  0.099031  0.015501  0.002843
  1.252747  0.097175  0.016710  0.003396
  1.318681  0.095331  0.017957  0.004012
```

```
  1.384615  0.093501  0.019243  0.004693
  1.450549  0.091683  0.020569  0.005441
  1.516484  0.089878  0.021935  0.006259
  1.582418  0.088086  0.023340  0.007147
  1.648352  0.086307  0.024787  0.008109
  1.714286  0.084540  0.026274  0.009145
  1.780220  0.082786  0.027802  0.010259
  1.846154  0.081045  0.029372  0.011451
  1.912088  0.079317  0.030984  0.012724
  1.978022  0.077602  0.032638  0.014079
  2.043956  0.075899  0.034335  0.015517
  2.109890  0.074209  0.036075  0.017041
  2.175824  0.072532  0.037857  0.018653
  2.241758  0.070867  0.039684  0.020353
  2.307692  0.069216  0.041554  0.022143
  2.373626  0.067577  0.043469  0.024025
  2.439560  0.065951  0.045428  0.026000
  2.505495  0.064337  0.047432  0.028070
  2.571429  0.062737  0.049482  0.030237
  2.637363  0.061149  0.051577  0.032501
  2.703297  0.059574  0.053718  0.034864
  2.769231  0.058012  0.055905  0.037328
  2.835165  0.056463  0.058139  0.039894
  2.901099  0.054926  0.060421  0.042562
  2.967033  0.053402  0.062749  0.045335
  3.032967  0.051891  0.065184  0.048214
  3.098901  0.050393  0.067668  0.051200
  3.164835  0.048907  0.070201  0.054294
  3.230769  0.047434  0.072785  0.057496
  3.296703  0.045974  0.075419  0.060808
  3.362637  0.044527  0.078103  0.062500
  3.428571  0.043093  0.080838  0.062500
  3.494505  0.041671  0.083625  0.062500
  3.560440  0.040262  0.086463  0.062500
  3.626374  0.038866  0.089353  0.062500
  3.692308  0.037482  0.092296  0.062500
  3.758242  0.036112  0.095291  0.062500
  3.824176  0.034754  0.098340  0.062500
  3.890110  0.033409  0.101442  0.062500
  3.956044  0.032077  0.104597  0.062500
  4.021978  0.030757  0.107807  0.062500
  4.087912  0.029451  0.111071  0.062500
  4.153846  0.028157  0.114390  0.062500
  4.219780  0.026875  0.117764  0.062500
  4.285714  0.025607  0.121194  0.062500
  4.351648  0.024351  0.124679  0.062500
  4.417582  0.023109  0.128221  0.062500
  4.483516  0.021878  0.131819  0.062500
  4.500000  0.020661  0.278728  0.062500
  END FTABLE  2
  FTABLE      1
   24    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.020661  0.000000  0.000000  0.000000  0.000000
  0.065934  0.135147  0.008842  0.000000  0.063874  0.000000
  0.131868  0.137249  0.017822  0.000000  0.065247  0.000000
  0.197802  0.139364  0.026941  0.000000  0.066621  0.000000
  0.263736  0.141491  0.036200  0.000000  0.067995  0.000000
  0.329670  0.143631  0.045600  0.000000  0.069368  0.000000
  0.395604  0.145784  0.055141  0.000000  0.070742  0.000000
  0.461538  0.147950  0.064824  0.000000  0.072115  0.000000
  0.527473  0.150129  0.074651  0.000000  0.073489  0.000000
  0.593407  0.152320  0.084622  0.000000  0.074863  0.000000
  0.659341  0.154524  0.094738  0.000000  0.076236  0.000000
  0.725275  0.156741  0.104999  0.000000  0.077610  0.000000
  0.791209  0.158971  0.115407  0.000000  0.078984  0.000000
  0.857143  0.161213  0.125963  0.000000  0.080357  0.000000
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0.923077  0.163468  0.136667  0.000000  0.081731  0.000000
0.989011  0.165736  0.147520  0.000000  0.083104  0.000000
1.054945  0.168017  0.158522  0.000000  0.084478  0.000000
1.120879  0.170311  0.169676  0.000000  0.085852  0.000000
1.186813  0.172617  0.180981  0.000000  0.087225  0.000000
1.252747  0.174936  0.192439  0.002294  0.088599  0.000000
1.318681  0.177268  0.204050  0.286178  0.089973  0.000000
1.384615  0.179613  0.215816  0.782533  0.091346  0.000000
1.450549  0.181970  0.227736  1.410104  0.092720  0.000000
1.500000  0.183747  0.236778  2.121771  0.093750  0.000000
END FTABLE  1
FTABLE      4
 76    4
   Depth      Area    Volume  Outflow1 Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
0.000000  0.016299  0.000000  0.000000
0.060440  0.016299  0.000384  0.000000
0.120879  0.016299  0.000768  0.000000
0.181319  0.016299  0.001153  0.000000
0.241758  0.016299  0.001537  0.000000
0.302198  0.016299  0.001921  0.000000
0.362637  0.016299  0.002305  0.000000
0.423077  0.016299  0.002689  0.000000
0.483516  0.016299  0.003074  0.000000
0.543956  0.016299  0.003458  0.000000
0.604396  0.016299  0.003842  0.000000
0.664835  0.016299  0.004226  0.000000
0.725275  0.016299  0.004610  0.000000
0.785714  0.016299  0.004995  0.000000
0.846154  0.016299  0.005379  0.000000
0.906593  0.016299  0.005763  0.001004
0.967033  0.016299  0.006147  0.001107
1.027473  0.016299  0.006531  0.001337
1.087912  0.016299  0.006916  0.001600
1.148352  0.016299  0.007300  0.001895
1.208791  0.016299  0.007684  0.002226
1.269231  0.016299  0.008068  0.002591
1.329670  0.016299  0.008452  0.002993
1.390110  0.016299  0.008837  0.003433
1.450549  0.016299  0.009221  0.003912
1.510989  0.016299  0.009605  0.004431
1.571429  0.016299  0.009989  0.004990
1.631868  0.016299  0.010373  0.005591
1.692308  0.016299  0.010758  0.006235
1.752747  0.016299  0.011142  0.006922
1.813187  0.016299  0.011526  0.007654
1.873626  0.016299  0.011910  0.008432
1.934066  0.016299  0.012294  0.009255
1.994505  0.016299  0.012679  0.010126
2.054945  0.016299  0.013063  0.011046
2.115385  0.016299  0.013447  0.012014
2.175824  0.016299  0.013831  0.013032
2.236264  0.016299  0.014215  0.014100
2.296703  0.016299  0.014600  0.015220
2.357143  0.016299  0.014984  0.016392
2.417582  0.016299  0.015368  0.017617
2.478022  0.016299  0.015752  0.018896
2.538462  0.016299  0.016136  0.020229
2.598901  0.016299  0.016521  0.021617
2.659341  0.016299  0.016905  0.023062
2.719780  0.016299  0.017289  0.024563
2.780220  0.016299  0.017673  0.026121
2.840659  0.016299  0.018057  0.027737
2.901099  0.016299  0.018442  0.029412
2.961538  0.016299  0.018826  0.031147
3.021978  0.016299  0.019235  0.032941
3.082418  0.016299  0.019643  0.034797
3.142857  0.016299  0.020052  0.036713
3.203297  0.016299  0.020461  0.038691
3.263736  0.016299  0.020870  0.040731
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  3.324176  0.016299  0.021279  0.042059
  3.384615  0.016299  0.021688  0.042059
  3.445055  0.016299  0.022096  0.042059
  3.505495  0.016299  0.022505  0.042059
  3.565934  0.016299  0.022914  0.042059
  3.626374  0.016299  0.023323  0.042059
  3.686813  0.016299  0.023732  0.042059
  3.747253  0.016299  0.024141  0.042059
  3.807692  0.016299  0.024549  0.042059
  3.868132  0.016299  0.024958  0.042059
  3.928571  0.016299  0.025367  0.042059
  3.989011  0.016299  0.025776  0.042059
  4.049451  0.016299  0.026185  0.042059
  4.109890  0.016299  0.026593  0.042059
  4.170330  0.016299  0.027002  0.042059
  4.230769  0.016299  0.027411  0.042059
  4.291209  0.016299  0.027820  0.042059
  4.351648  0.016299  0.028229  0.042059
  4.412088  0.016299  0.028638  0.042059
  4.472527  0.016299  0.029046  0.042059
  4.500000  0.016299  0.061388  0.042059
  END FTABLE  4
  FTABLE      3
   18    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.016299  0.000000  0.000000  0.000000  0.000000
  0.060440  0.016299  0.000985  0.000000  0.042906  0.000000
  0.120879  0.016299  0.001970  0.000000  0.043753  0.000000
  0.181319  0.016299  0.002955  0.000000  0.044601  0.000000
  0.241758  0.016299  0.003941  0.000000  0.045448  0.000000
  0.302198  0.016299  0.004926  0.000000  0.046295  0.000000
  0.362637  0.016299  0.005911  0.000000  0.047143  0.000000
  0.423077  0.016299  0.006896  0.000000  0.047990  0.000000
  0.483516  0.016299  0.007881  0.000000  0.048837  0.000000
  0.543956  0.016299  0.008866  0.146622  0.049685  0.000000
  0.604396  0.016299  0.009851  0.535530  0.050532  0.000000
  0.664835  0.016299  0.010836  1.056867  0.051379  0.000000
  0.725275  0.016299  0.011822  1.669534  0.052227  0.000000
  0.785714  0.016299  0.012807  2.338680  0.053074  0.000000
  0.846154  0.016299  0.013792  3.028884  0.053921  0.000000
  0.906593  0.016299  0.014777  3.704036  0.054769  0.000000
  0.967033  0.016299  0.015762  4.329606  0.055616  0.000000
  1.000000  0.016299  0.016299  4.876229  0.056078  0.000000
  END FTABLE  3
  FTABLE      6
   76    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.008770  0.000000  0.000000
  0.060440  0.008770  0.000207  0.000000
  0.120879  0.008770  0.000413  0.000000
  0.181319  0.008770  0.000620  0.000000
  0.241758  0.008770  0.000827  0.000000
  0.302198  0.008770  0.001034  0.000000
  0.362637  0.008770  0.001240  0.000000
  0.423077  0.008770  0.001447  0.000000
  0.483516  0.008770  0.001654  0.000000
  0.543956  0.008770  0.001860  0.000000
  0.604396  0.008770  0.002067  0.000000
  0.664835  0.008770  0.002274  0.000000
  0.725275  0.008770  0.002481  0.000000
  0.785714  0.008770  0.002687  0.000000
  0.846154  0.008770  0.002894  0.000000
  0.906593  0.008770  0.003101  0.000540
  0.967033  0.008770  0.003307  0.000596
  1.027473  0.008770  0.003514  0.000720
  1.087912  0.008770  0.003721  0.000861
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  1.148352  0.008770  0.003927  0.001020
  1.208791  0.008770  0.004134  0.001197
  1.269231  0.008770  0.004341  0.001394
  1.329670  0.008770  0.004548  0.001611
  1.390110  0.008770  0.004754  0.001847
  1.450549  0.008770  0.004961  0.002105
  1.510989  0.008770  0.005168  0.002384
  1.571429  0.008770  0.005374  0.002685
  1.631868  0.008770  0.005581  0.003008
  1.692308  0.008770  0.005788  0.003354
  1.752747  0.008770  0.005995  0.003724
  1.813187  0.008770  0.006201  0.004118
  1.873626  0.008770  0.006408  0.004536
  1.934066  0.008770  0.006615  0.004980
  1.994505  0.008770  0.006821  0.005448
  2.054945  0.008770  0.007028  0.005943
  2.115385  0.008770  0.007235  0.006464
  2.175824  0.008770  0.007442  0.007011
  2.236264  0.008770  0.007648  0.007586
  2.296703  0.008770  0.007855  0.008189
  2.357143  0.008770  0.008062  0.008819
  2.417582  0.008770  0.008268  0.009478
  2.478022  0.008770  0.008475  0.010166
  2.538462  0.008770  0.008682  0.010884
  2.598901  0.008770  0.008889  0.011631
  2.659341  0.008770  0.009095  0.012408
  2.719780  0.008770  0.009302  0.013215
  2.780220  0.008770  0.009509  0.014054
  2.840659  0.008770  0.009715  0.014923
  2.901099  0.008770  0.009922  0.015825
  2.961538  0.008770  0.010129  0.016758
  3.021978  0.008770  0.010349  0.017723
  3.082418  0.008770  0.010569  0.018722
  3.142857  0.008770  0.010789  0.019753
  3.203297  0.008770  0.011009  0.020817
  3.263736  0.008770  0.011229  0.021914
  3.324176  0.008770  0.011449  0.022629
  3.384615  0.008770  0.011669  0.022629
  3.445055  0.008770  0.011888  0.022629
  3.505495  0.008770  0.012108  0.022629
  3.565934  0.008770  0.012328  0.022629
  3.626374  0.008770  0.012548  0.022629
  3.686813  0.008770  0.012768  0.022629
  3.747253  0.008770  0.012988  0.022629
  3.807692  0.008770  0.013208  0.022629
  3.868132  0.008770  0.013428  0.022629
  3.928571  0.008770  0.013648  0.022629
  3.989011  0.008770  0.013868  0.022629
  4.049451  0.008770  0.014088  0.022629
  4.109890  0.008770  0.014308  0.022629
  4.170330  0.008770  0.014528  0.022629
  4.230769  0.008770  0.014748  0.022629
  4.291209  0.008770  0.014968  0.022629
  4.351648  0.008770  0.015188  0.022629
  4.412088  0.008770  0.015408  0.022629
  4.472527  0.008770  0.015628  0.022629
  4.500000  0.008770  0.033028  0.022629
  END FTABLE  6
  FTABLE      5
   18    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.008770  0.000000  0.000000  0.000000  0.000000
  0.060440  0.008770  0.000530  0.000000  0.023085  0.000000
  0.120879  0.008770  0.001060  0.000000  0.023540  0.000000
  0.181319  0.008770  0.001590  0.000000  0.023996  0.000000
  0.241758  0.008770  0.002120  0.000000  0.024452  0.000000
  0.302198  0.008770  0.002650  0.000000  0.024908  0.000000
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0.362637  0.008770  0.003180  0.000000  0.025364  0.000000
0.423077  0.008770  0.003710  0.000000  0.025820  0.000000
0.483516  0.008770  0.004240  0.000000  0.026276  0.000000
0.543956  0.008770  0.004770  0.146622  0.026732  0.000000
0.604396  0.008770  0.005300  0.535530  0.027188  0.000000
0.664835  0.008770  0.005830  1.056867  0.027643  0.000000
0.725275  0.008770  0.006360  1.669534  0.028099  0.000000
0.785714  0.008770  0.006890  2.338680  0.028555  0.000000
0.846154  0.008770  0.007420  3.028884  0.029011  0.000000
0.906593  0.008770  0.007950  3.704036  0.029467  0.000000
0.967033  0.008770  0.008480  4.329606  0.029923  0.000000
1.000000  0.008770  0.008770  4.876229  0.030172  0.000000
END FTABLE  5
FTABLE      7
 91    4
   Depth      Area    Volume  Outflow1 Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
0.000000  0.000000  0.000000  0.000000
0.055556  0.029238  0.001085  0.010155
0.111111  0.041115  0.003059  0.014361
0.166667  0.050069  0.005601  0.017588
0.222222  0.057481  0.008594  0.020309
0.277778  0.063891  0.011970  0.022706
0.333333  0.069576  0.015680  0.024874
0.388889  0.074702  0.019690  0.026867
0.444444  0.079378  0.023972  0.028722
0.500000  0.083678  0.028503  0.030464
0.555556  0.087658  0.033264  0.032112
0.611111  0.091360  0.038238  0.033679
0.666667  0.094816  0.043410  0.035177
0.722222  0.098053  0.048769  0.036613
0.777778  0.101092  0.054301  0.037995
0.833333  0.103949  0.059998  0.039329
0.888889  0.106640  0.065848  0.040618
0.944444  0.109177  0.071844  0.041869
1.000000  0.111570  0.077976  0.043082
1.055556  0.113829  0.084238  0.044263
1.111111  0.115960  0.090622  0.045413
1.166667  0.117972  0.097120  0.046534
1.222222  0.119870  0.103728  0.047629
1.277778  0.121660  0.110437  0.048700
1.333333  0.123346  0.117243  0.049747
1.388889  0.124932  0.124140  0.050773
1.444444  0.126422  0.131123  0.051779
1.500000  0.127820  0.138186  0.052765
1.555556  0.129128  0.145323  0.053733
1.611111  0.130350  0.152532  0.054684
1.666667  0.131487  0.159805  0.055619
1.722222  0.132542  0.167140  0.056539
1.777778  0.133516  0.174531  0.057443
1.833333  0.134413  0.181973  0.058334
1.888889  0.135232  0.189464  0.059211
1.944444  0.135976  0.196998  0.060076
2.000000  0.136645  0.204571  0.060928
2.055556  0.137241  0.212179  0.061768
2.111111  0.137765  0.219819  0.062597
2.166667  0.138218  0.227485  0.063416
2.222222  0.138599  0.235175  0.064223
2.277778  0.138911  0.242884  0.065021
2.333333  0.139153  0.250608  0.065809
2.388889  0.139325  0.258344  0.066588
2.444444  0.139428  0.266087  0.067358
2.500000  0.139463  0.273835  0.068119
2.555556  0.139428  0.281582  0.068872
2.611111  0.139325  0.289325  0.069617
2.666667  0.139153  0.297061  0.070353
2.722222  0.138911  0.304785  0.071082
2.777778  0.138599  0.312494  0.071804
2.833333  0.138218  0.320184  0.072518
2.888889  0.137765  0.327851  0.073226
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  2.944444  0.137241  0.335490  0.073927
  3.000000  0.136645  0.343098  0.074621
  3.055556  0.135976  0.350671  0.075309
  3.111111  0.135232  0.358205  0.075990
  3.166667  0.134413  0.365696  0.076666
  3.222222  0.133516  0.373139  0.077335
  3.277778  0.132542  0.380530  0.077999
  3.333333  0.131487  0.387864  0.078657
  3.388889  0.130350  0.395138  0.079310
  3.444444  0.129128  0.402346  0.079958
  3.500000  0.127820  0.409484  0.080600
  3.555556  0.126422  0.416546  0.131383
  3.611111  0.124932  0.423529  0.223702
  3.666667  0.123346  0.430426  0.343061
  3.722222  0.121660  0.437232  0.484284
  3.777778  0.119870  0.443942  0.644383
  3.833333  0.117972  0.450549  0.821338
  3.888889  0.115960  0.457048  1.013670
  3.944444  0.113829  0.463431  1.220231
  4.000000  0.111570  0.469693  1.440097
  4.055556  0.109177  0.475825  1.857546
  4.111111  0.106640  0.481821  2.619447
  4.166667  0.103949  0.487671  3.604443
  4.222222  0.101092  0.493368  4.767587
  4.277778  0.098053  0.498901  6.080405
  4.333333  0.094816  0.504259  7.520602
  4.388889  0.091360  0.509432  9.068365
  4.444444  0.087658  0.514406  10.70472
  4.500000  0.083678  0.519166  12.41074
  4.555556  0.079378  0.523697  14.16723
  4.611111  0.074702  0.527979  15.95460
  4.666667  0.069576  0.531989  17.75299
  4.722222  0.063891  0.535699  19.54245
  4.777778  0.057481  0.539075  21.30321
  4.833333  0.050069  0.542068  23.01608
  4.888889  0.041115  0.544610  24.66284
  4.944444  0.029238  0.546584  26.22673
  5.000000  0.001000  0.547669  27.69293
  END FTABLE  7
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP
WDM     22 IRRG     ENGL    0.7       SAME PERLND  45     EXTNL  SURLI
WDM      2 PREC     ENGL    1              RCHRES   1     EXTNL  PREC
WDM      2 PREC     ENGL    1              RCHRES   3     EXTNL  PREC
WDM      2 PREC     ENGL    1              RCHRES   5     EXTNL  PREC
WDM      1 EVAP     ENGL    0.5            RCHRES   1     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   2     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES   3     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   4     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES   5     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   6     EXTNL  POTEV

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   7 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   7 HYDR   STAGE  1 1        1      WDM   1001 STAG     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS
```

```
MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>             <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK         2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK     2

  MASS-LINK         3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK     3

  MASS-LINK         5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK     5

  MASS-LINK         6
RCHRES     ROFLOW                          RCHRES         INFLOW
  END MASS-LINK     6

  MASS-LINK         7
RCHRES     OFLOW  OVOL   1                 RCHRES         INFLOW IVOL
  END MASS-LINK     7

  MASS-LINK         8
RCHRES     OFLOW  OVOL   2                 RCHRES         INFLOW IVOL
  END MASS-LINK     8

  MASS-LINK        16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK    16

  MASS-LINK        17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK    17


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

```
ERROR/WARNING ID:   341   6

DATE/TIME: 1978/ 2/10  3:45

RCHRES:     1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB().  To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows.  This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS         V1         V2        VOL
24 9.9202E+03 1.0314E+04 1.0966E+04
```

```
ERROR/WARNING ID:   341   5

DATE/TIME: 1978/ 2/10  3:45

RCHRES:     1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated.  If extrapolation was small, no problem.
Remedy; extend ftable.  Relevant data are:

A          B          C      RDEP1      RDEP2  COUNT
7.7406E+01 1.5853E+04 -4.230E+04    2.6344  2.6344E+00      3
```

```
ERROR/WARNING ID:   341   6

DATE/TIME: 1978/ 2/10  4: 0

RCHRES:     1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB().  To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows.  This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS         V1         V2        VOL
24 9.9202E+03 1.0314E+04 1.0536E+04
```

```
ERROR/WARNING ID:   341   5

DATE/TIME: 1978/ 2/10  4: 0

RCHRES:     1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated.  If extrapolation was small, no problem.
Remedy; extend ftable.  Relevant data are:

A          B          C      RDEP1      RDEP2  COUNT
7.7406E+01 1.5853E+04 -2.489E+04    1.5582  1.5582E+00      3
```

```
ERROR/WARNING ID:   341   6

DATE/TIME: 1978/ 3/ 1  5:45

RCHRES:     1
```

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS	V1	V2	VOL
24	9.9202E+03	1.0314E+04	1.0794E+04

ERROR/WARNING ID: 341 5

DATE/TIME: 1978/ 3/ 1 5:45

RCHRES: 1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated. If extrapolation was small, no problem.
Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
7.7406E+01	1.5853E+04	-3.535E+04	2.2061	2.2061	3

ERROR/WARNING ID: 341 6

DATE/TIME: 1978/ 3/ 1 6:45

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS	V1	V2	VOL
24	9920.2	1.0314E+04	1.0655E+04

ERROR/WARNING ID: 341 5

DATE/TIME: 1978/ 3/ 1 6:45

RCHRES: 1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated. If extrapolation was small, no problem.
Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
7.7406E+01	1.5853E+04	-2.972E+04	1.8581	1.8581E+00	3

ERROR/WARNING ID: 341 6

DATE/TIME: 1978/ 3/ 2 13:45

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS	V1	V2	VOL
24	9.9202E+03	1.0314E+04	1.0572E+04

ERROR/WARNING ID: 341   5

DATE/TIME: 1978/ 3/ 2 13:45

RCHRES: 1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated. If extrapolation was small, no problem.
Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
7.7406E+01	1.5853E+04	-2.637E+04	1.6500	1.6500E+00	3

ERROR/WARNING ID: 341   6

DATE/TIME: 1980/ 2/13 23: 0

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS	V1	V2	VOL
24	9.9202E+03	1.0314E+04	1.0871E+04

ERROR/WARNING ID: 341   5

DATE/TIME: 1980/ 2/13 23: 0

RCHRES: 1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated. If extrapolation was small, no problem.
Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
7.7406E+01	1.5853E+04	-3.846E+04	2.3976	2.3976E+00	3

ERROR/WARNING ID: 341   6

DATE/TIME: 1980/ 2/14 7:45

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS	V1	V2	VOL
24	9.9202E+03	1.0314E+04	1.2038E+04

ERROR/WARNING ID: 341   5

DATE/TIME: 1980/ 2/14 7:45

RCHRES: 1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).

Probably ftable was extrapolated. If extrapolation was small, no problem.
Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
7.7406E+01	1.5853E+04	-8.567E+04	5.2684	5.2683E+00	3

ERROR/WARNING ID: 341   6

DATE/TIME: 1980/ 2/14 8:45

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS	V1	V2	VOL
24	9.9202E+03	1.0314E+04	1.0704E+04

ERROR/WARNING ID: 341   5

DATE/TIME: 1980/ 2/14 8:45

RCHRES: 1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated. If extrapolation was small, no problem.
Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
7.7406E+01	1.5853E+04	-3.170E+04	1.9805	1.9805	3

ERROR/WARNING ID: 341   6

DATE/TIME: 1982/11/30 9:15

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS	V1	V2	VOL
24	9920.2	1.0314E+04	1.0486E+04

ERROR/WARNING ID: 341   5

DATE/TIME: 1982/11/30 9:15

RCHRES: 1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated. If extrapolation was small, no problem.
Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
7.7406E+01	1.5853E+04	-2.288E+04	1.4334	1.4334E+00	3

ERROR/WARNING ID: 341   6

DATE/TIME: 1998/ 2/23 21: 0

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS	V1	V2	VOL
24	9.9202E+03	1.0314E+04	1.0428E+04

ERROR/WARNING ID: 341   5

DATE/TIME: 1998/ 2/23 21: 0

RCHRES: 1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated. If extrapolation was small, no problem.
Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
7.7406E+01	1.5853E+04	-2.056E+04	1.2885	1.2885E+00	3

ERROR/WARNING ID: 341   6

DATE/TIME: 1998/ 2/23 21:30

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS	V1	V2	VOL
24	9.9202E+03	1.0314E+04	1.0315E+04

ERROR/WARNING ID: 341   5

DATE/TIME: 1998/ 2/23 21:30

RCHRES: 1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated. If extrapolation was small, no problem.
Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
7.7406E+01	1.5853E+04	-1.598E+04	1.0029	1.0029E+00	3

ERROR/WARNING ID: 341   6

DATE/TIME: 1998/ 2/23 21:45

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

```
NROWS         V1          V2         VOL
24 9.9202E+03 1.0314E+04 1.0457E+04
```

```
ERROR/WARNING ID:   341   5

DATE/TIME: 1998/ 2/23 21:45

RCHRES:     1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated.  If extrapolation was small, no problem.
Remedy; extend ftable.  Relevant data are:

A          B          C      RDEP1      RDEP2  COUNT
7.7406E+01 1.5853E+04 -2.170E+04    1.3595  1.3595E+00      3
```

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SMRHM

PROJECT REPORT

General Model Information

Project Name:	2019-02-27 BMP9 POC-C
Site Name:	Costco Murrietta
Site Address:	215 & Clinton Keith Rd
City:	Murrieta
Report Date:	2/27/2019
Gage:	Wildomar / North Murrieta
Data Start:	1949/10/01
Data End:	2011/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2018/01/19

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year

Landuse Basin Data
Predeveloped Land Use

EX-C1-9

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Shrub,Mod(5-10%)	0.352
C D,Shrub,St(10-20%)	0.328
C D,Shrub,Very(>20%)	0.16
Pervious Total	0.84

Impervious Land Use	acre
Impervious Total	0
Basin Total	0.84

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

PD-C1-9

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	0.168
Pervious Total	0.168

Impervious Land Use	acre
Parking,Flat(0-5%)	0.672
Impervious Total	0.672
Basin Total	0.84

Element Flows To:

Surface	Interflow	Groundwater
Surface BMP-9	Surface BMP-9	

Routing Elements
Predeveloped Routing

Mitigated Routing

BMP-9

Bottom Length:	65.10 ft.
Bottom Width:	15.00 ft.
Material thickness of first layer:	3
Material type for first layer:	Amended 2.5 in/hr
Material thickness of second layer:	1
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	0.5
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	31.367
Total Outflow (ac-ft.):	35.786
Percent Through Underdrain:	87.65
Discharge Structure	
Riser Height:	1.5 ft.
Riser Diameter:	18 in.
Orifice 1 Diameter:	0.5 in. Elevation:0.5 ft.
Element Flows To:	
Outlet 1	Outlet 2

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.1048	0.0000	0.0000	0.0000
0.0659	0.1036	0.0006	0.0000	0.0000
0.1319	0.1019	0.0012	0.0000	0.0000
0.1978	0.1002	0.0018	0.0000	0.0000
0.2637	0.0985	0.0025	0.0000	0.0000
0.3297	0.0968	0.0032	0.0000	0.0000
0.3956	0.0951	0.0039	0.0000	0.0000
0.4615	0.0934	0.0047	0.0000	0.0000
0.5275	0.0918	0.0054	0.0000	0.0000
0.5934	0.0901	0.0062	0.0000	0.0000
0.6593	0.0885	0.0071	0.0000	0.0000
0.7253	0.0869	0.0079	0.0000	0.0000
0.7912	0.0853	0.0088	0.0000	0.0000
0.8571	0.0837	0.0097	0.0000	0.0000
0.9231	0.0821	0.0107	0.0002	0.0000
0.9890	0.0805	0.0116	0.0013	0.0000
1.0549	0.0790	0.0126	0.0018	0.0000
1.1209	0.0775	0.0137	0.0020	0.0000
1.1868	0.0759	0.0147	0.0022	0.0000
1.2527	0.0744	0.0158	0.0025	0.0000
1.3187	0.0729	0.0170	0.0028	0.0000
1.3846	0.0714	0.0181	0.0031	0.0000
1.4505	0.0700	0.0193	0.0033	0.0000
1.5165	0.0685	0.0205	0.0035	0.0000
1.5824	0.0670	0.0218	0.0037	0.0000
1.6484	0.0656	0.0231	0.0039	0.0000
1.7143	0.0642	0.0244	0.0041	0.0000
1.7802	0.0628	0.0257	0.0043	0.0000

1.8462	0.0614	0.0271	0.0045	0.0000
1.9121	0.0600	0.0285	0.0047	0.0000
1.9780	0.0586	0.0300	0.0048	0.0000
2.0440	0.0573	0.0315	0.0050	0.0000
2.1099	0.0559	0.0330	0.0051	0.0000
2.1758	0.0546	0.0346	0.0053	0.0000
2.2418	0.0533	0.0362	0.0054	0.0000
2.3077	0.0520	0.0378	0.0056	0.0000
2.3736	0.0507	0.0395	0.0057	0.0000
2.4396	0.0494	0.0412	0.0060	0.0000
2.5055	0.0481	0.0429	0.0061	0.0000
2.5714	0.0468	0.0447	0.0062	0.0000
2.6374	0.0456	0.0465	0.0063	0.0000
2.7033	0.0444	0.0484	0.0064	0.0000
2.7692	0.0432	0.0503	0.0066	0.0000
2.8352	0.0419	0.0522	0.0067	0.0000
2.9011	0.0408	0.0542	0.0068	0.0000
2.9670	0.0396	0.0562	0.0069	0.0000
3.0330	0.0384	0.0584	0.0070	0.0000
3.0989	0.0372	0.0606	0.0071	0.0000
3.1648	0.0361	0.0629	0.0072	0.0000
3.2308	0.0350	0.0652	0.0073	0.0000
3.2967	0.0339	0.0675	0.0074	0.0000
3.3626	0.0328	0.0699	0.0075	0.0000
3.4286	0.0317	0.0724	0.0076	0.0000
3.4945	0.0306	0.0749	0.0077	0.0000
3.5604	0.0295	0.0774	0.0078	0.0000
3.6264	0.0285	0.0800	0.0079	0.0000
3.6923	0.0274	0.0826	0.0080	0.0000
3.7582	0.0264	0.0853	0.0081	0.0000
3.8242	0.0254	0.0880	0.0082	0.0000
3.8901	0.0244	0.0907	0.0083	0.0000
3.9560	0.0234	0.0936	0.0084	0.0000
4.0000	0.0224	0.0955	0.0085	0.0000

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.0000	0.1048	0.0955	0.0000	0.0591	0.0000
4.0659	0.1065	0.1024	0.0000	0.0591	0.0000
4.1319	0.1083	0.1095	0.0000	0.0604	0.0000
4.1978	0.1101	0.1167	0.0000	0.0617	0.0000
4.2637	0.1119	0.1240	0.0000	0.0629	0.0000
4.3297	0.1137	0.1315	0.0000	0.0642	0.0000
4.3956	0.1155	0.1390	0.0000	0.0655	0.0000
4.4615	0.1173	0.1467	0.0000	0.0667	0.0000
4.5275	0.1191	0.1545	0.0011	0.0680	0.0000
4.5934	0.1210	0.1624	0.0021	0.0693	0.0000
4.6593	0.1229	0.1704	0.0027	0.0706	0.0000
4.7253	0.1247	0.1786	0.0032	0.0718	0.0000
4.7912	0.1266	0.1869	0.0037	0.0731	0.0000
4.8571	0.1285	0.1953	0.0041	0.0744	0.0000
4.9231	0.1304	0.2038	0.0044	0.0756	0.0000
4.9890	0.1324	0.2125	0.0047	0.0769	0.0000
5.0549	0.1343	0.2213	0.0051	0.0782	0.0000
5.1209	0.1363	0.2302	0.0053	0.0795	0.0000
5.1868	0.1382	0.2393	0.0056	0.0807	0.0000
5.2527	0.1402	0.2484	0.0059	0.0820	0.0000
5.3187	0.1422	0.2578	0.0061	0.0833	0.0000

5.3846	0.1442	0.2672	0.0064	0.0845	0.0000
5.4505	0.1462	0.2768	0.0066	0.0858	0.0000
5.5165	0.1483	0.2865	0.0405	0.0871	0.0000
5.5824	0.1503	0.2963	0.3831	0.0884	0.0000
5.6484	0.1524	0.3063	0.9114	0.0896	0.0000
5.7143	0.1545	0.3164	1.5604	0.0909	0.0000
5.7802	0.1565	0.3267	2.2841	0.0922	0.0000
5.8462	0.1586	0.3371	3.0368	0.0934	0.0000
5.9121	0.1607	0.3476	3.7715	0.0947	0.0000
5.9780	0.1629	0.3583	4.4438	0.0960	0.0000
6.0000	0.1636	0.3618	5.0171	0.0964	0.0000

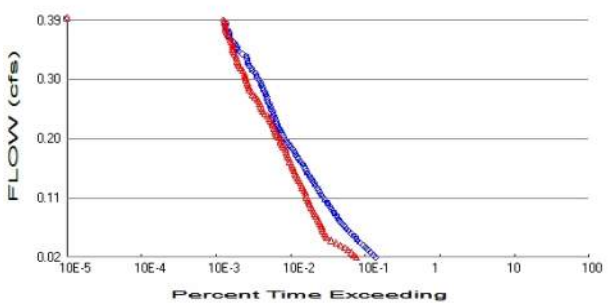
Surface BMP-9

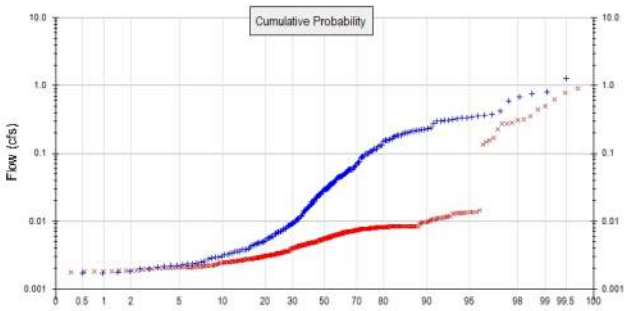
Element Flows To:

Outlet 1	Outlet 2
	BMP-9

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.84
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.168
Total Impervious Area: 0.672

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.190387
5 year	0.323167
10 year	0.388452
25 year	0.760828

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.011273
5 year	0.177797
10 year	0.331523
25 year	0.627907

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0190	3002	1647	54	Pass
0.0228	2778	1524	54	Pass
0.0265	2541	1406	55	Pass
0.0302	2343	1267	54	Pass
0.0340	2207	1153	52	Pass
0.0377	2023	1020	50	Pass
0.0414	1857	882	47	Pass
0.0452	1722	751	43	Pass
0.0489	1630	661	40	Pass
0.0526	1517	638	42	Pass
0.0564	1394	610	43	Pass
0.0601	1290	589	45	Pass
0.0638	1219	568	46	Pass
0.0675	1138	559	49	Pass
0.0713	1067	534	50	Pass
0.0750	998	515	51	Pass
0.0787	963	501	52	Pass
0.0825	906	471	51	Pass
0.0862	850	452	53	Pass
0.0899	814	443	54	Pass
0.0937	763	427	55	Pass
0.0974	738	403	54	Pass
0.1011	689	386	56	Pass
0.1049	661	379	57	Pass
0.1086	619	370	59	Pass
0.1123	590	354	60	Pass
0.1161	560	349	62	Pass
0.1198	536	339	63	Pass
0.1235	509	329	64	Pass
0.1273	490	311	63	Pass
0.1310	467	303	64	Pass
0.1347	443	292	65	Pass
0.1384	423	276	65	Pass
0.1422	401	269	67	Pass
0.1459	386	260	67	Pass
0.1496	365	248	67	Pass
0.1534	352	241	68	Pass
0.1571	337	234	69	Pass
0.1608	329	227	68	Pass
0.1646	315	222	70	Pass
0.1683	297	213	71	Pass
0.1720	277	207	74	Pass
0.1758	266	199	74	Pass
0.1795	252	194	76	Pass
0.1832	243	189	77	Pass
0.1870	232	184	79	Pass
0.1907	218	173	79	Pass
0.1944	209	165	78	Pass
0.1981	196	158	80	Pass
0.2019	190	157	82	Pass
0.2056	176	150	85	Pass
0.2093	171	141	82	Pass
0.2131	164	135	82	Pass

0.2168	159	134	84	Pass
0.2205	153	128	83	Pass
0.2243	145	124	85	Pass
0.2280	141	121	85	Pass
0.2317	139	115	82	Pass
0.2355	136	113	83	Pass
0.2392	130	107	82	Pass
0.2429	126	97	76	Pass
0.2467	124	93	75	Pass
0.2504	118	90	76	Pass
0.2541	116	87	75	Pass
0.2579	112	84	75	Pass
0.2616	107	82	76	Pass
0.2653	104	78	75	Pass
0.2690	104	72	69	Pass
0.2728	102	68	66	Pass
0.2765	97	65	67	Pass
0.2802	93	60	64	Pass
0.2840	92	60	65	Pass
0.2877	89	58	65	Pass
0.2914	87	57	65	Pass
0.2952	82	54	65	Pass
0.2989	77	54	70	Pass
0.3026	75	53	70	Pass
0.3064	73	52	71	Pass
0.3101	66	49	74	Pass
0.3138	64	46	71	Pass
0.3176	60	44	73	Pass
0.3213	58	43	74	Pass
0.3250	57	42	73	Pass
0.3287	56	41	73	Pass
0.3325	55	40	72	Pass
0.3362	49	38	77	Pass
0.3399	44	37	84	Pass
0.3437	42	36	85	Pass
0.3474	41	36	87	Pass
0.3511	39	36	92	Pass
0.3549	37	35	94	Pass
0.3586	35	34	97	Pass
0.3623	32	32	100	Pass
0.3661	32	31	96	Pass
0.3698	32	30	93	Pass
0.3735	31	29	93	Pass
0.3773	29	29	100	Pass
0.3810	29	29	100	Pass
0.3847	29	28	96	Pass
0.3885	27	28	103	Pass

Water Quality

Drawdown Time Results

Pond: Surface BMP-9

Days	Stage(feet)	Percent of Total Run Time
1	1.912	N/A
2	1.912	N/A
3	1.912	N/A
4	1.912	N/A
5	1.912	N/A

Maximum Stage: 1.912 Drawdown Time: Less than 1 day

Rational Method

Data for Rational Method is not available.

Model Default Modifications

Total of 0 changes have been made.

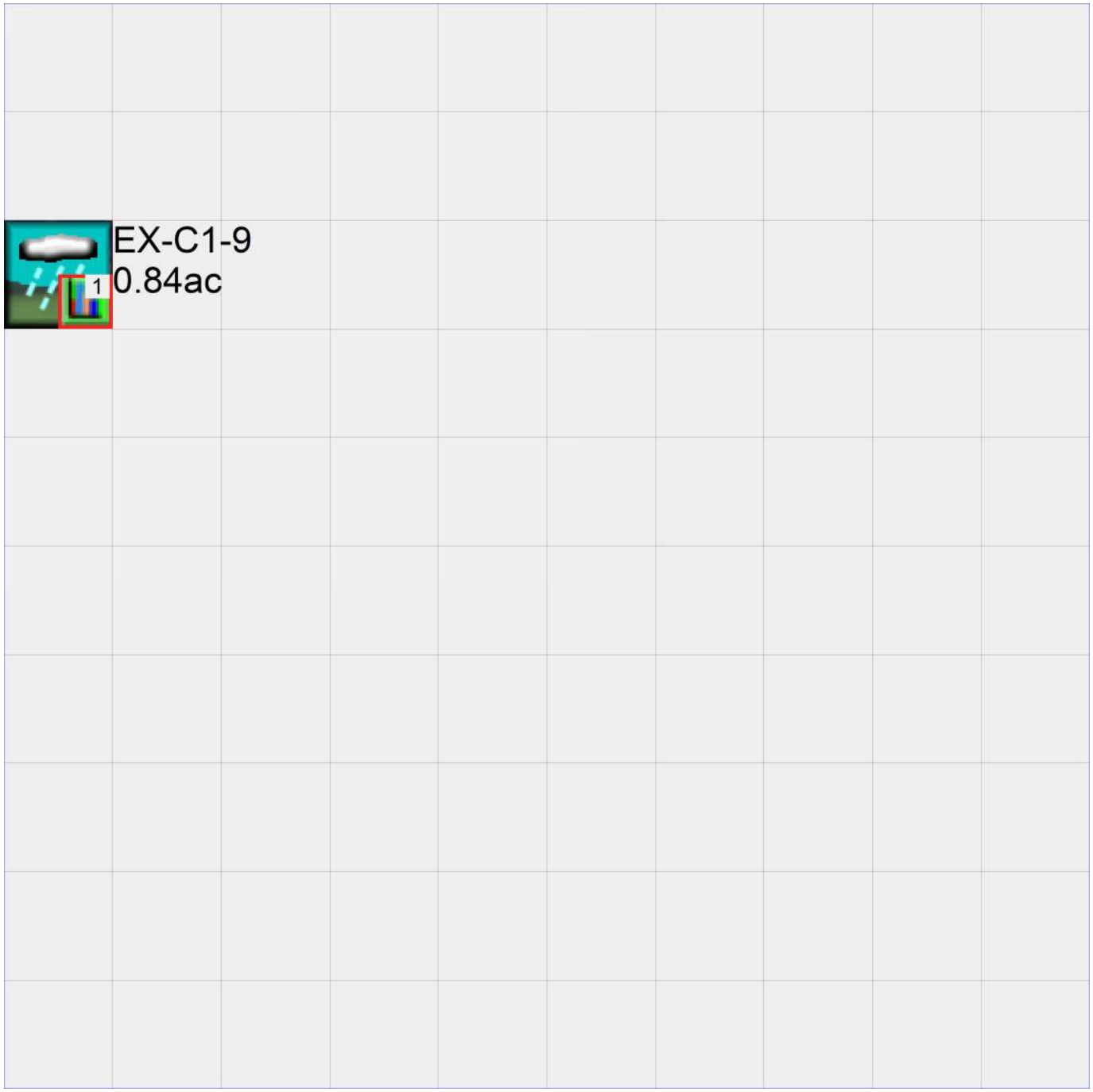
PERLND Changes

No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1949 10 01        END    2011 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   2019-02-27 BMP9 POC-C.wdm
MESSU       25   Pre2019-02-27 BMP9 POC-C.MES
            27   Pre2019-02-27 BMP9 POC-C.L61
            28   Pre2019-02-27 BMP9 POC-C.L62
            30   POC2019-02-27 BMP9 POC-C1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      38
      PERLND      39
      PERLND      40
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        EX-C1-9                    MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                       in  out           ***
   38     C/D,Shrub,Mod(5-10%)    1    1    1    1   27    0
   39     C/D,Shrub,St(10-20%)    1    1    1    1   27    0
   40     C/D,Shrub,Very(>20%)    1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   38         0    0    1    0    0    0    0    0    0    0    0    0
   39         0    0    1    0    0    0    0    0    0    0    0    0
   40         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY
```

```
  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   38         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   39         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   40         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   38         0    0    0    1    0    0    0    0    1    0    0
   39         0    0    0    1    0    0    0    0    1    0    0
   40         0    0    0    1    0    0    0    0    1    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   38              0       4.5      0.04       350       0.1         2      0.95
   39              0       4.2      0.03       300      0.15         2      0.95
   40              0         4     0.025       200      0.25         2      0.95
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3          ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   38             40        35         3         2      0.15      0.15         0
   39             40        35         3         2      0.15      0.15         0
   40             40        35         3         2      0.15      0.15         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   38              0       0.7       0.3       1.2      0.45         0
   39              0       0.5       0.3       0.8       0.4         0
   40              0       0.4       0.3       0.4      0.35         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3          ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   38       0.5  0.5  0.5  0.6 0.65 0.65 0.65 0.65 0.65 0.65 0.55  0.5
   39       0.5  0.5  0.5  0.6 0.65 0.65 0.65 0.65 0.65 0.65 0.55  0.5
   40       0.5  0.5  0.5  0.6 0.65 0.65 0.65 0.65 0.65 0.65 0.55  0.5
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3          ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   38      0.13 0.13 0.13 0.14 0.15 0.15 0.15 0.15 0.15 0.15 0.14 0.13
   39      0.13 0.13 0.13 0.14 0.15 0.15 0.15 0.15 0.15 0.15 0.14 0.13
   40      0.13 0.13 0.13 0.14 0.15 0.15 0.15 0.15 0.15 0.15 0.14 0.13
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   38              0         0      0.01         0       0.5       0.3      0.01
   39              0         0      0.01         0       0.5       0.3      0.01
   40              0         0      0.01         0       0.5       0.3      0.01
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
  END GEN-INFO
```

```
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
EX-C1-9***
PERLND  38                       0.352     COPY   501     12
PERLND  38                       0.352     COPY   501     13
PERLND  39                       0.328     COPY   501     12
PERLND  39                       0.328     COPY   501     13
PERLND  40                        0.16     COPY   501     12
PERLND  40                        0.16     COPY   501     13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<----------------><---> User T-series  Engl Metr LKFG            ***
                                        in  out                             ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
```

```
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                    ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
           FG FG FG FG  possible  exit  *** possible  exit      possible  exit
            *  *  *  *    *  *  *  *  *       *  *  *  *  *        ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                       ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1             PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1             IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1             PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1             IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1949 10 01        END    2011 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   2019-02-27 BMP9 POC-C.wdm
MESSU       25   Mit2019-02-27 BMP9 POC-C.MES
            27   Mit2019-02-27 BMP9 POC-C.L61
            28   Mit2019-02-27 BMP9 POC-C.L62
            30   POC2019-02-27 BMP9 POC-C1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      PERLND      45
      IMPLND      14
      GENER        2
      RCHRES       1
      RCHRES       2
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Surface BMP-9               MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
    2        24
  END OPCODE
  PARM
    #    #         K ***
    2             0.
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   45     C/D,Urban,Flat(0-5%)    1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   45         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY
```

```
  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   45         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   45         0    0    0    1    0    0    0    0    1    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   45              0       4.6      0.04       400      0.05         3     0.995
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   45             40        35         3         2      0.45      0.15         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   45              0       0.7      0.25         1       0.4         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   45       0.5  0.5  0.5  0.6 0.65 0.65 0.65 0.65 0.65 0.65 0.55  0.5
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   45      0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   45              0         0      0.01         0       3.5       1.7       0.1
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                      in  out           ***
   14     Parking,Flat(0-5%)      1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
   14         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
   14         0    0    4    0    0    0    1    9
  END PRINT-INFO
```

```
  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
   14         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
   14           100      0.05       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
   14              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
   14             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
PD-C1-9***
PERLND  45                       0.168     RCHRES   1      2
PERLND  45                       0.168     RCHRES   1      3
IMPLND  14                       0.672     RCHRES   1      5

******Routing******
PERLND  45                       0.168     COPY     1     12
IMPLND  14                       0.672     COPY     1     15
PERLND  45                       0.168     COPY     1     13
RCHRES   1                           1     RCHRES   2      8
RCHRES   2                           1     COPY   501     16
RCHRES   1                           1     COPY   501     17
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1
GENER    2 OUTPUT TIMSER      .0011111     RCHRES   1     EXTNL  OUTDGT 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<----------------><---> User T-series  Engl Metr LKFG             ***
                                        in  out                             ***
    1     Surface BMP-9           3    1    1    1   28    0    1
    2     BMP-9                   1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
    2         1    0    0    0    0    0    0    0    0    0
```

```
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
    2         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                    ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
           FG FG FG FG  possible  exit  *** possible  exit      possible  exit
            *  *  *  *    *  *  *  *  *      *  *  *  *  *        ***
    1        0  1  0  0    4  5  6  0  0       0  1  0  0  0       2  1  2  2  2
    2        0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN      DELTH     STCOR      KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->      ***
    1              1      0.01       0.0       0.0       0.5       0.0
    2              2      0.01       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                       ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
         *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <--><--><--><--><--> *** <--><--><--><--><-->
    1           0         4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2           0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
*** User-Defined Variable Quantity Lines
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol2   RCHRES   2 VOL             4
  UVQUAN v2m2   GLOBAL     WORKSP  1        3
  UVQUAN vpo2   GLOBAL     WORKSP  2        3
  UVQUAN v2d2   GENER    2 K       1        3
*** User-Defined Target Variable Names
***                  addr or                       addr or
***                 <------>                      <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m2    1 WORKSP  1         1.0 QUAN
  UVNAME  vpo2    1 WORKSP  2         1.0 QUAN
  UVNAME  v2d2    1 K       1         1.0 QUAN
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER   2                               v2m2           =  3871.
*** Compute remaining available pore space
  GENER   2                               vpo2           =  v2m2
  GENER   2                               vpo2          -=  vol2
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo2 < 0.0) THEN
  GENER   2                               vpo2           =  0.0
END IF
*** Infiltration volume
  GENER   2                               v2d2           =  vpo2
END SPEC-ACTIONS
FTABLES
  FTABLE      2
   62    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
```

```
  0.000000  0.104768  0.000000  0.000000
  0.065934  0.103608  0.000589  0.000000
  0.131868  0.101878  0.001203  0.000000
  0.197802  0.100160  0.001843  0.000000
  0.263736  0.098456  0.002509  0.000000
  0.329670  0.096764  0.003201  0.000000
  0.395604  0.095085  0.003920  0.000000
  0.461538  0.093419  0.004665  0.000000
  0.527473  0.091766  0.005438  0.000000
  0.593407  0.090125  0.006238  0.000000
  0.659341  0.088497  0.007067  0.000000
  0.725275  0.086882  0.007923  0.000000
  0.791209  0.085280  0.008808  0.000000
  0.857143  0.083691  0.009722  0.000000
  0.923077  0.082114  0.010665  0.000230
  0.989011  0.080550  0.011638  0.001266
  1.054945  0.078999  0.012640  0.001776
  1.120879  0.077460  0.013673  0.002031
  1.186813  0.075935  0.014736  0.002168
  1.252747  0.074422  0.015830  0.002499
  1.318681  0.072922  0.016956  0.002791
  1.384615  0.071434  0.018113  0.003055
  1.450549  0.069960  0.019301  0.003298
  1.516484  0.068498  0.020522  0.003524
  1.582418  0.067049  0.021775  0.003737
  1.648352  0.065613  0.023061  0.003938
  1.714286  0.064190  0.024381  0.004129
  1.780220  0.062779  0.025733  0.004312
  1.846154  0.061381  0.027120  0.004488
  1.912088  0.059996  0.028541  0.004657
  1.978022  0.058624  0.029996  0.004821
  2.043956  0.057264  0.031486  0.004979
  2.109890  0.055917  0.033011  0.005133
  2.175824  0.054583  0.034572  0.005283
  2.241758  0.053262  0.036168  0.005430
  2.307692  0.051954  0.037800  0.005576
  2.373626  0.050658  0.039469  0.005727
  2.439560  0.049375  0.041175  0.005961
  2.505495  0.048105  0.042918  0.006087
  2.571429  0.046847  0.044698  0.006210
  2.637363  0.045603  0.046516  0.006331
  2.703297  0.044371  0.048372  0.006450
  2.769231  0.043152  0.050266  0.006566
  2.835165  0.041946  0.052199  0.006681
  2.901099  0.040752  0.054172  0.006794
  2.967033  0.039572  0.056183  0.006904
  3.032967  0.038404  0.058366  0.007013
  3.098901  0.037248  0.060592  0.007121
  3.164835  0.036106  0.062860  0.007226
  3.230769  0.034976  0.065172  0.007331
  3.296703  0.033860  0.067527  0.007433
  3.362637  0.032755  0.069927  0.007535
  3.428571  0.031664  0.072370  0.007635
  3.494505  0.030586  0.074859  0.007734
  3.560440  0.029520  0.077392  0.007831
  3.626374  0.028467  0.079971  0.007927
  3.692308  0.027427  0.082596  0.008022
  3.758242  0.026399  0.085267  0.008116
  3.824176  0.025385  0.087984  0.008209
  3.890110  0.024383  0.090749  0.008301
  3.956044  0.023394  0.093560  0.008392
  4.000000  0.022417  0.200467  0.008452
  END FTABLE  2
  FTABLE      1
   32    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.022417  0.000000  0.000000  0.000000  0.000000
```

```
  0.065934  0.106519  0.006966  0.000000  0.059117  0.000000
  0.131868  0.108284  0.014047  0.000000  0.060388  0.000000
  0.197802  0.110060  0.021245  0.000000  0.061659  0.000000
  0.263736  0.111850  0.028561  0.000000  0.062931  0.000000
  0.329670  0.113652  0.035995  0.000000  0.064202  0.000000
  0.395604  0.115468  0.043548  0.000000  0.065473  0.000000
  0.461538  0.117296  0.051222  0.000000  0.066745  0.000000
  0.527473  0.119136  0.059016  0.001124  0.068016  0.000000
  0.593407  0.120990  0.066933  0.002073  0.069287  0.000000
  0.659341  0.122856  0.074971  0.002708  0.070559  0.000000
  0.725275  0.124735  0.083134  0.003220  0.071830  0.000000
  0.791209  0.126627  0.091420  0.003661  0.073101  0.000000
  0.857143  0.128532  0.099832  0.004054  0.074373  0.000000
  0.923077  0.130449  0.108370  0.004413  0.075644  0.000000
  0.989011  0.132379  0.117035  0.004744  0.076915  0.000000
  1.054945  0.134322  0.125827  0.005054  0.078187  0.000000
  1.120879  0.136278  0.134748  0.005346  0.079458  0.000000
  1.186813  0.138246  0.143798  0.005622  0.080729  0.000000
  1.252747  0.140227  0.152979  0.005886  0.082001  0.000000
  1.318681  0.142221  0.162290  0.006138  0.083272  0.000000
  1.384615  0.144228  0.171734  0.006381  0.084543  0.000000
  1.450549  0.146248  0.181310  0.006614  0.085815  0.000000
  1.516484  0.148280  0.191019  0.040537  0.087086  0.000000
  1.582418  0.150325  0.200864  0.383079  0.088357  0.000000
  1.648352  0.152383  0.210843  0.911395  0.089629  0.000000
  1.714286  0.154454  0.220958  1.560398  0.090900  0.000000
  1.780220  0.156537  0.231211  2.284113  0.092171  0.000000
  1.846154  0.158634  0.241601  3.036755  0.093442  0.000000
  1.912088  0.160743  0.252130  3.771507  0.094714  0.000000
  1.978022  0.162864  0.262798  4.443846  0.095985  0.000000
  2.000000  0.163574  0.266386  5.017137  0.096409  0.000000
  END FTABLE  1
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP
WDM     22 IRRG     ENGL    0.7       SAME PERLND  45     EXTNL  SURLI
WDM      2 PREC     ENGL    1              RCHRES   1     EXTNL  PREC
WDM      1 EVAP     ENGL    0.5            RCHRES   1     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   2     EXTNL  POTEV

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   2 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   2 HYDR   STAGE  1 1        1      WDM   1001 STAG     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1002 STAG     ENGL      REPL
RCHRES   1 HYDR   O      1 1        1      WDM   1003 FLOW     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>             <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3
```

```
  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK        8
RCHRES     OFLOW  OVOL   2                RCHRES         INFLOW IVOL
  END MASS-LINK    8

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

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SMRHM

PROJECT REPORT

General Model Information

Project Name:	2018-06-20 BMP-11-12A-12B-13 POC-C
Site Name:	Costco Murrietta
Site Address:	215 & Clinton Keith Rd
City:	Murrieta
Report Date:	6/20/2018
Gage:	Wildomar / North Murrieta
Data Start:	1949/10/01
Data End:	2011/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2018/01/19

POC Thresholds

Low Flow Threshold for POC2:	10 Percent of the 2 Year
High Flow Threshold for POC2:	10 Year
Low Flow Threshold for POC3:	10 Percent of the 2 Year
High Flow Threshold for POC3:	10 Year
Low Flow Threshold for POC4:	10 Percent of the 2 Year
High Flow Threshold for POC4:	10 Year
Low Flow Threshold for POC5:	10 Percent of the 2 Year
High Flow Threshold for POC5:	10 Year

Landuse Basin Data
Predeveloped Land Use

EX-C1-11

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Shrub,Mod(5-10%)	0.319
C D,Shrub,St(10-20%)	0.296
C D,Shrub,Very(>20%)	0.144
Pervious Total	0.759

Impervious Land Use	acre
Impervious Total	0
Basin Total	0.759

Element Flows To:

Surface	Interflow	Groundwater

EX-C1-13

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Shrub,Mod(5-10%)	0.1
C D,Shrub,St(10-20%)	0.093
C D,Shrub,Very(>20%)	0.045
Pervious Total	0.238

Impervious Land Use	acre
Impervious Total	0
Basin Total	0.238

Element Flows To:

Surface	Interflow	Groundwater

EX-C1-12A

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Shrub,Mod(5-10%)	0.307
C D,Shrub,St(10-20%)	0.286
C D,Shrub,Very(>20%)	0.139
Pervious Total	0.732
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.732

Element Flows To:

Surface	Interflow	Groundwater

EX-C1-12B

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Shrub,Mod(5-10%)	0.093
C D,Shrub,St(10-20%)	0.086
C D,Shrub,Very(>20%)	0.042
Pervious Total	0.221

Impervious Land Use	acre
Impervious Total	0
Basin Total	0.221

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

PD-C1-12B

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	0.044
Pervious Total	0.044

Impervious Land Use	acre
Parking,Flat(0-5%)	0.177
Impervious Total	0.177
Basin Total	0.221

Element Flows To:

Surface	Interflow	Groundwater
Surface BMP-12B	Surface BMP-12B	

PD-C1-13

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	0.071
Pervious Total	0.071

Impervious Land Use	acre
Parking,Flat(0-5%)	0.167
Impervious Total	0.167
Basin Total	0.238

Element Flows To:

Surface	Interflow	Groundwater
Surface BMP-13	Surface BMP-13	

PD-C1-12A

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	0.183
Pervious Total	0.183

Impervious Land Use	acre
Parking,Flat(0-5%)	0.549
Impervious Total	0.549
Basin Total	0.732

Element Flows To:

Surface	Interflow	Groundwater
Surface BMP-12A	Surface BMP-12A	

PD-C1-11

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	0.152
Pervious Total	0.152

Impervious Land Use	acre
Parking,Flat(0-5%)	0.607
Impervious Total	0.607
Basin Total	0.759

Element Flows To:

Surface	Interflow	Groundwater
Surface BMP-11	Surface BMP-11	

Routing Elements
Predeveloped Routing

Mitigated Routing

BMP-11

Bottom Length:	80.00 ft.
Bottom Width:	15.00 ft.
Material thickness of first layer:	3
Material type for first layer:	Amended 2.5 in/hr
Material thickness of second layer:	1.5
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	0.6
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	30.376
Total Outflow (ac-ft.):	32.427
Percent Through Underdrain:	93.67
Discharge Structure	
Riser Height:	0.8 ft.
Riser Diameter:	18 in.
Element Flows To:	
Outlet 1	Outlet 2

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.1358	0.0000	0.0000	0.0000
0.0604	0.1350	0.0007	0.0000	0.0000
0.1209	0.1331	0.0013	0.0000	0.0000
0.1813	0.1313	0.0021	0.0000	0.0000
0.2418	0.1295	0.0028	0.0000	0.0000
0.3022	0.1277	0.0036	0.0000	0.0000
0.3626	0.1259	0.0044	0.0000	0.0000
0.4231	0.1241	0.0052	0.0000	0.0000
0.4835	0.1223	0.0060	0.0000	0.0000
0.5440	0.1205	0.0069	0.0000	0.0000
0.6044	0.1188	0.0078	0.0000	0.0000
0.6648	0.1170	0.0087	0.0000	0.0000
0.7253	0.1153	0.0097	0.0000	0.0000
0.7857	0.1136	0.0106	0.0000	0.0000
0.8462	0.1118	0.0116	0.0000	0.0000
0.9066	0.1101	0.0127	0.0006	0.0000
0.9670	0.1084	0.0137	0.0018	0.0000
1.0275	0.1068	0.0148	0.0021	0.0000
1.0879	0.1051	0.0160	0.0023	0.0000
1.1484	0.1034	0.0171	0.0025	0.0000
1.2088	0.1018	0.0183	0.0030	0.0000
1.2692	0.1001	0.0195	0.0035	0.0000
1.3297	0.0985	0.0208	0.0035	0.0000
1.3901	0.0969	0.0220	0.0039	0.0000
1.4505	0.0953	0.0233	0.0042	0.0000
1.5110	0.0937	0.0247	0.0046	0.0000
1.5714	0.0921	0.0260	0.0049	0.0000
1.6319	0.0905	0.0274	0.0052	0.0000
1.6923	0.0890	0.0289	0.0054	0.0000

1.7527	0.0874	0.0303	0.0057	0.0000
1.8132	0.0859	0.0318	0.0060	0.0000
1.8736	0.0843	0.0333	0.0062	0.0000
1.9341	0.0828	0.0349	0.0064	0.0000
1.9945	0.0813	0.0365	0.0067	0.0000
2.0549	0.0798	0.0381	0.0069	0.0000
2.1154	0.0783	0.0398	0.0071	0.0000
2.1758	0.0768	0.0415	0.0073	0.0000
2.2363	0.0754	0.0432	0.0075	0.0000
2.2967	0.0739	0.0449	0.0077	0.0000
2.3571	0.0725	0.0467	0.0079	0.0000
2.4176	0.0710	0.0486	0.0080	0.0000
2.4780	0.0696	0.0504	0.0082	0.0000
2.5385	0.0682	0.0523	0.0084	0.0000
2.5989	0.0668	0.0543	0.0086	0.0000
2.6593	0.0654	0.0562	0.0087	0.0000
2.7198	0.0640	0.0582	0.0089	0.0000
2.7802	0.0626	0.0603	0.0091	0.0000
2.8407	0.0613	0.0624	0.0092	0.0000
2.9011	0.0599	0.0645	0.0094	0.0000
2.9615	0.0586	0.0666	0.0095	0.0000
3.0220	0.0573	0.0690	0.0097	0.0000
3.0824	0.0559	0.0713	0.0098	0.0000
3.1429	0.0546	0.0737	0.0100	0.0000
3.2033	0.0533	0.0762	0.0101	0.0000
3.2637	0.0521	0.0787	0.0103	0.0000
3.3242	0.0508	0.0812	0.0104	0.0000
3.3846	0.0495	0.0838	0.0106	0.0000
3.4451	0.0483	0.0864	0.0107	0.0000
3.5055	0.0470	0.0891	0.0110	0.0000
3.5659	0.0458	0.0917	0.0111	0.0000
3.6264	0.0446	0.0945	0.0112	0.0000
3.6868	0.0434	0.0973	0.0114	0.0000
3.7473	0.0422	0.1001	0.0115	0.0000
3.8077	0.0410	0.1030	0.0116	0.0000
3.8681	0.0398	0.1059	0.0117	0.0000
3.9286	0.0386	0.1088	0.0119	0.0000
3.9890	0.0375	0.1118	0.0120	0.0000
4.0495	0.0363	0.1149	0.0121	0.0000
4.1099	0.0352	0.1180	0.0122	0.0000
4.1703	0.0341	0.1211	0.0123	0.0000
4.2308	0.0330	0.1243	0.0124	0.0000
4.2912	0.0319	0.1275	0.0126	0.0000
4.3516	0.0308	0.1308	0.0127	0.0000
4.4121	0.0297	0.1341	0.0128	0.0000
4.4725	0.0286	0.1375	0.0129	0.0000
4.5000	0.0275	0.1390	0.0130	0.0000

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.5000	0.1358	0.1390	0.0000	0.0725	0.0000
4.5604	0.1377	0.1473	0.0000	0.0725	0.0000
4.6209	0.1395	0.1557	0.0000	0.0739	0.0000
4.6813	0.1414	0.1641	0.0000	0.0754	0.0000
4.7418	0.1433	0.1727	0.0000	0.0768	0.0000
4.8022	0.1452	0.1815	0.0000	0.0782	0.0000
4.8626	0.1471	0.1903	0.0000	0.0797	0.0000
4.9231	0.1491	0.1993	0.0000	0.0811	0.0000

4.9835	0.1510	0.2083	0.0000	0.0825	0.0000
5.0440	0.1529	0.2175	0.0000	0.0840	0.0000
5.1044	0.1549	0.2268	0.0000	0.0854	0.0000
5.1648	0.1569	0.2362	0.0000	0.0868	0.0000
5.2253	0.1588	0.2458	0.0000	0.0883	0.0000
5.2857	0.1608	0.2554	0.0000	0.0897	0.0000
5.3462	0.1628	0.2652	0.1577	0.0911	0.0000
5.4066	0.1648	0.2751	0.5525	0.0926	0.0000
5.4670	0.1668	0.2851	1.0778	0.0940	0.0000
5.5000	0.1680	0.2906	1.6931	0.0948	0.0000

Surface BMP-11

Element Flows To:

Outlet 1	Outlet 2
	BMP-11

BMP-12A

Bottom Length:	60.50 ft.
Bottom Width:	15.00 ft.
Material thickness of first layer:	3
Material type for first layer:	Amended 2.5 in/hr
Material thickness of second layer:	2
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	0.625
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	27.668
Total Outflow (ac-ft.):	29.603
Percent Through Underdrain:	93.46
Discharge Structure	
Riser Height:	0.8 ft.
Riser Diameter:	18 in.
Element Flows To:	
Outlet 1	Outlet 2

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.1038	0.0000	0.0000	0.0000
0.0659	0.1026	0.0005	0.0000	0.0000
0.1319	0.1012	0.0011	0.0000	0.0000
0.1978	0.0997	0.0017	0.0000	0.0000
0.2637	0.0983	0.0023	0.0000	0.0000
0.3297	0.0969	0.0029	0.0000	0.0000
0.3956	0.0955	0.0036	0.0000	0.0000
0.4615	0.0941	0.0042	0.0000	0.0000
0.5275	0.0927	0.0049	0.0000	0.0000
0.5934	0.0913	0.0056	0.0000	0.0000
0.6593	0.0900	0.0063	0.0000	0.0000
0.7253	0.0886	0.0071	0.0000	0.0000
0.7912	0.0872	0.0079	0.0000	0.0000
0.8571	0.0859	0.0086	0.0000	0.0000
0.9231	0.0846	0.0095	0.0000	0.0000
0.9890	0.0833	0.0103	0.0015	0.0000
1.0549	0.0819	0.0111	0.0017	0.0000
1.1209	0.0806	0.0120	0.0018	0.0000
1.1868	0.0794	0.0129	0.0025	0.0000
1.2527	0.0781	0.0139	0.0027	0.0000
1.3187	0.0768	0.0148	0.0032	0.0000
1.3846	0.0755	0.0158	0.0033	0.0000
1.4505	0.0743	0.0168	0.0038	0.0000
1.5165	0.0730	0.0178	0.0043	0.0000
1.5824	0.0718	0.0188	0.0047	0.0000
1.6484	0.0706	0.0199	0.0051	0.0000
1.7143	0.0694	0.0210	0.0051	0.0000
1.7802	0.0682	0.0221	0.0055	0.0000
1.8462	0.0670	0.0233	0.0058	0.0000
1.9121	0.0658	0.0244	0.0061	0.0000
1.9780	0.0646	0.0256	0.0064	0.0000

2.0440	0.0634	0.0269	0.0067	0.0000
2.1099	0.0623	0.0281	0.0070	0.0000
2.1758	0.0611	0.0294	0.0072	0.0000
2.2418	0.0600	0.0307	0.0075	0.0000
2.3077	0.0589	0.0320	0.0077	0.0000
2.3736	0.0577	0.0334	0.0080	0.0000
2.4396	0.0566	0.0348	0.0082	0.0000
2.5055	0.0555	0.0362	0.0084	0.0000
2.5714	0.0544	0.0376	0.0086	0.0000
2.6374	0.0534	0.0391	0.0089	0.0000
2.7033	0.0523	0.0406	0.0091	0.0000
2.7692	0.0512	0.0421	0.0093	0.0000
2.8352	0.0502	0.0437	0.0095	0.0000
2.9011	0.0491	0.0453	0.0097	0.0000
2.9670	0.0481	0.0469	0.0099	0.0000
3.0330	0.0471	0.0486	0.0100	0.0000
3.0989	0.0461	0.0504	0.0102	0.0000
3.1648	0.0451	0.0522	0.0104	0.0000
3.2308	0.0441	0.0541	0.0106	0.0000
3.2967	0.0431	0.0560	0.0108	0.0000
3.3626	0.0421	0.0579	0.0109	0.0000
3.4286	0.0411	0.0598	0.0111	0.0000
3.4945	0.0402	0.0618	0.0113	0.0000
3.5604	0.0392	0.0638	0.0114	0.0000
3.6264	0.0383	0.0659	0.0116	0.0000
3.6923	0.0374	0.0680	0.0118	0.0000
3.7582	0.0365	0.0701	0.0119	0.0000
3.8242	0.0355	0.0722	0.0121	0.0000
3.8901	0.0346	0.0744	0.0122	0.0000
3.9560	0.0338	0.0766	0.0124	0.0000
4.0220	0.0329	0.0789	0.0125	0.0000
4.0879	0.0320	0.0812	0.0127	0.0000
4.1538	0.0311	0.0835	0.0128	0.0000
4.2198	0.0303	0.0859	0.0130	0.0000
4.2857	0.0295	0.0883	0.0131	0.0000
4.3516	0.0286	0.0908	0.0133	0.0000
4.4176	0.0278	0.0932	0.0134	0.0000
4.4835	0.0270	0.0957	0.0135	0.0000
4.5495	0.0262	0.0983	0.0137	0.0000
4.6154	0.0254	0.1009	0.0138	0.0000
4.6813	0.0246	0.1035	0.0141	0.0000
4.7473	0.0238	0.1062	0.0142	0.0000
4.8132	0.0231	0.1089	0.0143	0.0000
4.8791	0.0223	0.1117	0.0145	0.0000
4.9451	0.0216	0.1144	0.0146	0.0000
5.0000	0.0208	0.1168	0.0147	0.0000

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
5.0000	0.1038	0.1168	0.0000	0.0549	0.0000
5.0659	0.1053	0.1237	0.0000	0.0549	0.0000
5.1319	0.1068	0.1307	0.0000	0.0561	0.0000
5.1978	0.1082	0.1378	0.0000	0.0573	0.0000
5.2637	0.1097	0.1450	0.0000	0.0585	0.0000
5.3297	0.1112	0.1522	0.0000	0.0597	0.0000
5.3956	0.1127	0.1596	0.0000	0.0608	0.0000
5.4615	0.1143	0.1671	0.0000	0.0620	0.0000
5.5275	0.1158	0.1747	0.0000	0.0632	0.0000

5.5934	0.1173	0.1824	0.0000	0.0644	0.0000
5.6593	0.1189	0.1902	0.0000	0.0656	0.0000
5.7253	0.1204	0.1981	0.0000	0.0668	0.0000
5.7912	0.1220	0.2060	0.0000	0.0679	0.0000
5.8571	0.1236	0.2141	0.2173	0.0691	0.0000
5.9231	0.1252	0.2223	0.6847	0.0703	0.0000
5.9890	0.1268	0.2306	1.2929	0.0715	0.0000
6.0000	0.1270	0.2320	1.9931	0.0717	0.0000

Surface BMP-12A

Element Flows To:

Outlet 1	Outlet 2
	BMP-12A

BMP-13

Bottom Length:	44.00 ft.
Bottom Width:	5.00 ft.
Material thickness of first layer:	3
Material type for first layer:	Amended 2.5 in/hr
Material thickness of second layer:	1.5
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	0.4
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	10.072
Total Outflow (ac-ft.):	10.316
Percent Through Underdrain:	97.64
Discharge Structure	
Riser Height:	0.75 ft.
Riser Diameter:	18 in.
Element Flows To:	
Outlet 1	Outlet 2

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0753	0.0000	0.0000	0.0000
0.0599	0.0751	0.0001	0.0000	0.0000
0.1198	0.0738	0.0003	0.0000	0.0000
0.1797	0.0725	0.0004	0.0000	0.0000
0.2396	0.0712	0.0006	0.0000	0.0000
0.2995	0.0699	0.0008	0.0000	0.0000
0.3593	0.0686	0.0009	0.0000	0.0000
0.4192	0.0673	0.0011	0.0000	0.0000
0.4791	0.0661	0.0014	0.0000	0.0000
0.5390	0.0648	0.0016	0.0000	0.0000
0.5989	0.0636	0.0019	0.0000	0.0000
0.6588	0.0623	0.0021	0.0000	0.0000
0.7187	0.0611	0.0024	0.0000	0.0000
0.7786	0.0599	0.0027	0.0000	0.0000
0.8385	0.0587	0.0030	0.0000	0.0000
0.8984	0.0575	0.0033	0.0002	0.0000
0.9582	0.0564	0.0037	0.0003	0.0000
1.0181	0.0552	0.0040	0.0004	0.0000
1.0780	0.0540	0.0044	0.0004	0.0000
1.1379	0.0529	0.0048	0.0005	0.0000
1.1978	0.0518	0.0052	0.0006	0.0000
1.2577	0.0506	0.0056	0.0007	0.0000
1.3176	0.0495	0.0061	0.0008	0.0000
1.3775	0.0484	0.0065	0.0010	0.0000
1.4374	0.0473	0.0070	0.0010	0.0000
1.4973	0.0462	0.0075	0.0011	0.0000
1.5571	0.0452	0.0080	0.0013	0.0000
1.6170	0.0441	0.0086	0.0014	0.0000
1.6769	0.0431	0.0091	0.0015	0.0000
1.7368	0.0420	0.0097	0.0015	0.0000
1.7967	0.0410	0.0103	0.0017	0.0000

1.8566	0.0400	0.0109	0.0019	0.0000
1.9165	0.0390	0.0116	0.0020	0.0000
1.9764	0.0380	0.0122	0.0021	0.0000
2.0363	0.0370	0.0129	0.0023	0.0000
2.0962	0.0360	0.0136	0.0024	0.0000
2.1560	0.0350	0.0143	0.0025	0.0000
2.2159	0.0341	0.0151	0.0026	0.0000
2.2758	0.0331	0.0158	0.0027	0.0000
2.3357	0.0322	0.0166	0.0028	0.0000
2.3956	0.0313	0.0174	0.0029	0.0000
2.4555	0.0304	0.0182	0.0030	0.0000
2.5154	0.0295	0.0191	0.0031	0.0000
2.5753	0.0286	0.0200	0.0032	0.0000
2.6352	0.0277	0.0209	0.0033	0.0000
2.6951	0.0268	0.0218	0.0034	0.0000
2.7549	0.0260	0.0227	0.0035	0.0000
2.8148	0.0251	0.0237	0.0036	0.0000
2.8747	0.0243	0.0247	0.0036	0.0000
2.9346	0.0234	0.0257	0.0037	0.0000
2.9945	0.0226	0.0268	0.0038	0.0000
3.0544	0.0218	0.0279	0.0039	0.0000
3.1143	0.0210	0.0291	0.0039	0.0000
3.1742	0.0202	0.0303	0.0040	0.0000
3.2341	0.0195	0.0315	0.0041	0.0000
3.2940	0.0187	0.0327	0.0041	0.0000
3.3538	0.0179	0.0340	0.0042	0.0000
3.4137	0.0172	0.0353	0.0043	0.0000
3.4736	0.0165	0.0366	0.0043	0.0000
3.5335	0.0157	0.0380	0.0044	0.0000
3.5934	0.0150	0.0394	0.0045	0.0000
3.6533	0.0143	0.0408	0.0045	0.0000
3.7132	0.0136	0.0422	0.0046	0.0000
3.7731	0.0129	0.0437	0.0047	0.0000
3.8330	0.0123	0.0452	0.0047	0.0000
3.8929	0.0116	0.0467	0.0048	0.0000
3.9527	0.0110	0.0483	0.0049	0.0000
4.0126	0.0103	0.0499	0.0050	0.0000
4.0725	0.0097	0.0515	0.0050	0.0000
4.1324	0.0091	0.0532	0.0051	0.0000
4.1923	0.0085	0.0549	0.0051	0.0000
4.2522	0.0079	0.0566	0.0052	0.0000
4.3121	0.0073	0.0583	0.0052	0.0000
4.3720	0.0067	0.0601	0.0053	0.0000
4.4319	0.0061	0.0619	0.0053	0.0000
4.4918	0.0056	0.0638	0.0054	0.0000
4.5000	0.0051	0.0641	0.0054	0.0000

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.5000	0.0753	0.0641	0.0000	0.0133	0.0000
4.5599	0.0766	0.0686	0.0000	0.0133	0.0000
4.6198	0.0780	0.0732	0.0000	0.0136	0.0000
4.6797	0.0793	0.0779	0.0000	0.0138	0.0000
4.7396	0.0807	0.0827	0.0000	0.0141	0.0000
4.7995	0.0821	0.0876	0.0000	0.0143	0.0000
4.8593	0.0835	0.0926	0.0000	0.0146	0.0000
4.9192	0.0849	0.0976	0.0000	0.0149	0.0000
4.9791	0.0863	0.1027	0.0000	0.0151	0.0000

5.0390	0.0877	0.1079	0.0000	0.0154	0.0000
5.0989	0.0891	0.1132	0.0000	0.0156	0.0000
5.1588	0.0906	0.1186	0.0000	0.0159	0.0000
5.2187	0.0920	0.1241	0.0000	0.0162	0.0000
5.2786	0.0935	0.1296	0.0769	0.0164	0.0000
5.3385	0.0950	0.1353	0.4180	0.0167	0.0000
5.3984	0.0964	0.1410	0.9041	0.0169	0.0000
5.4500	0.0977	0.1460	1.4897	0.0172	0.0000

Surface BMP-13

Element Flows To:

Outlet 1	Outlet 2
	BMP-13

BMP-12B

Bottom Length:	60.00 ft.
Bottom Width:	5.00 ft.
Material thickness of first layer:	3
Material type for first layer:	Amended 2.5 in/hr
Material thickness of second layer:	1.5
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	0.333
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	10.464
Total Outflow (ac-ft.):	10.612
Percent Through Underdrain:	98.61
Discharge Structure	
Riser Height:	0.8 ft.
Riser Diameter:	18 in.
Element Flows To:	
Outlet 1	Outlet 2

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0904	0.0000	0.0000	0.0000
0.0604	0.0897	0.0002	0.0000	0.0000
0.1209	0.0882	0.0004	0.0000	0.0000
0.1813	0.0867	0.0006	0.0000	0.0000
0.2418	0.0852	0.0008	0.0000	0.0000
0.3022	0.0837	0.0010	0.0000	0.0000
0.3626	0.0822	0.0013	0.0000	0.0000
0.4231	0.0808	0.0016	0.0000	0.0000
0.4835	0.0793	0.0019	0.0000	0.0000
0.5440	0.0779	0.0022	0.0000	0.0000
0.6044	0.0765	0.0025	0.0000	0.0000
0.6648	0.0750	0.0029	0.0000	0.0000
0.7253	0.0736	0.0032	0.0000	0.0000
0.7857	0.0723	0.0036	0.0000	0.0000
0.8462	0.0709	0.0041	0.0000	0.0000
0.9066	0.0695	0.0045	0.0002	0.0000
0.9670	0.0681	0.0049	0.0005	0.0000
1.0275	0.0668	0.0054	0.0005	0.0000
1.0879	0.0655	0.0059	0.0006	0.0000
1.1484	0.0641	0.0064	0.0007	0.0000
1.2088	0.0628	0.0070	0.0008	0.0000
1.2692	0.0615	0.0076	0.0009	0.0000
1.3297	0.0602	0.0081	0.0010	0.0000
1.3901	0.0589	0.0087	0.0011	0.0000
1.4505	0.0576	0.0094	0.0012	0.0000
1.5110	0.0564	0.0100	0.0013	0.0000
1.5714	0.0551	0.0107	0.0014	0.0000
1.6319	0.0539	0.0114	0.0015	0.0000
1.6923	0.0527	0.0121	0.0016	0.0000
1.7527	0.0514	0.0129	0.0017	0.0000
1.8132	0.0502	0.0137	0.0018	0.0000

1.8736	0.0490	0.0145	0.0018	0.0000
1.9341	0.0478	0.0153	0.0019	0.0000
1.9945	0.0467	0.0161	0.0020	0.0000
2.0549	0.0455	0.0170	0.0020	0.0000
2.1154	0.0443	0.0179	0.0021	0.0000
2.1758	0.0432	0.0188	0.0022	0.0000
2.2363	0.0421	0.0198	0.0022	0.0000
2.2967	0.0409	0.0208	0.0023	0.0000
2.3571	0.0398	0.0218	0.0024	0.0000
2.4176	0.0387	0.0228	0.0024	0.0000
2.4780	0.0376	0.0239	0.0025	0.0000
2.5385	0.0365	0.0249	0.0025	0.0000
2.5989	0.0355	0.0261	0.0026	0.0000
2.6593	0.0344	0.0272	0.0026	0.0000
2.7198	0.0334	0.0284	0.0027	0.0000
2.7802	0.0323	0.0296	0.0027	0.0000
2.8407	0.0313	0.0308	0.0028	0.0000
2.9011	0.0303	0.0320	0.0028	0.0000
2.9615	0.0293	0.0333	0.0029	0.0000
3.0220	0.0283	0.0347	0.0029	0.0000
3.0824	0.0273	0.0362	0.0030	0.0000
3.1429	0.0263	0.0376	0.0030	0.0000
3.2033	0.0254	0.0391	0.0031	0.0000
3.2637	0.0244	0.0406	0.0031	0.0000
3.3242	0.0235	0.0422	0.0032	0.0000
3.3846	0.0225	0.0438	0.0032	0.0000
3.4451	0.0216	0.0454	0.0033	0.0000
3.5055	0.0207	0.0471	0.0033	0.0000
3.5659	0.0198	0.0488	0.0034	0.0000
3.6264	0.0189	0.0505	0.0034	0.0000
3.6868	0.0180	0.0523	0.0035	0.0000
3.7473	0.0172	0.0541	0.0035	0.0000
3.8077	0.0163	0.0559	0.0035	0.0000
3.8681	0.0155	0.0577	0.0036	0.0000
3.9286	0.0146	0.0596	0.0036	0.0000
3.9890	0.0138	0.0616	0.0037	0.0000
4.0495	0.0130	0.0636	0.0037	0.0000
4.1099	0.0122	0.0656	0.0037	0.0000
4.1703	0.0114	0.0676	0.0038	0.0000
4.2308	0.0106	0.0697	0.0038	0.0000
4.2912	0.0099	0.0718	0.0038	0.0000
4.3516	0.0091	0.0740	0.0039	0.0000
4.4121	0.0084	0.0762	0.0039	0.0000
4.4725	0.0076	0.0784	0.0039	0.0000
4.5000	0.0069	0.0794	0.0040	0.0000

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.5000	0.0904	0.0794	0.0000	0.0181	0.0000
4.5604	0.0919	0.0849	0.0000	0.0181	0.0000
4.6209	0.0934	0.0905	0.0000	0.0185	0.0000
4.6813	0.0950	0.0962	0.0000	0.0188	0.0000
4.7418	0.0965	0.1020	0.0000	0.0192	0.0000
4.8022	0.0981	0.1079	0.0000	0.0196	0.0000
4.8626	0.0997	0.1139	0.0000	0.0199	0.0000
4.9231	0.1013	0.1199	0.0000	0.0203	0.0000
4.9835	0.1029	0.1261	0.0000	0.0206	0.0000
5.0440	0.1045	0.1324	0.0000	0.0210	0.0000

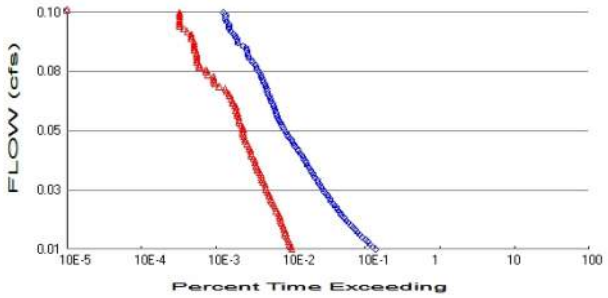
5.1044	0.1061	0.1387	0.0000	0.0214	0.0000
5.1648	0.1077	0.1452	0.0000	0.0217	0.0000
5.2253	0.1094	0.1517	0.0000	0.0221	0.0000
5.2857	0.1110	0.1584	0.0000	0.0224	0.0000
5.3462	0.1127	0.1652	0.1577	0.0228	0.0000
5.4066	0.1144	0.1720	0.5525	0.0231	0.0000
5.4670	0.1161	0.1790	1.0778	0.0235	0.0000
5.5000	0.1170	0.1828	1.6931	0.0237	0.0000

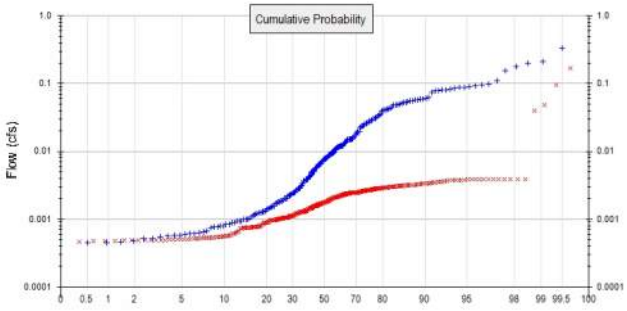
Surface BMP-12B

Element Flows To:

Outlet 1	Outlet 2
	BMP-12B

POC 2





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #2
Total Pervious Area: 0.221
Total Impervious Area: 0

Mitigated Landuse Totals for POC #2
Total Pervious Area: 0.044
Total Impervious Area: 0.177

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #2

Return Period	**Flow(cfs)**
2 year	0.050026
5 year	0.084987
10 year	0.102063
25 year	0.200079

Flow Frequency Return Periods for Mitigated. POC #2

Return Period	**Flow(cfs)**
2 year	0.003385
5 year	0.003878
10 year	0.003879
25 year	0.051394

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0050	2998	226	7	Pass
0.0060	2735	218	7	Pass
0.0070	2520	213	8	Pass
0.0079	2333	206	8	Pass
0.0089	2163	201	9	Pass
0.0099	1990	193	9	Pass
0.0109	1849	185	10	Pass
0.0119	1716	184	10	Pass
0.0128	1606	178	11	Pass
0.0138	1498	174	11	Pass
0.0148	1388	170	12	Pass
0.0158	1289	163	12	Pass
0.0168	1207	159	13	Pass
0.0177	1128	156	13	Pass
0.0187	1062	154	14	Pass
0.0197	1000	148	14	Pass
0.0207	951	141	14	Pass
0.0217	902	137	15	Pass
0.0226	849	132	15	Pass
0.0236	803	126	15	Pass
0.0246	757	121	15	Pass
0.0256	733	117	15	Pass
0.0266	688	112	16	Pass
0.0276	656	111	16	Pass
0.0285	612	106	17	Pass
0.0295	587	102	17	Pass
0.0305	560	100	17	Pass
0.0315	533	98	18	Pass
0.0325	506	93	18	Pass
0.0334	490	90	18	Pass
0.0344	454	89	19	Pass
0.0354	439	87	19	Pass
0.0364	421	84	19	Pass
0.0374	401	78	19	Pass
0.0383	381	76	19	Pass
0.0393	361	75	20	Pass
0.0403	350	72	20	Pass
0.0413	337	72	21	Pass
0.0423	323	69	21	Pass
0.0432	311	66	21	Pass
0.0442	296	64	21	Pass
0.0452	277	63	22	Pass
0.0462	265	61	23	Pass
0.0472	250	60	24	Pass
0.0481	242	57	23	Pass
0.0491	227	53	23	Pass
0.0501	215	53	24	Pass
0.0511	204	51	25	Pass
0.0521	196	50	25	Pass
0.0530	188	50	26	Pass
0.0540	174	50	28	Pass
0.0550	170	49	28	Pass
0.0560	164	47	28	Pass

0.0570	158	45	28	Pass
0.0579	150	44	29	Pass
0.0589	145	44	30	Pass
0.0599	141	42	29	Pass
0.0609	138	42	30	Pass
0.0619	135	40	29	Pass
0.0628	131	40	30	Pass
0.0638	126	39	30	Pass
0.0648	123	36	29	Pass
0.0658	118	36	30	Pass
0.0668	116	35	30	Pass
0.0677	111	33	29	Pass
0.0687	107	32	29	Pass
0.0697	104	30	28	Pass
0.0707	104	29	27	Pass
0.0717	102	24	23	Pass
0.0727	97	21	21	Pass
0.0736	93	20	21	Pass
0.0746	91	20	21	Pass
0.0756	89	20	22	Pass
0.0766	87	17	19	Pass
0.0776	82	16	19	Pass
0.0785	77	16	20	Pass
0.0795	75	13	17	Pass
0.0805	73	13	17	Pass
0.0815	67	12	17	Pass
0.0825	64	12	18	Pass
0.0834	59	12	20	Pass
0.0844	58	12	20	Pass
0.0854	57	12	21	Pass
0.0864	56	11	19	Pass
0.0874	55	11	20	Pass
0.0883	50	11	22	Pass
0.0893	43	11	25	Pass
0.0903	42	11	26	Pass
0.0913	41	10	24	Pass
0.0923	39	10	25	Pass
0.0932	37	10	27	Pass
0.0942	35	9	25	Pass
0.0952	32	8	25	Pass
0.0962	32	7	21	Pass
0.0972	32	7	21	Pass
0.0981	30	7	23	Pass
0.0991	29	7	24	Pass
0.1001	29	7	24	Pass
0.1011	29	7	24	Pass
0.1021	27	7	25	Pass

Water Quality

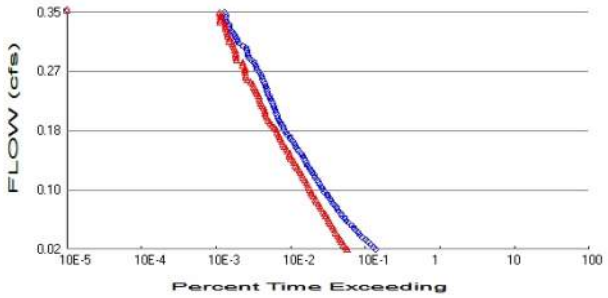
Drawdown Time Results

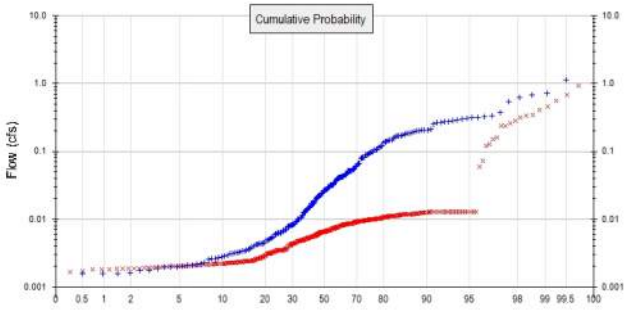
Pond: Surface BMP-12B

Days	Stage(feet)	Percent of Total Run Time
1	N/A	N/A
2	N/A	N/A
3	N/A	N/A
4	N/A	N/A
5	N/A	N/A

Maximum Stage: 0.906 Drawdown Time: Less than 1 day

POC 3





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #3
Total Pervious Area: 0.759
Total Impervious Area: 0

Mitigated Landuse Totals for POC #3
Total Pervious Area: 0.152
Total Impervious Area: 0.607

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #3

Return Period	**Flow(cfs)**
2 year	0.17185
5 year	0.291902
10 year	0.350562
25 year	0.687157

Flow Frequency Return Periods for Mitigated. POC #3

Return Period	**Flow(cfs)**
2 year	0.012679
5 year	0.170385
10 year	0.338573
25 year	0.563284

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0172	3015	1236	40	Pass
0.0206	2763	1161	42	Pass
0.0239	2576	1108	43	Pass
0.0273	2346	1044	44	Pass
0.0307	2198	1006	45	Pass
0.0340	1991	962	48	Pass
0.0374	1857	915	49	Pass
0.0408	1749	876	50	Pass
0.0441	1606	833	51	Pass
0.0475	1514	800	52	Pass
0.0509	1412	770	54	Pass
0.0542	1293	729	56	Pass
0.0576	1217	702	57	Pass
0.0610	1149	677	58	Pass
0.0643	1067	639	59	Pass
0.0677	1015	620	61	Pass
0.0711	952	583	61	Pass
0.0744	907	555	61	Pass
0.0778	858	536	62	Pass
0.0812	805	509	63	Pass
0.0845	761	483	63	Pass
0.0879	740	468	63	Pass
0.0913	689	435	63	Pass
0.0946	661	414	62	Pass
0.0980	612	403	65	Pass
0.1014	591	395	66	Pass
0.1047	569	383	67	Pass
0.1081	533	367	68	Pass
0.1115	509	352	69	Pass
0.1148	492	338	68	Pass
0.1182	455	322	70	Pass
0.1216	442	306	69	Pass
0.1249	426	294	69	Pass
0.1283	402	282	70	Pass
0.1317	386	268	69	Pass
0.1350	361	253	70	Pass
0.1384	352	242	68	Pass
0.1418	339	235	69	Pass
0.1451	324	216	66	Pass
0.1485	315	213	67	Pass
0.1519	304	210	69	Pass
0.1553	278	196	70	Pass
0.1586	265	189	71	Pass
0.1620	253	177	69	Pass
0.1654	243	172	70	Pass
0.1687	231	164	70	Pass
0.1721	215	158	73	Pass
0.1755	212	154	72	Pass
0.1788	197	149	75	Pass
0.1822	189	142	75	Pass
0.1856	177	138	77	Pass
0.1889	173	130	75	Pass
0.1923	165	121	73	Pass

0.1957	159	115	72	Pass
0.1990	150	108	72	Pass
0.2024	145	104	71	Pass
0.2058	142	101	71	Pass
0.2091	138	98	71	Pass
0.2125	136	98	72	Pass
0.2159	131	94	71	Pass
0.2192	126	90	71	Pass
0.2226	124	87	70	Pass
0.2260	120	85	70	Pass
0.2293	116	83	71	Pass
0.2327	113	81	71	Pass
0.2361	107	76	71	Pass
0.2394	105	74	70	Pass
0.2428	104	73	70	Pass
0.2462	102	70	68	Pass
0.2495	98	67	68	Pass
0.2529	94	63	67	Pass
0.2563	91	57	62	Pass
0.2596	90	55	61	Pass
0.2630	87	54	62	Pass
0.2664	83	53	63	Pass
0.2697	77	53	68	Pass
0.2731	75	53	70	Pass
0.2765	73	50	68	Pass
0.2798	70	49	70	Pass
0.2832	64	41	64	Pass
0.2866	60	40	66	Pass
0.2899	58	40	68	Pass
0.2933	57	40	70	Pass
0.2967	56	39	69	Pass
0.3001	55	38	69	Pass
0.3034	50	37	74	Pass
0.3068	44	36	81	Pass
0.3102	42	33	78	Pass
0.3135	41	33	80	Pass
0.3169	39	31	79	Pass
0.3203	37	31	83	Pass
0.3236	36	30	83	Pass
0.3270	33	29	87	Pass
0.3304	32	29	90	Pass
0.3337	32	29	90	Pass
0.3371	30	25	83	Pass
0.3405	29	25	86	Pass
0.3438	29	25	86	Pass
0.3472	29	25	86	Pass
0.3506	28	24	85	Pass

Water Quality

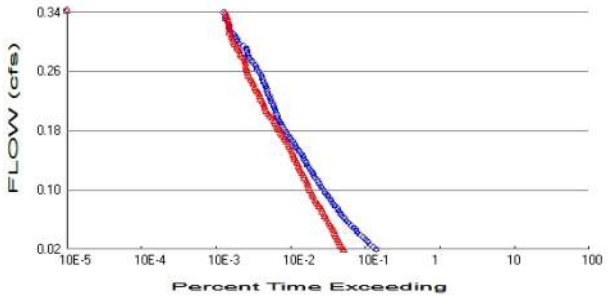
Drawdown Time Results

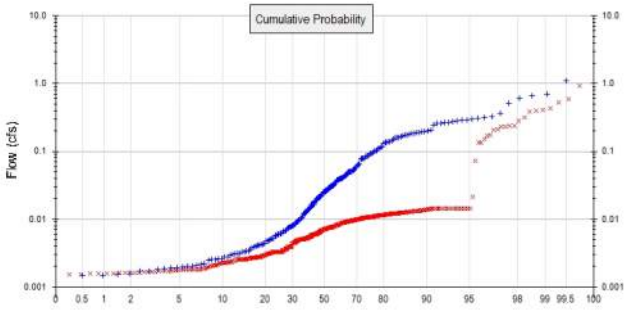
Pond: Surface BMP-11

Days	Stage(feet)	Percent of Total Run Time
1	N/A	0.0007
2	N/A	0.0007
3	N/A	0.0007
4	N/A	0.0007
5	N/A	0.0007

Maximum Stage: 0.906 Drawdown Time: Less than 1 day

POC 4





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #4
Total Pervious Area: 0.732
Total Impervious Area: 0

Mitigated Landuse Totals for POC #4
Total Pervious Area: 0.183
Total Impervious Area: 0.549

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #4

Return Period	**Flow(cfs)**
2 year	0.165832
5 year	0.281577
10 year	0.338231
25 year	0.662853

Flow Frequency Return Periods for Mitigated. POC #4

Return Period	**Flow(cfs)**
2 year	0.014319
5 year	0.230907
10 year	0.390877
25 year	0.53775

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0166	3052	1115	36	Pass
0.0198	2785	1058	37	Pass
0.0231	2522	1010	40	Pass
0.0263	2350	972	41	Pass
0.0296	2198	935	42	Pass
0.0328	2039	902	44	Pass
0.0361	1852	864	46	Pass
0.0393	1731	840	48	Pass
0.0426	1622	816	50	Pass
0.0458	1528	784	51	Pass
0.0491	1388	748	53	Pass
0.0523	1298	719	55	Pass
0.0556	1217	693	56	Pass
0.0588	1147	659	57	Pass
0.0621	1063	623	58	Pass
0.0653	1005	605	60	Pass
0.0686	960	578	60	Pass
0.0718	912	557	61	Pass
0.0751	849	523	61	Pass
0.0783	806	504	62	Pass
0.0816	762	478	62	Pass
0.0848	740	458	61	Pass
0.0881	689	433	62	Pass
0.0913	660	425	64	Pass
0.0946	619	413	66	Pass
0.0978	593	397	66	Pass
0.1011	560	382	68	Pass
0.1043	534	369	69	Pass
0.1076	511	364	71	Pass
0.1108	492	351	71	Pass
0.1141	454	333	73	Pass
0.1173	440	321	72	Pass
0.1206	425	306	72	Pass
0.1238	407	292	71	Pass
0.1270	381	285	74	Pass
0.1303	363	275	75	Pass
0.1335	352	264	75	Pass
0.1368	339	259	76	Pass
0.1400	323	244	75	Pass
0.1433	315	240	76	Pass
0.1465	302	234	77	Pass
0.1498	280	225	80	Pass
0.1530	265	217	81	Pass
0.1563	252	208	82	Pass
0.1595	243	201	82	Pass
0.1628	232	192	82	Pass
0.1660	215	180	83	Pass
0.1693	208	176	84	Pass
0.1725	196	166	84	Pass
0.1758	191	160	83	Pass
0.1790	174	148	85	Pass
0.1823	171	145	84	Pass
0.1855	165	139	84	Pass

0.1888	159	135	84	Pass
0.1920	151	131	86	Pass
0.1953	145	122	84	Pass
0.1985	142	113	79	Pass
0.2018	139	108	77	Pass
0.2050	135	100	74	Pass
0.2083	131	97	74	Pass
0.2115	126	97	76	Pass
0.2148	124	95	76	Pass
0.2180	118	91	77	Pass
0.2213	116	87	75	Pass
0.2245	112	84	75	Pass
0.2278	107	83	77	Pass
0.2310	104	78	75	Pass
0.2343	104	74	71	Pass
0.2375	102	72	70	Pass
0.2408	98	69	70	Pass
0.2440	93	67	72	Pass
0.2473	91	64	70	Pass
0.2505	90	62	68	Pass
0.2538	87	59	67	Pass
0.2570	82	57	69	Pass
0.2603	77	56	72	Pass
0.2635	75	55	73	Pass
0.2668	73	54	73	Pass
0.2700	67	54	80	Pass
0.2733	64	53	82	Pass
0.2765	60	51	85	Pass
0.2797	58	47	81	Pass
0.2830	57	46	80	Pass
0.2862	56	45	80	Pass
0.2895	55	42	76	Pass
0.2927	51	41	80	Pass
0.2960	44	39	88	Pass
0.2992	42	37	88	Pass
0.3025	41	36	87	Pass
0.3057	39	35	89	Pass
0.3090	37	35	94	Pass
0.3122	35	33	94	Pass
0.3155	32	33	103	Pass
0.3187	32	32	100	Pass
0.3220	32	32	100	Pass
0.3252	31	32	103	Pass
0.3285	29	31	106	Pass
0.3317	29	31	106	Pass
0.3350	29	30	103	Pass
0.3382	27	29	107	Pass

Water Quality

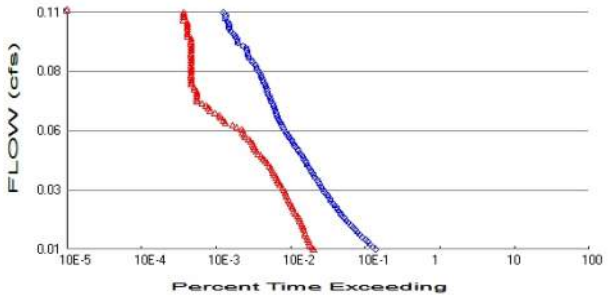
Drawdown Time Results

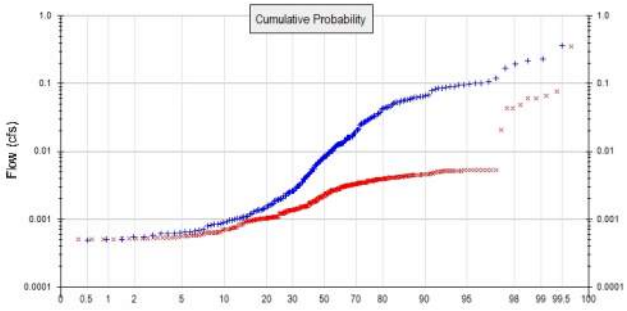
Pond: Surface BMP-12A

Days	Stage(feet)	Percent of Total Run Time
1	0.923	0.0005
2	0.923	0.0005
3	0.923	0.0005
4	0.923	0.0005
5	0.923	0.0005

Maximum Stage: 0.923 Drawdown Time: Less than 1 day

POC 5





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #5
Total Pervious Area: 0.238
Total Impervious Area: 0

Mitigated Landuse Totals for POC #5
Total Pervious Area: 0.071
Total Impervious Area: 0.167

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #5

Return Period	**Flow(cfs)**
2 year	0.053882
5 year	0.091528
10 year	0.109908
25 year	0.21544

Flow Frequency Return Periods for Mitigated. POC #5

Return Period	**Flow(cfs)**
2 year	0.004694
5 year	0.005306
10 year	0.044802
25 year	0.066218

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0054	2998	437	14	Pass
0.0064	2733	414	15	Pass
0.0075	2520	394	15	Pass
0.0086	2330	379	16	Pass
0.0096	2162	370	17	Pass
0.0107	1991	359	18	Pass
0.0117	1848	346	18	Pass
0.0128	1714	336	19	Pass
0.0138	1606	325	20	Pass
0.0149	1495	318	21	Pass
0.0159	1387	309	22	Pass
0.0170	1289	303	23	Pass
0.0181	1207	287	23	Pass
0.0191	1128	280	24	Pass
0.0202	1062	266	25	Pass
0.0212	1000	251	25	Pass
0.0223	951	242	25	Pass
0.0233	902	231	25	Pass
0.0244	849	226	26	Pass
0.0254	803	215	26	Pass
0.0265	757	207	27	Pass
0.0276	733	200	27	Pass
0.0286	688	192	27	Pass
0.0297	656	187	28	Pass
0.0307	612	183	29	Pass
0.0318	587	174	29	Pass
0.0328	560	169	30	Pass
0.0339	533	156	29	Pass
0.0349	507	147	28	Pass
0.0360	490	145	29	Pass
0.0371	454	138	30	Pass
0.0381	440	129	29	Pass
0.0392	421	127	30	Pass
0.0402	401	124	30	Pass
0.0413	381	120	31	Pass
0.0423	361	111	30	Pass
0.0434	350	105	30	Pass
0.0445	337	98	29	Pass
0.0455	323	93	28	Pass
0.0466	311	88	28	Pass
0.0476	297	79	26	Pass
0.0487	277	75	27	Pass
0.0497	265	70	26	Pass
0.0508	250	69	27	Pass
0.0518	242	68	28	Pass
0.0529	227	63	27	Pass
0.0540	215	59	27	Pass
0.0550	205	53	25	Pass
0.0561	196	51	26	Pass
0.0571	188	50	26	Pass
0.0582	174	48	27	Pass
0.0592	170	41	24	Pass
0.0603	164	36	21	Pass

0.0613	158	29	18	Pass
0.0624	151	27	17	Pass
0.0635	145	25	17	Pass
0.0645	141	24	17	Pass
0.0656	138	21	15	Pass
0.0666	135	18	13	Pass
0.0677	131	17	12	Pass
0.0687	126	16	12	Pass
0.0698	123	14	11	Pass
0.0708	118	12	10	Pass
0.0719	116	12	10	Pass
0.0730	111	12	10	Pass
0.0740	107	12	11	Pass
0.0751	104	12	11	Pass
0.0761	104	11	10	Pass
0.0772	102	11	10	Pass
0.0782	97	10	10	Pass
0.0793	93	10	10	Pass
0.0803	91	10	10	Pass
0.0814	89	10	11	Pass
0.0825	87	10	11	Pass
0.0835	82	10	12	Pass
0.0846	77	10	12	Pass
0.0856	75	10	13	Pass
0.0867	73	10	13	Pass
0.0877	67	10	14	Pass
0.0888	64	10	15	Pass
0.0898	59	10	16	Pass
0.0909	58	10	17	Pass
0.0920	57	10	17	Pass
0.0930	56	10	17	Pass
0.0941	55	10	18	Pass
0.0951	50	10	20	Pass
0.0962	43	10	23	Pass
0.0972	42	10	23	Pass
0.0983	41	10	24	Pass
0.0994	39	9	23	Pass
0.1004	37	9	24	Pass
0.1015	35	9	25	Pass
0.1025	32	9	28	Pass
0.1036	32	9	28	Pass
0.1046	32	9	28	Pass
0.1057	31	9	29	Pass
0.1067	29	8	27	Pass
0.1078	29	8	27	Pass
0.1089	29	8	27	Pass
0.1099	27	8	29	Pass

Water Quality

Drawdown Time Results

Pond: Surface BMP-13

Days	Stage(feet)	Percent of Total Run Time
1	0.838	0.0001
2	0.838	0.0001
3	0.838	0.0001
4	0.838	0.0001
5	0.838	0.0001

Maximum Stage: 0.838 Drawdown Time: Less than 1 day

Rational Method

Data for Rational Method is not available.

Model Default Modifications

Total of 0 changes have been made.

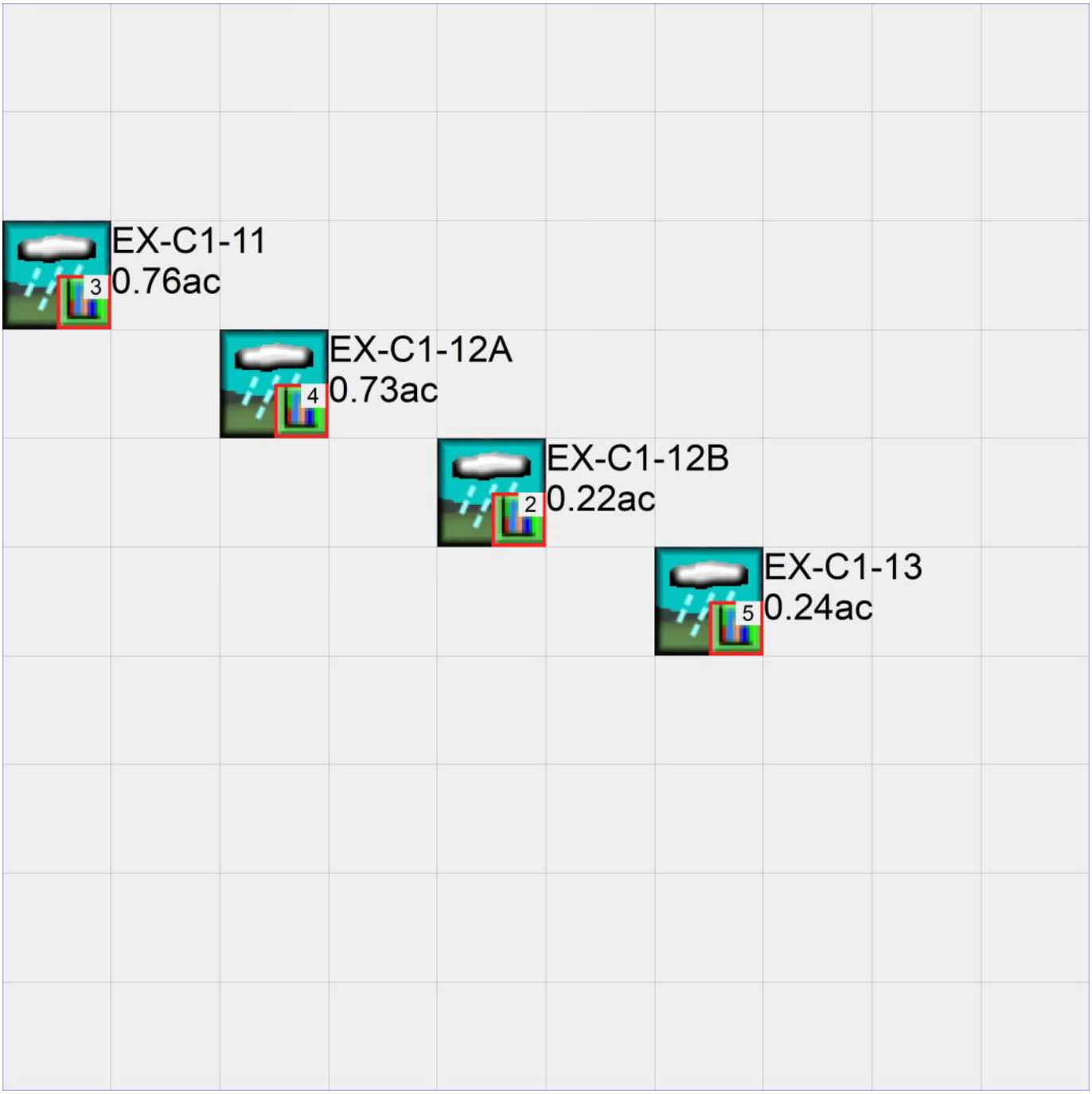
PERLND Changes

No PERLND changes have been made.

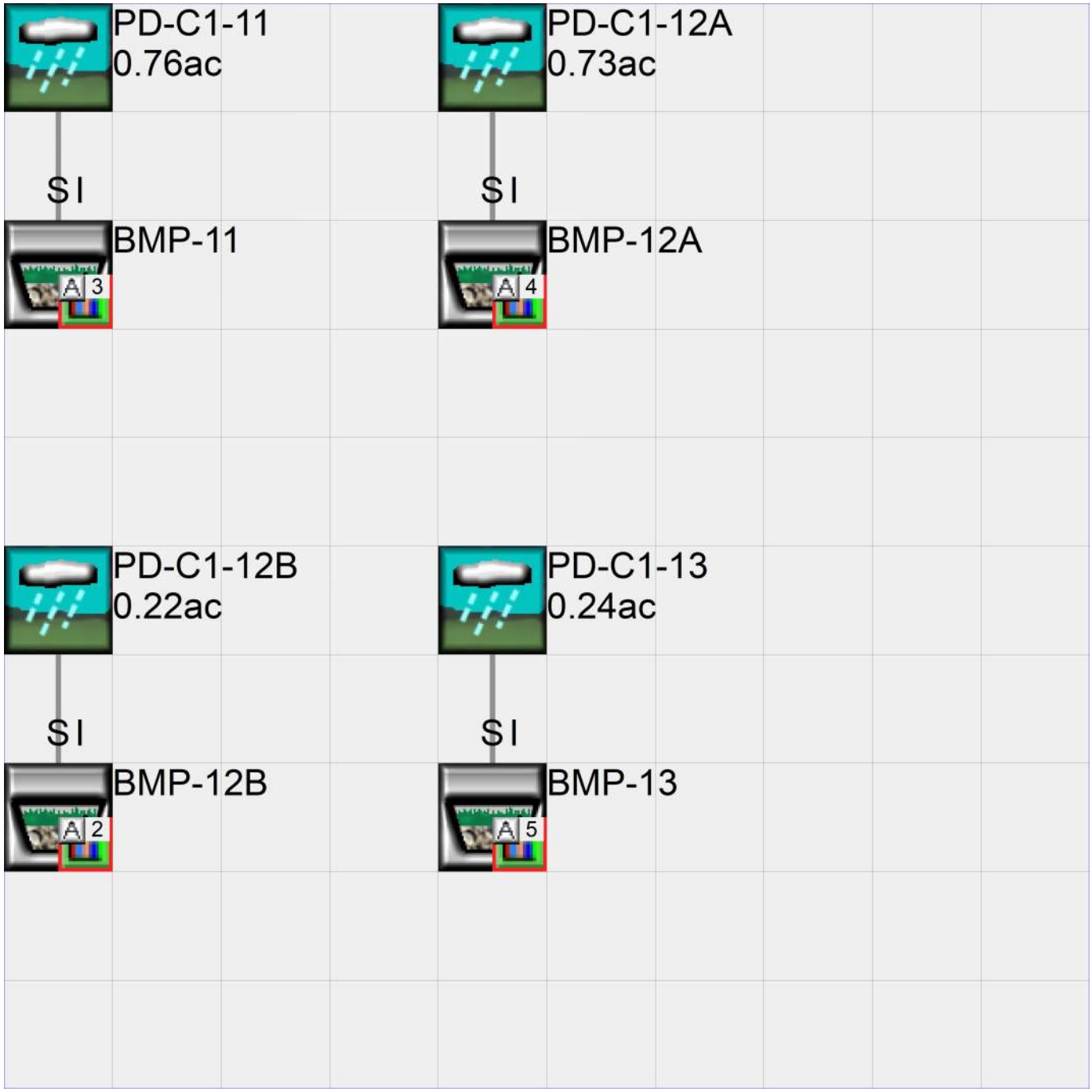
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

Mitigated UCI File

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

Legal Notice

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Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

How to use this worksheet (also see instructions in Section G of the WQMP Template):

1. Review Column 1 and identify which of these potential sources of stormwater pollutants apply to your site. Check each box that applies.
2. Review Column 2 and incorporate all of the corresponding applicable BMPs in your WQMP Exhibit.
3. Review Columns 3 and 4 and incorporate all of the corresponding applicable permanent controls and operational BMPs in your WQMP. Use the format shown in Table G.1on page 23 of this WQMP Template. Describe your specific BMPs in an accompanying narrative, and explain any special conditions or situations that required omitting BMPs or substituting alternative BMPs for those shown here.

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☒ **A.** On-site storm drain inlets	☒ Locations of inlets.	☒ Mark all inlets with the words "Only Rain Down the Storm Drain" or similar. Catch Basin Markers may be available from the Riverside County Flood Control and Water Conservation District, call 951.955.1200 to verify.	☒ Maintain and periodically repaint or replace inlet markings. ☒ Provide stormwater pollution prevention information to new site owners, lessees, or operators. ☒ See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com ☒ Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."
☒ **B.** Interior floor drains and elevator shaft sump pumps		☒ State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.	☒ Inspect and maintain drains to prevent blockages and overflow.
☐ **C.** Interior parking garages		☐ State that parking garage floor drains will be plumbed to the sanitary sewer.	☐ Inspect and maintain drains to prevent blockages and overflow.

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☐ **D1.** Need for future indoor & structural pest control		☐ Note building design features that discourage entry of pests.	☐ Provide Integrated Pest Management information to owners, lessees, and operators.
☒ **D2.** Landscape/ Outdoor Pesticide Use	☐ Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained. ☐ Show self-retaining landscape areas, if any. ☒ Show stormwater treatment and hydrograph modification management BMPs. (See instructions in Chapter 3, Step 5 and guidance in Chapter 5.)	State that final landscape plans will accomplish all of the following. ☒ Preserve existing native trees, shrubs, and ground cover to the maximum extent possible. ☒ Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. ☒ Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. ☒ Consider using pest-resistant plants, especially adjacent to hardscape. To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	☒ Maintain landscaping using minimum or no pesticides. ☐ See applicable operational BMPs in "What you should know for…..Landscape and Gardening" at http://rcflood.org/stormwater/Error! Hyperlink reference not valid. ☒ Provide IPM information to new owners, lessees and operators.

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☐ **E.** Pools, spas, ponds, decorative fountains, and other water features.	☐ Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet. (Exception: Public pools must be plumbed according to County Department of Environmental Health Guidelines.)	If the Co-Permittee requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.	☐ See applicable operational BMPs in "Guidelines for Maintaining Your Swimming Pool, Jacuzzi and Garden Fountain" at http://rcflood.org/stormwater/
☒ **F.** Food service	☒ For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment. ☒ On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.	☐ Describe the location and features of the designated cleaning area. ☐ Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.	☒ See the brochure, "The Food Service Industry Best Management Practices for: Restaurants, Grocery Stores, Delicatessens and Bakeries" at http://rcflood.org/stormwater/ Provide this brochure to new site owners, lessees, and operators.
☒ **G.** Refuse areas	☒ Show where site refuse and recycled materials will be handled and stored for pickup. See local municipal requirements for sizes and other details of refuse areas. ☒ If dumpsters or other receptacles are outdoors, show how the designated area will be covered, graded, and paved to prevent run-on and show locations of berms to prevent runoff from the area. ☐ Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer.	☒ State how site refuse will be handled and provide supporting detail to what is shown on plans. ☒ State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.	☒ State how the following will be implemented: Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☐ H. Industrial processes.	☐ Show process area.	☐ If industrial processes are to be located on site, state: "All process activities to be performed indoors. No processes to drain to exterior or to storm drain system."	☐ See Fact Sheet SC-10, "Non-Stormwater Discharges" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com See the brochure "Industrial & Commercial Facilities Best Management Practices for: Industrial, Commercial Facilities" at http://rcflood.org/stormwater/

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☐ **I.** Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)	☐ Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or run-off from area. ☐ Storage of non-hazardous liquids shall be covered by a roof and/or drain to the sanitary sewer system, and be contained by berms, dikes, liners, or vaults. ☐ Storage of hazardous materials and wastes must be in compliance with the local hazardous materials ordinance and a Hazardous Materials Management Plan for the site.	Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains. Where appropriate, reference documentation of compliance with the requirements of Hazardous Materials Programs for: ▪ Hazardous Waste Generation ▪ Hazardous Materials Release Response and Inventory ▪ California Accidental Release (CalARP) ▪ Aboveground Storage Tank ▪ Uniform Fire Code Article 80 Section 103(b) & (c) 1991 ▪ Underground Storage Tank www.cchealth.org/groups/hazmat/	☐ See the Fact Sheets SC-31, "Outdoor Liquid Container Storage" and SC-33, "Outdoor Storage of Raw Materials " in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
❑ J. Vehicle and Equipment Cleaning	❑ Show on drawings as appropriate: (1) Commercial/industrial facilities having vehicle/equipment cleaning needs shall either provide a covered, bermed area for washing activities or discourage vehicle/equipment washing by removing hose bibs and installing signs prohibiting such uses. (2) Multi-dwelling complexes shall have a paved, bermed, and covered car wash area (unless car washing is prohibited on-site and hoses are provided with an automatic shut-off to discourage such use). (3) Washing areas for cars, vehicles, and equipment shall be paved, designed to prevent run-on to or runoff from the area, and plumbed to drain to the sanitary sewer. (4) Commercial car wash facilities shall be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility shall discharge to the sanitary sewer, or a wastewater reclamation system shall be installed.	❑ If a car wash area is not provided, describe any measures taken to discourage on-site car washing and explain how these will be enforced.	Describe operational measures to implement the following (if applicable): ❑ Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system. Refer to "Outdoor Cleaning Activities and Professional Mobile Service Providers" for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/ ❑ Car dealerships and similar may rinse cars with water only.

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☐ **K.** Vehicle/Equipment Repair and Maintenance	☐ Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to prevent run-on and runoff of stormwater. ☐ Show secondary containment for exterior work areas where motor oil, brake fluid, gasoline, diesel fuel, radiator fluid, acid-containing batteries or other hazardous materials or hazardous wastes are used or stored. Drains shall not be installed within the secondary containment areas. ☐ Add a note on the plans that states either (1) there are no floor drains, or (2) floor drains are connected to wastewater pretreatment systems prior to discharge to the sanitary sewer and an industrial waste discharge permit will be obtained.	☐ State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area. ☐ State that there are no floor drains or if there are floor drains, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements. ☐ State that there are no tanks, containers or sinks to be used for parts cleaning or rinsing or, if there are, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.	In the Stormwater Control Plan, note that all of the following restrictions apply to use the site: ☐ No person shall dispose of, nor permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinsewater from parts cleaning into storm drains. ☐ No vehicle fluid removal shall be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building, except in such a manner as to ensure that any spilled fluid will be in an area of secondary containment. Leaking vehicle fluids shall be contained or drained from the vehicle immediately. ☐ No person shall leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment. Refer to "Automotive Maintenance & Car Care Best Management Practices for Auto Body Shops, Auto Repair Shops, Car Dealerships, Gas Stations and Fleet Service Operations". Brochure can be found at http://rcflood.org/stormwater/ Refer to Outdoor Cleaning Activities and Professional Mobile Service Providers for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☒ **L.** Fuel Dispensing Areas	☒ Fueling areas[6] shall have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are: a) graded at the minimum slope necessary to prevent ponding; and b) separated from the rest of the site by a grade break that prevents run-on of stormwater to the maximum extent practicable. ☒ Fueling areas shall be covered by a canopy that extends a minimum of ten feet in each direction from each pump. [Alternative: The fueling area must be covered and the cover's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area[1].] The canopy [or cover] shall not drain onto the fueling area.		☒ The property owner shall dry sweep the fueling area routinely. ☒ See the Fact Sheet SD-30 , "Fueling Areas" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

[6] The fueling area shall be defined as the area extending a minimum of 6.5 feet from the corner of each fuel dispenser or the length at which the hose and nozzle assembly may be operated plus a minimum of one foot, whichever is greater.

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☐ M. Loading Docks	☐ Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks shall be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts shall be positioned to direct stormwater away from the loading area. Water from loading dock areas shall be drained to the sanitary sewer, or diverted and collected for ultimate discharge to the sanitary sewer. ☐ Loading dock areas draining directly to the sanitary sewer shall be equipped with a spill control valve or equivalent device, which shall be kept closed during periods of operation. ☐ Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer.		☐ Move loaded and unloaded items indoors as soon as possible. ☐ See Fact Sheet SC-30, "Outdoor Loading and Unloading," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☐ **N.** Fire Sprinkler Test Water		☐ Provide a means to drain fire sprinkler test water to the sanitary sewer.	☐ See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
O. Miscellaneous Drain or Wash Water or Other Sources ☐ Boiler drain lines ☐ Condensate drain lines ☐ Rooftop equipment ☐ Drainage sumps ☒ Roofing, gutters, and trim. ☐ Other sources		☐ Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system. ☐ Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system. ☐ Rooftop equipment with potential to produce pollutants shall be roofed and/or have secondary containment. ☐ Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water. ☒ Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff. Include controls for other sources as specified by local reviewer.	

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☒ **P.** Plazas, sidewalks, and parking lots.			☒ Sweep plazas, sidewalks, and parking lots regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect washwater containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain.

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

How to use this worksheet (also see instructions in Section G of the WQMP Template):

1. Review Column 1 and identify which of these potential sources of stormwater pollutants apply to your site. Check each box that applies.
2. Review Column 2 and incorporate all of the corresponding applicable BMPs in your WQMP Exhibit.
3. Review Columns 3 and 4 and incorporate all of the corresponding applicable permanent controls and operational BMPs in your WQMP. Use the format shown in Table G.1on page 23 of this WQMP Template. Describe your specific BMPs in an accompanying narrative, and explain any special conditions or situations that required omitting BMPs or substituting alternative BMPs for those shown here.

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☒ **A.** On-site storm drain inlets		☒ Mark all inlets with the words "Only Rain Down the Storm Drain" or similar. Catch Basin Markers may be available from the Riverside County Flood Control and Water Conservation District, call 951.955.1200 to verify.	☒ Maintain and periodically repaint or replace inlet markings. ☒ Provide stormwater pollution prevention information to new site owners, lessees, or operators. ☒ See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com ☒ Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."
☒ **B.** Interior floor drains and elevator shaft sump pumps		☒ State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.	☒ Inspect and maintain drains to prevent blockages and overflow.
☐ **C.** Interior parking garages		☐ State that parking garage floor drains will be plumbed to the sanitary sewer.	☐ Inspect and maintain drains to prevent blockages and overflow.

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☐ **D1.** Need for future indoor & structural pest control		☐ Note building design features that discourage entry of pests.	☐ Provide Integrated Pest Management information to owners, lessees, and operators.
☒ **D2.** Landscape/ Outdoor Pesticide Use	☐ Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained. ☐ Show self-retaining landscape areas, if any. ☒ Show stormwater treatment and hydrograph modification management BMPs. (See instructions in Chapter 3, Step 5 and guidance in Chapter 5.)	State that final landscape plans will accomplish all of the following. ☒ Preserve existing native trees, shrubs, and ground cover to the maximum extent possible. ☒ Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. ☒ Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. ☒ Consider using pest-resistant plants, especially adjacent to hardscape. To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	☒ Maintain landscaping using minimum or no pesticides. ☐ See applicable operational BMPs in "What you should know for…..Landscape and Gardening" at http://rcflood.org/stormwater/Error! Hyperlink reference not valid. ☒ Provide IPM information to new owners, lessees and operators.

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☐ **E.** Pools, spas, ponds, decorative fountains, and other water features.	☐ Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet. (Exception: Public pools must be plumbed according to County Department of Environmental Health Guidelines.)	If the Co-Permittee requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.	☐ See applicable operational BMPs in "Guidelines for Maintaining Your Swimming Pool, Jacuzzi and Garden Fountain" at http://rcflood.org/stormwater/
☒ **F.** Food service	☒ For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment. ☒ On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.	☐ Describe the location and features of the designated cleaning area. ☐ Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.	☒ See the brochure, "The Food Service Industry Best Management Practices for: Restaurants, Grocery Stores, Delicatessens and Bakeries" at http://rcflood.org/stormwater/ Provide this brochure to new site owners, lessees, and operators.
☒ **G.** Refuse areas	☒ Show where site refuse and recycled materials will be handled and stored for pickup. See local municipal requirements for sizes and other details of refuse areas. ☒ If dumpsters or other receptacles are outdoors, show how the designated area will be covered, graded, and paved to prevent run-on and show locations of berms to prevent runoff from the area. ☐ Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer.	☒ State how site refuse will be handled and provide supporting detail to what is shown on plans. ☒ State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.	☒ State how the following will be implemented: Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☐ H. Industrial processes.	☐ Show process area.	☐ If industrial processes are to be located on site, state: "All process activities to be performed indoors. No processes to drain to exterior or to storm drain system."	☐ See Fact Sheet SC-10, "Non-Stormwater Discharges" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com See the brochure "Industrial & Commercial Facilities Best Management Practices for: Industrial, Commercial Facilities" at http://rcflood.org/stormwater/

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☐ I. Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)	☐ Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or run-off from area. ☐ Storage of non-hazardous liquids shall be covered by a roof and/or drain to the sanitary sewer system, and be contained by berms, dikes, liners, or vaults. ☐ Storage of hazardous materials and wastes must be in compliance with the local hazardous materials ordinance and a Hazardous Materials Management Plan for the site.	Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains. Where appropriate, reference documentation of compliance with the requirements of Hazardous Materials Programs for: ▪ Hazardous Waste Generation ▪ Hazardous Materials Release Response and Inventory ▪ California Accidental Release (CalARP) ▪ Aboveground Storage Tank ▪ Uniform Fire Code Article 80 Section 103(b) & (c) 1991 ▪ Underground Storage Tank www.cchealth.org/groups/hazmat/	☐ See the Fact Sheets SC-31, "Outdoor Liquid Container Storage" and SC-33, "Outdoor Storage of Raw Materials " in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☐ J. Vehicle and Equipment Cleaning	☐ Show on drawings as appropriate: (1) Commercial/industrial facilities having vehicle/equipment cleaning needs shall either provide a covered, bermed area for washing activities or discourage vehicle/equipment washing by removing hose bibs and installing signs prohibiting such uses. (2) Multi-dwelling complexes shall have a paved, bermed, and covered car wash area (unless car washing is prohibited on-site and hoses are provided with an automatic shut-off to discourage such use). (3) Washing areas for cars, vehicles, and equipment shall be paved, designed to prevent run-on to or runoff from the area, and plumbed to drain to the sanitary sewer. (4) Commercial car wash facilities shall be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility shall discharge to the sanitary sewer, or a wastewater reclamation system shall be installed.	☐ If a car wash area is not provided, describe any measures taken to discourage on-site car washing and explain how these will be enforced.	Describe operational measures to implement the following (if applicable): ☐ Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system. Refer to "Outdoor Cleaning Activities and Professional Mobile Service Providers" for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/ ☐ Car dealerships and similar may rinse cars with water only.

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
❑ **K.** Vehicle/Equipment Repair and Maintenance	❑ Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to prevent run-on and runoff of stormwater. ❑ Show secondary containment for exterior work areas where motor oil, brake fluid, gasoline, diesel fuel, radiator fluid, acid-containing batteries or other hazardous materials or hazardous wastes are used or stored. Drains shall not be installed within the secondary containment areas. ❑ Add a note on the plans that states either (1) there are no floor drains, or (2) floor drains are connected to wastewater pretreatment systems prior to discharge to the sanitary sewer and an industrial waste discharge permit will be obtained.	❑ State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area. ❑ State that there are no floor drains or if there are floor drains, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements. ❑ State that there are no tanks, containers or sinks to be used for parts cleaning or rinsing or, if there are, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.	In the Stormwater Control Plan, note that all of the following restrictions apply to use the site: ❑ No person shall dispose of, nor permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinsewater from parts cleaning into storm drains. ❑ No vehicle fluid removal shall be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building, except in such a manner as to ensure that any spilled fluid will be in an area of secondary containment. Leaking vehicle fluids shall be contained or drained from the vehicle immediately. ❑ No person shall leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment. Refer to "Automotive Maintenance & Car Care Best Management Practices for Auto Body Shops, Auto Repair Shops, Car Dealerships, Gas Stations and Fleet Service Operations". Brochure can be found at http://rcflood.org/stormwater/ Refer to Outdoor Cleaning Activities and Professional Mobile Service Providers for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☒ **L.** Fuel Dispensing Areas	☒ Fueling areas[6] shall have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are: a) graded at the minimum slope necessary to prevent ponding; and b) separated from the rest of the site by a grade break that prevents run-on of stormwater to the maximum extent practicable. ☒ Fueling areas shall be covered by a canopy that extends a minimum of ten feet in each direction from each pump. [Alternative: The fueling area must be covered and the cover's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area[1].] The canopy [or cover] shall not drain onto the fueling area.		☒ The property owner shall dry sweep the fueling area routinely. ☒ See the Fact Sheet SD-30 , "Fueling Areas" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

[6] The fueling area shall be defined as the area extending a minimum of 6.5 feet from the corner of each fuel dispenser or the length at which the hose and nozzle assembly may be operated plus a minimum of one foot, whichever is greater.

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☐ M. Loading Docks	☐ Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks shall be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts shall be positioned to direct stormwater away from the loading area. Water from loading dock areas shall be drained to the sanitary sewer, or diverted and collected for ultimate discharge to the sanitary sewer. ☐ Loading dock areas draining directly to the sanitary sewer shall be equipped with a spill control valve or equivalent device, which shall be kept closed during periods of operation. ☐ Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer.		☐ Move loaded and unloaded items indoors as soon as possible. ☐ See Fact Sheet SC-30, "Outdoor Loading and Unloading," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☐ N. Fire Sprinkler Test Water		☐ Provide a means to drain fire sprinkler test water to the sanitary sewer.	☐ See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
O. Miscellaneous Drain or Wash Water or Other Sources ☐ Boiler drain lines ☐ Condensate drain lines ☐ Rooftop equipment ☐ Drainage sumps ☒ Roofing, gutters, and trim. ☐ Other sources		☐ Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system. ☐ Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system. ☐ Rooftop equipment with potential to produce pollutants shall be roofed and/or have secondary containment. ☐ Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water. ☒ Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff. Include controls for other sources as specified by local reviewer.	

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☒ P. Plazas, sidewalks, and parking lots.			☒ Sweep plazas, sidewalks, and parking lots regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect washwater containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain.

Appendix 9: O&M

Operation and Maintenance Plan and Documentation of Finance, Maintenance and Recording Mechanisms

RECORDING REQUESTED BY AND
WHEN RECORDED RETURN TO:

(recorded copy to be included in the Final WQMP and provide the City with a copy)

Above Space for Recorder's Use

DECLARATION OF WATER QUALITY MANAGEMENT PLAN RESTRICTIVE COVENANT

This Declaration of Water Quality Management Plan Restrictive Covenant (this "Covenant") is made this ___ day of _____, 2009 by insert legal owner on title ("Owner")

A. The Owner of that certain real property (the "Property") located in the City of Murrieta, California ("City"), more particularly described in Exhibit "A" attached hereto and incorporated herein by this reference and has proposed that the Property be developed by Owner in accordance with the governmental approvals issued by the City and other governmental or quasi-governmental agencies having jurisdiction over the Property.

B. In accordance with the Murrieta Municipal Code, applicable State of California statutes, and other ordinances and regulations (collectively, the "Stormwater Laws") of City and the State of California which regulate land development and urban runoff, the Owners have prepared and submitted to the City a Final Water Quality Management Plan ("WQMP"), which is on file with City's Engineering Department and a copy of which is required to be kept on the Property. The WQMP proposes that stormwater runoff from the Property be managed by the use of the stormwater management facilities, which are identified in the WQMP as "Best Management Practices" or "BMP's." The precise location(s) and extent of the BMP's are indicated within the WQMP. The WQMP specifies the manner and standards by which the BMP's must be repaired and maintained in order to retain their effectiveness.

C. The purpose of this Covenant is to assure that the BMP's are adequately maintained by creating obligations which are enforceable against the Owner and its successors in interest in the Property. The Owner intends that these obligations be enforceable notwithstanding other provisions related to BMP maintenance which are provided by law.

COVENANT TERMS, CONDITIONS, AND RESTRICTIONS

In consideration of the above recitals and the mutual covenants, terms, conditions and restrictions contained herein, and pursuant to the laws of the United States, the State of

California and the City of Murrieta Municipal Code, Owner hereby declares the Property shall be held, transferred, conveyed, leased, occupied or otherwise disposed of and used subject to the following restrictive covenants (and incorporating the above recitals herein by reference), which shall run with the land and be binding on the Owner's heirs, successors in interest, administrators, assigns, lessees or other occupiers and users (collectively "Successors") of the Property or any portion thereof.

1. Maintenance of Stormwater Management Facilities.

    1.1. Owner agrees, for themselves and their successors in interest to all or any portion of the Property, to comply in all respects with the requirements of the Stormwater Laws and the WQMP with regards to the construction and maintenance of BMP's designated in the WQMP. The Owner and its Successors, in particular agree to perform, at its sole cost, expense and liability, all inspections, cleaning, repairs, servicing, and maintenance with respect to all of the BMP's listed in Exhibit "B" attached hereto and incorporated herein by this reference (the "Maintenance Activities"). The Owner and its Successors shall initiate, perform and complete all Maintenance Activities at the required time, without request or demand from the City, or any other agency. Owner and its Successors shall keep a report of any inspections and/or maintenance of the BMP's for review at any time by City or the Water Quality Board for the region. The Owner and its Successors further agree that Maintenance Activities shall include replacement or modification of the BMP's in the event of failure. Replacement shall be with an identical type, size and model of BMP subject to applicable Stormwater Laws, except that:

        A. The City Engineer may authorize substitution of an alternative BMP if he or she determines that it will function as well as the failed BMP; or

        B. If the failure of the BMP, in the reasonable judgment of the City Engineer indicates that the BMP in use is inappropriate or inadequate to the circumstances, the BMP must be modified or replaced with an upgraded BMP to prevent future failure.

    1.2. The Owner and its Successors shall, at all times, be subject to the Stormwater Laws with respect to the City's right of entry, inspection and maintenance or abatement.

2. Covenant Binds Successors and Runs with the Property. It is understood and agreed that the terms, covenants and conditions herein contained shall constitute covenants running with the land and shall be binding upon the heirs, executors, administrators, successors and assigns of the Owner and its Successors, and shall be deemed to be for the benefit of all persons owning any interest in the Property. It is the intent of the Owner that this Covenant may be recorded and shall be binding upon all persons purchasing or otherwise acquiring all or any lot, unit or other portion of the Property who shall be deemed to have consented to and become bound by all the provisions hereof.

3. Amendment and Release. The terms of this Covenant may be modified only by a written amendment approved and signed by City and by the Owner or its Successors in interest. This Covenant may be terminated and Owner and its Successors released from the covenants set forth herein by a written release which City may execute if it determines that another mechanism will assure the ongoing maintenance of the BMP's and transfers of ownership, or that it is no longer necessary to assure such maintenance and transfers of ownership.

4. Governing Law and Severability. This Covenant shall be governed by the laws of the State of California. Venue in any action related to this Covenant shall be in the Superior Court of the State of California, County of Riverside. In the event that any of the provisions of this Covenant are held to be unenforceable or invalid by any court of competent jurisdiction, the validity, and enforceability of the remaining provisions shall not be affected thereby.

5. Copy of Final WQMP. A copy of the Final WQMP must be kept on the Property at all times.

[SIGNATURES FOLLOW ON NEXT PAGE]

IN WITNESS WHEREOF, the Owner has executed this Covenant on the day and year first written above.

"OWNER":

Insert legal owner on title with correct signature block, LLC,
a California limited liability company

By:_____
Name:_____
Its:_____

Signature must be notarized. Attach notary acknowledgment

EXHIBIT “A”

PROPERTY

One can use a copy of the legal description from the title report. A metes and bounds legal description with a license surveyor stamp is not required.

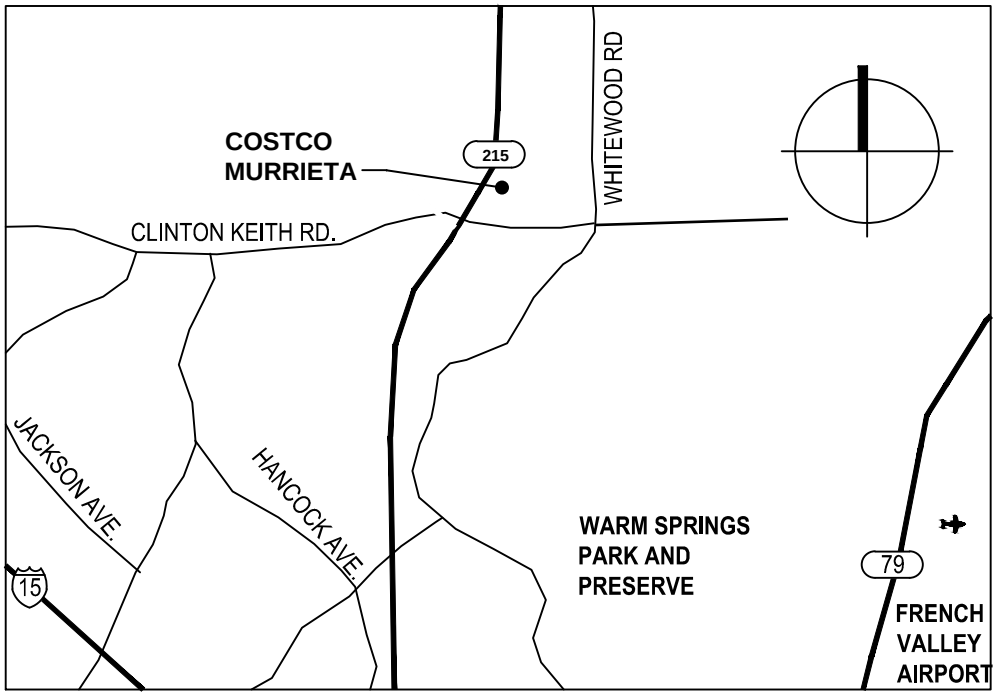
O&M AGREEMENT EXHIBIT A

LEGAL DESCRIPTION

THE LAND REFERRED TO ON THIS AGREEMENT IS IN THE STATE OF CALIFORNIA, COUNTY OF RIVERSIDE, CITY OF MURRIETA, AND IS DESCRIBED AS FOLLOWS:

ALL OF PARCELS 1 AND 2 OF UNIT 1, PARCEL MAP NO. 37511, FILED ON BOOK ___, PAGE ___, OF PARCEL MAPS, RECORDS OF RIVERSIDE COUNTY, TOGETHER WITH THE REVERSIONARY RIGHTS TO LOTS A AND B ON SAID PARCEL MAP, DEDICATED AND ACCEPTED FOR PUBLIC ROAD PURPOSES

VICINITY MAP



REGIONAL MAP

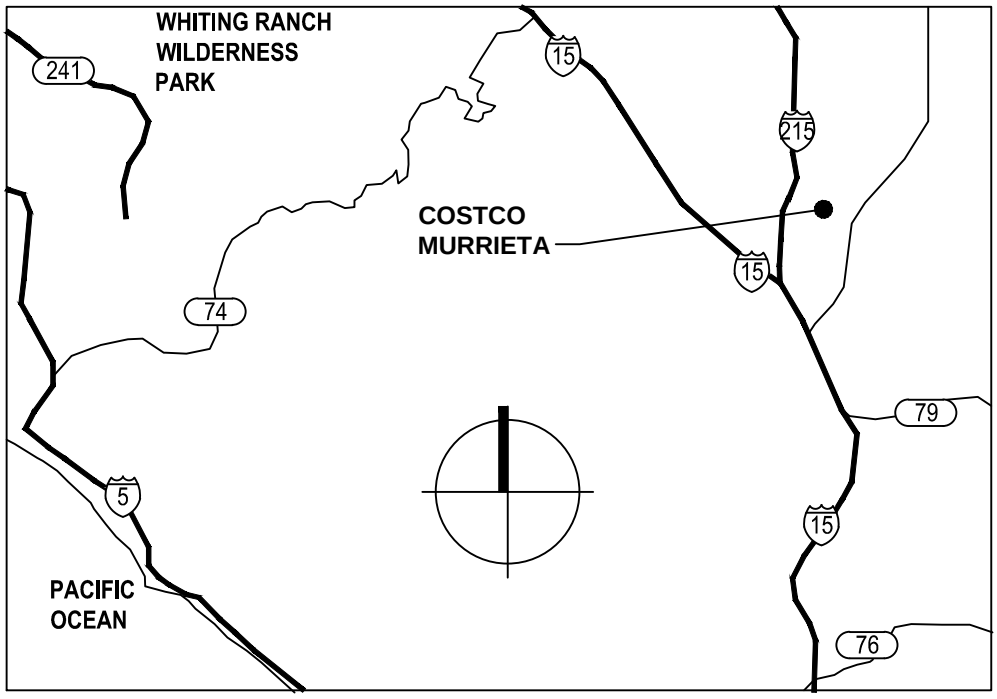


EXHIBIT "B"

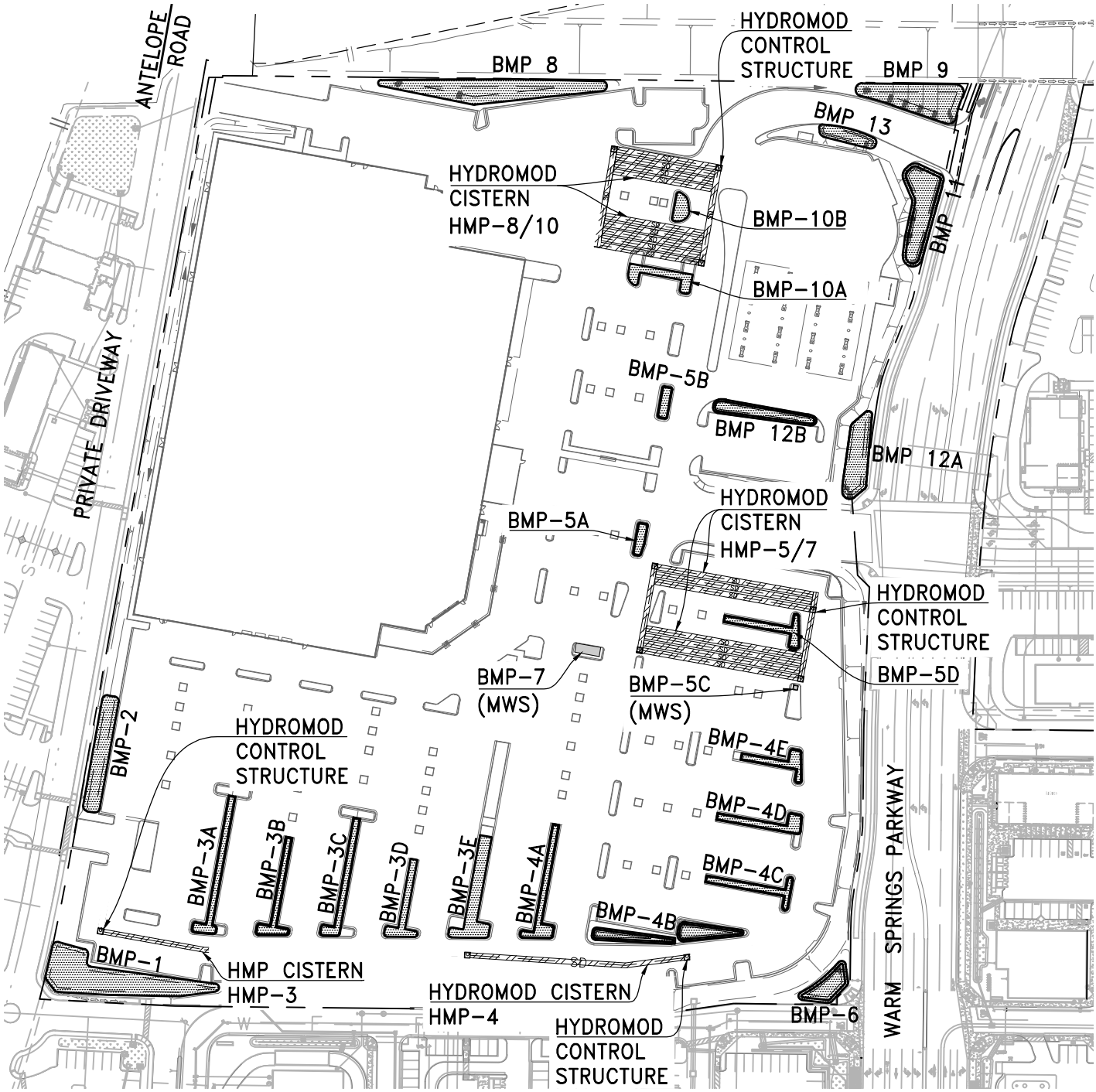
BEST MANAGEMENT PRACTICES

The following is a list of Source and Treatment Control BMP's on the property:

Please refer to the Final Water Quality Management Plan for a complete description of the operation and maintenance procedures. An up to date copy is required to be kept on the property at all times.

O&M AGREEMENT EXHIBIT B

BMP SITE MAP



LEGEND

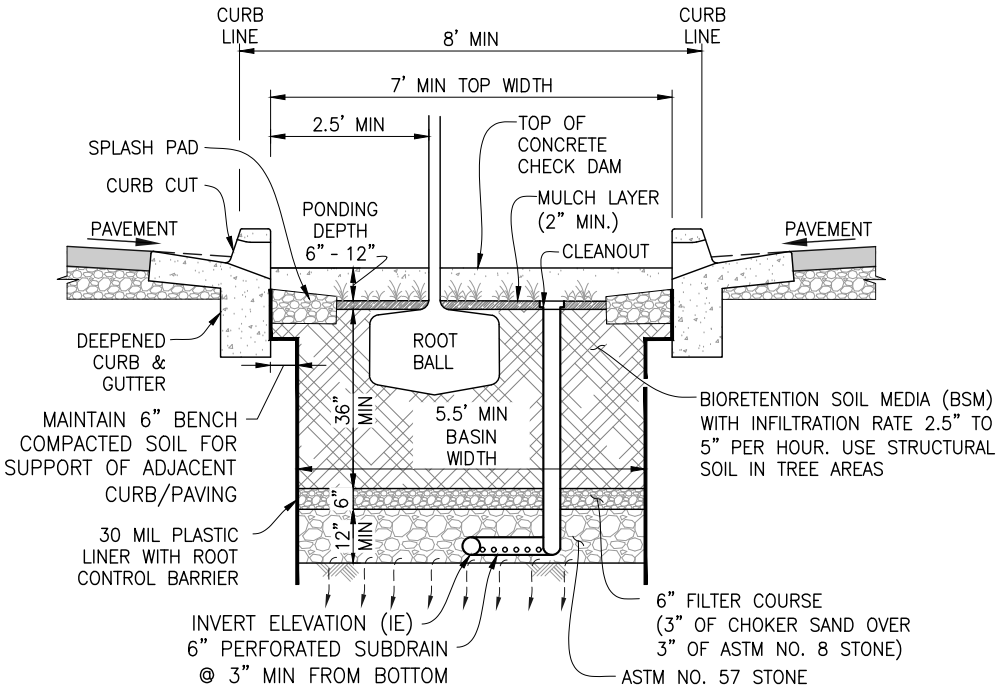
BMP NUMBER	BMP-3A
HMP BMP NUMBER	HMP-4
BIORETENTION BASIN	
HYDROMODIFICATION CISTERN	
BIOFILTRATION UNIT (MWS)	

SCALE: 1"=150'

BMP SITE MAP

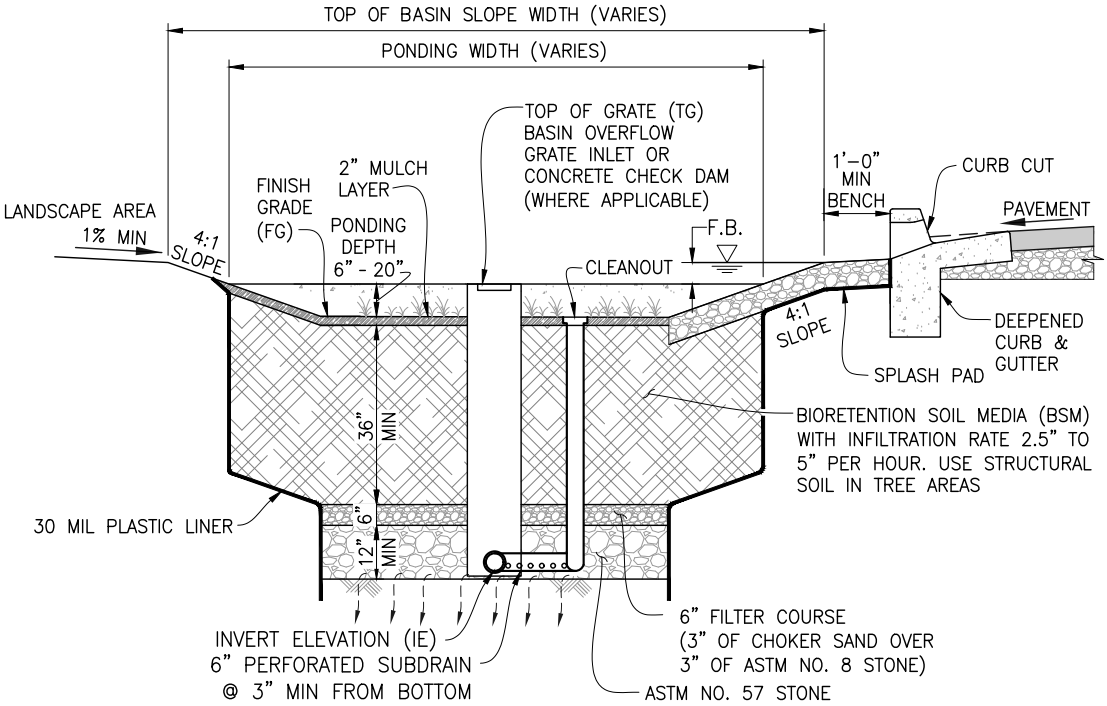
COSTCO MURRIETA
MURRIETA, CA
9/11/2018

O&M AGREEMENT EXHIBIT B



TYPICAL BIORETENTION PARKING PLANTER SECTION

NOT TO SCALE



TYPICAL BIORETENTION BASIN SECTION

NOT TO SCALE

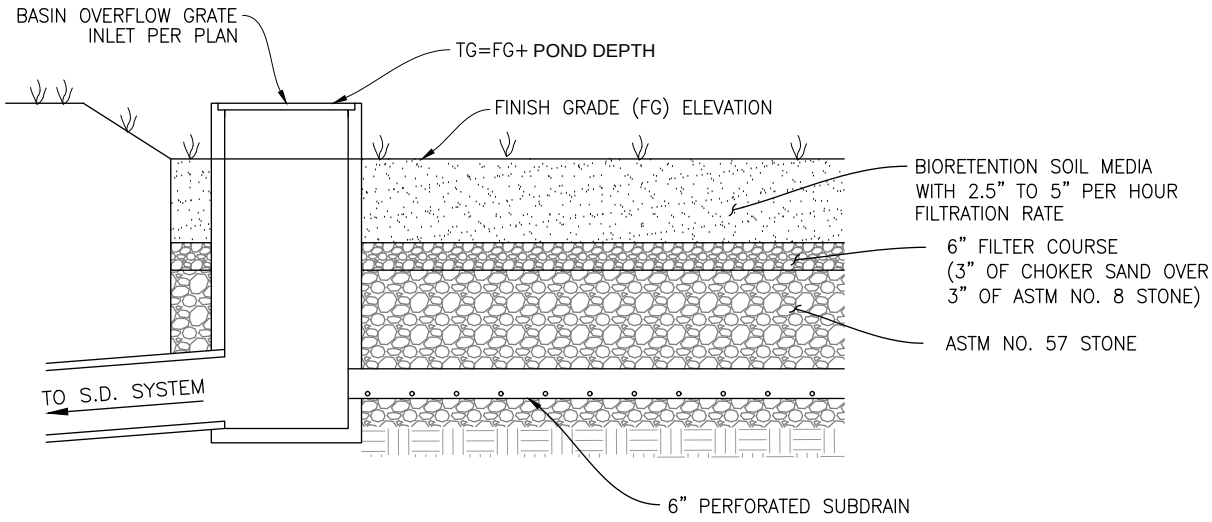
BMP DETAILS

COSTCO MURRIETA

MURRIETA, CA

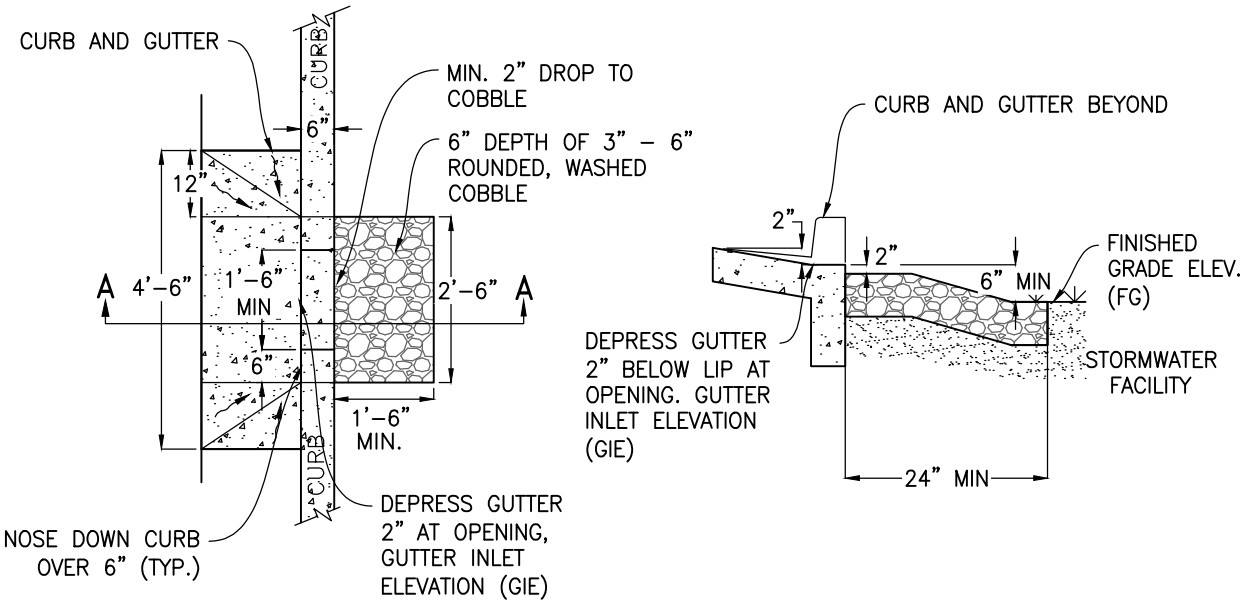
9/11/2018

O&M AGREEMENT EXHIBIT B



BIORETENTION TYPICAL LONGITUDINAL SECTION

N.T.S.



PLAN VIEW

SECTION A–A

CURB OPENING DETAIL

N.T.S.

BMP DETAILS

COSTCO MURRIETA

MURRIETA, CA

9/11/2018

PR-1

Biofiltration with Partial Retention

BMP MAINTENANCE FACT SHEET
FOR
STRUCTURAL BMP PR-1 BIOFILTRATION WITH PARTIAL RETENTION

Biofiltration with partial retention facilities are vegetated surface water systems that filter water through vegetation and soil or engineered media prior to infiltrating into native soils, discharge via underdrain, or overflow to the downstream conveyance system. These BMPs have an elevated underdrain discharge point that creates storage capacity in the aggregate storage layer. Typical biofiltration with partial retention components include:

- Inflow distribution mechanisms (e.g., perimeter flow spreader or filter strips)
- Energy dissipation mechanism for concentrated inflows (e.g., splash blocks or riprap)
- Shallow surface ponding for captured flows
- Side slope and basin bottom vegetation selected based on climate and ponding depth
- Non-floating mulch layer
- Media layer (planting mix or engineered media) capable of supporting vegetation growth
- Filter course layer consisting of aggregate to prevent the migration of fines into uncompacted native soils or the aggregate storage layer
- Aggregate storage layer with underdrain(s)
- Uncompacted native soils at the bottom of the facility
- Overflow structure

Normal Expected Maintenance

Biofiltration with partial retention requires routine maintenance to: remove accumulated materials such as sediment, trash or debris; maintain vegetation health; maintain infiltration capacity of the media layer; replenish mulch; and maintain integrity of side slopes, inlets, energy dissipators, and outlets. A summary table of standard inspection and maintenance indicators is provided within this Fact Sheet.

Non-Standard Maintenance or BMP Failure

If any of the following scenarios are observed, the BMP is not performing as intended to protect downstream waterways from pollution and/or erosion. Corrective maintenance, increased inspection and maintenance, BMP replacement, or a different BMP type will be required.

- The BMP is not drained between storm events. Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health, and surface ponding longer than approximately 96 hours following a storm event poses a risk of vector (mosquito) breeding. Poor drainage can result from clogging of the media layer, filter course, aggregate storage layer, underdrain, or outlet structure. The specific cause of the drainage issue must be determined and corrected.
- Sediment, trash, or debris accumulation greater than 25% of the surface ponding volume within one month. This means the load from the tributary drainage area is too high, reducing BMP function or clogging the BMP. This would require pretreatment measures within the tributary area draining to the BMP to intercept the materials. Pretreatment components, especially for sediment, will extend the life of components that are more expensive to replace such as media, filter course, and aggregate layers.

- Erosion due to concentrated storm water runoff flow that is not readily corrected by adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan. If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction.

Other Special Considerations

Biofiltration with partial retention is a vegetated structural BMP. Vegetated structural BMPs that are constructed in the vicinity of, or connected to, an existing jurisdictional water or wetland could inadvertently result in creation of expanded waters or wetlands. As such, vegetated structural BMPs have the potential to come under the jurisdiction of the United States Army Corps of Engineers, SDRWQCB, California Department of Fish and Wildlife, or the United States Fish and Wildlife Service. This could result in the need for specific resource agency permits and costly mitigation to perform maintenance of the structural BMP. Along with proper placement of a structural BMP, **routine maintenance is key to preventing this scenario**.

PR-1

Biofiltration with Partial Retention

SUMMARY OF STANDARD INSPECTION AND MAINTENANCE FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION		
The property owner is responsible to ensure inspection, operation and maintenance of permanent BMPs on their property unless responsibility has been formally transferred to an agency, community facilities district, homeowners association, property owners association, or other special district. Maintenance frequencies listed in this table are average/typical frequencies. Actual maintenance needs are site-specific, and maintenance may be required more frequently. Maintenance must be performed whenever needed, based on maintenance indicators presented in this table. The BMP owner is responsible for conducting regular inspections to see when maintenance is needed based on the maintenance indicators. During the first year of operation of a structural BMP, inspection is recommended at least once prior to August 31 and then monthly from September through May. Inspection during a storm event is also recommended. After the initial period of frequent inspections, the minimum inspection and maintenance frequency can be determined based on the results of the first year inspections.		
Threshold/Indicator	**Maintenance Action**	**Typical Maintenance Frequency**
Accumulation of sediment, litter, or debris	Remove and properly dispose of accumulated materials, without damage to the vegetation or compaction of the media layer.	• Inspect monthly. If the BMP is 25% full* or more in one month, increase inspection frequency to monthly plus after every 0.1-inch or larger storm event. • Remove any accumulated materials found at each inspection.
Obstructed inlet or outlet structure	Clear blockage.	• Inspect monthly and after every 0.5-inch or larger storm event. • Remove any accumulated materials found at each inspection.
Damage to structural components such as weirs, inlet or outlet structures	Repair or replace as applicable.	• Inspect annually. • Maintenance when needed.
Poor vegetation establishment	Re-seed, re-plant, or re-establish vegetation per original plans.	• Inspect monthly. • Maintenance when needed.
Dead or diseased vegetation	Remove dead or diseased vegetation, re-seed, re-plant, or re-establish vegetation per original plans.	• Inspect monthly. • Maintenance when needed.
Overgrown vegetation	Mow or trim as appropriate.	• Inspect monthly. • Maintenance when needed.
2/3 of mulch has decomposed, or mulch has been removed	Remove decomposed fraction and top off with fresh mulch to a total depth of 3 inches.	• Inspect monthly. • Replenish mulch annually, or more frequently when needed based on inspection.

*"25% full" is defined as ¼ of the depth from the design bottom elevation to the crest of the outflow structure (e.g., if the height to the outflow opening is 12 inches from the bottom elevation, then the materials must be removed when there is 3 inches of accumulation – this should be marked on the outflow structure).

PR-1

Biofiltration with Partial Retention

SUMMARY OF STANDARD INSPECTION AND MAINTENANCE FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION (Continued from previous page)		
Threshold/Indicator	**Maintenance Action**	**Typical Maintenance Frequency**
Erosion due to concentrated irrigation flow	Repair/re-seed/re-plant eroded areas and adjust the irrigation system.	• Inspect monthly. • Maintenance when needed.
Erosion due to concentrated storm water runoff flow	Repair/re-seed/re-plant eroded areas, and make appropriate corrective measures such as adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan. If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction.	• Inspect after every 0.5-inch or larger storm event. If erosion due to storm water flow has been observed, increase inspection frequency to after every 0.1-inch or larger storm event. • Maintenance when needed. If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction.
Standing water in BMP for longer than 24 hours following a storm event Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health	Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, clearing underdrains, or repairing/replacing clogged or compacted soils.	• Inspect monthly and after every 0.5-inch or larger storm event. If standing water is observed, increase inspection frequency to after every 0.1-inch or larger storm event. • Maintenance when needed.
Presence of mosquitos/larvae For images of egg rafts, larva, pupa, and adult mosquitos, see http://www.mosquito.org/biology	If mosquitos/larvae are observed: first, immediately remove any standing water by dispersing to nearby landscaping; second, make corrective measures as applicable to restore BMP drainage to prevent standing water. If mosquitos persist following corrective measures to remove standing water, or if the BMP design does not meet the 96-hour drawdown criteria due to release rates controlled by an orifice installed on the underdrain, the [City Engineer] shall be contacted to determine a solution. A different BMP type, or a Vector Management Plan prepared with concurrence from the County of San Diego Department of Environmental Health, may be required.	• Inspect monthly and after every 0.5-inch or larger storm event. If mosquitos are observed, increase inspection frequency to after every 0.1-inch or larger storm event. • Maintenance when needed.
Underdrain clogged	Clear blockage.	• Inspect if standing water is observed for longer than 24-96 hours following a storm event. • Maintenance when needed.

PR-1

Biofiltration with Partial Retention

References

American Mosquito Control Association.
http://www.mosquito.org/

California Storm Water Quality Association (CASQA). 2003. Municipal BMP Handbook.
https://www.casqa.org/resources/bmp-handbooks/municipal-bmp-handbook

County of San Diego. 2014. Low Impact Development Handbook.
http://www.sandiegocounty.gov/content/sdc/dpw/watersheds/susmp/lid.html

San Diego County Copermittees. 2016. Model BMP Design Manual, Appendix E, Fact Sheet PR-1.
http://www.projectcleanwater.org/index.php?option=com_content&view=article&id=250&Itemid=220

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	
Property / Development Name:	Responsible Party Name and Phone Number:	
Property Address of BMP:	Responsible Party Address:	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 1 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Accumulation of sediment, litter, or debris Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove and properly dispose of accumulated materials, without damage to the vegetation ☐ If sediment, litter, or debris accumulation exceeds 25% of the surface ponding volume within one month (25% full*), add a forebay or other pre-treatment measures within the tributary area draining to the BMP to intercept the materials. ☐ Other / Comments:		
Poor vegetation establishment Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		

*"25% full" is defined as ¼ of the depth from the design bottom elevation to the crest of the outflow structure (e.g., if the height to the outflow opening is 12 inches from the bottom elevation, then the materials must be removed when there is 3 inches of accumulation – this should be marked on the outflow structure).

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 2 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Dead or diseased vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove dead or diseased vegetation, re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		
Overgrown vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Mow or trim as appropriate ☐ Other / Comments:		
2/3 of mulch has decomposed, or mulch has been removed Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove decomposed fraction and top off with fresh mulch to a total depth of 3 inches ☐ Other / Comments:		

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 3 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Erosion due to concentrated irrigation flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair/re-seed/re-plant eroded areas and adjust the irrigation system ☐ Other / Comments:		
Erosion due to concentrated storm water runoff flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair/re-seed/re-plant eroded areas, and make appropriate corrective measures such as adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan ☐ If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction ☐ Other / Comments:		

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 4 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Obstructed inlet or outlet structure Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		
Underdrain clogged (inspect underdrain if standing water is observed for longer than 24-96 hours following a storm event) Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		
Damage to structural components such as weirs, inlet or outlet structures Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair or replace as applicable ☐ Other / Comments:		

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 5 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Standing water in BMP for longer than 24 hours following a storm event* Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, clearing underdrains, or repairing/replacing clogged or compacted soils ☐ Other / Comments:		
Presence of mosquitos/larvae For images of egg rafts, larva, pupa, and adult mosquitos, see http://www.mosquito.org/biology Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Apply corrective measures to remove standing water in BMP when standing water occurs for longer than 24-96 hours following a storm event.** ☐ Other / Comments:		

*Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health, and surface ponding longer than approximately 96 hours following a storm event poses a risk of vector (mosquito) breeding. Poor drainage can result from clogging of the media layer, filter course, aggregate storage layer, underdrain, or outlet structure. The specific cause of the drainage issue must be determined and corrected.

**If mosquitos persist following corrective measures to remove standing water, or if the BMP design does not meet the 96-hour drawdown criteria due to release rates controlled by an orifice installed on the underdrain, the [City Engineer] shall be contacted to determine a solution. A different BMP type, or a Vector Management Plan prepared with concurrence from the County of San Diego Department of Environmental Health, may be required.

HMP BMP
Hydromodification Cistern

BMP MAINTENANCE FACT SHEET
FOR
STRUCTURAL HYDROMODIFICATION CISTERN

Cisterns are containers that capture runoff (typically rooftop runoff) and store it for hydromodification requirements for controlled discharge between storm events. Cisterns can be aboveground or below ground systems. Typical cistern components include:

- Storage container, barrel or tank for holding captured flows
- Inlet
- Outlet control structure with risers with orifices and/or weirs for controlled discharge
- Overflow outlet and/or weirs for discharge of storms greater than 10-year storm events
- Access riser or tank serviceway (i.e., access for underground and above-ground cisterns)
- Optional pump
- Optional first flush diverters
- Optional debris screen or pretreatment BMP (e.g., roof drain filter, drainage inlet insert)
- Optional roof, supports, foundation, level indicator, and other accessories

Normal Expected Maintenance

Cisterns can be expected to accumulate sediment and debris that is small enough to pass through the inlet into the storage container. Larger debris such as leaves or trash may accumulate at the inlet. While the storage container is generally a permanent structure, ancillary parts including valves, piping, screens, level indicators, and other accessories will wear and require occasional replacement. Maintenance of a cistern generally involves: removing accumulated sediment and debris from the inlet and storage container on a routine basis; and replacement of ancillary parts on an as-needed basis. A summary table of standard inspection and maintenance indicators is provided within this Fact Sheet. If the system as a whole includes a pump or other electrical equipment, maintenance of the equipment shall be based on the manufacturer's recommended maintenance plan.

Non-Standard Maintenance or BMP Failure

If any of the following scenarios are observed, the BMP is not performing as intended to protect downstream waterways from pollution and/or erosion. Corrective maintenance, increased inspection and maintenance, BMP replacement, or a different BMP type will be required.

- The inlet is found to be obstructed at every inspection such that storm water bypasses the cistern. The cistern is not functioning properly if it is not capturing storm water. This would require addition of ancillary features to protect the inlet, or pretreatment measures within the watershed draining to the cistern to intercept larger debris, such as screens on roof gutters, or drainage inserts within catch basins. Increase the frequency of inspection until the issue is resolved.
- Accumulation of sediment within one year is greater than 25% of the volume of the cistern. This means the sediment load from the tributary drainage area has diminished the storage volume of the cistern and the cistern will not capture the required volume of storm water. This would require pretreatment measures within the tributary area draining to the cistern to intercept sediment.
- The cistern is not drained between storm events. If the cistern is not drained between storm events, the storage volume will be diminished and the cistern will not capture the required volume of storm water from subsequent storms. This would require implementation of practices onsite to drain and use the stored water, or a different BMP if onsite use cannot be reliably sustained.

HMP BMP
Hydromodification Cistern

SUMMARY OF STANDARD INSPECTION AND MAINTENANCE FOR HYDROMODIFICATION CISTERN		
The property owner is responsible to ensure inspection, operation and maintenance of permanent BMPs on their property unless responsibility has been formally transferred to an agency, community facilities district, homeowners association, property owners association, or other special district. Maintenance frequencies listed in this table are average/typical frequencies. Actual maintenance needs are site-specific, and maintenance may be required more frequently. Maintenance must be performed whenever needed, based on maintenance indicators presented in this table. The BMP owner is responsible for conducting regular inspections to see when maintenance is needed based on the maintenance indicators. During the first year of operation of a structural BMP, inspection is recommended at least once prior to August 31 and then monthly from September through May. Inspection during a storm event is also recommended. After the initial period of frequent inspections, the minimum inspection and maintenance frequency can be determined based on the results of the first year inspections.		
Threshold/Indicator	**Maintenance Action**	**Typical Inspection and Maintenance Frequency**
Accumulation of sediment, litter, or debris at the inlet	Remove and properly dispose of accumulated materials.	• Inspect monthly and after every 0.5-inch or larger storm event. • Remove any accumulated materials found at each inspection.
Outlet blocked	Clear blockage.	• Inspect monthly and after every 0.5-inch or larger storm event. • Remove any accumulated materials found at each inspection.
Accumulation of sediment, litter, or debris in the storage container	Remove and properly dispose of accumulated materials.	• Inspect monthly. If the BMP is 25% full* or more in one month, increase inspection frequency to monthly plus after every 0.1-inch or larger storm event. • Remove materials annually (minimum), or more frequently when BMP is 25% full* (or at manufacturer threshold if manufacturer threshold is less than 25% full*) in less than one year, or if accumulation blocks outlet
Standing water in storage container between storm events outside of normal use timeframe for the stored water. Normal use timeframe is 36 to 96 hours following a storm event depending on the purpose and design of the cistern.	Use the water as intended, or disperse to landscaping. Implement practices onsite to drain and use the stored water. Contact the [City Engineer] to determine a solution if onsite use cannot be reliably sustained.	• Inspect monthly and after every 0.5-inch or larger storm event. If standing water is observed, increase inspection frequency to after every 0.1-inch or larger storm event. • Maintenance when needed.

*"25% full" is defined as ¼ of the depth from the design bottom elevation to the crest of the outflow structure (e.g., if the height to the outflow opening is 12 inches from the bottom elevation, then the materials must be removed when there is 3 inches of accumulation – this should be marked on the outflow structure)

HMP BMP
Hydromodification Cistern

SUMMARY OF STANDARD INSPECTION AND MAINTENANCE FOR HYDROMODIFICATION CISTERN (Continued from previous page)		
Threshold/Indicator	**Maintenance Action**	**Typical Inspection and Maintenance Frequency**
Presence of mosquitos/larvae For images of egg rafts, larva, pupa, and adult mosquitos, see http://www.mosquito.org/biology	If mosquitos/larvae are observed: first, immediately remove any standing water by using the water as intended for irrigation or alternative grey water, or by dispersing to landscaping; second, check cistern outlet for blockage and clear blockage if applicable to restore drainage; third, install barriers such as screens that prevent mosquito access to the storage container.	• Inspect monthly and after every 0.5-inch or larger storm event. If mosquitos are observed, increase inspection frequency to after every 0.1-inch or larger storm event. • Maintenance when needed.
Leaks or other damage to ancillary parts including valves, piping, screens, level indicators, and other accessories	Repair or replace as applicable.	• Inspect twice per year. • Maintenance when needed.
Leaks or other damage to storage container	Repair or replace as applicable.	• Inspect twice per year. • Maintenance when needed.
Cistern leaning or unstable, damage to roof, supports, anchors, or foundation	Make repairs as appropriate to correct the problem and stabilize the system.	• Inspect twice per year. • Maintenance when needed.

References

American Mosquito Control Association.
http://www.mosquito.org/

California Storm Water Quality Association (CASQA). 2003. Municipal BMP Handbook.
https://www.casqa.org/resources/bmp-handbooks/municipal-bmp-handbook

County of San Diego. 2014. Low Impact Development Handbook.
http://www.sandiegocounty.gov/content/sdc/dpw/watersheds/susmp/lid.html

San Diego County Copermittees. 2016. Model BMP Design Manual
http://www.projectcleanwater.org/index.php?option=com_content&view=article&id=250&Itemid=220

HMP BMP
Hydromodification Cistern

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	
Property / Development Name:	Responsible Party Name and Phone Number:	
Property Address of BMP:	Responsible Party Address:	

INSPECTION AND MAINTENANCE CHECKLIST HYDROMODIFICATION CISTERN PAGE 1 of 4			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Accumulation of sediment, litter, or debris at the inlet Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove and properly dispose of accumulated materials ☐ If the inlet is found to be obstructed at every inspection, add features to protect the inlet, or pretreatment measures within the watershed ☐ Other / Comments:		
Outlet blocked Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		

HMP BMP
Hydromodification Cistern

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR HYDROMODIFICATION CISTERN PAGE 2 of 4			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Standing water in storage container between storm events outside of normal use timeframe for the stored water. Normal use timeframe is 36 to 96 hours following a storm event depending on the purpose and design of the cistern. Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Use the water as intended, or disperse to landscaping ☐ Implement practices onsite to drain and use the stored water ☐ Contact the [City Engineer] to determine a solution if onsite use cannot be reliably sustained ☐ Other / Comments:		
Presence of mosquitos/larvae For images of egg rafts, larva, pupa, and adult mosquitos, see http://www.mosquito.org/biology Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Use the water as intended, or disperse to landscaping ☐ Install barriers such as screens that prevent mosquito access to the storage container ☐ Other / Comments:		

HMP BMP
Hydromodification Cistern

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR HYDROMODIFICATION CISTERN PAGE 3 of 4			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Accumulation of sediment, litter, or debris in the storage container – to be cleared once per year or when debris accumulation is 25% of the total container volume, or accumulation blocks outlet, whichever is more frequent Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove and properly dispose of accumulated materials ☐ If accumulation of sediment within one year is >25% of the volume of the cistern, add pretreatment measures within the watershed ☐ Other / Comments:		
Leaks or other damage to storage container Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair or replace as applicable ☐ Other / Comments:		

HMP BMP
Hydromodification Cistern

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

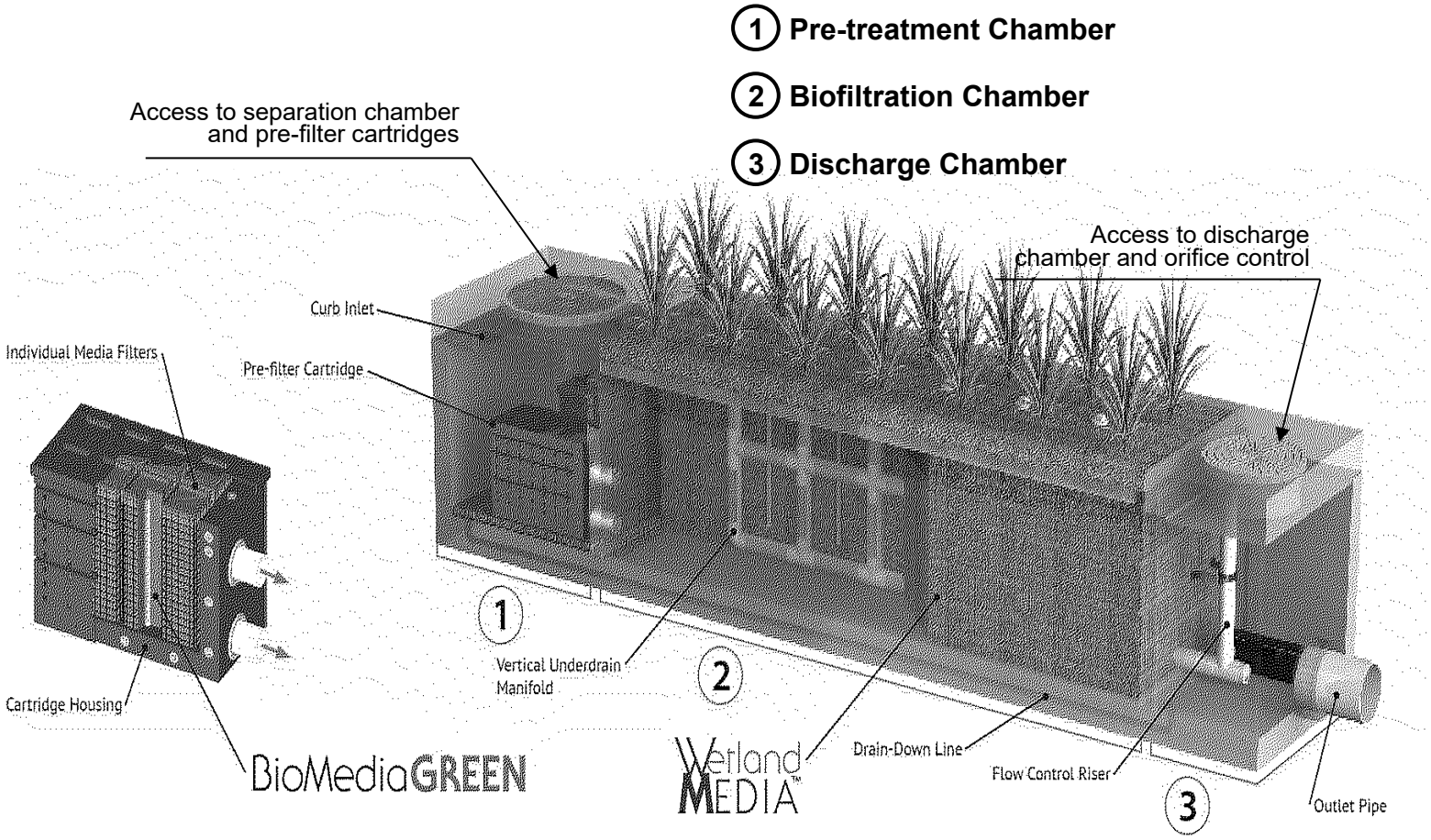
INSPECTION AND MAINTENANCE CHECKLIST FOR HYDROMODIFICATION CISTERN PAGE 4 of 4			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Leaks or other damage to ancillary parts including valves, piping, screens, level indicators, and other accessories Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair or replace as applicable ☐ Other / Comments:		
Cistern leaning or unstable, damage to roof, supports, anchors, or foundation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Make repairs as appropriate to correct the problem and stabilize the system ☐ Other / Comments:		

Inspection Guidelines for Modular Wetland System - Linear

Inspection Summary

- Inspect Pre-Treatment, Biofiltration and Discharge Chambers – average inspection interval is 6 to 12 months.
  - (1*5 minute average inspection time*).
- NOTE: Pollutant loading varies greatly from site to site and no two sites are the same. Therefore, the first year requires inspection monthly during the wet season and every other month during the dry season in order to observe and record the amount of pollutant loading the system is receiving.

System Diagram



Inspection Overview

As with all stormwater BMPs inspection and maintenance on the MWS Linear is necessary. Stormwater regulations require that all BMPs be inspected and maintained to ensure they are operating as designed to allow for effective pollutant removal and provide protection to receiving water bodies. It is recommended that inspections be performed multiple times during the first year to assess the site specific loading conditions. This is recommended because pollutant loading and pollutant characteristics can vary greatly from site to site. Variables such as nearby soil erosion or construction sites, winter sanding on roads, amount of daily traffic and land use can increase pollutant loading on the system. The first year of inspections can be used to set inspection and maintenance intervals for subsequent years to ensure appropriate maintenance is provided. Without appropriate maintenance a BMP will exceed its storage capacity which can negatively affect its continued performance in removing and retaining captured pollutants.

Inspection Equipment

Following is a list of equipment to allow for simple and effective inspection of the MWS Linear:

- Modular Wetland Inspection Form
- Flashlight
- Manhole hook or appropriate tools to remove access hatches and covers
- Appropriate traffic control signage and procedures
- Measuring pole and/or tape measure.
- Protective clothing and eye protection.
- 7/16” open or closed ended wrench.
- Large permanent black marker (initial inspections only – first year)
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine inspections of the system.



Inspection Steps

The core to any successful stormwater BMP maintenance program is routine inspections. The inspection steps required on the MWS Linear are quick and easy. As mentioned above the first year should be seen as the maintenance interval establishment phase. During the first year more frequent inspections should occur in order to gather loading data and maintenance requirements for that specific site. This information can be used to establish a base for long term inspection and maintenance interval requirements.

The MWS Linear can be inspected though visual observation without entry into the system. All necessary pre-inspection steps must be carried out before inspection occurs, especially traffic control and other safety measures to protect the inspector and near-by pedestrians from any dangers associated with an open access hatch or manhole. Once these access covers have been safely opened the inspection process can proceed:

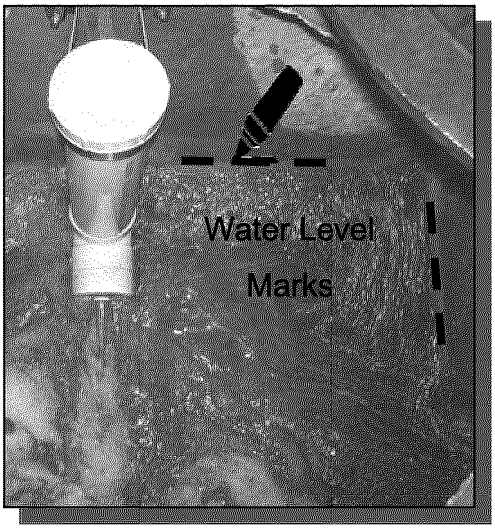
- Prepare the inspection form by writing in the necessary information including project name, location, date & time, unit number and other info (see inspection form).
- Observe the inside of the system through the access hatches. If minimal light is available and vision into the unit is impaired utilize a flashlight to see inside the system and all of its chambers.
- Look for any out of the ordinary obstructions in the inflow pipe, pre-treatment chamber, biofiltration chamber, discharge chamber or outflow pipe. Write down any observations on the inspection form.
- Through observation and/or digital photographs estimate the amount of trash, debris and sediment accumulated in the pre-treatment chamber. Utilizing a tape measure or measuring stick estimate the amount of trash, debris and sediment in this chamber. Record this depth on the inspection form.

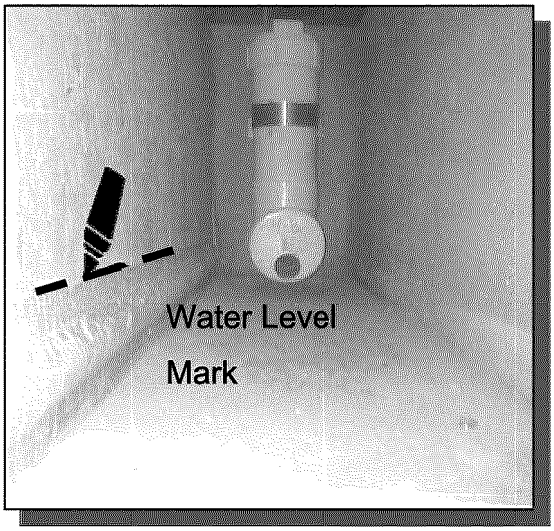
- Through visual observation inspect the condition of the pre-filter cartridges. Look for excessive build-up of sediments on the cartridges, any build-up on the top of the cartridges, or clogging of the holes. Record this information on the inspection form. The pre-filter cartridges can further be inspected by removing the cartridge tops and assessing the color of the BioMediaGREEN filter cubes (requires entry into pre-treatment chamber – see notes above regarding confined space entry). Record the color of the material. New material is a light green in color. As the media becomes clogged it will turn darker in color, eventually becoming dark brown or black. Using the below color indicator record the percentage of media exhausted.



- The biofiltration chamber is generally maintenance free due to the system's advanced pre-treatment chamber. For units which have open planters with vegetation it is recommended that the vegetation be inspected. Look for any plants that are dead or showing signs of disease or other negative stressors. Record the general health of the plants on the inspection and indicate through visual observation or digital photographs if trimming of the vegetation is needed.
- The discharge chamber houses the orifice control structure and is connected to the outflow pipe. It is important to check to ensure the orifice is in proper operating conditions and free of any obstructions. Generally, the discharge chamber will be clean and free of debris. Inspect the water marks on the side walls. If possible, inspect the discharge chamber during a rain event to assess the amount of flow leaving the system while it is at 100% capacity (pre-treatment chamber water level at peak HGL). The water level of the flowing water should be compared to the watermark level on the side walls which is an indicator of the highest discharge rate the system achieved when initially installed. Record on the form is there is any difference in level from watermark in inches.

- NOTE: During the first few storms the water level in the outflow chamber should be observed and a 6" long horizontal watermark line drawn (using a large permanent marker) at the water level in the discharge chamber while the system is operating at 100% capacity. The diagram below illustrates where a line should be drawn. This line is a reference point for future inspections of the system:







Using a permanent marker draw a 6 inch long horizontal line, as shown, at the higher water level in the MWS Linear discharge chamber.

- Water level in the discharge chamber is a function of flow rate and pipe size. Observation of water level during the first few months of operation can be used as a benchmark level for future inspections. The initial mark and all future observations shall be made when system is at 100% capacity (water level at maximum level in pre-treatment chamber). If future water levels are below this mark when system is at 100% capacity this is an indicator that maintenance to the pre-filter cartridges may be needed.
- Finalize inspection report for analysis by the maintenance manager to determine if maintenance is required.

Maintenance Indicators

Based upon observations made during inspection, maintenance of the system may be required based on the following indicators:

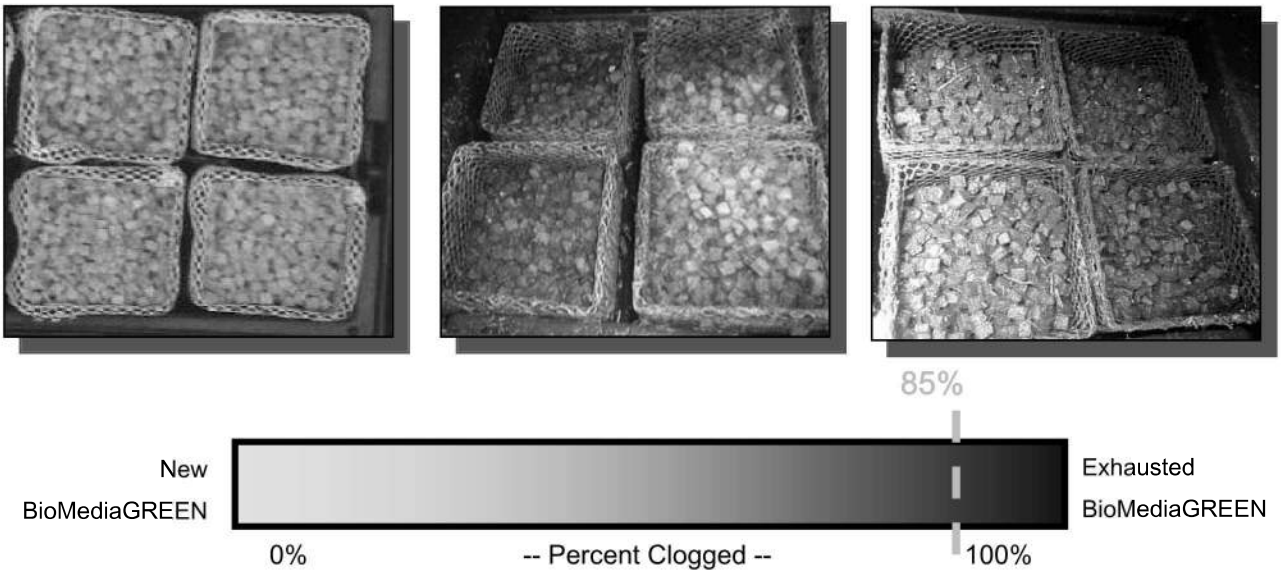
- Missing or damaged internal components or cartridges.
- Obstructions in the system or its inlet or outlet.
- Excessive accumulation of floatables in the pre-treatment chamber in which the length and width of the chamber is fully impacted more than 18”.



- Excessive accumulation of sediment in the pre-treatment chamber of more than 6” in depth.



- Excessive accumulation of sediment on the BioMediaGREEN media housed within the pre-filter cartridges. The following chart shows photos of the condition of the BioMediaGREEN contained within the pre-filter cartridges. When media is more than 85% clogged replacement is required.



- Overgrown vegetation.



- Water level in discharge chamber during 100% operating capacity (pre-treatment chamber water level at max height) is lower than the watermark by 20%.

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Inspection Notes

1. Following maintenance and/or inspection, it is recommended the maintenance operator prepare a maintenance/inspection record. The record should include any maintenance activities performed, amount and description of debris collected, and condition of the system and its various filter mechanisms.

2. The owner should keep maintenance/inspection record(s) for a minimum of five years from the date of maintenance. These records should be made available to the governing municipality for inspection upon request at any time.

3. Transport all debris, trash, organics and sediments to approved facility for disposal in accordance with local and state requirements.

4. Entry into chambers may require confined space training based on state and local regulations.

5. No fertilizer shall be used in the Biofiltration Chamber.

6. Irrigation should be provided as recommended by manufacturer and/or landscape architect. Amount of irrigation required is dependent on plant species. Some plants may not require irrigation after initial establishment.

O&M AGREEMENT EXHIBIT C

Inspection Report
Modular Wetlands System

Project Name _____

Project Address _____ (city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ____/____/____ Time _____ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition _____ Additional Notes _____

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(Reviewed By)
(Date)
Office personnel to complete section to the left.

Inspection Checklist

Modular Wetland System Type (Curb, Grate or UG Vault): _____ Size (22', 14' or etc.): _____

Structural Integrity:	**Yes**	**No**	**Comments**
Damage to pre-treatment access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Damage to discharge chamber access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Does the MWS unit show signs of structural deterioration (cracks in the wall, damage to frame)?			
Is the inlet/outlet pipe or drain down pipe damaged or otherwise not functioning properly?			
Working Condition:			
Is there evidence of illicit discharge or excessive oil, grease, or other automobile fluids entering and clogging the unit?			
Is there standing water in inappropriate areas after a dry period?			
Is the filter insert (if applicable) at capacity and/or is there an accumulation of debris/trash on the shelf system?			
Does the depth of sediment/trash/debris suggest a blockage of the inflow pipe, bypass or cartridge filter? If yes, specify which one in the comments section. Note depth of accumulation in in pre-treatment chamber.			Depth:
Does the cartridge filter media need replacement in pre-treatment chamber and/or discharge chamber?			Chamber:
Any signs of improper functioning in the discharge chamber? Note issues in comments section.			
Other Inspection Items:			
Is there an accumulation of sediment/trash/debris in the wetland media (if applicable)?			
Is it evident that the plants are alive and healthy (if applicable)? Please note Plant Information below.			
Is there a septic or foul odor coming from inside the system?			

Waste:	**Yes**	**No**
Sediment / Silt / Clay		
Trash / Bags / Bottles		
Green Waste / Leaves / Foliage		

Recommended Maintenance	
No Cleaning Needed	
Schedule Maintenance as Planned	
Needs Immediate Maintenance	

Plant Information	
Damage to Plants	
Plant Replacement	
Plant Trimming	

Additional Notes: _____

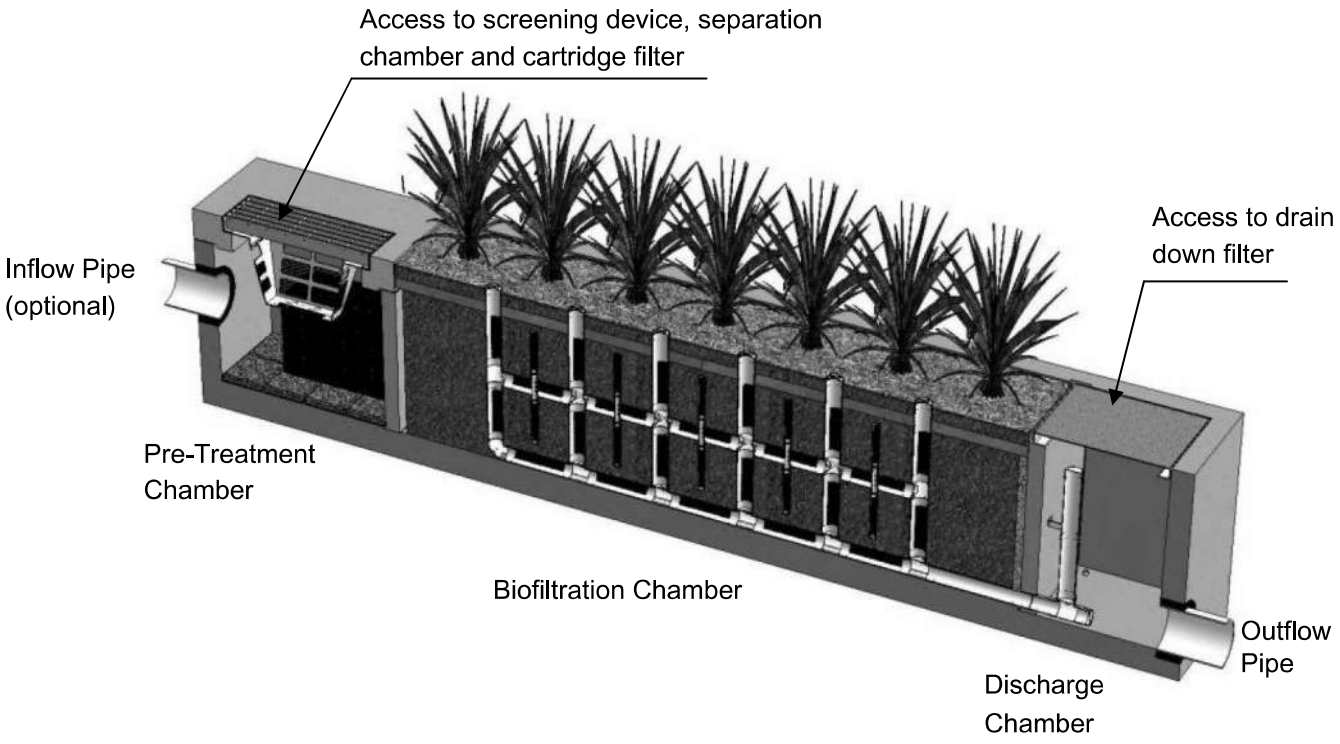
2972 San Luis Rey Road, Oceanside, CA 92058 P (760) 433-7640 F (760) 433-3176

Maintenance Guidelines for Modular Wetland System - Linear

Maintenance Summary

- Remove Trash from Screening Device – average maintenance interval is 6 to 12 months.
  - (*5 minute average service time*).
- Remove Sediment from Separation Chamber – average maintenance interval is 12 to 24 months.
  - (*10 minute average service time*).
- Replace Cartridge Filter Media – average maintenance interval 12 to 24 months.
  - (*10-15 minute per cartridge average service time*).
- Replace Drain Down Filter Media – average maintenance interval is 12 to 24 months.
  - (*5 minute average service time*).
- Trim Vegetation – average maintenance interval is 6 to 12 months.
  - (*Service time varies*).

System Diagram



Maintenance Overview

The time has come to maintain your Modular Wetland System Linear (MWS Linear). To ensure successful and efficient maintenance on the system we recommend the following. The MWS Linear can be maintained by removing the access hatches over the systems various chambers. All necessary pre-maintenance steps must be carried out before maintenance occurs, especially traffic control and other safety measures to protect the inspector and near-by pedestrians from any dangers associated with an open access hatch or manhole. Once traffic control has been set up per local and state regulations and access covers have been safely opened the maintenance process can begin. It should be noted that some maintenance activities require confined space entry. All confined space requirements must be strictly followed before entry into the system. In addition the following is recommended:

- Prepare the maintenance form by writing in the necessary information including project name, location, date & time, unit number and other info (see maintenance form).
- Set up all appropriate safety and cleaning equipment.
- Ensure traffic control is set up and properly positioned.
- Prepare a pre-checks (OSHA, safety, confined space entry) are performed.

Maintenance Equipment

Following is a list of equipment required for maintenance of the MWS Linear:

- Modular Wetland Maintenance Form
- Manhole hook or appropriate tools to access hatches and covers
- Protective clothing, flashlight and eye protection.
- 7/16” open or closed ended wrench.
- Vacuum assisted truck with pressure washer.
- Replacement BioMediaGREEN for Pre-Filter Cartridges if required (order from manufacturer).



O&M AGREEMENT EXHIBIT C

Maintenance Procedures

Screening Device

1. Remove grate or manhole cover to gain access to the screening device in the Pre-Treatment Chamber. Vault type units do not have screening device. Maintenance can be performed without entry.
2. Remove all pollutants collected by the screening device. Removal can be done manually or with the use of a vacuum truck. The hose of the vacuum truck will not damage the screening device.
3. Screening device can easily be removed from the Pre-Treatment Chamber to gain access to separation chamber and media filters below. Replace grate or manhole cover when completed.

Separation Chamber

1. Perform maintenance procedures of screening device listed above before maintaining the separation chamber.
2. With a pressure washer spray down pollutants accumulated on walls and cartridge filters.
3. Vacuum out Separation Chamber and remove all accumulated pollutants. Replace screening device, grate or manhole cover when completed.

Cartridge Filters

1. Perform maintenance procedures on screening device and separation chamber before maintaining cartridge filters.
2. Enter separation chamber.
3. Unscrew the two bolts holding the lid on each cartridge filter and remove lid.
4. Remove each of 4 to 8 media cages holding the media in place.
5. Spray down the cartridge filter to remove any accumulated pollutants.
6. Vacuum out old media and accumulated pollutants.
7. Reinstall media cages and fill with new media from manufacturer or outside supplier. Manufacturer will provide specification of media and sources to purchase.
8. Replace the lid and tighten down bolts. Replace screening device, grate or manhole cover when completed.

Drain Down Filter

1. Remove hatch or manhole cover over discharge chamber and enter chamber.
2. Unlock and lift drain down filter housing and remove old media block. Replace with new media block. Lower drain down filter housing and lock into place.
3. Exit chamber and replace hatch or manhole cover.

Maintenance Notes

1. Following maintenance and/or inspection, it is recommended the maintenance operator prepare a maintenance/inspection record. The record should include any maintenance activities performed, amount and description of debris collected, and condition of the system and its various filter mechanisms.

2. The owner should keep maintenance/inspection record(s) for a minimum of five years from the date of maintenance. These records should be made available to the governing municipality for inspection upon request at any time.

3. Transport all debris, trash, organics and sediments to approved facility for disposal in accordance with local and state requirements.

4. Entry into chambers may require confined space training based on state and local regulations.

5. No fertilizer shall be used in the Biofiltration Chamber.

6. Irrigation should be provided as recommended by manufacturer and/or landscape architect. Amount of irrigation required is dependent on plant species. Some plants may require irrigation.

O&M AGREEMENT EXHIBIT C

Cleaning and Maintenance Report
Modular Wetlands System

Project Name _____

Project Address _____ (city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ____/____/____ Time _____ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition _____ Additional Notes _____

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(Reviewed By)
(Date)
Office personnel to complete section to the left.

Site Map #	GPS Coordinates of Insert	Manufacturer / Description / Sizing	Trash Accumulation	Foliage Accumulation	Sediment Accumulation	Total Debris Accumulation	Condition of Media 25/50/75/100 (will be changed @ 75%)	Operational Per Manufactures' Specifications (If not, why?)
	Lat: Long:	MWS Catch Basins						
		MWS Sedimentation Basin						
		Media Filter Condition						
		Plant Condition						
		Drain Down Media Condition						
		Discharge Chamber Condition						
		Drain Down Pipe Condition						
		Inlet and Outlet Pipe Condition						

Comments:

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Maintenance Steps

1. Pre-treatment Chamber (bottom of chamber)

   A. Remove access hatch or manhole cover over pre-treatment chamber and position vacuum truck accordingly.
   B. With a pressure washer spray down pollutants accumulated on walls and pre-filter cartridges.
   C. Vacuum out Pre-Treatment Chamber and remove all accumulated pollutants including trash, debris and sediments. Be sure to vacuum the floor until pervious pavers are visible and clean.
   D. If Pre-Filter Cartridges require media replacement move onto step 2. If not, replace access hatch or manhole cover.



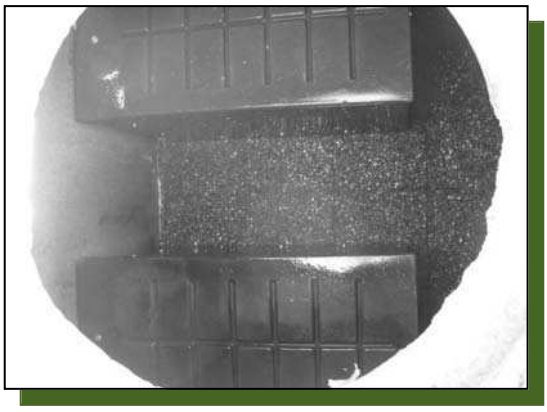
Removal of access hatch to gain access below.



Insertion of vacuum hose into separation chamber.



Removal of trash, sediment and debris.



Fully cleaned separation chamber.

2. Pre-Filter Cartridges (attached to wall of pre-treatment chamber)

A. After finishing step 1 enter pre-treatment chamber.

B. Unscrew the two bolts holding the lid on each cartridge filter and remove lid.



Pre-filter cartridges with tops on.



Inside cartridges showing media filters ready for replacement.

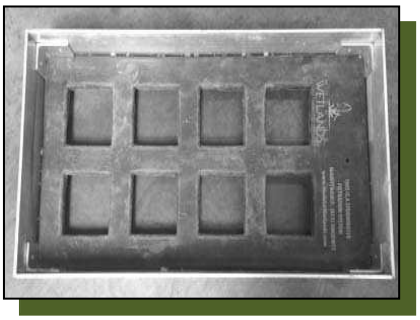
C. Place the vacuum hose over each individual media filter to suck out filter media.



Vacuuming out of media filters.

D. Once filter media has been sucked use a pressure washer to spray down inside of the cartridge and it's containing media cages. Remove cleaned media cages and place to the side. Once removed the vacuum hose can be inserted into the cartridge to vacuum out any remaining material near the bottom of the cartridge.

E. Reinstall media cages and fill with new media from manufacturer or outside supplier. Manufacturer will provide specification of media and sources to purchase. Utilize the manufacture provided refilling trey and place on top of cartridge. Fill trey with new bulk media and shake down into place. Using your hands slightly compact media into each filter cage. Once cages are full removed refilling trey and replace cartridge top ensuring bolts are properly tightened.



Refilling trey for media replacement.



Refilling trey on cartridge with bulk media.



F. Exit pre-treatment chamber. Replace access hatch or manhole cover.

3. Biofiltration Chamber (middle vegetated chamber)

A. In general, the biofiltration chamber is maintenance free with the exception of maintaining the vegetation. Using standard gardening tools properly trim back the vegetation to healthy levels. The MWS Linear utilizes vegetation similar to surrounding landscape areas therefore trim vegetation to match surrounding vegetation. If any plants have died replace plants with new ones:





Appendix 10: Educational Materials

BMP Fact Sheets, Maintenance Guidelines and Other End-User BMP Information

Spill Prevention, Control & Cleanup SC-11



Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Description

Spills and leaks, if not properly controlled, can adversely impact the storm drain system and receiving waters. Due to the type of work or the materials involved, many activities that occur either at a municipal facility or as a part of municipal field programs have the potential for accidental spills and leaks. Proper spill response planning and preparation can enable municipal employees to effectively respond to problems when they occur and minimize the discharge of pollutants to the environment.

Targeted Constituents

Sediment	
Nutrients	☑
Trash	
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑
Oxygen Demanding	☑

Approach

- An effective spill response and control plan should include:
  - Spill/leak prevention measures;
  - Spill response procedures;
  - Spill cleanup procedures;
  - Reporting; and
  - Training
- A well thought out and implemented plan can prevent pollutants from entering the storm drainage system and can be used as a tool for training personnel to prevent and control future spills as well.

Pollution Prevention

- Develop and implement a Spill Prevention Control and Response Plan. The plan should include:

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- A description of the facility, the address, activities and materials involved
- Identification of key spill response personnel
- Identification of the potential spill areas or operations prone to spills/leaks
- Identification of which areas should be or are bermed to contain spills/leaks
- Facility map identifying the key locations of areas, activities, materials, structural BMPs, etc.
- Material handling procedures
- Spill response procedures including:
    - Assessment of the site and potential impacts
    - Containment of the material
    - Notification of the proper personnel and evacuation procedures
    - Clean up of the site
    - Disposal of the waste material and
    - Proper record keeping

- Product substitution – use less toxic materials (i.e. use water based paints instead of oil based paints)
- Recycle, reclaim, or reuse materials whenever possible. This will reduce the amount of materials that are brought into the facility or into the field.

Suggested Protocols

Spill/Leak Prevention Measures

- If possible, move material handling indoors, under cover, or away from storm drains or sensitive water bodies.
- Properly label all containers so that the contents are easily identifiable.
- Berm storage areas so that if a spill or leak occurs, the material is contained.
- Cover outside storage areas either with a permanent structure or with a seasonal one such as a tarp so that rain can not come into contact with the materials.
- Check containers (and any containment sumps) often for leaks and spills. Replace containers that are leaking, corroded, or otherwise deteriorating with containers in good condition. Collect all spilled liquids and properly dispose of them.

- Store, contain and transfer liquid materials in such a manner that if the container is ruptured or the contents spilled, they will not discharge, flow or be washed into the storm drainage system, surface waters, or groundwater.
- Place drip pans or absorbent materials beneath all mounted taps and at all potential drip and spill locations during the filling and unloading of containers. Any collected liquids or soiled absorbent materials should be reused/recycled or properly disposed of.
- For field programs, only transport the minimum amount of material needed for the daily activities and transfer materials between containers at a municipal yard where leaks and spill are easier to control.
- If paved, sweep and clean storage areas monthly, do not use water to hose down the area unless all of the water will be collected and disposed of properly.
- Install a spill control device (such as a tee section) in any catch basins that collect runoff from any storage areas if the materials stored are oil, gas, or other materials that separate from and float on water. This will allow for easier cleanup if a spill occurs.
- If necessary, protect catch basins while conducting field activities so that if a spill occurs, the material will be contained.

Training

- Educate employees about spill prevention, spill response and cleanup on a routine basis.
- Well-trained employees can reduce human errors that lead to accidental releases or spills:
  - The employees should have the tools and knowledge to immediately begin cleaning up a spill if one should occur.
  - Employees should be familiar with the Spill Prevention Control and Countermeasure Plan if one is available.
- Training of staff from all municipal departments should focus on recognizing and reporting potential or current spills/leaks and who they should contact.
- Employees responsible for aboveground storage tanks and liquid transfers for large bulk containers should be thoroughly familiar with the Spill Prevention Control and Countermeasure Plan and the plan should be readily available.

Spill Response and Prevention

- Identify key spill response personnel and train employees on who they are.
- Store and maintain appropriate spill cleanup materials in a clearly marked location near storage areas; and train employees to ensure familiarity with the site's spill control plan and/or proper spill cleanup procedures.
- Locate spill cleanup materials, such as absorbents, where they will be readily accessible (e.g. near storage and maintenance areas, on field trucks).

SC-11 Spill Prevention, Control & Cleanup

- Follow the Spill Prevention Control and Countermeasure Plan if one is available.
- If a spill occurs, notify the key spill response personnel immediately. If the material is unknown or hazardous, the local fire department may also need to be contacted.
- If safe to do so, attempt to contain the material and block the nearby storm drains so that the area impacted is minimized. If the material is unknown or hazardous wait for properly trained personnel to contain the materials.
- Perform an assessment of the area where the spill occurred and the downstream area that it could impact. Relay this information to the key spill response and clean up personnel.

Spill Cleanup Procedures

- Small non-hazardous spills
  - Use a rag, damp cloth or absorbent materials for general clean up of liquids
  - Use brooms or shovels for the general clean up of dry materials
  - If water is used, it must be collected and properly disposed of. The wash water can not be allowed to enter the storm drain.
  - Dispose of any waste materials properly
  - Clean or dispose of any equipment used to clean up the spill properly
- Large non-hazardous spills
  - Use absorbent materials for general clean up of liquids
  - Use brooms, shovels or street sweepers for the general clean up of dry materials
  - If water is used, it must be collected and properly disposed of. The wash water can not be allowed to enter the storm drain.
  - Dispose of any waste materials properly
  - Clean or dispose of any equipment used to clean up the spill properly
- For hazardous or very large spills, a private cleanup company or Hazmat team may need to be contacted to assess the situation and conduct the cleanup and disposal of the materials.
- Chemical cleanups of material can be achieved with the use of absorbents, gels, and foams. Remove the adsorbent materials promptly and dispose of according to regulations.
- If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to a certified laundry (rags) or disposed of as hazardous waste.

Reporting

- Report any spills immediately to the identified key municipal spill response personnel.

- Report spills in accordance with applicable reporting laws. Spills that pose an immediate threat to human health or the environment must be reported immediately to the Office of Emergency Service (OES)
- Spills that pose an immediate threat to human health or the environment may also need to be reported within 24 hours to the Regional Water Quality Control Board.
- Federal regulations require that any oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hour)
- After the spill has been contained and cleaned up, a detailed report about the incident should be generated and kept on file (see the section on Reporting below). The incident may also be used in briefing staff about proper procedures

Other Considerations

- State regulations exist for facilities with a storage capacity of 10,000 gallons or more of petroleum to prepare a Spill Prevention Control and Countermeasure Plan (SPCC) Plan (Health & Safety Code Chapter 6.67).
- State regulations also exist for storage of hazardous materials (Health & Safety Code Chapter 6.95), including the preparation of area and business plans for emergency response to the releases or threatened releases.
- Consider requiring smaller secondary containment areas (less than 200 sq. ft.) to be connected to the sanitary sewer, if permitted to do so, prohibiting any hard connections to the storm drain.

Requirements

Costs

- Will vary depending on the size of the facility and the necessary controls.
- Prevention of leaks and spills is inexpensive. Treatment and/or disposal of wastes, contaminated soil and water is very expensive

Maintenance

- This BMP has no major administrative or staffing requirements. However, extra time is needed to properly handle and dispose of spills, which results in increased labor costs

Supplemental Information

Further Detail of the BMP

Reporting

Record keeping and internal reporting represent good operating practices because they can increase the efficiency of the response and containment of a spill. A good record keeping system helps the municipality minimize incident recurrence, correctly respond with appropriate containment and cleanup activities, and comply with legal requirements.

A record keeping and reporting system should be set up for documenting spills, leaks, and other discharges, including discharges of hazardous substances in reportable quantities. Incident records describe the quality and quantity of non-stormwater discharges to the storm drain.

These records should contain the following information:

- Date and time of the incident
- Weather conditions
- Duration of the spill/leak/discharge
- Cause of the spill/leak/discharge
- Response procedures implemented
- Persons notified
- Environmental problems associated with the spill/leak/discharge

Separate record keeping systems should be established to document housekeeping and preventive maintenance inspections, and training activities. All housekeeping and preventive maintenance inspections should be documented. Inspection documentation should contain the following information:

- The date and time the inspection was performed
- Name of the inspector
- Items inspected
- Problems noted
- Corrective action required
- Date corrective action was taken

Other means to document and record inspection results are field notes, timed and dated photographs, videotapes, and drawings and maps.

Examples

The City of Palo Alto includes spill prevention and control as a major element of its highly effective program for municipal vehicle maintenance shops.

References and Resources

King County Stormwater Pollution Control Manual - http://dnr.metrokc.gov/wlr/dss/spcm.htm

Orange County Stormwater Program
http://www.ocwatersheds.com/stormwater/swp_introduction.asp

San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Program (URMP)
http://www.projectcleanwater.org/pdf/Model%20Program%20Municipal%20Facilities.pdf

Vehicle and Equipment Fueling SC-20



Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize

Targeted Constituents

Sediment	
Nutrients	
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑
Oxygen Demanding	

Description

Spills and leaks that occur during vehicle and equipment fueling can contribute hydrocarbons, oil and grease, as well as heavy metals to stormwater runoff. Implementing the following management practices can help prevent fuel spills and leaks.

Approach

Reduce potential for pollutant discharge through source control pollution prevention and BMP implementation. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

Pollution Prevention

- Use properly maintained offsite fueling stations whenever possible. These businesses are better equipped to handle fuel and spills properly.
- Educate employees about pollution prevention measures and goals
- Focus pollution prevention activities on containment of spills and leaks, most of which may occur during liquid transfers.

Suggested Protocols

General

- "Spot clean" leaks and drips routinely. Leaks are not cleaned up until the absorbent is picked up and disposed of properly.

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- Label drains within the facility boundary, by paint/stencil (or equivalent), to indicate whether they flow to an oil/water separator, directly to the sewer, or to a storm drain. Labels are not necessary for plumbing fixtures directly connected to the sanitary sewer but may be useful to help eliminate confusion about where the drain leads.
- Post signs to remind employees not to top off the fuel tank when filling and signs that ban employees from changing engine oil or other fluids at that location.
- Report leaking vehicles to fleet maintenance.
- Install inlet catch basin equipped with a small sedimentation basin or grit chamber to remove large particles from stormwater in highly impervious areas. Proper maintenance of these devices is necessary.
- Accumulated non-contaminated stormwater (e.g., in a secondary containment) should be released prior to next storm.
- Ensure the following safeguards are in place:
  - Overflow protection devices on tank systems to warn the operator to automatically shutdown transfer pumps when the tank reaches full capacity.
  - Protective guards around tanks and piping to prevent vehicle or forklift damage.
  - Clearly tagging or labeling all valves to reduce human error.
  - Automatic shut off for severed fuel hoses.

Fuel Dispensing Areas

- Maintain clean fuel-dispensing areas using dry cleanup methods such as sweeping for removal of litter and debris, or use of rags and absorbents for leaks and spills. Do not wash down areas with water.
- Fit underground storage tanks with spill containment and overfill prevention systems meeting the requirements of Section 2635(b) of Title 23 of the California Code of Regulations.
- Fit fuel dispensing nozzles with "hold-open latches" (automatic shutoffs) except where prohibited by local fire departments.
- Post signs at the fuel dispenser or fuel island warning vehicle owners/operators against "topping off" of vehicle fuel tanks.
- Design fueling area to prevent stormwater runoff and spills.
- Cover fueling area with an overhanging roof structure or canopy so that precipitation cannot come in contact with the fueling area and if possible use a perimeter drain or slope pavement inward with drainage to a blind sump (must be properly maintained and water properly disposed of); pave area with concrete rather than asphalt.

- Apply a suitable sealant that protects the asphalt from spilled fuels in areas where covering is infeasible and the fuel island is surrounded by pavement.
- Install vapor recovery nozzles to help control drips as well as air pollution.
- Use secondary containment when transferring fuel from the tank truck to the fuel tank.
- Cover storm drains in the vicinity during transfer.

Outdoor Waste Receptacle Area

- Spot clean leaks and drips routinely to prevent runoff of spillage.
- Minimize the possibility of stormwater pollution from outside waste receptacles by using an effective combination of the following:
  - use only watertight waste receptacle(s) and keep the lid(s) closed, or
  - grade and pave the waste receptacle area to prevent runon of stormwater, or
  - install a roof over the waste receptacle area, or
  - install a low containment berm around the waste receptacle area, or
  - use and maintain drip pans under waste receptacles. Containment areas and drip pans must be properly maintained and collected water disposed of properly (e.g., to sanitary sewer). Several drip pans should be stored in a covered location near outdoor waste receptacle area so that they are always available, yet protected from precipitation when not in use.
- Post "no littering" signs.

Air/Water Supply Area

- Minimize the possibility of stormwater pollution from air/water supply areas by implementing an effective combination of the following:
  - spot clean leaks and drips routinely to prevent runoff of spillage, or
  - grade and pave the air/water supply area to prevent runon of stormwater, or
  - install a roof over the air/water supply area, or
  - install a low containment berm around the air/water supply area. Maintain containment areas and dispose of contaminated water properly (e.g., to sanitary sewer).

Inspection

- Aboveground Tank Leak and Spill Control:
  - Check for external corrosion and structural failure.

- Check for spills and overfills due to operator error.
- Check for failure of piping system.
- Check for leaks or spills during pumping of liquids or gases from truck or rail car to a storage facility or vice versa.
- Visually inspect new tank or container installation for loose fittings, poor welding, and improper or poorly fitted gaskets.
- Inspect tank foundations, connections, coatings, and tank walls and piping system. Look for corrosion, leaks, cracks, scratches, and other physical damage that may weaken the tank or container system.
- Periodically, integrity testing should be conducted by a qualified professional.

- Inspect and clean, if necessary, storm drain inlets and catch basins within the facility boundary before October 1 each year.

Training

- Train all employees upon hiring and annually thereafter on proper methods for handling and disposing of waste. Make sure that all employees understand stormwater discharge prohibitions, wastewater discharge requirements, and these best management practices.
- Train employees on proper fueling and cleanup procedures.
- Use a training log or similar method to document training.
- Ensure that employees are familiar with the site's spill control plan and/or proper spill cleanup procedures.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Place stockpiles of spill cleanup materials where they are readily accessible.
- Use adsorbent materials on small spills and general cleaning rather than hosing down the area. Remove the adsorbent materials promptly and dispose properly.
- Store portable absorbent booms (long flexible shafts or barriers made of absorbent material) in unbermed fueling areas.
- Report spills promptly.
- Install an oil/water separator and connect to the sanitary sewer (if allowed), if a dead-end sump is not used to collect spills.

Other Considerations

- Carry out all federal and state requirements regarding underground storage tanks, or install above ground tanks.

Requirements

Costs

- The retrofitting of existing fueling areas to minimize stormwater exposure or spill runoff can be expensive. Good design must occur during the initial installation.
- Extruded curb along the "upstream" side of the fueling area to prevent stormwater runon is of modest cost.

Maintenance

- Clean oil/water separators at appropriate intervals.
- Keep ample supplies of spill cleanup materials onsite.
- Inspect fueling areas, storage tanks, catch basin inserts, containment areas, and drip pans on a regular schedule.

Supplemental Information

Design Considerations

Designing New Installations

The elements listed below should be included in the design and construction of new or substantially remodeled facilities.

Fuel Dispensing Areas

- Fuel dispensing areas must be paved with Portland cement concrete (or, equivalent smooth impervious surface), with a 2% to 4% slope to prevent ponding, and must be separated from the rest of the site by a grade break that prevents runon of stormwater to the extent practicable. The fuel dispensing area is defined as extending 6.5 feet from the corner of each fuel dispenser or the length at which the hose and nozzle assembly may be operated plus 1 foot, whichever is less. The paving around the fuel dispensing area may exceed the minimum dimensions of the "fuel dispensing area" stated above.
- The fuel dispensing area must be covered, and the cover's minimum dimensions must be equal to or greater than the area within the grade break or the fuel dispensing area, as defined above. The cover must not drain onto the fuel dispensing area.
- If necessary install and maintain an oil control device in the appropriate catch basin(s) to treat runoff from the fueling area.

Outdoor Waste Receptacle Area

- Grade and pave the outdoor waste receptacle area to prevent runon of stormwater to the extent practicable.

Air/Water Supply Area

- Grade and pave the air/water supply area to prevent runon of stormwater to the extent practicable.

Designated Fueling Area

- If your facility has large numbers of mobile equipment working throughout the site and you currently fuel them with a mobile fuel truck, consider establishing a designated fueling area. With the exception of tracked equipment such as bulldozers and perhaps small forklifts, most vehicles should be able to travel to a designated area with little lost time. Place temporary "caps" over nearby catch basins or manhole covers so that if a spill occurs it is prevented from entering the storm drain.

Examples

The Spill Prevention Control and Countermeasure (SPCC) Plan, which is required by law for some facilities, is an effective program to reduce the number of accidental spills and minimize contamination of stormwater runoff.

The City of Palo Alto has an effective program for commercial vehicle service facilities. Many of the program's elements, including specific BMP guidance and lists of equipment suppliers, are also applicable to industrial facilities.

References and Resources

Best Management Practice Guide for Retail Gasoline Outlets, California Stormwater Quality Task Force. 1997.

King County Stormwater Pollution Control Manual – http//www.dnr.metrokc.gov/wlr/dss/spcm.htm

Orange County Stormwater Program http://www.ocwatersheds.com/StormWater/swp_introduction.asp

San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Program (URMP)

Plaza and Sidewalk Cleaning SC-71



Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑
Oxygen Demanding	☑

Description

Pollutants on sidewalks and other pedestrian traffic areas and plazas are typically due to littering and vehicle use. This fact sheet describes good housekeeping practices that can be incorporated into the municipality's existing cleaning and maintenance program.

Approach

Pollution Prevention

- Use dry cleaning methods whenever practical for surface cleaning activities.
- Use the least toxic materials available (e.g. water based paints, gels or sprays for graffiti removal).

Suggested Protocols

Surface Cleaning

- Regularly broom (dry) sweep sidewalk, plaza and parking lot areas to minimize cleaning with water.
- Dry cleanup first (sweep, collect, and dispose of debris and trash) when cleaning sidewalks or plazas, then wash with or without soap.
- Block the storm drain or contain runoff when cleaning with water. Discharge wash water to landscaping or collect water and pump to a tank or discharge to sanitary sewer if allowed. (Permission may be required from local sanitation district.)

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- Block the storm drain or contain runoff when washing parking areas, driveways or drive-throughs. Use absorbents to pick up oil; then dry sweep. Clean with or without soap. Collect water and pump to a tank or discharge to sanitary sewer if allowed. Street Repair and Maintenance.

Graffiti Removal

- Avoid graffiti abatement activities during rain events.
- Implement the procedures under Painting and Paint Removal in SC-70 Roads, Streets, and Highway Operation and Maintenance fact sheet when graffiti is removed by painting over.
- Direct runoff from sand blasting and high pressure washing (with no cleaning agents) into a dirt or landscaped area after treating with an appropriate filtering device.
- Plug nearby storm drain inlets and vacuum/pump wash water to the sanitary sewer if authorized to do so if a graffiti abatement method generates wash water containing a cleaning compound (such as high pressure washing with a cleaning compound). Ensure that a non-hazardous cleaning compound is used or dispose as hazardous waste, as appropriate.

Surface Removal and Repair

- Schedule surface removal activities for dry weather if possible.
- Avoid creating excess dust when breaking asphalt or concrete.
- Take measures to protect nearby storm drain inlets prior to breaking up asphalt or concrete (e.g. place hay bales or sand bags around inlets). Clean afterwards by sweeping up as much material as possible.
- Designate an area for clean up and proper disposal of excess materials.
- Remove and recycle as much of the broken pavement as possible to avoid contact with rainfall and stormwater runoff.
- When making saw cuts in pavement, use as little water as possible. Cover each storm drain inlet completely with filter fabric during the sawing operation and contain the slurry by placing straw bales, sandbags, or gravel dams around the inlets. After the liquid drains or evaporates, shovel or vacuum the slurry residue from the pavement or gutter and remove from site.
- Always dry sweep first to clean up tracked dirt. Use a street sweeper or vacuum truck. Do not dump vacuumed liquid in storm drains. Once dry sweeping is complete, the area may be hosed down if needed. Wash water should be directed to landscaping or collected and pumped to the sanitary sewer if allowed.

Concrete Installation and Repair

- Schedule asphalt and concrete activities for dry weather.

- Take measures to protect any nearby storm drain inlets and adjacent watercourses, prior to breaking up asphalt or concrete (e.g. place san bags around inlets or work areas).
- Limit the amount of fresh concrete or cement mortar mixed, mix only what is needed for the job.
- Store concrete materials under cover, away from drainage areas. Secure bags of cement after they are open. Be sure to keep wind-blown cement powder away from streets, gutters, storm drains, rainfall, and runoff.
- Return leftover materials to the transit mixer. Dispose of small amounts of hardened excess concrete, grout, and mortar in the trash.
- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile, or dispose in the trash.
- Protect applications of fresh concrete from rainfall and runoff until the material has dried.
- Do not allow excess concrete to be dumped onsite, except in designated areas.
- Wash concrete trucks off site or in designated areas on site designed to preclude discharge of wash water to drainage system.

Controlling Litter

- Post "No Littering" signs and enforce anti-litter laws.
- Provide litter receptacles in busy, high pedestrian traffic areas of the community, at recreational facilities, and at community events.
- Cover litter receptacles and clean out frequently to prevent leaking/spillage or overflow.
- Clean parking lots on a regular basis with a street sweeper.

Training

- Provide regular training to field employees and/or contractors regarding surface cleaning and proper operation of equipment.
- Train employee and contractors in proper techniques for spill containment and cleanup.
- Use a training log or similar method to document training.

Spill Response and Prevention

- Refer to SC-11, Spill Prevention, Control & Cleanup.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

Other Considerations

- Limitations related to sweeping activities at large parking facilities may include current sweeper technology to remove oil and grease.
- Surface cleaning activities that require discharges to the local sewering agency will require coordination with the agency.
- Arrangements for disposal of the swept material collected must be made, as well as accurate tracking of the areas swept and the frequency of sweeping.

Requirements

Costs

- The largest expenditures for sweeping and cleaning of sidewalks, plazas, and parking lots are in staffing and equipment. Sweeping of these areas should be incorporated into street sweeping programs to reduce costs.

Maintenance

Not applicable

Supplemental Information

Further Detail of the BMP

Community education, such as informing residents about their options for recycling and waste disposal, as well as the consequences of littering, can instill a sense of citizen responsibility and potentially reduce the amount of maintenance required by the municipality.

Additional BMPs that should be considered for parking lot areas include:

- Allow sheet runoff to flow into biofilters (vegetated strip and swale) and infiltration devices.
- Utilize sand filters or oleophilic collectors for oily waste in low concentrations.
- Arrange rooftop drains to prevent drainage directly onto paved surfaces.
- Design lot to include semi-permeable hardscape.
- Structural BMPs such as storm drain inlet filters can be very effective in reducing the amount of pollutants discharged from parking facilities during periods of rain.

References and Resources

Bay Area Stormwater Management Agencies Association (BASMAA). 1996. Pollution From Surface Cleaning Folder http://www.basmaa.org

Model Urban Runoff Program: A How-To Guide for Developing Urban Runoff Programs for Small Municipalities. Prepared by City of Monterey, City of Santa Cruz, California Coastal Commission, Monterey Bay National Marine Sanctuary, Association of Monterey Bay Area Governments, Woodward-Clyde, Central Coast Regional Water Quality Control Board. July. 1998.

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

Orange County Stormwater Program
http://www.ocwatersheds.com/stormwater/swp_introduction.asp

Santa Clara Valley Urban Runoff Pollution Prevention Program. 1997 Urban Runoff Management Plan. September 1997, updated October 2000.

Santa Clara Valley Urban Runoff Pollution Prevention Program. Maintenance Best Management Practices for the Construction Industry. Brochures: Landscaping, Gardening, and Pool; Roadwork and Paving; and Fresh Concrete and Mortar Application. June 2001.

San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Plan. 2001. Municipal Activities Model Program Guidance. November.

Water & Sewer Utility Maintenance SC-76



Objectives

- Contain
- Educate
- Reduce/Minimize

Description

Although the operation and maintenance of public utilities are not considered chronic sources of stormwater pollution, some activities and accidents can result in the discharge of pollutants that can pose a threat to both human health and the quality of receiving waters if they enter the storm drain system. Sewage incident response and investigation may involve a coordinated effort between staff from a number of different departments/agencies. Cities that do not provide maintenance of water and sewer utilities must coordinate with the contracting agency responsible for these activities and ensure that these model procedures are followed.

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	
Metals	
Bacteria	☑
Oil and Grease	☑
Organics	☑
Oxygen Demanding	☑

Approach

Pollution Prevention

Inspect potential non-stormwater discharge flow paths and clear/cleanup any debris or pollutants found (i.e. remove trash, leaves, sediment, and wipe up liquids, including oil spills).

Suggested Protocols

Water Line Maintenance and Cleaning

Procedures can be employed to reduce pollutants from discharges associated with water utility operation and maintenance activities. Planned discharges may include fire hydrant testing, flushing water supply mains after new construction, flushing lines due to complaints of taste and odor, dewatering mains for maintenance work. Unplanned discharges from treated, recycled water, raw water, and groundwater systems operation and maintenance activities can occur from water main

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breaks, sheared fire hydrants, equipment malfunction, and operator error.

Planned discharges

- Identify a suitable discharge option in the following order of preference:
  - Apply to the land.
  - Reuse water for dust suppression, irrigation, or construction compaction.
  - Discharge to a sanitary sewer system with approval.
  - Discharge to the storm drain system using applicable pollution control measures. (Only available to clean water discharges such as water main/ water storage tank/water hydrant flushing).
- If water is discharged to a storm drain, control measures must be put in place to control potential pollutants (i.e. sediment, chlorine, etc.). Examples of some storm drain protection options include:
  - Silt fence – appropriate where the inlet drains a relatively flat area.
  - Gravel and wire mesh sediment filter – Appropriate where concentrated flows are expected.
  - Wooden weir and fabric – use at curb inlets where a compact installation is desired.
- Prior to discharge, inspect discharge flow path and clear/cleanup any debris or pollutants found (i.e. remove trash, leaves, sediment, and wipe up liquids, including oil spills).
- General Design considerations for inlet protection devices include the following:
  - The device should be constructed such that cleaning and disposal of trapped sediment is made easy, while minimizing interference with discharge activities.
  - Devices should be constructed so that any standing water resulting from the discharge will not cause excessive inconvenience or flooding/damage to adjacent land or structures.
- The effectiveness of control devices must be monitored during the discharge period and any necessary repairs or modifications made.

Unplanned Discharges

- Stop the discharge as quickly as possible.
- Inspect flow path of the discharged water:
  - Identify erodible areas which may need to be repaired or protected during subsequent repairs or corrective actions

- Identify the potential for pollutants to be washed into the waterway

- If repairs or corrective action will cause additional discharges of water, select the appropriate procedures for erosion control, chlorine residual, turbidity, and chemical additives. Prevent potential pollutants from entering the flow path.

Sanitary Sewer Maintenance

Applicable to municipalities who own and operated a sewage collection system. Facilities that are covered under this program include sanitary sewer pipes and pump stations owned and operated by a municipality. The owner of the sanitary sewer facilities is the entity responsible for carrying out this prevention and response program.

- Clean sewer lines on a regular basis to remove grease, grit, and other debris that may lead to sewer backups.

- Establish routine maintenance program. Cleaning should be conducted at an established minimum frequency and more frequently for problem areas such as restaurants that are identified

- Cleaning activities may require removal of tree roots and other identified obstructions.

- During routine maintenance and inspection note the condition of sanitary sewer structures and identify areas that need repair or maintenance. Items to note may include the following:

  - Cracked/deteriorating pipes

  - Leaking joints/seals at manhole

  - Frequent line plugs

  - Line generally flows at or near capacity

  - Suspected infiltration or exfiltration.

- Prioritize repairs based on the nature and severity of the problem. Immediate clearing of blockage or repair is required where an overflow is currently occurring or for urgent problems that may cause an imminent overflow (e.g. pump station failures, sewer line ruptures, sewer line blockages). These repairs may be temporary until scheduled or capital improvements can be completed.

- Review previous sewer maintenance records to help identify "hot spots" or areas with frequent maintenance problems and locations of potential system failure.

Spills and Overflows

- Identify and track sanitary sewer discharges. Identify dry weather infiltration and inflow first. Wet weather overflow connections are very difficult to locate.

- Locate wet weather overflows and leaking sanitary sewers using conventional source identification techniques such as monitoring and field screening. Techniques used to identify other illicit connection sources can also be used for sewer system evaluation surveys (see SC74 Drainage System Operation and Maintenance).

- Implement community awareness programs for monitoring sanitary sewer wet weather overflows. A citizen's hotline for reporting observed overflow conditions should be established to supplement field screening efforts.

- Establish lead department/agency responsible for spill response and containment. Provide coordination within departments.

- When a spill, leak, and/or overflow occurs and when disinfecting a sewage contaminated area, take every effort to ensure that the sewage, disinfectant and/or sewage treated with the disinfectant is not discharged to the storm drain system or receiving waters. Methods may include:

  - Blocking storm drain inlets and catch basins

  - Containing and diverting sewage and disinfectant away from open channels and other storm drain fixtures (using sandbags, inflatable dams, etc.)

  - Removing the material with vacuum equipment

- Record required information at the spill site.

- Perform field tests as necessary to determine the source of the spill.

- Develop notification procedures regarding spill reporting.

Septic Systems

- Ensure that homeowners, installers, and inspectors are educated in proper maintenance of septic systems. This may require coordination with staff from other departments. Outreach to homeowners should include inspection reminders informing then that inspection and perhaps maintenance is due for their systems. Recommend that the system be inspected annually and pumped-out regularly.

- Programs which seek to address failing septic systems should consider using field screening to pinpoint areas where more detailed onsite inspection surveys are warranted.

Training

- Conduct annual training of water utility personnel and service contractors. (field screening, sampling, smoke/dye testing, TV inspection).

- OSHA-required Health and Safety Training 29 CFR 1910.120 plus annual Refresher Training (as needed).

- OSHA Confined Space Entry training (Cal-OSHA Confined Space, Title 8 and federal OSHA 29 CFR 1910.146).

Spill Response and Prevention

- See previous section regarding spills and overflows.
- Refer to SC-11, Spill Prevention, Control & Cleanup.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

Other Considerations

- Enact ordinance granting "right-of-entry" to locate potentially responsible parties for sewer overflows.
- Reliance on individual onsite inspection to detect failed septic systems can be a major limitation. The individual onsite inspection is very labor-intensive and requires access to private property to pinpoint the exact location of the failing system.
- A significant limitation to correcting failing septic systems is the lack of techniques available for detecting individual failed septic systems.

Requirements

Costs

- Departmental cooperation recommended for sharing or borrowing staff resources and equipment from municipal wastewater department.
- Infiltration, inflow, and wet weather overflows from sanitary sewers are very labor and equipment intensive to locate.
- The costs associated with detecting and correcting septic system failures are subject to a number of factors, including availability of trained personnel, cost of materials, and the level of follow-up required to fix the system problems.

Maintenance

- Minimum 2-person teams to perform field screening and associated sampling.
- Larger teams required for implementing other techniques (i.e. zinc chloride smoke testing, fluorometric dye testing, television camera inspection and physical inspection with confined space entry) to identify sewer system leaks.
- Program coordination required for handling emergencies, record keeping, etc.
- Many of the problems associated with improper use of septic systems may be attributed to lack of user knowledge on operation and maintenance. Educational materials for homeowners and training courses for installers and inspectors can reduce the incidence of pollution from these widespread and commonly used pollution control devices.

SC-76 Water & Sewer Utility Maintenance

Supplemental Information

Further Detail of the BMP

Onsite Sewage Disposal Systems

New onsite sewage disposal systems should be designed, located, and installed away from open waterbodies and sensitive resources such as wetlands and floodplains. A protective separation between the OSDS and groundwater should also be established. OSDSs should be operated and maintained to prevent surface water discharges and reduce pollutant loadings to groundwater. Inspection of OSDSs should occur regularly and repairs made immediately. New or replacement plumbing fixtures should be of the high efficiency type.

Typical Sanitary Sewer Problems

- Old and deteriorated main and lateral pipes - Sewers range in age from 30 to 100 years with an average age of 50 years.
- Cracked sewer pipes - Existing sewers are mostly clay pipes which can crack as they deteriorate with age and also by earth movement.
- Misaligned and open pipe joints - Most of the mortar used to seal the joints between sections of clay pipe has deteriorated.
- Undersized sewer pipe - The existing sewer system is overloaded due to new sewer hook-ups, underground water infiltration, and illegal roof and/or yard drain connections.
- Defective manholes - Old manholes are made of bricks. Typical problems associated with brick manholes are loose bricks, missing bricks, and misaligned manholes.
- Missing and/or unrecorded sewer pipes and manholes - This problem is typical in the easement/backline sewer. Sewer pipe locations shown on the sewer record map are different from the actual sewer location.
- Sewer main under houses and other improvements - Complaints of sewer main alignment crossing the house and other improvements. A solution to this problem requires an agreement with the property owner for a new sewer easement at a relocated line.

Causes of Sanitary Sewer Backups

- Root infiltration - Tree roots are a major cause of backups.
- Water inflow/infiltration - Rain water entering the sewer pipe causes overflows.
- Solids - Typical solids that buildup in the pipe and cause backups are grease, dirt, bones, tampons, paper towels, diapers, broken dishware, garbage, concrete, and debris.
- Structural defects in pipes and manholes - Sags in the line, cracks, holes, protruding laterals, misaligned pipe, offset joints are all possible causes of backups.

Design Considerations

Sanitary sewer overflows can often be reduced or eliminated by a number of practices, in addition to sewer system cleaning and maintenance, including the following:

- Reducing infiltration and inflow through rehabilitation and repair of broken or leaking sewer lines.
- Enlarging or upgrading the capacity of sewer lines, pump stations, or sewage treatment plants.
- Constructing wet weather storage and treatment facilities to treat excess flows.
- Addressing SSOs during sewer system master planning and facilities planning.

Septic Systems

Two field screening techniques that have been used with success at identifying possible locations of failing septic systems are the brightener test and color infrared (CIR) aerial photography. The first involves the use of specific phosphorus-based elements found in many laundry products, often called brighteners, as an indicator of the presence of failing onsite wastewater systems. The second technique uses color infrared (CIR) aerial photography to characterize the performance of septic systems. This method has been found to be a quick and cost-effective method for assessing the potential impacts of failing systems and uses variations in vegetative growth or stress patterns over septic system field lines to identify those systems that may potentially be malfunctioning. Then a more detailed onsite visual and physical inspection will confirm whether the system has truly failed and the extent of the repairs needed. These inspections may be carried out by county health departments or other authorized personnel.

References and Resources

Alameda Countywide Clean Water Program on-line
http://www.ci.berkeley.ca.us/pw/Storm/stormala.html

Los Angeles County Stormwater Quality. Public Agency Activities Model Program. On-line: http://ladpw.org/wmd/npdes/public_TC.cfm

Orange County Stormwater Program
http://www.ocwatersheds.com/StormWater/swp_introduction.asp

Santa Clara Valley Urban Runoff Pollution Prevention Program. 1997 Urban Runoff Management Plan. September 1997, updated October 2000.

Santa Clara Valley Urban Runoff Pollution Prevention Program. 1998. Water Utility Operation and Maintenance Discharge Pollution Prevention Plan. June

United States Environmental Protection Agency (USEPA). 2001. Illicit Discharge Detection and Elimination. On-line: http://cfpub.epa.gov/npdes/stormwater/menuofbmps/illi_1.cfm

United States Environmental Protection Agency (USEPA). 2001. Pollution Prevention/Good Housekeeping for Municipal Operators Septic System Controls. On-line: http://www.epa.gov/npdes/menuofbmps/poll_14.htm

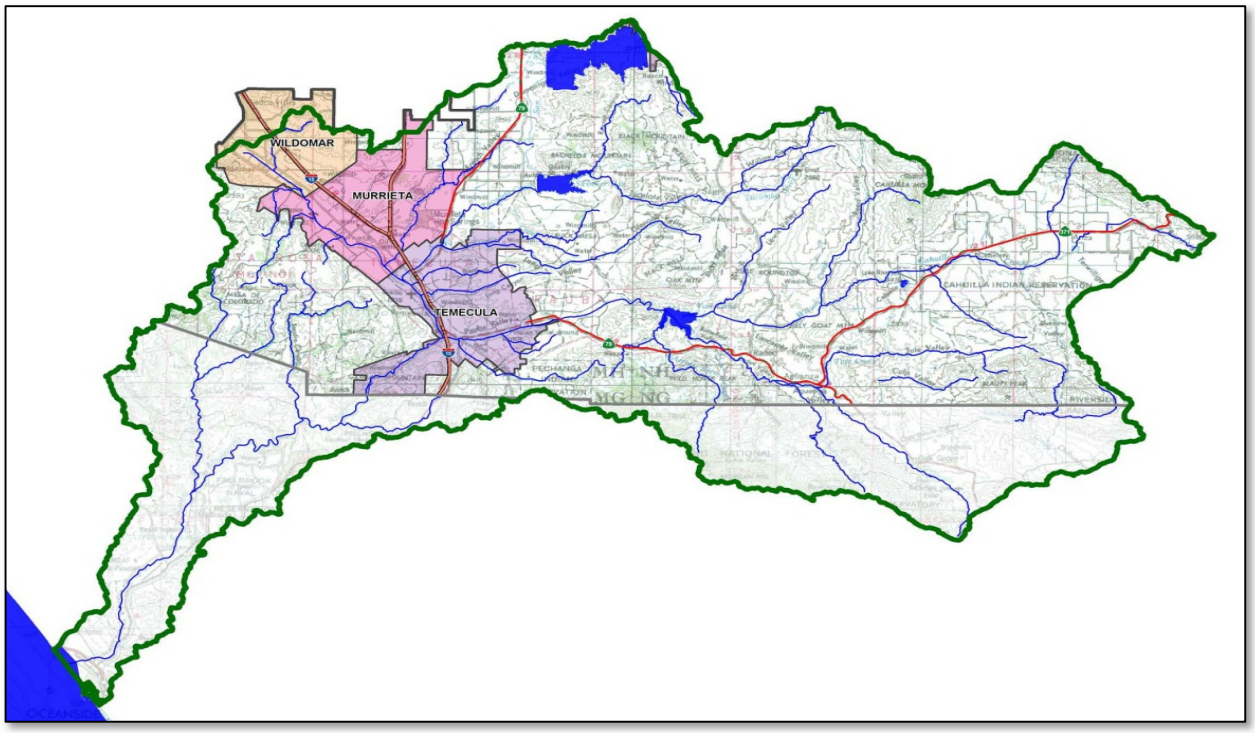
Project Specific Water Quality Management Plan

*A Template for preparing Project Specific WQMPs for Priority Development Projects located within the **Santa Margarita Region** of Riverside County*

Project Title: Candee

Development No: DPO-2018-1656

Design Review/Case No: TPM 3754, UNIT 2



☒ **Preliminary**
☐ **Final**

Original Date Prepared: March 27, 2018

Revision Date(s): September 27, 2018

Prepared for Compliance with
Regional Board Order No. **R9-2010-0016**

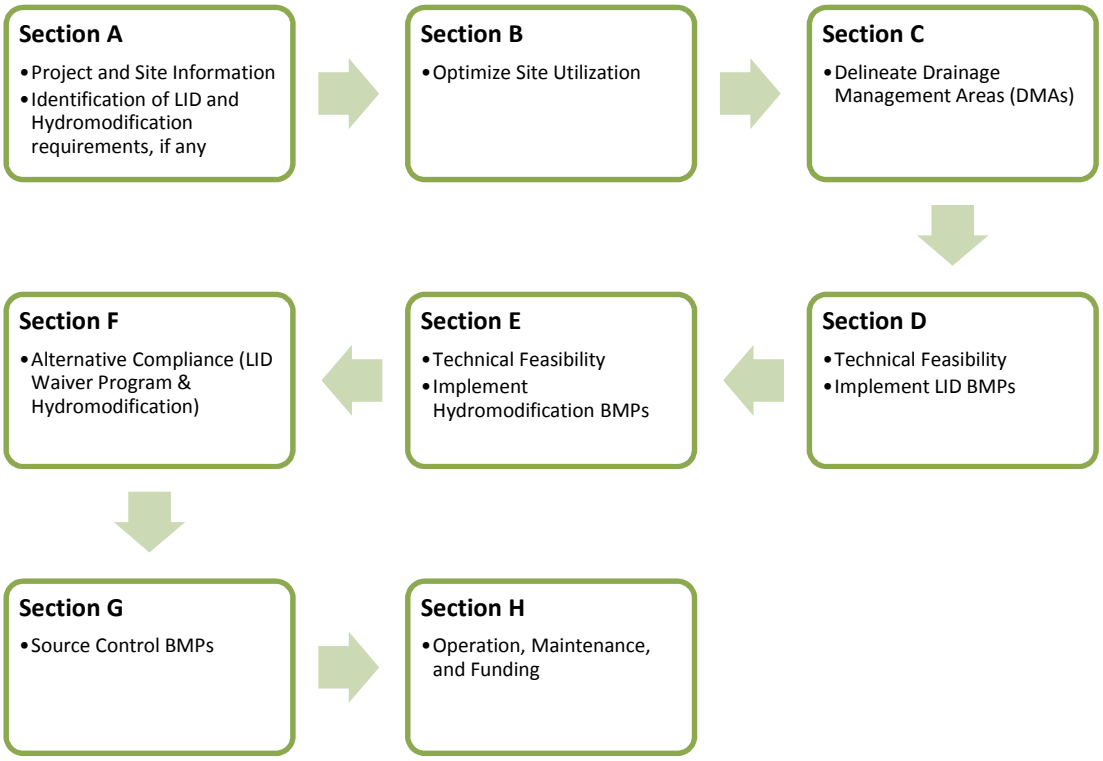
Contact Information:

Prepared for: CK-17, LP, A CALIFORNIA LTD PARTNERSHIP

Prepared by: EXCEL ENGINEERING

A Brief Introduction

The Municipal Separate Stormwater Sewer System (MS4) Permit[1] for the **Santa Margarita Region** (SMR) requires preparation of a Project-Specific Water Quality Management Plan (WQMP) for all Development Projects as defined in section F.1.d.(1) of the Permit. This Project-Specific WQMP Template for Development Projects in the **Santa Margarita Region** has been prepared to help document compliance and prepare a WQMP submittal. Below is a flowchart for the layout of this Template that will provide the steps required to document compliance.



[1] Order No. R9-2010-0016, NPDES No. CAS0108766, Waste Discharge Requirements for Discharges from the MS4 Draining the County of Riverside, the Incorporated Cities of Riverside County, and the Riverside County Flood Control and Water Conservation District within the San Diego Region, California Regional Water Quality Control Board, November 10, 2010.

OWNER'S CERTIFICATION

This Project-Specific WQMP has been prepared for CK 17, LP, A California Limited Partnership by Excel Engineering for the The Candee project.

This WQMP is intended to comply with the requirements of City of Murrieta for R9-2010-0016 which includes the requirement for the preparation and implementation of a Project-Specific WQMP.

The undersigned, while owning the property/project described in the preceding paragraph, shall be responsible for the implementation and funding of this WQMP and will ensure that this WQMP is amended as appropriate to reflect up-to-date conditions on the site. In addition, the property owner accepts responsibility for interim operation and maintenance of Stormwater Best Management Practices until such time as this responsibility is formally transferred to a subsequent owner. This WQMP will be reviewed with the facility operator, facility supervisors, employees, tenants, maintenance and service contractors, or any other party (or parties) having responsibility for implementing portions of this WQMP. At least one copy of this WQMP will be maintained at the project site or project office in perpetuity. The undersigned is authorized to certify and to approve implementation of this WQMP. The undersigned is aware that implementation of this WQMP is enforceable under City of Murrieta Water Quality Ordinance (Municipal Code Section8.36).

"I, the undersigned, certify under penalty of law that the provisions of this WQMP have been reviewed and accepted and that the WQMP will be transferred to future successors in interest."

Owner's Signature	Date
Owner's Printed Name	Owner's Title/Position

PREPARER'S CERTIFICATION

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control Best Management Practices in this plan meet the requirements of Regional Water Quality Control Board Order No. **R9-2010-0016** and any subsequent amendments thereto."

Preparer's Signature	Date
Preparer's Printed Name	Preparer's Title/Position

Preparer's Licensure:

Table of Contents

Section A: Project and Site Information 6
A.1 Description of Watershed 6
A.2 Maps and Site Plans 7
A.3 Identify Receiving Waters 8
A.4 Drainage System Susceptibility to Hydromodification 9
A.5 Additional Permits/Approvals required for the Project: 10
Section B: Optimize Site Utilization (LID Principles) 10
Section C: Delineate Drainage Management Areas (DMAs) 11
Section D: Implement LID BMPs 14
D.1 Infiltration Applicability 12
D.2 Harvest and Use Assessment 15
D.3 Bioretention and Biotreatment Assessment 17
D.4 Other Limiting Geotechnical Conditions 17
D.5 Feasibility Assessment Summaries 17
D.6 LID BMP Sizing 17
Section E: Implement Hydrologic Control BMPs and Sediment Supply BMPs 21
E.1 Onsite Feasibility of Hydrologic Control BMPs 21
E.2 Meeting the HMP Performance Standard for Small Project Sites 21
E.3 Hydrologic Control BMP Selection 22
E.4 Hydrologic Control BMP Sizing 23
E.5 Implement Sediment Supply BMPs 23
Section F: Alternative Compliance 27
F.1 Identify Pollutants of Concern 28
F.2 Stormwater Credits 29
F.3 Sizing Criteria 29
F.4 Treatment Control BMP Selection 30
F.5 Hydrologic Performance Standard – Alternative Compliance Approach 30
F.6 Sediment Supply Performance Standard - Alternative Compliance 31
Section G: Source Control BMPs 32
Section H: Construction Plan Checklist 34
Section I: Operation, Maintenance and Funding 36
Acronyms, Abbreviations and Definitions 37

List of Tables

Table A.1 Identification of Receiving Waters 7
Table A.2 Identification of Susceptibility to Hydromodification 8
Table A.3 Other Applicable Permits 8
Table C.1 DMA Classifications 10
Table C.2 Type 'A', Self-Treating Areas 10
Table C.3 Type 'B', Self-Retaining Areas 11
Table C.4 Type 'C', Areas that Drain to Self-Retaining Areas 11
Table C.5 Type 'D', Areas Draining to BMPs 11
Table D.1 Infiltration Feasibility 13
Table D.2 Geotechnical Concerns for Onsite Retention Table 17
Table D.3 LID Prioritization Summary Matrix 17
Table D.4 DCV Calculations for LID BMPs 18
Table D.5 LID BMP Sizing 20
Table E.1 LID & Hydromodification BMP Location 22
Table E.2 Hydrologic Control BMP Sizing 23
Table F.1 Potential Pollutants by Land Use Type 28
Table F.2 Stormwater Credits 29
Table F.3 Treatment Control BMP Sizing 29
Table F.4 Treatment Control BMP Selection 30
Table F.5 Offsite Hydrologic Control BMP Sizing 31
Table G.1 Structural and Operational Source Control BMP 32
Table H.1 Construction Plan Cross-reference 35

List of Appendices

Appendix 1: Maps and Site Plans 44
Appendix 2: Construction Plans 45
Appendix 3: Soils Information 46
Appendix 4: Historical Site Conditions 47
Appendix 5: LID Infeasibility 48
Appendix 6: BMP Design Details 49
Appendix 7: Hydromodification 50
Appendix 8: Source Control 51
Appendix 9: O&M 52
Appendix 10: Educational Materials 43

Section A: Project and Site Information

PROJECT INFORMATION	
Type of Project:	Commercial
Planning Area:	Community Commercial
Community Name:	Community Commercial
Development Name:	
PROJECT LOCATION	
Latitude & Longitude (DMS): 33.6005783°, -117.1680955°	
Project Watershed and Sub-Watershed: Santa Margarita, Murrieta (HAS 902.32)	
APN(s): 392-290-026 and 392-290-029	
Map Book and Page No.: Page 898 Grid C7	
PROJECT CHARACTERISTICS	
Proposed or potential land use(s)	Commercial
Proposed or Potential SIC Code(s)	Division G & I
Area of Impervious Project Footprint (SF)	269,915
Total area of proposed Impervious Surfaces within the Project Limits (SF)/or Replacement	341,467 SF
Total Project Area (ac)	7.839 acres
Does the project consist of offsite road improvements?	☒ Y ☐ N
Does the project propose to construct unpaved roads?	☐ Y ☒ N
Is the project part of a larger common plan of development (phased project)?	☒ Y ☐ N
Is the project exempt from HMP Performance Standards?	☐ Y ☒ N
EXISTING SITE CHARACTERISTICS	
Total area of existing Impervious Surfaces within the project limits (SF)	0 SF
Is the project located within any Multi-Species Habitat Conservation Plan (MSHCP Criteria Cell?	☐ Y ☒ N
If so, identify the Cell number:	Insert text here.
Are there any natural hydrologic features on the project site?	☐ Y ☒ N
Is a Geotechnical Report attached?	☒ Y ☐ N
If no Geotech. Report, list the Natural Resources Conservation Service (NRCS) soils type(s) present on the site (A, B, C and/or D)	Insert text here.
What is the Water Quality Design Storm Depth for the project?	.61 IN.

A.1 Description of Watershed

Existing Conditions Topography

The site is undeveloped vacant land and is sparsely covered by native grasses. In its natural condition, approximately a half of the site drains to the northeast (POC-1) and the other half drains to southeast (POC-2). Runoff from the site to the south is collected in browditch to the southeast (POC-2). The 42" pipe drains east from this point. This point is labeled as Point of Compliance 1 or POC-1.

Appendix 8 DMA & Source Control Exhibits, found later in this report, contains the natural condition Watershed Topographic Map. A grading operation, onsite is currently under way. The temporary graded condition will not affect calculations for the pre-developed condition and does not reflect the final product. It is mentioned here for clarification only.

Post-Development Project Topography

At 100 percent buildout, the site will be approximately 80 percent impervious. When brought to grade the site will become much flatter than its natural condition. At 100 percent buildout, all impervious areas will drain to a detention pipe storage, Lid BMP's, roof drains, loading dock, Tree wells along Warm Springs Parkway, water quality basins, then to private, then to public storm drain system. The developed site will drain to the 42" pipe along the southeast (POC-2) and 42" pipe on the northeast corner (POC-1). In general, private and public runoff are kept separated until confluencing at POC 2. Predeveloped and Post Developed Topographic Maps can be found as Attachment C in this report.

The owner is responsible for implementing and maintaining all BMPs that are mentioned in this WQMP. Completed copies of the inspection and maintenance checklist must be kept on site and made available to the City and Regional Board upon request.

A.2 Maps and Site Plans

When completing your Project-Specific WQMP, include a map of the Project vicinity and existing site. In addition, include all grading, drainage, landscape/plant palette and other pertinent construction plans in Appendix 2. At a **minimum**, your WQMP Site Plan should include the following:

- Drainage Management Areas (DMAs)
- Proposed Structural Best Management Practices (BMPs)
- Drainage Path
- Drainage infrastructure, inlets, overflows
- Source Control BMPs
- Buildings, Roof Lines, Downspouts
- Impervious Surfaces
- Standard Labeling

Use your discretion on whether or not you may need to create multiple sheets or can appropriately accommodate these features on one or two sheets. Keep in mind that the Copermittee plan reviewer must be able to easily analyze your Project utilizing this template and its associated site plans and maps.

A.3 Identify Receiving Waters

Using Table A.1 below, list in order of upstream to downstream, the Receiving Waters that the Project site is tributary to. Continue to fill each row with the Receiving Water's 303(d) listed impairments (if any), designated Beneficial Uses, and proximity, if any, to a RARE Beneficial Use. Include a map of the Receiving Waters in Appendix 1. *(http://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/)*

Table A.1 Identification of Receiving Waters

Receiving Waters	USEPA Approved 303(d) List Impairments	Designated Beneficial Uses	Proximity to RARE Beneficial Use
Warm Springs Creek 902.32	Chlorpyrifos, Escherichia coli (E. coli), Fecal Coliform, Iron, Manganese, Phosphorus, Total Nitrogen as N	Municipal & Domestic Supply, Agricultural, Industrial service, Industrial process, Ground Water Recharge,Non-	None

		contact water recreation, Warm Freshwater habitat, wildlife habitat	

A.4 Drainage System Susceptibility to Hydromodification

Using Table A.2 below, list in order of the point of discharge at the project site down to the Santa Margarita River, each drainage system or receiving water that the project site is tributary to. Continue to fill each row with the material of the drainage system, the storm drain susceptibility using the SWCT2 (Stormwater & Water Conservation Tracking Tool - http://rivco.permitrack.com/) or Map 2 of the Hydromodification Susceptibility Documentation Report and Mapping: Santa Margarita Region (Appendix D of the SMR HMP), and the condition for exempting the drainage system, if applicable. If the exemption includes receiving waters that were not evaluated in Appendix D, provide supporting documentation in Appendix 7 to demonstrate that they classify as Engineered, Fully Hardened and Maintained (EFHM) channels, consistent with the definition provided in Appendix D. Include a map exhibiting each drainage system and the associated susceptibility in Appendix 1.

Table A.2 Identification of Susceptibility to Hydromodification

Drainage System	Drainage System Material	Susceptibility of Drainage System	Hydromodification Exemption
.17 Miles of 42" hdpe storm drain	42" hdpe storm drain	Low susceptibility	NONE.
1.54 miles of open channel	Natural Open channel	High susceptibility	NONE.
6.78 miles of city storm drain	Natural Open Channel	High susceptibility	NONE.
31.96 miles of engineered channel	Natural Open channel	High Susceptibility	NONE.

A.5 Additional Permits/Approvals required for the Project:

Table A.3 Other Applicable Permits

Agency	Permit Required	
State Department of Fish and Game, 1602 Streambed Alteration Agreement	☐ Y	☒ N
State Water Resources Control Board, Clean Water Act Section 401 Water Quality Certification	☐ Y	☒ N
US Army Corps of Engineers, Clean Water Act Section 404 Permit	☐ Y	☒ N
US Fish and Wildlife, Endangered Species Act Section 7 Biological Opinion	☐ Y	☒ N
Statewide Construction General Permit Coverage	☒ Y	☐ N
Statewide Industrial General Permit Coverage	☐ Y	☒ N

Western Riverside MSHCP Consistency Approval (e.g., JPR, DBESP)	☒ Y	☐ N
Other *(please list in the space below as required)*	☐ Y	☒ N

If yes is answered to any of the questions above, the Copermittee may require proof of approval/coverage from those agencies as applicable including documentation of any associated requirements that may affect this Project-Specific WQMP.

Section B: Optimize Site Utilization (LID Principles)

Review of the information collected in Section 'A' will aid in identifying the principal constraints on site design and selection of LID BMPs as well as opportunities to reduce imperviousness and incorporate LID Principles into the site and landscape design. For example, **constraints** might include impermeable soils, high groundwater, groundwater pollution or contaminated soils, steep slopes, geotechnical instability, high-intensity land use, heavy pedestrian or vehicular traffic, utility locations or safety concerns. **Opportunities** might include existing natural areas, low areas, oddly configured or otherwise unbuildable parcels, easements and landscape amenities including open space and buffers (which can double as locations for LID Bioretention BMPs), and differences in elevation (which can provide hydraulic head). Prepare a brief narrative for each of the site optimization strategies described below. This narrative will help you as you proceed with your Low Impact Development (LID) design and explain your design decisions to others.

The 2010 SMR MS4 Permit further requires that LID Retention BMPs (Infiltration Only or Harvest and Use) be used unless it can be shown that those BMPs are infeasible. Therefore, it is important that your narrative identify and justify if there are any constraints that would prevent the use of those categories of LID BMPs. Similarly, you should also note opportunities that exist which will be utilized during project design. Upon completion of identifying Constraints and Opportunities, include these on your WQMP Site plan in Appendix 1.

Site Optimization

The following questions are based upon Section 3.2 of the WQMP Guidance Document. Review of the WQMP Guidance Document will help you determine how best to optimize your site and subsequently identify opportunities and/or constraints, and document compliance.

Did you identify and preserve existing drainage patterns? If so, how? If not, why?

Yes, the proposed grading reflects the exisiting drainage patterns and biorention basins are place at low points. The proposed discharge point coincides with the existing drainage pattern.

Did you identify and protect existing vegetation? If so, how? If not, why?

The entirety of the site will be graded and developed as a commercial development. There are no existing areas on the site with a dense vegatative community.

Did you identify and preserve natural infiltration capacity? If so, how? If not, why?

Yes, we provide bioretention with infiltration at the bottom of the layer.

Did you identify and minimize impervious area? If so, how? If not, why?

The project adheres to a typical commercial development site which is 80% impervious. Landscape will be placed where possible (between curb areas, etc.)

Did you identify and disperse runoff to adjacent pervious areas? If so, how? If not, why?

Yes, curb cuts are placed onsite to drain runoff to onsite BMP's. Hillside drainage is dispersed to swales and sent to onsite storm drains.

Section C: Delineate Drainage Management Areas (DMAs)

Utilizing the procedure in Section 3.3 of the WQMP Guidance Document which discusses the methods of delineating and mapping your project site into individual DMAs, complete Table C.1 below to appropriately categorize the types of classification (e.g., Type A, Type B, etc.) per DMA for your Project site. Upon completion of this table, this information will then be used to populate and tabulate the corresponding tables for their respective DMA classifications.

Table C.1 DMA Classifications

DMA Name or Identification	Surface Type(s)[1]	Area (Sq. Ft.)	DMA Type
1	Mixed	8,825	Type D
2	Mixed	11,358	Type D
3	Mixed	83,417	Type D
4	Mixed	14,959	Type D
5	Mixed	27,434	Type D
6	Mixed	62,944	Type D
7	Mixed	83,091	Type D
8	Mixed	37,823	Type D
C1	Mixed	39,332	Type D
C2	Mixed	31,725	Type D

[1]*Reference Table 2-1 in the WQMP Guidance Document to populate this column*
Please note that: these areas include the Bioretention areas

Table C.2 Type 'A', Self-Treating Areas

DMA Name or Identification	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)
A	14,336	Native Low Water Use	Drip Irrigation
B	21,175	Native Low Water Use	Drip Irrigation
9	9,030	Native Low Water Use	Drip Irrigation
10	3,046	Native Low Water Use	Drip Irrigation

Table C.3 Type 'B', Self-Retaining Areas

Self-Retaining Area				Type 'C' DMAs that are draining to the Self-Retaining Area		
DMA Name/ ID	Post-project surface type	Area (square feet) [A]	Storm Depth (inches) [B]	DMA Name / ID	[C] from Table C.4 = [C]	Required Retention Depth (inches) [D]

$$[D] = [B] + \frac{[B] \cdot [C]}{[A]}$$

Table C.4 Type 'C', Areas that Drain to Self-Retaining Areas

DMA					Receiving Self-Retaining DMA		
DMA Name/ ID	Area (square feet) [A]	Post-project surface type	Runoff factor [B]	Product [C] = [A] x [B]	DMA name /ID	Area (square feet) [D]	Ratio [C]/[D]

Note: (See Section 3.3 of WQMP Guidance Document) Ensure that partially pervious areas draining to a Self-Retaining area do not exceed the following ratio:

$$\left(\frac{2}{\boldsymbol{Impervious\ Fraction}}\right) : 1$$

(Tributary Area: Self-Retaining Area)

Table C.5 Type 'D', Areas Draining to BMPs

DMA Name or ID	BMP Name or ID	BMP Type
DMA 1	BMP 1	Bioretention
DMA 2	BMP 2	Bioretention
DMA 3	BMP 3	Bioretention
DMA 4	BMP 4	Bioretention
DMA 5	BMP 5	Bioretention
DMA 6	BMP 6	Bioretention
DMA 7	BMP 7	Bioretention
DMA 8	BMP 8	Bioretention
DMA 9	BMP 9	Bioretention

DMA 10	BMP 10	Bioretention
DMA C1	BMP C1	Tree well
DMA C2	BMP C2	Tree well

Note: More than one DMA may drain to a single LID BMP; however, one DMA may not drain to more than one BMP.

Section D: Implement LID BMPs

D.1 Infiltration Applicability

An assessment of the feasibility of utilizing Infiltration BMPs is required for all projects, *except in the following case:*

☐ Harvest and Use BMPs will be implemented to address the Design Capture Volume (see the Harvest and Use Assessment below) for all Drainage Management Areas AND the project is exempt from HMP Performance Standards (*Proceed to Section D.2 and Section E*).

If the above box remains unchecked, perform a site-specific evaluation of the feasibility of Infiltration BMPs using each of the applicable criteria identified in Chapter 3.4.1 of the WQMP Guidance Document and complete the remainder of Section D.1.

Is there an infiltration concern (see discussion in Chapter 2.3.4 of the WQMP Guidance Document for further details)? ☒ Y ☐ N

If yes has been checked, both Infiltration BMPs and Hydrologic Control BMPs that include an infiltration functionalities may not be feasible for the site. It is recommended that you contact your Copermittee to verify whether or not infiltration within the Project is infeasible.

Geotechnical Report

A Geotechnical Report or Phase I Environmental Site Assessment may be required by the Copermittee to confirm present and past site characteristics that may affect the use of Infiltration BMPs. In addition, the Copermittee, at their discretion, may not require a geotechnical report for small projects as described in Chapter 2 of the WQMP Guidance Document. If a geotechnical report has been prepared, include it in Appendix 3. In addition, if a Phase I Environmental Site Assessment has been prepared, include it in Appendix 4.

Is this project classified as a small project consistent with the requirements of Chapter 2 of the WQMP Guidance Document? ☐ Y ☒ N

Infiltration Feasibility

Table D.1 below is meant to provide a simple means of assessing which DMAs on your site support Infiltration BMPs and is discussed in the WQMP Guidance Document in Chapter 2.3.4. Check the appropriate box for each question and then list affected DMAs as applicable. If additional space is needed, add a row below the corresponding answer.

Table D.1 Infiltration Feasibility

Does the project site…	YES	NO
…have any DMAs with a seasonal high groundwater mark shallower than 10 feet?		X
If Yes, list affected DMAs:		
…have any DMAs located within 100 feet of a water supply well?		X
If Yes, list affected DMAs:		
…have any areas identified by the geotechnical report as posing a public safety risk where infiltration of stormwater could have a negative impact?		X
If Yes, list affected DMAs:		
…have measured in-situ infiltration rates of less than 1.6 inches / hour?		X
If Yes, list affected DMAs:		
…have significant cut and/or fill conditions that would preclude in-situ testing of infiltration rates at the final infiltration surface?		X
If Yes, list affected DMAs:		
…have any contaminated groundwater plume in the vicinity of the site?		X
If Yes, list affected DMAs:		
…geotechnical report identifies other site-specific factors that would preclude effective and safe infiltration?	X	
Describe here: The geotechnical report specifies the site consists of dense bedrock which make infiltration infeasible for the project.		

If you answered "Yes" to any of the questions above for any DMA, Infiltration BMPs should not be used for those DMAs and you should proceed to the assessment for Harvest and Use below.

D.2 Harvest and Use Assessment

Please check what applies*:*

☐ Reclaimed water will be used for the non-potable water demands for the Project.

☐Downstream water rights may be impacted by Harvest and Use as approved by the Regional Board (verify with the Copermittee).

☐The Design Capture Volume (DCV) will be addressed using Infiltration Only BMPs. In such a case, Harvest and Use BMPs are still encouraged, but it would not be required if the DCV will be infiltrated or evapotranspired.

If any of the above boxes have been checked, Harvest and Use BMPs need not be assessed for the site. If neither of the above criteria applies, follow the steps below to assess the feasibility of irrigation use, toilet use and other non-potable uses (e.g., industrial use).

Irrigation Use Feasibility

Complete the following steps to determine the feasibility of harvesting stormwater runoff for Irrigation Use BMPs on your site:

Step 1: Identify the total area of irrigated landscape on the site, and the type of landscaping used.

Total Area of Irrigated Landscape: 1.64

Type of Landscaping (Conservation Design or Active Turf): Conservation Design

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for irrigation use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: 6.196 Acres

Step 3: Cross reference the Design Storm depth for the project site (see Exhibit A of the WQMP Guidance Document) with the left column of Table 2-4 in Chapter 2 to determine the minimum area of Effective Irrigated Area per Tributary Impervious Area (EIATIA).

Enter your EIATIA factor: 0.79

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum irrigated area that would be required.

Minimum required irrigated area: 4.895 Acres

Step 5: Determine if harvesting stormwater runoff for irrigation use is feasible for the project by comparing the total area of irrigated landscape (Step 1) to the minimum required irrigated area (Step 4).

Minimum required irrigated area (Step 4)	Available Irrigated Landscape (Step 1)
4.895 Acres	1.64 Acres

Toilet Use Feasibility

Complete the following steps to determine the feasibility of harvesting stormwater runoff for toilet flushing uses on your site:

Step 1: Identify the projected total number of daily toilet users during the wet season, and account for any periodic shut downs or other lapses in occupancy:

Projected Number of Daily Toilet Users: 350

Project Type: Commercial

Step 2: Identify the planned total of all impervious areas on the proposed Project from which runoff might be feasibly captured and stored for toilet use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the Project site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: 6.196 Acres

Step 3: Enter the Design Storm depth for the project site (see Exhibit A) into the left column of Table 2-3 in Chapter 2 to determine the minimum number or toilet users per tributary impervious acre (TUTIA).

Enter your TUTIA factor: 132

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum number of toilet users that would be required.

Minimum number of toilet users: 824

Step 5: Determine if harvesting stormwater runoff for toilet flushing use is feasible for the Project by comparing the Number of Daily Toilet Users (Step 1) to the minimum required number of toilet users (Step 4).

Minimum required Toilet Users (Step 4)	Projected number of toilet users (Step 1)
824	350

Other Non-Potable Use Feasibility

Are there other non-potable uses for stormwater runoff on the site (e.g. industrial use)? See Chapter 2 of the Guidance for further information. If yes, describe below. If no, write N/A.

n/a

Step 1: Identify the projected average daily non-potable demand, in gallons per day, during the Wet Season and accounting for any periodic shut downs or other lapses in occupancy or operation.

Average Daily Demand: Projected Average Daily Use (gpd)

Step 2: Identify the planned total of all impervious areas on the proposed Project from which runoff might be feasibly captured and stored for the identified non-potable use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the Project site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: Insert Area (Acres)

Step 3: Enter the Design Storm Depth for the Project site (see Exhibit A) into the left column of Table 2-5 in Chapter 2 to determine the minimum demand for non-potable uses of stormwater runoff per tributary impervious acre.

Enter the factor from Table 2-3: Enter Value

Step 4: Multiply the unit value obtained from Step 4 by the total of impervious areas from Step 3 to develop the minimum gpd of non-potable use that would be required.

Minimum required use: Minimum use required (gpd)

Step 5: Determine if harvesting stormwater runoff for other non-potable use is feasible for the Project by comparing the Number of Daily Toilet Users (Step 1) to the minimum required number of toilet users (Step 4).

Minimum required non-potable use (Step 4)	Projected average daily use (Step 1)
Minimum use required (gpd)	Projected Average Daily Use (gpd)

If Irrigation, Toilet and Other Use feasibility anticipated demands are less than the applicable minimum values, Harvest and Use BMPs are not required and you should proceed to utilize LID Bioretention and Biotreatment BMPs, unless a site-specific analysis has been completed that demonstrates technical infeasibility as noted in D.3 below.

D.3 Bioretention and Biotreatment Assessment

Other LID Bioretention and Biotreatment BMPs as described in Chapter 2.3 of the WQMP Guidance Document are feasible on nearly all development sites with sufficient advance planning.

Select one of the following:

[X] LID Bioretention/Biotreatment BMPs will be used for some or all DMAs of the Project as noted below in Section D.4

[ ] A site-specific analysis demonstrating the technical infeasibility of all LID BMPs has been performed and is included in Appendix 5. If you plan to submit an analysis demonstrating the technical infeasibility of LID BMPs, request a pre-submittal meeting with the Copermittee with jurisdiction over the Project site to discuss this option. Proceed to Section E to document your alternative compliance measures.

D.4 Other Limiting Geotechnical Conditions

Onsite retention may not be feasible due to specific geotechnical concerns identified in the Geotechnical Report. If any, describe below. If no, write N/A:

N/A

Table D.2 Geotechnical Concerns for Onsite Retention Table

Type of Geotechnical Concern	DMAs Feasible (By Name or ID)	DMAs Infeasible (By Name or ID)
Collapsible Soil		
Expansive Soil		
Slopes		
Liquefaction		
Other		

D.5 Feasibility Assessment Summaries

From the Infiltration, Harvest and Use, Bioretention and Biotreatment Sections above, complete Table D.3 below to summarize which LID BMPs are technically feasible, and which are not, based upon the established hierarchy.

Table D.3 LID Prioritization Summary Matrix

BMP Name/ID	LID BMP Hierarchy				No LID (Alternative Compliance)
	1. Infiltration	2. Harvest and use	3. Bioretention	4. Biotreatment	
1	☐	☐	☒	☐	☐
2	☐	☐	☒	☐	☐
C1	☐	☐	☒	☐	☐
C2	☐	☐	☒	☐	☐

Note: C1 and C2 are tree wells and are public treatment control.

For those DMAs where LID BMPs are not feasible, provide a brief narrative below summarizing why they are not feasible, include your technical infeasibility criteria in Appendix 5, and proceed to Section E below to document Alternative Compliance measures for those DMAs. Recall that each proposed DMA must pass through the LID BMP hierarchy before alternative compliance measures may be considered.

Insert narrative description here.

D.6 LID BMP Sizing

Each LID BMP must be designed to ensure that the DCV will be addressed by the selected BMPs. First**,** calculate the DCV for each LID BMP using the V_{BMP} worksheet in Appendix F of the LID BMP Design Handbook. Second**,** design the LID BMP to meet the required V_{BMP} using a method approved by the Copermittee with jurisdiction over the Project site. Utilize the worksheets found in the LID BMP Design Handbook or consult with the Copermittee to assist you in correctly sizing your LID BMPs. Complete Table D.4 below to document the DCV and the Proposed Volume for each LID BMP. Provide the completed design procedure sheets for each LID BMP in Appendix 6. You may add additional rows to the table below as needed.

Table D.4 DCV Calculations for LID BMPs

DMA Type/ID	DMA (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Enter BMP Name / Identifier Here* **BMP-1**		
	[A]		[B]	[C]	[A] x [C]			
1	*8,825*	*Mixed*	*0.9*	*0.73*	*6,442*			
2	*11,360*	*Landscape*	*0.9*	*0.73*	*8,293*			
3	*85,003*	*Mixed*	*0.9*	*0.73*	*62,052*			
4	*14,959*	*Mixed*	*0.9*	*0.73*	*10,920*			
5	*27,434*	*Concrete*	*0.9*	*0.73*	*20,027*			
9	*9,030*	*Mixed*	*0.9*	*0.73*	*6,592*	*Design Storm Depth (in)*	*DCV, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
BMP-1	*6,504*	*Landscape*	*0.9*	*0.73*	*4,748*			
	163,115				*119,074*	*0.58*	*5,709*	*6,503*

DMA Type/ID	DMA (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Enter BMP Name / Identifier Here* **BMP-2**		
	[A]		[B]	[C]	[A] x [C]			
6	*49,854*	*Mixed*	*0.9*	*0.73*	*36,394*			
7	*86,876*	*Landscape*	*0.9*	*0.73*	*63,420*			
8	*37,823*	*Mixed*	*0.9*	*0.73*	*27,611*			
10	*3,045*	*Concrete*	*0.9*	*0.73*	*2,223*	*Design Storm Depth (in)*	*DCV, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
BMP-2	*6,024*	*Landscape*	*0.9*	*0.73*	*4,398*			
	183,623				*134,045*	*0.58*	*6,427*	*7,231*

DMA Type/ID	DMA (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Enter BMP Name / Identifier Here* **BMP-C1**		
	[A]		[B]	[C]	[A] x [C]			
C1	*39,332*	*Mixed*	*0.9*	*0.73*	*28,712*			
						Design Storm Depth (in)	*DCV, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	183,623				*28,712*	*0.58*	*1,377*	*1,476*

DMA Type/ID	DMA (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Enter BMP Name / Identifier Here* *BMP-C2*		
	[A]		[B]	[C]	[A] x [C]			
C2	*31,725*	*Mixed*	*0.9*	*0.73*	*23,159*	*Design Storm Depth (in)*	*DCV, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	183,623				*23,159*	*0.58*	*1,110*	*1,476*

Tree Wells were calculated based on Tree Credit Volume Table Section B.2.2.1 Street Trees of County of San Diego BMP Manual 2016.

Mature Tree Canopy Diameter (ft)	Tree Credit Volume (ft^3/tree)
5	10
10	40
15	100
20	180
25	290
30	420

DMA-C1 drains to BMP-C1, Six tree wells are proposed as pollutant control for this area. Tree selected is 23 ft tree canopy diameter, the Tree Credit Volume is 246 cuft/tree. The required Vbmp = 1,377 cuft, therefore 6 trees are adequate.
6 trees x 246 cuft/tree = 1,476 cuft > 1,377 cuft ... OK!

DMA-C2 drains to BMP-C2, Six tree wells are proposed as pollutant control for this area. Tree selected is 23 ft tree canopy diameter, the Tree Credit Volume is 246 cuft/tree. The required Vbmp = 1,110 cuft, therefore 6 trees are adequate.
6 trees x 246 cuft/tree = 1,476 cuft > 1,110 cuft ... OK!

Soil Volume Sizing Per Tree

Adequate planting soil space provides nutrients, water, air, and root space that trees need to have a long, healthy life. The planting soil volume required depends on the fully-grown tree size. In general, 2 cuft of soil per one square foot of the tree's mature canopy area. Planting soil amendments for trees should be 3 ft deep; the length and width must ensure the appropriate volume for the tree species and site. CU structural soil (or equivalent) is to be used in planting areas experiencing load from sidewalks curb and gutter, parking stalls or roadways.

BMP-C1 (located at DMA-C1)

- Area of 23 ft diameter of mature tree is 415.5 sqft.
- Soil Volume: 2 cuft/sqft canopy = 2 cuft/sqft x 415.5 sqft = 831 cuft.
- Planting depth= 3ft.
- Number of trees = 6
- Therefore area of soil is = 831 cuft/3 ft = 277 sqft. ⟶ 10.65' W x 26'L Use 12'x 26'

BMP-C2 (located at DMA-C2)

- Area of 23 ft diameter of mature tree is 415.5 sqft.
- Soil Volume: 2 cuft/sqft canopy = 2 cuft/sqft x 415.5 sqft =831 cuft.
- Planting depth= 3ft.
- Number of trees = 6
- Therefore area of soil is = 831 cuft/3 ft = 277 sqft. ⟶ 10.65' W x 26'L Use 12'x 26'

Each LID BMP must be designed to ensure that the Design Capture Volume (DCV) will be addressed by the selected BMPs. First**,** calculate the Design Capture Volume for each LID BMP using the 'V_{BMP}' worksheet in Appendix F of the LID BMP Design Handbook. Second**,** design the LID BMP to meet the required V_{BMP} using a method approved by the Copermittee. Utilize the worksheets found in the LID BMP Design Handbook or consult with your Copermittee. Complete Table D.5 below to document the Design Capture Volume and the Proposed Volume for each LID BMP. You can add rows to the table as needed. Alternatively, the Santa Margarita Hydrology Model (SMRHM) can be used to size LID BMPs to address the DCV and, if applicable, to size Hydrologic Control BMPs to meet the Hydrologic Performance Standard of the SMR HMP, as identified in Section E.

Table D.5 LID BMP Sizing

BMP Name / ID	DMA No.	BMP Type / Description	Design Capture Volume (ft^3)	Proposed Volume (ft^3)
1	1	Bioretention	5,393	6,503
2	2	Bioretention	6,743	7,231
C1	C1	Tree well	1,377	1,476
C2	C2	Tree well	1,110	1,476

Section E: Implement Hydrologic Control BMPs and Sediment Supply BMPs

If a completed Table A.2 demonstrates that the project is exempt from HMP Performance Standards, specify N/A of proceed to Section F, if applicable, and Section G.

E.1 Onsite Feasibility of Hydrologic Control BMPs

An assessment of the feasibility of implementing onsite Hydrologic Control BMPs is required for all projects.

Select one of the following:

[X] Yes – The implementation of Hydrologic Control BMPs is feasible onsite. *(Proceed to Step E.3 and Step E.4)*

- *Or* -

☐ No – The project site is larger than one acre and the implementation of Hydrologic Control BMPs is not feasible onsite. *(Proceed to Step E.5 and Step F for Alternative Compliance upon approval of the Technical Feasibility Assessment by the Copermittee)*

☐ No – The project site is smaller than one acre and the implementation of Hydrologic Control BMPs is not feasible onsite. *(Proceed to Step E.2)*

If the reasons for infeasibility are different from those listed in Section D.1, describe the technical or spatial reasons that preclude the implementation of onsite Hydrologic Control BMPs. If none, write N/A:

Insert narrative description here.

Approval of the condition for infeasibility, if any, is required by the Copermittee. Has the condition for infeasibility been approved by the Copermittee?

☐ Y ☐ N ☐ N/A

E.2 Meeting the HMP Performance Standard for Small Project Sites

Select one of the following:

[X] Yes – The project site is equal to or larger than one acre. *(Proceed to Step E.3, Step E.4, and Step E.5)*

- *Or* -

☐ No – The project site is less than one acre. *(Follow the remainder of Step E.2)*

Only a Simplified Technical Feasibility Study is required from the applicant. Complete the Simplified Technical Feasibility Study in Appendix 7, which must include, at a minimum, the soil conditions at the

PDP, a demonstration of the lack of available space for onsite Hydrologic Control BMPs, an explanation of prohibitive costs to implement Hydrologic Control BMPs, and a written opinion from a Registered Geotechnical Engineer identifying the infeasibility due to geotechnical concerns.

Select one of the following:

[X] Yes – Onsite Hydrologic Control BMPs are feasible. *(Proceed to Step E., Step E.4, and Step E.5)*

- *Or* -

☐ No – Onsite Hydrologic Control BMPs are not feasible per the Simplified Technical Feasibility Study. *(Proceed to Section E.5 for Sediment Supply Performance Standard and Section F for Alternative Compliance)*

E.3 Hydrologic Control BMP Selection

Capture of the DCV and achievement of the Hydrologic Performance Standard may be met by combined and/or separate structural BMPs. Similarly, compliance with the two identified requirements may be fully or partially achieved onsite.

For each DMA, identify in Table E.1 if the DCV is fully or partially captured onsite, if the Hydrologic Performance Standard is fully or partially met onsite (by using the SMRHM identified in Step E.4), and if structural BMPs for compliance with the LID requirement and the Hydrologic Performance Standard are combined.

Table E.1 LID & Hydromodification BMP Location

DMA	LID BMP	Hydrologic Control BMP	Combined BMP	BMP type and ID
1	☒ Onsite ☐ Partially Onsite ☐ Offsite ☐ None Required	☒ Onsite ☐ Partially Onsite ☐ Offsite ☐ None Required	☒ Yes ☐ No	BMP 1, Bioretention
2	☒ Onsite ☐ Partially Onsite ☐ Offsite ☐ None Required	☒ Onsite ☐ Partially Onsite ☐ Offsite ☐ None Required	☒ Yes ☐ No	BMP 2, Bioretention

For each DMA provide a narrative describing if the DCV and the Hydrologic Performance Standard are to be fully managed onsite. If not, the narrative should detail how and where offsite structural BMPs will achieve management of the DCV and the Hydrologic Performance Standard.

E.4 Hydrologic Control BMP Sizing

Each Hydrologic Control BMP must be designed to ensure that the flow duration curve of the post-development DMA will not exceed that of the pre-existing, naturally occurring, DMA by more than ten percent over a one-year period. Using SMRHM, the applicant shall demonstrate that the performance of each designed Hydrologic Control BMP complies with the Hydrologic Performance Standard. Complete Table E.2 below and identify, for each DMA, the type of Hydrologic Control BMP, if the SMRHM model confirmed the management (Identified as "passed" in SMRHM), the total volume capacity of the Hydrologic Control BMP, the Hydrologic Control BMP footprint at top floor elevation, and the drawdown time of the Hydrologic Control BMP. SMRHM summary reports should be documented in Appendix 7. Refer to the SMRHM Guidance Document for additional information on SMRHM. You can add rows to the table as needed.

Table E.2 Hydrologic Control BMP Sizing

BMP Name / ID	DMA No.	BMP Type / Description	SMRHM Passed*	BMP Volume (Cuft)	BMP Footprint (sqft)	Drawdown time (hr)
1	1, 2, 3, 4, 5, 9	Bioretention	☒	5,709	6,503	13.5
2	6, 7, 8, 10	Bioretention	☒	6,427	6,024	16.1

*SMRHM is substituted by SWMM (Storm Water Management Model) version 5.1

E.5 Implement Sediment Supply BMPs

The applicant may refer to Section 2.3 of the SMR HMP for a comprehensive description of the methodology to meet the Sediment Supply Performance Standard. Complete the following steps to determine compliance with the Sediment Supply Performance Standard:

Step 1: Identify if the site is a Significant Source of Bed Sediment Supply to the receiving channel

☐ Step 1.A – Is the Bed Sediment of onsite streams similar to that of receiving streams?

Rate the similarity:
☐ High
☒ Medium
☐ Low

Results from the geotechnical and sieve analysis to be performed both onsite and in the receiving channel should be documented in Appendix 7. Of particular interest, the results of the sieve analysis, the soil erodibility factor, a description of the topographic relief of the project area, and the lithology of onsite soils should be reported in Appendix 7.

☐ Step 1.B – Are onsite streams capable of delivering Bed Sediment Supply from the site, if any, to the receiving channel?

Rate the potential:

☐ High

☐ Medium

☒ Low

Results from the analyses of the sediment delivery potential to the receiving channel should be documented in Appendix 7 and identify, at a minimum, the Sediment Source, the distance to the receiving channel, the onsite channel density, the project watershed area, the slope, length, land use, and rainfall intensity.

☐ Step 1.C – Will the receiving channel adversely respond to a change in Bed Sediment Load?

Rate the need for bed sediment supply:

☐ High

☐ Medium

☒ Low

Results from the in-stream analysis to be performed both onsite should be documented in Appendix 7. The analysis should, at a minimum, quantify the bank stability and the degree of incision, provide a gradation of the Bed Sediment within the receiving channel, and identify if the channel is sediment supply-limited.

☐ Step 1.D – Summary of Step 1

Summarize in Table E.3 the findings of Step 1 and associate a score (in parenthesis) to each step. The sum of the three individual scores determines if a stream is a significant contributor to the receiving stream.

- Sum is equal to or greater than eight - Site is a significant source of sediment bed material – all on-site streams must be preserved or by-passed within the site plan. The applicant shall proceed to Step 2 for all onsite streams.
- Sum is greater than five but lower than eight. Site is a source of sediment bed material – some of the on-site streams must be preserved (with identified streams noted). The applicant shall proceed to Step 2 for the identified streams only.
- Sum is equal to or lower than five. Site is not a significant source of sediment bed material. The applicant may advance to Section F.

Table E.3 Triad Assessment Summary

Step	**Rating**			**Total Score**
1.A	☐ High (3)	☒ Medium (2)	☐ Low (1)	2
1.B	☐ High (3)	☐ Medium (2)	☒ Low (1)	1
1.C	☐ High (3)	☐ Medium (2)	☒ Low (1)	1
Significant Source Rating of Bed Sediment to the receiving channel(s)				4

Step 2: Preservation of Identified Onsite Channels

Onsite streams identified as a Significant Source of Bed Sediment should be avoided in the site design.

Check one of the following:

☐ The site design does avoid all onsite channels identified as a Significant Source of Bed Sediment *(The applicant may disregard subsequent steps of Section E.5 and directly advance directly to Section F.*)

- *Or* -

☐ The site design **does NOT avoid** all onsite channels identified as a Significant Source of Bed Sediment *(The applicant may proceed with the subsequent steps of Section E.5).*

Provide in Appendix 7 a site map that identifies all onsite channels and highlights those onsite channels that were identified as a Significant Source of Bed Sediment. The site map shall demonstrate, if feasible, that the site design avoids those onsite channels identified as a Significant Source of Bed Sediment. In addition, the applicant shall describe the characteristics of each onsite channel identified as a Significant Source of Bed Sediment. If the design plan cannot avoid the onsite channels, please provide a rationale for each channel individually.

Identified Channel #1 - Insert narrative description here

Identified Channel #2 - Insert narrative description here

Identified Channel #3 - Insert narrative description here

Step 3: By-Pass of Upstream Drainage(s) to preserve the discharge of Bed Sediment Supply to the receiving channel(s)

Onsite channels identified as a Significant Source of Bed Sediment Supply should be by-passed the discharge of Bed Sediment Supply to the receiving channel(s).

Check one of the following:

☐ The site design does avoid and/or bypass all onsite channels identified as a source of Bed Sediment Supply *(The applicant may directly advance to Section F.*)

- *Or* -

☐ The site design **does NOT avoid or by-pass** all onsite channels identified as a source of Bed Sediment Supply *(The applicant may proceed to an Alternative Approach, as defined in Section F).*

Provide in Appendix 7 a site map that identifies all onsite channels and highlights those onsite channels that were identified as a Significant Source of Bed Sediment Supply. The site map shall demonstrate, if feasible, that the site design avoids or by-passes those onsite channels of significant Bed Sediment Supply to the receiving channel(s). In addition, the applicant shall describe the characteristics of each onsite channel identified as a Significant Source of Bed Sediment Supply. If the design plan cannot avoid or by-pass the onsite channels, please provide a rationale for each channel individually.

Identified Channel #1 - Insert narrative description here

Identified Channel #2 - Insert narrative description here

Identified Channel #3 - Insert narrative description here

Section F: Alternative Compliance

LID BMPs and Hydrologic Control BMPs are expected to be feasible on virtually all projects. Where LID BMPs and/or Hydrologic Control BMPs have been demonstrated to be infeasible as documented in Section D and/or Section E, respectively, other Treatment Control BMPs or alternative compliance approaches must be used (subject LID waiver and/or HMP alternative compliance approval by the Copermittee).

In addition, if supporting documentation demonstrates the infeasibility to implement Sediment Supply BMPs onsite (See Section E.5), the applicant may refer to Section F.5.

Check one of the following boxes:

☒ LID Principles, LID BMPs, Hydrologic Control BMPs, and Sediment Supply BMPs have been incorporated into the site design to fully address all Drainage Management Areas. No alternative compliance measures are required for this project and thus this Section is not required to be completed.

- *Or* -

☐ LID Principles and LID BMPs have NOT been incorporated into the site design to fully address the LID requirements for all Drainage Management Areas AND HMP Performance Standards are not fully addressed in the following Drainage Management Areas.

- The following Drainage Management Areas are unable to be addressed using LID BMPs. A site specific analysis demonstrating technical infeasibility of LID BMPs has been approved by the Copermittee and included in Appendix 5. The following alternative compliance measures on the following pages are being implemented to ensure that any pollutant loads expected to be discharged by not incorporating LID BMPs, are fully mitigated. The applicant should complete Section F.1, Section F.2, and Section F.3, as applicable.
- A site specific analysis demonstrating technical infeasibility of Hydrologic Control BMPs and Sediment Supply BMPs has been approved by the Copermittee and included in Appendix 7. Projects less than one acre have completed the Simplified Technical Feasibility Study. The applicant should complete Section F.5 and/or Section F.6, as applicable.

List DMAs Here.

- *Or* -

☐ LID Principles and LID BMPs have been incorporated into the site design to fully address the DCV for all Drainage Management Areas. However, HMP Performance Standards are not fully addressed in the following Drainage Management Areas. A site specific analysis demonstrating technical infeasibility of Hydrologic Control BMPs and Sediment Supply BMPs has been approved by the Copermittee and included in Appendix 7. Projects less than one acre have completed the Simplified Technical Feasibility. The applicant should complete Section F.5 and/or Section F.6, as applicable.

List DMAs Here.

F.1 Identify Pollutants of Concern

Utilizing Table A.1 from Section A above which noted your project's Receiving Waters and their associated USEPA approved 303(d) listed impairments, cross reference this information with that of your selected Priority Development Project Category in Table F.1 below. If the identified General Pollutant Categories are the same as those listed for your Receiving Waters, then these will be your Pollutants of Concern and the appropriate box or boxes will be checked on the last row. The purpose of this is to document compliance and to help you appropriately plan for mitigating your Pollutants of Concern in lieu of implementing LID BMPs.

Table F.1 Potential Pollutants by Land Use Type

Priority Development Project Categories and/or Project Features (check those that apply)	General Pollutant Categories							
	Bacterial Indicators	Metals	Nutrients	Pesticides	Toxic Organic Compounds	Sediments	Trash & Debris	Oil & Grease
☐ Detached Residential Development	P	N	P	P	N	P	P	P
☐ Attached Residential Development	P	N	P	P	N	P	P	P[(2)]
☒ Commercial/Industrial Development	P[(3)]	P	P[(1)]	P[(1)]	P[(5)]	P[(1)]	P	P
☐ Automotive Repair Shops	N	P	N	N	P[(4, 5)]	N	P	P
☒ Restaurants (>5,000 ft^2)	P	N	N	N	N	N	P	P
☐ Hillside Development (>5,000 ft^2)	P	N	P	P	N	P	P	P
☒ Parking Lots (>5,000 ft^2)	P[(6)]	P	P[(1)]	P[(1)]	P[(4)]	P[(1)]	P	P
☐ Retail Gasoline Outlets	N	P	N	N	P	N	P	P
Project Priority Pollutant(s) of Concern	☒	☒	☐	☐	☒	☒	☒	☒

P = Potential

N = Not Potential

(1) A potential Pollutant if non-native landscaping exists or is proposed onsite; otherwise not expected

(2) A potential Pollutant if the project includes uncovered parking areas; otherwise not expected

(3) A potential Pollutant is land use involving animal waste

(4) Specifically petroleum hydrocarbons

(5) Specifically solvents

(6) Bacterial indicators are routinely detected in pavement runoff

F.2 Stormwater Credits

Projects that cannot implement LID BMPs but nevertheless implement Smart Growth Principles are potentially eligible for Stormwater Credits. Utilize Table 3-7 within the WQMP Guidance Document to identify your Project Category and its associated Water Quality Credit. If not applicable, write N/A.
N/A

Table F.2 Stormwater Credits

Qualifying Project Categories	Credit Percentage[2]
Total Credit Percentage[1]	

[1]Cannot Exceed 50%
[2]Obtain corresponding data from Table 3-7 in the WQMP Guidance Document

F.3 Sizing Criteria

After you appropriately considered Stormwater Credits for your Project, utilize Table F.3 below to appropriately size them to the DCV, or Design Flow Rate, as applicable. Please reference Chapter 3.5.5 of the WQMP Guidance Document for further information.

Table F.3 Treatment Control BMP Sizing

DMA Type/ID	**DMA (square feet)**	**Post-Project Surface Type**	**Effective Impervious Fraction, I_f**	**DMA Runoff Factor**	**DMA x Runoff Factor**		***Enter BMP Name / Identifier Here***		
	[A]		[B]	[C]	[A] x [C]				
						Design Storm Depth (in)	*Minimum DCV or Design Flow Rate (cubic feet or cfs)*	*Total Storm Water Credit % Reduction*	*Proposed Volume or Flow on Plans (cubic feet or cfs)*
	A_T = Σ[A]				Σ= [D]	[E]	$[F] = \frac{[D]x[E]}{[G]}$	[F] X (1-[H])	[I]

[B], [C] is obtained as described in Section 2.5 from the WQMP Guidance Document
[E] is obtained from Exhibit A in the WQMP Guidance Document
[G] is for Flow-Based Treatment Control BMPs [G] = 43,560, for Volume-Based Control Treatment BMPs, [G] = 12
[H] is from the Total Stormwater Credit Percentage as Calculated from Table E.2 above
[I] as obtained from a design procedure sheet from the BMP manufacturer and should be included in Appendix 6

No Storm water credit reduction, See Section D.6 for DCV calculations

F.4 Treatment Control BMP Selection

Treatment Control BMPs typically provide proprietary treatment mechanisms to treat potential Pollutants in runoff, but do not sustain significant biological processes. Treatment Control BMPs must have a removal efficiency of a medium or high effectiveness as quantified below:

- **High**: equal to or greater than 80% removal efficiency
- **Medium**: between 40% and 80% removal efficiency

Such removal efficiency documentation (e.g., studies, reports, etc.) as further discussed in Chapter 3.5.2 of the WQMP Guidance Document, must be included in Appendix 6. In addition, ensure that proposed Treatment Control BMPs are properly identified on the WQMP Site Plan in Appendix 1.

Table F.4 Treatment Control BMP Selection

Selected Treatment Control BMP Name or ID[1]	Priority Pollutant(s) of Concern to Mitigate[2]	Removal Efficiency Percentage[3]
BMP-1	Bacterial, Metals, Organic, Sediment, trash debris and oil & grease	>80%
BMP-2	Bacterial, Metals, Organic, Sediment, trash debris and oil & grease	>80%
BMP-C1	Bacterial, Metals, Organic, Sediment, trash debris and oil & grease	>80%
BMP-C2	Bacterial, Metals, Organic, Sediment, trash debris and oil & grease	>80%

[1] Treatment Control BMPs must not be constructed within Receiving Waters. In addition, a proposed Treatment Control BMP may be listed more than once if they possess more than one qualifying pollutant removal efficiency.
[2] Cross Reference Table E.1 above to populate this column.
[3] As documented in a Copermittee Approved Study and provided in Appendix 6.

F.5 Hydrologic Performance Standard – Alternative Compliance Approach

Alternative compliance options are only available if the governing Copermittee has acknowledged the infeasibility of onsite Hydrologic Control BMPs and approved an alternative compliance approach. Attach to Appendix 7 the Technical Feasibility Study (Projects equal or greater than one acre) or Simplified Technical Feasibility Study (Projects less than one acre) along with a written approval from the Copermittee. The applicant may refer to Section 2.2.iv of the SMR HMP for extensive guidelines on the alternative compliance approach.

Select the pursued alternative and describe the specifics of the alternative:

☐ Offsite Hydrologic Control Management within the same channel system

Insert narrative description here

☐ In-Stream Restoration Project

Insert narrative description here

For Offsite Hydrologic Control BMP Option

Each Hydrologic Control BMP must be designed to ensure that the flow duration curve of the post-development DMA will not exceed that of the pre-existing, naturally occurring, DMA by more than ten

percent over a one-year period. Using SMRHM, the applicant shall demonstrate that the performance of each designed Hydrologic Control BMP is equivalent with the Hydrologic Performance Standard for onsite conditions. Complete Table F.4 below and identify, for each Hydrologic Control BMP, the equivalent DMA the Hydrologic Control BMP mitigates, that the SMRHM model passed, the total volume capacity of the BMP, the BMP footprint at top floor elevation, and the drawdown time of the BMP. SMRHM summary reports for the alternative approach should be documented in Appendix 7. Refer to the SMRHM Guidance Document for additional information on SMRHM. You can add rows to the table as needed.

Table F.5 Offsite Hydrologic Control BMP Sizing

BMP Name / Type	Equivalent DMA (ac)	SMRHM Passed	BMP Volume (ac-ft)	BMP Footprint (ac)	Drawdown time (hr)
		☐			
		☐			
		☐			
		☐			

For Instream Restoration Option

Attach to Appendix 7 the technical report detailing the condition of the receiving channel subject to the proposed hydrologic and sediment regimes. Provide the full design plans for the in-stream restoration project that have been approved by the Copermittee.

F.6 Sediment Supply Performance Standard - Alternative Compliance

The alternative compliance option to the Sediment Supply Performance Standard is only available if the governing Copermittee has approved the investigation of alternative Bed Sediment Supply options. Attach to Appendix 7 the Technical Feasibility Study, along with the modeling analysis, the long-term monitoring program, and the potential corrective actions, that demonstrate the performance of the overall alternative compliance program. The applicant may refer to Section 2.3.ii of the SMR HMP for extensive guidelines on the alternative compliance approach.

Provide a narrative describing the alternative Bed Sediment Supply approach, including the long-term monitoring program and the findings of the numerical modeling.

N/A

Section G: Source Control BMPs

Source Control BMPs include permanent, structural features that may be required in your Project plans — such as roofs over and berms around trash and recycling areas — and Operational BMPs, such as regular sweeping and "housekeeping", that must be implemented by the site's occupant or user. The Maximum Extent Practicable (MEP) standard typically requires both types of BMPs. In general, Operational BMPs cannot be substituted for a feasible and effective structural BMP. Using the Pollutant Sources/Source Control Checklist in Appendix 8, review the following procedure to specify Source Control BMPs for your site:

1. ***Identify Pollutant Sources*:** Review Column 1 in the Pollutant Sources/Source Control Checklist. Check off the potential sources of Pollutants that apply to your site.

2. ***Note Locations on Project-Specific WQMP Exhibit*:** Note the corresponding requirements listed in Column 2 of the Pollutant Sources/Source Control Checklist. Show the location of each Pollutant source and each permanent Source Control BMP in your Project-Specific WQMP Exhibit located in Appendix 1.

3. ***Prepare a Table and Narrative*:** Check off the corresponding requirements listed in Column 3 in the Pollutant Sources/Source Control Checklist. In the left column of Table G.1 below, list each potential source of Pollutants on your site (from those that you checked in the Pollutant Sources/Source Control Checklist). In the middle column, list the corresponding permanent, Structural Source Control BMPs (from Columns 2 and 3 of the Pollutant Sources/Source Control Checklist) used to prevent Pollutants from entering runoff. **Add additional narrative** in this column that explains any special features, materials or methods of construction that will be used to implement these permanent, Structural Source Control BMPs.

4. ***Identify Operational Source Control BMPs:*** To complete your table, refer once again to the Pollutant Sources/Source Control Checklist. List in the right column of your table the Operational BMPs that should be implemented as long as the anticipated activities continue at the site. Copermittee stormwater ordinances require that applicable Source Control BMPs be implemented; the same BMPs may also be required as a condition of a use permit or other revocable Discretionary Approval for use of the site.

Table G.1 Structural and Operational Source Control BMP

Potential Sources of Runoff Pollutants	Structural Source Control BMPs	Operational Source Control BMPs
On-Site Storm Drain Inlets	Signage of all inlets with language such as "No dumping/ Only rain down the drain"	• Maintain and periodically repaint or replace inlet markings. • Provide stormwater pollution prevention information to new site owners, lessees, or operators.

		• Provide storm drain inlet protection per SE-10 of the BMP handbook • Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."
Interior floor drains	Interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.	Inspect and maintain drains to prevent blockages and overflow.
Landscape/outdoor pesticide use	• Preserve existing native trees, shrubs, and ground cover to the maximum extent possible. • Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides the can contribute to stormwater pollution. • Where landscape areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions.	• Maintain landscaping using minimum or no pesticides. • Provide Imp information to new owners, lessees, and operators.
Food service	Owner shall provide information on the items to be cleaned.	Provide "The Food Service Industry Best Management Practices for: Restaurants, Grocery Stores, Delicatessens and Bakeries" brochure to new site owners, lessees, and operators.

Refuse areas	• Signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar • Trash areas are protected from rainfall, run-on, runoff, and wind dispersal by roofed, walled enclosure located away from storm drains.	• All trash storage areas shall be inspected daily to insure that they are clean from trash. Also the following shall be inspected annually 30 days prior to October lst of each year: • Pavement is in good repair. • Drainage will not run-off onto adjacent areas. • That they remain screened or walled to prevent off-site transport of trash. • That all lids are closed and/or awnings are in good repair to minimize direct precipitation
Roofing, gutter, and trim	Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.	
Plazas, sidewalks, and parking lots		Sweep plazas, sidewalks, and parking lots regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect washwater containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain

Section H: Construction Plan Checklist

Populate Table H.1 below to assist the plan checker in an expeditious review of your project. The first two columns will contain information that was prepared in previous steps, while the last column will be populated with the corresponding plan sheets. This table is to be completed with the submittal of your final Project-Specific WQMP.

Table H.1 Construction Plan Cross-reference

BMP No. or ID	BMP Identifier and Description	Corresponding Plan Sheet(s)
BMP-1	Bioretention, Depth Soil: 24", Gravel: 36"	Sheets 5 and 9
BMP-2	Bioretention, Depth Soil: 18", Gravel: 48"	Sheets 5 and 9
BMP-C1	Tree wells	Sheets 6 and 10
BMP-C2	Tree wells	Sheets 7 and 11

Note that the updated table — or Construction Plan WQMP Checklist — is **only a reference tool** to facilitate an easy comparison of the construction plans to your Project-Specific WQMP. The Copermittee with jurisdiction over the Project site can advise you regarding the process required to propose changes to the approved Project-Specific WQMP.

Section I: Operation, Maintenance and Funding

The Copermittee with jurisdiction over the Project site will periodically verify that BMPs on your Project are maintained and continue to operate as designed. To make this possible, the Copermittee will require that you include in Appendix 9 of this Project-Specific WQMP:

1. A means to finance and implement maintenance of BMPs in perpetuity, including replacement cost.
2. Acceptance of responsibility for maintenance from the time the BMPs are constructed until responsibility for operation and maintenance is legally transferred. A warranty covering a period following construction may also be required.
3. An outline of general maintenance requirements for the Stormwater BMPs you have selected.
4. Figures delineating and designating pervious and impervious areas, location, and type of Stormwater BMP, and tables of pervious and impervious areas served by each facility. Geo-locating the BMPs using a coordinate system of latitude and longitude is recommended to help facilitate a future statewide database system.
5. A separate list and location of self-retaining areas or areas addressed by LID Principles that do not require specialized Operations and Maintenance or inspections but will require typical landscape maintenance as noted in Chapter 5, in the WQMP Guidance. Include a brief description of typical landscape maintenance for these areas.

The Copermittee with jurisdiction over the Project site will also require that you prepare and submit a detailed BMP Operation and Maintenance Plan that sets forth a maintenance schedule for each of the BMPs built on your site. An agreement assigning responsibility for maintenance and providing for inspections and certification may also be required.

Details of these requirements and instructions for preparing a BMP Operation and Maintenance Plan are in Chapter 5 of the WQMP Guidance Document.

Maintenance Mechanism: A maintenance agreement

Will the proposed BMPs be maintained by a Homeowners' Association (HOA) or Property Owners Association (POA)?

☐ N ☒ Y

Include your Operation and Maintenance Plan and Maintenance Mechanism in Appendix 9. Additionally, include all pertinent forms of educational materials for those personnel that will be maintaining the proposed BMPs within this Project-Specific WQMP in Appendix 10.

Acronyms, Abbreviations and Definitions

2010 SMR MS4 Permit	Order No. R9-2010-0016, an NPDES Permit issued by the San Diego Regional Water Quality Control Board.
Applicant	Public or private entity seeking the discretionary approval of new or replaced improvements from the Copermittee with jurisdiction over the project site. The Applicant has overall responsibility for the implementation and the approval of a Priority Development Project. The WQMP uses consistently the term "user" to refer to the applicant such as developer or project proponent. The WQMP employs also the designation "user" to identify the Registered Professional Civil Engineer responsible for submitting the Project-Specific WQMP, and designing the required BMPs.
Best Management Practice (BMP)	Defined in 40 CFR 122.2 as schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the United States. BMPs also include treatment requirements, operating procedures and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. In the case of municipal storm water permits, BMPs are typically used in place of numeric effluent limits.
BMP Fact Sheets	BMP Fact Sheets are available in the LID BMP Design Handbook. Individual BMP Fact Sheets include sitting considerations, and design and sizing guidelines for seven types of structural BMPs (infiltration basin, infiltration trench, permeable pavement, harvest-and-use, bioretention, extended detention basin, and sand filter).
California Stormwater Quality Association (CASQA)	Publisher of the California Stormwater Best Management Practices Handbooks, available at www.cabmphandbooks.com.
Conventional Treatment Control BMP	A type of BMP that provides treatment of stormwater runoff. Conventional treatment control BMPs, while designed to treat particular Pollutants, typically do not provide the same level of volume reduction as LID BMPs, and commonly require more specialized maintenance than LID BMPs. As such, the 2010 SMR MS4 Permit and this WQMP require the use of LID BMPs wherever feasible, before Conventional Treatment BMPs can be considered or implemented.
Copermittees	The 2010 SMR MS4 Permit identifies the Cities of Murrieta, Temecula, and Wildomar, the County, and the District, as Copermittees for the SMR.
County	The abbreviation refers to the County of Riverside in this document.

CEQA	California Environmental Quality Act - a statute that requires state and local agencies to identify the significant environmental impacts of their actions and to avoid or mitigate those impacts, if feasible.
CIMIS	California Irrigation Management Information System - an integrated network of 118 automated active weather stations all over California managed by the California Department of Water Resources.
CWA	Clean Water Act - is the primary federal law governing water pollution. Passed in 1972, the CWA established the goals of eliminating releases of high amounts of toxic substances into water, eliminating additional water pollution by 1985, and ensuring that surface waters would meet standards necessary for human sports and recreation by 1983. CWA Section 402(p) is the federal statute requiring NPDES permits for discharges from MS4s.
CWA Section 303(d) Waterbody	Impaired water in which water quality does not meet applicable water quality standards and/or is not expected to meet water quality standards, even after the application of technology based pollution controls required by the CWA. The discharge of urban runoff to these water bodies by the Copermittees is significant because these discharges can cause or contribute to violations of applicable water quality standards.
Design Storm	The 2010 SMR MS4 Permit has established the 85th percentile, 24-hour storm event as the "Design Storm". The applicant may refer to Exhibit A to identify the applicable Design Storm Depth (D85) to the project.
DCV	Design Capture Volume (DCV) is the volume of runoff produced from the Design Storm to be mitigated through LID Retention BMPs, Other LID BMPs and Volume Based Conventional Treatment BMPs, as appropriate.
Design Flow Rate	The design flow rate represents the minimum flow rate capacity that flow-based conventional treatment control BMPs should treat to the MEP, when considered.
DCIA	Directly Connected Impervious Areas - those impervious areas that are hydraulically connected to the MS4 (i.e. street curbs, catch basins, storm drains, etc.) and thence to the structural BMP without flowing over pervious areas.
Discretionary Approval	A decision in which a Copermittee uses its judgment in deciding whether and how to carry out or approve a project.
District	Riverside County Flood Control and Water Conservation District.
DMA	A Drainage Management Area - a delineated portion of a project site that is hydraulically connected to a common structural BMP or conveyance point. The Applicant may refer to Section 3.3 for further guidelines on how to delineate DMAs.

Drawdown Time	Refers to the amount of time the design volume takes to pass through the BMP. The specified or incorporated drawdown times are to ensure that adequate contact or detention time has occurred for treatment, while not creating vector or other nuisance issues. It is important to abide by the drawdown time requirements stated in the fact sheet for each specific BMP.
Effective Area	Area which 1) is suitable for a BMP (for example, if infiltration is potentially feasible for the site based on infeasibility criteria, infiltration must be allowed over this area) and 2) receives runoff from impervious areas.
ESA	An Environmental Sensitive Area (ESA) designates an area "in which plants or animals life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which would be easily disturbed or degraded by human activities and developments". (Reference: California Public Resources Code § 30107.5).
ET	Evapotranspiration (ET) is the loss of water to the atmosphere by the combined processes of evaporation (from soil and plant surfaces) and transpiration (from plant tissues). It is also an indicator of how much water crops, lawn, garden, and trees need for healthy growth and productivity
FAR	The Floor Area Ratio (FAR) is the total square feet of a building divided by the total square feet of the lot the building is located on.
Flow-Based BMP	Flow-based BMPs are conventional treatment control BMPs that are sized to treat the design flow rate.
FPPP	Facility Pollution Prevention Plan
HCOC	Hydrologic Condition of Concern - Exists when the alteration of a site's hydrologic regime caused by development would cause significant impacts on downstream channels and aquatic habitats, alone or in conjunction with impacts of other projects.
HMP	Hydromodification Management Plan – Plan defining Performance Standards for PDPs to manage increases in runoff discharge rates and durations.
Hydrologic Control BMP	BMP to mitigate the increases in runoff discharge rates and durations and meet the Performance Standards set forth in the HMP.
HSG	Hydrologic Soil Groups – soil classification to indicate the minimum rate of infiltration obtained for bare soil after prolonged wetting. The HSGs are A (very low runoff potential/high infiltration rate), B, C, and D (high runoff potential/very low infiltration rate)

Hydromodification	The 2010 SMR MS4 Permit identifies that increased volume, velocity, frequency and discharge duration of storm water runoff from developed areas has the potential to greatly accelerate downstream erosion, impair stream habitat in natural drainages, and negatively impact beneficial uses.
JRMP	A separate Jurisdictional Runoff Management Plan (JRMP) has been developed by each Copermittee and identifies the local programs and activities that the Copermittee is implementing to meet the 2010 SMR MS4 Permit requirements.
LID	Low Impact Development (LID) is a site design strategy with a goal of maintaining or replicating the pre-development hydrologic regime through the use of design techniques. LID site design BMPs help preserve and restore the natural hydrologic cycle of the site, allowing for filtration and infiltration which can greatly reduce the volume, peak flow rate, velocity, and pollutant loads of storm water runoff.
LID BMP	A type of stormwater BMP that is based upon Low Impact Development concepts. LID BMPs not only provide highly effective treatment of stormwater runoff, but also yield potentially significant reductions in runoff volume – helping to mimic the pre-project hydrologic regime, and also require less ongoing maintenance than Treatment Control BMPs. The applicant may refer to Chapter 2.
LID BMP Design Handbook	The LID BMP Design Handbook was developed by the Copermittees to provide guidance for the planning, design and maintenance of LID BMPs which may be used to mitigate the water quality impacts of PDPs within the County.
LID Bioretention BMP	LID Bioretention BMPs are bioretention areas are vegetated (i.e., landscaped) shallow depressions that provide storage, infiltration, and evapotranspiration, and provide for pollutant removal (e.g., filtration, adsorption, nutrient uptake) by filtering stormwater through the vegetation and soils. In bioretention areas, pore spaces and organic material in the soils help to retain water in the form of soil moisture and to promote the adsorption of pollutants (e.g., dissolved metals and petroleum hydrocarbons) into the soil matrix. Plants use soil moisture and promote the drying of the soil through transpiration. The 2010 SMR MS4 Permit defines "retain" as to keep or hold in a particular place, condition, or position without discharge to surface waters.
LID Biotreatment BMP	BMPs that reduce stormwater pollutant discharges by intercepting rainfall on vegetative canopy, and through incidental infiltration and/or evapotranspiration, and filtration, and other biological and chemical processes. As stormwater passes down through the planting soil, pollutants are filtered, adsorbed, biodegraded, and sequestered by the soil and plants, and collected through an underdrain.

LID Harvest and Reuse BMP	BMPs used to facilitate capturing Stormwater Runoff for later use without negatively impacting downstream water rights or other Beneficial Uses.
LID Infiltration BMP	BMPs to reduce stormwater runoff by capturing and infiltrating the runoff into in-situ soils or amended onsite soils. Typical LID Infiltration BMPs include infiltration basins, infiltration trenches and pervious pavements.
LID Retention BMP	BMPs to ensure full onsite retention without runoff of the DCV such as infiltration basins, bioretention, chambers, trenches, permeable pavement and pavers, harvest and reuse.
LID Principles	Site design concepts that prevent or minimize the causes (or drivers) of post-construction impacts, and help mimic the pre-development hydrologic regime.
MEP	Maximum Extent Practicable - standard established by the 1987 amendments to the CWA for the reduction of Pollutant discharges from MS4s. Refer to Attachment C of the 2010 SMR MS4 Permit for a complete definition of MEP.
MF	Multi-family – zoning classification for parcels having 2 or more living residential units.
MS4	Municipal Separate Storm Sewer System (MS4) is a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains): (i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or designated and approved management agency under section 208 of the CWA that discharges to waters of the United States; (ii) Designated or used for collecting or conveying storm water; (iii) Which is not a combined sewer; (iv) Which is not part of the Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.26.
New Development Project	Defined by the 2010 MS4 permit as 'Priority Development Projects' if the project, or a component of the project meets the categories and thresholds described in Section 1.1.1.
NPDES	National Pollution Discharge Elimination System - Federal program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under Sections 307, 318, 402, and 405 of the CWA.
NRCS	Natural Resources Conservation Service

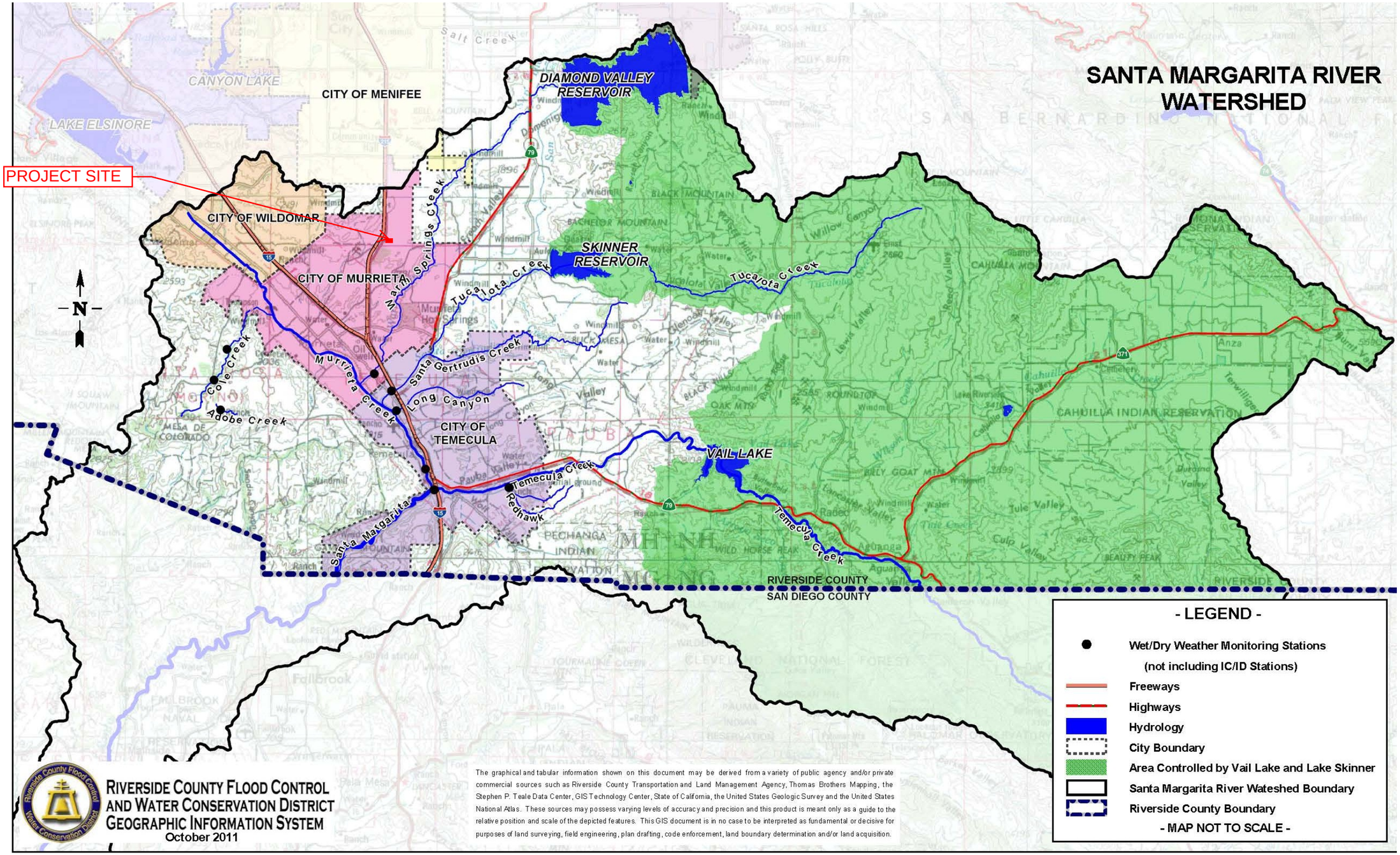
PDP	Priority Development Project - Includes New Development and Redevelopment project categories listed in Section F.1.d(2) of Order No. R9-2009-0002.
Priority Pollutants of Concern	Pollutants expected to be present on the project site and for which a downstream water body is also listed as Impaired under the CWA Section 303(d) list or by a TMDL.
Project-Specific WQMP	A plan specifying and documenting permanent LID Principles and Stormwater BMPs to control post-construction Pollutants and stormwater runoff for the life of the PDP, and the plans for operation and maintenance of those BMPs for the life of the project.
Receiving Waters	Waters of the United States.
Redevelopment Project	The creation, addition, and or replacement of impervious surface on an already developed site. Examples include the expansion of a building footprint, road widening, the addition to or replacement of a structure, and creation or addition of impervious surfaces. Replacement of impervious surfaces includes any activity that is not part of a routine maintenance activity where impervious material(s) are removed, exposing underlying soil during construction. Redevelopment does not include trenching and resurfacing associated with utility work; resurfacing existing roadways; new sidewalk construction, pedestrian ramps, or bike lane on existing roads; and routine replacement of damaged pavement, such as pothole repair. Project that meets the criteria described in Section 1.
Runoff Fund	Runoff Funds have not been established by the Copermittees and are not available to the Applicant. If established, a Runoff Fund will develop regional mitigation projects where PDPs will be able to buy mitigation credits if it is determined that implementing onsite controls is infeasible.
San Diego Regional Board	San Diego Regional Water Quality Control Board - The term "Regional Board", as defined in Water Code section 13050(b), is intended to refer to the California Regional Water Quality Control Board for the San Diego Region as specified in Water Code Section 13200. State agency responsible for managing and regulating water quality in the SMR.
SCCWRP	Southern California Coastal Water Research Project
Site Design BMP	Site design BMPs prevent or minimize the causes (or drivers) of post-construction impacts, and help mimic the pre-development hydrologic regime.
SF	Parcels with a zoning classification for a single residential unit.
SMC	Southern California Stormwater Monitoring Coalition
SMR	The Santa Margarita Region (SMR) represents the portion of the Santa Margarita Watershed that is included within the County of Riverside.

Source Control BMP	Source Control BMPs land use or site planning practices, or structural or nonstructural measures that aim to prevent runoff pollution by reducing the potential for contamination at the source of pollution. Source control BMPs minimize the contact between Pollutants and runoff.
Stormwater Credit	Stormwater Credit can be claimed by an Applicant if certain development practices that provide broad-scale environmental benefits to communities are incorporated into the project design. Refer to Section 3.5.4 for additional information on Stormwater Credits.
Structural BMP	Structures designed to remove pollutants from stormwater runoff and mitigate hydromodification impacts.
SWPPP	Storm Water Pollution Prevention Plan
Tentative Tract Map	Tentative Tract Maps are required for all subdivision creating five (5) or more parcels, five (5) or more condominiums as defined in Section 783 of the California Civil Code, a community apartment project containing five (5) or more parcels, or for the conversion of a dwelling to a stock cooperative containing five (5) or more dwelling units.
TMDL	Total Maximum Daily Load - the maximum amount of a Pollutant that can be discharged into a waterbody from all sources (point and non-point) and still maintain Water Quality Standards. Under CWA Section 303(d), TMDLs must be developed for all waterbodies that do not meet Water Quality Standards after application of technology-based controls.
USEPA	United States Environmental Protection Agency
Volume-Based BMP	Volume-Based BMPs applies to BMPs where the primary mode of pollutant removal depends upon the volumetric capacity such as detention, retention, and infiltration systems.
WQMP	Water Quality Management Plan
Wet Season	The 2010 SMR MS4 Permit defines the wet season from October 1 through April 30.

Appendix 1: Maps and Site Plans

Location Map, WQMP Site Plan and Receiving Waters Map

Figure 2. Watershed Map of Upper Santa Margarita River



CK 17 THE CANDEE
DMA AND SOURCE CONTROL EXHIBIT

SCALE: 1"=40'
0 40 80 120 160

DMA-A
0.3665 ACRES
AREA TO BE PLANTED WITH CALIFORNIA FRIENDLY PLANTS

DMA-B
0.5629 ACRES
AREA TO BE PLANTED WITH CALIFORNIA FRIENDLY PLANTS

DMA-1
0.2026 ACRES
SOIL TYPE D

PRIVATE STORM DRAIN

PROPOSED DETENTION PRIOR TO BIOFILTRATON

EXTENTS OF CLEANING
BIORETENTION BMP-1
SOIL TYPE C
.1857 ACRES

LANDSCAPE AREAS TO ALLOW FOR FLOW-THRU (TYP.)

CENTERLINE

DMA-4
SOIL TYPE C
0.3434 ACRES

DMA-9
0.0273 ACRES

AREA TO BE PLANTED WITH CALIFORNIA FRIENDLY PLANTS

POC-1

DMA-3
SOIL TYPE D
1.915 ACRES

DMA-5
0.6298 ACRES

EXACT LOCATIONS OF ROOF DRAINS ARE TO BE DETERMINED AT FINAL ENGINEERING. ROOF DRAINS WILL BE DISCHARGED TO ADJACENT LANDSCAPE AREAS AND OR TREE-WELLS.

LANDSCAPE AREAS TO ALLOW FOR FLOW-THRU (TYP.)

DIVIDING LINE FOR C AND D TYPE SOILS

DMA-C1
0.903 ACRES

DMA-6
SOIL TYPE D
1.1445 ACRES

LANDSCAPE AREAS TO ALLOW FOR FLOW-THRU (TYP.)

0.8683 ACRES
DMA-8

EXACT LOCATIONS OF ROOF DRAINS ARE TO BE DETERMINED AT FINAL ENGINEERING. ROOF DRAINS WILL BE DISCHARGED TO ADJACENT LANDSCAPE AREAS AND OR TREE-WELLS.

DMA-C2
0.7283 ACRES

DMA-7
SOIL TYPE C
1.9075 ACRES

PRIVATE STORM DRAIN

PROPOSED DETENTION PRIOR TO BIOFILTRATON

PRIVATE STORM DRAIN

BIORETENTION BMP-2
0.2252 ACRES
0.1363 ACRES

DMA-10
0.0699 ACRES

EXTENTS OF CLEANING

AREA TO BE PLANTED WITH CALIFORNIA FRIENDLY PLANTS

POC-2

PUBLIC STORM DRAIN

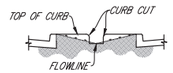
PUBLIC STORM DRAIN EASEMENT

PRIVATE STORM DRAIN

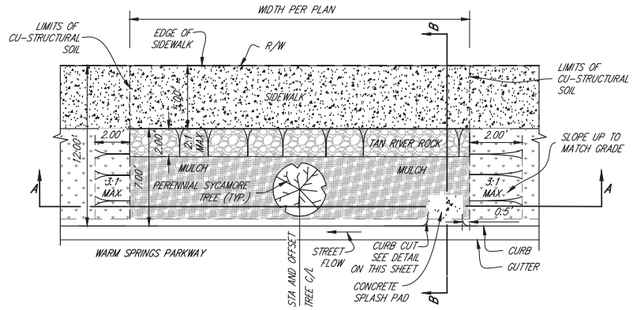
PUBLIC STORM DRAIN

WARM SPRING ROAD

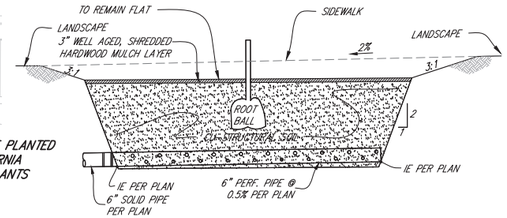
TYP. FLOW-THRU LANDSCAPE ISLAND
NO SCALE



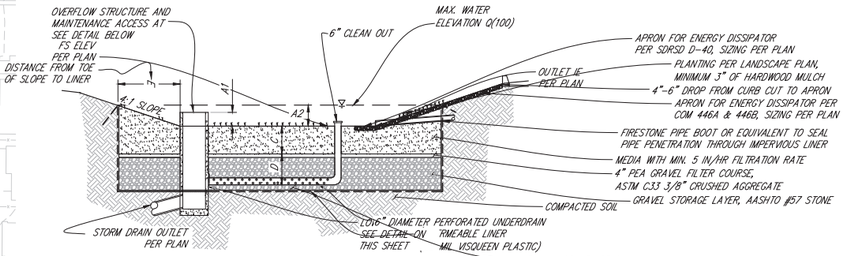
TREE WELL DETAIL PLAN VIEW
NOT TO SCALE



TREE WELL SECTION A-A
NOT TO SCALE



CATCHBASIN AND BIORETENTION BASIN DETAIL
NOT TO SCALE



LEGEND - ABBREVIATIONS:

- INDICATES DMA BOUNDARY.
- INDICATES SUB DMA BOUNDARY.
- SHEET FLOW

IMPERVIOUS AREAS
- A/C PAVEMENT
- PCC PAVEMENT
- ROOF

PERVIOUS AREAS
- LANDSCAPE AREAS

SOURCE CONTROL BMP

1. STENCILING AND SIGNAGE OF ALL STORM DRAIN INLETS AND CATCH BASINS WITHIN THE PROJECT AREA WITH PROHIBITIVE LANGUAGE SUCH AS: "NO DUMPING/ ONLY RAIN IN THE DRAIN"
2. TRASH AREAS ARE PROTECTED FROM RAINFALL, RUN-ON, RUNOFF, AND WIND DISPERSAL BY ROOFED, WALLED ENCLOSURE LOCATED AWAY FROM STORM DRAINS. KEEP AREAS CLEAN
3. FLOOR SINK DRAINS WILL BE CONNECTED TO A GREASE INTERCEPTOR BEFORE DISCHARGING TO SANITARY SEWER
4. LOADING DOCKS TO BE KEPT CLEAN OF TRASH AND DEBRIS. TRASH SHALL BE REMOVED AND ANY FILTERS CLEANED.

BIO-BASIN SUMMARY TABLE

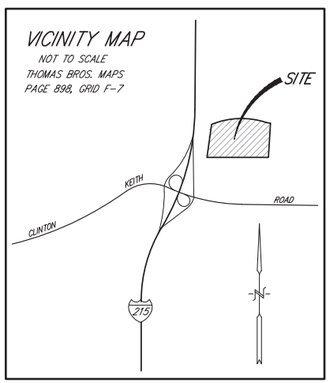
BASIN	TYPE OF BMP	EFFECTIVE AREA (SQFT)	A1 (INCH) RISER	A2 (INCH) TOP OF BASIN	C (INCH) MEDIA	D (INCH) GRAVEL	E FEET	BOX RISER / OVERFLOW STRUCTURE SIZE (INCHES)	ORIFICES DIAMETER		IMPERMEABLE LINER?
									UPPER (INCH)	LOWER (INCH)	
BMP-1	BIORETENTION	6,503	6	12.0	18.0	36	2	36X36	–	0.875	NO
BMP-2	BIORETENTION	6,024	6	12	18	48	2	36X36	–	1.687	YES

DMA TYPE/ID	DMA (SQUARE FEET)	POST-PROJECT SURFACE TYPE	EFFECTIVE IMPERVIOUS FRACTION, If	DMA RUNOFF FACTOR	DMA AREAS X RUNOFF FACTOR	ENTER BMP NAME / IDENTIFIER HERE		
	[A]		[B]	[C]	[A] X [C]	BMP-1		
1	8,825	MIXED	0.9000	0.7300	6,442			
2	11,360	LANDSCAPE	0.9000	0.7300	8,293			
3	85,003	MIXED	0.9000	0.7300	62,052			
4	14,959	MIXED	0.9000	0.7300	10,920			
5	27,434	CONCRETE	0.9000	0.7300	20,027			
9	9,030	MIXED	0.9000	0.7300	6,592			
BMP-1	6,504	LANDSCAPE	0.9000	0.7300	4,748			
	163,115				119,074	0.5800	5,709	6,503

DESIGN STORM DEPTH (IN) | DCV, VBMP (CUBIC FEET) | PROPOSED VOLUME ON PLANS (CUBIC FEET)

TABLE D.4

VICINITY MAP
NOT TO SCALE
THOMAS BROS. MAPS
PAGE 898, GRID F-7



EXCEL ENGINEERING
LAND PLANNING • ENGINEERING • SURVEYING
440 STATE PLACE, ESCONDIDO, CA 92029
PH (760)745-8118 FAX (760)745-1890
ROBERT D. DENTINO
RCE: 45629 EXP:12/31/18

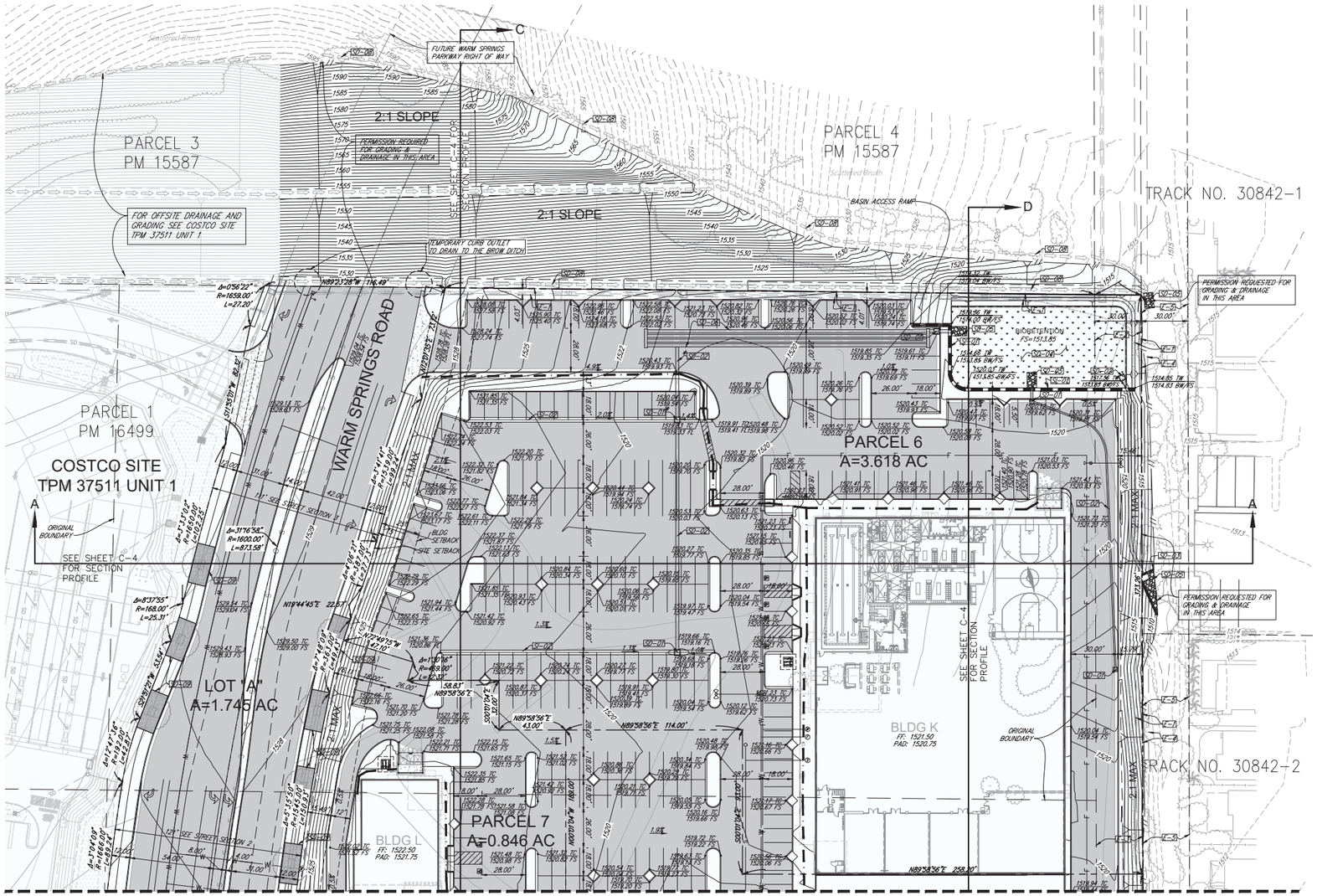
Dec 19, 2018
DATE

OF WORK

K:\7\7065 engineering\7M\CURRENT\STORM\SWMP\17065-DMA exhibit.dwg 12/19/2018 3:46 PM ORIGINAL PLOT SIZE: -----

Appendix 2: Construction Plans

Grading and Drainage Plans



CONSTRUCTION NOTES

SD-01	STORM DRAIN INLET/BOX/CLEANOUT WITH TRAFFIC LID AND (CB INSERT FILTER)*
SD-02	STORM DRAIN PIPE
SD-03	STORM DRAIN HEADWALL
SD-04	BIORETENTION BASIN
SD-05	RIPRAP
SD-06	UNDERGROUND DETENTION PIPE
SD-07	TRENCH DRAIN
SD-08	BROW DITCH
SD-09	STREET TREE-WELL FOR WATER QUALITY BMP
SI-01	GEOGRID TYPE RETAINING WALL
SI-02	PCC RIBBON GUTTER
UT-01	WATER MAIN (PUBLIC)
UT-02	SEWER MAIN (PUBLIC)
UT-03	WATER LINE (PRIVATE)
UT-04	FIRE LINE (PRIVATE)
UT-05	SEWER LINE (PRIVATE)

* CB INSERT FILTER ONLY APPLICABLE WHERE * IS SHOWN

EASEMENT NOTES

(1) E-1	AN EXISTING EASEMENT FOR UNDERGROUND ELECTRICAL SUPPLY SYSTEMS, COMMUNICATION SYSTEMS & INCIDENTAL PURPOSES IN FAVOR OF SOUTHERN CALIFORNIA EDISON CO. AS CONTAINED IN AN INSTRUMENT RECORDED OCTOBER 3, 1978 AS INSTRUMENT NO. 209460. TO BE QUITCLAIMED WITH THE FINAL PARCEL MAP.
(2) E-2	EXISTING OFFER OF DEDICATION OF LOT D OF PARCEL MAP 16499 TO BE ABANDONED ON THE FINAL PARCEL MAP FOR THIS TENTATIVE PARCEL MAP.
(3) E-3	EXISTING OFFER OF DEDICATION OF LOT C OF PARCEL MAP 16499 TO BE ABANDONED ON THE FINAL PARCEL MAP FOR THIS TENTATIVE PARCEL MAP.
E-4	INDICATES AN EASEMENT FOR ELECTRIC LINE PURPOSES IN FAVOR OF SOUTHERN CALIFORNIA EDISON COMPANY RECORDED OCTOBER 3, 1978, AS INSTRUMENT NO. 174694 OF OFFICIAL RECORDS.
E-5	INDICATES A DECLARATION OF AN EASEMENT FOR ROAD & PUBLIC UTILITY PURPOSES RECORDED SEPTEMBER 24, 1980 AS INSTRUMENT NO. 174694 OF OFFICIAL RECORDS.
E-6	PROPOSED PUBLIC DRAINAGE EASEMENT TO BE GRANTED ON THE FINAL PARCEL MAP FOR THIS TENTATIVE PARCEL MAP.

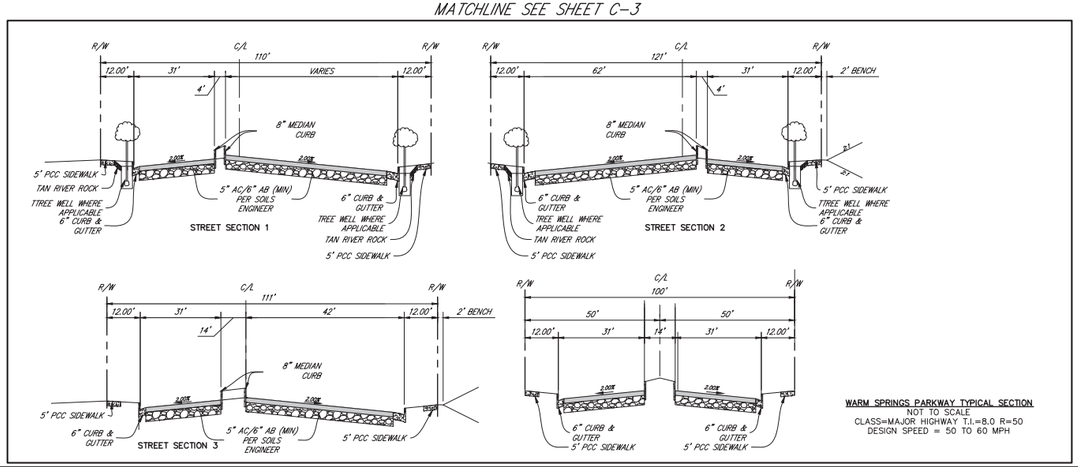
(X)=INDACATES PRELIMINARY TITLE REPORT NUMBER DESIGNATION

LEGEND

- BOUNDARY LINE
- RIGHT OF WAY LINE — RW —
- PARCEL LOT LINE — PL —
- PCC CURB
- PCC CURB & GUTTER
- SEWER LINE — S — S — S —
- WATER LINE — W — W — W —
- FIRE LINE — F — F — F —
- FIRE HYDRANT
- BLDG FIRE SERVICE LATERAL (F)
- WATER SERVICE LATERAL (W)
- SEWER SERVICE LATERAL (S)
- DOUBLE DETECTOR CHECK VALVE
- STORM DRAIN INLETS / CLEANOUTS
- HEADWALL
- RIP-RAP
- BIORETENTION BASIN
- EXIST. TOPO MAJOR CONTOUR — 1000 —
- EXIST. TOPO MINOR CONTOUR
- PROPOSED TOPO MAJOR CONTOUR — 1000 —
- PROPOSED TOPO MINOR CONTOUR
- ADA PATH

SCALE 1"=30'

0 30 60 Feet



WARM SPRINGS PARKWAY TYPICAL SECTION
NOT TO SCALE
CLASS=MAJOR HIGHWAY T.I.=8.0 R=50
DESIGN SPEED = 50 TO 60 MPH

DP-20185-1656

REGISTERED PROFESSIONAL ENGINEER ROBERT D. BENSO No. 45629 Exp.12-31-18 CIVIL STATE OF CALIFORNIA

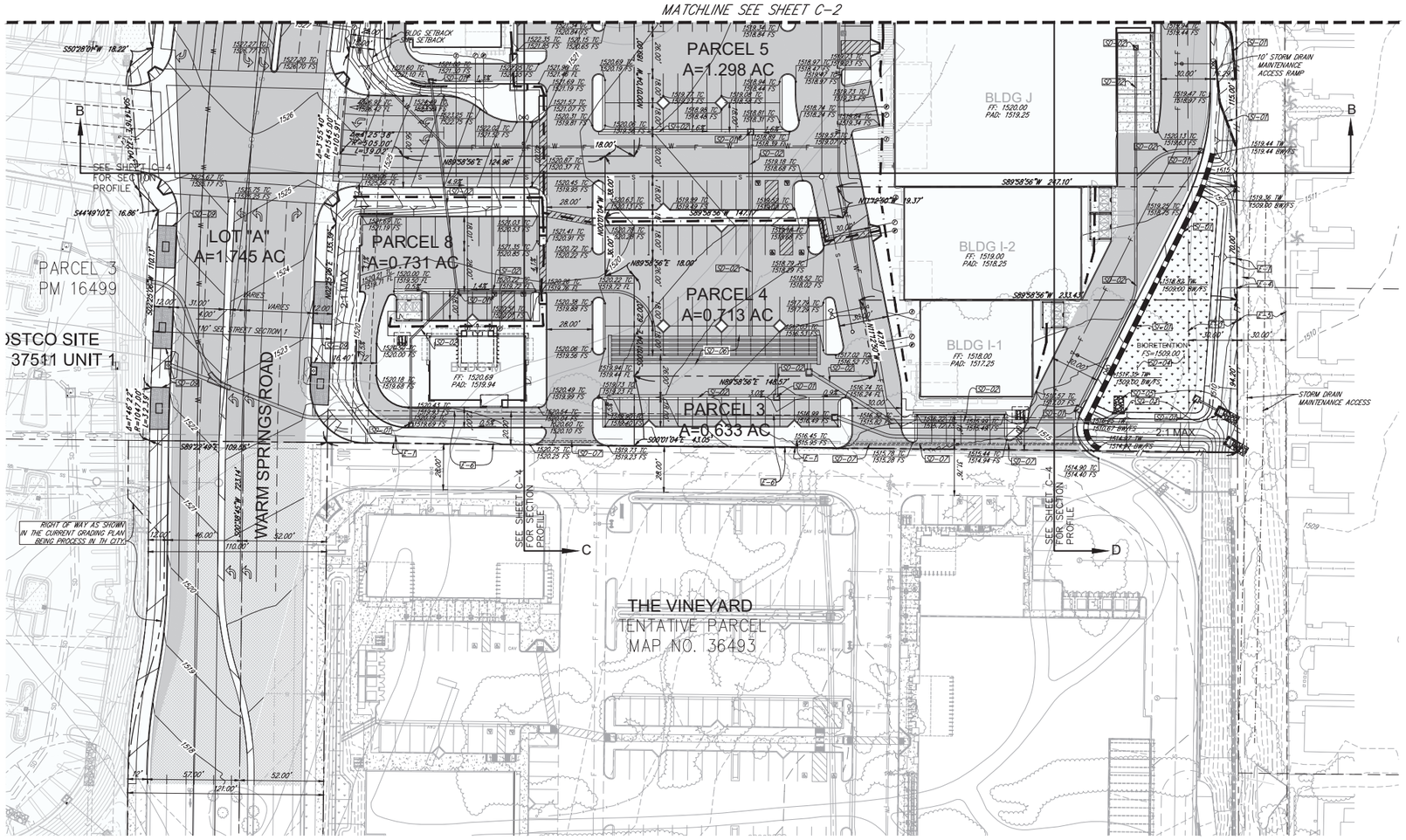
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PROJECT ADDRESS:
CLINTON KEITH ROAD
MURRIETA, CA 92562

SHEET No. / TITLE:
GRADING CONCEPT FOR TPM 37511 UNIT 2 (NORTH)
SHEET C-2 OF C-4

ORIGINAL DATE:
03/22/2018

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CONSTRUCTION NOTES

- SD-01 STORM DRAIN INLET/BOX/CLEANOUT WITH TRAFFIC LID AND (CB INSERT FILTER)*
- SD-02 STORM DRAIN PIPE
- SD-03 STORM DRAIN HEADWALL
- SD-04 BIORETENTION BASIN
- SD-05 RIPRAP
- SD-06 UNDERGROUND DETENTION PIPE
- SD-07 TRENCH DRAIN
- SD-08 BROW DITCH
- SD-09 STREET TREE-WELL FOR WATER QUALITY BMP
- SD-11 GEOGRID TYPE RETAINING WALL
- SD-12 PCC RIBBON GUTTER
- WT-01 WATER MAIN (PUBLIC)
- WT-02 SEWER MAIN (PUBLIC)
- WT-03 WATER LINE (PRIVATE)
- WT-04 FIRE LINE (PRIVATE)
- WT-05 SEWER LINE (PRIVATE)

* CB INSERT FILTER ONLY APPLICABLE WHERE * IS SHOWN

EASEMENT NOTES

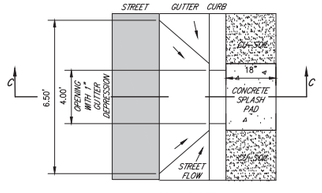
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- (R) (T-2) EXISTING OFFER OF DEDICATION OF LOT D OF PARCEL MAP 16499 TO BE ABANDONED ON THE FINAL PARCEL MAP FOR THIS TENTATIVE PARCEL MAP.
- (R) (T-3) EXISTING OFFER OF DEDICATION OF LOT C OF PARCEL MAP 16499 TO BE ABANDONED ON THE FINAL PARCEL MAP FOR THIS TENTATIVE PARCEL MAP.
- (T-4) INDICATES AN EASEMENT FOR ELECTRIC LINE PURPOSES IN FAVOR OF SOUTHERN CALIFORNIA EDISON COMPANY RECORDED OCTOBER 3, 1978, AS INSTRUMENT NO. 174694 OF OFFICIAL RECORDS.
- (T-5) INDICATES A DECLARATION OF AN EASEMENT FOR ROAD & PUBLIC UTILITY PURPOSES RECORDED SEPTEMBER 24, 1980 AS INSTRUMENT NO. 174694 OF OFFICIAL RECORDS.
- (T-6) PROPOSED PUBLIC DRAINAGE EASEMENT TO BE GRANTED ON THE FINAL PARCEL MAP FOR THIS TENTATIVE PARCEL MAP.

(R)=INDACATES PRELIMINARY TITLE REPORT NUMBER DESIGNATION

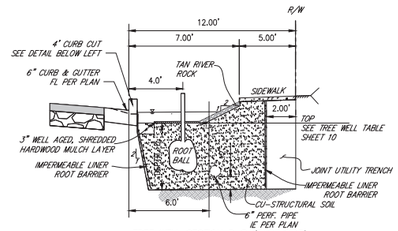
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- RIGHT OF WAY LINE (RW)
- PARCEL LOT LINE (PL)
- PCC CURB
- PCC CURB & GUTTER
- SEWER LINE (S)
- WATER LINE (W)
- FIRE LINE (F)
- FIRE HYDRANT
- BLDG FIRE SERVICE LATERAL (F)
- WATER SERVICE LATERAL (W)
- SEWER SERVICE LATERAL (S)
- DOUBLE DETECTOR CHECK VALVE
- STORM DRAIN INLETS / CLEANOUTS
- HEADWALL
- RIP-RAP
- BIORETENTION BASIN
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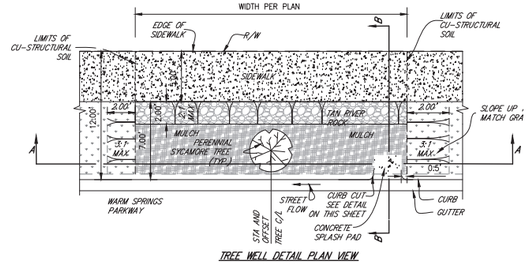
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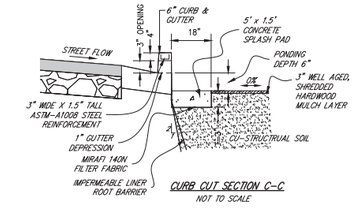
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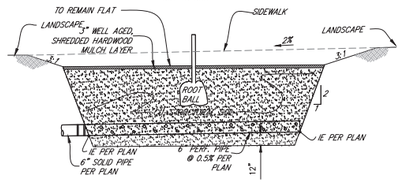


TREE WELL DETAIL PLAN VIEW
NOT TO SCALE



CURB CUT SECTION C-C
NOT TO SCALE

TREE WELL TYPICAL DETAIL
NOT TO SCALE



TREE WELL SECTION A-A
NOT TO SCALE

DP-20185-1656

ENGINEER'S PROFESSIONAL CERTIFICATE — GREGORY D. DENNIS — No. 45629 — Exp.12-31-18 — CIVIL — STATE OF CALIFORNIA

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PROJECT ADDRESS:	SHEET No. / TITLE:	ORIGINAL DATE:
CLINTON KEITH ROAD MURRIETA, CA 92562	GRADING CONCEPT FOR TPM 37511 UNIT 2 (SOUTH) SHEET C-3 OF C-4	03/22/2018

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Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

GEOTECHNICAL PROFESSIONALS INC

PRELIMINARY GEOTECHNICAL INVESTIGATION
PROPOSED VINEYARD/VAL VISTA CENTER
NEC CLINTON KEITH ROAD AND 215 FREEWAY
MURRIETA, CALIFORNIA

Prepared for:
CK 17 LP
c/o Retail Development Advisors
27890 Clinton Keith Road, Suite D-490
Murrieta, California 92562

Prepared by:
Geotechnical Professionals Inc.
5736 Corporate Avenue
Cypress, California 90630
(714) 220-2211

Project No. 2833.I

September 7, 2017

GPI GEOTECHNICAL PROFESSIONALS INC

September 7, 2017

CK 17 LP
c/o Retail Development Advisors
27890 Clinton Keith Road, Suite D-490
Murrieta, California 92562

Attention: Mr. Allan Davis

Subject: Report of Preliminary Geotechnical Investigation
Proposed Vineyard/Val Vista Center
NEC Clinton Keith Road and 215 Freeway
Murrieta, California
GPI Project No. 2833.I

Dear Mr. Davis:

Transmitted herewith is our report of preliminary geotechnical investigation for the subject project. The report presents our evaluation of the foundation conditions at the site and recommendations for design and construction.

We are providing this report in an electronic format. Further copies of the report can be provided if required for City submittal upon request.

We appreciate the opportunity of offering our services on this project and look forward to seeing the project through its successful completion. Feel free to call us if you have any questions regarding our report or need further assistance.

Very truly yours,
Geotechnical Professionals Inc.

Paul R. Schade, G.E.
Principal

PRS:sph

2833-I-01L.doc

TABLE OF CONTENTS

	PAGE
1.0 INTRODUCTION	1
1.1 GENERAL	1
1.2 PROJECT DESCRIPTION	1
1.3 PURPOSE OF INVESTIGATION	2
1.4 PRIOR SITE WORK	2
2.0 SCOPE OF WORK	3
3.0 SITE CONDITIONS	4
3.1 SITE HISTORY	4
3.2 SURFACE CONDITIONS	4
3.3 SUBSURFACE SOILS	4
3.4 GROUNDWATER AND CAVING	5
4.0 CONCLUSIONS AND RECOMMENDATIONS	6
4.1 GENERAL	6
4.2 SEISMIC CONSIDERATIONS	7
4.2.1 General	7
4.2.2 Strong Ground Motion Potential	7
4.2.3 Potential for Ground Rupture	8
4.2.4 Liquefaction and Dynamic Settlement	8
4.2.5 Seismic Ground Subsidence	8
4.3 EARTHWORK	9
4.3.1 Clearing and Grubbing	9
4.3.2 Excavations	9
4.3.3 Subgrade Preparation	12
4.3.4 Material for Fill	12
4.3.5 Placement and Compaction of Fills	13
4.3.6 Shrinkage and Subsidence	14
4.3.7 Trench/Wall Backfill	14
4.3.8 Observation and Testing	14
4.4 FOUNDATIONS	15
4.4.1 General	15
4.4.2 Allowable Bearing Pressures	15
4.4.3 Minimum Footing Width and Embedment	15
4.4.4 Estimated Settlements	16
4.4.5 Lateral Load Resistance	16
4.4.6 Foundation Concrete	16
4.4.7 Foundation Observation	16
4.4.8 Light Standard Bases	16
4.5 BUILDING FLOOR SLABS	17
4.6 LATERAL EARTH PRESSURES	18
4.7 CORROSIVITY	18
4.8 DRAINAGE	18
4.9 EXTERIOR CONCRETE AND MASONRY FLATWORK	19
4.10 PAVED AREAS	19
4.11 EXTERIOR CONCRETE AND MASONRY FLATWORK	20
4.12 SUBSURFACE INFILTRATION	20
4.13 GEOTECHNICAL OBSERVATION AND TESTING	21
5.0 LIMITATIONS	22

REFERENCES

APPENDICES
- A EXPLORATORY BORINGS
- B LABORATORY TESTS

LIST OF FIGURES

FIGURE NO.

1	Site Location Map
2	Site Plan

APPENDIX A

A-1 to A-20	Logs of Borings

APPENDIX B

B-1 to B-3	Gradation Test Results
B-4	Atterberg Limits Test Results
B-5 to B-7	Direct Shear Test Results

1.0 INTRODUCTION

1.1 GENERAL

This report presents the results of a preliminary geotechnical investigation performed by Geotechnical Professionals Inc. (GPI) for the proposed Vineyard/Val Vista Center development to be located near the northeast corner of Clinton Keith Road and the 215 Freeway in Murrieta, California. The geographical site location is shown on the Site Location Map, Figure 1.

1.2 PROJECT DESCRIPTION

The Vineyard project will be a mixed-use development extending from the northbound I-215 on-ramp to an existing residential development east of the newly planned Warm Springs Parkway alignment on the north side of Clinton Keith Road. The subject site is approximately 46 acres in size. Based on a conceptual site plan provided by CK-17, the proposed development will consist of a 4-story hotel, a Costco warehouse, numerous 1-story retail pads, and associated surface parking. The Costco parcel is being investigated by others and will not be included in our studies. The hotel building will be approximately 91,000 square feet in plan area while the 1-story retail buildings will vary from about 3,500 to 34,000 square feet in plan area. The proposed site configuration and limits of the development covered by this preliminary report are shown on the Site Plan, Figure 2.

Structural loads for the hotel building and retail pads were not available at the time of this preliminary report but are anticipated to be up to 300 kips and 50 kips, respectively. The grades at the site are currently being lowered or are planned to be lowered during the ongoing mining and exporting activities. Within an area covered by this preliminary investigation (between the northbound I-215 on-ramp and the new Warm Springs Parkway), the existing grades appear to be up to about 20 feet above the planned finished site grades. These cuts are planned to be performed prior to the completion of the project design. It is our understanding that select areas of the site have already been overexcavated to allow engineered fill to be placed to reach finished grade.

Based on the provided site plan, the proposed development will also likely include a storm water retention/infiltration system located along the southern and/or western property lines. Details of the infiltration system were not available at the time of this preliminary report but are anticipated to consist of near-surface infiltration via bio-swales or shallow retention basins.

Our preliminary recommendations are based on the above structural and grading information. We should be notified if the project plans change significantly from the above. GPI should review the project plans prior to finalizing the project design.

1.3 PURPOSE OF INVESTIGATION

The primary purpose of this investigation and report is to provide a preliminary evaluation of the existing geotechnical and geologic conditions at the site as they relate to the design and construction of the proposed development. More specifically, this investigation was aimed at providing preliminary geotechnical recommendations for earthwork, and design of foundations, floor slabs, retaining walls, infiltration systems, and pavements.

1.4 PRIOR SITE WORK

Several prior geotechnical investigations have been performed by GPI and others on portions of the subject site. The scope of work for the subject preliminary investigation included a review of these investigations.

GPI previously performed geotechnical investigations at the subject site for the new Warm Springs Parkway (to replace the vacated section of old Antelope Road) and a proposed commercial/retail development located to the east of the new road (GPI, 2009). Although not developed, the previously proposed project is similar to the type of development that is the subject of this report. The findings from our prior investigations were used in our current evaluation. The explorations performed for the prior investigations, as well as the lab testing on samples obtained from these explorations, have been incorporated into this report.

As part of our past work at the site, we were provided with prior investigations performed by others. These investigations included a preliminary geotechnical investigation for a proposed commercial development (EcoTech, 2004), a rock hardness/rippability study of the onsite materials to evaluate the site as a proposed borrow source (GeoSoils, 2005), and another preliminary geotechnical investigation for a proposed commercial/retail development and realignment of Antelope Road (T.H.E. Soils Co., 2008). The pertinent information within these reports was considered in preparing our preliminary report.

2.0 SCOPE OF WORK

Our scope of work for this investigation consisted of a review of existing data, field exploration, limited field infiltration testing, laboratory testing, engineering analysis, and the preparation of this report.

As part of a prior geotechnical investigation at the subject site, we performed 17 hollow-stem auger borings (B-1 to B-17) located along the new Warm Springs Parkway and within the portion of the site between the Warm Springs Parkway alignment and the existing residential developments to the east (GPI, 2009). These exploratory borings were performed to depths ranging from 11 to 26 feet below the site grades at the time of the investigation. Refusal in the dense, less weathered bedrock occurred in two of the borings prior to reaching their planned depths, likely due to the presence of cobbles and boulders.

The new fieldwork performed for this investigation included three hollow-stem auger borings (B-101 to B-103) performed to depths of 31 to 38 feet below existing grades before refusing in the dense, less weathered bedrock. A description of field procedures and logs of the current and prior explorations are presented in Appendix A. The locations of the subsurface explorations are shown on the Site Plan, Figure 2.

Laboratory tests were performed on selected representative samples as an aid in soil classification and to evaluate the engineering properties of the soils. The geotechnical laboratory testing program included determinations of moisture content and dry density, gradation, fines content, Atterberg Limits, direct shear, maximum dry density and optimum moisture content, R-value, and soil corrosivity.

R-value and soil corrosivity testing was performed by GeoLogic, Inc. and Schiff Associates (currently HDR), respectively, under subcontract to GPI. Laboratory testing procedures and results are summarized in Appendix B.

Engineering evaluations were performed to provide preliminary earthwork criteria, foundation and slab design parameters, preliminary pavement sections and assessments of seismic hazards. The results of our evaluations are presented in the remainder of the report.

3.0 SITE CONDITIONS

3.1 SITE HISTORY

Our understanding of the site history is based on a review of the prior investigations by GPI and others and a review of historical aerial photographs (Historic Aerials) dating back to 1938. Up to 1967, the site and surrounding area appears to be largely undeveloped except for a highway (known then as US 395) located west of the subject site area. In 1978, the highway (I-215) is shown being widened and the northbound on-ramp and Antelope Road appear to be under construction. The remaining majority of the site remains undeveloped. Between 1978 and 2002, the site appears to remain unchanged. In 2005, the residential developments to the east of the subject site are now in-place. Sometime between early 2007 and mid-2009, mining and exporting operations began on the northern half of the subject site and the portion of Antelope Road located along the west side of the subject site was closed. Since 2009, the site has remained relatively unchanged apart from the continued mining operations.

3.2 SURFACE CONDITIONS

The site is approximately 46 acres of vacant land and bounded by Clinton Keith Road to the south, the on-ramp to the northbound I-215 freeway to the west, vacant land followed by Cape Aire Way to the north, and a residential development to the east. Excluding the Costco Warehouse parcel, which is being evaluated by others, the portion of the site covered by our evaluation is approximately 28 acres in size.

Ground surface elevations across the site vary from about +1505 feet in the southeast corner to an approximate peak of +1610 feet in the northern middle portion of the site. Due to the ongoing mining and exporting activities, the grades are continuing to be lowered across a majority of the site. Existing slopes are highly variable, with localized areas exhibiting grades as steep as 2.5:1 (horizontal to vertical).

The existing alignment of Antelope Road, located in the western portion of the site, is currently abandoned. Ground surface elevations for Antelope Road vary from approximately +1546 in the north to +1526 in the south at the intersection with Clinton Keith Road. Pavement sections for the road were not determined.

3.3 SUBSURFACE SOILS

Our field investigations disclosed a subsurface profile consisting of topsoil and weathered organic bedrock over less weathered organic bedrock. It should be noted that these descriptions reflect the subsurface profiles at the location and time our explorations were performed. Borings B-1 through B-17 were performed in 2009 and were limited to the eastern half of the subject site. Borings B-101 through B-103 were performed as part of the current investigation and are located along the existing vacated portion of Antelope Road. Since 2009, the ongoing mining/exporting operations have resulted in significant cuts and the potential for significant fills throughout the site. Detailed descriptions of the conditions encountered are shown on the Logs of Borings in Appendix A.

The near-surface soil materials consisted primarily of weathered granitic bedrock (silty sands, sands, and sandy silts) with varying amounts of gravel. Drilling was performed with small diameter equipment, making it difficult to identify potential cobbles and boulders. However, based on our experience (cobbles and boulders were noted within the excavation being performed by others to the northwest of the site) and our observation of surficial conditions, localized boulders and cobbles should be anticipated. During our 2009 investigation, we observed exposed outcrops of boulders on the site that included material greater than 5 feet in diameter. However, the majority of the oversized material exposed in adjacent excavations at the time appeared to be between 2 and 3 feet in diameter. Based on information provided by the site developer, some onsite boulders are as large as 15 feet in diameter.

Based on blowcounts, the native soils generally range from very loose to very dense, with density increasing abruptly with depth and reduction in weathering of the granitic materials. The soils encountered within select 2009 explorations (Borings B-8, 12, 13, 15, 16, and 17) appeared to encounter the loose topsoil to deeper extents than other areas of the site. The moisture contents ranged from dry to moist, generally decreasing in content with depth.

As part of the ongoing mining activities at the site, some fill has been placed in select areas of the site for stockpiling purposes. Based on discussions with the site developer, decomposed granitic bedrock (planned for sale and export) has been placed in two separate stockpiles up to 10 feet in height. The complete extent of stockpile generation as a result of the mining activities is expected to vary with the export operations.

We did not note fill in our explorations performed as part of the current field investigation.

3.4 GROUNDWATER AND CAVING

Groundwater was not encountered in our borings to the maximum explored depth of 38 feet below existing ground surface. State historical records for groundwater were not available in the area of the subject site.

Caving was not noted within the relatively small-diameter hollow-stem auger borings. Localized caving may be encountered in the upper loose and dry sandy deposits; however, the general increase in density and cementation of the granular materials with depth make caving of the deeper materials unlikely if the excavation guidelines presented herein are followed.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 GENERAL

Based on the results of our investigation, it is our opinion that from a geotechnical viewpoint it is feasible to develop the site as proposed. The proposed structures can be supported on shallow foundations following remedial grading to mitigate the geotechnical constraints discussed below. The most significant geotechnical issues that will affect the design and construction of the proposed structures are as follows:

- The site contains topsoil/weathered bedrock over very dense granitic bedrock. The topsoil and upper portions weathered bedrock within the upper 2 to 7 feet below existing site grades is generally loose and not considered suitable for subsequent fill placement or uniform support of footings, slab-on-grade floors, and pavements. We recommend that the topsoil and low density weathered bedrock be removed prior to subsequent fill placement to design grades.

- To provide uniform support for the planned buildings in fill areas, the soils should be removed to a depth of at least 5 feet below the planned finished pad grade or 2 feet below the base of foundations, whichever is greater. Foundations for minor structures, such as site walls, may be supported in the undisturbed bedrock or be underlain by at least 2 feet of properly compacted fill. Deeper overexcavation in the area of deep cuts into the bedrock may be desirable in utility corridors to aid in excavating with conventional equipment.

- The undisturbed bedrock is suitable for direct support of building foundations but may be undesirable for future excavations of footings or utility trenches. To aid in excavation with conventional equipment, we recommend the removals for building pads established entirely in bedrock materials extend to a depth of at least 3 feet below the finished pad grade.

- Based on the variable depths to bedrock across the site, select building footprints may span bedrock and compacted fill. Such buildings will have an increased potential for differential settlement. For these transition pads, we recommend removal depths of at least 3 feet beneath the base of footings across the entire bedrock portion of the pad.

- The required grading will involve excavation into very dense granitic bedrock materials. Heavy ripping and relatively slow earthwork operations are anticipated in most of the deeper cuts. Some difficulty will be encountered in ripping the granitic materials and drilling and shooting or blasting may aid in grading production rates. Large floating boulders will be encountered during grading. Earthwork subcontractor should discuss the subsurface conditions with the site owner and personnel performing the recent mining operations to better understand the excavation issues anticipated.

- Because of the nature of the site bedrock and likely presence of boulders and cobbles, oversize material (greater than 12-inches in maximum dimension) should be anticipated to be generated from site cuts. Special handling and/or crushing of oversize material will be required in order to use the material as compacted fill. On-site placement of the boulders in compacted fills will depend on the final site grades.

- Bedding sand can be generated at the site for use in utility trenches and under slabs.

- Class II Aggregate Base, for use as backfill in onsite and offsite street work and other paved areas, may be generated from onsite crushed materials. Prior to the use of these materials, they should be properly graded and pass the necessary hardness tests in accordance with the Greenbook requirements.

Our recommendations related to the geotechnical aspects of the development of the site are presented in the subsequent sections of this report.

4.2 SEISMIC CONSIDERATIONS

4.2.1 General

The site is located in a seismically active area typical of Southern California and is likely to be subjected to strong ground shaking due to earthquakes on nearby faults.

We assume that seismic design of the proposed development will be in accordance with 2016 California Building Code (CBC) criteria. For the 2016 CBC, Site Class C may be used. The seismic code values can be obtained directly from the tables in the building code using the above value and appropriate United States Geological Survey web site (earthquake.usgs.gov). The Project Structural Engineer should determine the seismic design method.

4.2.2 Strong Ground Motion Potential

Based on published information (geohazards.usgs.gov), the most significant fault in the proximity of the site is the Elsinore Fault, which is located about 3.4 miles to the southwest.

During the life of the project, the site will likely be subject to strong ground motions due to earthquakes on nearby faults. Based on the USGS website (earthquake.usgs.gov), we computed that the site could be subjected to a peak ground acceleration (PGA_M) of 0.70g for a magnitude 7.0 earthquake. This acceleration has been computed using the mapped Maximum Considered Geometric Mean peak ground acceleration from ASCE 7-10 (ASCE, 2010) and a site coefficient (F_{PGA}) based on site class. The predominant earthquake magnitude was determined using a 2-percent probability of exceedance in a 50-year period, or an average return period of 2,475 years. The structural design will need to

incorporate measures to mitigate the effects of strong ground motion.

4.2.3 Potential for Ground Rupture

The site is not located within an Alquist-Priolo Special Studies Zone and there are no known faults crossing or projecting toward the site. Therefore, ground rupture due to faulting is considered unlikely at this site.

4.2.4 Liquefaction and Dynamic Settlement

Liquefaction is a phenomenon in which saturated cohesionless soils undergo a temporary loss of strength during severe ground shaking and acquire a degree of mobility sufficient to permit ground deformation. In extreme cases, the soil particles can become suspended in groundwater, resulting in the soil deposit becoming mobile and fluid-like. Liquefaction is generally considered to occur primarily in loose to medium dense deposits of saturated sandy soils. Thus, three conditions are required for liquefaction to occur: (1) a sandy soil of loose to medium density; (2) saturated conditions; and (3) rapid, large strain, cyclic loading, normally provided by earthquake motions.

The site is not located within an area mapped by the State of California as having a potential for soil liquefaction, in accordance with the Seismic Hazards Mapping Act as shown in the Murrieta Quadrangle (CGS, 2007). Groundwater was not encountered in our borings to a depth of 38 feet. Historical high groundwater data is not available in the vicinity of the site (CGS, 2007). Excluding the site from a potential liquefaction zone appears to have been based primarily on the depth to groundwater and the dense to very dense subsurface soils and the presence of weathered granitic bedrock.

Based on our findings, the potential for soil liquefaction to adversely affect the planned project is considered to be very low

4.2.5 Seismic Ground Subsidence

Seismic ground subsidence (not related to liquefaction induced settlements), occurs when loose, granular (sandy) soils above the groundwater are densified during strong earthquake shaking. Earthquake-induced seismic subsidence during a strong earthquake is not anticipated to adversely affect the planned project because of the dense to very dense nature of the near surface sandy soils and the presence of bedrock materials underlying those soils. Based on our analysis, potential earthquake-induced seismic subsidence during a strong earthquake is estimated to be less than ¼-inch.

4.3 EARTHWORK

The earthwork at the subject site is anticipated to consist of clearing and grubbing, significant cuts (up to 20 feet) to finished grade, overexcavation of disturbed soils under buildings, in utility corridors, and under settlement sensitive hardscape, subgrade preparation, and the placement and compaction of fills.

Significant ripping, oversized materials, and slow earthwork operations should be anticipated. Based on our explorations and observations of grading operations at nearby project sites, the upper weathered granite will break down under the ripping and compaction equipment to the consistency of a granular soil with some cemented larger particles. Localized clusters of less weathered rock are exposed at the ground surface, were encountered at depth in our explorations, and have been encountered in the adjacent on-going excavations. Some large boulders encountered on-site may be used in landscaping. The remaining oversized materials can be placed on-site in the compacted fill as recommended in a following section, if access is available.

4.3.1 Clearing and Grubbing

Prior to grading, the areas to be developed should be stripped of vegetation and cleared of debris. Buried obstructions, such as footings, utilities and tree roots, should be removed. Deleterious material generated during the clearing operation should be removed from the site. Although not anticipated in great extent because the site is undeveloped, and if acceptable to the regulatory agencies, on-site inert demolition debris, such as concrete and asphalt, may be crushed for re-use in engineered fills in accordance with criteria presented in the "Material for Fill" section of this report.

Although not encountered during our investigations, cesspools or septic systems encountered within building areas during grading should be removed in their entirety. The resulting excavation should be backfilled as recommended in the "Subgrade Preparation" and "Placement and Compaction of Fill" sections of this report. As an alternative, cesspools can be backfilled with lean sand-cement slurry. At the conclusion of the clearing operations, a representative of the personnel from GPI should observe and accept the site prior to further grading.

Two wells were observed on-site during our 2009 investigation. Details regarding the wells in regards to their current status and/or operation were not available. If the wells are still in place and are not planned to be used for production, they should be properly abandoned in accordance with City and County guidelines.

4.3.2 Excavations

Excavations at this site will include cut of existing materials to design grades, removals of loose topsoil and portions of the weathered bedrock, footing excavations, and trenching for proposed utility lines.

Prior to placing fills or the construction of the proposed buildings or other foundation supported improvements, the loose or disturbed upper soils within the proposed building

areas should be removed and replaced as properly compacted fill. Although not encountered in our explorations, existing undocumented fills should also be removed below building pads or foundation supported improvements.

Based on our explorations, the depth of topsoil and low density highly weathered bedrock ranges from about 2 to 7 feet below existing site grades, with an average depth of about 4 feet below existing site grades. Where not removed by planned cuts, these materials should be removed and replaced with properly compacted fill.

The recommended earthwork will depend on the area of the site (bedrock or topsoil) as well as the planned improvement and cut/fill conditions. The actual depths of removal should be determined in the field during grading by a representative of GPI. For planning purposes, we recommend the following overexcavation depths:

- At least 2 feet below the existing ground surface in areas to receive fill to remove and recompact the near-surface disturbed natural soils.

- At least 5 feet below the planned finish pad grade or 2 feet below the base of foundations, whichever is greater, for buildings and other major foundation supported improvements in fill areas.

- At least 3 feet beneath the base of footings for buildings spanning across bedrock and compacted fill (transition pad).

- At least 2 feet below the base of foundations for minor foundation supported improvements such as short retaining walls or screen walls, unless the foundations will be established in the undisturbed bedrock.

- At least 2 feet below the existing grade within planned drives and parking areas (may be replaced with scarification, moisture-conditioning, and compaction in areas of cut greater than 2 feet).

The undisturbed bedrock is suitable for direct support of building foundations. Conventional excavating equipment (e.g. backhoe) may have difficulty excavating footings or pad utility trenches in the undisturbed bedrock. As such, we recommend the removals for building pads established entirely in bedrock materials extend to a depth of at least 3 feet below the finished pad grade. Deeper removals may be beneficial if deep footings or pad utilities are planned. Also, overexcavation and recompaction for site utility corridors may be beneficial in areas of deep cut where less weathered bedrock is anticipated so that conventional installation of utilities is possible.

The Project Surveyor should accurately stake the corners of the areas to be overexcavated in the field. The base of the excavations should extend laterally at least 10 feet beyond the outside edge of the foundations or a minimum distance equal to the depth of overexcavation/compaction below finish grade (i.e., a 1:1 projection below the top edge of footings), whichever is greater. This includes the footprint of the building, hardscape along the building, and other foundation supported improvements, such as site walls, canopies,

equipment pads, and enclosures.

Where not removed by the aforementioned excavations, existing utility trench backfill within building areas should be removed and replaced as properly compacted fill. This is especially important for deeper fills such as existing sewers and storm drains. For planning purposes, removals over the utilities should extend to within 1-foot of the top of the pipe. For utilities that are 3 feet or shallower, the removal should extend laterally 1-foot beyond both sides of the pipe. For deeper utilities, the removals should include a zone defined by a 1:1 projection upward (and away from the pipe) from each side of the pipe. The actual limits of removal will be confirmed in the field. We recommend that known utilities be shown on the grading plan. It is our understanding that existing utilities under the vacated portion of Antelope Road will be left-in-place and should not be disturbed.

Temporary construction excavations may be made vertically without shoring to a depth of 5 feet below adjacent grade. For deeper cuts up to 20 feet, the slopes should be properly shored or sloped back at least 1:1 or flatter in the moderately to highly weathered bedrock and ¾:1 (horizontal:vertical) in the less weathered granitic bedrock. The allowable temporary slope inclination is measured from the toe to top of slope. As such, if a vertical cut is incorporated into the slope, the remaining portion must be flattened to achieve the recommended inclination. Some raveling should be anticipated at the slope inclinations recommended if sandy deposits are exposed. If raveling cannot be tolerated, flatter slope inclinations should be considered. The exposed slope face should be kept moist (but not saturated) during construction to reduce local sloughing.

In areas where removals are performed adjacent to property lines, existing streets, or other improvements where temporary slopes are not feasible, temporary shoring or “ABC” slot cuts should be utilized. The slots should be no wider than 8 feet and no deeper than 8 feet, and should be backfilled immediately to finish grade prior to excavation of the adjacent two slots. If localized dry, clean sand deposits are encountered, narrower slots may be required. We should review the plans for excavation adjacent to property lines and existing improvements when they are developed.

Surcharge loads should not be permitted within a horizontal distance equal to the height of cut from the top of the excavation or 5 feet from the top of the slopes, whichever is greater, unless the cut is properly shored. Excavations that extend below an imaginary plane inclined at 45 degrees below the edge of any adjacent existing site facilities should be properly shored to maintain support of adjacent elements. Excavations and shoring systems should meet the minimum requirements given in the most current State of California Occupational Safety and Health Standards. If cuts greater than 20 feet are required, we should be contacted to provide an allowable slope inclination.

In general, the excavations will extend into both loose topsoil/weathered bedrock and very dense bedrock material. Conventional soil excavation equipment such as backhoes, loaders, scrapers, or dozers is being used for the on-going excavations on the adjacent site, but may have difficulty excavating into the dense bedrock. Relatively slow earthwork operations should be anticipated in most of the deeper cuts. Some difficulty will be encountered in ripping the dense granitic materials and drilling and shooting or blasting may aid in increasing earthwork production in deep cut areas.

4.3.3 Subgrade Preparation

Prior to placing fills or construction of the proposed structures, the subgrade soils should be scarified to a depth of 8 inches, moisture-conditioned, and compacted to at least 90 percent of the maximum dry density in accordance with ASTM D 1557. Subgrade processing should be omitted where the exposed soils are well over the optimum moisture content or if moist, undisturbed bedrock is exposed.

4.3.4 Material for Fill

The on-site soils are, in general, suitable for use as compacted fill within the building pad and pavement areas. Particles larger than 12 inches in diameter should be placed at least 2 feet below the finished subgrade in parking and landscape area fills. The location selected for the rock placement should avoid future underground work, such as utility installation. The larger rock should be placed to avoid “nesting.” Cobbles less than 12 inches in diameter may be placed in building pad fills, with the exception of the upper 3 to 4 feet (at least 1-foot below the planned footing depths), which should consist of cleaner sandy soils (particles sizes of less than 3-inch in diameter and not more than 25 percent of the material larger than 1-inch in diameter) to facilitate footing excavations.

Although not encountered in our explorations, clayey soils should not be placed within 2 feet of the building pads or within retaining wall backfill. Soils used as retaining wall backfill should be predominately granular (contain no more than 40 percent fines - portion passing No. 200 sieve) and non-expansive (E.I. less than 20). Such materials are anticipated to be available on-site.

If required, imported fill material should be predominately granular (contain no more than 40 percent fines - portion passing No. 200 sieve) and non-expansive (E.I. less than 20). The import should also exhibit an R-value of at least 50 if used in proposed paved areas. GPI should be provided with a sample (at least 50 pounds) and notified of the location of soils proposed for import at least 72 hours in prior to importing. Each proposed import source should be sampled, tested and accepted for use prior to delivery of the soils to the site. Soils imported prior to acceptance by GPI may be rejected if not suitable. Imported materials larger than 6 inches in diameter should not be used in the compacted fills.

Although not anticipated in significant quantities and if acceptable to the City and the owner, the on-site inert debris, such as concrete, asphalt, or brick, can be used in planned fills if it is adequately crushed and mixed with the on-site soils. For general fills, the material should be crushed to the consistency of aggregate base (3-inch minus) and mixed with at least three parts soil. Such material should not be placed in proposed landscape areas or beneath planned buildings.

4.3.5 Placement and Compaction of Fills

Fill soils should be placed in horizontal lifts, moisture-conditioned, and mechanically compacted to at least 90 percent of the maximum dry density in accordance with ASTM D 1557. Fill soils placed within 12 inches of the finished pavement subgrade or deeper than 5 feet below finished grade should be compacted to at least 95 percent. The optimum lift thickness will depend on the compaction equipment used and can best be determined in the field. The following uncompacted lift thickness can be used as preliminary guidelines.

Plate compactors	4-6 inches
Small vibratory or static rollers (5-ton)	6-8 inches
Scrapers, heavy loaders, and large vibratory rollers	8-12 inches

The maximum lift thickness should not be greater than 12 inches and each lift should be thoroughly compacted and accepted prior to subsequent lifts. Earthwork contractors should consider additional equipment utilizing a sheepsfoot compactor to readily breakdown oversized bedrock material from the cut during compactions.

The moisture contents of the on-site soils are widely variable (dry to moist), such that mixing and moisture conditioning during grading will be required. The earthwork contractors should allow for the variable conditions in their bids. The moisture content of the on-site materials should be between 1 to 3 percent over the optimum moisture conditions at the time of compaction. Care should be taken by the Contractor to maintain the moisture content of the soils exposed at finished grade in slab, hardscape, and pavement areas until the soils are covered. If the soils are allowed to dry out, additional processing will be required.

During backfill of excavations, the fill should be properly benched into the construction slopes as it is placed in lifts.

If the boulders encountered in the on-site cuts are to be placed in the parking lot or landscape area fills, the materials should be disposed of in windrows or pits to reduce the potential for voids. Boulders up to 36 inches in diameter should be disposed of in windrows. The windrows should be constructed in a trench condition (engineered fill brought up at a higher elevation on both sides) to allow for the voids between the boulders to be filled with sands and flooded or jetted. The particles should be placed far enough apart to prevent nesting and to permit placement and flooding/jetting of sand around each particle to avoid permanent voids. The sands used for the jetting should consist of the on-site sands or imported materials with no more than 35 percent by weight retained on the No. 200 sieve and no particles larger than 1-inch in diameter. Upon jetting, the windrows can be covered with one lift of soil before mechanically compacting with a vibratory compactor (minimum 40,000 pounds dynamic force) or large static compaction equipment (Caterpillar 824 or equivalent). A horizontal spacing of at least 20 feet should be provided between windrows. Vertically, the bottom of a new windrow should be spaced at least 5 feet from the top of the old windrow and should be offset such that the windrows are not constructed directly over the underlying windrow. The windrows should be constructed parallel with any existing permanent fill slopes and should be maintained at a horizontal distance of at least 15 feet from the face of slopes.

Boulders larger than 36 inches in diameter should be broken to achieve smaller sizes (less than 36 inches). A less desirable but acceptable alternative would be to dispose of larger boulders in pits. The pits should be constructed similarly to the windrows discussed above but only one boulder should be placed in each pit. The pit should be backfilled with sand to a distance of 36 inches from the base of the pit and flooded or jetted. Above 36 inches, the backfill should be mechanically compacted in lifts.

The locations of the windrows or pits should be coordinated by the contractor to avoid conflicts with other planned improvements, such as utilities or parking lot light standards. Alternative methods for disposal of oversized materials proposed by the contractor can be evaluated.

4.3.6 Shrinkage and Subsidence

Shrinkage is the loss of soil volume caused by compaction of fills to a higher density than before grading. Subsidence is the settlement of in-place subgrade soils caused by loads generated by large earthmoving equipment. For earthwork volume estimating purposes, an average shrinkage value of 5 to 10 percent for the surficial soils (generally in the upper 2 to 5 feet) and a bulking value of 0 to 5 percent in the deeper materials (cut) may be assumed. A subsidence of 0.1 feet may be assumed for the surficial natural soils in planned pavement areas where the surficial soils will be scarified and compacted in place. These values are estimates only and exclude losses due to removal of vegetation or debris. Actual shrinkage and subsidence will depend on the types of earthmoving equipment used and should be determined during grading.

4.3.7 Trench/Wall Backfill

Utility trench and wall backfill consisting of the on-site material or imported sand should be mechanically compacted in lifts. Soils placed as retaining wall backfill should be granular and relatively non-expansive, as previously defined. Lift thickness should not exceed those values given in the "Placement and Compaction of Fills" section of this report. Moisture conditioning of the on-site soils will be required prior to re-use as backfill. Jetting or flooding of backfill materials should not be permitted with the exception of disposing oversized materials. A representative of GPI should observe and test trench and wall backfills as they are placed.

In backfill areas where mechanical compaction of soil backfill is impractical due to space constraints, sand-cement slurry may be substituted for compacted backfill. The slurry should contain 1½ sacks of cement per cubic yard and have a maximum slump of 5 inches. When set, such a mix typically has the consistency of compacted soil.

4.3.8 Observation and Testing

A representative of GPI should observe excavations, subgrade preparation, and fill placement activities. Sufficient in-place field density tests should be performed during fill placement and in-place compaction to evaluate the overall compaction of the soils. Soils

that do not meet minimum compaction requirements should be reworked and retested prior to placement of additional fill.

4.4 FOUNDATIONS

4.4.1 General

The proposed structures may be supported on conventional isolated and/or continuous shallow footings, provided the subsurface soils are prepared in accordance with the recommendations given in this report. Footings should be supported on properly compacted fill.

The onsite sandy soils will dry out relatively quickly if left exposed. Immediately prior to placing reinforcing steel and concrete, we recommend the base of the footings be wetted and surficially compacted using a hand compactor.

4.4.2 Allowable Bearing Pressures

Based on the shear strength and elastic settlement characteristics of the recompacted on-site soils, a static allowable bearing pressure of 4,000 pounds per square foot (psf) may be used for both continuous footings and isolated column footings. These bearing pressures are for dead-plus-live-loads, and may be increased one-third for short-term, transient, wind and seismic loading. The actual bearing pressure used may be less than the value presented above and can be based on economics and structural loads to determine the minimum width for footings as discussed below. The maximum edge pressures induced by eccentric loading or overturning moments should not be allowed to exceed these recommended values.

4.4.3 Minimum Footing Width and Embedment

The following minimum footing widths and embedments are recommended for the corresponding allowable bearing pressure.

STATIC BEARING PRESSURE (psf)	MINIMUM FOOTING WIDTH (inches)	MINIMUM FOOTING* EMBEDMENT (inches)
4,000	48	24
3,000	24	24
2,500	18	24
2,000	18	18

* Refers to minimum depth below lowest adjacent grade.

A minimum footing width of 18 inches should be used even if the actual bearing pressure is less than 2,000 psf.

4.4.4 Estimated Settlements

Maximum total static settlement of the more heavily loaded column footings (assumed to 300 kips) is expected to be less than 1-inch. Maximum total static settlement of the moderately loaded column footings (assumed to be 50 to 100 kips) is expected to be less than ½-inch. Maximum differential settlements between similarly loaded adjacent footings are expected to be less than ½-inch and ¼-inch for heavily loaded and moderately loaded column footings, respectively.

The above estimates are based on the assumption that the recommended earthwork will be performed and the footings will be sized in accordance with our recommendations.

4.4.5 Lateral Load Resistance

Soil resistance to lateral loads will be provided by a combination of frictional resistance between the bottom of footings and underlying soils and by passive soil pressures acting against the embedded sides of the footings. For frictional resistance, a coefficient of friction of 0.35 may be used for design. In addition, an allowable lateral bearing pressure equal to an equivalent fluid weighing of 300 pounds per cubic foot, may be used, provided the footings are poured tight against compacted fill soils. These values may be used in combination without reduction.

4.4.6 Foundation Concrete

Laboratory testing by Schiff and Associates (currently HDR, Appendix B) indicates a soluble sulfate content of 8 mg/kg (less than 0.01 percent by weight). For the 2016 CBC, Foundation concrete should conform to the requirements outlined in ACI 318, Section 4.3, for negligible levels of soluble sulfate exposure from the on-site soil.

4.4.7 Foundation Observation

Prior to placement of concrete and steel, a representative of GPI should observe and approve foundation excavation.

4.4.8 Light Standard Bases

The design of light standard bases is generally governed by lateral force considerations. For design by the simplified pole formula presented in Section 1807A.3.2.1 of the 2016 California Building Code, a unit passive resistance of 300 pounds per square foot per foot (to a maximum of 3,000 pounds per square foot) may be used for the piles with level ground in lieu of the presumptive lateral bearing values presented in Table 1806A.2. As stated in the code, a passive resistance of 600 pounds per square foot per foot (to a maximum of 6,000 pounds per square foot) may be used for isolated piles as determined by the Project Structural Engineer. This value incorporates the allowable increase stated in Section 1806A.3.4 of the code for single poles that can tolerate ½-inch of deflection under short-term loads.

A pile designed for adequate embedment to resist the anticipated lateral loads should have adequate axial capacity to support the anticipated vertical loads. The net allowable vertical compressive capacity can be conservatively calculated based on a unit side friction of 500 pounds per square foot, neglecting any end bearing contribution. We recommend that the upper 1-foot of the subgrade soils be ignored in determining the required depth of embedment to allow for future surface disturbance adjacent to the pile.

4.5 BUILDING FLOOR SLABS

Slab-on-grade floors should be supported on granular (sandy), non-expansive, compacted soils as discussed in the “Material for Fill” section. The on-site sands and silty sands encountered are anticipated to be suitable for direct support of the slabs.

A vapor/moisture retarder should be placed under slabs that are to be covered with moisture-sensitive floor coverings (parquet, vinyl, tile, etc.). Polyolefin in 15-mil thickness should be covered by a layer of clean sand (less than 5 percent by weight passing the No. 200 sieve) having a minimum thickness of 2 inches. Based on our explorations and laboratory testing, the soils at the site are not suitable for this purpose. The function of the sand layer is to protect the vapor retarder during construction and to aid in the uniform curing of the concrete. This layer should be nominally compacted using light equipment. The sand placed over the vapor retarder should only be slightly moist. If the sand gets wet (for example because of rainfall or excessive moistening) it must be allowed to dry prior to placing concrete. Care should be taken to avoid infiltration of water into the sand layer after placement of the concrete slab, such as at slab cut-outs and other exposures. Placement of the sand over the retarder is a construction related issue. If the Contractor desires to omit the sand layer and takes the necessary steps to protect the vapor retarder and properly cure the concrete slab (prevent curling), we take no exception.

It should be noted that the material used as a vapor retarder is only one of several factors affecting the prevention of moisture accumulation under floor coverings. Other factors include maintaining a low water-cement ratio for the concrete used for the floor slab, effective sealing of joints and edges (particularly at pipe penetrations) as well as excess moisture in the concrete. The manufacturer of the floor coverings should be consulted for establishing acceptable criteria for the condition of the floor surface prior to placing moisture-sensitive floor coverings.

For the elastic design of slabs supporting sustained concentrated loads, a modulus of subgrade reaction (k) of 200 pounds per cubic inch (pounds per square inch per inch of deflection) may be used. This value is for a 1-foot by 1-foot square loaded area and should be adjusted by the structural designer for the area of the proposed building slab using appropriate elastic theory.

For lateral resistance design, a coefficient of friction value of 0.35 between aggregate base or select fill and concrete may be used. For a slab on a visqueen moisture barrier, a coefficient of 0.1 should be used.

4.6 LATERAL EARTH PRESSURES

Based on information available to us at the time this report was prepared, no major retaining walls are planned for the project. The following recommendations are provided for walls less than 8 feet high at the project site. We recommend that retaining walls be backfilled with on-site or imported non-expansive granular soils.

Active earth pressures can be used for designing walls that can yield at least ½-inch laterally in 10 feet of wall height under the imposed loads. For level backfill comprised of on-site or imported granular soils (non-expansive with no more than 40 percent passing No. 200 sieve), the magnitude of active pressures are equivalent to the pressures imposed by a fluid weighing 35 pounds per cubic foot (pcf). This pressure may also be used for the design of temporary excavation support.

At-rest pressures should be used for restrained walls that remain rigid enough to be essentially non-yielding. At-rest pressures imposed by a fluid weighing 52 pounds per cubic foot should be used for drained granular backfill.

Walls subject to surcharge loads should be designed for an additional uniform lateral pressure equal to one-third and one-half the anticipated surcharge pressure for unrestrained and restrained walls, respectively.

The wall backfill should be well-drained to relieve possible hydrostatic pressure or designed to withstand these pressures. A drain consisting of perforated pipe and gravel wrapped in filter fabric should be used. One cubic foot of rock should be used for each lineal foot of pipe. The fabric (non-woven filter fabric, Mirafi 140N or equivalent) should be lapped at the top. We prefer pipe and gravel drains to weep holes to avoid potential for constant flow of surface water in front of the wall.

The Structural Engineer should specify the use of select, granular wall backfill on the plans. Wall footings should be designed as discussed in the "Foundations" section.

4.7 CORROSIVITY

Based on results of laboratory testing (Appendix B), the on-site soils are moderately corrosive to ferrous metals. GPI does not practice corrosion engineering. Should the use of buried pipe be proposed, a corrosion engineer such as HDR should be contacted to provide recommendations to protect these elements from corrosion.

4.8 DRAINAGE

Positive surface gradients should be provided adjacent to structures so as to direct surface water run-off and roof drainage away from foundations and slabs toward suitable discharge facilities. The introduction of water into uncompacted natural soils can result in subsidence due to densification of the collapsible soils. Long-term ponding of surface water should not be allowed on pavements or adjacent to buildings. We recommend that landscape planters be avoided immediately adjacent to the building. If planters are required, they should be provided with surface drains and planted with drought tolerant plants to reduce the

potential for the infiltration of surface water beneath the building foundations and floor slabs.

4.9 EXTERIOR CONCRETE AND MASONRY FLATWORK

Exterior concrete and masonry flatwork should be supported on granular, non-expansive (EI not greater than 20) compacted fill. Prior to placement of concrete, the subgrade should be prepared as recommended in "Subgrade Preparation" section. It should be noted that the sidewalk in front of the buildings should be considered as part of the building pad for earthwork purposes.

4.10 PAVED AREAS

R-value test results indicate that the subgrade soils have an R-value of 63. Preliminary pavement design has been based on an R-value of 50. The California Division of Highways Design Method was used for design of the recommended preliminary asphalt concrete pavement sections. These recommendations are based on the assumption that the pavement subgrades will consist of existing near surface soils. Final pavement design should be based on R-value testing performed near the conclusion of rough grading. The following pavement sections are recommended for planning purposes only.

PAVEMENT SECTIONS

PAVEMENT AREA	TRAFFIC INDEX	SECTION THICKNESS (inches)	
		ASPHALT/PORTLAND CONCRETE	AGGREGATE BASE COURSE
Asphalt Concrete			
Automobile Parking	4.0	3.0	4.0
Automobile Drives	5.0	3.0	5.0
Truck/Bus Drives	6.0	3.5	5.0
Portland Cement Concrete			
Automobile Parking	4.0	6.0	4.0
Automobile Drives	5.0	6.0	4.0
Truck/Bus Drives	6.0	6.5	4.0

The pavement subgrade underlying the aggregate base should be properly prepared and compacted in accordance with the recommendations outlined under "Subgrade Preparation" or “Placement and Compaction of Fills”.

The pavement base course should be compacted to at least 95 percent of maximum density (ASTM D 1557). Aggregate base should conform to the requirements of Section 26 of the California Department of Transportation Standard Specifications for Class II aggregate base (three-quarter inch maximum) or Section 200-2 of the Standard Specifications for Public Works Construction (Green Book) for untreated base materials (except processed miscellaneous base).

The concrete used for paving should have a modulus of rupture of at least 550 psi (equivalent to an approximate compressive strength of 3,700 psi at the time the pavement is subjected to traffic). The upper 12 inches of the subgrade soils should be compacted to at least 95 percent of the maximum dry density (ASTM D 1557).

The above recommendations are based on the assumption that the base course and compacted subgrade will be properly drained. The design of paved areas should incorporate measures to prevent moisture build-up within the base course, which can otherwise lead to premature pavement failure. For example, curbing adjacent to landscaped areas should be deep enough to act as a barrier to infiltration of irrigation water into the adjacent base course.

4.11 SLOPES

New slopes or modifications to existing slopes up to 15 feet in height may be constructed at inclinations of 2:1 (horizontal:vertical) or flatter. For higher slopes, GPI should be provided with the details to evaluate the recommended inclination.

Achieving good compaction at the face of the slope is important in reducing the potential for erosion. Modifications to the existing slopes should be overbuilt by at least 3 feet during rough grading and trimmed back to a hard and unyielding surface. The fill should be properly benched into the existing slopes as it is placed in lifts. Slope rolling to achieve a finished compacted surface should not be used if surficial erosion is not tolerable.

Slopes should be seeded or planted as soon as possible to reduce the erosion potential. Other protective measures, such as installing drains and grading the top of the slope to drain should be performed. We recommend that the condition of the existing slopes on-site be periodically reviewed to confirm that the erosion protection measures are in good repair.

Setbacks of structures from the top and toe of the existing and planned slopes should be maintained in accordance with the County of Riverside standards.

4.12 SUBSURFACE INFILTRATION

To provide a preliminary evaluation of the infiltration characteristics for a proposed stormwater bio-infiltration system, we performed two near-surface field infiltration tests. Details of the infiltration system have not been established, but based on the request of the Project Team, we have performed infiltration tests along Clinton Keith Road at the existing alignment of Antelope Road and along Antelope Road between our borings B-101 and B-102. Both tests were performed at approximate depths of 1-foot below the current ground surface. The tests were performed in general accordance with the County of Riverside methods (County of Riverside, 2011).

The tests were performed in shallow borings drilled with an 8-inch hollow stem auger. The test wells were filled with approximately 1-foot of water at the initiation of the test. During the initial soak, the wells exhibited two consecutive measurements of greater than 6 inches of water surface drop in less than 25 minutes, meeting the criteria for Sandy Soils as detailed in the County guidelines. As such, we performed the subsequent infiltration tests over 10-minute intervals. The tests were repeated until 8 readings were obtained. The pre-adjusted infiltration rate was calculated as the depth of water drained over the associated

time interval.

Once the pre-adjusted infiltration rate was determined, we corrected the results using the Porchet Method as outlined by the County. We determined the following stabilized and corrected rates:

- P-101 – 2.2 inches per hour
- P-102 – 2.1 inches per hour

Significantly lower infiltration rates, approaching zero, are anticipated in the less weathered bedrock materials. Additional testing should be performed when finished grades are established. Additional factors of safety in computing the design infiltration rate of the proposed infiltration BMP should be determined by the project Civil Engineer. The results of the infiltration tests are presented in Table 1, Borehole Infiltration Test Results.

It should be noted that the volume of water applied during our test was relatively low compared to the planned system. Due to the dense nature of the near surface and subsurface soils and the presence of shallow weathered bedrock, infiltration of large volumes of water into the near surface soils may result in limited percolation rates and the potential for long-term mounding or perched conditions. The Civil Engineer should evaluate the feasibility of subsurface infiltration using the rates provided.

The testing was performed with clean, clear water, and the results do not include effects of sediments, fines, dissolved solids, or other debris, as these will significantly reduce the percolation rates of the subsurface soils. The infiltration system should include processes to clean the inflow of sediments or other deleterious materials to reduce the potential for clogging and reduced infiltration rates.

4.13 GEOTECHNICAL OBSERVATION AND TESTING

We recommend that a representative of GPI observe earthwork during construction to confirm that the recommendations provided in our report are applicable during construction. The earthwork activities include grading, compaction of fills, subgrade preparation, backfill of utility trenches and retaining walls, pavement construction and foundation excavations. If conditions are different than expected, we should be afforded the opportunity to provide an alternative recommendation based on the actual conditions encountered.

5.0 LIMITATIONS

The report, exploration logs, and other materials resulting from GPI's efforts were prepared exclusively for use by CK 17 LP, Felicita Inc., and their consultants in designing the proposed development. If relying on this report, those entities besides CK 17 LP are bound by the terms and conditions in our contract with CK 17 LP (a copy can be provided upon request). The report is not intended to be suitable for reuse on extensions or modifications of the project or for use on any project other than the currently proposed development, as it may not contain sufficient or appropriate information for such uses. If this report or portions of this report are provided to contractors or included in specifications, it should be understood that they are provided for information only. This report cannot be utilized by another entity without the express written permission of GPI. This report is an instrument of our services and remains the property of GPI.

Soil deposits may vary in type, strength, and many other important properties between points of exploration due to non-uniformity of the geologic formations or to man-made cut and fill operations. While we cannot evaluate the consistency of the properties of materials in areas not explored, the conclusions drawn in this report are based on the assumption that the data obtained in the field and laboratory are reasonably representative of field conditions and are conducive to interpolation and extrapolation.

Furthermore, our recommendations were developed with the assumption that a proper level of field observation and construction review will be provided during grading, excavation, and foundation construction by GPI. If field conditions during construction appear to be different than is indicated in this report, we should be notified immediately so that we may assess the impact of such conditions on our recommendations. If construction phase services are performed by others they must accept full responsibility (as Project Geotechnical Engineer) for the geotechnical aspects of the project, including this report.

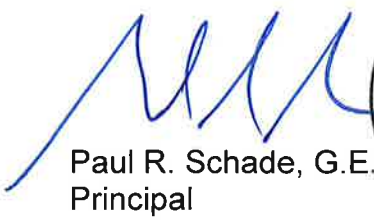
Our investigation and evaluations were performed using generally accepted engineering approaches and principles available at this time and the degree of care and skill ordinarily exercised under similar circumstances by reputable Geotechnical Engineers practicing in this area. No other representation, either expressed or implied, is included or intended in our report.

Respectfully submitted,
Geotechnical Professionals Inc.



Dylan J. Boyle, P.E.
Project Engineer





Paul R. Schade, G.E.
Principal



DJB/PRS:sph

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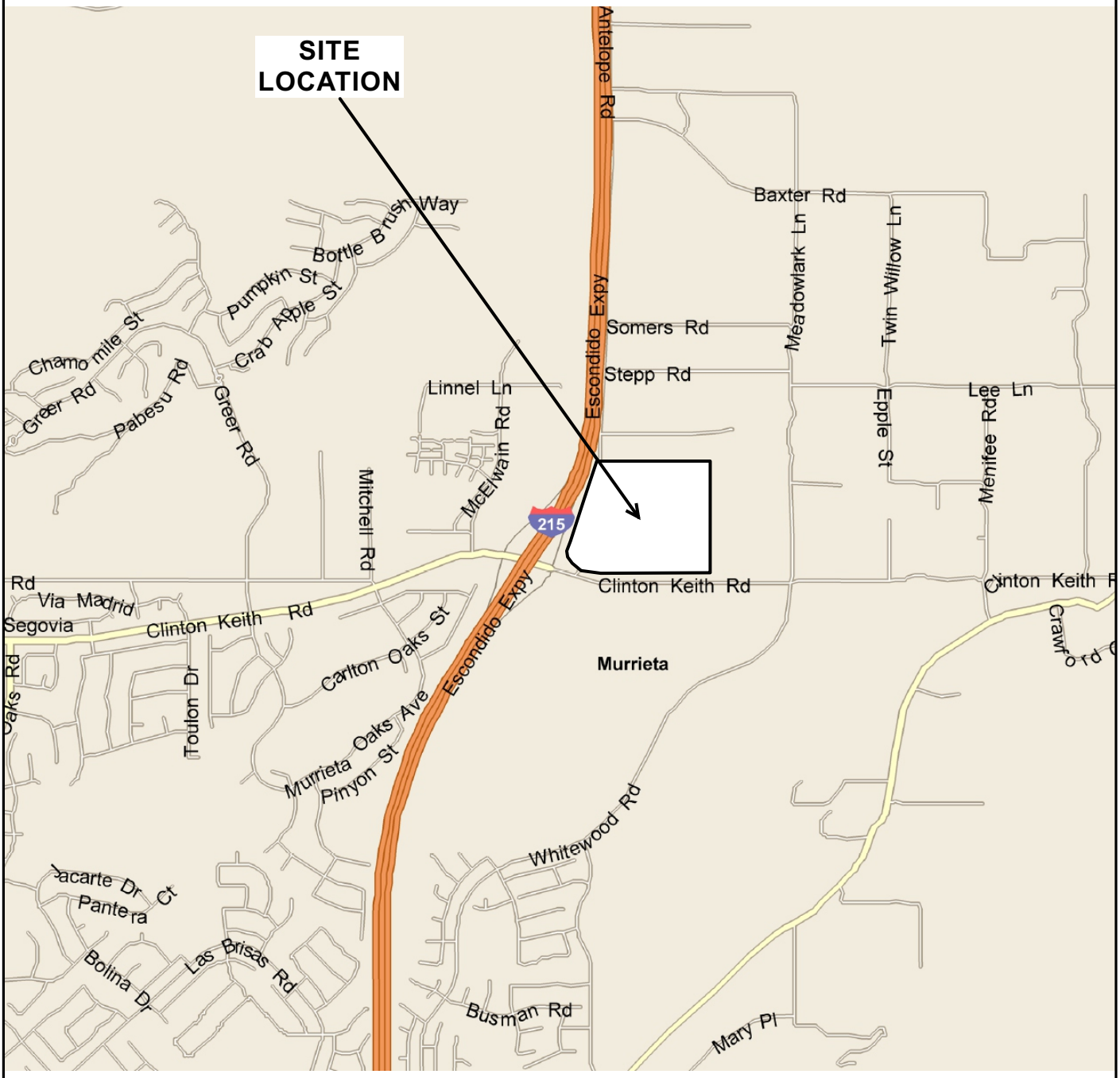
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BASE MAP REPRODUCED FROM MICROSOFT STREETS AND TRIPS © 2008

GEOTECHNICAL PROFESSIONALS, INC.

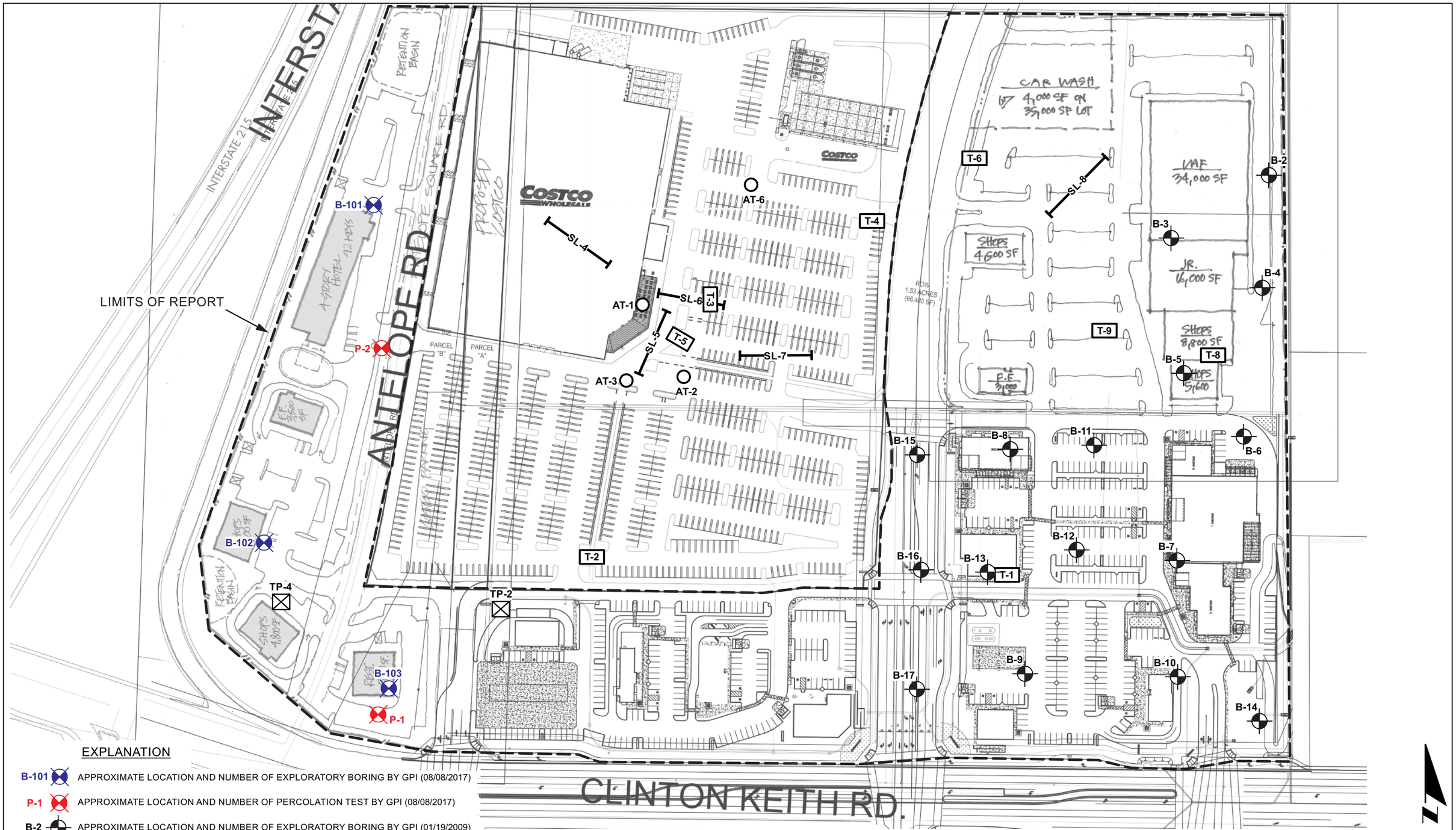
VINEYARD / VAL VISTA CENTER

GPI PROJECT NO.: 2833.I

SCALE: 1" = 2000'

SITE LOCATION MAP

FIGURE 1



EXPLANATION

- B-101 — APPROXIMATE LOCATION AND NUMBER OF EXPLORATORY BORING BY GPI (08/08/2017)
- P-1 — APPROXIMATE LOCATION AND NUMBER OF PERCOLATION TEST BY GPI (08/08/2017)
- B-2 — APPROXIMATE LOCATION AND NUMBER OF EXPLORATORY BORING BY GPI (01/19/2009)
- AT-3 — APPROXIMATE LOCATION AND NUMBER OF AIR TRACK BORINGS BY GEOTEK (2004)
- T-1 — APPROXIMATE LOCATION AND NUMBER OF EXPLORATORY TRENCHES BY THE SOILS CO. (3/15/2007)
- TP-4 — APPROXIMATE LOCATION AND NUMBER OF TEST PIT BY ECOTECH (7/26/2004)
- SL-5 — APPROXIMATE LOCATION AND NUMBER OF SEISMIC LINES BY GEOSOILS, INC (10/3/05)

0 150 300 FEET

BASE PLAN REPRODUCED FROM CONCEPTUAL PLAN PROVIDED BY CK-17, LP: (UNDATED)

GPI GEOTECHNICAL PROFESSIONALS, INC.

VINEYARD / VAL VISTA CENTER

GPI PROPOSAL NO.: 2833.I | SCALE: 1" = 150'

SITE PLAN

FIGURE 2

TABLE 1

BOREHOLE INFILTRATION TEST RESULTS (corrected with Porchet Method)

Riverside County Method-TGD, 2011

Project No. 2833.I Project Name: Vineyard CK17 Date: 8/18/2017

Test Date 8/8/2017 NOTE: Slowest rate from percolation testing used to calculate infiltration rate

		Water	Water	Total		Initial	Final	Change in	Average	
	Test	Depth	Depth	Depth of	Hole	Water	Water	Height of	Height of	Infiltration
Test Well	Duration	Initial	Final	Test Hole	Diameter	Height	Height	Water	Water	Rate
	(min)	(ft)	(ft)	(ft)	(inches)	(ft)	(ft)	(ft)	(ft)	(in/hr)
	Δt	D_o	D_f	D_T		H_o	H_f	$\Delta H=\Delta D$	H_{avg}	I_t
P-101	10	0.00	0.28	1.13	8	1.13	0.85	0.28	0.99	2.9
P-101	10	0.00	0.26	1.13	8	1.13	0.87	0.26	1.00	2.7
P-101	10	0.00	0.25	1.13	8	1.13	0.88	0.25	1.00	2.6
P-101	10	0.00	0.24	1.13	8	1.13	0.89	0.24	1.01	2.5
P-101	10	0.00	0.24	1.13	8	1.13	0.89	0.24	1.01	2.5
P-101	10	0.00	0.23	1.13	8	1.13	0.90	0.23	1.01	2.3
P-101	10	0.00	0.22	1.13	8	1.13	0.91	0.22	1.02	2.2
P-101	10	0.00	0.22	1.13	8	1.13	0.91	0.22	1.02	2.2

Test Date 8/8/2017 NOTE: Slowest rate from percolation testing used to calculate infiltration rate

		Water	Water	Total		Initial	Final	Change in	Average	
	Test	Depth	Depth	Depth of	Hole	Water	Water	Height of	Height of	Infiltration
Test Well	Duration	Initial	Final	Test Hole	Diameter	Height	Height	Water	Water	Rate
	(min)	(ft)	(ft)	(ft)	(inches)	(ft)	(ft)	(ft)	(ft)	(in/hr)
	Δt	D_o	D_f	D_T		H_o	H_f	$\Delta H=\Delta D$	H_{avg}	I_t
P-102	10	0.08	0.33	1.08	8	1.00	0.75	0.25	0.88	2.9
P-102	10	0.08	0.32	1.08	8	1.00	0.76	0.24	0.88	2.8
P-102	10	0.08	0.32	1.08	8	1.00	0.76	0.24	0.88	2.8
P-102	10	0.08	0.30	1.08	8	1.00	0.78	0.22	0.89	2.5
P-102	10	0.08	0.30	1.08	8	1.00	0.78	0.22	0.89	2.5
P-102	10	0.08	0.29	1.08	8	1.00	0.79	0.21	0.90	2.4
P-102	10	0.08	0.27	1.08	8	1.00	0.81	0.19	0.91	2.1
P-102	10	0.08	0.27	1.08	8	1.00	0.81	0.19	0.91	2.1

APPENDIX A

APPENDIX A

EXPLORATORY BORINGS

The subsurface conditions at the site were investigated by drilling and sampling 20 exploratory borings over two separate field investigations at the subject site. A total of 17 borings (B-1 through B-17), located on the eastern half of the site, were performed in January 2009. Three borings (B-101 through B-103) were performed as part of the current investigation. The borings were advanced to depths ranging from 11 to 39 feet below the existing ground surface (at the time of drilling). Several explorations were terminated prior to the planned depths after meeting practical refusal on dense native soils or possible due to the presence of cobbles or boulders. The locations of the explorations from both investigations are shown on the Site Plan, Figure 2.

The exploratory boring was drilled using truck-mounted hollow-stem auger drill equipment. Relatively undisturbed samples were obtained using a brass ring lined sampler (ASTM D 3550). The brass rings have an inside diameter of 2.42 inches. The ring samples were driven into the soil by a 140-pound hammer dropping 30 inches. The number of blows needed to drive the sampler into the soil was recorded as the penetration resistance.

At selected locations, disturbed samples were obtained using a split-spoon sampler by means of the Standard Penetration Test (SPT, ASTM D 6066). The spoon sampler was driven into the soil by a 140-pound hammer dropping 30 inches, employing the “free-fall” hammer described above. After an initial seating drive of 6 inches, the number of blows needed to drive the sampler into the soil a depth of 12 inches was recorded as the penetration resistance. These values are the raw uncorrected blowcounts.

The field explorations for the investigation were performed under the continuous technical supervision of GPI's representative, who visually inspected the site, maintained detailed logs of the borings, classified the soils encountered, and obtained relatively undisturbed samples for examination and laboratory testing. The site contains topsoil/weathered bedrock over bedrock materials. However, the materials encountered in the borings were classified in the field and through further examination in the laboratory in accordance with the Unified Soils Classification System. Detailed logs of the borings are presented in Figures A-1 to A-20 in this appendix.

The boring locations were laid out in the field based on the available site plans, topographic information, and by measuring from existing site features. Ground surface elevations for the explorations from our 2009 investigation were obtained from a topographic map. Elevations for explorations from the current investigation were estimated from internet sources. In both cases, the ground surface elevations should be considered approximate.

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
				0	This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
10.3	122	25	D		Weathered Granitic Bedrock: **SILTY SAND (SM)** brown, moist @ 2 ft, medium dense	
5.8		50	S	5		1515
3.8	110	50/4"	D		Moderately Weathered Granitic Bedrock: **SILTY SAND (SM)** brown, moist, very dense @ 7 ft, dry	
2.3		50/5"	S	10		1510
17.8		50/3"	D	15	@ 15 ft, light brown, very moist, increase of fines and trace of gravel	1505
2.8		50/5"	S	20	@ 20 ft, brown, dry	1500
4.6		50/5"	S	25		1495
					Total Depth 26 ft	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 1-19-09

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2833.I

VINEYARD/VAL VISTA

LOG OF BORING NO. B-1

FIGURE A-1

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
			B	0	Weathered Granitic Bedrock: **SILTY SAND (SM)** brown, moist	
5.4	127	75/10"	D		Moderately Weathered Granitic Bedrock: **SILTY SAND (SM)** slightly moist, light brown to brown, very dense	1510
3.3		50/4"	D	5	@ 5 ft, brown, dry, with gravel	
2.2		50/3"	D			1505
2.0		50/3"	D	10		
		50/2"	D	15	@ 15 ft, no sample recovery	1500
2.0		50/3"	S			
					Total Depth 17 ft	

This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 1-19-09

EQUIPMENT USED: 8 " Hollow Stem

GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2833.1
VINEYARD/VAL VISTA

LOG OF BORING NO. B-2

FIGURE A-2

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	ELEVATION (FEET)
				0	Weathered Granitic Bedrock: **SAND (SP)** brown, slightly moist, with gravel	
3.4	127	50/6"	D		Moderately Weathered Granitic Bedrock: **SAND (SP)** brown, trace of silt, dry, very dense, with gravel	
2.3		50/4"	D	5		1515
7.6		50/5"	S		**SILTY SAND (SM)** brown, slightly moist, very dense, with gravel	
24.9		36	S	10	**SANDY SILT (ML)** light brown, very moist, very stiff, with gravel (highly weathered)	1510
18.2		16	S	15	@ 15 ft, stiff	1505
3.1		50/3"	D	20	**SILTY CLAY (CL)** brown, dry, hard, with gravel	1500
					Total Depth 21 ft	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 1-19-09

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2833.I

VINEYARD/VAL VISTA

LOG OF BORING NO. B-3

FIGURE A-3

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
			B	0	Weathered Granitic Bedrock: **SILTY SAND (SM)** brown, moist	
6.9	135	59	D		@ 2 ft, slightly moist, dense, trace of gravel	
3.5		50/6"	S	5	Moderately Weathered Granitic Bedrock: **SAND WITH SILT (SP-SM)** brown, dry, very dense, with gravel	1510
3.2		50/5"	S		**SILTY SAND (SM)** brown, dry, very dense, trace of gravel	
2.4		50/5"	S	10		1505
2.2		50/4"	S	15	**SAND WITH SILT (SP-SM)** brown, dry, very dense, with gravel	1500
2.1		50/4"	S	20	**SILTY SAND (SM)** brown, dry, very dense, with gravel	1495
1.8		50/2"	S	25	**SAND WITH SILT (SP-SM)** brown, dry, very dense, with gravel	1490
					Total Depth 26 ft	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 1-19-09

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2833.I

VINEYARD/VAL VISTA

LOG OF BORING NO. B-4

FIGURE A-4

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
				0	This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
					Weathered Granitic Bedrock: **SILTY SAND (SM)** light brown, moist, with gravel	1510
8.6	117	83/11"	D		Moderately Weathered Granitic Bedrock: **SILTY SAND (SM)** light brown, moist, very dense, with gravel	
7.9	112	50/5"	D	5		
4.3	128	52	D		@ 7 ft, light brown to brown, dry, dense	1505
		50/3"	D	10	@ 10 ft, no sample recovery	1500
1.9		50/3"	D	15	**SAND WITH SILT (SP-SM)** brown, dry, very dense, with gravel	
					Total Depth 16 ft	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 1-19-09

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2833.I

VINEYARD/VAL VISTA

LOG OF BORING NO. B-5

FIGURE A-5

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
				0	This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
					Weathered Granitic Bedrock: **SILTY SAND (SM)** brown, moist	
13.0	116	80/9"	D		Moderately Weathered Granitic Bedrock: **SILTY SAND (SM)** brown, moist, very dense, with gravel and trace clay	1505
6.7	100	80/9"	D	5	**SAND WITH SILT (SP-SM)** light brown, slightly moist, very dense	
8.6	113	50/5"	D		**SILTY SAND (SM)** light brown, moist, very dense, with gravel	1500
13.0		50/5"	S	10	**SANDY SILT (ML)** light brown, moist, hard, with gravel	
					Auger Refusal at 13 ft, likely the presence of boulders/cobbles	1495

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 1-19-09

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2833.I

VINEYARD/VAL VISTA

LOG OF BORING NO. B-6

FIGURE A-6

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
				0	This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
					Weathered Granitic Bedrock: **SILTY SAND (SM)** brown, moist	
3.4	144	88	D		Moderately Weathered Granitic Bedrock: **SILTY SAND (SM)** brown, dry, very dense, with gravel	1505
2.8	119	50/6"	D	5	**SAND WITH SILT (SW-SM)** brown, dry, very dense	
1.6		50/5"	D		@ 7 ft, with gravel	1500
2.5		50/2"	S	10		
						1495
4.6		50/5"	D	15	@ 15 ft, slightly moist	
					Auger Refusal at 16 ft, likely the presence of boulders/cobbles	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 1-19-09

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2833.I

VINEYARD/VAL VISTA

LOG OF BORING NO. B-7

FIGURE A-7

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
				0	Natural Soil: **SILTY SAND (SM)**brown, moist	
8.7	106	8	D		@ 2 ft, loose, trace of porosity	
				5		1515
2.8	104	31	D		Weathered Granitic Bedrock: **SILTY SAND (SM)** reddish brown, dry, medium dense	
3.4	116	63	D		Moderately Weathered Granitic Bedrock: **SAND WITH SILT(SP-SM)**red to brown, dry, dense, trace of gravel	
1.2		50/4"	S	10	@ 10 ft, very dense, with gravel	1510
				15	@ 15 ft, greyish brown	1505
1.7		50/4"	D		Total Depth 16 ft	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 1-19-09

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2833.I

VINEYARD/VAL VISTA

LOG OF BORING NO. B-8

FIGURE A-8

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
				0		
10.1	125	58	D		Weathered Granitic Bedrock: **SILTY SAND (SM)** brown, moist @ 2 ft, dense, with gravel	1515
2.9		50/5"	D	5	Moderately Weathered Granitic Bedrock: **SAND WITH SILT(SP-SM)** light brown, dry, very dense, with gravel	1510
1.6		50/4"	S		**SILTY SAND (SM)** light brown, dry, with trace of gravel	
1.4		50/3"	S	10	**SAND WITH SILT (SP-SM)** light brown, dry, very dense, with gravel	1505
1.7		50/3"	S	15		
					Total Depth 16 ft	1500

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 1-19-09

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2833.I

VINEYARD/VAL VISTA

LOG OF BORING NO. B-9

FIGURE A-9

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
				0	This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
					Weathered Granitic Bedrock: **SILTY SAND (SM)** brown, moist	1505
6.2	136	80/10"	D		Moderately Weathered Granitic Bedrock: **SILTY SAND (SM)** brown, slightly moist, very dense, with gravel	
1.3		50/3"	D	5	**SAND WITH SILT (SP-SM)** with gravel, brown, dry, very dense	
4.6		50/1"	D		**SILTY SAND (SM)** with gravel, light brown, slightly moist, very dense	1500
		50/5"	D	10	@ 10 ft, no sample recovery	1495
1.0		50/4"	D	15	**SAND WITH SILT (SP-SM)** grey, dry, very dense, with gravel	
					Total Depth 16 ft	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 1-19-09

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2833.I

VINEYARD/VAL VISTA

LOG OF BORING NO. B-10

FIGURE A-10

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
				0	This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
9.3	119	25	D		Weathered Granitic Bedrock: **SILTY SAND (SM)** brown, moist @ 2 ft, light brown, medium dense, with gravel	
1.4		50/5"	D	5	Moderately Weathered Granitic Bedrock: **SAND (SP)** light brown, dry, very dense	1510
1.8	128	50/5"	D		**SAND WITH SILT (SP-SM)**light brown, dry, very dense, with gravel	
1.4		50/3"	S	10		1505
					Total Depth 11 ft	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 1-19-09

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2833.I

VINEYARD/VAL VISTA

LOG OF BORING NO. B-11

FIGURE A-11

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
				0	This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
9.1	109	6	D		Natural Soil: **SILTY SAND (SM)**brown, moist @ 2 ft, trace of porosity, very loose to loose	
		75/10"	D	5	Moderately Weathered Granitic Bedrock: **SILTY SAND (SM)** light brown, dry, very dense, with trace of gravel	1510
		50/3"	S		@ 7 ft, no sample recovery	
2.1		50/1"	S	10		1505
					Total Depth 11 ft	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 1-19-09

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not encountered

GPI

PROJECT NO.: 2833.I

VINEYARD/VAL VISTA

LOG OF BORING NO. B-12

FIGURE A-12

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
				0	Natural Soil: **SILTY SAND (SM)** brown, moist, very loose to loose	1515
9.7	111	6	D			
2.5	123	72	D	5	Moderately Weathered Granitic Bedrock: **SILTY SAND (SM)** brown, dry, trace of porosity, very dense, with gravel	1510
2.0		50/5"	S		**SAND WITH SILT (SP-SM)** light brown, dry, very dense, with trace of gravel	
2.5		50/5"	S	10	@ 10 ft, with gravel	
					Total Depth 11 ft	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 1-19-09

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not encountered

GPI

PROJECT NO.: 2833.I

VINEYARD/VAL VISTA

LOG OF BORING NO. B-13

FIGURE A-13

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
			B	0	Natural Soil: **SANDY SILT (ML)**brown, moist, trace of clay	
12.0	125	34	D		Weathered Granitic Bedrock: **SILTY SAND (SM)**light brown, moist, medium dense	1500
1.9		50/4"	D	5	Moderately Weathered Granitic Bedrock: **SAND WITH SILT (SP-SM)**brown, dry, very dense, with gravel	
2.2		50/4"	S			1495
2.2		50/3"	S	10		1490
7.0		73	S	15	**SILTY SAND (SM)**grey to brown, slightly moist, very dense, with gravel	
					Total Depth 16 ft	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 1-19-09

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not encountered

GPI

PROJECT NO.: 2833.I

VINEYARD/VAL VISTA

LOG OF BORING NO. B-14

FIGURE A-14

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
			B	0	Natural Soil: **SILTY SAND (SM)** brown, moist	1525
9.3	109	6	D		@ 2 ft, trace of porosity, very loose to loose	
4.0	108	39	D	5	Weathered Granitic Bedrock: **SILTY SAND (SM)** brown, dry, medium dense, trace gravel	1520
2.3		50/4"	S		Moderately Weathered Granitic Bedrock: **SILTY SAND (SM)** brownish grey, very dense	
2.2		50/6"	S	10	**SAND WITH SILT (SP-SM)** light brown, dry, very dense, trace of gravel	1515
		50/1"	S	15	@ 15 ft, no sample recovery	1510
					Total Depth 15 ft	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 1-20-09

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not encountered

GPI

PROJECT NO.: 2833.I

VINEYARD/VAL VISTA

LOG OF BORING NO. B-15

FIGURE A-15

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
			B	0	Natural Soil: **SILTY SAND (SM)** brown, moist, loose	
8.5	109	8	D			
						1515
4.6	111	39	D	5	Weathered Granitic Bedrock: **SILTY SAND (SM)** brown, slightly moist, medium dense, trace gravel	
4.4	134	80/11"	D		Moderately Weathered Granitic Bedrock: **SILTY SAND (SM)** light brown, very dense	
						1510
1.8		50/2"	S	10	@ 10 ft, dry, with gravel	
						1505
		50/1"	S	15		
					Total Depth 16 ft	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 1-20-09

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not encountered

GPI

PROJECT NO.: 2833.I

VINEYARD/VAL VISTA

LOG OF BORING NO. B-16

FIGURE A-16

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
			B	0	Natural Soil: **SILTY SAND (SM)** brown, moist	
5.5	92	11	D		**SANDY SILT (ML)** light brown, slightly moist, firm, with gravel	1515
1.9	133	80/11"	D	5	Moderately Weathered Granitic Bedrock: **SILTY SAND (SM)** light brown, dry, very dense	
		50/5"	S		@ 7 ft, no sample recovery	1510
2.4		50/1"	S	10	@ 10 ft, grey, with gravel	
					Total Depth 11 ft	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 1-20-09

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not encountered

GPI

PROJECT NO.: 2833.I

VINEYARD/VAL VISTA

LOG OF BORING NO. B-17

FIGURE A-17

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
			B	0	Natural: **SANDY SILT (ML)** brown, dry to slightly moist	
10.1	106	64	D		Weathered Granitic Bedrock: **SAND (SP)** red brown, moist, dense	1545
3.8	121	85/11"	D	5	Moderately Weathered Granitic Bedrock: **SILTY SAND (SM)** brown, slightly moist, very dense	
3.7	108	50/5"	D			1540
3.7	110	50/5"	D	10	@ 10 feet, trace gravel	
						1535
4.1		77/11"	S	15	@ 15 feet, grey	
						1530
3.0		50/5"	S	20		
						1525
3.3		50/4"	S	25		
						1520
2.8		50/3	S	30		
						1515
2.9		50/1.5"	S	35		
2.7		50/2"	S			
					Refusal @ 38 feet	

This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 8-8-17
EQUIPMENT USED: 8 " Hollow Stem Auger
GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2833.I
VINEYARD/VAL VISTA

LOG OF BORING NO. B-101

FIGURE A-18

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
			B	0	Natural: **SILTY SAND (SM)** dry to slightly moist, brown, very dense, with gravel	1540
6.1	114	79	D			
5.1	103	50/4"	D	5	Weathered Granitic Bedrock: **SAND with SILT (SP-SM) brown, slightly moist, very dense**	1535
8.0	118	50/5"	D		Moderately Weathered Granitic Bedrock: **SILTY SAND (SM)** brown, moist, very dense, with gravel	
5.3		72/9"	S	10	@ 10 feet, slightly moist, trace gravel	1530
1.7		50/2"	D	15	**SAND with SILT (SP-SM)** brown, dry, very dense, with gravel	1525
1.5		50/2"	S	20	**SAND (SP)** grey, dry, very dense	1520
1.8		50/3"	S	25		1515
		50/1"	S	30	@ 10 feet, no recovery	
					Refusal @ 31 feet	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 8-8-17
EQUIPMENT USED: 8 " Hollow Stem Auger
GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2833.I
VINEYARD/VAL VISTA

LOG OF BORING NO. B-102

FIGURE A-19

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
				0	Natural: **SILTY SAND (SM)** brown, dry to slightly moist, dense to very dense with gravel	
3.8	123	75	D		@ 2 feet, moist	
						1540
3.6	104	50/4"	D	5	Weathered Granitic Bedrock: **SILTY SAND (SM)** brown, slightly moist, very dense	
4.4	113	50/2"	D			
3.9						1535
3.3		50/3"	D	10	Moderately Weathered Granitic Bedrock: **SILTY SAND (SM)** brown, slightly moist, very dense, with gravel	
						1530
2.3		50/1.5"	S	15		
						1525
2.0		50/1.5"	D	20		
						1520
2.5		50/2"	S	25		
						1515
6.5		50/1.5"	D	30		
		50/1"	S			
					Refusal @ 33 feet	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 8-8-17
EQUIPMENT USED: 8 " Hollow Stem Auger
GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2833.I
VINEYARD/VAL VISTA

LOG OF BORING NO. B-103

FIGURE A-20

APPENDIX B

APPENDIX B

LABORATORY TESTS

INTRODUCTION

Representative undisturbed soil samples and bulk samples were carefully packaged in the field and sealed to prevent moisture loss. The samples were then transported to our Cypress office for examination and testing assignments. Laboratory tests were performed on selected representative samples as an aid in classifying the soils and to evaluate the physical properties of the soils affecting foundation design and construction procedures. Detailed descriptions of the laboratory tests are presented below under the appropriate test headings. Test results are presented in the figures that follow.

MOISTURE CONTENT AND DRY DENSITY

Moisture content and dry density were determined from a number of the samples. The samples were first trimmed to obtain volume, weighed to determined the wet weight, and then were dried in accordance with ASTM D 2216. After drying, the weight of each sample was measured, and moisture content and dry density were calculated. Moisture content and dry density values are presented on the boring logs in Appendix A.

GRAIN SIZE DISTRIBUTION

Multiple soil samples were dried, weighed, soaked in water until individual soil particles were separated, and then washed on the No. 200 sieve. That portion of the material retained on the No. 200 sieve was oven-dried and weighed to determine the percentage of the material passing the No. 200 sieve. For select samples, the retained material was then run through a standard set of sieves in accordance with ASTM D 422 to classify the coarse fraction of representative sample. A summary of the percentages passing the No. 200 sieve is presented below. The grain size distribution data obtained from the full sieve analyses are presented in Figures B-1 to B-3.

BORING NO.	DEPTH (ft)	SOIL DESCRIPTION	PERCENT PASSING No. 200 SIEVE
B-2	2	Silty Sand (SM)	25
B-6	5	Sand with Silt (SP-SM)	8
B-8	5	Silty Sand (SM)	27
B-11	7	Sand with Silt (SP-SM)	10
B-12	5	Silty Sand (SM)	21
B-14	0 – 5	Silty Sand (SM)	38
B-15	0 – 5	Silty Sand (SM)	32
B-15	2	Silty Sand (SM)	30

BORING NO.	DEPTH (ft)	SOIL DESCRIPTION	PERCENT PASSING No. 200 SIEVE
B-15	5	Silty Sand (SM)	28
B-15	10	Sand with Silt (SP-SM)	11
B-16	2	Silty Sand (SM)	27
B-16	5	Silty Sand (SM)	31
B-16	7	Silty Sand (SM)	17
B-16	10	Silty Sand (SM)	13
B-17	0 – 5	Silty Sand (SM)	35
B-17	2	Sandy Silt (ML)	53
B-17	10	Silty Sand (SM)	16
B-101	2	Sandy Silt (ML)	53
B-101	7	Silty Sand (SM)	17
B-102	5	Sand with Silt (SP-SM)	11
B-102	10	Silty Sand (SM)	21
B-103	5	Silty Sand (SM)	16
B-103	10	Silty Sand (SM)	13

ATTERBERG LIMITS

Liquid and plastic limits were determined for select samples of cohesive material in accordance with ASTM D 4318. Results of the Atterberg Limits tests are summarized on Figure B-4.

DIRECT SHEAR

Direct shear tests were performed on undisturbed and remolded bulk samples in accordance with ASTM D 3080. The bulk sample was remolded to approximately 90 percent of maximum density (ASTM D1557). The samples were placed in the shear machine, and a normal load comparable to the in-situ overburden stress was applied. The samples were inundated, allowed to consolidate, and then were sheared to failure. The tests were repeated on additional test specimens under increased normal loads. Shear stress and sample deformation were monitored throughout the test. The results of the direct shear tests are presented in Figures B-5 to B-7.

COMPACTION TEST

Maximum dry density/optimum moisture tests were performed in accordance with ASTM D 1557 on select, representative bulk samples of the site soils. The test results are as follows:

BORING NO.	DEPTH (ft)	SOIL DESCRIPTION	OPIMUM MOISTURE (%)	MAXIMUM DRY DENSITY (pcf)
B-14	0 – 5	Silty Sand (SM)	9.0	133
B-16	0 – 5	Silty Sand (SM)	8.0	132

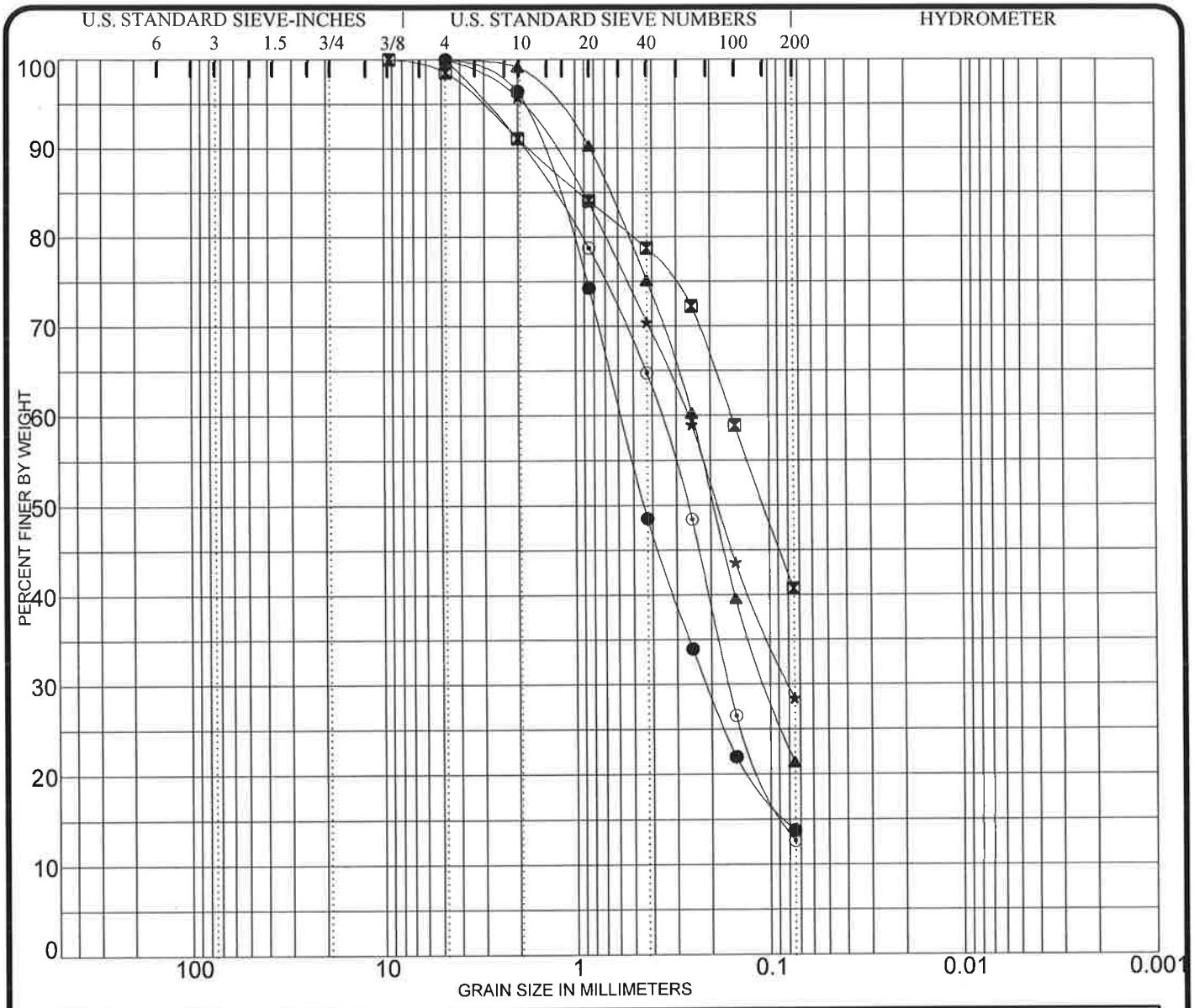
R-VALUE

Suitability of the near-surface soils for pavement was evaluated by conducting an R-value test. The test was performed in accordance with ASTM D 2844 by GeoLogic Associates (GLA) under subcontract to GPI. The result of the test is as follows:

BORING NO.	DEPTH (ft)	SOIL DESCRIPTION	R-VALUE BY EXPANSION
B-16	0 – 5	Silty Sand (SM)	63

CORROSIVITY

Soil corrosivity testing was performed by Schiff and Associates (currently HDR) on a soil samples provided by GPI. The test results are summarized in Table 1 of this Appendix.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample Location		Classification	MC%	LL	PL	PI	Cc	Cu
●	B-1	5.0	SILTY SAND (SM)						
⊠	B-1	15.0	SILTY SAND (SM)						
▲	B-15	7.0	SILTY SAND (SM)						
★	B-16	0.0	SILTY SAND (SM)						
⊙	B-17	5.0	SILTY SAND (SM)						

	Sample Location		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-1	5.0	4.75	0.58	0.211		0.0	86.2	13.8	
⊠	B-1	15.0	9.35	0.16			1.5	57.8	40.7	
▲	B-15	7.0	4.75	0.25	0.104		0.0	78.7	21.3	
★	B-16	0.0	4.75	0.26	0.081		0.0	71.6	28.4	
⊙	B-17	5.0	4.75	0.36	0.163		0.0	87.4	12.6	

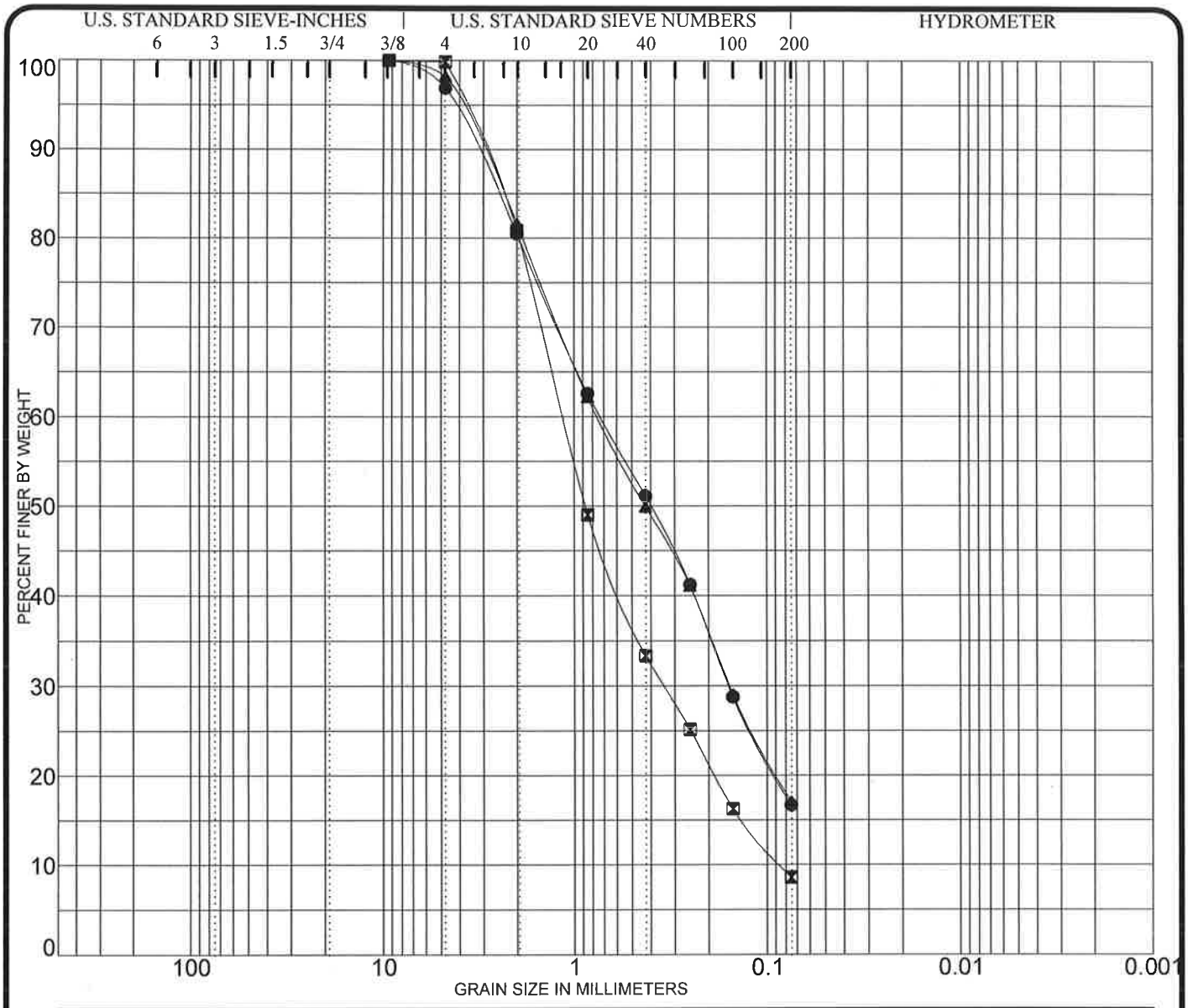
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GRAIN SIZE DISTRIBUTION

FIGURE B-1



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample Location		Classification	MC%	LL	PL	PI	Cc	Cu
●	B-4	10.0	SILTY SAND (SM)						
⊠	B-7	5.0	SAND with SILT (SW-SM)					1.21	13.4
▲	B-9	7.0	SILTY SAND (SM)						

	Sample Location		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-4	10.0	9.35	0.73	0.158		3.1	80.2	16.7	
⊠	B-7	5.0	9.35	1.14	0.343	0.0853	0.1	91.3	8.6	
▲	B-9	7.0	9.35	0.75	0.156		1.8	81.2	17.1	

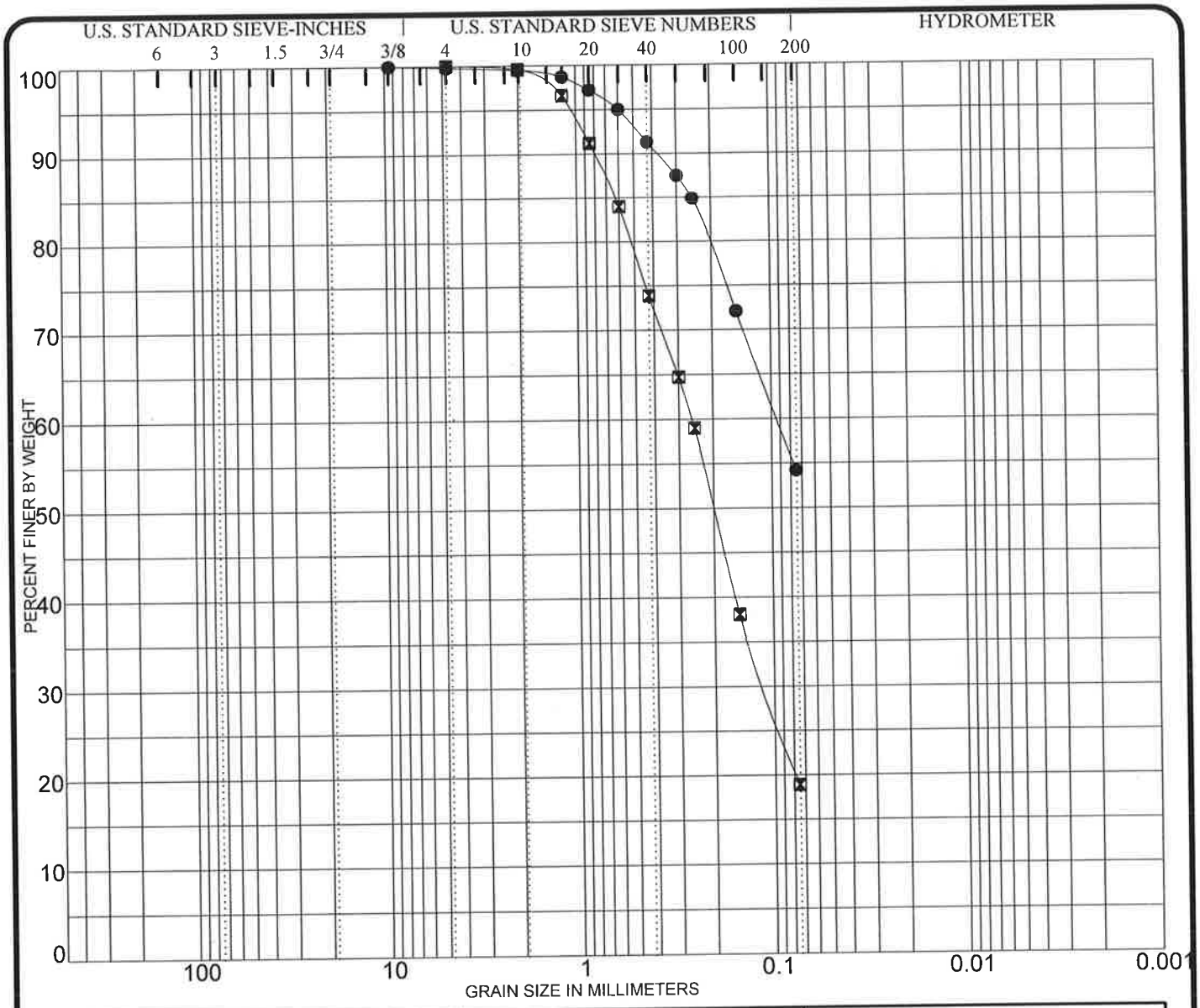
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GRAIN SIZE DISTRIBUTION

FIGURE B-2



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample Location		Classification	MC%	LL	PL	PI	Cc	Cu
●	B-101	2.0	SANDY SILT (ML)						
⊠	B-101	7.0	SILTY SAND (SM)						

	Sample Location		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-101	2.0	9.50	0.09			0.2	45.6	54.2	
⊠	B-101	7.0	4.75	0.26	0.112		0.0	81.1	18.9	

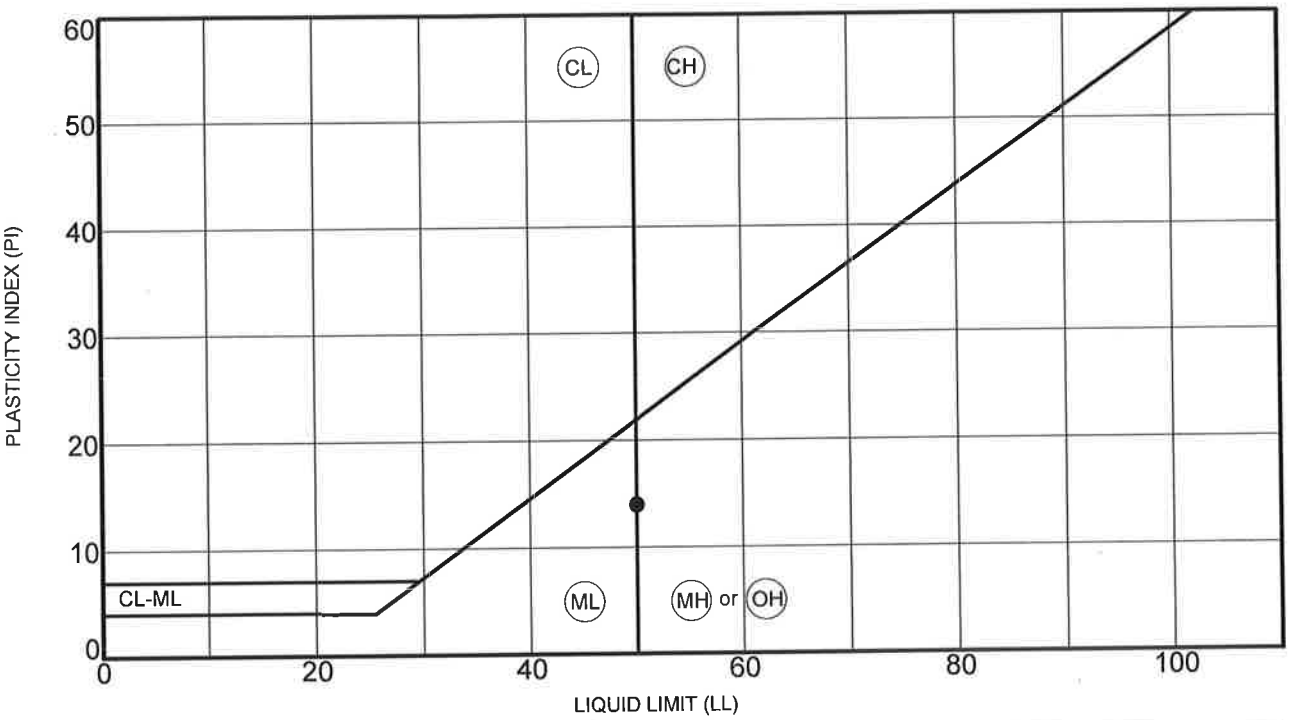
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GPI

GRAIN SIZE DISTRIBUTION

FIGURE B-3



	SAMPLE LOCATION		LL	PL	PI	Fines, %	Classification
●	B-3	15.0	50	36	14		SANDY SILT (ML/MH)

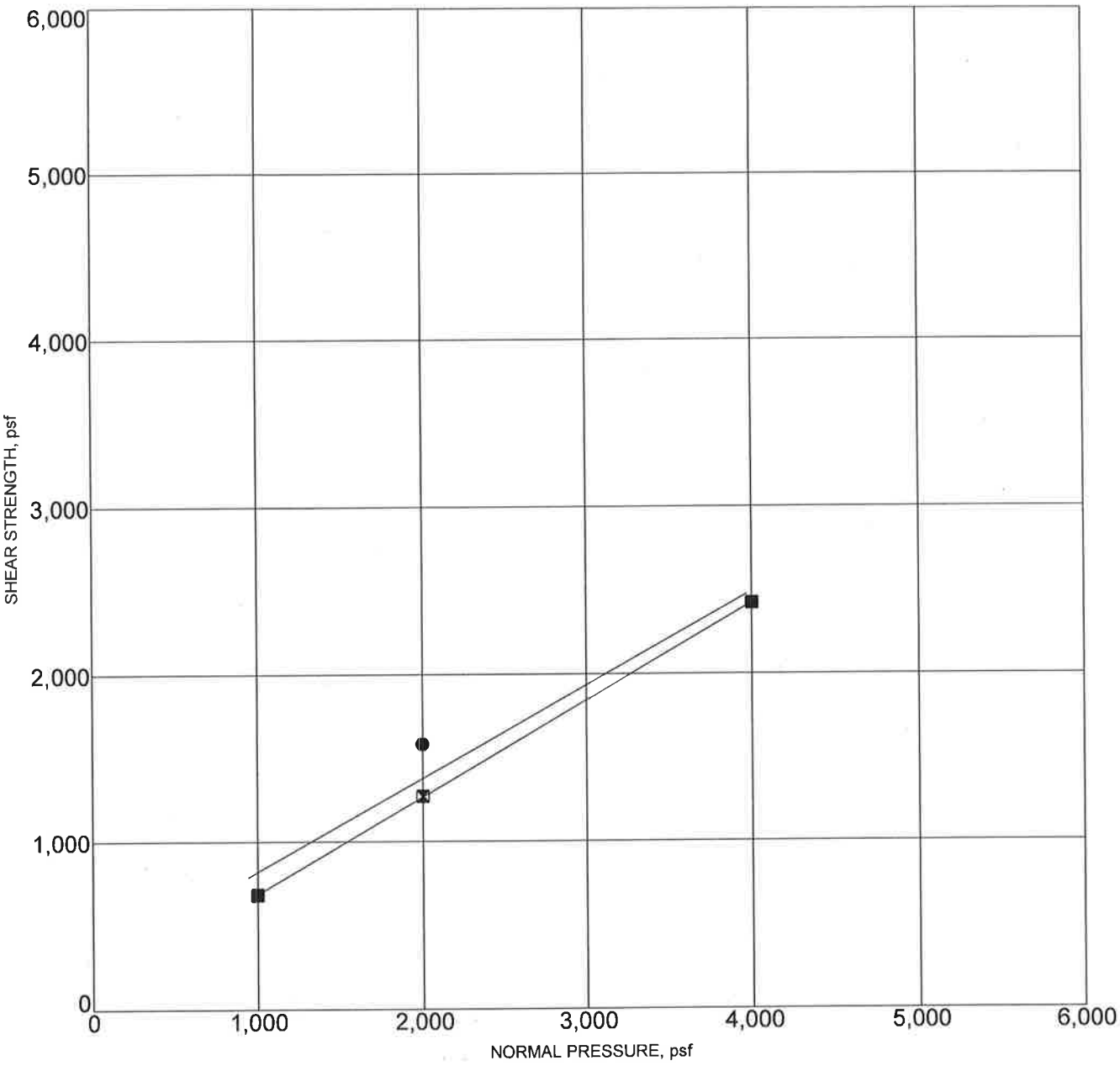
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GPI

ATTERBERG LIMITS TEST RESULTS

FIGURE B-4



● **PEAK STRENGTH**
Friction Angle= 29 degrees
Cohesion= 264 psf

⊠ **ULTIMATE STRENGTH**
Friction Angle= 30 degrees
Cohesion= 108 psf

Sample Location		Classification	DD,pcf	MC,%
B-8	5.0	SILTY SAND (SM)	104	2.8

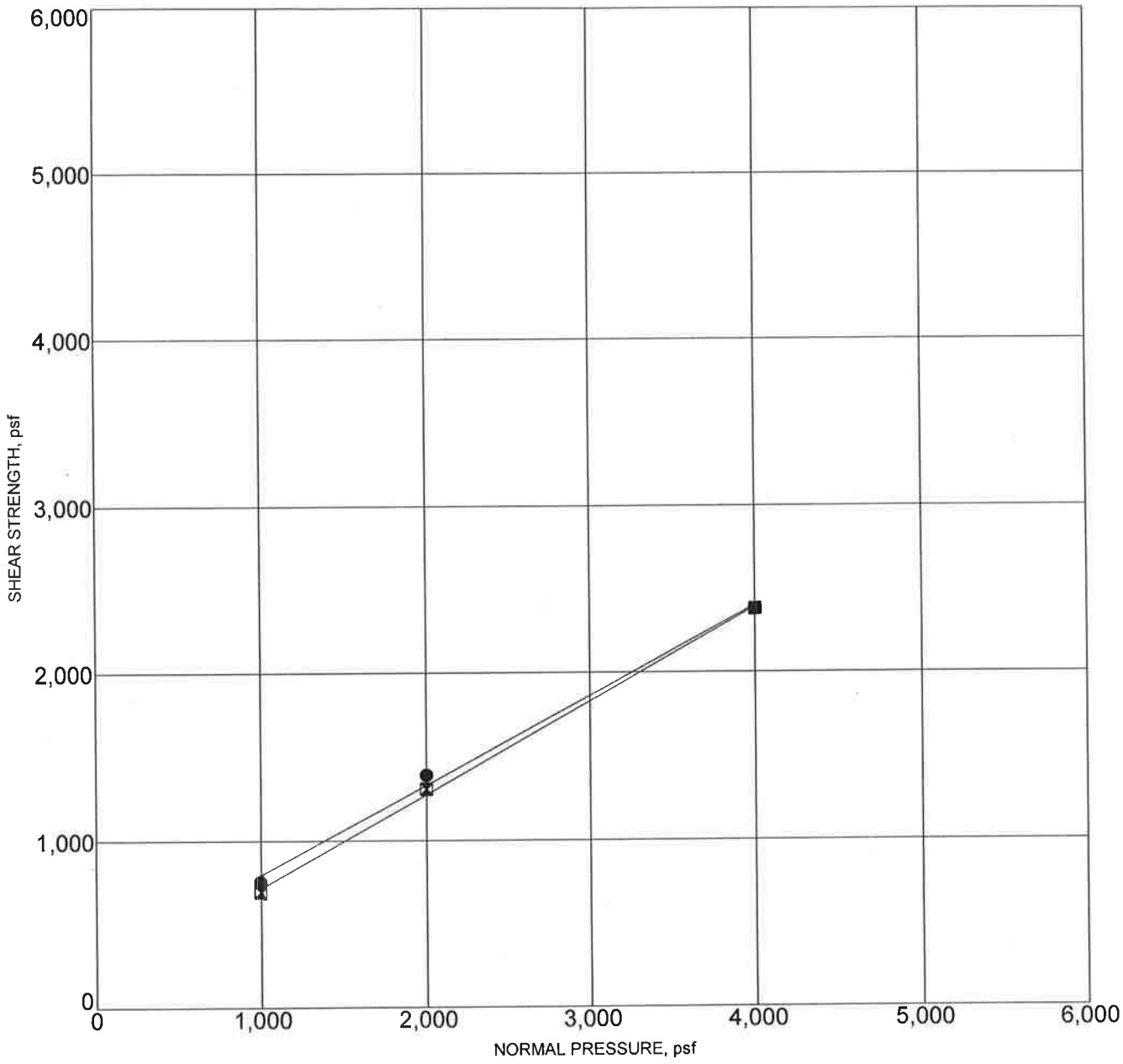
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DIRECT SHEAR TEST RESULTS

FIGURE B-5



● **PEAK STRENGTH**
Friction Angle= 28 degrees
Cohesion= 264 psf

⊠ **ULTIMATE STRENGTH**
Friction Angle= 29 degrees
Cohesion= 162 psf

Note: Samples remolded to 90% of maximum dry density

Sample Location		Classification	DD,pcf	MC,%
B-14	0-5	SILTY SAND (SM)	120	9.5

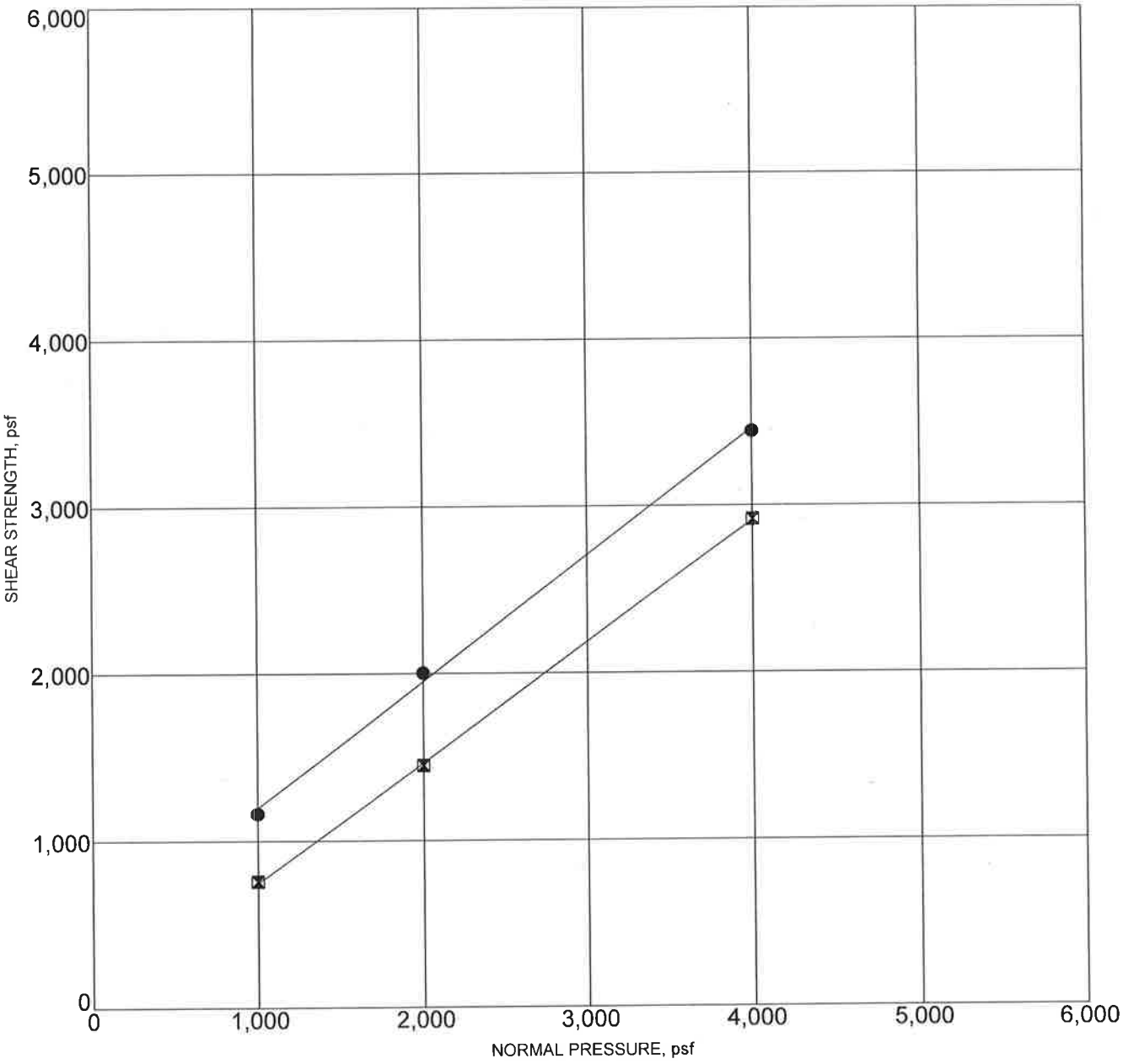
PROJECT: VINEYARD/VAL VISTA

PROJECT NO.: 2833.I

GPI

DIRECT SHEAR TEST RESULTS

FIGURE B-6



● **PEAK STRENGTH**
Friction Angle= 37 degrees
Cohesion= 444 psf

⊠ **ULTIMATE STRENGTH**
Friction Angle= 36 degrees
Cohesion= 24 psf

Sample Location		Classification	DD,pcf	MC,%
B-101	5.0	WEATHERED BEDROCK: SILTY SAND (SM)	121	3.8

PROJECT: VINEYARD/VAL VISTA

PROJECT NO.: 2833.I

GPI

DIRECT SHEAR TEST RESULTS

FIGURE B-7

Appendix 4: Historical Site Conditions

Phase I Environmental Site Assessment or Other Information on Past Site Use

Not Applicable

Appendix 5: LID Infeasibility

LID Technical Infeasibility Analysis

Not Applicable

Appendix 6: BMP Design Details

BMP Sizing, Design Details and other Supporting Documentation

Santa Margarita Watershed

BMP Design Volume, V_{BMP} (Rev. 03-2012)

Legend: Required Entries / Calculated Cells

(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)

Company Name	Excel Engineering	Date	3/26/2018
Designed by	Ian Zachary	County/City Case No	
Company Project Number/Name	17-065		
Drainage Area Number/Name	BMP-1 Bio-Retention		

Enter the Area Tributary to this Feature A_T = 3.745 acres

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

Site Location

Township: T 06 S

Range: R 03 W

Section: 26

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.58

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Mixed Surface Types

Effective Impervious Fraction I_f = 0.90

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$

C = 0.73

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$

V_u = 0.42 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 5,709 ft^3

Notes:

Santa Margarita Watershed

BMP Design Volume, V_{BMP} (Rev. 03-2012)

Legend: Required Entries / Calculated Cells

(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)

Company Name	Excel Engineering	Date	3/26/2018
Designed by	Ian Zachary	County/City Case No	
Company Project Number/Name	17-065		
Drainage Area Number/Name	BMP-2 Bio Retention		

Enter the Area Tributary to this Feature A_T = 4.215 acres

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

Site Location

Township: T 06 S

Range: R 03 W

Section: 26

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.58

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Mixed Surface Types

Effective Impervious Fraction I_f = 0.90

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$

C = 0.73

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$

V_u = 0.42 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 6,427 ft^3

Notes:

Santa Margarita Watershed

BMP Design Volume, V_{BMP} (Rev. 03-2012)

Legend: Required Entries / Calculated Cells

(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)

Company Name	Excel Engineering	Date	3/26/2018
Designed by	Ian Zachary	County/City Case No	
Company Project Number/Name	17-065		
Drainage Area Number/Name	BMP-C1 Westside of Warm Springs Parkway		

Enter the Area Tributary to this Feature A_T = 0.903 acres

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

Site Location

Township: T 06 S

Range: R 03 W

Section: 26

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.58

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Mixed Surface Types

Effective Impervious Fraction I_f = 0.90

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$

C = 0.73

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$

V_u = 0.42 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 1,377 ft^3

Notes:

Santa Margarita Watershed

BMP Design Volume, V_{BMP} (Rev. 03-2012)

Legend: Required Entries / Calculated Cells

(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)

Company Name	Excel Engineering	Date	3/26/2018
Designed by	Ian Zachary	County/City Case No	
Company Project Number/Name	17-065		
Drainage Area Number/Name	BMP-C2 Eastside of Warm Springs Parkway		

Enter the Area Tributary to this Feature A_T = 0.728 acres

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

Site Location

Township: T 06 S

Range: R 03 W

Section: 26

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.58

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Mixed Surface Types

Effective Impervious Fraction I_f = 0.90

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$

C = 0.73

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$

V_u = 0.42 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 1,110 ft^3

Notes:

Tree Wells were calculated based on Tree Credit Volume Table Section B.2.2.1 Street Trees of County of San Diego BMP Manual 2016.

Mature Tree Canopy Diameter (ft)	Tree Credit Volume (ft^3/tree)
5	10
10	40
15	100
20	180
25	290
30	420

DMA-C1 drains to BMP-C1, Six tree wells are proposed as pollutant control for this area. Tree selected is 25 ft tree canopy diameter, the Tree Credit Volume is 246 cuft/tree. The required Vbmp = 1,377 cuft, therefore 6 trees are adequate.
6 trees x 246 cuft/tree = 1,476 cuft > 1,377 cuft ... OK!

DMA-C2 drains to BMP-C2, Six tree wells are proposed as pollutant control for this area. Tree selected is 25 ft tree canopy diameter, the Tree Credit Volume is 246 cuft/tree. The required Vbmp = 1,110 cuft, therefore 6 trees are adequate.
6 trees x 246 cuft/tree = 1,476 cuft > 1,110 cuft ... OK!

Soil Volume Sizing Per Tree

Adequate planting soil space provides nutrients, water, air, and root space that trees need to have a long, healthy life. The planting soil volume required depends on the fully-grown tree size. In general, 2 cuft of soil per one square foot of the tree's mature canopy area. Planting soil amendments for trees should be 3 ft deep; the length and width must ensure the appropriate volume for the tree species and site. CU structural soil (or equivalent) is to be used in planting areas experiencing load from sidewalks curb and gutter, parking stalls or roadways.

BMP-C1 (located at DMA-C1)

- Area of 23 ft diameter of mature tree is 415.5 sqft.
- Soil Volume: 2 cuft/sqft canopy = 2 cuft/sqft x 415.5 sqft = 831 cuft.
- Planting depth= 3ft.
- Number of trees = 6
- Therefore area of soil is = 831 cuft/3 ft = 277 sqft. ⟶ 10.65' W x 26'L Use 12'x 26'

BMP-C2 (located at DMA-C2)

- Area of 23 ft diameter of mature tree is 415.5 sqft.
- Soil Volume: 2 cuft/sqft canopy = 2 cuft/sqft x 415.5 sqft =831 cuft.
- Planting depth= 3ft.
- Number of trees = 6
- Therefore area of soil is = 831 cuft/3 ft = 277 sqft. ⟶ 10.65' W x 26'L Use 12'x 26'

Bioretention Facility - Design Procedure	BMP ID: BMP 1	Legend:	Required Entries / Calculated Cells

Company Name: Excel Engineering — Date: 26-Mar-18

Designed by: Ian Zachary — County/City Case No.:

Design Volume

Enter the area tributary to this feature — A_T = 3.537 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP} = 5,709 ft^3

Type of Bioretention Facility Design

(●) Side slopes required (parallel to parking spaces or adjacent to walkways)

( ) No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer — d_S = 18.0 ft

Top Width of Bioretention Facility, excluding curb — w_T = 56.0 ft

Total Effective Depth, d_E

$d_E = (0.3) \times d_S + (0.4) \times 1 - (0.7/w_T) + 0.5$ — d_E = 1.79 ft

Minimum Surface Area, A_m

$$A_M\ (ft^2) = \frac{V_{BMP}\ (ft^3)}{d_E\ (ft)}$$

A_M = 3,194 ft^2

Proposed Surface Area — A= 6,503 ft^2

Bioretention Facility Properties

Side Slopes in Bioretention Facility — z = 4 :1

Diameter of Underdrain — 6 inches

Longitudinal Slope of Site (3% maximum) — 0.5 %

6" Check Dam Spacing — 0 feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID: BMP 1	Legend:	Required Entries / Calculated Cells

Company Name:	Excel Engineering	Date:	26-Mar-18
Designed by:	Ian Zachary	County/City Case No.:	

Design Volume

Enter the area tributary to this feature — A_T = 4.4227 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP} = 6,427 ft^3

Type of Bioretention Facility Design

(●) Side slopes required (parallel to parking spaces or adjacent to walkways)

( ) No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer — d_S = 18.0 ft

Top Width of Bioretention Facility, excluding curb — w_T = 56.0 ft

Total Effective Depth, d_E

$d_E = (0.3) \times d_S + (0.4) \times 1 - (0.7/w_T) + 0.5$ — d_E = 1.79 ft

Minimum Surface Area, A_m

$$A_M\ (ft^2) = \frac{V_{BMP}\ (ft^3)}{d_E\ (ft)}$$

A_M = 3,596 ft^2

Proposed Surface Area — A= 6,024 ft^2

Bioretention Facility Properties

Side Slopes in Bioretention Facility — z = 4 :1

Diameter of Underdrain — 6 inches

Longitudinal Slope of Site (3% maximum) — 0.5 %

6" Check Dam Spacing — 0 feet

Describe Vegetation:

Notes:

Appendix 7: Hydromodification

Supporting Detail Relating to compliance with the HMP Performance Standards

SECTION I - **Introduction**

This report provides Hydromodification analysis for a project located on the northeast corner of Clinton Keith Road and Antelope Road, Murrieta, California. The project proposes a business center with retail buildings such as stores, and fitness center. The current grading plans involve several units of construction. This report accounts for unit 2 of the design and will assume unit 1 is constructed. The overall area will be mass graded and calls for three parcels to be graded to final pads and parking lots to subgrade. This report provides analysis for a complete site buildout based on the approved development plan for unit 2.

Hydromodification calculations are performed utilizing continuous simulation analysis to determine the flow duration for the flow rates that fall within the geomorphologically significant flows[1]. Storm Water Management Model (SWMM) version 5.1 distributed by USEPA is the basis of all calculations within this report. SWMM generates peak flow recurrence frequencies and flow duration series statistics based on an assigned rain gauge for pre-development, unmitigated and mitigated flows to determine compliance with the Santa Margarita Region Hydromodification Management Plan (SMR HMP) in response to Provision F.1.h of the 2010 SMR Municipal Separate Storm Sewer System (MS4) Permit (order R9-2010-0016). The rain gauge station 048844 in Temecula California is utilized for this project to determine the historical rain data for continuous simulation in SWMM.

The analysis of this project requires only one Point-Of-Compliance (POC) and is referred to as POC-1 and POC-2 for both pre-development and mitigated post-development conditions. Tributary areas to POC-1 are labeled Basins in the pre-developed conditions and as DMA (Drainage Management Area) in the post-developed conditions. A distinction is made between private and public tributary areas in the post-development conditions. DMAs that are within privately owned areas of the project are labeled with numbers while DMAs within the public right-of-way are labeled with letters.

Pre-development conditions contain 4 Basins labeled 1 to 4 while the post-development conditions contain 14 DMAs labeled 1 to 10 and A to C1 and C2. The total tributary within the project is approximately 8.89 acres.

The Hydromodification and Water Quality systems proposed for this project is bioretention basin located throughout the project development. Detention pipe with flow control orifices are utilized as hydromodification tool. The systems are designed to capture and detain storm runoff on the surface and filter through a soil mix to a gravel storage area below the surface. The runoff is then conveyed through an underground pipe network to an existing open channel which currently collects the sites storm flows. The resulting mitigated outflows are shown to be equal to, less than the pre-developed outflows or within the 10% tolerance.

Low Flow Threshold

A low flow threshold of 10% of 2-year storm event (0.1Q2) was used for this analysis. This low flow threshold will be used to meet peak flow frequency and flow duration controls. No downstream channel assessment was done.

[1] Geomorphically significant flows are defined as the rate of storm water runoff flow causes erosive conditions. For this study, these flows occur during the 10% of 2-year, 2-year, 5-year and 10-year flows.

SECTION II - **SWMM MODEL SETUP**

SWMM provides continuous precipitation based on historical rain gauge data onto a sub-catchment. A model for both pre-developed and post-developed conditions is then developed to analyze the amount and frequency of runoff due to surface conditions. The resulting data for both the pre-developed and post-developed conditions are then compared to determine the impact of runoff to the project due to the development of the site.

Pre-development Model Setup
The pre-development areas are divided into five basins delineated based on the soil types and hydrology features. Site delineation can be found in Figure-2 on the next page.

For the purpose of this study, the site is assumed to have 0% of impervious surface area. The site is a natural vacant land. Viewing historical aerials of the site, it is determined that the site had land coverage of a rough bare packed soil. Giving the site characteristics, a manning's value of 0.040 is used.

Post-Development Model Setup
The post-development areas are divided into 14 DMAs (Drainage Management Areas) based on topography, soil type and hydraulic systems. Figure 3 (on the next page) shows the delineation of each DMA.

Bioretention sections are similar in configuration as seen in figure-1 below. The bottom elevation for each is assumed at 0 ft within the LID editor. The variations of the two systems consist of the minimum width that each is constructed to. Figure-1 below demonstrates a 6' minimum width for bioretention basins. The bioretention basins utilize the BMP manual's default value of 5 in/hr for surface infiltration rates follow SWMM's default values listed in the help file under "Soil Characteristics".

The assumed manning's number for the post-developed conditions is based off of well-maintained landscape areas with medium trees and shrubs. Thus, an N-value of 0.1 is used for this analysis.

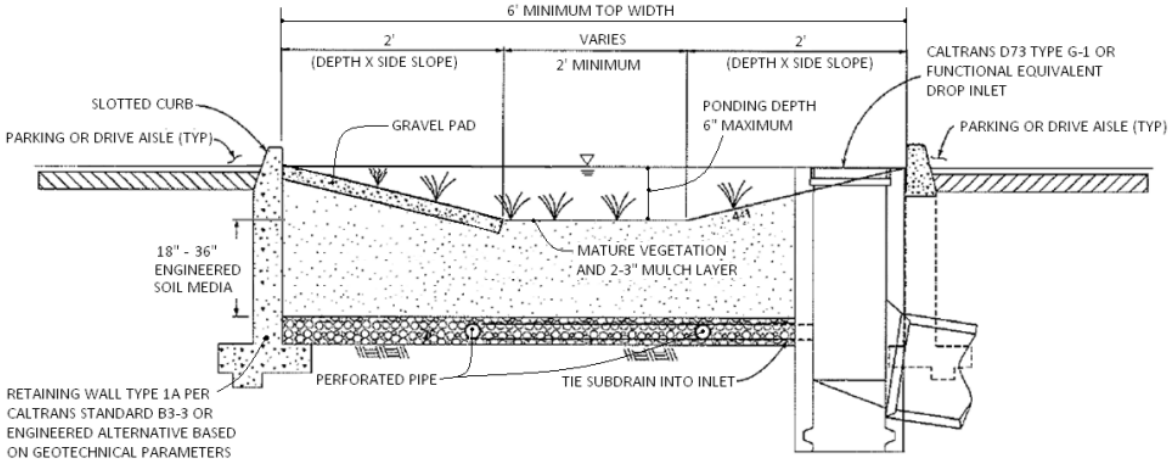
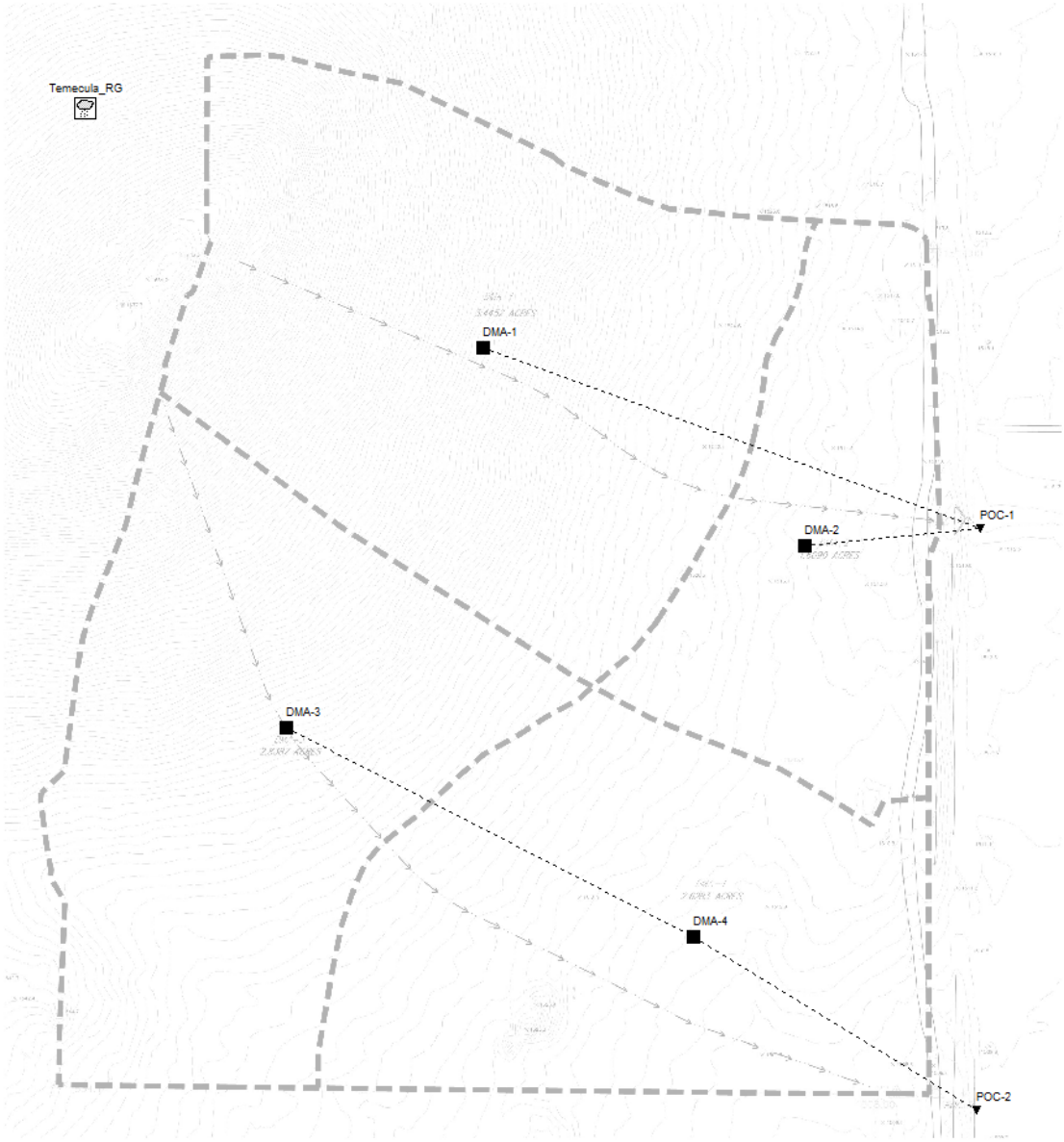


Figure-1. Bioretention (BMP-1~15) Section



N

Figure-2. Pre-Development of SWMM continuous model
(See Attachment I for more detail)

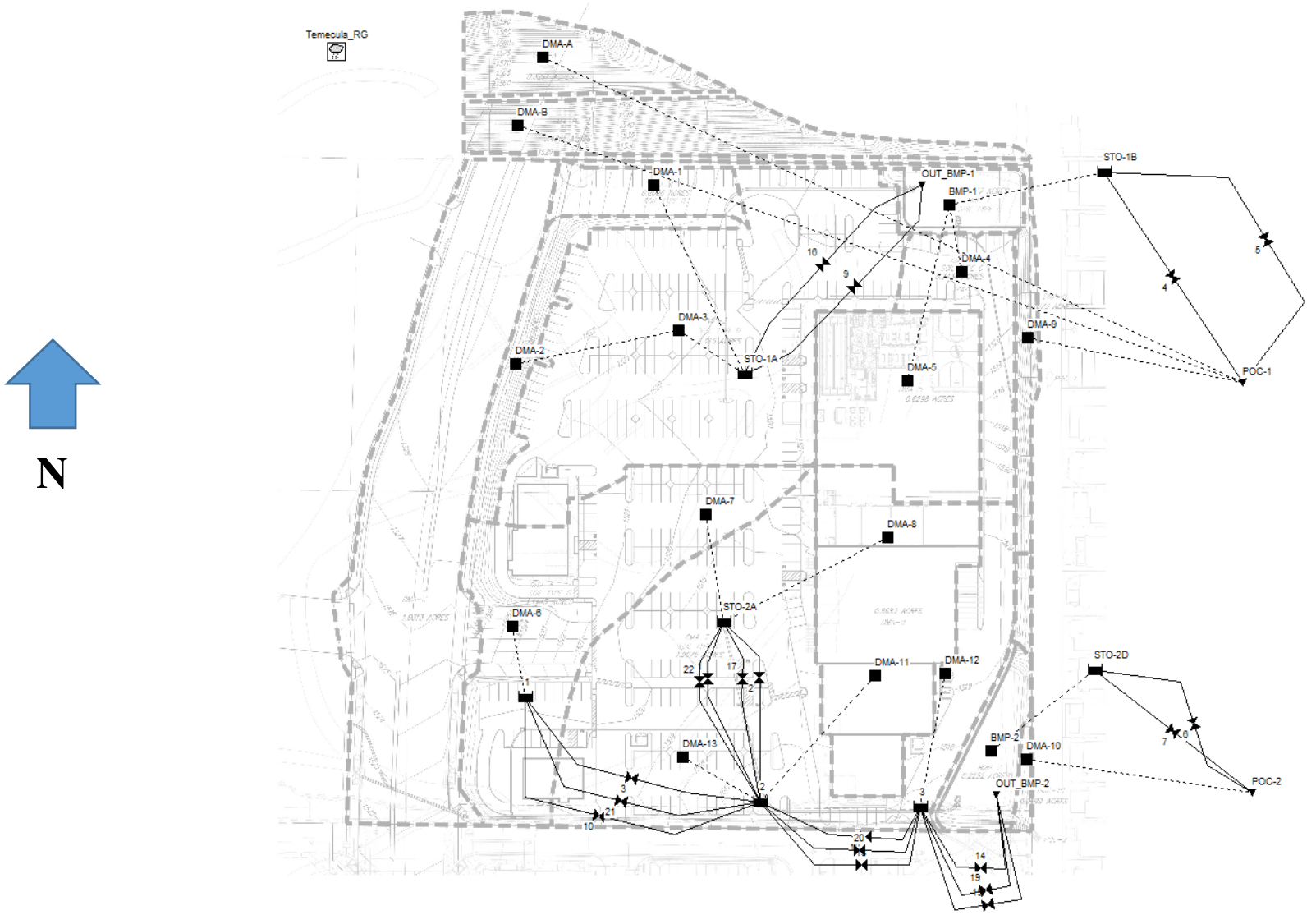


Figure-3. Mitigated Post-Development of SWMM continuous model
(See Attachment I for more detail)

Pre-Development Basin Areas & Post-Development (DMAs)

Basin areas and DMAs provide an important framework for feasibility screening, BMP prioritization and storm water management system configuration. Both Basin Areas and DMAs are defined based on drainage patterns of the site and the BMPs to which they drain. Below is a summarization of Basins and DMAs within this study, excluding any LID area that resides within its boundary:

PRE-DEVELOPMENT SUBCATCHMENT

Name	Rain Gage	Outlet	Area	%Imperv	Width	%Slope
DMA-1	Temecula_RG	POC-1	3.8372	0	342	30
DMA-2	Temecula_RG	POC-1	0.8802	0	420	6
DMA-3	Temecula_RG	POC-1	3.4134	0	1420	20
DMA-4	Temecula_RG	POC-1	0.7591	0	1571	15
		Total Area	8.89	acres		

POST-DEVELOPMENT SUBCATCHMENT

DMA Name	Rain Gage	Outlet	Area	%Imperv	Width	%Slope
DMA-1	Temecula_RG	STO-1A	0.2026	85	50	5
DMA-2	Temecula_RG	DMA-3	0.2608	0	437	50
DMA-3	Temecula_RG	STO-1A	1.9514	85	509	2.5
DMA-4	Temecula_RG	BMP-1	0.3434	85	120	3.8
DMA-5	Temecula_RG	bmp-1	0.6298	100	343	1
DMA-6	Temecula_RG	1	0.8097	85	167	2
DMA-7	Temecula_RG	STO-2A	0.9615	85	115	2.6
DMA-8	Temecula_RG	STO-2A	0.3921	100	125	1
DMA-9	Temecula_RG	POC-1	0.2073	0	475	50
DMA-10	Temecula_RG	POC-2	0.0699	0	203	50
BMP-2	Temecula_RG	STO-2D	0.1383	0	89	0.5
DMA-A	Temecula_RG	POC-1	0.3665	0	243	50
DMA-B	Temecula_RG	POC-1	0.5629	0	481	50
BMP-1	Temecula_RG	STO-1B	0.1493	0	135	0.5
DMA-11	Temecula_RG	2	0.4762	100	125	0.5
DMA-12	Temecula_RG	3	0.4407	100	40	0.5
DMA-13	Temecula_RG	2	0.8953	85	200	0.5
		Total Area	8.86	acres		

SECTION III - **SYSTEM REPRESENTATION**

SWMM is a distributed model, which means that a study area can be subdivided into any number of irregular sub-catchments to best capture the effect that spatial variability in topography, drainage pathways, land cover, and soil characteristics have on runoff generation. For modeling of Hydromodification calculations, there are four main system representations: Rain gage, Sub-catchment (contributing basin or LID area), Nodes and Links.

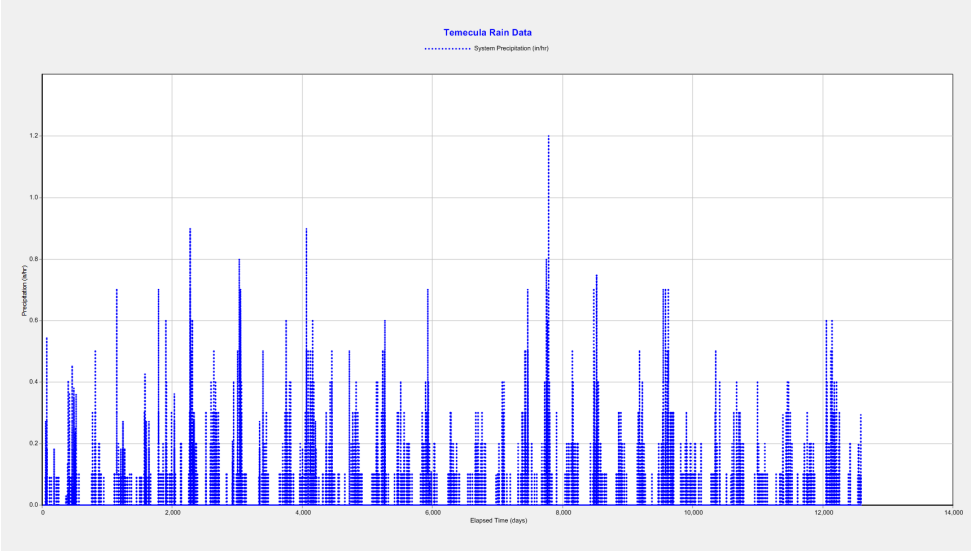


Fig. 4 – Time series rain data, which corresponds to runoff estimates for each of the 10,219 time of the 35-year simulation period. (Inches/hour vs. elapsed time)

Rain Gage

The properties of a rain gage describe the source and format of the precipitation data that are applied to the study area. For this project, the rainfall data used is from rain gauge station 048844 in Temecula California. This rain gauge data was obtain via the EPA program "EPA Storm water Calculator".

The Temecula rain data has 35 years of hourly precipitation data from 10/16/1971 to 03/29/2006 and generates 35 years of hourly runoff estimates, which corresponds to runoff estimates for each of the 10,219 time steps of the 35 year simulation period. See figure 4 for hourly precipitation intensity graph for the 35-year dataset.

Sub-catchment (contributing basin or LID area)

A basin is modeled using a sub-catchment object, which contains some of the following properties:

Rain Gage

The rate of storm water runoff and volume depends directly on the precipitation magnitude and its spatial and temporal distribution over the catchment. Each sub-catchment in SWMM is linked to a rain gage object that describes the format and source of the rainfall input for the sub-catchment.

Area
This area is bounded by the sub-catchment boundary. Its value is determined directly from maps or field surveys of the site or by using SWMM's Auto-length tool when the sub-catchment is drawn to scale on SWMM's study area map. This Project is divided into several sub-catchments based on drainage patterns and its outfall.

Width
The width for each sub-catchment is determined by conceptually creating an idealized representation of the irregular shaped sub-catchment. The idealization is done by utilizing the method found in SWMM Reference Manual, Volume 1, section 3.8.4, equations 3-10 & 3-12.

In brief, the idealized width for a sub-catchment is defined by dividing the sub-catchment into two sections. The dividing line for a sub-catchment is the longest overland flow path for the storm water runoff within the sub-catchment (also known as the main drainage channel). The larger of the two determined sections is divided by the total area to ascertain the skew factor for the idealized shape, per Equation 3-10. The shape factor for the actual water shed is then determined by dividing the total area of the sub-catchment and dividing by the square of the main drainage channel length. The idealized shape factor is then determined by using the derived skew factor and watershed shape factor in Equation 3-12. Lastly, the idealized shape factor is multiplied by the length of the main drainage channel to determine the width used for the sub-catchment. Provided below are the equations found in the SWMM Reference Manual, Volume 1:

$\boldsymbol{Z = A_m/A}$	Skew Factor (Eq. 3-10)
$\boldsymbol{X = A/L^2}$	Watershed Shape Factor
$\boldsymbol{Y = 2X(1.5 - Z)(2K^2 - X)/(2K - 1)}$	Idealized Shape Factor (Eq. 3-12)
$\boldsymbol{W = Y * L}$	Sub-catchment Width

Slope
This is the area-weighted average of slopes within a sub-catchment.

Imperviousness
This is the percentage of sub-catchment area covered by impervious surfaces such as sidewalks and roadways or wherever rainfall cannot infiltrate into the surfaces.

Roughness Coefficient
The roughness coefficient reflects the amount of resistance that overland flow encounters as it runs off of the sub-catchment surface. This is determined from the HEC RAS User Manuel Table 3-1.

Infiltration Model
The infiltration model used for the proposed project is based on the Green-Ampt infiltration model. Based on surface conditions and soils report, it was determined that the proposed project site contains soil type C and D with infiltration rate of .38 in/hr.

[2] A default value of 4 is used for 'K', the upper limit on the watershed shape factor

LID controls

LID controls are established to model storm water runoff collection, detention and/or treatment. This project proposes to use bio-retention module, for storm water treatment and runoff collection. This LID type contain an engineered soil mixture placed above a gravel drainage bed. Further discussion can be found in Section IV of this report. Below is a chart denoting each LID used within a sub-catchment:

SUBCATCHMENT	LID	BMP AREA
BMP-1	BMP-1	6503.51
BMP-2	BMP-2	6024.35

SECTION IV - **CONTINUOUS SIMULATION OPTIONS**

Kinematic Wave Routing Model
This routing method solves the continuity equation along with a simplified form of the momentum equation in each conduit. The latter requires that the slope of the water surface be equal to the slope of the conduit.

The maximum flow that can be conveyed through a conduit is the full normal flow value. Any flow in excess of this value, entering the inlet node, is either lost from the system or can pond atop the inlet node and be re-introduced into the conduit as capacity becomes available.

Kinematic wave routing allows flow and area to vary both spatially and temporally within a conduit. This can result in attenuated and delayed outflow hydrographs as inflow is routed through the channel. However this form of routing cannot account for backwater effects, entrance/exit losses, flow reversal, or pressurized flow, and is also restricted to dendritic network layouts. For this reason, the model does not contain any conduits and utilizes storage nodes for runoff capture and release.

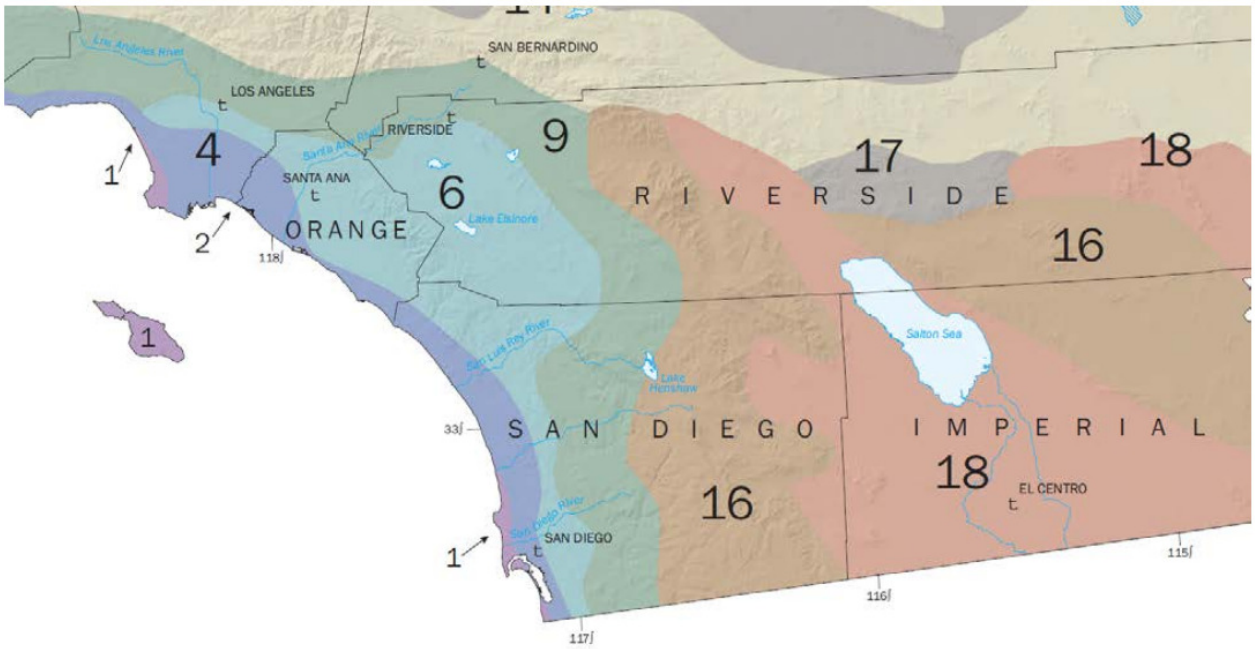
Simulation Dates
These dates determine the starting and ending dates/times of a simulation and are chosen based on the rain data availability within the selected rain gauge.
Start analysis on 10/16/1971
Start Reporting on 10/16/1971
End Analysis on 03/29/2006

Time Steps
Simulation dates are divided into intervals (time steps) at which computations will be analyzed. At each time step SWMM performs runoff computation, routing computation and results reporting. Time steps are specified in days and hours: minutes: seconds, except for flow routing which is entered as decimal seconds.

Climatology
-Evaporation Data
The available monthly evaporation data for the project area is obtained from the California Irrigation Management Information System "Reference Evapotranspiration Zones" brochure and map (CIMIS ETo Zone Map), prepared by California Department of Water Resources, dated January 2012. Project site falls in "Zone 6" Upland Central Coast and Los Angeles Basins based on CIMIS ETo Zone map.

Table 2 – Zone 6 Monthly Evaporation data (in/day)

January	February	March	April	May	June
0.060	0.080	0.110	0.160	0.180	0.210
July	August	September	October	November	December
0.210	0.200	0.160	0.120	0.080	0.060



SECTION V - **BIORETENTION LID CONTROL PARAMETERS**

LID controls are represented by a combination of vertical layers whose properties are defined on a per-unit-area basis. This allows an LID of the same design but differing coverage area to easily be placed within different sub-catchments of a study area. During a simulation, SWMM performs a moisture balance that keeps track of how much water moves between and is stored within each LID layer. If the bioretention basin is full and water is leaving the upper weir, the flow is divided in two flows: the lower flow discharging from the bottom orifice directly draining to the point of compliance and the upper flow is routed at the top of the bio-retention basin and after routing, discharged to the point of compliance.

1. Surface

The Surface tab within the LID Control Editor establishes the constraints of the Bioretention LID at the surface. The parameters and default values are described below:

Storage Depth
When confining walls or berms are present, this is the maximum depth to which water can pond above the surface of the unit before overflow occurs (in inches). The surface storage depth for this project is set to the first outlet of the overflow riser. Any additional storage capacity of the Bioretention unit above the berm is modeled as a storage unit to ensure that the full storage depth is routed through the pond and does not contribute to overland flow.

Vegetation Volume Fraction
Vegetation Volume Fraction is the fraction of the volume within the storage depth that is filled with vegetation. This is the volume occupied by stems and leaves, not the surface area

coverage provided by the vegetation. BMPs for this project propose minimal use of vegetation. Therefore, the value of 0 for the vegetation volume fraction is used.

Surface Roughness
Surface roughness is assigned to all DMAs using Manning's n value. LIDs are assigned to a DMA and do not require the addition of a Manning's n value. Therefore, Manning's n value for overland flow over the surface of a vegetative pond is 0 (n=0).

Surface Slope
Bioretentions are designed to detain storm runoff and contain no slope. Thus, surface slope is considered 0 percent.

2. Soil

The Soil tab within the LID Control Editor describes the properties of the engineered soil mixture used within the Bioretention LID. The parameters and default values are described below:

Thickness
The thickness of the soil layer (inches). A typical thickness of a bioretention is 18".

Porosity
The volume of pore spaces relative to the total volume of soil (as a fraction). A maximum porosity value of 0.40 is used for the soil mix to reach an efficient percolation rate.

Field Capacity
The volume of pore water relative to total volume after the soil has been allowed to drain fully (as a fraction). A value of 0.2 is used as no vertical drainage occurs through the soil layer below this value.

Wilting Point
Soil moisture content at which plants cannot survive below this value (as a fraction). We assumed the minimum moisture content within the bioretention soil is 0.1.

Conductivity
Hydraulic conductivity for fully saturated soil. The minimum value for percolation requires a design rate of 5 inches/hour.

Conductivity Slope
Rate at which conductivity decreases with decreasing soil moisture. Typical values range from 5 for sands to 15 for silty clay. The conductivity slope for this project is set to 5 due to the soil mixture design having a very good percolation rate.

Suction Head
The average value of soil capillary suction along the wetting front (inches). This is designed as the suction head for a soil mix after several years of bioretention life span. Utilizing San Diego County's BMP Design Manual, Appendix G.1.5.3.4, Table G.1-7 design parameters for guidance, a suction head value of 1.5 inches was selected.

3. *Storage*

The Storage tab within the LID Control Editor describes the properties of the crushed stone or gravel layer used in bioretention cells as a bottom storage/drainage layer. The parameters and default values are described below:

Height
This parameter is the thickness of the gravel layer (inches). Gravel layer includes gravel and filter course below the engineered soil mixture.

Void Ratio
The volume of void space relative to the volume of solids in the layer (as a fraction). Note, void ratio = porosity / (1 + porosity). Riverside County's design requirement for the gravel storage layer sets the value for porosity at 0.40. Using the void ratio equation, a value of 0.67 is used.

Seepage Rate
The rate at which water infiltrates into the native soil below the layer (in/hour). This is the saturated hydraulic conductivity of the surrounding sub-catchment. Based on percolation test conducted by the soils engineer, the soil type is C and D and the value will be set to zero.

Clogging Factor
Total volume of treated runoff it takes to completely clog the bottom of the layer divided by the void volume of the storage layer. Clogging is ignored due to insignificant seepage rate and is set to zero.

4. *Drain*

The Drain tab within the LID Control Editor describes the properties of an optional undrain system within the storage layer of the LID unit. The parameters presented in this tab are used to determine the rate of flow through the underdrain. The parameter's default values are described below:

Flow Coefficient - C
Determines the restriction of flow on the underdrain orifice. To derive this value see explanation below:

Per SWMM "Drain Advisor":
"The user specifies… volumetric flow rate (per unit area)":

$$\boldsymbol{q = \frac{Q}{A_{lid}}} \qquad \text{Eq. 4.1}$$

Where: q = volumetric flow, $\frac{ft}{sec}$
Q = flow, cfs

A_{lid}= surface area of LID

Per SWMM "LID Control Editor – Drain system":
"The drain coefficient C and exponent n determines the rate of flow through a drain as a function of the height of stored water above the drain's offset. The following equation is used to compute this flow rate (per unit area of the LID unit)":

$$q = C_d h^n \qquad \text{Eq. 4.2}$$

Where:
q = volumetric flow, $\frac{ft}{sec}$
C_d= drain coefficient, unitless
h = ponding height above orifice, in
n = typical value for n is 0.5 (makes drain act like an orifice)

Standard orifice equation:

$$Q = C_o A_o \sqrt{2gh} \qquad \text{Eq. 4.3}$$

Where:
Q = flow, cfs
C_o= orifice coefficient, unitless
A_o= cross-sectional area of orifice, in
h = ponding height above orifice, in
g = gavity, 32.2 $\frac{ft}{sec^2}$

Converting orifice equation into volumetric flow per unit area of LID element:

$$\frac{Q}{A_{lid}} = \frac{C_o A_o \sqrt{2gh}}{A_{lid}} = q \qquad \text{Eq. 4.4}$$

Equations 4.2 and 4.3 are now in similar terms and can be compared:

$$C_d h^{0.5} = \frac{C_o A_o \sqrt{2gh}}{A_{lid}} \qquad \text{Eq. 4.5}$$

The height on both sides of the equation are similar and can be factored out:

$$C_d = C_o \sqrt{2g} \frac{A_o}{A_{lid}} \qquad \text{Eq. 4.6}$$

With an orifice coefficient of 0.6, equation 4.6 yields:

$$C_d = 60046 * \frac{A_o}{A_{lid}} \qquad \text{Eq. 4.7}$$

An example for use of Equation 4.7 can be found in the slotted drain example within the SWMM Drain Advisor (EPA SWMM 5.1 Help/Contents/Reference/Special Dialog Forms/LID

Editors/LID Control Editor/LID Drain System/Drain Advisor). The underdrain coefficient used for each LID within this project is listed below:

Sub Cat Name*	LID Area (sf)*	Orifice D (1/16in)	UD C factor*	ORIFICE (INCHES)
BMP-1	6503.51	11	0.0385	0.875
BMP-2	6024.35	14	0.157	1.687

The character * in the column heading indicates that the values was read directly from the SWMM inp file.
Assume: orifice coefficient C_o = 0.60, void ratio for surface = 1.0, centroid of underdrain orifice is located at h=0

BMP-14 is connected to the underground detention pipe, therefore orifice controller is not part of the bioretention but it's included in the box control of the underground detention pipe.

Flow Exponent - n
Establishes the underdrain characteristics. The outlets for each bioretention LID are designed to function as an orifice. Thus, the value is set to 0.5, per SWMM Help file.

Offset Height - H_d
Distance from the bottom of the Storage layer to the invert of the drain outlet (inches). For this project, the offset value is set to 3 inches.

SECTION VI - **SWMM Hydraulic Components**

SWMM contains a flexible set of hydraulic modeling capabilities used to route runoff and external inflows through a storm drain network, channels, storage and diversion structures. The components used within this model are described below:

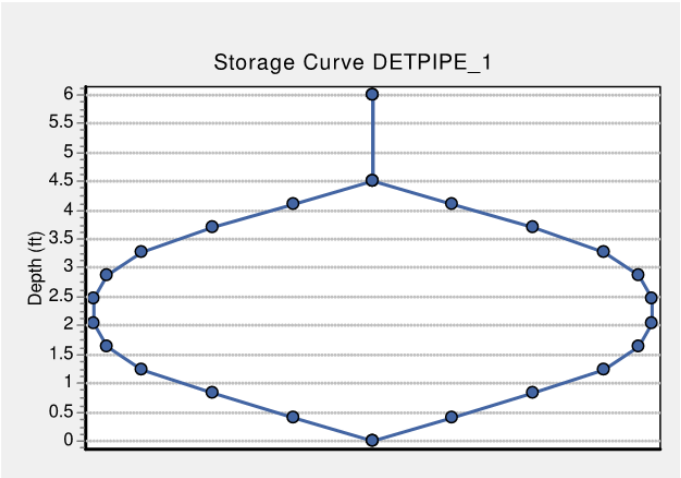
1. ***Storage Nodes***

   Storage nodes provide a storage unit within SWMM which provides storage of storm water runoff. Physically, the node represents storage facilities as small as a catch basin or surface storage up anything as large as a lake. The volumetric properties of the storage node is described in a table of surface area versus height.

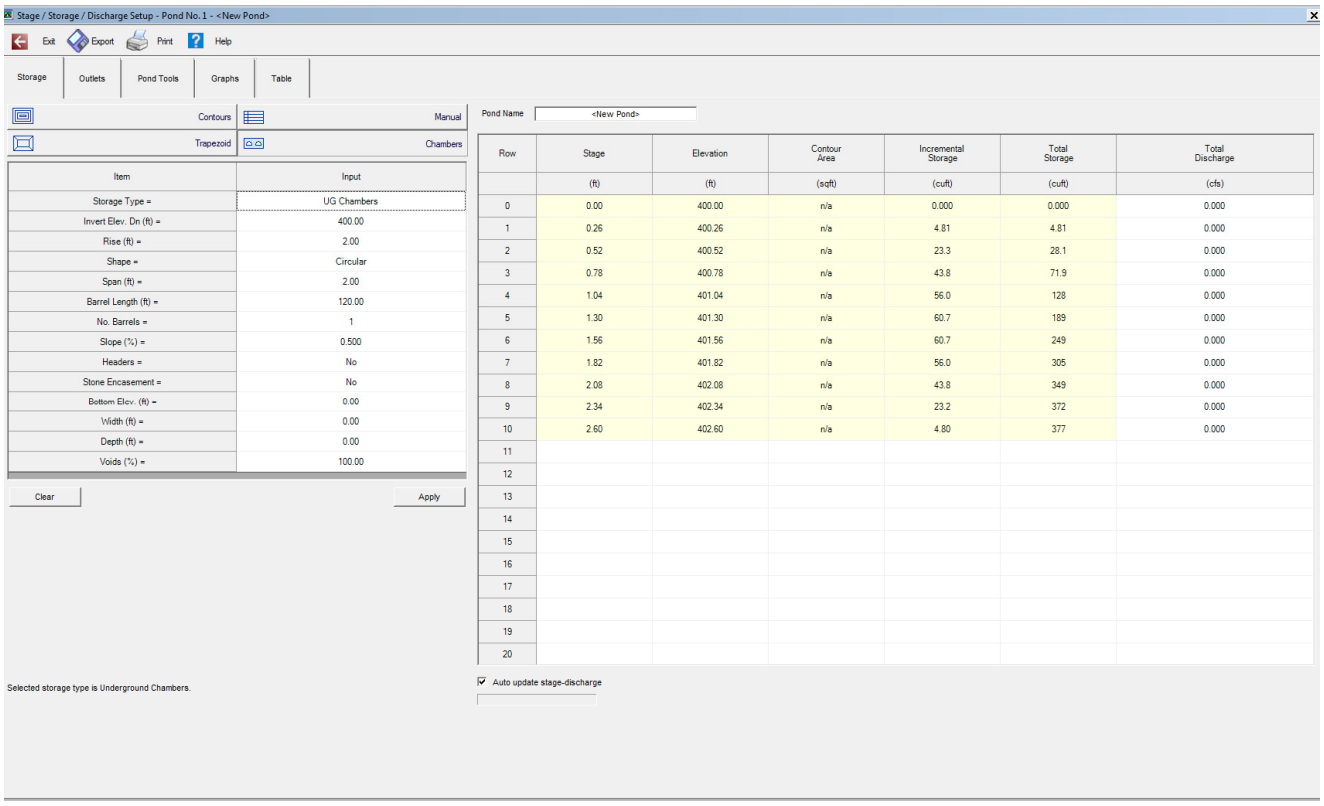
   Storage nodes are used to model the surface storage capacity of the bioretention LID above the berm height. In addition, storage nodes are used to represent two detention pipes to ensure the amount and duration of peak flow are below the pre-developed conditions. The storage nodes are each linked with a storage curve table which describes how the surface area of a storage unit node varies with water depth. An important note to make is that the storage curve table and cross-sectional view is greatly impacted by the longitudinal slope of the detention pipe.

The steepness of the pipe will produce different phases or shape: parabolic, trapezoidal or ellipse.

The detention pipes in this study are designed with a 0.5% longitudinal slope and produce the resulting cross-sectional view and storage tables shown below:



Hydrograph Hydraflow Hydrographs Extension Version 10.4 by Autodesk, Inc. was used to determine the volume of the storage pipe up to the proposed weir. The following diagram below depicts a simple scenario where a pipe was constructed and then the volume and depth were extracted. An Excel Spreadsheet was then used to determine the area versus the depth of the detention pipe. These to values were then able to be placed in a storage curve of swmm to allow the program to determine the volume of the pipe.



2. *Orifice Links*

An orifice link provides a connection type between two nodes within SWMM. The orifice can either be circular or rectangular shaped. For this study, the orifice link is used to represent the opening along the side or bottom of the storage node that serves as an outlet. The orifice link connects the upstream storage node to the outfall.

A circular shaped orifice was selected to drain the surface storage in each bioretention LID and two detention pipes in this study.

3. *Weir Links*

A weir link, much like an orifice link, provides a connection between two nodes within SWMM and provides an option to model outlet and diversion of flows within the drainage system. There are several varieties of weirs available within SWMM. However, this study utilizes only the transverse weir to represent the overflow outlet in the bioretention LID storage node and the rectangular-shaped weir to represent the outlet of the detention pipe at the cleanout box.

SECTION VII - **RUNNING THE SIMULATION**

In general, the Run time will depend on the complexity of the watershed being modeled, the routing method used, and the size of the routing time step used. The larger the time steps, the faster the simulation, but the less detailed the results.

Model Results

SWMM's Status Report summarizes overall results for the 35-yr simulation. After the simulation run completes successfully, the mass continuity errors for runoff, flow routing, and pollutant routing is displayed in the Run Status window. These errors represent the percent difference between initial storage + total inflow and final storage + total outflow for the entire drainage system. If the values exceed some reasonable level, such as 10 percent, then the validity of the analysis results must be questioned. This simulation produced a runoff continuity error -6.56% and the flow routing continuity error 0.0018 and is within reasonable error to determine this study to be valid.

In addition to the system continuity error, the Status Report produced by a run lists those nodes of the drainage network that have the largest flow continuity errors. If the error for a node is excessive, then one should first consider if the node in question is of importance to the purpose of the simulation. If it is, then further study is warranted to determine how the error might be reduced. For this study all node errors were within range of what is reasonable.

SECTION VIII - **RESULT ANALYSIS**

Development of the Flow Duration Statistics

The flow duration statistics are also developed directly from the SWMM binary output file. It should be noted right from the start that the "durations" that we are talking about in this section have nothing to do with the "storm durations" presented in the peak flow statistics section. Other than using the same sequence of letters for the word, the two concepts have nothing to do with each other and the reader is cautioned not to confuse the two. The goal of the flow duration statistics is to determine, for the flow rates that fall within the geomorphologicaly significant range, the length of time that each of those flow rates occur. Since the amount of sediment transported by a river or stream is proportional to the velocity of the water flowing and the length of time that velocity of flow acts on the sediment, knowing the velocity and length of time for each flow rate is very useful.

Methodology

The methodology for determining the flow duration curves comes from a document developed by the U.S. Geological Survey (USGS). The first stop on the journey to find this document was a link to the USGS water site (http://www.usgs.gov/water/). This link is found in Appendix E (SDHMP Continuous Simulation Modeling Primer), found in the County Hydromodification Management Plan[3]. On this web site a search for "Flow Duration Curves" leads to USGS Publication 1542-A,

[3] FINAL HYDROMODIFICATION MANAGEMENT PLAN, Prepared for County of San Diego, California, March 2011, by Brown and Caldwell Engineering of San Diego.
(http://www.projectcleanwater.org/images/stories/Docs/LDS/HMP/0311_SD_HMP_wAppendices.pdf)

Flow-duration curves, by James K. Searcy 1959 (http://pubs.er.usgs.gov/publication/wsp1542A). In this publication the development of the flow duration curves is discussed in detail.
In Pub 1542-A, beginning on page 7 an example problem is used to illustrate the compilation of data used to create the flow duration plots. On page 8 a completed form 9-217-c form shows the monthly tabulation of flow rates for Bowie Creek near Hattiesburg, Miss. For each flow range the number of readings is tabulated and then the total number of each flow rate is totaled for the year. It should be noted that while this example is for a stream with a minimum flow rate of 100cfs, for the purposes of run-off studies in Southern California the minimum flow rate of zero (0) cfs is the common low flow value. Once each of the year's data has been compiled the summary numbers from each year are transferred to form 9-217-d. On this form the total number of each flow rate is again totaled and the percentage of time exceeded calculated (as will be explained later under the discussion of our calculations). Once the data has been compiled a graph of Discharge Rate vs. Percent Time Exceeded is developed. As will be explained in the next section, the use of these curves leads to the amount of time each particular flow can be expected to occur (based on historical data).

How to Read the Graphs[4]

Figure 1 shows a flow duration curve for a hypothetical development. The three curves show what percentage of the time a range of flow rates are exceeded for three different conditions: pre-project, post-project and post-project with storm water mitigation. Under pre-project conditions the minimum geomorphically significant flow rate is 0.10 cfs (assumed) and as read from the graph, flows would equal or exceed this value about 0.14% of the time (or about 12 hours per year) (0.0014 x 365 days x 24 hour/day). For post-project conditions, this flow rate would occur more often – about 0.38% of the time (or about 33 hours per year) (0.0038 x 365 days x 24 hour/day). This increase in the duration of the geomorphically significant flow after development illustrates why duration control is closely linked to protecting creeks from accelerated erosion.

[4] The graph and the explanation were taken directly from Appendix E of the Hydromodification Plan

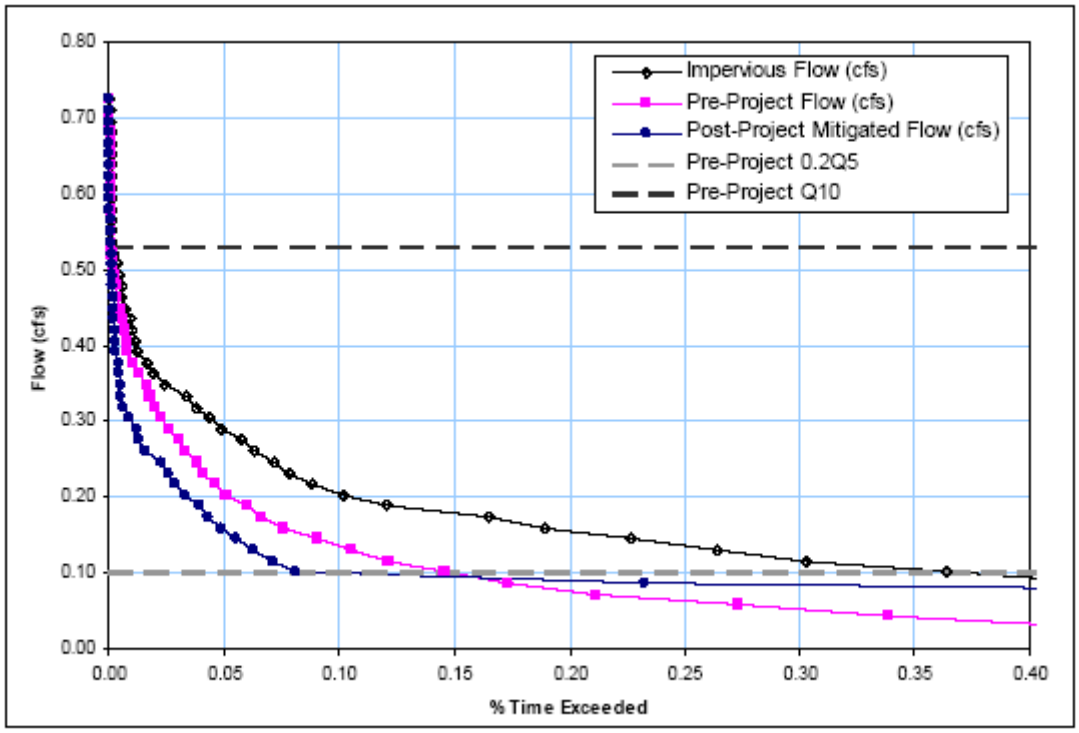


Figure 1. Flow Duration Series Statistics for a Hypothetical Development Scenario

Development of Flow Duration Curves

The first step in developing the flow duration curves is to count the number of occurrences of each flow rate. This is done by first rounding every non-zero flow value to an appropriate number of decimal places (say two places). This in effect groups each flow into closely related values or "bins" as they are referred to in publication 9-217d. Then the entire runoff record is queried for each value and the number of each value counted. The next step is to enter the results of the query into a grid patterned after form 9-217d. The data is entered in ascending order starting with the lowest flow first. The grid is composed of four columns. They are (from left to right) Discharge Rate, Number of Periods (count), Total Periods Exceeding (the total number of periods equal to or exceeding this value), and Percent Time Exceeded. Starting at the top row (row 1), the flow rate (which is often times zero) is entered with the corresponding number of times that value was found. The next column is the total number of values greater than or equal to that flow rate. For the first flow rate point, by definition all flow rate values are greater than or equal to this value, therefore the total number of runoff records of the rainfall record is entered here. The final column which is the percent of time exceeded is calculated by dividing the total periods exceeded by the total number of periods in the study. For the first row this number should be 100%

For the next row (row 2), the flow rate, and the flow rate count are entered. The total number of periods exceeding for row 2 is calculated by subtracting Number of Periods of row 1 from the Total Periods Exceeding of line 1. This result is entered in the Total Periods Exceeding on row 2. As was the case for line 1, the final column is calculated by dividing the total periods exceeded by the total number of periods in the study. For the second row this number should be something less than 100%

and continually decrease as we move down the chart. If all the calculations are correct, then everything should zero out on the last line of the calculations.
The final step in developing the flow duration curves is to make a plot of the Discharge Rate vs. the Percent Time Exceeded. For the purposes of this report, the first value corresponding to the zero flow rate is not plotted allowing the graph to be focused on the actual flow rate values.

The Flow Duration Analysis

The Peak Flow Statistics analysis is composed of the following series of files:

1. The Flow Duration Plot
2. Comparison of the Un-Mitigated Flow Duration Curve to the Pre-Development Curve (Pass/Fail)
3. Comparison of the Mitigated Flow Duration Curve to the Pre-Development Curve (Pass/Fail)
4. The calculations for the Pre-Development flow duration curve development (USGS9217d)
5. The calculations for the Post-Development flow duration curve development (USGS9217d)
6. The calculations for the Mitigated flow duration curve development (USGS9217d)

The Flow Duration Plot

The Flow Duration Curves Plot is the plotting of all three (pre, un-mitigated and mitigated) sets of Discharge Rate vs. the Percent Time Exceeded data point pair lists. In addition to these curves horizontal lines are plotted corresponding to the Q_{10} and Q_{lf} (low flow threshold) values. Within the geomorphically significant range ($Q_{10} – Q_{lf}$) one can see a visual representation of the relative positions of the flow duration curves. The flow duration curves are compared in an East/West (horizontal) direction to compare post development Discharge Rates to pre-development Discharge Rates. The pre-development curve is plotted in blue, the unmitigated curve is plotted in red, and the mitigated curve is plotted in green. As long as the post development curve lies to the left of the pre-development curve (mostly[5]), the project meets the peak flow hydromodification requirements.

Pass/Fail comparison of the curves

The next two sets of data are the point by point comparison of the post-development curve(s) and the pre-development curve. The Pass/Fail table is helpful in determining compliance since the plotted lines can be difficult to see at the scales suitable for use in a report. Each point on the post-development curve has a corresponding "Y" value (Flow Rate), and "X" value (% Time Exceeded). For each point on the post development curve, the "Y" value is used to interpolate the corresponding Percent Time Exceeded (X) value from the pre-development curve. Then the Post-development Percent Time Exceeded value is compared to the pre-development Percent Time Exceeded value. Based on the relative values of each point, pass/fail criteria are determined point by point.
For each set of data, the upper right hand header value shows the name of the file being displayed (ex. flowDurationPassFailMitigated.TXT). The first line of the file shows the name of the SWMM output file (*.out). The next line shows the time stamp of the SWMM file that is being analyzed. The time stamps of all of the report files should be within a minute or two of each other, otherwise there may

[5] See hydromodification limits for exceedance of pre-development values

have been tampering with the files. Each report run creates and prints all of the files and reports at one time so all the time stamps should be very close.
The first column is the zero based number of the point. The next two columns show the post development "X" and "Y" values. The next column shows the value interpolated between the two bounding points on the pre-development curve. The next three columns show the true or false values of the comparison of the two "X" values. The last column shows the resultant pass or fail status of the point. There are three ways a point can pass. They are:

1. Q_{post} being outside of the geomorphically significant range Q_{lf} to Q_{10}
2. Q_{post} being less than Q_{pre}
3. Q_{post} being less than 110% of the value of Q_{pre} if the point is between Q_{lf} and Q_{10}

There are two ways that a point can fail. They are:

1. Q_{post} being greater than 110% of Q_{pre} if the point is between Q_{lf} and Q_{10}
2. If more than 10% of the points are between 100% and 110% of Q_{pre} for the points between Q_{lf} and Q_{10}

A quick scan down the last column will quickly tell if there are any points that fail.
At the bottom of each set of data are the date stamp of the report to the left, and to the right is the page number/number of pages for the specific set of data (not the pages of the report!). Each new set of data has its own page numbering. Between the file name in the header row and the page numbering in the footer row, the engineer can readily scan the document for the data of interest.

As was described under the peak flow section, is the responsibility of the reviewing agency to confirm that the data sets presented are valid results from consistent calculations, and that any and all results can be duplicated by manual methods and achieve the same results. In light of these goals, the plan checker is invited to consider the following tasks as part of the plan check process.

Compare the Data Stamps for Each of the Statistics Files Used In This Analysis.
As was described in the Peak Flows section, all report files should have time stamps that are nearly identical. If the time values are more than a few minutes apart then the potential for inconsistent results files should be investigated.

Verifying the Flow Rate Counts
For each of the pre, un-mitigate and mitigated flow duration tables, a few randomly selected flow value counts should be checked against the values taken directly from the SWMM file. This can be done by opening the corresponding SWMM file, selecting the outfall node, selecting Report>Table>By Object, Setting the time format to Date/Time, selecting the appropriate node value, and clicking the OK button to generate a table of the date/time/Total Inflow values. Next step is to click in the left most header row of the SWMM table which will select the entire table. Now from the main menu select Edit>Copy To>Clipboard. Now open a new blank sheet in MS Excel (or suitable spread sheet program) select cell A1 and paste the results from the clipboard into the spread sheet. Now sort the values based on the Total Inflow column. This will group all the flow values together enabling the number of occurrences of each value to be counted. At this point the a few (or all) of the counts on the various USGS9217d.txt files can be verified.
Manually Verify That the Percent Exceeded Values (form USGS9217d) are Correctly Calculated
The discharge rates and counts are confirmed as was described above. The top row should be the smallest runoff value (0.00 cfs usually). Total Periods Exceeding of the first line should be the total number of rainfall records in the study. The percentage of Time Exceeding should be the total periods

Exceeding divided by the total number of rainfall records in the study (100% for the first line). For each successive discharge rate, the total periods exceeding for the current line should be the total periods exceeding from the line above minus the number of periods from the line above. The number of periods and the number of periods exceeding should zero out at the last line.

Compare Plotted Curves to Table Data

Randomly check a few of the plotted points against the values verified above.

Verify by Observation that the plotted values of $Q_{10\ a}$nd Q_{lf} are reasonable.

Verify that the correct values for each of these return periods are plotted correctly on the graph.

Development of the Peak Flow Statistics

The peak flow statistics are developed directly from the binary output file produced by the SWMM program. The site is modeled three ways, Pre-Development, Post-Development-Unmitigated, and Post-Development-Mitigated. For each of these files a specific time period differentiating distinct storms is chosen. The SWMM results are extracted and each flow value is queried. The majority of the values for Southern California sites are zero flow. As each successive record is read, as soon as a non-zero value is read the time and flow value of that record are recorded as the beginning of an event. The first record is automatically recorded as the "tentative" peak value. As each successive non-zero value is read and the successive flow value is compared to the peak value and the greater value is retained as the peak value of the storm. As soon as a successive number of zero values equal to the predetermined storm separation value, then the time value of the last non-zero value is recorded as the end of the storm, the duration of the storm is the difference between the end time and the start time, and the peak value is recorded as the highest flow value between the start and end times.

Once the entire SWMM output file is read all of the distinct storm events will have been recorded in a special list. The storms will be in the order of their occurrence. To develop the peak flow statistics table the first step is to sort the storms in descending order of the peak flow value. Once the list is sorted then the relative rank of each storm is assigned with the highest ranking storm being the storm with the highest peak flow. There are several methods that can be used to determine which storm should be ranked above another equally valued storm. For the purposes of these studies an Ordinal ranking is used so that each storm has a unique rank number. Where two or more storms have equal flow values, the earlier storm is assigned the higher rank. This is done consistently throughout the storm record. Since we are only looking at peak flow statistics, it is assumed that the relative ranking of individual (but equal) storms is irrelevant to the calculations.

The exceedance frequency and return period are both computed using the Weibull formula for plotting position. Therefore, for a specific event the exceedance frequency F and the return period in years T are calculated using the following equations[6]:

$F=m/(n_R+1)$ and $T=n+1/m$

Where m is the event's rank, n_R is the total number of events and n is the number of years under analysis.

Once the Peak flow statistics table is complete, a plot of Return Frequency vs. peak flow is created. All three conditions (pre, post and mitigated) are plotted on the same plot.

The Peak Flow Statistics Analysis

The Peak Flow Statistics analysis is composed of the following series of files:

1. The Peak Flow Frequency Plot

[6] Pg 169-170 STORM WATER MANAGEMENT MODEL APPLICATIONS MANUAL, EPA/600/R-09/000 July 2009

2. The Comparison of the Un-Mitigated Peak Flow Curve to the Pre-Development Curve (Pass/Fail)
3. The Comparison of the Mitigated Conditions Curve to the Pre-Development Curve (Pass/Fail)
4. The Peak Flow Statistics Calculation for the Pre-Development Curve.
5. The Peak Flow Statistics Calculation for the Un-Mitigated Curve.
6. The Peak Flow Statistics Calculation for the Mitigated Curve.

The Peak Flow Frequency Plot

The Peak Flow Frequency Curves are the plotting of all three (Pre, Un-Mitigated and Mitigated) sets of return Period vs peak flow data point pair lists. In addition to these curves horizontal lines are plotted corresponding to the Q_{10}, Q_5, Q_2 and Q_{lf} (low flow threshold) values. Within the geomorphically significant range ($Q_{10} - Q_{lf}$) one can see a visual representation of the relative positions of the peak flow curves. The peak flow curves are compared in a North/South (vertical) direction to compare post development peak flows to pre-development flows. The Pre-Development curve is plotted in blue, the unmitigated curve is plotted in red, and the mitigated curve is plotted in green. As long as the post development curve lies below the pre-development curve (mostly[7]), the project meets the peak flow hydromodification requirements.

Pass/Fail comparison of the curves

The next two sets of data are the point by point comparison of the post-development curve(s) and the pre-development curve. The Pass/Fail table is helpful in determining compliance since the plotted lines can be difficult to see at the scales suitable for use in a report. Each point on the post-development curve has a corresponding "X" value (Recurrence Interval), and "Y" value (Peak Flow). For each point on the post development curve, the "X" value is used to interpolate the corresponding peak flow value from the pre-development curve. Then the Post-development peak flow value is compared to the pre-development peak flow value. Based on the relative values of each point, pass/fail criteria are determined point by point.

For each set of data, the upper right hand header value shows the name of the file being displayed (ex. peakFlowPassFailMitigated.TXT). The first line of the file also shows this value. The next line shows the time stamp of the file that is being analyzed. The time stamps of all of the report files should be within a minute or two of each other, otherwise there may have been tampering with the files. Each report run creates and prints all of the files and reports at one time so all the time stamps should be very close. It should be noted that the SWMM.out files will not have related time stamps since each file is developed independently.

The first column is the zero based number of the point. The next two columns show the post development "X" and "Y" values. The next column shows the value interpolated between the two bounding points on the pre-development curve. The next three columns show the true or false values of the comparison of the two "Y" values. The last column shows the resultant pass or fail status of the point. There are three ways a point can pass. They are:

1. Point is outside of the geomorphically significant range $Q_{10} - Q_{lf}$
2. Q_{post} being less than Q_{pre}
3. Q_{post} being less than 110% of the value of Q_{pre} if the point is between Q_5 and Q_{10}[8]

[7] See hydromodification limits for exceedance of pre-development values

[8] See section on how a point can fail point number 3 hereon

There are four ways that a point can fail. They are:

1. Q_{post} being greater than Q_{pre} if the point is between Q_{lf} and Q_5
2. Q_{post} being greater than 110% of Q_{pre} if the point is between Q_{lf} and Q_{10}
3. If more than 10% of the points are between 100% and 110% of Q_{pre} for the points between Q_5 and Q_{10}
4. If the frequency interval for points > 100% of Q_{pre} is greater than 1 year for the points between Q_5 and Q_{10}

A quick scan down the last column will quickly tell if there are any points that fail.
At the bottom of each set of data are the date stamp of the report to the left, and to the right is the page number/number of pages for the specific set of data (not the pages of the report!). Each new set of data has its own page numbering. Between the file name in the header row and the page numbering in the footer row, the engineer can readily scan the document for the data of interest.

The Peak Flow Statistics Calculations

There are three sets of data for the Peak Flow Statistics calculations (Pre-Development, Un-Mitigated, and Mitigated). As was the case for the pass/fail data, the upper right hand corner of each sheet has the file name. The first row of the data is the SWMM file name. The second row is the SWMM file time stamp of the file being analyzed. The 4th, 5th, and 6th rows are the calculated values for Q_{10}, Q_5, and Q_2. These values are derived by linear interpolation between the nearest bounding points in the listing. While the relationship between the points in the peak flow analysis is not technically a linear relationship, the error introduced in using linear interpolation between such relatively close data points is assumed to be irrelevant. Finally, the footer row shows the report time and the page/number of pages of the data set.

As was previously discussed, each storm listed was determined by reading the flow values directly from the binary output file from the SWMM program. The storms were then sorted in descending order of peak flow values. Then each storm was assigned a unique rank, then the Frequency and Return Period were calculated using Weibull formulas. Every discharge value for the entire rainfall record is listed in each of these lists. It should be noted that the derivation of these peak flow statistics values use full precision (i.e. no rounding off) of the SWMM output values. Since the precision of the calculations may not be the same as the SWMM program uses, and also the assignment of rank to values of equal peak flow value may differ slightly from the way SWMM calculates the tables, minor variances in the data values and/or the order of storms can be expected.
Finally, as was previously stated, the values of the Return Period were plotted vs. the peak flow values to develop the peak flow frequency curves.

Verifying A Few Random Storm Statistics

For each of the Pre- and Mitigated peak flow statics tables, a few randomly selected storms should be checked against the values taken directly from the SWMM file. This can be done by opening the corresponding SWMM file, selecting the outfall node, selecting Report>Table>By Object, Setting the time format to Date/Time, selecting the appropriate node value, and clicking the OK button to generate a table of the date/time/Total Inflow values. Now scroll down the list to the start date and time of the randomly selected storm. Verify that the start date, end date, and the highest flow value between the start and end date correspond to the values shown in the statistics table. Do this for a few storm to verify that the data corresponds to the SWMM output file. Verify by hand a few of the frequency and return period values.

Compare Plotted Curves to Table Data
Randomly check a few of the plotted points against the values found in the Peak Flow Frequency Tables.

Verify by Observation that the values of Q_{10}, Q_5, Q_2 and Q_{lf} are reasonable.
For each value shown on the reports, verify that the value shown for say Q10 is in between the next higher return period and the next lower period. Also verify that the correct values for each of these return periods are plotted correctly on the peak flow frequency graph.
Manually Verify That the Pass Fail Table Is Correctly Calculated
Select at random several points on each of the pass/fail tables to verify that the values for post X/Y and interpolated Y look reasonable. Also check that the various test results are shown accurately in the chart and also the final pass/fail result looks accurate.

Drawdown Time of Bioretention Surface Ponding
The general equation used for drawdown time for surface ponding is derived by utilizing SWMM's underdrain coefficient (C factor). To derive the equation, the change in water volume with respect to time is set equal to the standard orifice equation found in the County Hydraulics manual:

$$q = \frac{dh}{dt} nA_p = C_o A_o \sqrt{2gh} \qquad \text{Eq. 6.1}$$

Where: q = flow, cfs
dh = change in ponding height above orifice, in
dt = change in time to drain, hr
n = porosity (set to 1 for surface layer)
A_o= cross-sectional area of orifice, in
C_o= orifice coefficient, unitless
A_o= cross-sectional area of orifice, in
g = gravity, 32.2 $\frac{ft}{sec^2}$

Substituting 1 for porosity and rearranging Eq. 6.1 we get:

$$\frac{dh}{dt} = \frac{C_o A_o \sqrt{2gh}}{A_p} \qquad \text{Eq. 6.2}$$

Solving the definite integral height from h_1 to h_2 and drain time from zero to an ultimate time (T):

$$\int_{h=h1}^{h=h2} h^{-0.5} dh = \int_{t=0}^{t=T} \frac{CoAo\sqrt{2g}}{Ap} \, dt$$

$$\int_{h=h1}^{h=h2} h^{-0.5}dh = \int_{t=0}^{t=T} \frac{CoAo\sqrt{2g}}{Ap}\ dt$$

$$2(\sqrt{h2} - \sqrt{h1}) = \frac{CoAo\sqrt{2g}}{Ap}\ (T)$$

$$Per\ Eq\ 4.6\text{:}\ C = \frac{CoAo\sqrt{2g}}{Ap}\ \left(\frac{in^{0.5}}{hr}\right)$$

$$2n\left(\sqrt{h2} - \sqrt{h1}\right) = C\ (T)$$

$$T = \frac{2n\left(\sqrt{h2} - \sqrt{h1}\right)}{C}\ (hr) \qquad \text{Eq. 6.3}$$

Where: T = Ultimate time to drain change in head, hr
C = SWMM underdrain coefficient
h_1 = head above the underdrain orifice at bottom of surface, in
h_2 = beginning head above the underdrain orifice at surface, in

Each Bioretention LID is analyzed to determine its surface draw down time and results are presented below:

LID Data		Underdrain Orifice Data			Layer Thickness			Drawdown surface (hr)
LID Process*	LID Area (sf)*	Orifice D (1/16in)	UD C factor*	Orifice D (inches)	T surf (in)*	T soil (in)*	T store (in)*	
BMP-1	6503.51	14	0.038	0.875	6	24	36	20.1
BMP-2	6024.35	27	0.157	1.687	6	24	48	6.1

Assume: orifice coefficient C_o = 0.60, void ratio for surface = 1.0, centroid of underdrain orifice is located at h=0

SECTION IX - **SUMMARY AND CONCLUSION**

The analysis is performed over a site that is approximately 8.89 acres in pre-developed condition and is planned for commercial land use. Runoff from the proposed project is treated through a bioretention. Basins are modeled within SWMM as a bioretention LID, with modification to parameters that match the design constraints of each. Two point of compliances (POCs) are used in for the pre and post development conditions and are labeled as POC-1 and POC-2. The POC-1 is located at the northeasterly boundary of the site and POC-2 is located on the southeasterly. The hydromodification calculations are performed using Version 5.1 of the EPA's Storm Water Management Model (SWMM). The results from SWMM on both the pre and post developed conditions are analyzed and shown in the Figure 9.1 and 9.2 below.

In the Flow Duration Curves (FDC), the mitigated flow duration curve is composed of 100 flow bins (points) between the upper flow threshold (cfs) and lower flow threshold (cfs). Each point represents the number of hours where the discharge was equal to or greater than the discharge value, but less than the next greater flow value. Comparing the post-development flow duration curve to the pre-development curve, 100 point(s) have a lower duration than predevelopment conditions, and 0 points have a duration that exceeds the pre-development by less than 10%, and for less than 10% of the curve length. These points all pass. There are no points that failed, therefore the mitigated conditions flow duration requirements have been met.

Therefore, it is concluded that from 100 flow data (points) the duration of the geomorphically significant flow after development is reduced to or smaller than that of the pre-development and no adverse effect impacting the downstream.

As shown in Figure 9.1, the proposed development does not increase the peak flow frequency of the low flow, 2-year flow, 5-year flow or 10-year flow. Figure 9.2 shows that the flow duration curve for the existing condition is 25.1 hours (0.287%×365days×24 hour/day = 25.1 hours) and the proposed development is 21.8 hours (0.249%×365days×24 hour/day =21.8 hours).

POC-2 the proposed development does not increase the peak flow frequency of the low flow, 2-year flow, 5-year flow or 10-year flow. Figure 9.4 shows that the flow duration curve for the existing condition is 28.4 hours (0.324%×365days×24 hour/day = 28.4 hours) and the proposed development is 22.9 hours (0.261%×365days×24 hour/day =22.9 hours).

In conclusion, the analysis has shown that the project is in compliance with the SMR HMP and WQMP manual.

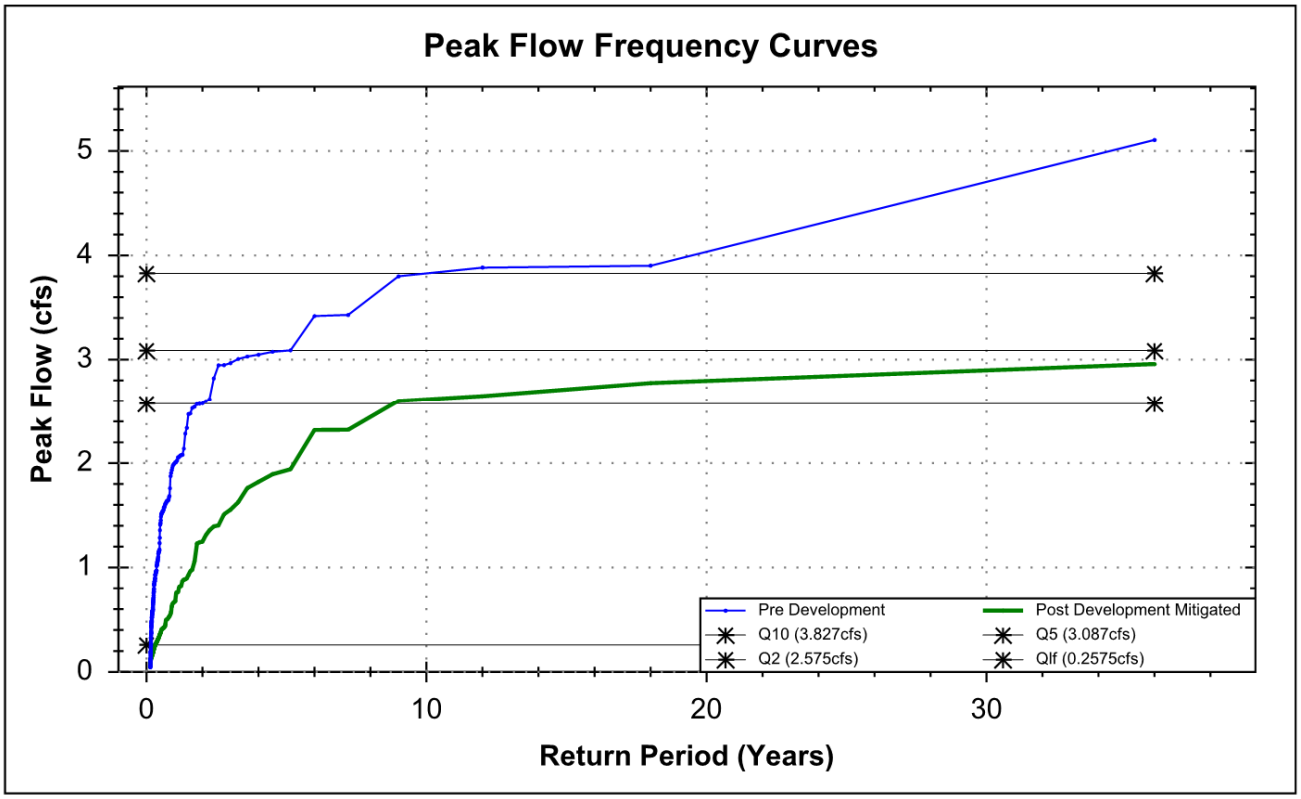


Figure 9. 1 Peak Flow Frequency Curves for both pre and post development conditions for POC-1

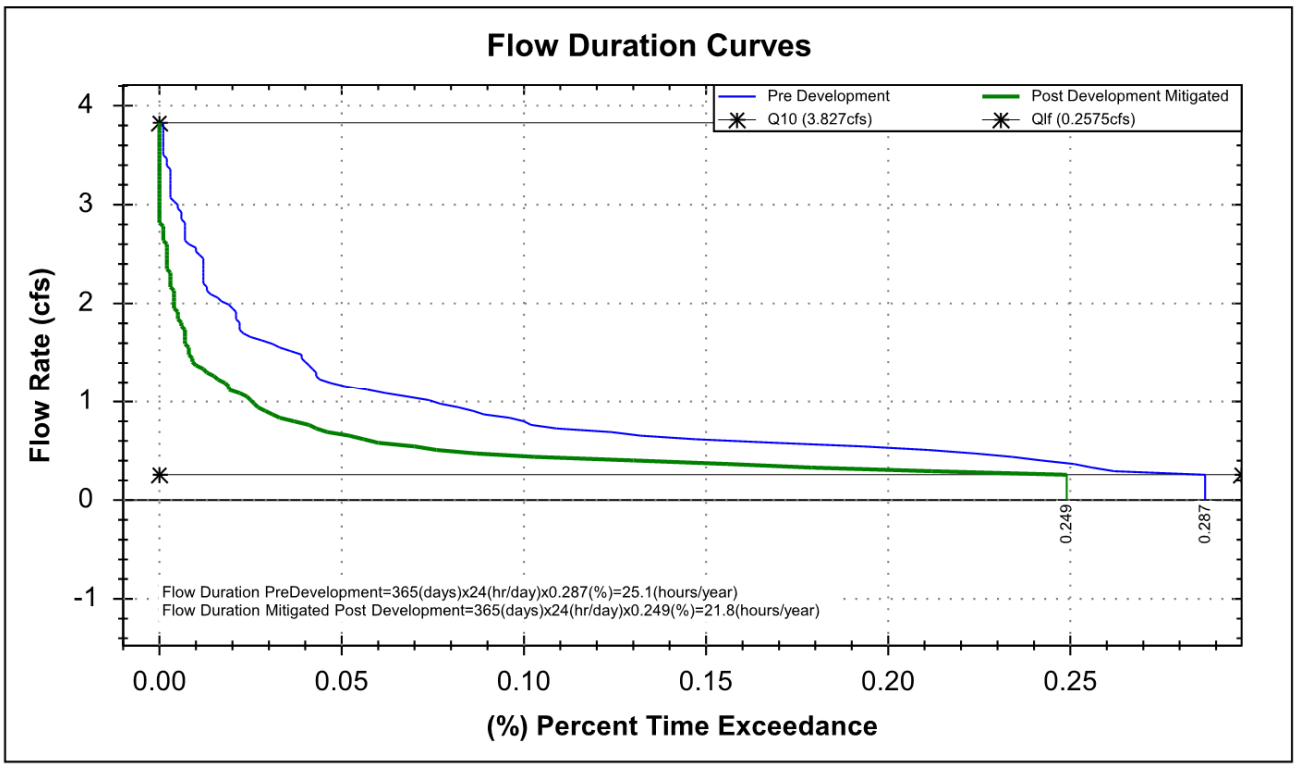


Figure 9. 2 Flow Duration Curves for POC-2

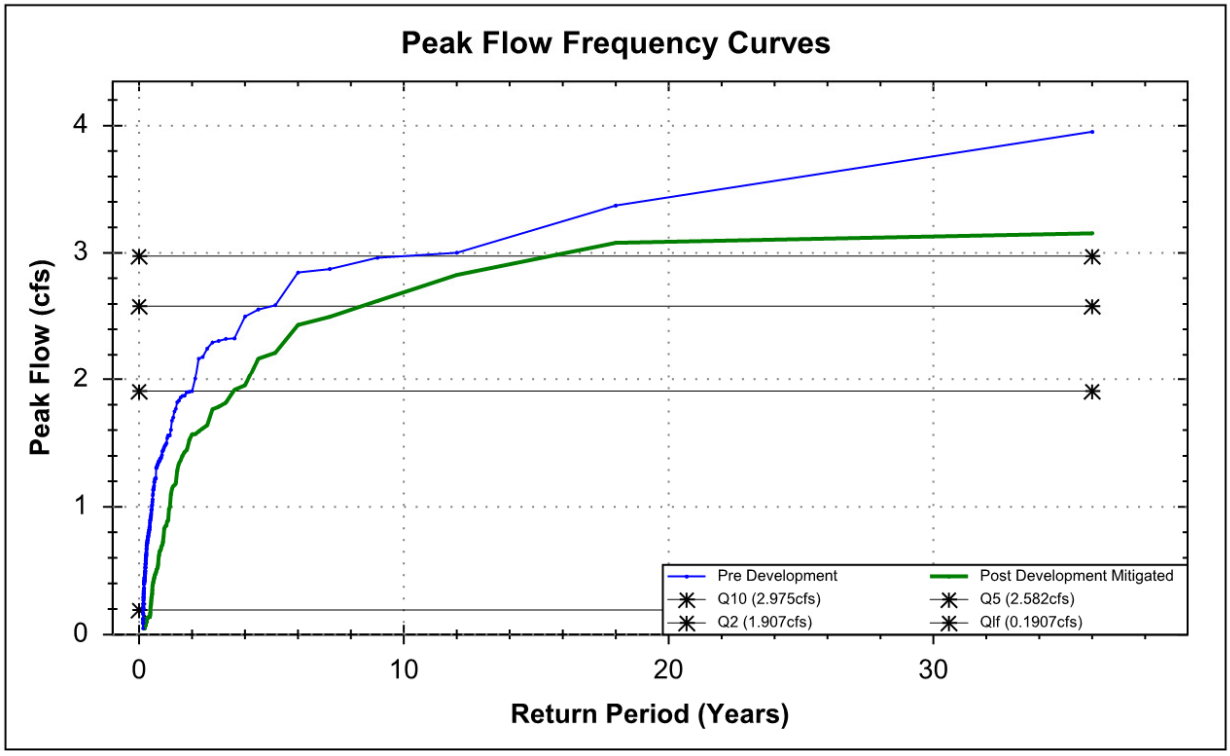


Figure 10. 3 Peak Flow Frequency Curves for both pre and post development conditions for POC-2

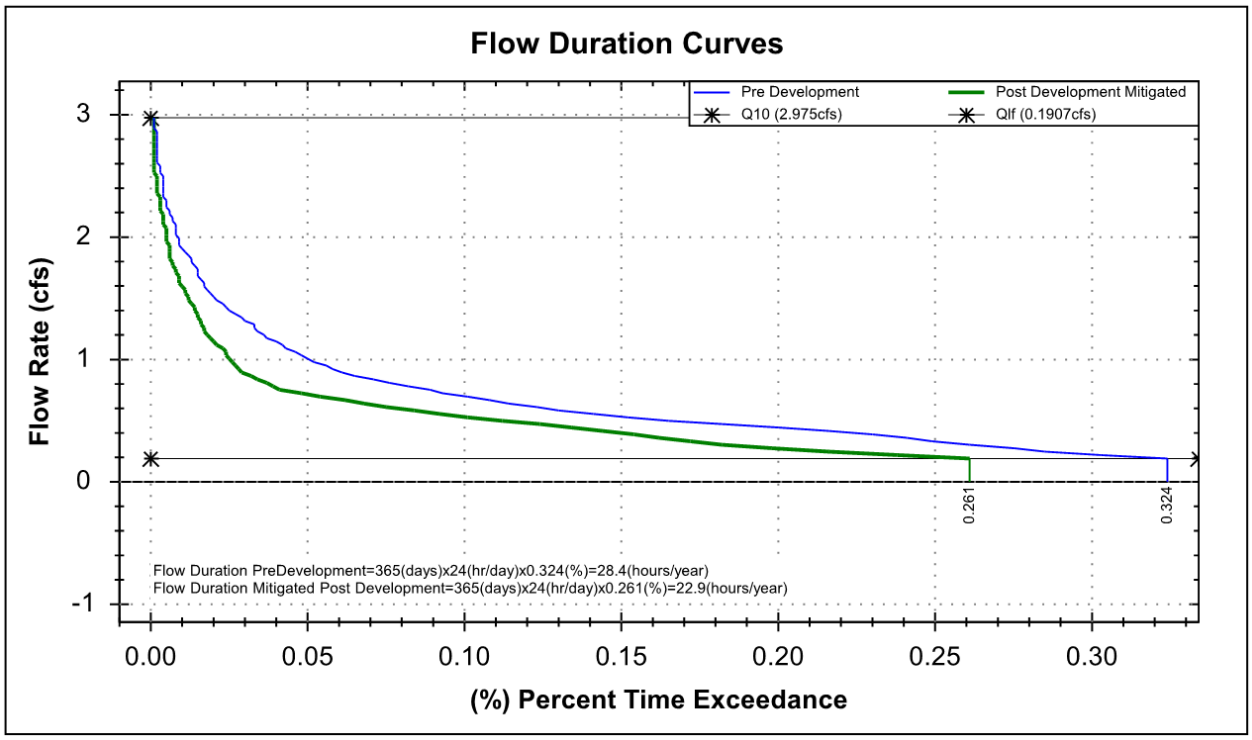
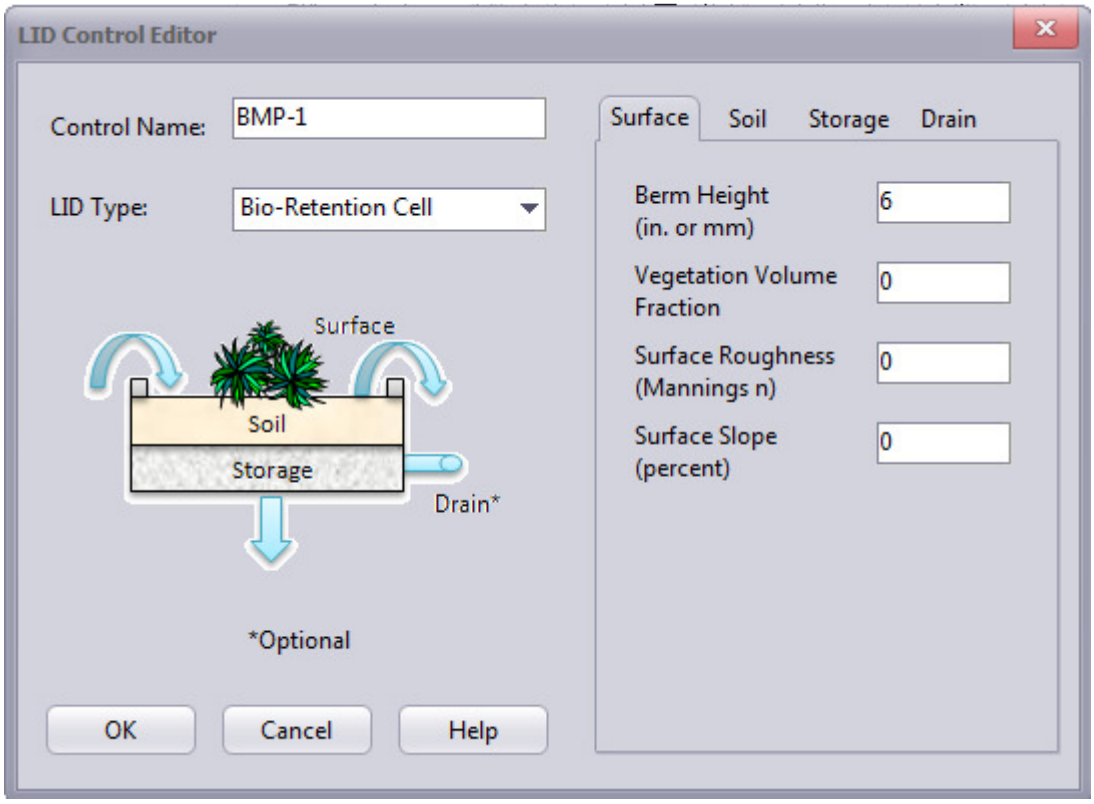
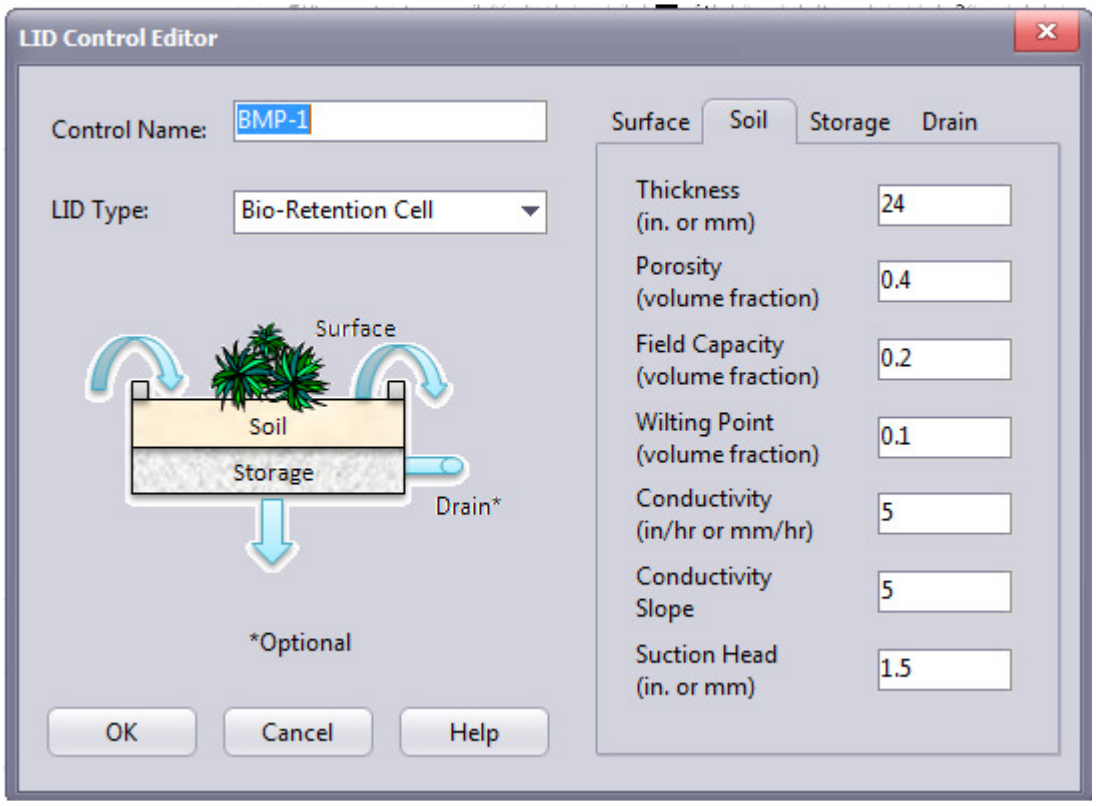
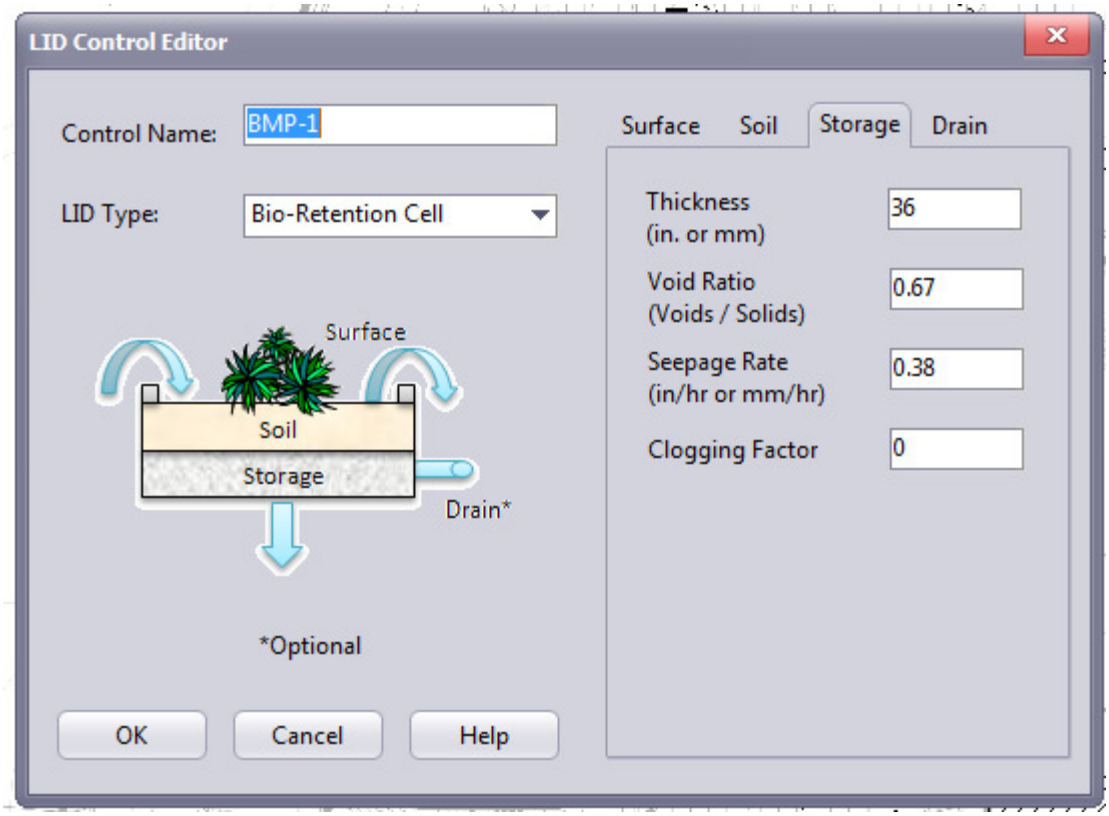
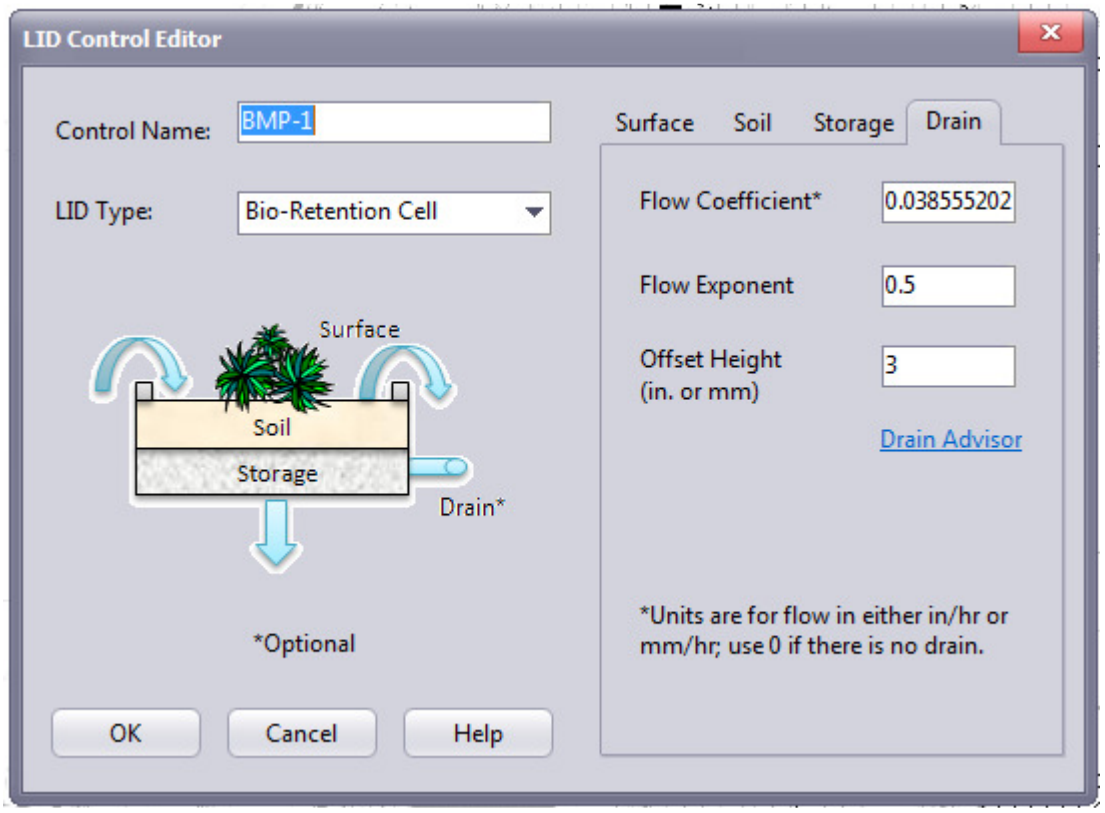


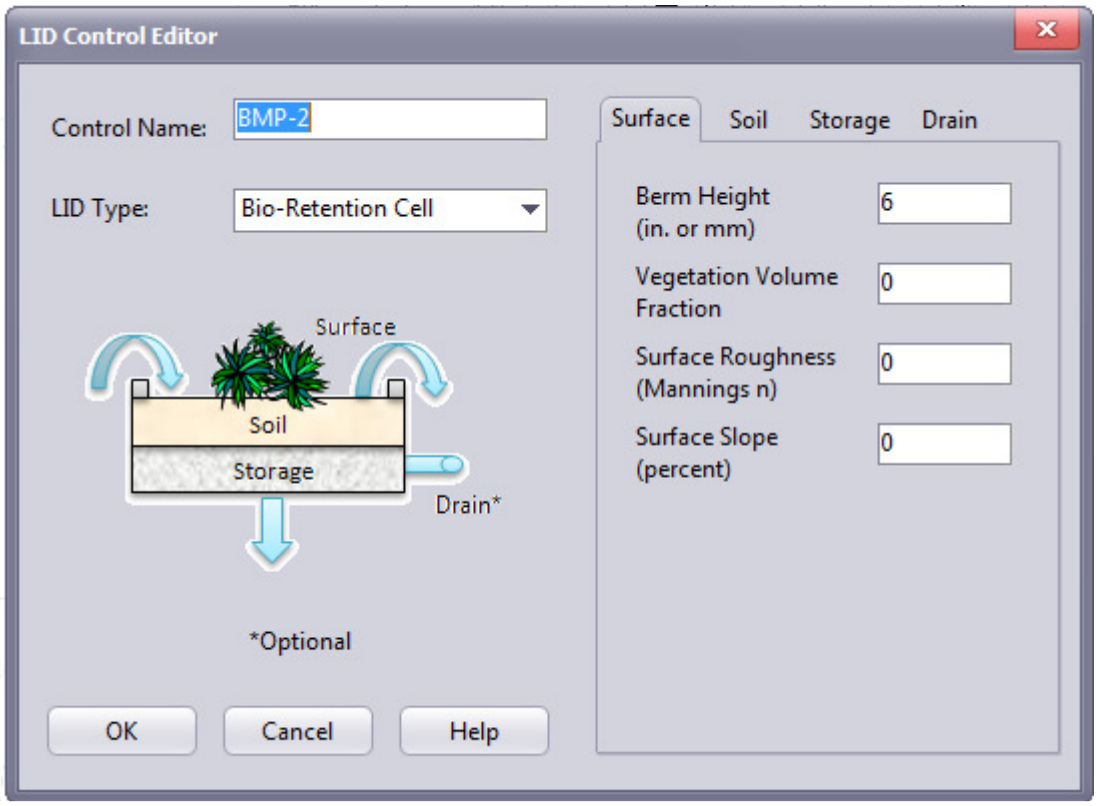
Figure 10. 4 Flow Duration Curves for POC-2

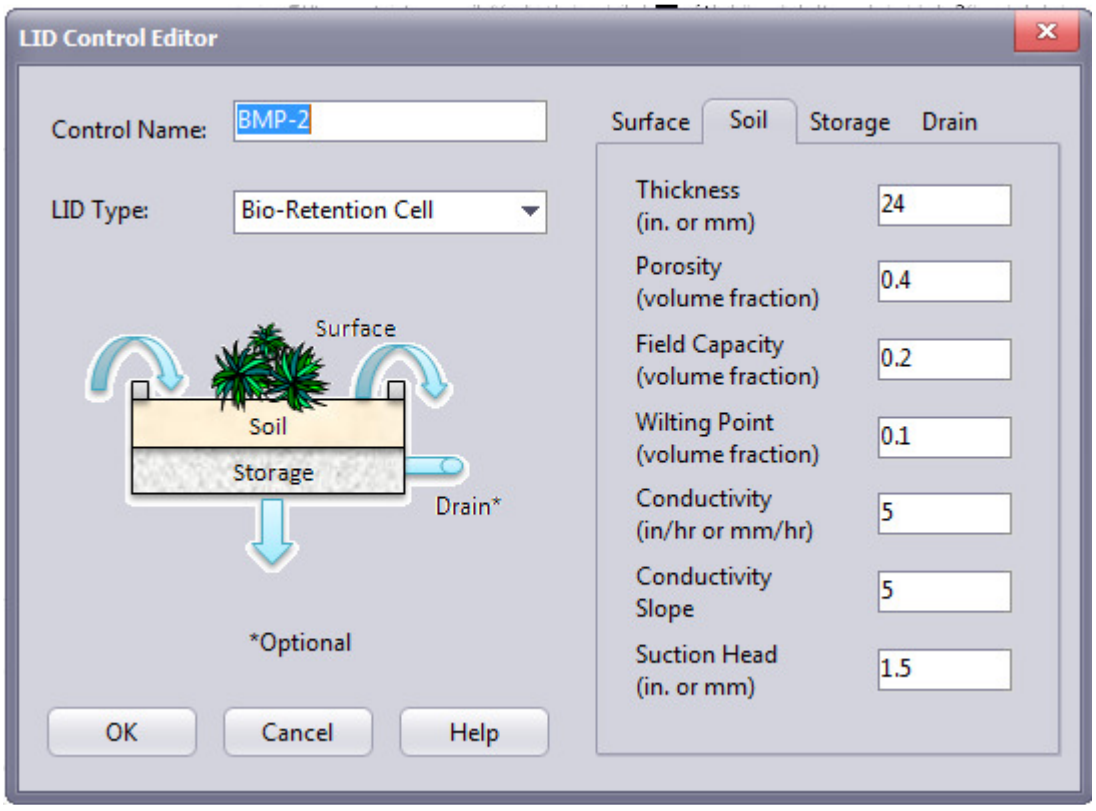

LID Control Editor
Control Name:
BMP-1
LID Type:
Bio-Retention Cell
Surface
Soil
Storage
Drain*
*Optional
OK
Cancel
Help
Surface
Soil
Storage
Drain
Berm Height (in. or mm)
6
Vegetation Volume Fraction
0
Surface Roughness (Mannings n)
0
Surface Slope (percent)
0

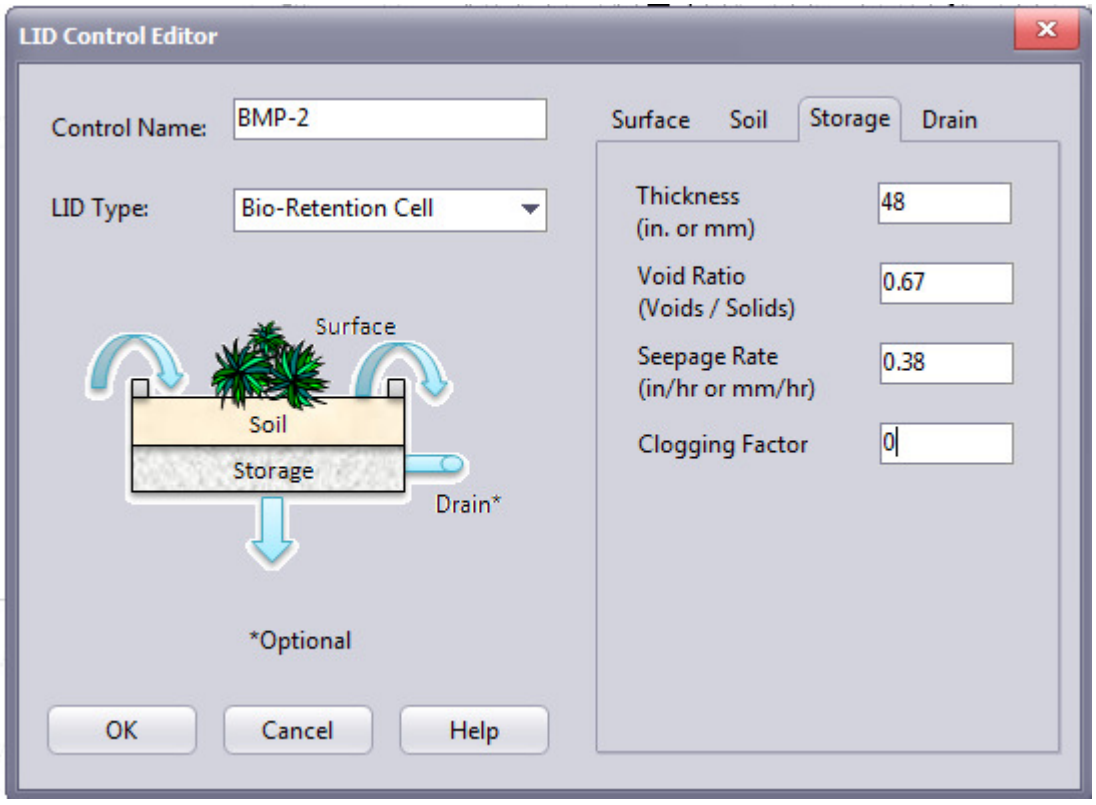

LID Control Editor
Control Name:
BMP-1
LID Type:
Bio-Retention Cell
Surface
Soil
Storage
Drain*
*Optional
OK
Cancel
Help
Surface
Soil
Storage
Drain
Thickness (in. or mm)
24
Porosity (volume fraction)
0.4
Field Capacity (volume fraction)
0.2
Wilting Point (volume fraction)
0.1
Conductivity (in/hr or mm/hr)
5
Conductivity Slope
5
Suction Head (in. or mm)
1.5

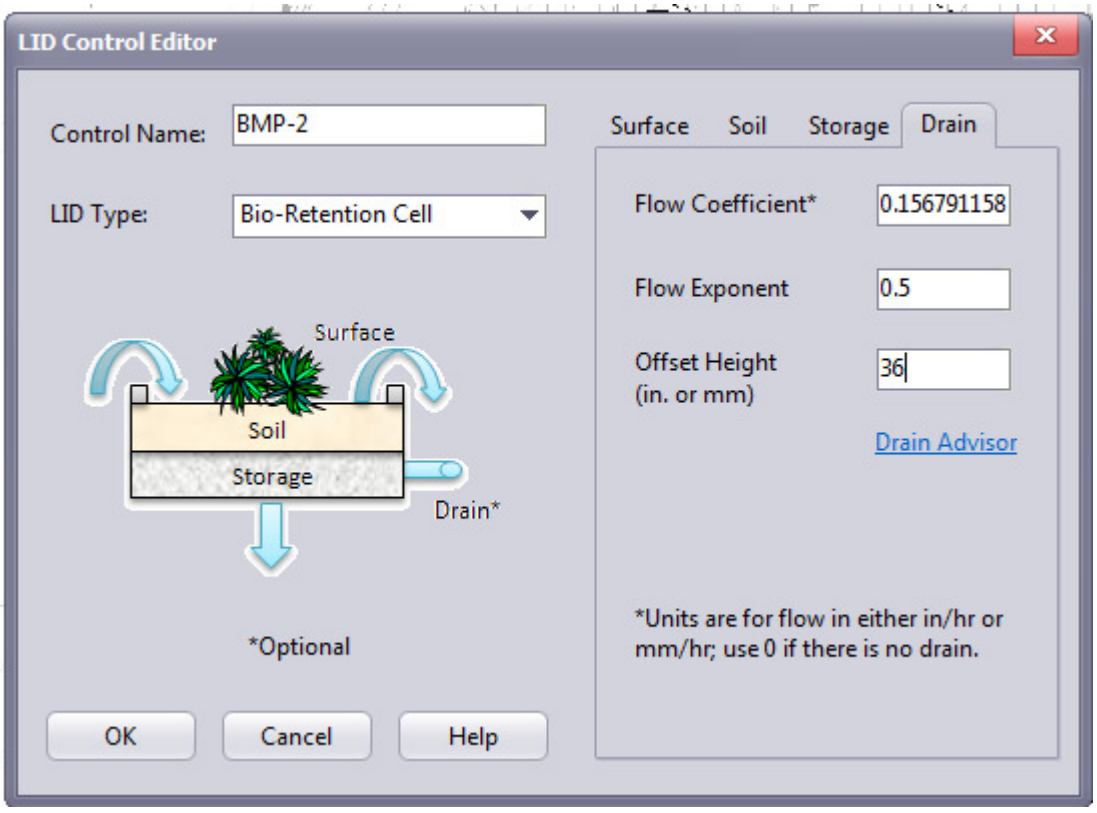

LID Control Editor
Control Name:
BMP-1
LID Type:
Bio-Retention Cell
Surface
Soil
Storage
Drain*
*Optional
OK
Cancel
Help
Surface
Soil
Storage
Drain
Thickness (in. or mm)
36
Void Ratio (Voids / Solids)
0.67
Seepage Rate (in/hr or mm/hr)
0.38
Clogging Factor
0


LID Control Editor
Control Name:
BMP-1
LID Type:
Bio-Retention Cell
Surface
Soil
Storage
Drain*
*Optional
OK
Cancel
Help
Surface
Soil
Storage
Drain
Flow Coefficient*
0.038555202
Flow Exponent
0.5
Offset Height (in. or mm)
3
Drain Advisor
*Units are for flow in either in/hr or mm/hr; use 0 if there is no drain.


LID Control Editor
Control Name:
BMP-2
LID Type:
Bio-Retention Cell
Surface
Soil
Storage
Drain*
*Optional
OK
Cancel
Help
Surface
Soil
Storage
Drain
Berm Height (in. or mm)
6
Vegetation Volume Fraction
0
Surface Roughness (Mannings n)
0
Surface Slope (percent)
0


LID Control Editor
Control Name:
BMP-2
LID Type:
Bio-Retention Cell
Surface
Soil
Storage
Drain*
*Optional
OK
Cancel
Help
Surface
Soil
Storage
Drain
Thickness (in. or mm)
24
Porosity (volume fraction)
0.4
Field Capacity (volume fraction)
0.2
Wilting Point (volume fraction)
0.1
Conductivity (in/hr or mm/hr)
5
Conductivity Slope
5
Suction Head (in. or mm)
1.5


LID Control Editor
Control Name:
BMP-2
LID Type:
Bio-Retention Cell
Surface
Soil
Storage
Drain*
*Optional
OK
Cancel
Help
Surface
Soil
Storage
Drain
Thickness
(in. or mm)
48
Void Ratio
(Voids / Solids)
0.67
Seepage Rate
(in/hr or mm/hr)
0.38
Clogging Factor
0


LID Control Editor
Control Name:
BMP-2
LID Type:
Bio-Retention Cell
Surface
Soil
Storage
Drain*
*Optional
OK
Cancel
Help
Surface
Soil
Storage
Drain
Flow Coefficient*
0.156791158
Flow Exponent
0.5
Offset Height
(in. or mm)
36
Drain Advisor
*Units are for flow in either in/hr or
mm/hr; use 0 if there is no drain.

STATISTICS ANALYSIS OF THE SWMM FILES FOR:

DISCHARGE NODE: POC-1

ANALYSIS DETAILS

Statistics Selection: Nodes/Total Inflow
Stream Susceptibility to Channel Erosion: High (Qlf = (0.1)Q2)
Assumed time between storms (hours): 24

PRE-DEVELOPMENT SWMM FILE

SWMM file name: V:\17\17065\engineering\TM\CURRENT\STORM\SWMM\17065pre-development.out
SWMM file time stamp: 4/2/2018 1:49:06 PM
Selected Node to Analyze: POC-1

POST-DEVELOPMENT MITIGATED SWMM FILE

SWMM file name: V:\17\17065\engineering\TM\CURRENT\STORM\SWMM\17065post-development.out
SWMM file time stamp: 4/2/2018 1:45:46 PM
Selected Node to Analyze: POC-1

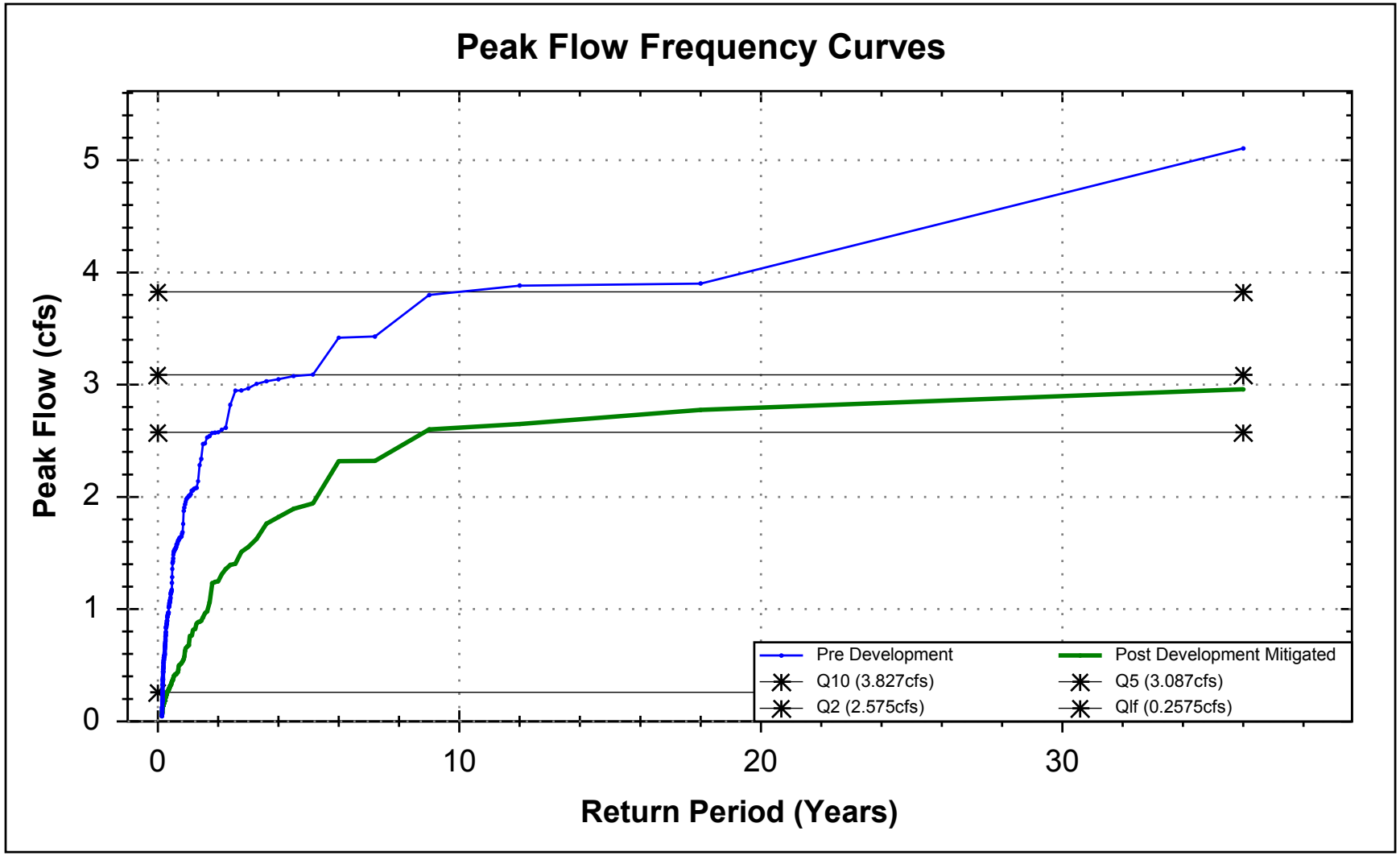
MITIGATED CONDITIONS RESULTS

For the Mitigated Conditions:

Peak Flow Conditions PASS
Flow Duration Conditions PASS

The Mitigated Conditions peak flow frequency curve is composed of 282 points. Of the points, 0 point(s) are above the flow control upper limit (Q10), 166 point(s) are below the low flow threshold value (Qlf). Of the points within the flow control range (Qlf to Q10), 116 point(s) have a lower peak flow rate than pre-development conditions. These points all pass. There are no points that failed, therefore the unmitigated conditions peak flow requirements have been met.

The Mitigated Conditions flow duration curve is composed of 100 flow bins (points) between the upper flow threshold (cfs) and lower flow threshold (cfs). Each point represents the number of hours where the discharge was equal to or greater than the discharge value, but less than the next greater flow value. Comparing the post-development flow duration curve to the pre-development curve, 99 point(s) have a lower duration than pre-development conditions. These points all pass. There are no points that failed, therefore the unmitigated conditions flow duration requirements have been met.


Peak Flow Frequency Curves
Peak Flow (cfs)
0
1
2
3
4
5
0
10
20
30
Return Period (Years)
Pre Development
Post Development Mitigated
Q10 (3.827cfs)
Q5 (3.087cfs)
Q2 (2.575cfs)
Qlf (0.2575cfs)

Compare Post-Development Curve to Pre-Development Curve

post-development SWMM file: V:\17\17065\engineering\TM\CURRENT\STORM\SWMM\17065post-development.out
post-development time stamp: 4/2/2018 1:45:46 PM
Compared to:
pre-development SWMM file: V:\17\17065\engineering\TM\CURRENT\STORM\SWMM\17065pre-development.out
pre-development time stamp: 4/2/2018 1:49:06 PM

Post PT #	Rtn Prd (yrs)	Post Dev Q	Pre Dev Q	Qpost < Qpre	Qpost > Qpre	Qpost > 110% Qpre	Pass/Fail
0	36.00	2.96	5.11	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
1	18.00	2.77	3.90	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
2	12.00	2.65	3.88	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
3	9.00	2.60	3.80	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
4	7.20	2.32	3.43	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
5	6.00	2.32	3.42	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
6	5.14	1.94	3.09	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
7	4.50	1.89	3.08	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
8	4.00	1.82	3.05	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
9	3.60	1.76	3.03	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
10	3.27	1.63	3.01	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
11	3.00	1.55	2.97	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
12	2.77	1.51	2.95	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
13	2.57	1.40	2.95	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
14	2.40	1.39	2.82	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
15	2.25	1.36	2.62	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
16	2.12	1.31	2.60	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
17	2.00	1.25	2.58	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
18	1.90	1.24	2.57	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
19	1.80	1.23	2.57	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
20	1.71	1.06	2.54	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
21	1.64	0.98	2.53	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
22	1.57	0.96	2.48	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
23	1.50	0.93	2.47	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
24	1.44	0.90	2.34	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
25	1.39	0.89	2.28	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
26	1.33	0.88	2.14	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
27	1.29	0.87	2.08	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
28	1.24	0.82	2.08	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
29	1.20	0.82	2.07	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
30	1.16	0.81	2.06	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
31	1.13	0.76	2.05	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
32	1.09	0.76	2.03	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
33	1.06	0.76	2.01	TRUE	FALSE	FALSE	Pass- Qpost < Qpre

Post PT #	Rtn Prd (yrs)	Post Dev Q	Pre Dev Q	Qpost < Qpre	Qpost > Qpre	Qpost > 110% Qpre	Pass/Fail
34	1.03	0.68	2.01	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
35	1.00	0.67	2.00	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
36	0.97	0.67	1.99	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
37	0.95	0.66	1.98	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
38	0.92	0.65	1.96	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
39	0.90	0.63	1.93	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
40	0.88	0.58	1.90	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
41	0.86	0.55	1.88	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
42	0.84	0.54	1.76	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
43	0.82	0.53	1.69	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
44	0.80	0.53	1.67	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
45	0.78	0.52	1.65	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
46	0.77	0.51	1.64	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
47	0.75	0.51	1.64	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
48	0.74	0.50	1.64	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
49	0.72	0.50	1.64	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
50	0.71	0.50	1.63	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
51	0.69	0.50	1.61	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
52	0.68	0.46	1.61	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
53	0.67	0.44	1.61	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
54	0.66	0.44	1.59	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
55	0.64	0.43	1.58	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
56	0.63	0.43	1.58	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
57	0.62	0.42	1.58	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
58	0.61	0.42	1.55	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
59	0.60	0.42	1.55	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
60	0.59	0.42	1.54	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
61	0.58	0.42	1.54	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
62	0.57	0.42	1.54	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
63	0.56	0.41	1.53	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
64	0.55	0.41	1.52	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
65	0.55	0.41	1.52	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
66	0.54	0.40	1.51	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
67	0.53	0.40	1.51	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
68	0.52	0.39	1.50	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
69	0.51	0.39	1.48	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
70	0.51	0.38	1.45	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
71	0.50	0.37	1.43	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
72	0.49	0.37	1.42	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
73	0.49	0.37	1.41	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
74	0.48	0.36	1.36	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
75	0.47	0.36	1.28	TRUE	FALSE	FALSE	Pass- Qpost < Qpre

Post PT #	Rtn Prd (yrs)	Post Dev Q	Pre Dev Q	Qpost < Qpre	Qpost > Qpre	Qpost > 110% Qpre	Pass/Fail
76	0.47	0.35	1.23	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
77	0.46	0.35	1.17	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
78	0.46	0.35	1.17	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
79	0.45	0.34	1.16	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
80	0.44	0.34	1.15	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
81	0.44	0.33	1.15	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
82	0.43	0.33	1.15	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
83	0.43	0.32	1.14	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
84	0.42	0.32	1.13	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
85	0.42	0.32	1.10	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
86	0.41	0.32	1.10	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
87	0.41	0.32	1.08	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
88	0.40	0.31	1.08	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
89	0.40	0.31	1.07	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
90	0.40	0.31	1.07	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
91	0.39	0.31	1.06	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
92	0.39	0.30	1.06	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
93	0.38	0.30	1.05	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
94	0.38	0.30	1.04	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
95	0.38	0.29	1.03	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
96	0.37	0.29	1.02	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
97	0.37	0.29	1.02	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
98	0.36	0.28	1.02	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
99	0.36	0.28	1.01	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
100	0.36	0.28	0.97	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
101	0.35	0.28	0.97	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
102	0.35	0.28	0.97	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
103	0.35	0.28	0.97	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
104	0.34	0.28	0.96	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
105	0.34	0.27	0.96	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
106	0.34	0.27	0.96	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
107	0.33	0.27	0.95	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
108	0.33	0.27	0.95	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
109	0.33	0.27	0.94	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
110	0.32	0.27	0.94	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
111	0.32	0.27	0.93	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
112	0.32	0.27	0.93	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
113	0.32	0.26	0.93	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
114	0.31	0.26	0.93	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
115	0.31	0.26	0.93	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
116	0.31	0.26	0.90	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
117	0.31	0.26	0.89	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold

Post PT #	Rtn Prd (yrs)	Post Dev Q	Pre Dev Q	Qpost < Qpre	Qpost > Qpre	Qpost > 110% Qpre	Pass/Fail
118	0.30	0.25	0.89	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
119	0.30	0.25	0.89	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
120	0.30	0.25	0.88	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
121	0.30	0.25	0.87	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
122	0.29	0.24	0.87	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
123	0.29	0.24	0.87	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
124	0.29	0.24	0.87	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
125	0.29	0.24	0.86	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
126	0.28	0.23	0.86	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
127	0.28	0.23	0.86	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
128	0.28	0.23	0.84	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
129	0.28	0.23	0.84	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
130	0.28	0.23	0.84	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
131	0.27	0.23	0.84	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
132	0.27	0.23	0.83	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
133	0.27	0.22	0.83	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
134	0.27	0.22	0.80	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
135	0.27	0.22	0.79	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
136	0.26	0.22	0.79	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
137	0.26	0.22	0.77	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
138	0.26	0.22	0.77	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
139	0.26	0.22	0.76	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
140	0.26	0.21	0.76	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
141	0.25	0.21	0.73	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
142	0.25	0.21	0.72	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
143	0.25	0.21	0.71	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
144	0.25	0.21	0.71	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
145	0.25	0.21	0.70	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
146	0.25	0.20	0.69	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
147	0.24	0.20	0.69	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
148	0.24	0.20	0.68	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
149	0.24	0.20	0.67	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
150	0.24	0.19	0.67	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
151	0.24	0.19	0.67	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
152	0.24	0.19	0.66	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
153	0.23	0.19	0.65	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
154	0.23	0.19	0.64	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
155	0.23	0.19	0.63	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
156	0.23	0.19	0.61	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
157	0.23	0.18	0.60	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
158	0.23	0.18	0.60	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
159	0.23	0.18	0.59	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold

Post PT #	Rtn Prd (yrs)	Post Dev Q	Pre Dev Q	Qpost < Qpre	Qpost > Qpre	Qpost > 110% Qpre	Pass/Fail
160	0.22	0.18	0.59	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
161	0.22	0.18	0.59	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
162	0.22	0.18	0.59	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
163	0.22	0.18	0.59	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
164	0.22	0.18	0.58	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
165	0.22	0.18	0.58	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
166	0.22	0.17	0.58	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
167	0.21	0.17	0.58	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
168	0.21	0.17	0.58	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
169	0.21	0.17	0.58	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
170	0.21	0.17	0.58	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
171	0.21	0.17	0.58	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
172	0.21	0.17	0.57	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
173	0.21	0.17	0.57	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
174	0.21	0.17	0.57	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
175	0.21	0.17	0.57	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
176	0.20	0.16	0.57	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
177	0.20	0.16	0.57	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
178	0.20	0.16	0.56	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
179	0.20	0.16	0.56	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
180	0.20	0.16	0.55	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
181	0.20	0.16	0.55	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
182	0.20	0.16	0.55	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
183	0.20	0.16	0.54	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
184	0.20	0.16	0.54	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
185	0.19	0.16	0.53	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
186	0.19	0.15	0.53	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
187	0.19	0.15	0.52	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
188	0.19	0.15	0.52	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
189	0.19	0.15	0.52	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
190	0.19	0.15	0.52	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
191	0.19	0.15	0.52	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
192	0.19	0.15	0.50	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
193	0.19	0.15	0.49	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
194	0.19	0.15	0.49	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
195	0.18	0.15	0.48	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
196	0.18	0.15	0.48	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
197	0.18	0.15	0.48	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
198	0.18	0.14	0.48	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
199	0.18	0.14	0.47	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
200	0.18	0.14	0.47	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
201	0.18	0.14	0.46	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold

Post PT #	Rtn Prd (yrs)	Post Dev Q	Pre Dev Q	Qpost < Qpre	Qpost > Qpre	Qpost > 110% Qpre	Pass/Fail
202	0.18	0.14	0.46	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
203	0.18	0.14	0.44	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
204	0.18	0.14	0.44	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
205	0.18	0.14	0.44	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
206	0.17	0.14	0.44	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
207	0.17	0.14	0.44	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
208	0.17	0.14	0.43	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
209	0.17	0.14	0.43	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
210	0.17	0.14	0.43	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
211	0.17	0.14	0.41	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
212	0.17	0.14	0.40	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
213	0.17	0.14	0.38	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
214	0.17	0.14	0.38	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
215	0.17	0.13	0.38	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
216	0.17	0.13	0.37	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
217	0.17	0.13	0.37	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
218	0.16	0.13	0.36	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
219	0.16	0.13	0.36	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
220	0.16	0.13	0.35	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
221	0.16	0.13	0.34	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
222	0.16	0.13	0.33	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
223	0.16	0.13	0.33	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
224	0.16	0.13	0.32	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
225	0.16	0.13	0.30	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
226	0.16	0.13	0.30	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
227	0.16	0.13	0.27	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
228	0.16	0.13	0.26	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
229	0.16	0.13	0.26	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
230	0.16	0.12	0.24	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
231	0.16	0.12	0.24	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
232	0.16	0.12	0.24	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
233	0.15	0.12	0.22	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
234	0.15	0.12	0.22	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
235	0.15	0.12	0.22	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
236	0.15	0.12	0.20	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
237	0.15	0.12	0.20	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
238	0.15	0.12	0.20	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
239	0.15	0.12	0.19	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
240	0.15	0.12	0.18	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
241	0.15	0.11	0.18	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
242	0.15	0.11	0.17	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
243	0.15	0.11	0.17	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold

Post PT #	Rtn Prd (yrs)	Post Dev Q	Pre Dev Q	Qpost < Qpre	Qpost > Qpre	Qpost > 110% Qpre	Pass/Fail
244	0.15	0.10	0.16	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
245	0.15	0.10	0.15	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
246	0.15	0.10	0.15	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
247	0.15	0.09	0.13	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
248	0.15	0.09	0.13	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
249	0.14	0.09	0.13	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
250	0.14	0.09	0.12	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
251	0.14	0.08	0.12	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
252	0.14	0.08	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
253	0.14	0.07	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
254	0.14	0.07	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
255	0.14	0.07	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
256	0.14	0.07	0.07	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
257	0.14	0.07	0.07	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
258	0.14	0.07	0.06	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
259	0.14	0.06	0.05	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
260	0.14	0.06	0.05	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
261	0.14	0.06	0.05	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
262	0.14	0.06	0.05	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
263	0.14	0.06	0.05	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
264	0.14	0.06	0.05	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
265	0.14	0.06	0.04	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
266	0.14	0.06	0.04	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
267	0.13	0.06	0.04	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
268	0.13	0.06	0.04	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
269	0.13	0.06	0.04	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
270	0.13	0.06	0.04	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
271	0.13	0.06	0.04	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
272	0.13	0.06	0.04	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
273	0.13	0.06	0.04	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
274	0.13	0.05	0.04	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
275	0.13	0.05	0.04	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
276	0.13	0.05	0.04	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
277	0.13	0.05	0.04	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
278	0.13	0.05	0.04	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
279	0.13	0.05	0.04	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
280	0.13	0.05	0.04	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
281	0.13	0.05	0.04	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold

SWMM.out file name: V:\17\17065\engineering\TM\CURRENT\STORM\SWMM\17065pre-development.out
SWMM.out time stamp: 4/2/2018 1:49:06 PM

Q10: 3.827
Q5: 3.087
Q2: 2.575

Peak Flow Statistics Table Values

Rank	Start Date	End Date	Duration	Peak	Frequency	Return Period
1	1993/02/08 01:00:00	1993/02/08 15:00:00	15	5.106	0.38%	36
2	1978/01/09 17:00:00	1978/01/10 18:00:00	26	3.901	0.75%	18
3	1978/01/04 14:00:00	1978/01/05 17:00:00	28	3.883	1.13%	12
4	1982/11/29 21:00:00	1982/11/30 04:00:00	8	3.799	1.51%	9
5	1980/01/27 21:00:00	1980/01/28 07:00:00	11	3.429	1.89%	7.2
6	1993/01/06 04:00:00	1993/01/07 23:00:00	44	3.419	2.26%	6
7	1993/01/15 12:00:00	1993/01/18 15:00:00	76	3.09	2.64%	5.14
8	1998/02/22 04:00:00	1998/02/24 04:00:00	49	3.076	3.02%	4.5
9	1980/02/17 23:00:00	1980/02/21 10:00:00	84	3.048	3.40%	4
10	1995/02/14 06:00:00	1995/02/14 18:00:00	13	3.031	3.77%	3.6
11	1980/02/15 19:00:00	1980/02/16 20:00:00	26	3.007	4.15%	3.27
12	1995/01/04 12:00:00	1995/01/05 01:00:00	14	2.968	4.53%	3
13	1976/09/10 04:00:00	1976/09/11 04:00:00	25	2.948	4.91%	2.77
14	1998/01/09 12:00:00	1998/01/10 00:00:00	13	2.947	5.28%	2.57
15	1997/12/06 11:00:00	1997/12/06 17:00:00	7	2.82	5.66%	2.4
16	2005/01/07 15:00:00	2005/01/11 06:00:00	88	2.616	6.04%	2.25
17	1983/02/28 19:00:00	1983/03/02 22:00:00	52	2.599	6.42%	2.12
18	1974/12/04 07:00:00	1974/12/04 15:00:00	9	2.575	6.79%	2
19	1978/01/16 18:00:00	1978/01/16 21:00:00	4	2.572	7.17%	1.9
20	1978/02/08 21:00:00	1978/02/10 12:00:00	40	2.569	7.55%	1.8
21	1986/03/15 21:00:00	1986/03/16 20:00:00	24	2.542	7.92%	1.71
22	1992/03/20 21:00:00	1992/03/21 01:00:00	5	2.529	8.30%	1.64
23	2004/10/19 21:00:00	2004/10/20 14:00:00	18	2.477	8.68%	1.57
24	1982/01/20 04:00:00	1982/01/21 04:00:00	25	2.471	9.06%	1.5
25	1988/01/05 14:00:00	1988/01/05 16:00:00	3	2.338	9.43%	1.44
26	1971/12/24 06:00:00	1971/12/25 20:00:00	39	2.283	9.81%	1.39
27	1974/01/06 17:00:00	1974/01/08 05:00:00	37	2.139	10.19%	1.33
28	1983/01/29 00:00:00	1983/01/29 03:00:00	4	2.08	10.57%	1.29
29	2000/02/20 21:00:00	2000/02/21 20:00:00	24	2.076	10.94%	1.24
30	1994/02/07 10:00:00	1994/02/08 06:00:00	21	2.072	11.32%	1.2
31	1995/01/10 16:00:00	1995/01/12 15:00:00	48	2.058	11.70%	1.16
32	1980/02/12 15:00:00	1980/02/14 17:00:00	51	2.055	12.08%	1.13
33	1986/03/10 06:00:00	1986/03/10 17:00:00	12	2.025	12.45%	1.09
34	1992/03/23 02:00:00	1992/03/23 04:00:00	3	2.01	12.83%	1.06
35	1986/02/14 23:00:00	1986/02/15 10:00:00	12	2.009	13.21%	1.03
36	1992/02/12 16:00:00	1992/02/13 11:00:00	20	1.997	13.58%	1
37	1978/01/19 12:00:00	1978/01/19 13:00:00	2	1.991	13.96%	0.97
38	1976/12/30 21:00:00	1976/12/31 14:00:00	18	1.98	14.34%	0.95
39	1992/02/15 12:00:00	1992/02/15 17:00:00	6	1.957	14.72%	0.92

Rank	Start Date	End Date	Duration	Peak	Frequency	Return Period
40	1979/01/05 17:00:00	1979/01/06 05:00:00	13	1.934	15.09%	0.9
41	1982/12/22 16:00:00	1982/12/22 23:00:00	8	1.905	15.47%	0.88
42	1980/01/09 13:00:00	1980/01/09 15:00:00	3	1.875	15.85%	0.86
43	1983/12/25 05:00:00	1983/12/25 17:00:00	13	1.759	16.23%	0.84
44	1976/02/08 14:00:00	1976/02/09 17:00:00	28	1.685	16.60%	0.82
45	1973/01/16 20:00:00	1973/01/16 22:00:00	3	1.67	16.98%	0.8
46	1983/02/26 13:00:00	1983/02/27 16:00:00	28	1.647	17.36%	0.78
47	1998/02/07 22:00:00	1998/02/09 00:00:00	27	1.643	17.74%	0.77
48	1995/03/05 01:00:00	1995/03/06 00:00:00	24	1.638	18.11%	0.75
49	1982/03/17 06:00:00	1982/03/18 05:00:00	24	1.638	18.49%	0.74
50	1993/01/12 20:00:00	1993/01/14 05:00:00	34	1.636	18.87%	0.72
51	1998/02/03 10:00:00	1998/02/03 19:00:00	10	1.626	19.25%	0.71
52	1983/02/08 03:00:00	1983/02/08 05:00:00	3	1.615	19.62%	0.69
53	1983/03/24 02:00:00	1983/03/24 03:00:00	2	1.614	20.00%	0.68
54	1991/03/25 08:00:00	1991/03/27 05:00:00	46	1.608	20.38%	0.67
55	1996/12/09 18:00:00	1996/12/09 20:00:00	3	1.594	20.75%	0.66
56	1978/01/14 16:00:00	1978/01/15 05:00:00	14	1.58	21.13%	0.64
57	1977/01/03 00:00:00	1977/01/03 06:00:00	7	1.576	21.51%	0.63
58	2004/12/28 09:00:00	2004/12/29 15:00:00	31	1.575	21.89%	0.62
59	1985/11/29 12:00:00	1985/11/29 16:00:00	5	1.554	22.26%	0.61
60	1973/02/11 06:00:00	1973/02/13 03:00:00	46	1.552	22.64%	0.6
61	1991/02/27 17:00:00	1991/03/01 11:00:00	43	1.54	23.02%	0.59
62	2001/01/11 03:00:00	2001/01/12 08:00:00	30	1.536	23.40%	0.58
63	1995/03/11 01:00:00	1995/03/11 22:00:00	22	1.536	23.77%	0.57
64	1993/02/18 13:00:00	1993/02/20 08:00:00	44	1.534	24.15%	0.56
65	1984/12/27 03:00:00	1984/12/27 21:00:00	19	1.523	24.53%	0.55
66	1979/01/31 02:00:00	1979/02/01 12:00:00	35	1.522	24.91%	0.55
67	2005/01/03 06:00:00	2005/01/04 08:00:00	27	1.515	25.28%	0.54
68	2005/02/19 10:00:00	2005/02/19 15:00:00	6	1.511	25.66%	0.53
69	1982/04/01 10:00:00	1982/04/01 17:00:00	8	1.501	26.04%	0.52
70	1994/02/18 14:00:00	1994/02/18 20:00:00	7	1.484	26.42%	0.51
71	1992/03/27 15:00:00	1992/03/27 15:00:00	1	1.452	26.79%	0.51
72	1983/01/27 08:00:00	1983/01/27 18:00:00	11	1.427	27.17%	0.5
73	2005/03/22 21:00:00	2005/03/22 22:00:00	2	1.415	27.55%	0.49
74	2003/02/25 02:00:00	2003/02/26 09:00:00	32	1.41	27.92%	0.49
75	1972/11/14 13:00:00	1972/11/14 14:00:00	2	1.358	28.30%	0.48
76	2004/10/27 02:00:00	2004/10/27 07:00:00	6	1.285	28.68%	0.47
77	2000/04/18 06:00:00	2000/04/18 06:00:00	1	1.233	29.06%	0.47
78	2001/02/25 11:00:00	2001/02/28 08:00:00	70	1.174	29.43%	0.46
79	2005/02/21 04:00:00	2005/02/23 09:00:00	54	1.166	29.81%	0.46
80	1984/12/18 14:00:00	1984/12/20 03:00:00	38	1.161	30.19%	0.45
81	1982/02/10 14:00:00	1982/02/10 22:00:00	9	1.153	30.57%	0.44
82	1977/05/08 18:00:00	1977/05/08 19:00:00	2	1.149	30.94%	0.44
83	1977/12/28 07:00:00	1977/12/28 17:00:00	11	1.147	31.32%	0.43
84	1991/03/19 00:00:00	1991/03/20 10:00:00	35	1.139	31.70%	0.43
85	1991/12/29 15:00:00	1991/12/30 00:00:00	10	1.132	32.08%	0.42
86	1995/03/03 07:00:00	1995/03/03 10:00:00	4	1.104	32.45%	0.42

Rank	Start Date	End Date	Duration	Peak	Frequency	Return Period
87	1992/01/05 09:00:00	1992/01/06 02:00:00	18	1.096	32.83%	0.41
88	1974/01/04 15:00:00	1974/01/05 12:00:00	22	1.083	33.21%	0.41
89	1978/11/21 17:00:00	1978/11/21 19:00:00	3	1.076	33.58%	0.4
90	1988/12/21 03:00:00	1988/12/21 06:00:00	4	1.072	33.96%	0.4
91	1994/02/17 12:00:00	1994/02/17 13:00:00	2	1.065	34.34%	0.4
92	1997/01/15 18:00:00	1997/01/15 18:00:00	1	1.058	34.72%	0.39
93	1983/11/24 23:00:00	1983/11/25 00:00:00	2	1.056	35.09%	0.39
94	1998/03/29 02:00:00	1998/03/29 03:00:00	2	1.05	35.47%	0.38
95	1978/03/04 08:00:00	1978/03/05 08:00:00	25	1.039	35.85%	0.38
96	1978/02/28 01:00:00	1978/03/02 14:00:00	62	1.027	36.23%	0.38
97	1998/02/14 13:00:00	1998/02/14 18:00:00	6	1.024	36.60%	0.37
98	2000/02/23 16:00:00	2000/02/23 17:00:00	2	1.022	36.98%	0.37
99	1972/12/04 13:00:00	1972/12/04 15:00:00	3	1.017	37.36%	0.36
100	1980/03/03 00:00:00	1980/03/03 11:00:00	12	1.015	37.74%	0.36
101	1981/01/29 17:00:00	1981/01/29 18:00:00	2	0.971	38.11%	0.36
102	1983/10/01 10:00:00	1983/10/01 11:00:00	2	0.969	38.49%	0.35
103	1988/01/17 11:00:00	1988/01/17 21:00:00	11	0.968	38.87%	0.35
104	1985/11/11 08:00:00	1985/11/11 14:00:00	7	0.966	39.25%	0.35
105	1998/05/12 16:00:00	1998/05/13 14:00:00	23	0.96	39.62%	0.34
106	1983/04/20 04:00:00	1983/04/21 01:00:00	22	0.956	40.00%	0.34
107	1982/03/14 12:00:00	1982/03/14 19:00:00	8	0.955	40.38%	0.34
108	1979/01/15 13:00:00	1979/01/15 21:00:00	9	0.954	40.75%	0.33
109	1982/01/01 08:00:00	1982/01/01 10:00:00	3	0.951	41.13%	0.33
110	1980/03/06 13:00:00	1980/03/06 14:00:00	2	0.945	41.51%	0.33
111	1996/11/21 20:00:00	1996/11/22 04:00:00	9	0.941	41.89%	0.32
112	1986/11/17 23:00:00	1986/11/18 03:00:00	5	0.933	42.26%	0.32
113	2003/03/15 15:00:00	2003/03/16 03:00:00	13	0.932	42.64%	0.32
114	1995/01/07 23:00:00	1995/01/08 03:00:00	5	0.932	43.02%	0.32
115	1975/03/08 07:00:00	1975/03/08 12:00:00	6	0.93	43.40%	0.31
116	1987/12/18 12:00:00	1987/12/18 12:00:00	1	0.927	43.77%	0.31
117	1996/01/31 17:00:00	1996/01/31 21:00:00	5	0.902	44.15%	0.31
118	1992/12/07 08:00:00	1992/12/07 16:00:00	9	0.894	44.53%	0.31
119	2001/02/13 04:00:00	2001/02/14 00:00:00	21	0.894	44.91%	0.3
120	1998/02/06 13:00:00	1998/02/06 19:00:00	7	0.894	45.28%	0.3
121	1990/02/17 15:00:00	1990/02/17 20:00:00	6	0.882	45.66%	0.3
122	1984/12/16 03:00:00	1984/12/16 04:00:00	2	0.873	46.04%	0.3
123	1990/01/17 00:00:00	1990/01/17 04:00:00	5	0.868	46.42%	0.29
124	2003/02/12 13:00:00	2003/02/12 17:00:00	5	0.868	46.79%	0.29
125	1987/12/16 19:00:00	1987/12/17 08:00:00	14	0.867	47.17%	0.29
126	2003/12/25 18:00:00	2003/12/25 20:00:00	3	0.862	47.55%	0.29
127	1997/01/12 15:00:00	1997/01/14 03:00:00	37	0.86	47.92%	0.28
128	1978/03/11 22:00:00	1978/03/11 23:00:00	2	0.86	48.30%	0.28
129	1976/02/06 09:00:00	1976/02/06 12:00:00	4	0.845	48.68%	0.28
130	1986/03/08 19:00:00	1986/03/08 20:00:00	2	0.843	49.06%	0.28
131	1996/02/27 21:00:00	1996/02/28 01:00:00	5	0.842	49.43%	0.28
132	1979/03/17 06:00:00	1979/03/17 07:00:00	2	0.841	49.81%	0.27
133	1988/12/24 21:00:00	1988/12/25 00:00:00	4	0.832	50.19%	0.27

Rank	Start Date	End Date	Duration	Peak	Frequency	Return Period
134	1993/02/23 20:00:00	1993/02/23 20:00:00	1	0.832	50.57%	0.27
135	1987/10/12 10:00:00	1987/10/12 15:00:00	6	0.8	50.94%	0.27
136	1976/03/02 22:00:00	1976/03/02 23:00:00	2	0.792	51.32%	0.27
137	1979/02/21 04:00:00	1979/02/21 05:00:00	2	0.789	51.70%	0.26
138	1973/01/18 21:00:00	1973/01/18 22:00:00	2	0.771	52.08%	0.26
139	1973/03/11 12:00:00	1973/03/11 12:00:00	1	0.768	52.45%	0.26
140	2003/04/14 14:00:00	2003/04/14 19:00:00	6	0.757	52.83%	0.26
141	1998/05/04 20:00:00	1998/05/04 23:00:00	4	0.755	53.21%	0.26
142	1973/11/23 00:00:00	1973/11/23 01:00:00	2	0.734	53.58%	0.25
143	1986/09/25 04:00:00	1986/09/25 04:00:00	1	0.716	53.96%	0.25
144	1981/01/28 06:00:00	1981/01/28 06:00:00	1	0.708	54.34%	0.25
145	1978/02/12 18:00:00	1978/02/13 11:00:00	18	0.706	54.72%	0.25
146	1978/09/05 19:00:00	1978/09/05 21:00:00	3	0.704	55.09%	0.25
147	2005/05/06 05:00:00	2005/05/06 05:00:00	1	0.693	55.47%	0.25
148	1971/12/22 08:00:00	1971/12/22 22:00:00	15	0.691	55.85%	0.24
149	1973/03/20 06:00:00	1973/03/20 07:00:00	2	0.683	56.23%	0.24
150	1997/01/26 00:00:00	1997/01/26 11:00:00	12	0.673	56.60%	0.24
151	1977/12/26 06:00:00	1977/12/26 18:00:00	13	0.671	56.98%	0.24
152	1990/04/16 22:00:00	1990/04/16 23:00:00	2	0.666	57.36%	0.24
153	1977/03/25 03:00:00	1977/03/25 13:00:00	11	0.658	57.74%	0.24
154	1987/01/04 18:00:00	1987/01/04 20:00:00	3	0.647	58.11%	0.23
155	1987/11/04 18:00:00	1987/11/05 08:00:00	15	0.639	58.49%	0.23
156	2004/02/26 04:00:00	2004/02/26 10:00:00	7	0.626	58.87%	0.23
157	1995/01/24 20:00:00	1995/01/26 04:00:00	33	0.615	59.25%	0.23
158	1982/01/05 13:00:00	1982/01/05 17:00:00	5	0.602	59.62%	0.23
159	1989/02/04 13:00:00	1989/02/04 16:00:00	4	0.6	60.00%	0.23
160	1971/12/27 13:00:00	1971/12/28 13:00:00	25	0.594	60.38%	0.23
161	1974/03/08 02:00:00	1974/03/08 13:00:00	12	0.591	60.75%	0.22
162	1998/04/11 01:00:00	1998/04/11 01:00:00	1	0.586	61.13%	0.22
163	1987/01/06 22:00:00	1987/01/07 00:00:00	3	0.586	61.51%	0.22
164	1986/10/09 20:00:00	1986/10/09 20:00:00	1	0.586	61.89%	0.22
165	1977/01/05 23:00:00	1977/01/06 23:00:00	25	0.585	62.26%	0.22
166	2004/02/22 04:00:00	2004/02/22 09:00:00	6	0.582	62.64%	0.22
167	1983/03/21 04:00:00	1983/03/21 04:00:00	1	0.582	63.02%	0.22
168	1993/01/10 12:00:00	1993/01/10 13:00:00	2	0.581	63.40%	0.21
169	1981/03/01 08:00:00	1981/03/02 08:00:00	25	0.581	63.77%	0.21
170	1998/02/17 04:00:00	1998/02/17 07:00:00	4	0.58	64.15%	0.21
171	1975/04/08 12:00:00	1975/04/08 23:00:00	12	0.579	64.53%	0.21
172	2000/03/08 13:00:00	2000/03/08 15:00:00	3	0.577	64.91%	0.21
173	1982/03/30 00:00:00	1982/03/30 16:00:00	17	0.574	65.28%	0.21
174	1979/03/19 04:00:00	1979/03/19 06:00:00	3	0.573	65.66%	0.21
175	1979/03/27 14:00:00	1979/03/28 20:00:00	31	0.572	66.04%	0.21
176	1976/03/01 14:00:00	1976/03/01 16:00:00	3	0.57	66.42%	0.21
177	2005/02/11 13:00:00	2005/02/12 00:00:00	12	0.569	66.79%	0.2
178	2001/03/10 03:00:00	2001/03/10 05:00:00	3	0.568	67.17%	0.2
179	2004/10/28 09:00:00	2004/10/28 10:00:00	2	0.564	67.55%	0.2
180	1978/02/07 18:00:00	1978/02/07 20:00:00	3	0.556	67.92%	0.2

Rank	Start Date	End Date	Duration	Peak	Frequency	Return Period
181	1975/03/11 13:00:00	1975/03/11 14:00:00	2	0.548	68.30%	0.2
182	1999/01/26 11:00:00	1999/01/26 22:00:00	12	0.545	68.68%	0.2
183	1971/12/07 01:00:00	1971/12/07 01:00:00	1	0.545	69.06%	0.2
184	1983/04/29 05:00:00	1983/04/29 09:00:00	5	0.545	69.43%	0.2
185	1988/04/20 05:00:00	1988/04/21 05:00:00	25	0.542	69.81%	0.2
186	1979/11/08 03:00:00	1979/11/08 04:00:00	2	0.533	70.19%	0.19
187	1995/04/18 11:00:00	1995/04/18 13:00:00	3	0.527	70.57%	0.19
188	1984/11/13 08:00:00	1984/11/13 09:00:00	2	0.522	70.94%	0.19
189	2004/12/31 14:00:00	2004/12/31 15:00:00	2	0.521	71.32%	0.19
190	2000/02/12 05:00:00	2000/02/12 06:00:00	2	0.516	71.70%	0.19
191	2006/03/28 21:00:00	2006/03/28 21:00:00	1	0.516	72.08%	0.19
192	2000/03/05 10:00:00	2000/03/05 13:00:00	4	0.51	72.45%	0.19
193	1994/04/25 16:00:00	1994/04/26 17:00:00	26	0.503	72.83%	0.19
194	1994/03/24 23:00:00	1994/03/25 02:00:00	4	0.492	73.21%	0.19
195	1978/03/31 04:00:00	1978/03/31 05:00:00	2	0.488	73.58%	0.19
196	1997/12/07 20:00:00	1997/12/07 20:00:00	1	0.484	73.96%	0.18
197	1994/02/20 13:00:00	1994/02/20 15:00:00	3	0.48	74.34%	0.18
198	1989/01/05 19:00:00	1989/01/05 20:00:00	2	0.477	74.72%	0.18
199	1993/11/14 08:00:00	1993/11/14 08:00:00	1	0.476	75.09%	0.18
200	1996/03/13 03:00:00	1996/03/13 05:00:00	3	0.475	75.47%	0.18
201	1985/02/02 11:00:00	1985/02/02 11:00:00	1	0.467	75.85%	0.18
202	1983/03/18 11:00:00	1983/03/19 01:00:00	15	0.465	76.23%	0.18
203	1995/03/23 07:00:00	1995/03/23 07:00:00	1	0.461	76.60%	0.18
204	1998/12/07 05:00:00	1998/12/07 05:00:00	1	0.444	76.98%	0.18
205	2006/02/28 01:00:00	2006/02/28 05:00:00	5	0.443	77.36%	0.18
206	1977/08/17 04:00:00	1977/08/17 09:00:00	6	0.442	77.74%	0.18
207	1990/01/14 00:00:00	1990/01/14 01:00:00	2	0.441	78.11%	0.17
208	1992/02/10 00:00:00	1992/02/10 01:00:00	2	0.44	78.49%	0.17
209	2005/04/28 08:00:00	2005/04/28 10:00:00	3	0.434	78.87%	0.17
210	1983/01/23 03:00:00	1983/01/23 03:00:00	1	0.425	79.25%	0.17
211	1975/03/06 06:00:00	1975/03/06 06:00:00	1	0.424	79.62%	0.17
212	1985/11/25 06:00:00	1985/11/25 07:00:00	2	0.412	80.00%	0.17
213	2001/11/24 17:00:00	2001/11/24 17:00:00	1	0.395	80.38%	0.17
214	1985/02/09 09:00:00	1985/02/09 11:00:00	3	0.384	80.75%	0.17
215	1973/03/06 12:00:00	1973/03/06 23:00:00	12	0.375	81.13%	0.17
216	2002/12/16 18:00:00	2002/12/16 19:00:00	2	0.374	81.51%	0.17
217	1975/03/10 11:00:00	1975/03/10 12:00:00	2	0.371	81.89%	0.17
218	2004/11/21 08:00:00	2004/11/21 09:00:00	2	0.37	82.26%	0.17
219	1978/04/07 02:00:00	1978/04/07 04:00:00	3	0.363	82.64%	0.16
220	1992/03/02 18:00:00	1992/03/02 21:00:00	4	0.354	83.02%	0.16
221	1978/12/17 01:00:00	1978/12/18 16:00:00	40	0.353	83.40%	0.16
222	2003/02/11 08:00:00	2003/02/11 11:00:00	4	0.337	83.77%	0.16
223	1980/12/05 01:00:00	1980/12/05 01:00:00	1	0.33	84.15%	0.16
224	1999/02/04 18:00:00	1999/02/04 18:00:00	1	0.325	84.53%	0.16
225	1996/02/21 09:00:00	1996/02/21 09:00:00	1	0.324	84.91%	0.16
226	1983/01/24 17:00:00	1983/01/24 18:00:00	2	0.301	85.28%	0.16
227	1982/11/10 02:00:00	1982/11/10 02:00:00	1	0.279	85.66%	0.16

Rank	Start Date	End Date	Duration	Peak	Frequency	Return Period
228	1978/11/13 20:00:00	1978/11/13 21:00:00	2	0.267	86.04%	0.16
229	1984/09/16 14:00:00	1984/09/16 14:00:00	1	0.263	86.42%	0.16
230	1979/01/17 08:00:00	1979/01/17 09:00:00	2	0.246	86.79%	0.16
231	1983/11/12 17:00:00	1983/11/12 18:00:00	2	0.244	87.17%	0.16
232	1998/02/19 21:00:00	1998/02/20 00:00:00	4	0.24	87.55%	0.16
233	1980/03/26 03:00:00	1980/03/26 06:00:00	4	0.232	87.92%	0.16
234	1980/03/10 19:00:00	1980/03/10 20:00:00	2	0.219	88.30%	0.15
235	1986/01/30 05:00:00	1986/01/30 06:00:00	2	0.216	88.68%	0.15
236	2003/02/27 12:00:00	2003/02/27 12:00:00	1	0.205	89.06%	0.15
237	1981/03/19 22:00:00	1981/03/19 22:00:00	1	0.197	89.43%	0.15
238	1998/03/31 07:00:00	1998/03/31 10:00:00	4	0.196	89.81%	0.15
239	1984/11/24 17:00:00	1984/11/24 22:00:00	6	0.191	90.19%	0.15
240	1987/10/31 06:00:00	1987/10/31 16:00:00	11	0.189	90.57%	0.15
241	1973/03/22 00:00:00	1973/03/22 01:00:00	2	0.182	90.94%	0.15
242	1996/02/25 10:00:00	1996/02/25 10:00:00	1	0.181	91.32%	0.15
243	2002/12/20 08:00:00	2002/12/20 09:00:00	2	0.174	91.70%	0.15
244	1979/02/23 06:00:00	1979/02/23 06:00:00	1	0.17	92.08%	0.15
245	1999/04/07 09:00:00	1999/04/07 09:00:00	1	0.16	92.45%	0.15
246	1981/02/09 04:00:00	1981/02/09 06:00:00	3	0.152	92.83%	0.15
247	1994/02/04 06:00:00	1994/02/04 11:00:00	6	0.145	93.21%	0.15
248	1986/02/08 10:00:00	1986/02/08 10:00:00	1	0.133	93.58%	0.15
249	2005/02/24 20:00:00	2005/02/24 20:00:00	1	0.126	93.96%	0.15
250	1983/11/20 10:00:00	1983/11/20 11:00:00	2	0.125	94.34%	0.14
251	1992/12/29 14:00:00	1992/12/29 14:00:00	1	0.124	94.72%	0.14
252	1987/03/06 15:00:00	1987/03/06 15:00:00	1	0.119	95.09%	0.14
253	1998/03/27 13:00:00	1998/03/27 15:00:00	3	0.102	95.47%	0.14
254	1989/01/04 10:00:00	1989/01/04 11:00:00	2	0.099	95.85%	0.14
255	1986/03/13 20:00:00	1986/03/13 20:00:00	1	0.097	96.23%	0.14
256	1984/12/11 07:00:00	1984/12/11 07:00:00	1	0.079	96.60%	0.14
257	2005/02/18 08:00:00	2005/02/18 08:00:00	1	0.065	96.98%	0.14
258	1974/03/02 09:00:00	1974/03/02 09:00:00	1	0.064	97.36%	0.14
259	1998/04/05 14:00:00	1998/04/05 14:00:00	1	0.058	97.74%	0.14
260	1986/03/12 12:00:00	1986/03/12 12:00:00	1	0.052	98.11%	0.14
261	1976/02/07 14:00:00	1976/02/07 14:00:00	1	0.05	98.49%	0.14
262	1991/03/13 17:00:00	1991/03/13 17:00:00	1	0.046	98.87%	0.14
263	2000/11/25 05:00:00	2000/11/25 05:00:00	1	0.046	99.25%	0.14
264	1992/12/28 03:00:00	1992/12/28 03:00:00	1	0.045	99.62%	0.14
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Q10: 0.000
Q5: 0.000
Q2: 0.000

Peak Flow Statistics Table Values

Rank	Start Date	End Date	Duration	Peak	Frequency	Return Period
1	1980/01/27 21:00:00	1980/01/29 09:00:00	37	2.958	0.35%	36
2	1995/01/04 12:00:00	1995/01/05 15:00:00	28	2.774	0.71%	18
3	1978/01/04 14:00:00	1978/01/06 08:00:00	43	2.649	1.06%	12
4	1993/01/12 20:00:00	1993/01/19 07:00:00	156	2.601	1.41%	9
5	1993/01/06 04:00:00	1993/01/08 16:00:00	61	2.321	1.77%	7.2
6	1998/02/22 04:00:00	1998/02/24 18:00:00	63	2.319	2.12%	6
7	1982/11/29 20:00:00	1982/11/30 19:00:00	24	1.942	2.47%	5.14
8	2005/01/07 14:00:00	2005/01/11 22:00:00	105	1.894	2.83%	4.5
9	1983/03/01 13:00:00	1983/03/03 16:00:00	52	1.821	3.18%	4
10	1993/02/08 01:00:00	1993/02/09 09:00:00	33	1.761	3.53%	3.6
11	1995/02/13 19:00:00	1995/02/15 09:00:00	39	1.626	3.89%	3.27
12	1974/01/04 15:00:00	1974/01/08 19:00:00	101	1.553	4.24%	3
13	1980/02/12 14:00:00	1980/02/22 00:00:00	227	1.51	4.59%	2.77
14	1976/09/10 04:00:00	1976/09/11 20:00:00	41	1.404	4.95%	2.57
15	1982/01/20 04:00:00	1982/01/21 20:00:00	41	1.394	5.30%	2.4
16	1979/01/05 16:00:00	1979/01/06 23:00:00	32	1.357	5.65%	2.25
17	1986/02/14 22:00:00	1986/02/16 09:00:00	36	1.311	6.01%	2.12
18	1982/12/22 16:00:00	1982/12/23 14:00:00	23	1.248	6.36%	2
19	1991/02/27 17:00:00	1991/03/02 03:00:00	59	1.243	6.71%	1.9
20	2004/10/19 21:00:00	2004/10/21 08:00:00	36	1.231	7.07%	1.8
21	1995/03/11 00:00:00	1995/03/12 10:00:00	35	1.06	7.42%	1.71
22	1978/01/09 17:00:00	1978/01/11 11:00:00	43	0.979	7.77%	1.64
23	1995/01/10 16:00:00	1995/01/13 02:00:00	59	0.964	8.13%	1.57
24	2000/02/20 21:00:00	2000/02/22 10:00:00	38	0.926	8.48%	1.5
25	1997/12/06 07:00:00	1997/12/07 20:00:00	38	0.895	8.83%	1.44
26	1978/01/14 15:00:00	1978/01/17 12:00:00	70	0.887	9.19%	1.39
27	1991/03/25 08:00:00	1991/03/28 00:00:00	65	0.884	9.54%	1.33
28	1994/02/07 10:00:00	1994/02/08 22:00:00	37	0.872	9.89%	1.29
29	1971/12/22 08:00:00	1971/12/26 06:00:00	95	0.822	10.25%	1.24
30	1995/03/05 01:00:00	1995/03/06 14:00:00	38	0.821	10.60%	1.2
31	1996/11/21 16:00:00	1996/11/22 20:00:00	29	0.812	10.95%	1.16
32	1982/03/17 06:00:00	1982/03/18 23:00:00	42	0.765	11.31%	1.13
33	1998/01/09 12:00:00	1998/01/10 19:00:00	32	0.76	11.66%	1.09
34	1976/02/07 14:00:00	1976/02/10 13:00:00	72	0.76	12.01%	1.06
35	2005/02/20 19:00:00	2005/02/24 20:00:00	98	0.678	12.37%	1.03
36	1978/02/08 21:00:00	1978/02/11 10:00:00	62	0.671	12.72%	1
37	1992/03/20 16:00:00	1992/03/21 22:00:00	31	0.668	13.07%	0.97
38	1986/03/15 21:00:00	1986/03/17 10:00:00	38	0.656	13.43%	0.95
39	1974/12/04 07:00:00	1974/12/05 05:00:00	23	0.653	13.78%	0.92

Rank	Start Date	End Date	Duration	Peak	Frequency	Return Period
40	1988/01/05 14:00:00	1988/01/05 14:00:00	1	0.626	14.13%	0.9
41	1979/01/30 23:00:00	1979/02/02 04:00:00	54	0.575	14.49%	0.88
42	2003/02/25 02:00:00	2003/02/26 09:00:00	32	0.554	14.84%	0.86
43	1983/01/27 08:00:00	1983/01/29 17:00:00	58	0.543	15.19%	0.84
44	1976/12/30 21:00:00	1976/12/31 14:00:00	18	0.535	15.55%	0.82
45	1992/03/23 01:00:00	1992/03/23 20:00:00	20	0.525	15.90%	0.8
46	1986/03/10 06:00:00	1986/03/10 17:00:00	12	0.521	16.25%	0.78
47	1980/01/09 05:00:00	1980/01/10 04:00:00	24	0.511	16.61%	0.77
48	1983/12/24 19:00:00	1983/12/26 09:00:00	39	0.509	16.96%	0.75
49	1992/02/12 15:00:00	1992/02/14 01:00:00	35	0.504	17.31%	0.74
50	1978/01/19 11:00:00	1978/01/19 13:00:00	3	0.502	17.67%	0.72
51	2004/12/28 09:00:00	2004/12/30 05:00:00	45	0.5	18.02%	0.71
52	1992/02/15 12:00:00	1992/02/15 22:00:00	11	0.495	18.37%	0.69
53	1998/02/03 10:00:00	1998/02/04 15:00:00	30	0.459	18.73%	0.68
54	2003/03/15 15:00:00	2003/03/17 03:00:00	37	0.438	19.08%	0.67
55	1993/02/18 13:00:00	1993/02/21 00:00:00	60	0.436	19.43%	0.66
56	1996/12/09 17:00:00	1996/12/10 06:00:00	14	0.434	19.79%	0.64
57	1973/02/11 06:00:00	1973/02/13 19:00:00	62	0.431	20.14%	0.63
58	2001/01/11 03:00:00	2001/01/12 08:00:00	30	0.423	20.49%	0.62
59	1998/02/07 22:00:00	1998/02/09 11:00:00	38	0.421	20.85%	0.61
60	1983/02/26 13:00:00	1983/02/28 12:00:00	48	0.42	21.20%	0.6
61	1984/12/27 03:00:00	1984/12/28 11:00:00	33	0.42	21.55%	0.59
62	1977/01/03 00:00:00	1977/01/03 19:00:00	20	0.419	21.91%	0.58
63	1973/01/16 19:00:00	1973/01/17 02:00:00	8	0.418	22.26%	0.57
64	1983/02/08 00:00:00	1983/02/08 05:00:00	6	0.41	22.61%	0.56
65	1978/02/27 20:00:00	1978/03/03 04:00:00	81	0.409	22.97%	0.55
66	1985/11/29 11:00:00	1985/11/30 10:00:00	24	0.406	23.32%	0.55
67	1983/03/24 02:00:00	1983/03/24 03:00:00	2	0.405	23.67%	0.54
68	2005/02/18 05:00:00	2005/02/19 15:00:00	35	0.404	24.03%	0.53
69	1994/02/18 14:00:00	1994/02/20 15:00:00	50	0.389	24.38%	0.52
70	2005/01/03 06:00:00	2005/01/04 08:00:00	27	0.386	24.73%	0.51
71	1982/04/01 10:00:00	1982/04/01 21:00:00	12	0.381	25.09%	0.51
72	2005/03/22 21:00:00	2005/03/22 22:00:00	2	0.37	25.44%	0.5
73	1972/11/14 13:00:00	1972/11/14 13:00:00	1	0.366	25.80%	0.49
74	1997/01/12 14:00:00	1997/01/14 11:00:00	46	0.366	26.15%	0.49
75	1992/03/27 15:00:00	1992/03/27 15:00:00	1	0.364	26.50%	0.48
76	2004/10/27 02:00:00	2004/10/28 17:00:00	40	0.359	26.86%	0.47
77	2000/04/18 06:00:00	2000/04/18 06:00:00	1	0.354	27.21%	0.47
78	1992/01/05 09:00:00	1992/01/06 15:00:00	31	0.349	27.56%	0.46
79	1980/03/02 23:00:00	1980/03/03 16:00:00	18	0.347	27.92%	0.46
80	1984/12/18 14:00:00	1984/12/20 14:00:00	49	0.338	28.27%	0.45
81	1995/03/03 07:00:00	1995/03/03 15:00:00	9	0.337	28.62%	0.44
82	1977/05/08 14:00:00	1977/05/09 20:00:00	31	0.326	28.98%	0.44
83	1997/01/15 18:00:00	1997/01/15 18:00:00	1	0.326	29.33%	0.43
84	1991/12/29 15:00:00	1991/12/30 08:00:00	18	0.323	29.68%	0.43
85	2001/02/25 10:00:00	2001/02/28 08:00:00	71	0.323	30.04%	0.42
86	1991/03/19 00:00:00	1991/03/21 10:00:00	59	0.32	30.39%	0.42

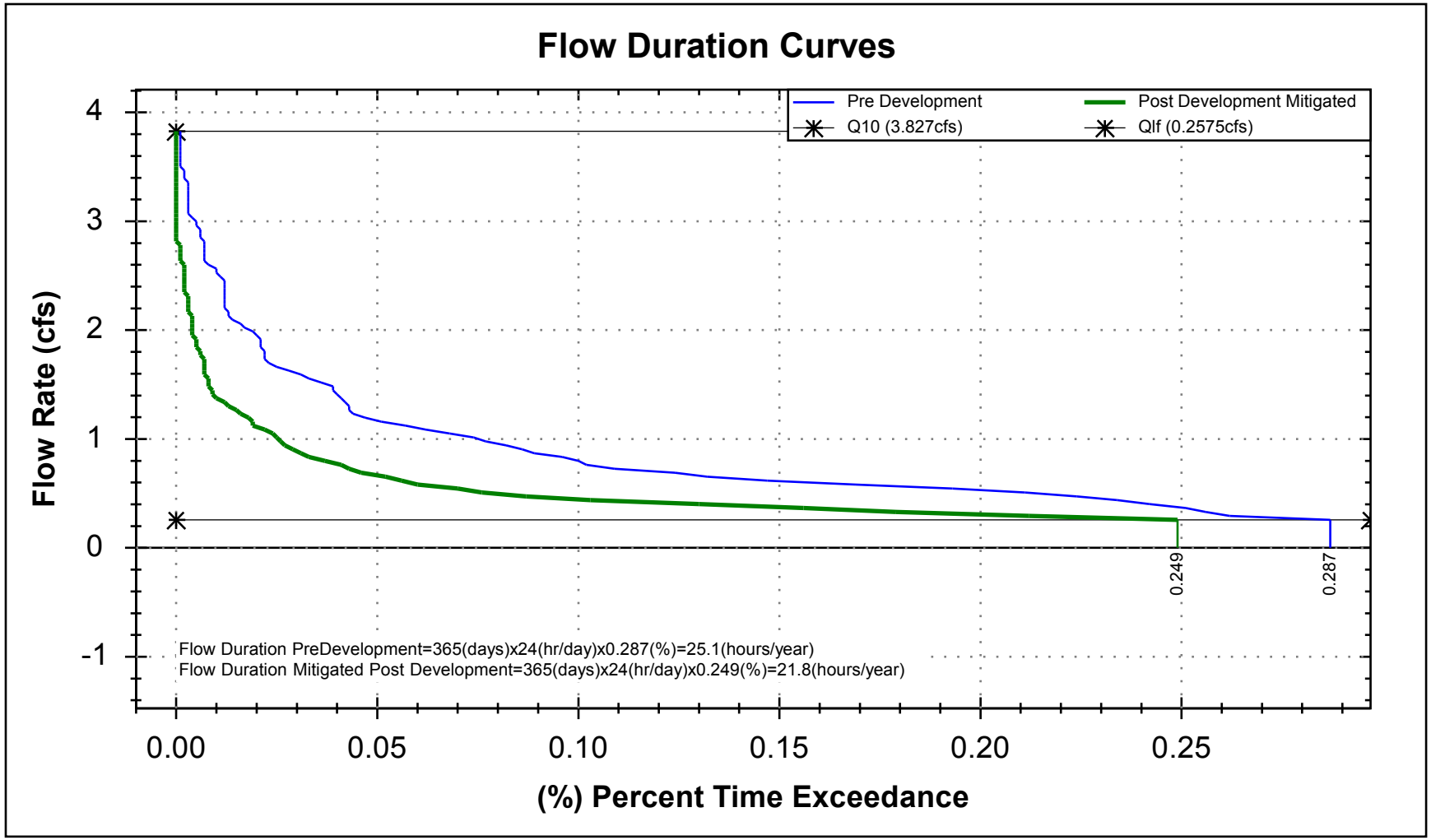
Rank	Start Date	End Date	Duration	Peak	Frequency	Return Period
87	1988/01/17 11:00:00	1988/01/18 11:00:00	25	0.318	30.74%	0.41
88	1977/12/26 06:00:00	1977/12/28 22:00:00	65	0.315	31.10%	0.41
89	1983/11/24 23:00:00	1983/11/25 00:00:00	2	0.313	31.45%	0.4
90	1978/03/04 07:00:00	1978/03/05 16:00:00	34	0.306	31.80%	0.4
91	1998/05/12 16:00:00	1998/05/13 14:00:00	23	0.305	32.16%	0.4
92	1982/02/10 14:00:00	1982/02/11 07:00:00	18	0.305	32.51%	0.39
93	1978/11/21 17:00:00	1978/11/21 17:00:00	1	0.301	32.86%	0.39
94	1998/02/14 13:00:00	1998/02/15 08:00:00	20	0.298	33.22%	0.38
95	1985/11/11 08:00:00	1985/11/12 14:00:00	31	0.296	33.57%	0.38
96	1988/12/21 03:00:00	1988/12/21 06:00:00	4	0.293	33.92%	0.38
97	1998/03/29 02:00:00	1998/03/29 03:00:00	2	0.29	34.28%	0.37
98	1994/02/17 12:00:00	1994/02/17 13:00:00	2	0.289	34.63%	0.37
99	2003/02/12 13:00:00	2003/02/13 16:00:00	28	0.284	34.98%	0.36
100	2000/02/23 16:00:00	2000/02/23 17:00:00	2	0.282	35.34%	0.36
101	1980/03/06 13:00:00	1980/03/06 14:00:00	2	0.282	35.69%	0.36
102	1986/11/17 23:00:00	1986/11/18 18:00:00	20	0.281	36.04%	0.35
103	1996/01/31 17:00:00	1996/02/01 12:00:00	20	0.279	36.40%	0.35
104	1990/02/17 15:00:00	1990/02/18 03:00:00	13	0.276	36.75%	0.35
105	1987/12/16 19:00:00	1987/12/17 08:00:00	14	0.275	37.10%	0.34
106	1978/03/11 22:00:00	1978/03/11 23:00:00	2	0.272	37.46%	0.34
107	1972/12/04 13:00:00	1972/12/04 21:00:00	9	0.271	37.81%	0.34
108	1995/01/07 22:00:00	1995/01/08 03:00:00	6	0.27	38.16%	0.33
109	1982/01/01 08:00:00	1982/01/01 13:00:00	6	0.269	38.52%	0.33
110	1979/01/15 13:00:00	1979/01/15 21:00:00	9	0.268	38.87%	0.33
111	1992/12/07 08:00:00	1992/12/08 06:00:00	23	0.268	39.22%	0.32
112	2003/12/25 18:00:00	2003/12/25 20:00:00	3	0.266	39.58%	0.32
113	1981/01/29 17:00:00	1981/01/29 18:00:00	2	0.265	39.93%	0.32
114	1990/01/17 00:00:00	1990/01/17 04:00:00	5	0.263	40.28%	0.32
115	1982/03/14 12:00:00	1982/03/15 09:00:00	22	0.261	40.64%	0.31
116	1998/02/06 13:00:00	1998/02/06 19:00:00	7	0.26	40.99%	0.31
117	1984/12/16 03:00:00	1984/12/16 04:00:00	2	0.257	41.34%	0.31
118	1987/12/18 12:00:00	1987/12/18 12:00:00	1	0.257	41.70%	0.31
119	2003/04/14 11:00:00	2003/04/15 15:00:00	29	0.255	42.05%	0.3
120	1987/10/12 09:00:00	1987/10/13 04:00:00	20	0.251	42.40%	0.3
121	1976/02/06 09:00:00	1976/02/06 12:00:00	4	0.25	42.76%	0.3
122	1996/02/27 21:00:00	1996/02/28 01:00:00	5	0.247	43.11%	0.3
123	1988/12/24 21:00:00	1988/12/25 00:00:00	4	0.244	43.46%	0.29
124	2001/02/12 18:00:00	2001/02/14 10:00:00	41	0.244	43.82%	0.29
125	1983/09/30 09:00:00	1983/10/01 11:00:00	27	0.24	44.17%	0.29
126	1983/04/20 03:00:00	1983/04/21 01:00:00	23	0.237	44.52%	0.29
127	1986/03/08 18:00:00	1986/03/08 20:00:00	3	0.235	44.88%	0.28
128	1981/01/28 06:00:00	1981/01/28 06:00:00	1	0.235	45.23%	0.28
129	1979/03/17 06:00:00	1979/03/17 07:00:00	2	0.233	45.58%	0.28
130	1975/03/08 07:00:00	1975/03/08 12:00:00	6	0.232	45.94%	0.28
131	1978/02/12 18:00:00	1978/02/14 00:00:00	31	0.231	46.29%	0.28
132	1998/05/04 20:00:00	1998/05/04 23:00:00	4	0.226	46.64%	0.27
133	1993/02/23 20:00:00	1993/02/23 20:00:00	1	0.225	47.00%	0.27

Rank	Start Date	End Date	Duration	Peak	Frequency	Return Period
134	1976/03/02 22:00:00	1976/03/02 23:00:00	2	0.223	47.35%	0.27
135	1973/03/11 12:00:00	1973/03/11 12:00:00	1	0.221	47.70%	0.27
136	1992/02/10 00:00:00	1992/02/10 01:00:00	2	0.221	48.06%	0.27
137	1973/01/18 21:00:00	1973/01/18 22:00:00	2	0.219	48.41%	0.26
138	1973/03/20 06:00:00	1973/03/20 07:00:00	2	0.218	48.76%	0.26
139	1973/11/22 23:00:00	1973/11/23 01:00:00	3	0.218	49.12%	0.26
140	1979/02/21 02:00:00	1979/02/21 05:00:00	4	0.215	49.47%	0.26
141	1978/09/05 19:00:00	1978/09/06 06:00:00	12	0.215	49.82%	0.26
142	1986/09/25 03:00:00	1986/09/25 04:00:00	2	0.21	50.18%	0.25
143	2005/05/06 05:00:00	2005/05/06 05:00:00	1	0.21	50.53%	0.25
144	1997/01/25 23:00:00	1997/01/27 01:00:00	27	0.208	50.88%	0.25
145	1979/11/08 03:00:00	1979/11/08 04:00:00	2	0.208	51.24%	0.25
146	1998/11/29 06:00:00	1998/11/29 20:00:00	15	0.205	51.59%	0.25
147	1974/03/08 01:00:00	1974/03/08 23:00:00	23	0.201	51.94%	0.25
148	1977/03/25 03:00:00	1977/03/25 13:00:00	11	0.201	52.30%	0.24
149	1987/01/04 18:00:00	1987/01/05 07:00:00	14	0.196	52.65%	0.24
150	1986/10/09 20:00:00	1986/10/09 20:00:00	1	0.195	53.00%	0.24
151	1998/04/11 01:00:00	1998/04/11 01:00:00	1	0.193	53.36%	0.24
152	2004/02/26 03:00:00	2004/02/26 15:00:00	13	0.193	53.71%	0.24
153	1990/04/16 22:00:00	1990/04/16 23:00:00	2	0.191	54.06%	0.24
154	1977/01/05 23:00:00	1977/01/07 02:00:00	28	0.19	54.42%	0.23
155	1979/03/18 23:00:00	1979/03/19 09:00:00	11	0.189	54.77%	0.23
156	2006/03/28 21:00:00	2006/03/28 21:00:00	1	0.186	55.12%	0.23
157	1984/11/13 08:00:00	1984/11/13 08:00:00	1	0.186	55.48%	0.23
158	1983/03/21 04:00:00	1983/03/21 04:00:00	1	0.185	55.83%	0.23
159	1979/03/27 14:00:00	1979/03/28 20:00:00	31	0.182	56.18%	0.23
160	1976/03/01 14:00:00	1976/03/01 20:00:00	7	0.182	56.54%	0.23
161	1971/12/07 01:00:00	1971/12/07 01:00:00	1	0.181	56.89%	0.22
162	2001/11/24 17:00:00	2001/11/24 20:00:00	4	0.181	57.24%	0.22
163	1975/03/06 06:00:00	1975/03/06 06:00:00	1	0.179	57.60%	0.22
164	1978/12/17 01:00:00	1978/12/19 11:00:00	59	0.179	57.95%	0.22
165	1975/04/08 09:00:00	1975/04/09 07:00:00	23	0.177	58.30%	0.22
166	1987/11/04 18:00:00	1987/11/05 08:00:00	15	0.176	58.66%	0.22
167	2004/02/22 04:00:00	2004/02/22 09:00:00	6	0.175	59.01%	0.22
168	1988/04/20 05:00:00	1988/04/21 05:00:00	25	0.172	59.36%	0.21
169	1977/08/16 22:00:00	1977/08/17 23:00:00	26	0.171	59.72%	0.21
170	2001/03/10 01:00:00	2001/03/10 05:00:00	5	0.171	60.07%	0.21
171	2005/02/11 04:00:00	2005/02/12 11:00:00	32	0.169	60.42%	0.21
172	1999/01/26 11:00:00	1999/01/26 22:00:00	12	0.169	60.78%	0.21
173	1994/04/25 16:00:00	1994/04/26 17:00:00	26	0.169	61.13%	0.21
174	1982/01/05 11:00:00	1982/01/05 17:00:00	7	0.167	61.48%	0.21
175	1995/01/24 20:00:00	1995/01/26 04:00:00	33	0.166	61.84%	0.21
176	1980/12/05 01:00:00	1980/12/05 06:00:00	6	0.165	62.19%	0.21
177	1981/03/01 08:00:00	1981/03/02 08:00:00	25	0.165	62.54%	0.2
178	1998/02/17 01:00:00	1998/02/17 07:00:00	7	0.163	62.90%	0.2
179	1983/03/18 04:00:00	1983/03/19 01:00:00	22	0.163	63.25%	0.2
180	1971/12/27 13:00:00	1971/12/28 13:00:00	25	0.161	63.60%	0.2

Rank	Start Date	End Date	Duration	Peak	Frequency	Return Period
181	1984/09/16 14:00:00	1984/09/16 14:00:00	1	0.161	63.96%	0.2
182	1987/01/06 22:00:00	1987/01/07 00:00:00	3	0.159	64.31%	0.2
183	1982/11/09 08:00:00	1982/11/10 02:00:00	19	0.159	64.66%	0.2
184	1973/03/06 12:00:00	1973/03/06 23:00:00	12	0.159	65.02%	0.2
185	1985/11/25 02:00:00	1985/11/25 07:00:00	6	0.158	65.37%	0.2
186	2000/03/05 09:00:00	2000/03/05 13:00:00	5	0.156	65.72%	0.19
187	1976/04/13 03:00:00	1976/04/13 03:00:00	1	0.154	66.08%	0.19
188	2004/12/31 14:00:00	2004/12/31 15:00:00	2	0.153	66.43%	0.19
189	1978/03/31 01:00:00	1978/03/31 05:00:00	5	0.152	66.78%	0.19
190	1994/03/07 03:00:00	1994/03/07 05:00:00	3	0.152	67.14%	0.19
191	1982/03/29 23:00:00	1982/03/30 16:00:00	18	0.151	67.49%	0.19
192	1993/01/10 12:00:00	1993/01/10 13:00:00	2	0.151	67.84%	0.19
193	2003/02/11 08:00:00	2003/02/11 11:00:00	4	0.15	68.20%	0.19
194	1981/02/09 04:00:00	1981/02/09 06:00:00	3	0.149	68.55%	0.19
195	1978/02/07 17:00:00	1978/02/07 20:00:00	4	0.149	68.90%	0.19
196	1983/11/12 17:00:00	1983/11/12 18:00:00	2	0.149	69.26%	0.18
197	2006/02/28 00:00:00	2006/02/28 07:00:00	8	0.148	69.61%	0.18
198	1986/01/30 05:00:00	1986/01/30 13:00:00	9	0.145	69.96%	0.18
199	1996/03/13 03:00:00	1996/03/13 07:00:00	5	0.144	70.32%	0.18
200	1990/01/14 00:00:00	1990/01/14 01:00:00	2	0.144	70.67%	0.18
201	1992/05/22 17:00:00	1992/05/22 19:00:00	3	0.143	71.02%	0.18
202	1994/03/24 22:00:00	1994/03/25 02:00:00	5	0.143	71.38%	0.18
203	1975/03/10 10:00:00	1975/03/11 14:00:00	29	0.143	71.73%	0.18
204	1995/04/18 11:00:00	1995/04/18 13:00:00	3	0.141	72.08%	0.18
205	1998/12/07 05:00:00	1998/12/07 05:00:00	1	0.14	72.44%	0.18
206	1992/12/29 13:00:00	1992/12/29 14:00:00	2	0.14	72.79%	0.18
207	2000/03/08 13:00:00	2000/03/08 15:00:00	3	0.14	73.14%	0.17
208	1989/01/05 19:00:00	1989/01/05 20:00:00	2	0.14	73.50%	0.17
209	1995/03/23 07:00:00	1995/03/23 07:00:00	1	0.14	73.85%	0.17
210	1985/02/02 11:00:00	1985/02/02 11:00:00	1	0.139	74.20%	0.17
211	2005/01/28 16:00:00	2005/01/28 16:00:00	1	0.137	74.56%	0.17
212	1985/01/28 19:00:00	1985/01/28 19:00:00	1	0.137	74.91%	0.17
213	1983/01/23 03:00:00	1983/01/23 03:00:00	1	0.137	75.27%	0.17
214	1983/01/24 17:00:00	1983/01/24 18:00:00	2	0.136	75.62%	0.17
215	1973/02/28 01:00:00	1973/02/28 07:00:00	7	0.136	75.97%	0.17
216	1978/04/07 02:00:00	1978/04/07 04:00:00	3	0.134	76.33%	0.17
217	1998/04/05 14:00:00	1998/04/05 14:00:00	1	0.134	76.68%	0.17
218	1978/11/13 20:00:00	1978/11/13 21:00:00	2	0.134	77.03%	0.17
219	1985/02/09 09:00:00	1985/02/09 13:00:00	5	0.133	77.39%	0.16
220	2003/11/13 00:00:00	2003/11/13 00:00:00	1	0.133	77.74%	0.16
221	2000/11/25 05:00:00	2000/11/25 05:00:00	1	0.132	78.09%	0.16
222	1999/02/04 18:00:00	1999/02/04 18:00:00	1	0.132	78.45%	0.16
223	1993/11/14 08:00:00	1993/11/14 08:00:00	1	0.131	78.80%	0.16
224	1987/03/06 15:00:00	1987/03/06 15:00:00	1	0.131	79.15%	0.16
225	2005/04/28 07:00:00	2005/04/28 10:00:00	4	0.131	79.51%	0.16
226	1986/02/07 22:00:00	1986/02/08 10:00:00	13	0.131	79.86%	0.16
227	2002/12/16 18:00:00	2002/12/16 19:00:00	2	0.129	80.21%	0.16

Rank	Start Date	End Date	Duration	Peak	Frequency	Return Period
228	1984/11/24 17:00:00	1984/11/24 22:00:00	6	0.129	80.57%	0.16
229	1996/02/25 10:00:00	1996/02/26 02:00:00	17	0.128	80.92%	0.16
230	1983/11/20 10:00:00	1983/11/20 11:00:00	2	0.128	81.27%	0.16
231	2000/02/12 04:00:00	2000/02/12 05:00:00	2	0.125	81.63%	0.16
232	1992/03/02 16:00:00	1992/03/02 21:00:00	6	0.125	81.98%	0.16
233	1989/01/04 10:00:00	1989/01/04 10:00:00	1	0.124	82.33%	0.16
234	1978/11/11 14:00:00	1978/11/11 14:00:00	1	0.124	82.69%	0.15
235	1998/03/27 13:00:00	1998/03/27 13:00:00	1	0.123	83.04%	0.15
236	1999/04/07 05:00:00	1999/04/07 09:00:00	5	0.122	83.39%	0.15
237	1994/02/04 04:00:00	1994/02/04 15:00:00	12	0.122	83.75%	0.15
238	2004/11/21 07:00:00	2004/11/21 08:00:00	2	0.122	84.10%	0.15
239	1991/03/13 17:00:00	1991/03/13 17:00:00	1	0.12	84.45%	0.15
240	1981/03/19 21:00:00	1981/03/19 22:00:00	2	0.119	84.81%	0.15
241	1990/02/04 11:00:00	1990/02/04 11:00:00	1	0.115	85.16%	0.15
242	1992/12/28 01:00:00	1992/12/28 01:00:00	1	0.115	85.51%	0.15
243	1996/02/21 08:00:00	1996/02/21 12:00:00	5	0.112	85.87%	0.15
244	1998/03/24 23:00:00	1998/03/24 23:00:00	1	0.111	86.22%	0.15
245	1992/02/06 12:00:00	1992/02/06 23:00:00	12	0.105	86.57%	0.15
246	1988/04/15 01:00:00	1988/04/15 01:00:00	1	0.099	86.93%	0.15
247	1987/02/25 00:00:00	1987/02/25 00:00:00	1	0.097	87.28%	0.15
248	2003/02/27 11:00:00	2003/02/27 12:00:00	2	0.089	87.63%	0.15
249	1983/04/29 08:00:00	1983/04/29 08:00:00	1	0.087	87.99%	0.15
250	1992/10/30 18:00:00	1992/10/30 18:00:00	1	0.086	88.34%	0.14
251	1989/02/04 14:00:00	1989/02/04 14:00:00	1	0.085	88.69%	0.14
252	1987/10/31 05:00:00	1987/10/31 16:00:00	12	0.085	89.05%	0.14
253	1974/03/02 09:00:00	1974/03/02 09:00:00	1	0.083	89.40%	0.14
254	1979/01/17 08:00:00	1979/01/17 09:00:00	2	0.075	89.75%	0.14
255	1992/01/07 20:00:00	1992/01/07 20:00:00	1	0.073	90.11%	0.14
256	1993/01/31 01:00:00	1993/01/31 01:00:00	1	0.072	90.46%	0.14
257	1998/03/31 07:00:00	1998/03/31 10:00:00	4	0.071	90.81%	0.14
258	1977/02/24 13:00:00	1977/02/24 17:00:00	5	0.069	91.17%	0.14
259	1986/04/06 06:00:00	1986/04/06 10:00:00	5	0.066	91.52%	0.14
260	1987/12/04 21:00:00	1987/12/04 22:00:00	2	0.062	91.87%	0.14
261	1994/03/19 09:00:00	1994/03/19 11:00:00	3	0.062	92.23%	0.14
262	1976/09/03 19:00:00	1976/09/03 19:00:00	1	0.061	92.58%	0.14
263	1983/02/02 14:00:00	1983/02/02 15:00:00	2	0.061	92.93%	0.14
264	1986/03/13 20:00:00	1986/03/13 20:00:00	1	0.06	93.29%	0.14
265	1982/02/08 10:00:00	1982/02/08 10:00:00	1	0.06	93.64%	0.14
266	1979/02/14 05:00:00	1979/02/14 05:00:00	1	0.059	93.99%	0.14
267	1991/03/15 19:00:00	1991/03/15 19:00:00	1	0.059	94.35%	0.14
268	1976/05/07 08:00:00	1976/05/07 09:00:00	2	0.059	94.70%	0.13
269	1986/03/12 12:00:00	1986/03/12 12:00:00	1	0.058	95.05%	0.13
270	1989/03/02 20:00:00	1989/03/02 20:00:00	1	0.057	95.41%	0.13
271	1998/02/19 22:00:00	1998/02/20 00:00:00	3	0.056	95.76%	0.13
272	1979/02/23 05:00:00	1979/02/23 06:00:00	2	0.056	96.11%	0.13
273	2001/01/26 17:00:00	2001/01/26 17:00:00	1	0.055	96.47%	0.13
274	1973/03/21 23:00:00	1973/03/22 01:00:00	3	0.055	96.82%	0.13

Rank	Start Date	End Date	Duration	Peak	Frequency	Return Period
275	1987/03/15 02:00:00	1987/03/15 02:00:00	1	0.055	97.17%	0.13
276	2002/12/20 07:00:00	2002/12/20 09:00:00	3	0.054	97.53%	0.13
277	1972/12/08 20:00:00	1972/12/08 20:00:00	1	0.053	97.88%	0.13
278	1981/03/05 16:00:00	1981/03/05 16:00:00	1	0.052	98.23%	0.13
279	1984/12/11 06:00:00	1984/12/11 07:00:00	2	0.052	98.59%	0.13
280	1977/12/18 05:00:00	1977/12/18 07:00:00	3	0.05	98.94%	0.13
281	1982/09/26 08:00:00	1982/09/26 08:00:00	1	0.047	99.29%	0.13
282	1996/03/05 04:00:00	1996/03/05 04:00:00	1	0.046	99.65%	0.13
--End of Data----------						


Flow Duration Curves
Pre Development
Post Development Mitigated
Q10 (3.827cfs)
Qlf (0.2575cfs)
Flow Rate (cfs)
4
3
2
1
0
-1
0.249
0.287
Flow Duration PreDevelopment=365(days)x24(hr/day)x0.287(%)=25.1(hours/year)
Flow Duration Mitigated Post Development=365(days)x24(hr/day)x0.249(%)=21.8(hours/year)
0.00
0.05
0.10
0.15
0.20
0.25
(%) Percent Time Exceedance

Compare Post-Development Curve to Pre-Development Curve

post-development SWMM file: V:\17\17065\engineering\TM\CURRENT\STORM\SWMM\17065post-development.out
post-development time stamp: 4/2/2018 1:45:46 PM
Compared to:
pre-development SWMM file: V:\17\17065\engineering\TM\CURRENT\STORM\SWMM\17065pre-development.out
pre-development time stamp: 4/2/2018 1:49:06 PM

Post PT #	Flow Rate	Post Dev % Exceed	Pre Dev % Exceed	%Ex post < %Ex pre	%Ex post > %Ex pre	%Ex post > 110% %Ex pre	Pass/Fail
0	0.26	0.25	0.29	TRUE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
1	0.29	0.21	0.26	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
2	0.33	0.18	0.26	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
3	0.37	0.16	0.25	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
4	0.40	0.13	0.24	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
5	0.44	0.10	0.23	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
6	0.47	0.09	0.22	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
7	0.51	0.08	0.21	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
8	0.55	0.07	0.19	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
9	0.58	0.06	0.17	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
10	0.62	0.06	0.15	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
11	0.65	0.05	0.13	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
12	0.69	0.05	0.12	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
13	0.73	0.04	0.11	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
14	0.76	0.04	0.10	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
15	0.80	0.04	0.10	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
16	0.83	0.03	0.10	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
17	0.87	0.03	0.09	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
18	0.91	0.03	0.09	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
19	0.94	0.03	0.08	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
20	0.98	0.03	0.08	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
21	1.01	0.03	0.07	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
22	1.05	0.02	0.07	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
23	1.09	0.02	0.06	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
24	1.12	0.02	0.06	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
25	1.16	0.02	0.05	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
26	1.19	0.02	0.05	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
27	1.23	0.02	0.04	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
28	1.27	0.02	0.04	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
29	1.30	0.01	0.04	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
30	1.34	0.01	0.04	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
31	1.38	0.01	0.04	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration

Post PT #	Flow Rate	Post Dev % Exceed	Pre Dev % Exceed	%Ex post < %Ex pre	%Ex post > %Ex pre	%Ex post > 110% %Ex pre	Pass/Fail
32	1.41	0.01	0.04	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
33	1.45	0.01	0.04	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
34	1.48	0.01	0.04	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
35	1.52	0.01	0.04	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
36	1.56	0.01	0.03	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
37	1.59	0.01	0.03	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
38	1.63	0.01	0.03	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
39	1.66	0.01	0.03	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
40	1.70	0.01	0.02	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
41	1.74	0.01	0.02	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
42	1.77	0.01	0.02	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
43	1.81	0.01	0.02	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
44	1.84	0.01	0.02	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
45	1.88	0.01	0.02	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
46	1.92	0.01	0.02	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
47	1.95	0.00	0.02	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
48	1.99	0.00	0.02	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
49	2.02	0.00	0.02	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
50	2.06	0.00	0.02	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
51	2.10	0.00	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
52	2.13	0.00	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
53	2.17	0.00	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
54	2.20	0.00	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
55	2.24	0.00	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
56	2.28	0.00	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
57	2.31	0.00	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
58	2.35	0.00	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
59	2.38	0.00	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
60	2.42	0.00	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
61	2.46	0.00	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
62	2.49	0.00	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
63	2.53	0.00	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
64	2.56	0.00	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
65	2.60	0.00	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
66	2.64	0.00	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
67	2.67	0.00	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
68	2.71	0.00	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
69	2.75	0.00	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
70	2.78	0.00	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
71	2.82	0.00	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration

Post PT #	Flow Rate	Post Dev % Exceed	Pre Dev % Exceed	%Ex post < %Ex pre	%Ex post > %Ex pre	%Ex post > 110% %Ex pre	Pass/Fail
72	2.85	0.00	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
73	2.89	0.00	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
74	2.93	0.00	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
75	2.96	0.00	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
76	3.00	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
77	3.03	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
78	3.07	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
79	3.11	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
80	3.14	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
81	3.18	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
82	3.21	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
83	3.25	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
84	3.29	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
85	3.32	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
86	3.36	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
87	3.39	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
88	3.43	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
89	3.47	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
90	3.50	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
91	3.54	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
92	3.57	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
93	3.61	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
94	3.65	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
95	3.68	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
96	3.72	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
97	3.75	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
98	3.79	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
99	3.83	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration

Duration Table Summary at Project Discharge Point

file name: V:\17\17065\engineering\TM\CURRENT\STORM\SWMM\17065pre-development.out
time stamp: 4/2/2018 1:49:06 PM

DISCHARGE		Number of periods when discharge was equal to or greater than DISCHARGE column but less than that shown on the next line		
Bin Number	Discharge Rate	Number of Periods	Total Periods Exceeding	Percent Time Exceeded
1	0.26	78	868	0.287
2	0.29	18	790	0.262
3	0.33	15	772	0.256
4	0.37	25	757	0.251
5	0.40	25	732	0.242
6	0.44	31	707	0.234
7	0.47	38	676	0.224
8	0.51	56	638	0.211
9	0.55	71	582	0.193
10	0.58	68	511	0.169
11	0.62	43	443	0.147
12	0.65	27	400	0.132
13	0.69	43	373	0.124
14	0.73	21	330	0.109
15	0.76	8	309	0.102
16	0.80	10	301	0.100
17	0.83	21	291	0.096
18	0.87	9	270	0.089
19	0.91	14	261	0.086
20	0.94	15	247	0.082
21	0.98	9	232	0.077
22	1.01	17	223	0.074
23	1.05	20	206	0.068
24	1.09	13	186	0.062
25	1.12	18	173	0.057
26	1.16	13	155	0.051
27	1.19	10	142	0.047
28	1.23	2	132	0.044
29	1.27	1	130	0.043
30	1.30	2	129	0.043
31	1.34	2	127	0.042
32	1.38	3	125	0.041
33	1.41	3	122	0.040
34	1.45	2	119	0.039
35	1.48	7	117	0.039
36	1.52	10	110	0.036
37	1.56	6	100	0.033
38	1.59	9	94	0.031
39	1.63	11	85	0.028
40	1.66	5	74	0.025
41	1.70	2	69	0.023
42	1.74	1	67	0.022
43	1.77	1	66	0.022
44	1.81	1	65	0.022
45	1.84	1	64	0.021
46	1.88	1	63	0.021
47	1.92	2	62	0.021
48	1.95	3	60	0.020
49	1.99	5	57	0.019
50	2.02	3	52	0.017
51	2.06	6	49	0.016

Bin Number	Discharge Rate	Number of Periods	Total Periods Exceeding	Percent Time Exceeded
52	2.10	3	43	0.014
53	2.13	2	40	0.013
54	2.17	1	38	0.013
55	2.20	0	37	0.012
56	2.24	0	37	0.012
57	2.28	1	37	0.012
58	2.31	1	36	0.012
59	2.35	0	35	0.012
60	2.38	0	35	0.012
61	2.42	0	35	0.012
62	2.46	2	35	0.012
63	2.49	2	33	0.011
64	2.53	2	31	0.010
65	2.56	6	29	0.010
66	2.60	2	23	0.008
67	2.64	0	21	0.007
68	2.67	1	21	0.007
69	2.71	0	20	0.007
70	2.75	0	20	0.007
71	2.78	0	20	0.007
72	2.82	3	20	0.007
73	2.85	0	17	0.006
74	2.89	0	17	0.006
75	2.93	2	17	0.006
76	2.96	1	15	0.005
77	3.00	3	14	0.005
78	3.03	1	11	0.004
79	3.07	2	10	0.003
80	3.11	0	8	0.003
81	3.14	0	8	0.003
82	3.18	0	8	0.003
83	3.21	0	8	0.003
84	3.25	0	8	0.003
85	3.29	0	8	0.003
86	3.32	0	8	0.003
87	3.36	1	8	0.003
88	3.39	2	7	0.002
89	3.43	0	5	0.002
90	3.47	1	5	0.002
91	3.50	0	4	0.001
92	3.54	0	4	0.001
93	3.57	0	4	0.001
94	3.61	0	4	0.001
95	3.65	0	4	0.001
96	3.68	0	4	0.001
97	3.72	0	4	0.001
98	3.75	0	4	0.001
99	3.79	1	4	0.001
100	3.83	0	3	0.001
---------End of Data----------				

Duration Table Summary at Project Discharge Point

file name: V:\17\17065\engineering\TM\CURRENT\STORM\SWMM\17065post-development.out
time stamp: 4/2/2018 1:45:46 PM

DISCHARGE		Number of periods when discharge was equal to or greater than DISCHARGE column but less than that shown on the next line		
Bin Number	Discharge Rate	Number of Periods	Total Periods Exceeding	Percent Time Exceeded
1	0.26	114	753	0.249
2	0.29	98	639	0.212
3	0.33	71	541	0.179
4	0.37	78	470	0.156
5	0.40	80	392	0.130
6	0.44	50	312	0.103
7	0.47	31	262	0.087
8	0.51	20	231	0.076
9	0.55	31	211	0.070
10	0.58	11	180	0.060
11	0.62	11	169	0.056
12	0.65	19	158	0.052
13	0.69	10	139	0.046
14	0.73	6	129	0.043
15	0.76	11	123	0.041
16	0.80	13	112	0.037
17	0.83	6	99	0.033
18	0.87	6	93	0.031
19	0.91	5	87	0.029
20	0.94	4	82	0.027
21	0.98	2	78	0.026
22	1.01	4	76	0.025
23	1.05	7	72	0.024
24	1.09	7	65	0.022
25	1.12	2	58	0.019
26	1.16	3	56	0.019
27	1.19	4	53	0.018
28	1.23	5	49	0.016
29	1.27	4	44	0.015
30	1.30	4	40	0.013
31	1.34	5	36	0.012
32	1.38	4	31	0.010
33	1.41	0	27	0.009
34	1.45	2	27	0.009
35	1.48	1	25	0.008
36	1.52	1	24	0.008
37	1.56	1	23	0.008
38	1.59	1	22	0.007
39	1.63	0	21	0.007
40	1.66	0	21	0.007
41	1.70	1	21	0.007
42	1.74	2	20	0.007
43	1.77	0	18	0.006
44	1.81	2	18	0.006
45	1.84	0	16	0.005
46	1.88	2	16	0.005
47	1.92	1	14	0.005
48	1.95	0	13	0.004
49	1.99	1	13	0.004
50	2.02	0	12	0.004
51	2.06	0	12	0.004

Bin Number	Discharge Rate	Number of Periods	Total Periods Exceeding	Percent Time Exceeded
52	2.10	0	12	0.004
53	2.13	2	12	0.004
54	2.17	0	10	0.003
55	2.20	0	10	0.003
56	2.24	0	10	0.003
57	2.28	0	10	0.003
58	2.31	3	10	0.003
59	2.35	1	7	0.002
60	2.38	1	6	0.002
61	2.42	0	5	0.002
62	2.46	0	5	0.002
63	2.49	0	5	0.002
64	2.53	0	5	0.002
65	2.56	0	5	0.002
66	2.60	1	5	0.002
67	2.64	1	4	0.001
68	2.67	0	3	0.001
69	2.71	0	3	0.001
70	2.75	1	3	0.001
71	2.78	1	2	0.001
72	2.82	0	1	0.000
73	2.85	0	1	0.000
74	2.89	0	1	0.000
75	2.93	1	1	0.000
76	2.96	0	0	0.000
77	3.00	0	0	0.000
78	3.03	0	0	0.000
79	3.07	0	0	0.000
80	3.11	0	0	0.000
81	3.14	0	0	0.000
82	3.18	0	0	0.000
83	3.21	0	0	0.000
84	3.25	0	0	0.000
85	3.29	0	0	0.000
86	3.32	0	0	0.000
87	3.36	0	0	0.000
88	3.39	0	0	0.000
89	3.43	0	0	0.000
90	3.47	0	0	0.000
91	3.50	0	0	0.000
92	3.54	0	0	0.000
93	3.57	0	0	0.000
94	3.61	0	0	0.000
95	3.65	0	0	0.000
96	3.68	0	0	0.000
97	3.72	0	0	0.000
98	3.75	0	0	0.000
99	3.79	0	0	0.000
100	3.83	0	0	0.000
---------End of Data----------				

END OF STATISTICS ANALYSIS

STATISTICS ANALYSIS OF THE SWMM FILES FOR:

DISCHARGE NODE: POC-2

ANALYSIS DETAILS

Statistics Selection: Nodes/Total Inflow
Stream Susceptibility to Channel Erosion: High (Qlf = (0.1)Q2)
Assumed time between storms (hours): 24

PRE-DEVELOPMENT SWMM FILE

SWMM file name: V:\17\17065\engineering\TM\CURRENT\STORM\SWMM\17065pre-development.out
SWMM file time stamp: 4/2/2018 1:49:06 PM
Selected Node to Analyze: POC-2

POST-DEVELOPMENT MITIGATED SWMM FILE

SWMM file name: V:\17\17065\engineering\TM\CURRENT\STORM\SWMM\17065post-development.out
SWMM file time stamp: 4/2/2018 1:45:46 PM
Selected Node to Analyze: POC-2

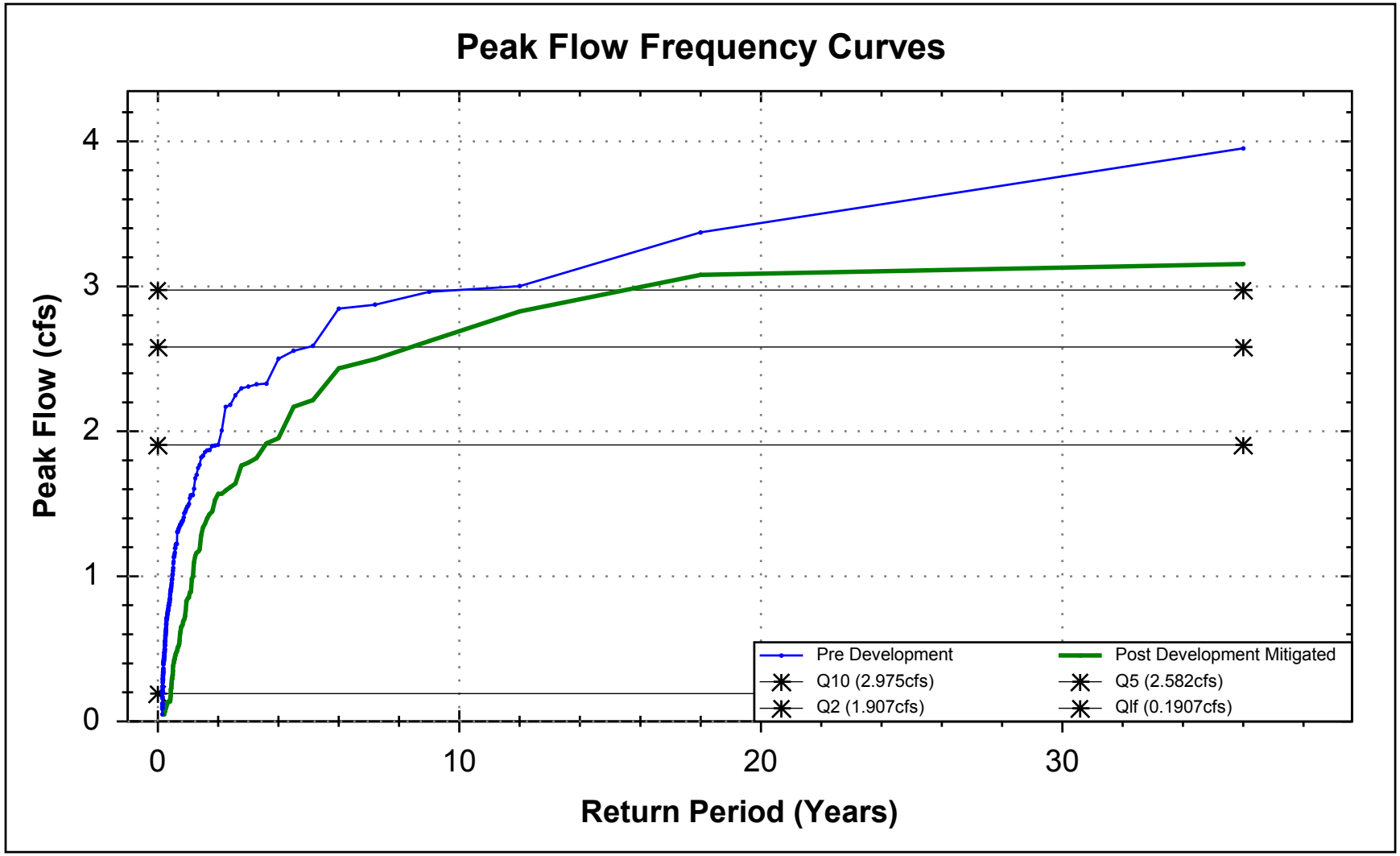
MITIGATED CONDITIONS RESULTS

For the Mitigated Conditions:

Peak Flow Conditions PASS
Flow Duration Conditions PASS

The Mitigated Conditions peak flow frequency curve is composed of 180 points. Of the points, 2 point(s) are above the flow control upper limit (Q10), 96 point(s) are below the low flow threshold value (Qlf). Of the points within the flow control range (Qlf to Q10), 82 point(s) have a lower peak flow rate than pre-development conditions. These points all pass. There are no points that failed, therefore the unmitigated conditions peak flow requirements have been met.

The Mitigated Conditions flow duration curve is composed of 100 flow bins (points) between the upper flow threshold (cfs) and lower flow threshold (cfs). Each point represents the number of hours where the discharge was equal to or greater than the discharge value, but less than the next greater flow value. Comparing the post-development flow duration curve to the pre-development curve, 100 point(s) have a lower duration than pre-development conditions. These points all pass. There are no points that failed, therefore the unmitigated conditions flow duration requirements have been met.


Peak Flow Frequency Curves
Peak Flow (cfs)
0
1
2
3
4
0
10
20
30
Return Period (Years)
Pre Development
Post Development Mitigated
Q10 (2.975cfs)
Q5 (2.582cfs)
Q2 (1.907cfs)
Qlf (0.1907cfs)

Compare Post-Development Curve to Pre-Development Curve

post-development SWMM file: V:\17\17065\engineering\TM\CURRENT\STORM\SWMM\17065post-development.out
post-development time stamp: 4/2/2018 1:45:46 PM
Compared to:
pre-development SWMM file: V:\17\17065\engineering\TM\CURRENT\STORM\SWMM\17065pre-development.out
pre-development time stamp: 4/2/2018 1:49:06 PM

Post PT #	Rtn Prd (yrs)	Post Dev Q	Pre Dev Q	Qpost < Qpre	Qpost > Qpre	Qpost > 110% Qpre	Pass/Fail
0	36.00	3.15	3.95	FALSE	FALSE	FALSE	Pass- Qpost Above Flow Control Upper Limit
1	18.00	3.08	3.37	FALSE	FALSE	FALSE	Pass- Qpost Above Flow Control Upper Limit
2	12.00	2.83	3.00	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
3	9.00	2.62	2.96	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
4	7.20	2.50	2.87	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
5	6.00	2.43	2.85	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
6	5.14	2.21	2.59	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
7	4.50	2.17	2.56	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
8	4.00	1.95	2.50	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
9	3.60	1.92	2.33	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
10	3.27	1.82	2.32	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
11	3.00	1.78	2.31	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
12	2.77	1.76	2.30	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
13	2.57	1.64	2.25	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
14	2.40	1.61	2.18	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
15	2.25	1.59	2.17	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
16	2.12	1.57	2.01	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
17	2.00	1.57	1.91	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
18	1.90	1.53	1.90	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
19	1.80	1.45	1.90	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
20	1.71	1.43	1.87	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
21	1.64	1.40	1.87	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
22	1.57	1.36	1.86	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
23	1.50	1.34	1.83	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
24	1.44	1.28	1.82	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
25	1.39	1.18	1.77	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
26	1.33	1.17	1.75	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
27	1.29	1.16	1.70	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
28	1.24	1.14	1.68	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
29	1.20	1.10	1.60	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
30	1.16	1.00	1.56	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
31	1.13	0.98	1.56	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
32	1.09	0.89	1.56	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
33	1.06	0.89	1.54	TRUE	FALSE	FALSE	Pass- Qpost < Qpre

Post PT #	Rtn Prd (yrs)	Post Dev Q	Pre Dev Q	Qpost < Qpre	Qpost > Qpre	Qpost > 110% Qpre	Pass/Fail
34	1.03	0.85	1.50	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
35	1.00	0.85	1.48	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
36	0.97	0.84	1.48	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
37	0.95	0.83	1.47	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
38	0.92	0.77	1.45	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
39	0.90	0.73	1.44	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
40	0.88	0.70	1.43	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
41	0.86	0.70	1.41	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
42	0.84	0.69	1.39	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
43	0.82	0.66	1.38	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
44	0.80	0.66	1.38	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
45	0.78	0.65	1.37	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
46	0.77	0.65	1.36	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
47	0.75	0.62	1.36	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
48	0.74	0.60	1.35	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
49	0.72	0.55	1.34	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
50	0.71	0.53	1.34	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
51	0.69	0.52	1.33	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
52	0.68	0.52	1.32	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
53	0.67	0.51	1.31	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
54	0.66	0.51	1.31	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
55	0.64	0.49	1.31	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
56	0.63	0.49	1.22	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
57	0.62	0.48	1.22	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
58	0.61	0.47	1.22	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
59	0.60	0.47	1.22	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
60	0.59	0.46	1.21	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
61	0.58	0.45	1.19	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
62	0.57	0.45	1.19	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
63	0.56	0.44	1.16	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
64	0.55	0.43	1.15	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
65	0.55	0.43	1.14	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
66	0.54	0.41	1.14	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
67	0.53	0.40	1.13	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
68	0.52	0.40	1.10	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
69	0.51	0.39	1.09	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
70	0.51	0.38	1.06	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
71	0.50	0.35	1.04	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
72	0.49	0.32	1.02	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
73	0.49	0.31	1.01	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
74	0.48	0.31	1.00	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
75	0.47	0.29	0.98	TRUE	FALSE	FALSE	Pass- Qpost < Qpre

Post PT #	Rtn Prd (yrs)	Post Dev Q	Pre Dev Q	Qpost < Qpre	Qpost > Qpre	Qpost > 110% Qpre	Pass/Fail
76	0.47	0.29	0.98	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
77	0.46	0.28	0.97	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
78	0.46	0.26	0.95	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
79	0.45	0.24	0.94	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
80	0.44	0.23	0.93	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
81	0.44	0.23	0.92	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
82	0.43	0.22	0.91	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
83	0.43	0.21	0.91	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
84	0.42	0.17	0.90	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
85	0.42	0.17	0.89	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
86	0.41	0.15	0.89	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
87	0.41	0.14	0.87	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
88	0.40	0.14	0.86	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
89	0.40	0.14	0.84	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
90	0.40	0.14	0.84	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
91	0.39	0.14	0.84	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
92	0.39	0.14	0.82	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
93	0.38	0.14	0.82	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
94	0.38	0.14	0.82	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
95	0.38	0.14	0.81	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
96	0.37	0.14	0.80	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
97	0.37	0.14	0.80	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
98	0.36	0.14	0.80	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
99	0.36	0.14	0.80	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
100	0.36	0.13	0.80	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
101	0.35	0.13	0.79	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
102	0.35	0.13	0.78	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
103	0.35	0.13	0.78	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
104	0.34	0.13	0.77	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
105	0.34	0.13	0.76	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
106	0.34	0.13	0.76	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
107	0.33	0.13	0.76	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
108	0.33	0.13	0.76	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
109	0.33	0.13	0.75	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
110	0.32	0.13	0.75	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
111	0.32	0.13	0.74	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
112	0.32	0.13	0.74	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
113	0.32	0.13	0.74	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
114	0.31	0.13	0.74	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
115	0.31	0.13	0.73	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
116	0.31	0.12	0.73	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
117	0.31	0.12	0.72	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold

Post PT #	Rtn Prd (yrs)	Post Dev Q	Pre Dev Q	Qpost < Qpre	Qpost > Qpre	Qpost > 110% Qpre	Pass/Fail
118	0.30	0.12	0.71	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
119	0.30	0.12	0.71	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
120	0.30	0.12	0.71	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
121	0.30	0.12	0.71	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
122	0.29	0.12	0.71	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
123	0.29	0.12	0.71	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
124	0.29	0.12	0.70	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
125	0.29	0.11	0.70	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
126	0.28	0.11	0.70	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
127	0.28	0.11	0.68	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
128	0.28	0.10	0.67	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
129	0.28	0.10	0.67	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
130	0.28	0.10	0.65	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
131	0.27	0.10	0.64	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
132	0.27	0.10	0.64	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
133	0.27	0.10	0.63	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
134	0.27	0.10	0.62	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
135	0.27	0.10	0.62	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
136	0.26	0.09	0.62	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
137	0.26	0.09	0.62	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
138	0.26	0.09	0.61	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
139	0.26	0.09	0.60	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
140	0.26	0.09	0.60	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
141	0.25	0.09	0.59	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
142	0.25	0.09	0.59	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
143	0.25	0.09	0.58	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
144	0.25	0.08	0.58	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
145	0.25	0.08	0.57	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
146	0.25	0.08	0.56	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
147	0.24	0.08	0.55	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
148	0.24	0.08	0.55	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
149	0.24	0.08	0.55	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
150	0.24	0.08	0.54	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
151	0.24	0.08	0.53	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
152	0.24	0.08	0.52	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
153	0.23	0.08	0.52	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
154	0.23	0.07	0.52	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
155	0.23	0.07	0.50	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
156	0.23	0.07	0.50	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
157	0.23	0.07	0.49	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
158	0.23	0.07	0.49	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
159	0.23	0.07	0.48	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold

Post PT #	Rtn Prd (yrs)	Post Dev Q	Pre Dev Q	Qpost < Qpre	Qpost > Qpre	Qpost > 110% Qpre	Pass/Fail
160	0.22	0.07	0.48	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
161	0.22	0.06	0.48	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
162	0.22	0.06	0.48	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
163	0.22	0.06	0.47	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
164	0.22	0.06	0.47	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
165	0.22	0.06	0.46	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
166	0.22	0.06	0.45	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
167	0.21	0.06	0.45	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
168	0.21	0.06	0.45	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
169	0.21	0.06	0.45	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
170	0.21	0.05	0.45	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
171	0.21	0.05	0.45	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
172	0.21	0.05	0.44	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
173	0.21	0.05	0.44	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
174	0.21	0.05	0.44	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
175	0.21	0.05	0.44	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
176	0.20	0.05	0.44	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
177	0.20	0.05	0.43	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
178	0.20	0.05	0.43	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold
179	0.20	0.05	0.43	FALSE	FALSE	FALSE	Pass- Qpost Below Flow Control Threshold

SWMM.out file name: V:\17\17065\engineering\TM\CURRENT\STORM\SWMM\17065pre-development.out
SWMM.out time stamp: 4/2/2018 1:49:06 PM

Q10: 2.975
Q5: 2.582
Q2: 1.907

Peak Flow Statistics Table Values

Rank	Start Date	End Date	Duration	Peak	Frequency	Return Period
1	1993/02/08 02:00:00	1993/02/08 16:00:00	15	3.951	0.40%	36
2	1978/01/04 15:00:00	1978/01/05 18:00:00	28	3.372	0.81%	18
3	1980/01/27 22:00:00	1980/01/28 08:00:00	11	3.002	1.21%	12
4	1993/01/06 05:00:00	1993/01/08 00:00:00	44	2.962	1.62%	9
5	1978/01/09 18:00:00	1978/01/10 19:00:00	26	2.873	2.02%	7.2
6	1982/11/29 22:00:00	1982/11/30 05:00:00	8	2.846	2.43%	6
7	1993/01/15 13:00:00	1993/01/18 16:00:00	76	2.589	2.83%	5.14
8	1995/01/04 13:00:00	1995/01/05 02:00:00	14	2.556	3.24%	4.5
9	1998/02/22 05:00:00	1998/02/24 05:00:00	49	2.5	3.64%	4
10	1980/02/18 00:00:00	1980/02/21 11:00:00	84	2.328	4.05%	3.6
11	1995/02/14 07:00:00	1995/02/14 19:00:00	13	2.325	4.45%	3.27
12	1997/12/06 11:00:00	1997/12/06 18:00:00	8	2.308	4.86%	3
13	1980/02/15 19:00:00	1980/02/16 21:00:00	27	2.296	5.26%	2.77
14	1976/09/10 11:00:00	1976/09/11 05:00:00	19	2.248	5.67%	2.57
15	1998/01/09 18:00:00	1998/01/10 01:00:00	8	2.182	6.07%	2.4
16	2005/01/07 15:00:00	2005/01/11 07:00:00	89	2.169	6.48%	2.25
17	1983/03/01 14:00:00	1983/03/02 23:00:00	34	2.006	6.88%	2.12
18	1982/01/20 05:00:00	1982/01/21 05:00:00	25	1.907	7.29%	2
19	1978/02/08 22:00:00	1978/02/10 13:00:00	40	1.902	7.69%	1.9
20	2004/10/19 22:00:00	2004/10/20 15:00:00	18	1.899	8.10%	1.8
21	1986/03/15 22:00:00	1986/03/16 21:00:00	24	1.871	8.50%	1.71
22	1992/03/20 21:00:00	1992/03/21 02:00:00	6	1.869	8.91%	1.64
23	1974/12/04 08:00:00	1974/12/04 12:00:00	5	1.857	9.31%	1.57
24	1978/01/16 19:00:00	1978/01/16 22:00:00	4	1.832	9.72%	1.5
25	1971/12/24 07:00:00	1971/12/25 21:00:00	39	1.82	10.12%	1.44
26	1988/01/05 14:00:00	1988/01/05 15:00:00	2	1.769	10.53%	1.39
27	1974/01/06 18:00:00	1974/01/08 06:00:00	37	1.747	10.93%	1.33
28	2000/02/20 22:00:00	2000/02/21 21:00:00	24	1.7	11.34%	1.29
29	1995/01/10 17:00:00	1995/01/12 16:00:00	48	1.676	11.74%	1.24
30	1980/02/12 16:00:00	1980/02/14 18:00:00	51	1.604	12.15%	1.2
31	1986/02/14 23:00:00	1986/02/15 11:00:00	13	1.56	12.55%	1.16
32	1983/01/29 01:00:00	1983/01/29 04:00:00	4	1.559	12.96%	1.13
33	1992/02/12 16:00:00	1992/02/13 12:00:00	21	1.559	13.36%	1.09
34	1994/02/07 11:00:00	1994/02/08 07:00:00	21	1.539	13.77%	1.06
35	1979/01/05 18:00:00	1979/01/06 06:00:00	13	1.499	14.17%	1.03
36	1992/03/23 03:00:00	1992/03/23 05:00:00	3	1.483	14.57%	1
37	1978/01/19 12:00:00	1978/01/19 14:00:00	3	1.482	14.98%	0.97
38	1986/03/10 14:00:00	1986/03/10 18:00:00	5	1.467	15.38%	0.95
39	1992/02/15 13:00:00	1992/02/15 18:00:00	6	1.454	15.79%	0.92

Rank	Start Date	End Date	Duration	Peak	Frequency	Return Period
40	1998/02/07 23:00:00	1998/02/09 01:00:00	27	1.443	16.19%	0.9
41	1983/12/25 06:00:00	1983/12/25 18:00:00	13	1.434	16.60%	0.88
42	1983/03/24 02:00:00	1983/03/24 04:00:00	3	1.407	17.00%	0.86
43	1976/02/08 15:00:00	1976/02/09 18:00:00	28	1.39	17.41%	0.84
44	1993/01/12 21:00:00	1993/01/14 06:00:00	34	1.38	17.81%	0.82
45	1980/01/09 13:00:00	1980/01/09 15:00:00	3	1.379	18.22%	0.8
46	1998/02/03 11:00:00	1998/02/03 18:00:00	8	1.371	18.62%	0.78
47	1976/12/30 21:00:00	1976/12/30 22:00:00	2	1.358	19.03%	0.77
48	1991/03/25 09:00:00	1991/03/27 06:00:00	46	1.358	19.43%	0.75
49	1985/11/29 13:00:00	1985/11/29 17:00:00	5	1.355	19.84%	0.74
50	1979/01/31 03:00:00	1979/02/01 13:00:00	35	1.344	20.24%	0.72
51	1978/01/14 19:00:00	1978/01/15 06:00:00	12	1.336	20.65%	0.71
52	1996/12/09 19:00:00	1996/12/09 21:00:00	3	1.328	21.05%	0.69
53	1982/12/22 17:00:00	1982/12/23 00:00:00	8	1.324	21.46%	0.68
54	1982/03/17 07:00:00	1982/03/18 06:00:00	24	1.308	21.86%	0.67
55	2001/01/11 04:00:00	2001/01/12 09:00:00	30	1.307	22.27%	0.66
56	1995/03/05 02:00:00	1995/03/06 01:00:00	24	1.306	22.67%	0.64
57	1983/01/27 08:00:00	1983/01/27 19:00:00	12	1.224	23.08%	0.63
58	1973/01/16 21:00:00	1973/01/16 22:00:00	2	1.223	23.48%	0.62
59	1984/12/27 04:00:00	1984/12/27 22:00:00	19	1.223	23.89%	0.61
60	1991/02/27 18:00:00	1991/03/01 10:00:00	41	1.219	24.29%	0.6
61	2005/01/03 07:00:00	2005/01/03 11:00:00	5	1.215	24.70%	0.59
62	1982/04/01 11:00:00	1982/04/01 18:00:00	8	1.194	25.10%	0.58
63	2003/02/25 03:00:00	2003/02/25 10:00:00	8	1.194	25.51%	0.57
64	1983/02/26 14:00:00	1983/02/27 17:00:00	28	1.165	25.91%	0.56
65	1993/02/18 14:00:00	1993/02/20 09:00:00	44	1.152	26.32%	0.55
66	1983/02/08 04:00:00	1983/02/08 06:00:00	3	1.136	26.72%	0.55
67	1995/03/11 02:00:00	1995/03/11 23:00:00	22	1.136	27.13%	0.54
68	2004/12/28 10:00:00	2004/12/29 09:00:00	24	1.13	27.53%	0.53
69	1977/01/03 01:00:00	1977/01/03 07:00:00	7	1.102	27.94%	0.52
70	1973/02/11 06:00:00	1973/02/13 04:00:00	47	1.088	28.34%	0.51
71	2005/02/19 10:00:00	2005/02/19 11:00:00	2	1.058	28.74%	0.51
72	2004/10/27 03:00:00	2004/10/27 08:00:00	6	1.038	29.15%	0.5
73	1977/05/08 18:00:00	1977/05/08 20:00:00	3	1.016	29.55%	0.49
74	1992/03/27 15:00:00	1992/03/27 16:00:00	2	1.013	29.96%	0.49
75	1972/11/14 13:00:00	1972/11/14 14:00:00	2	1.003	30.36%	0.48
76	2005/03/22 22:00:00	2005/03/22 23:00:00	2	0.982	30.77%	0.47
77	1994/02/18 14:00:00	1994/02/18 21:00:00	8	0.975	31.17%	0.47
78	1984/12/18 15:00:00	1984/12/20 04:00:00	38	0.974	31.58%	0.46
79	1994/02/17 13:00:00	1994/02/17 14:00:00	2	0.952	31.98%	0.46
80	1991/03/20 07:00:00	1991/03/20 11:00:00	5	0.937	32.39%	0.45
81	2005/02/21 04:00:00	2005/02/23 10:00:00	55	0.929	32.79%	0.44
82	1983/11/25 00:00:00	1983/11/25 01:00:00	2	0.918	33.20%	0.44
83	1992/01/05 10:00:00	1992/01/06 00:00:00	15	0.913	33.60%	0.43
84	1978/02/28 02:00:00	1978/03/02 15:00:00	62	0.91	34.01%	0.43
85	1998/02/14 14:00:00	1998/02/14 18:00:00	5	0.898	34.41%	0.42
86	1974/01/04 16:00:00	1974/01/05 13:00:00	22	0.892	34.82%	0.42

Rank	Start Date	End Date	Duration	Peak	Frequency	Return Period
87	1995/03/03 08:00:00	1995/03/03 11:00:00	4	0.892	35.22%	0.41
88	1980/03/06 14:00:00	1980/03/06 15:00:00	2	0.874	35.63%	0.41
89	1988/01/17 12:00:00	1988/01/17 22:00:00	11	0.856	36.03%	0.4
90	2000/04/18 06:00:00	2000/04/18 07:00:00	2	0.843	36.44%	0.4
91	2003/03/15 16:00:00	2003/03/16 04:00:00	13	0.838	36.84%	0.4
92	1991/12/29 16:00:00	1991/12/30 01:00:00	10	0.838	37.25%	0.39
93	2001/02/25 14:00:00	2001/02/28 09:00:00	68	0.822	37.65%	0.39
94	1978/11/21 18:00:00	1978/11/21 18:00:00	1	0.821	38.06%	0.38
95	1981/01/29 17:00:00	1981/01/29 19:00:00	3	0.818	38.46%	0.38
96	1997/01/15 18:00:00	1997/01/15 19:00:00	2	0.81	38.87%	0.38
97	1998/03/29 02:00:00	1998/03/29 04:00:00	3	0.801	39.27%	0.37
98	1977/12/28 08:00:00	1977/12/28 15:00:00	8	0.801	39.68%	0.37
99	1972/12/04 14:00:00	1972/12/04 16:00:00	3	0.801	40.08%	0.36
100	1998/05/12 17:00:00	1998/05/13 14:00:00	22	0.8	40.49%	0.36
101	1982/02/10 14:00:00	1982/02/10 23:00:00	10	0.798	40.89%	0.36
102	2003/02/12 14:00:00	2003/02/12 17:00:00	4	0.793	41.30%	0.35
103	1988/12/24 22:00:00	1988/12/25 01:00:00	4	0.779	41.70%	0.35
104	1986/11/18 00:00:00	1986/11/18 04:00:00	5	0.777	42.11%	0.35
105	1995/01/08 00:00:00	1995/01/08 04:00:00	5	0.774	42.51%	0.34
106	1982/03/14 13:00:00	1982/03/14 20:00:00	8	0.765	42.91%	0.34
107	1997/01/12 16:00:00	1997/01/13 07:00:00	16	0.763	43.32%	0.34
108	1982/01/01 09:00:00	1982/01/01 11:00:00	3	0.76	43.72%	0.33
109	2003/12/25 19:00:00	2003/12/25 20:00:00	2	0.76	44.13%	0.33
110	1988/12/21 04:00:00	1988/12/21 07:00:00	4	0.75	44.53%	0.33
111	1976/02/06 10:00:00	1976/02/06 12:00:00	3	0.749	44.94%	0.32
112	1983/10/01 10:00:00	1983/10/01 11:00:00	2	0.744	45.34%	0.32
113	1990/01/17 01:00:00	1990/01/17 05:00:00	5	0.741	45.75%	0.32
114	1996/11/21 21:00:00	1996/11/22 03:00:00	7	0.739	46.15%	0.32
115	1978/03/04 09:00:00	1978/03/05 09:00:00	25	0.738	46.56%	0.31
116	1978/03/11 23:00:00	1978/03/11 23:00:00	1	0.731	46.96%	0.31
117	1985/11/11 09:00:00	1985/11/11 13:00:00	5	0.73	47.37%	0.31
118	1992/12/07 09:00:00	1992/12/07 17:00:00	9	0.719	47.77%	0.31
119	1987/12/18 13:00:00	1987/12/18 13:00:00	1	0.714	48.18%	0.3
120	2000/02/23 17:00:00	2000/02/23 18:00:00	2	0.713	48.58%	0.3
121	1996/01/31 18:00:00	1996/01/31 22:00:00	5	0.713	48.99%	0.3
122	1996/02/27 22:00:00	1996/02/28 02:00:00	5	0.713	49.39%	0.3
123	1983/04/20 04:00:00	1983/04/21 02:00:00	23	0.712	49.80%	0.29
124	1975/03/08 07:00:00	1975/03/08 13:00:00	7	0.706	50.20%	0.29
125	1987/10/12 11:00:00	1987/10/12 16:00:00	6	0.7	50.61%	0.29
126	1979/01/15 14:00:00	1979/01/15 22:00:00	9	0.698	51.01%	0.29
127	1990/02/17 16:00:00	1990/02/17 20:00:00	5	0.696	51.42%	0.28
128	2001/02/13 05:00:00	2001/02/14 01:00:00	21	0.682	51.82%	0.28
129	1998/02/06 14:00:00	1998/02/06 20:00:00	7	0.671	52.23%	0.28
130	1980/03/03 01:00:00	1980/03/03 12:00:00	12	0.669	52.63%	0.28
131	1991/03/19 01:00:00	1991/03/19 04:00:00	4	0.653	53.04%	0.28
132	1984/12/16 04:00:00	1984/12/16 05:00:00	2	0.64	53.44%	0.27
133	1973/11/23 01:00:00	1973/11/23 02:00:00	2	0.637	53.85%	0.27

Rank	Start Date	End Date	Duration	Peak	Frequency	Return Period
134	1987/12/16 20:00:00	1987/12/17 09:00:00	14	0.629	54.25%	0.27
135	1971/12/22 09:00:00	1971/12/22 22:00:00	14	0.623	54.66%	0.27
136	1978/02/12 19:00:00	1978/02/13 12:00:00	18	0.621	55.06%	0.27
137	1973/01/18 21:00:00	1973/01/18 23:00:00	3	0.617	55.47%	0.26
138	1976/03/02 22:00:00	1976/03/02 23:00:00	2	0.616	55.87%	0.26
139	1993/02/23 21:00:00	1993/02/23 21:00:00	1	0.608	56.28%	0.26
140	1977/12/26 07:00:00	1977/12/26 19:00:00	13	0.599	56.68%	0.26
141	1997/01/26 01:00:00	1997/01/26 12:00:00	12	0.596	57.09%	0.26
142	1979/02/21 05:00:00	1979/02/21 05:00:00	1	0.593	57.49%	0.25
143	1973/03/20 07:00:00	1973/03/20 08:00:00	2	0.588	57.89%	0.25
144	1973/03/11 12:00:00	1973/03/11 13:00:00	2	0.576	58.30%	0.25
145	2003/04/14 15:00:00	2003/04/14 19:00:00	5	0.576	58.70%	0.25
146	1987/01/04 19:00:00	1987/01/04 21:00:00	3	0.568	59.11%	0.25
147	1986/03/08 21:00:00	1986/03/08 21:00:00	1	0.556	59.51%	0.25
148	2004/02/26 05:00:00	2004/02/26 11:00:00	7	0.555	59.92%	0.24
149	1974/03/08 03:00:00	1974/03/08 14:00:00	12	0.554	60.32%	0.24
150	1987/11/04 19:00:00	1987/11/05 09:00:00	15	0.554	60.73%	0.24
151	1977/01/06 01:00:00	1977/01/07 00:00:00	24	0.545	61.13%	0.24
152	1998/05/04 21:00:00	1998/05/05 00:00:00	4	0.529	61.54%	0.24
153	1979/03/17 07:00:00	1979/03/17 08:00:00	2	0.525	61.94%	0.24
154	1990/04/16 23:00:00	1990/04/17 00:00:00	2	0.524	62.35%	0.23
155	2004/02/22 05:00:00	2004/02/22 10:00:00	6	0.517	62.75%	0.23
156	2001/03/10 04:00:00	2001/03/10 06:00:00	3	0.5	63.16%	0.23
157	1979/03/19 05:00:00	1979/03/19 07:00:00	3	0.498	63.56%	0.23
158	1979/11/08 04:00:00	1979/11/08 05:00:00	2	0.493	63.97%	0.23
159	1998/02/17 01:00:00	1998/02/17 08:00:00	8	0.49	64.37%	0.23
160	1979/03/27 15:00:00	1979/03/28 21:00:00	31	0.48	64.78%	0.23
161	1981/03/01 12:00:00	1981/03/02 09:00:00	22	0.478	65.18%	0.22
162	1971/12/27 14:00:00	1971/12/28 14:00:00	25	0.477	65.59%	0.22
163	2004/10/28 10:00:00	2004/10/28 11:00:00	2	0.475	65.99%	0.22
164	1981/01/28 07:00:00	1981/01/28 07:00:00	1	0.474	66.40%	0.22
165	1976/03/01 15:00:00	1976/03/01 17:00:00	3	0.47	66.80%	0.22
166	1982/03/30 01:00:00	1982/03/30 02:00:00	2	0.462	67.21%	0.22
167	1978/09/05 20:00:00	1978/09/05 22:00:00	3	0.453	67.61%	0.22
168	1986/09/25 05:00:00	1986/09/25 05:00:00	1	0.452	68.02%	0.21
169	1983/01/24 18:00:00	1983/01/24 19:00:00	2	0.451	68.42%	0.21
170	1977/03/25 04:00:00	1977/03/25 04:00:00	1	0.449	68.83%	0.21
171	1975/04/08 16:00:00	1975/04/09 00:00:00	9	0.449	69.23%	0.21
172	1988/04/20 07:00:00	1988/04/20 13:00:00	7	0.446	69.64%	0.21
173	1989/02/04 14:00:00	1989/02/04 16:00:00	3	0.445	70.04%	0.21
174	1983/03/21 05:00:00	1983/03/21 05:00:00	1	0.443	70.45%	0.21
175	1995/01/24 21:00:00	1995/01/25 23:00:00	27	0.441	70.85%	0.21
176	2005/05/06 06:00:00	2005/05/06 06:00:00	1	0.441	71.26%	0.21
177	2004/12/31 15:00:00	2004/12/31 16:00:00	2	0.438	71.66%	0.2
178	1999/01/26 12:00:00	1999/01/26 23:00:00	12	0.432	72.06%	0.2
179	1982/01/05 14:00:00	1982/01/05 15:00:00	2	0.429	72.47%	0.2
180	1995/04/18 12:00:00	1995/04/18 14:00:00	3	0.428	72.87%	0.2

Rank	Start Date	End Date	Duration	Peak	Frequency	Return Period
181	2005/02/11 18:00:00	2005/02/11 18:00:00	1	0.421	73.28%	0.2
182	1987/01/06 23:00:00	1987/01/07 01:00:00	3	0.419	73.68%	0.2
183	2000/02/12 06:00:00	2000/02/12 07:00:00	2	0.418	74.09%	0.2
184	1997/12/07 21:00:00	1997/12/07 21:00:00	1	0.416	74.49%	0.2
185	1992/02/10 01:00:00	1992/02/10 01:00:00	1	0.416	74.90%	0.2
186	1989/01/05 20:00:00	1989/01/05 20:00:00	1	0.413	75.30%	0.19
187	1975/03/11 14:00:00	1975/03/11 15:00:00	2	0.412	75.71%	0.19
188	2000/03/08 14:00:00	2000/03/08 15:00:00	2	0.411	76.11%	0.19
189	1978/12/17 02:00:00	1978/12/18 16:00:00	39	0.408	76.52%	0.19
190	1994/04/26 12:00:00	1994/04/26 18:00:00	7	0.406	76.92%	0.19
191	1975/03/10 12:00:00	1975/03/10 13:00:00	2	0.405	77.33%	0.19
192	1993/01/10 13:00:00	1993/01/10 14:00:00	2	0.403	77.73%	0.19
193	1978/02/07 21:00:00	1978/02/07 21:00:00	1	0.402	78.14%	0.19
194	1977/08/17 05:00:00	1977/08/17 06:00:00	2	0.399	78.54%	0.19
195	1998/04/11 02:00:00	1998/04/11 02:00:00	1	0.397	78.95%	0.19
196	1994/02/20 14:00:00	1994/02/20 16:00:00	3	0.395	79.35%	0.18
197	1994/03/25 00:00:00	1994/03/25 02:00:00	3	0.392	79.76%	0.18
198	2000/03/05 10:00:00	2000/03/05 14:00:00	5	0.364	80.16%	0.18
199	1984/11/13 09:00:00	1984/11/13 09:00:00	1	0.363	80.57%	0.18
200	1973/03/06 13:00:00	1973/03/07 00:00:00	12	0.351	80.97%	0.18
201	1978/03/31 05:00:00	1978/03/31 06:00:00	2	0.351	81.38%	0.18
202	1983/03/18 12:00:00	1983/03/18 15:00:00	4	0.346	81.78%	0.18
203	1978/11/13 21:00:00	1978/11/13 21:00:00	1	0.342	82.19%	0.18
204	1998/12/07 06:00:00	1998/12/07 06:00:00	1	0.337	82.59%	0.18
205	1995/03/23 08:00:00	1995/03/23 08:00:00	1	0.336	83.00%	0.18
206	2002/12/16 19:00:00	2002/12/16 19:00:00	1	0.333	83.40%	0.18
207	1985/02/09 10:00:00	1985/02/09 10:00:00	1	0.328	83.81%	0.17
208	1975/03/06 07:00:00	1975/03/06 07:00:00	1	0.326	84.21%	0.17
209	1971/12/07 02:00:00	1971/12/07 02:00:00	1	0.322	84.62%	0.17
210	1996/03/13 04:00:00	1996/03/13 05:00:00	2	0.318	85.02%	0.17
211	1986/10/09 21:00:00	1986/10/09 21:00:00	1	0.317	85.43%	0.17
212	1985/02/02 12:00:00	1985/02/02 12:00:00	1	0.316	85.83%	0.17
213	2006/03/28 22:00:00	2006/03/28 22:00:00	1	0.313	86.23%	0.17
214	1993/11/14 09:00:00	1993/11/14 09:00:00	1	0.3	86.64%	0.17
215	2001/11/24 18:00:00	2001/11/24 18:00:00	1	0.296	87.04%	0.17
216	2006/02/28 03:00:00	2006/02/28 03:00:00	1	0.29	87.45%	0.17
217	1978/04/07 03:00:00	1978/04/07 03:00:00	1	0.288	87.85%	0.17
218	1983/01/23 04:00:00	1983/01/23 04:00:00	1	0.282	88.26%	0.17
219	1983/11/12 18:00:00	1983/11/12 18:00:00	1	0.269	88.66%	0.16
220	1980/12/05 02:00:00	1980/12/05 02:00:00	1	0.268	89.07%	0.16
221	2005/04/28 08:00:00	2005/04/28 09:00:00	2	0.268	89.47%	0.16
222	1999/02/04 19:00:00	1999/02/04 19:00:00	1	0.242	89.88%	0.16
223	1985/11/25 07:00:00	1985/11/25 07:00:00	1	0.241	90.28%	0.16
224	1986/01/30 06:00:00	1986/01/30 07:00:00	2	0.241	90.69%	0.16
225	1996/02/21 10:00:00	1996/02/21 10:00:00	1	0.239	91.09%	0.16
226	2003/02/11 09:00:00	2003/02/11 12:00:00	4	0.224	91.50%	0.16
227	1982/11/10 03:00:00	1982/11/10 03:00:00	1	0.208	91.90%	0.16

Rank	Start Date	End Date	Duration	Peak	Frequency	Return Period
228	1992/03/02 19:00:00	1992/03/02 19:00:00	1	0.208	92.31%	0.16
229	1998/03/27 14:00:00	1998/03/27 14:00:00	1	0.203	92.71%	0.16
230	1990/01/14 01:00:00	1990/01/14 02:00:00	2	0.196	93.12%	0.16
231	2004/11/21 09:00:00	2004/11/21 09:00:00	1	0.196	93.52%	0.16
232	1979/01/17 09:00:00	1979/01/17 10:00:00	2	0.168	93.93%	0.16
233	1998/09/03 19:00:00	1998/09/03 19:00:00	1	0.168	94.33%	0.16
234	1996/02/25 11:00:00	1996/02/25 11:00:00	1	0.161	94.74%	0.15
235	1981/02/09 05:00:00	1981/02/09 05:00:00	1	0.157	95.14%	0.15
236	1998/03/31 09:00:00	1998/03/31 11:00:00	3	0.125	95.55%	0.15
237	1984/11/24 18:00:00	1984/11/24 22:00:00	5	0.124	95.95%	0.15
238	2003/02/27 13:00:00	2003/02/27 13:00:00	1	0.12	96.36%	0.15
239	1986/03/13 21:00:00	1986/03/13 21:00:00	1	0.119	96.76%	0.15
240	1984/09/16 15:00:00	1984/09/16 15:00:00	1	0.116	97.17%	0.15
241	1973/03/22 01:00:00	1973/03/22 02:00:00	2	0.113	97.57%	0.15
242	1986/03/12 13:00:00	1986/03/12 13:00:00	1	0.095	97.98%	0.15
243	1983/11/20 11:00:00	1983/11/20 11:00:00	1	0.094	98.38%	0.15
244	1992/01/07 21:00:00	1992/01/07 21:00:00	1	0.089	98.79%	0.15
245	1989/01/04 11:00:00	1989/01/04 11:00:00	1	0.085	99.19%	0.15
246	1994/02/04 11:00:00	1994/02/04 11:00:00	1	0.048	99.60%	0.15
--End of Data----------						

SWMM.out file name: V:\17\17065\engineering\TM\CURRENT\STORM\SWMM\17065post-development.out
SWMM.out time stamp: 4/2/2018 1:45:46 PM

Q10: 0.000
Q5: 0.000
Q2: 0.000

Peak Flow Statistics Table Values

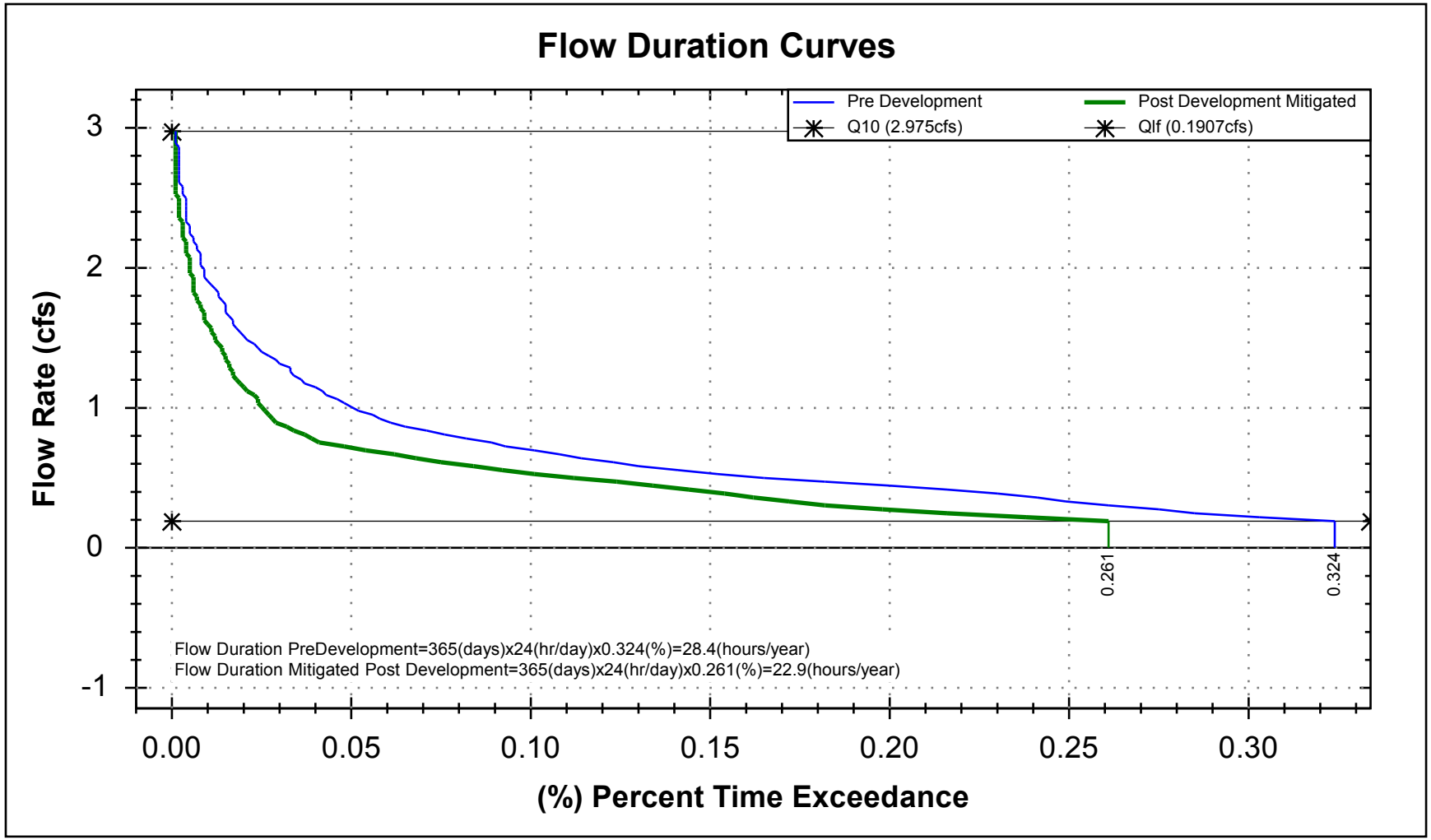
Rank	Start Date	End Date	Duration	Peak	Frequency	Return Period
1	1978/01/04 17:00:00	1978/01/06 08:00:00	40	3.154	0.55%	36
2	1980/01/28 01:00:00	1980/01/29 11:00:00	35	3.08	1.10%	18
3	1993/01/06 08:00:00	1993/01/08 18:00:00	59	2.826	1.66%	12
4	1995/01/04 18:00:00	1995/01/05 17:00:00	24	2.622	2.21%	9
5	1993/02/08 02:00:00	1993/02/09 11:00:00	34	2.498	2.76%	7.2
6	1993/01/13 06:00:00	1993/01/19 09:00:00	148	2.435	3.31%	6
7	1982/11/30 00:00:00	1982/11/30 20:00:00	21	2.215	3.87%	5.14
8	1998/02/22 12:00:00	1998/02/24 20:00:00	57	2.169	4.42%	4.5
9	2005/01/07 21:00:00	2005/01/12 00:00:00	100	1.953	4.97%	4
10	1995/02/14 08:00:00	1995/02/15 10:00:00	27	1.917	5.52%	3.6
11	1983/02/27 10:00:00	1983/03/03 19:00:00	106	1.816	6.08%	3.27
12	1980/02/12 21:00:00	1980/02/22 02:00:00	222	1.784	6.63%	3
13	1976/09/10 13:00:00	1976/09/11 22:00:00	34	1.765	7.18%	2.77
14	1998/01/09 22:00:00	1998/01/10 20:00:00	23	1.639	7.73%	2.57
15	2004/10/20 03:00:00	2004/10/21 10:00:00	32	1.615	8.29%	2.4
16	1982/01/20 07:00:00	1982/01/21 22:00:00	40	1.591	8.84%	2.25
17	1978/01/10 05:00:00	1978/01/11 13:00:00	33	1.569	9.39%	2.12
18	1974/01/04 21:00:00	1974/01/08 21:00:00	97	1.569	9.94%	2
19	1995/01/10 22:00:00	1995/01/13 04:00:00	55	1.526	10.50%	1.9
20	1979/01/05 20:00:00	1979/01/07 02:00:00	31	1.446	11.05%	1.8
21	1986/02/15 02:00:00	1986/02/16 12:00:00	35	1.429	11.60%	1.71
22	1982/12/22 21:00:00	1982/12/23 16:00:00	20	1.399	12.15%	1.64
23	1991/03/26 09:00:00	1991/03/28 01:00:00	41	1.363	12.71%	1.57
24	1994/02/07 17:00:00	1994/02/09 00:00:00	32	1.337	13.26%	1.5
25	1978/01/15 00:00:00	1978/01/17 14:00:00	63	1.283	13.81%	1.44
26	1991/02/27 21:00:00	1991/03/02 05:00:00	57	1.183	14.36%	1.39
27	1995/03/11 04:00:00	1995/03/12 10:00:00	31	1.169	14.92%	1.33
28	1976/02/05 14:00:00	1976/02/10 17:00:00	124	1.164	15.47%	1.29
29	1995/03/05 07:00:00	1995/03/06 16:00:00	34	1.141	16.02%	1.24
30	2000/02/21 04:00:00	2000/02/22 12:00:00	33	1.096	16.57%	1.2
31	1971/12/22 14:00:00	1971/12/26 07:00:00	90	0.998	17.13%	1.16
32	1992/03/20 23:00:00	1992/03/22 00:00:00	26	0.983	17.68%	1.13
33	1997/12/06 13:00:00	1997/12/07 14:00:00	26	0.89	18.23%	1.09
34	1996/11/21 23:00:00	1996/11/22 22:00:00	24	0.889	18.78%	1.06
35	1983/12/25 07:00:00	1983/12/26 12:00:00	30	0.854	19.34%	1.03
36	1998/02/06 22:00:00	1998/02/09 12:00:00	63	0.853	19.89%	1
37	1982/03/17 14:00:00	1982/03/19 02:00:00	37	0.841	20.44%	0.97
38	1974/12/04 10:00:00	1974/12/05 07:00:00	22	0.829	20.99%	0.95
39	2003/03/15 18:00:00	2003/03/17 07:00:00	38	0.766	21.55%	0.92

Rank	Start Date	End Date	Duration	Peak	Frequency	Return Period
40	1978/02/09 07:00:00	1978/02/11 06:00:00	48	0.725	22.10%	0.9
41	1998/02/14 17:00:00	1998/02/15 10:00:00	18	0.703	22.65%	0.88
42	1985/11/29 15:00:00	1985/11/30 13:00:00	23	0.696	23.20%	0.86
43	2003/02/25 05:00:00	2003/02/27 20:00:00	64	0.688	23.76%	0.84
44	1979/01/31 05:00:00	1979/02/02 10:00:00	54	0.664	24.31%	0.82
45	1991/03/19 08:00:00	1991/03/21 11:00:00	52	0.659	24.86%	0.8
46	1978/02/28 05:00:00	1978/03/03 03:00:00	71	0.654	25.41%	0.78
47	2005/02/21 08:00:00	2005/02/24 01:00:00	66	0.646	25.97%	0.77
48	1988/01/17 17:00:00	1988/01/18 13:00:00	21	0.619	26.52%	0.75
49	2004/12/28 12:00:00	2004/12/30 07:00:00	44	0.599	27.07%	0.74
50	1994/02/17 18:00:00	1994/02/19 16:00:00	47	0.555	27.62%	0.72
51	2001/01/11 07:00:00	2001/01/12 15:00:00	33	0.535	28.18%	0.71
52	1977/05/08 21:00:00	1977/05/09 23:00:00	27	0.52	28.73%	0.69
53	1987/10/12 13:00:00	1987/10/13 07:00:00	19	0.516	29.28%	0.68
54	2004/10/27 04:00:00	2004/10/28 22:00:00	43	0.512	29.83%	0.67
55	1997/01/12 20:00:00	1997/01/14 13:00:00	42	0.507	30.39%	0.66
56	1982/03/14 19:00:00	1982/03/15 11:00:00	17	0.491	30.94%	0.64
57	1992/01/05 17:00:00	1992/01/06 17:00:00	25	0.485	31.49%	0.63
58	1973/02/11 13:00:00	1973/02/13 20:00:00	56	0.476	32.04%	0.62
59	1996/01/31 22:00:00	1996/02/01 17:00:00	20	0.475	32.60%	0.61
60	1997/01/26 07:00:00	1997/01/27 03:00:00	21	0.471	33.15%	0.6
61	1988/01/05 16:00:00	1988/01/06 02:00:00	11	0.462	33.70%	0.59
62	2003/04/14 17:00:00	2003/04/15 17:00:00	25	0.454	34.25%	0.58
63	1993/02/18 16:00:00	1993/02/21 02:00:00	59	0.446	34.81%	0.57
64	1984/12/27 09:00:00	1984/12/28 13:00:00	29	0.437	35.36%	0.56
65	1977/12/26 15:00:00	1977/12/27 12:00:00	22	0.425	35.91%	0.55
66	1992/12/07 15:00:00	1992/12/08 08:00:00	18	0.425	36.46%	0.55
67	2003/02/11 14:00:00	2003/02/13 19:00:00	54	0.413	37.02%	0.54
68	1986/03/16 05:00:00	1986/03/17 12:00:00	32	0.403	37.57%	0.53
69	1977/01/03 06:00:00	1977/01/03 22:00:00	17	0.4	38.12%	0.52
70	1983/01/27 10:00:00	1983/01/29 19:00:00	58	0.388	38.67%	0.51
71	1985/11/11 13:00:00	1985/11/12 18:00:00	30	0.383	39.23%	0.51
72	1978/02/13 03:00:00	1978/02/14 02:00:00	24	0.348	39.78%	0.5
73	1980/01/09 13:00:00	1980/01/10 09:00:00	21	0.322	40.33%	0.49
74	1986/11/18 02:00:00	1986/11/18 20:00:00	19	0.31	40.88%	0.49
75	1986/03/10 17:00:00	1986/03/11 09:00:00	17	0.309	41.44%	0.48
76	1998/02/03 13:00:00	1998/02/04 20:00:00	32	0.293	41.99%	0.47
77	1992/02/12 18:00:00	1992/02/14 03:00:00	34	0.292	42.54%	0.47
78	1974/03/08 08:00:00	1974/03/09 08:00:00	25	0.282	43.09%	0.46
79	1990/02/17 20:00:00	1990/02/18 17:00:00	22	0.263	43.65%	0.46
80	1992/02/15 15:00:00	1992/02/16 07:00:00	17	0.244	44.20%	0.45
81	1996/12/09 20:00:00	1996/12/10 17:00:00	22	0.227	44.75%	0.44
82	1977/08/17 05:00:00	1977/08/18 05:00:00	25	0.227	45.30%	0.44
83	1984/12/19 02:00:00	1984/12/20 15:00:00	38	0.221	45.86%	0.43
84	1973/01/16 23:00:00	1973/01/17 15:00:00	17	0.21	46.41%	0.43
85	1992/03/23 06:00:00	1992/03/24 02:00:00	21	0.171	46.96%	0.42
86	1983/03/24 05:00:00	1983/03/24 13:00:00	9	0.17	47.51%	0.42

Rank	Start Date	End Date	Duration	Peak	Frequency	Return Period
87	1982/02/10 20:00:00	1982/02/11 14:00:00	19	0.153	48.07%	0.41
88	2004/02/26 10:00:00	2004/02/27 02:00:00	17	0.139	48.62%	0.41
89	2001/02/13 10:00:00	2001/02/14 16:00:00	31	0.139	49.17%	0.4
90	1987/01/04 23:00:00	1987/01/05 18:00:00	20	0.138	49.72%	0.4
91	1978/09/05 23:00:00	1978/09/06 17:00:00	19	0.138	50.28%	0.4
92	2005/01/03 13:00:00	2005/01/04 17:00:00	29	0.138	50.83%	0.39
93	1976/03/01 18:00:00	1976/03/03 14:00:00	45	0.137	51.38%	0.39
94	1975/04/08 22:00:00	1975/04/09 16:00:00	19	0.137	51.93%	0.38
95	1988/04/20 11:00:00	1988/04/21 16:00:00	30	0.137	52.49%	0.38
96	2006/02/28 05:00:00	2006/02/28 22:00:00	18	0.137	53.04%	0.38
97	1979/03/28 00:00:00	1979/03/29 10:00:00	35	0.136	53.59%	0.37
98	1978/03/04 16:00:00	1978/03/05 21:00:00	30	0.136	54.14%	0.37
99	1972/12/04 16:00:00	1972/12/05 08:00:00	17	0.135	54.70%	0.36
100	1991/12/29 23:00:00	1991/12/30 17:00:00	19	0.135	55.25%	0.36
101	1995/03/03 14:00:00	1995/03/04 03:00:00	14	0.135	55.80%	0.36
102	1978/12/17 08:00:00	1978/12/19 16:00:00	57	0.134	56.35%	0.35
103	1977/12/28 12:00:00	1977/12/29 06:00:00	19	0.134	56.91%	0.35
104	1977/01/06 07:00:00	1977/01/07 16:00:00	34	0.134	57.46%	0.35
105	1980/03/03 06:00:00	1980/03/04 02:00:00	21	0.133	58.01%	0.34
106	1982/04/01 13:00:00	1982/04/02 07:00:00	19	0.133	58.56%	0.34
107	2003/12/25 23:00:00	2003/12/26 12:00:00	14	0.133	59.12%	0.34
108	1994/02/04 12:00:00	1994/02/05 04:00:00	17	0.132	59.67%	0.33
109	1983/11/12 10:00:00	1983/11/13 12:00:00	27	0.131	60.22%	0.33
110	1982/11/10 01:00:00	1982/11/10 17:00:00	17	0.131	60.77%	0.33
111	2001/02/25 21:00:00	2001/02/28 15:00:00	67	0.13	61.33%	0.32
112	2000/04/18 09:00:00	2000/04/18 22:00:00	14	0.13	61.88%	0.32
113	1981/03/01 18:00:00	1981/03/02 17:00:00	24	0.13	62.43%	0.32
114	1979/03/19 08:00:00	1979/03/19 21:00:00	14	0.129	62.98%	0.32
115	2005/02/19 10:00:00	2005/02/20 03:00:00	18	0.128	63.54%	0.31
116	2005/02/11 21:00:00	2005/02/12 21:00:00	25	0.127	64.09%	0.31
117	1986/01/30 12:00:00	1986/01/31 01:00:00	14	0.124	64.64%	0.31
118	1979/01/15 21:00:00	1979/01/16 09:00:00	13	0.124	65.19%	0.31
119	1995/01/25 20:00:00	1995/01/26 14:00:00	19	0.124	65.75%	0.3
120	1992/02/07 00:00:00	1992/02/07 13:00:00	14	0.123	66.30%	0.3
121	1987/12/17 02:00:00	1987/12/17 20:00:00	19	0.121	66.85%	0.3
122	1992/03/02 23:00:00	1992/03/03 09:00:00	11	0.121	67.40%	0.3
123	1998/05/12 23:00:00	1998/05/14 03:00:00	29	0.12	67.96%	0.29
124	1978/11/11 20:00:00	1978/11/12 13:00:00	18	0.12	68.51%	0.29
125	1976/12/30 23:00:00	1977/01/01 05:00:00	31	0.12	69.06%	0.29
126	1986/09/25 08:00:00	1986/09/25 20:00:00	13	0.114	69.61%	0.29
127	2004/02/22 12:00:00	2004/02/23 09:00:00	22	0.111	70.17%	0.28
128	1981/01/29 22:00:00	1981/01/30 07:00:00	10	0.109	70.72%	0.28
129	1990/04/17 04:00:00	1990/04/17 12:00:00	9	0.105	71.27%	0.28
130	1994/03/25 06:00:00	1994/03/25 14:00:00	9	0.102	71.82%	0.28
131	1994/03/19 13:00:00	1994/03/19 22:00:00	10	0.1	72.38%	0.28
132	1978/03/31 09:00:00	1978/03/31 17:00:00	9	0.098	72.93%	0.27
133	1996/02/21 15:00:00	1996/02/22 07:00:00	17	0.097	73.48%	0.27

Rank	Start Date	End Date	Duration	Peak	Frequency	Return Period
134	1985/11/25 10:00:00	1985/11/25 18:00:00	9	0.097	74.03%	0.27
135	1986/03/09 00:00:00	1986/03/09 08:00:00	9	0.097	74.59%	0.27
136	1998/02/17 10:00:00	1998/02/17 18:00:00	9	0.095	75.14%	0.27
137	1986/02/08 12:00:00	1986/02/08 22:00:00	11	0.094	75.69%	0.26
138	2004/11/21 13:00:00	2004/11/21 20:00:00	8	0.092	76.24%	0.26
139	1996/03/13 09:00:00	1996/03/13 20:00:00	12	0.091	76.80%	0.26
140	1974/03/02 14:00:00	1974/03/02 22:00:00	9	0.091	77.35%	0.26
141	1987/11/05 10:00:00	1987/11/05 21:00:00	12	0.091	77.90%	0.26
142	1971/12/27 20:00:00	1971/12/28 22:00:00	27	0.09	78.45%	0.25
143	1973/11/18 16:00:00	1973/11/18 23:00:00	8	0.086	79.01%	0.25
144	2001/11/25 01:00:00	2001/11/25 07:00:00	7	0.085	79.56%	0.25
145	1978/01/19 18:00:00	1978/01/20 01:00:00	8	0.085	80.11%	0.25
146	1977/03/25 15:00:00	1977/03/26 01:00:00	11	0.083	80.66%	0.25
147	1998/03/29 07:00:00	1998/03/29 14:00:00	8	0.082	81.22%	0.25
148	1988/12/25 05:00:00	1988/12/25 11:00:00	7	0.08	81.77%	0.24
149	2000/02/23 22:00:00	2000/02/24 04:00:00	7	0.078	82.32%	0.24
150	1998/11/29 21:00:00	1998/11/30 05:00:00	9	0.078	82.87%	0.24
151	1995/01/08 06:00:00	1995/01/08 19:00:00	14	0.077	83.43%	0.24
152	2005/03/23 04:00:00	2005/03/23 10:00:00	7	0.076	83.98%	0.24
153	1983/02/08 11:00:00	1983/02/08 19:00:00	9	0.075	84.53%	0.24
154	1998/05/05 04:00:00	1998/05/05 09:00:00	6	0.075	85.08%	0.23
155	1988/04/15 06:00:00	1988/04/15 12:00:00	7	0.075	85.64%	0.23
156	1978/11/22 00:00:00	1978/11/22 05:00:00	6	0.073	86.19%	0.23
157	1990/01/14 07:00:00	1990/01/14 15:00:00	9	0.07	86.74%	0.23
158	2000/03/05 18:00:00	2000/03/05 23:00:00	6	0.068	87.29%	0.23
159	1982/01/01 16:00:00	1982/01/01 22:00:00	7	0.067	87.85%	0.23
160	2002/12/17 01:00:00	2002/12/17 06:00:00	6	0.067	88.40%	0.23
161	1980/12/05 10:00:00	1980/12/05 15:00:00	6	0.066	88.95%	0.22
162	1984/11/25 02:00:00	1984/11/25 07:00:00	6	0.064	89.50%	0.22
163	1981/02/09 10:00:00	1981/02/09 15:00:00	6	0.063	90.06%	0.22
164	1981/01/28 15:00:00	1981/01/28 21:00:00	7	0.062	90.61%	0.22
165	2001/03/10 10:00:00	2001/03/10 14:00:00	5	0.061	91.16%	0.22
166	2003/11/13 05:00:00	2003/11/13 08:00:00	4	0.06	91.71%	0.22
167	1987/10/31 19:00:00	1987/11/01 03:00:00	9	0.059	92.27%	0.22
168	1983/04/21 05:00:00	1983/04/21 09:00:00	5	0.059	92.82%	0.21
169	1988/12/21 12:00:00	1988/12/21 15:00:00	4	0.059	93.37%	0.21
170	1975/03/08 16:00:00	1975/03/08 20:00:00	5	0.057	93.92%	0.21
171	1973/03/20 14:00:00	1973/03/21 02:00:00	13	0.055	94.48%	0.21
172	1985/02/09 17:00:00	1985/02/09 20:00:00	4	0.054	95.03%	0.21
173	1975/03/11 19:00:00	1975/03/11 22:00:00	4	0.053	95.58%	0.21
174	1979/02/21 10:00:00	1979/02/21 16:00:00	7	0.053	96.13%	0.21
175	1992/12/28 09:00:00	1992/12/28 12:00:00	4	0.053	96.69%	0.21
176	1981/11/28 14:00:00	1981/11/28 16:00:00	3	0.049	97.24%	0.21
177	1983/10/01 17:00:00	1983/10/01 18:00:00	2	0.049	97.79%	0.2
178	1980/03/06 20:00:00	1980/03/06 22:00:00	3	0.048	98.34%	0.2
179	1987/01/07 06:00:00	1987/01/07 07:00:00	2	0.048	98.90%	0.2
180	1994/02/20 20:00:00	1994/02/20 21:00:00	2	0.048	99.45%	0.2

Rank	Start Date	End Date	Duration	Peak	Frequency	Return Period
--End of Data----------						


Flow Duration Curves
Pre Development
Post Development Mitigated
Q10 (2.975cfs)
Qlf (0.1907cfs)
Flow Rate (cfs)
3
2
1
0
-1
0.261
0.324
Flow Duration PreDevelopment=365(days)x24(hr/day)x0.324(%)=28.4(hours/year)
Flow Duration Mitigated Post Development=365(days)x24(hr/day)x0.261(%)=22.9(hours/year)
0.00
0.05
0.10
0.15
0.20
0.25
0.30
(%) Percent Time Exceedance

Compare Post-Development Curve to Pre-Development Curve

post-development SWMM file: V:\17\17065\engineering\TM\CURRENT\STORM\SWMM\17065post-development.out
post-development time stamp: 4/2/2018 1:45:46 PM
Compared to:
pre-development SWMM file: V:\17\17065\engineering\TM\CURRENT\STORM\SWMM\17065pre-development.out
pre-development time stamp: 4/2/2018 1:49:06 PM

Post PT #	Flow Rate	Post Dev % Exceed	Pre Dev % Exceed	%Ex post < %Ex pre	%Ex post > %Ex pre	%Ex post > 110% %Ex pre	Pass/Fail
0	0.19	0.26	0.32	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
1	0.22	0.24	0.30	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
2	0.25	0.22	0.29	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
3	0.28	0.20	0.28	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
4	0.30	0.18	0.26	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
5	0.33	0.17	0.25	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
6	0.36	0.16	0.24	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
7	0.39	0.15	0.23	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
8	0.42	0.14	0.22	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
9	0.44	0.13	0.20	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
10	0.47	0.12	0.18	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
11	0.50	0.11	0.17	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
12	0.53	0.10	0.15	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
13	0.56	0.09	0.14	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
14	0.58	0.08	0.13	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
15	0.61	0.08	0.12	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
16	0.64	0.07	0.11	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
17	0.67	0.06	0.11	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
18	0.70	0.05	0.10	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
19	0.73	0.05	0.09	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
20	0.75	0.04	0.09	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
21	0.78	0.04	0.08	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
22	0.81	0.04	0.08	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
23	0.84	0.03	0.07	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
24	0.87	0.03	0.07	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
25	0.89	0.03	0.06	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
26	0.92	0.03	0.06	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
27	0.95	0.03	0.06	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
28	0.98	0.03	0.05	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
29	1.01	0.03	0.05	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
30	1.03	0.02	0.05	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
31	1.06	0.02	0.05	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration

Post PT #	Flow Rate	Post Dev % Exceed	Pre Dev % Exceed	%Ex post < %Ex pre	%Ex post > %Ex pre	%Ex post > 110% %Ex pre	Pass/Fail
32	1.09	0.02	0.04	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
33	1.12	0.02	0.04	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
34	1.15	0.02	0.04	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
35	1.18	0.02	0.04	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
36	1.20	0.02	0.04	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
37	1.23	0.02	0.03	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
38	1.26	0.02	0.03	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
39	1.29	0.02	0.03	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
40	1.32	0.02	0.03	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
41	1.34	0.02	0.03	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
42	1.37	0.02	0.03	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
43	1.40	0.01	0.03	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
44	1.43	0.01	0.02	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
45	1.46	0.01	0.02	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
46	1.48	0.01	0.02	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
47	1.51	0.01	0.02	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
48	1.54	0.01	0.02	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
49	1.57	0.01	0.02	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
50	1.60	0.01	0.02	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
51	1.63	0.01	0.02	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
52	1.65	0.01	0.02	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
53	1.68	0.01	0.02	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
54	1.71	0.01	0.02	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
55	1.74	0.01	0.02	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
56	1.77	0.01	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
57	1.79	0.01	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
58	1.82	0.01	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
59	1.85	0.01	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
60	1.88	0.01	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
61	1.91	0.01	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
62	1.93	0.01	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
63	1.96	0.01	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
64	1.99	0.01	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
65	2.02	0.01	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
66	2.05	0.01	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
67	2.08	0.01	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
68	2.10	0.00	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
69	2.13	0.00	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
70	2.16	0.00	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
71	2.19	0.00	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration

Post PT #	Flow Rate	Post Dev % Exceed	Pre Dev % Exceed	%Ex post < %Ex pre	%Ex post > %Ex pre	%Ex post > 110% %Ex pre	Pass/Fail
72	2.22	0.00	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
73	2.24	0.00	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
74	2.27	0.00	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
75	2.30	0.00	0.01	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
76	2.33	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
77	2.36	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
78	2.38	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
79	2.41	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
80	2.44	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
81	2.47	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
82	2.50	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
83	2.53	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
84	2.55	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
85	2.58	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
86	2.61	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
87	2.64	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
88	2.67	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
89	2.69	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
90	2.72	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
91	2.75	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
92	2.78	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
93	2.81	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
94	2.83	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
95	2.86	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
96	2.89	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
97	2.92	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
98	2.95	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration
99	2.98	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration < Pre Duration

Duration Table Summary at Project Discharge Point

file name: V:\17\17065\engineering\TM\CURRENT\STORM\SWMM\17065pre-development.out
time stamp: 4/2/2018 1:49:06 PM

DISCHARGE		Number of periods when discharge was equal to or greater than DISCHARGE column but less than that shown on the next line		
Bin Number	Discharge Rate	Number of Periods	Total Periods Exceeding	Percent Time Exceeded
1	0.19	63	977	0.324
2	0.22	54	914	0.303
3	0.25	30	860	0.285
4	0.28	41	830	0.275
5	0.30	37	789	0.261
6	0.33	23	752	0.249
7	0.36	33	729	0.241
8	0.39	44	696	0.230
9	0.42	48	652	0.216
10	0.44	55	604	0.200
11	0.47	51	549	0.182
12	0.50	38	498	0.165
13	0.53	35	460	0.152
14	0.56	33	425	0.141
15	0.58	21	392	0.130
16	0.61	28	371	0.123
17	0.64	18	343	0.114
18	0.67	21	325	0.108
19	0.70	22	304	0.101
20	0.73	14	282	0.093
21	0.75	19	268	0.089
22	0.78	18	249	0.082
23	0.81	18	231	0.076
24	0.84	17	213	0.071
25	0.87	11	196	0.065
26	0.89	10	185	0.061
27	0.92	6	175	0.058
28	0.95	11	169	0.056
29	0.98	7	158	0.052
30	1.01	6	151	0.050
31	1.03	6	145	0.048
32	1.06	9	139	0.046
33	1.09	4	130	0.043
34	1.12	6	126	0.042
35	1.15	7	120	0.040
36	1.18	3	113	0.037
37	1.20	7	110	0.036
38	1.23	3	103	0.034
39	1.26	1	100	0.033
40	1.29	8	99	0.033
41	1.32	4	91	0.030
42	1.34	6	87	0.029
43	1.37	6	81	0.027
44	1.40	2	75	0.025
45	1.43	5	73	0.024
46	1.46	5	68	0.023
47	1.48	4	63	0.021
48	1.51	1	59	0.020
49	1.54	3	58	0.019
50	1.57	3	55	0.018
51	1.60	2	52	0.017

Bin Number	Discharge Rate	Number of Periods	Total Periods Exceeding	Percent Time Exceeded
52	1.63	1	50	0.017
53	1.65	3	49	0.016
54	1.68	2	46	0.015
55	1.71	0	44	0.015
56	1.74	2	44	0.015
57	1.77	2	42	0.014
58	1.79	2	40	0.013
59	1.82	1	38	0.013
60	1.85	5	37	0.012
61	1.88	2	32	0.011
62	1.91	3	30	0.010
63	1.93	0	27	0.009
64	1.96	1	27	0.009
65	1.99	2	26	0.009
66	2.02	1	24	0.008
67	2.05	0	23	0.008
68	2.08	0	23	0.008
69	2.10	1	23	0.008
70	2.13	0	22	0.007
71	2.16	4	22	0.007
72	2.19	1	18	0.006
73	2.22	1	17	0.006
74	2.24	1	16	0.005
75	2.27	1	15	0.005
76	2.30	2	14	0.005
77	2.33	1	12	0.004
78	2.36	0	11	0.004
79	2.38	0	11	0.004
80	2.41	0	11	0.004
81	2.44	0	11	0.004
82	2.47	0	11	0.004
83	2.50	1	11	0.004
84	2.53	0	10	0.003
85	2.55	2	10	0.003
86	2.58	1	8	0.003
87	2.61	0	7	0.002
88	2.64	0	7	0.002
89	2.67	0	7	0.002
90	2.69	0	7	0.002
91	2.72	1	7	0.002
92	2.75	0	6	0.002
93	2.78	0	6	0.002
94	2.81	0	6	0.002
95	2.83	1	6	0.002
96	2.86	1	5	0.002
97	2.89	0	4	0.001
98	2.92	0	4	0.001
99	2.95	1	4	0.001
100	2.98	0	3	0.001
---------End of Data----------				

Duration Table Summary at Project Discharge Point

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DISCHARGE		Number of periods when discharge was equal to or greater than DISCHARGE column but less than that shown on the next line		
Bin Number	Discharge Rate	Number of Periods	Total Periods Exceeding	Percent Time Exceeded
1	0.19	70	788	0.261
2	0.22	67	718	0.238
3	0.25	52	651	0.216
4	0.28	50	599	0.198
5	0.30	31	549	0.182
6	0.33	29	518	0.172
7	0.36	25	489	0.162
8	0.39	30	464	0.154
9	0.42	29	434	0.144
10	0.44	32	405	0.134
11	0.47	34	373	0.124
12	0.50	33	339	0.112
13	0.53	28	306	0.101
14	0.56	23	278	0.092
15	0.58	29	255	0.084
16	0.61	21	226	0.075
17	0.64	18	205	0.068
18	0.67	23	187	0.062
19	0.70	20	164	0.054
20	0.73	19	144	0.048
21	0.75	8	125	0.041
22	0.78	6	117	0.039
23	0.81	7	111	0.037
24	0.84	6	104	0.034
25	0.87	10	98	0.032
26	0.89	4	88	0.029
27	0.92	2	84	0.028
28	0.95	2	82	0.027
29	0.98	6	80	0.026
30	1.01	1	74	0.025
31	1.03	2	73	0.024
32	1.06	2	71	0.024
33	1.09	5	69	0.023
34	1.12	3	64	0.021
35	1.15	4	61	0.020
36	1.18	2	57	0.019
37	1.20	3	55	0.018
38	1.23	1	52	0.017
39	1.26	2	51	0.017
40	1.29	1	49	0.016
41	1.32	2	48	0.016
42	1.34	2	46	0.015
43	1.37	2	44	0.015
44	1.40	1	42	0.014
45	1.43	3	41	0.014
46	1.46	2	38	0.013
47	1.48	1	36	0.012
48	1.51	1	35	0.012
49	1.54	0	34	0.011
50	1.57	4	34	0.011
51	1.60	2	30	0.010

Bin Number	Discharge Rate	Number of Periods	Total Periods Exceeding	Percent Time Exceeded
52	1.63	1	28	0.009
53	1.65	1	27	0.009
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55	1.71	1	25	0.008
56	1.74	2	24	0.008
57	1.77	1	22	0.007
58	1.79	2	21	0.007
59	1.82	0	19	0.006
60	1.85	1	19	0.006
61	1.88	0	18	0.006
62	1.91	1	18	0.006
63	1.93	1	17	0.006
64	1.96	0	16	0.005
65	1.99	1	16	0.005
66	2.02	1	15	0.005
67	2.05	0	14	0.005
68	2.08	1	14	0.005
69	2.10	1	13	0.004
70	2.13	0	12	0.004
71	2.16	1	12	0.004
72	2.19	1	11	0.004
73	2.22	2	10	0.003
74	2.24	0	8	0.003
75	2.27	0	8	0.003
76	2.30	0	8	0.003
77	2.33	1	8	0.003
78	2.36	0	7	0.002
79	2.38	0	7	0.002
80	2.41	1	7	0.002
81	2.44	0	6	0.002
82	2.47	1	6	0.002
83	2.50	1	5	0.002
84	2.53	0	4	0.001
85	2.55	0	4	0.001
86	2.58	0	4	0.001
87	2.61	1	4	0.001
88	2.64	0	3	0.001
89	2.67	0	3	0.001
90	2.69	0	3	0.001
91	2.72	0	3	0.001
92	2.75	0	3	0.001
93	2.78	0	3	0.001
94	2.81	1	3	0.001
95	2.83	0	2	0.001
96	2.86	0	2	0.001
97	2.89	0	2	0.001
98	2.92	0	2	0.001
99	2.95	0	2	0.001
100	2.98	0	2	0.001
---------End of Data----------				

END OF STATISTICS ANALYSIS

Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

Appendix 8

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

How to use this worksheet (also see instructions in Section G of the 2014 SMR WQMP Template):

1. Review Column 1 and identify which of these potential sources of stormwater pollutants apply to your site. Check each box that applies.
2. Review Column 2 and incorporate all of the corresponding applicable BMPs in your WQMP Exhibit.
3. Review Columns 3 and 4 and incorporate all of the corresponding applicable permanent controls and operational BMPs in your WQMP. Use the format shown in Table G.1on page 31 of this WQMP Template. Describe your specific BMPs in an accompanying narrative, and explain any special conditions or situations that required omitting BMPs or substituting alternative BMPs for those shown here.

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☑ A. **On-site storm drain inlets**	❑ **Locations of inlets.**	❑ **Mark all inlets with the words "Only Rain Down the Storm Drain" or similar. Catch Basin Markers may be available from the Riverside County Flood Control and Water Conservation District, call 951.955.1200 to verify.**	❑ **Maintain and periodically repaint or replace inlet markings.** ❑ **Provide stormwater pollution prevention information to new site owners, lessees, or operators.** ❑ **See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com** ❑ **Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."**
❑ B. **Interior floor drains and elevator shaft sump pumps**		❑ **State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.**	❑ **Inspect and maintain drains to prevent blockages and overflow.**
❑ C. **Interior parking garages**		❑ **State that parking garage floor drains will be plumbed to the sanitary sewer.**	❑ **Inspect and maintain drains to prevent blockages and overflow.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ D1. **Need for future indoor & structural pest control**		❑ **Note building design features that discourage entry of pests.**	❑ **Provide Integrated Pest Management information to owners, lessees, and operators.**
☑ D2. **Landscape/ Outdoor Pesticide Use**	❑ **Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained.** ❑ **Show self-retaining landscape areas, if any.** ❑ **Show stormwater treatment and hydrograph modification management BMPs. (See instructions in Chapter 3, Step 5 and guidance in Chapter 5.)**	**State that final landscape plans will accomplish all of the following.** ❑ **Preserve existing native trees, shrubs, and ground cover to the maximum extent possible.** ❑ **Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution.** ❑ **Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions.** ❑ **Consider using pest-resistant plants, especially adjacent to hardscape. To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.**	❑ **Maintain landscaping using minimum or no pesticides.** ❑ **See applicable operational BMPs in "What you should know for…..Landscape and Gardening"** at http://www.rcflood.org/stormwater/Downloads/LandscapeGardenBrochure.pdf ❑ **Provide IPM information to new owners, lessees and operators.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ E. **Pools, spas, ponds, decorative fountains, and other water features.**	❑ **Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet. (Exception: Public pools must be plumbed according to County Department of Environmental Health Guidelines.)**	**If the Co-Permittee requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.**	❑ **See applicable operational BMPs in "Guidelines for Maintaining Your Swimming Pool, Jacuzzi and Garden Fountain" at http://www.rcflood.org/stormwater/Downloads/poolsandspas.pdf**
☑ F. **Food service**	❑ **For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment.** ❑ **On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.**	❑ **Describe the location and features of the designated cleaning area.** ❑ **Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.**	❑ **See the brochure, "The Food Service Industry Best Management Practices for: Restaurants, Grocery Stores, Delicatessens and Bakeries" at http://www.rcflood.org/stormwater/downloads/FoodServ.pdf** **Provide this brochure to new site owners, lessees, and operators.**
☑ G. **Refuse areas**	❑ **Show where site refuse and recycled materials will be handled and stored for pickup. See local municipal requirements for sizes and other details of refuse areas.** ❑ **If dumpsters or other receptacles are outdoors, show how the designated area will be covered, graded, and paved to prevent run-on and show locations of berms to prevent runoff from the area.** ❑ **Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer.**	❑ **State how site refuse will be handled and provide supporting detail to what is shown on plans.** ❑ **State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.**	❑ **State how the following will be implemented:** **Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ H. **Industrial processes.**	❑ **Show process area.**	❑ **If industrial processes are to be located on site, state: "All process activities to be performed indoors. No processes to drain to exterior or to storm drain system."**	❑ **See Fact Sheet SC-10, "Non-Stormwater Discharges" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com** See the brochure "Industrial & Commercial Facilities Best Management Practices for: Industrial, Commercial Facilities" at http://www.rcflood.org/stormwater/Downloads/IndustrialCommercialFacilities.pdf
❑ I. **Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)**	❑ **Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or run-off from area.** ❑ **Storage of non-hazardous liquids shall be covered by a roof and/or drain to the sanitary sewer system, and be contained by berms, dikes, liners, or vaults.** ❑ **Storage of hazardous materials and wastes must be in compliance with the local hazardous materials ordinance and a Hazardous Materials Management Plan for the site.**	❑ **Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains.** **Where appropriate, reference documentation of compliance with the requirements of Hazardous Materials Programs for:** ▪ **Hazardous Waste Generation** ▪ **Hazardous Materials Release Response and Inventory** ▪ **California Accidental Release (CalARP)** ▪ **Aboveground Storage Tank** ▪ **Uniform Fire Code Article 80 Section 103(b) & (c) 1991** ▪ **Underground Storage Tank** www.cchealth.org/groups/hazmat/	❑ **See the Fact Sheets SC-31, "Outdoor Liquid Container Storage" and SC-33, "Outdoor Storage of Raw Materials " in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ J. **Vehicle and Equipment Cleaning**	❑ **Show on drawings as appropriate:** **(1) Commercial/industrial facilities having vehicle/equipment cleaning needs shall either provide a covered, bermed area for washing activities or discourage vehicle/equipment washing by removing hose bibs and installing signs prohibiting such uses.** **(2) Multi-dwelling complexes shall have a paved, bermed, and covered car wash area (unless car washing is prohibited on-site and hoses are provided with an automatic shut-off to discourage such use).** **(3) Washing areas for cars, vehicles, and equipment shall be paved, designed to prevent run-on to or runoff from the area, and plumbed to drain to the sanitary sewer.** **(4) Commercial car wash facilities shall be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility shall discharge to the sanitary sewer, or a wastewater reclamation system shall be installed.**	❑ **If a car wash area is not provided, describe any measures taken to discourage on-site car washing and explain how these will be enforced.**	**Describe operational measures to implement the following (if applicable):** ❑ **Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system. Refer to "Outdoor Cleaning Activities and Professional Mobile Service Providers" for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://www.rcflood.org/stormwater/downloads/OutdoorCleaningActivities.pdf** ❑ **Car dealerships and similar may rinse cars with water only.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ K. **Vehicle/Equipment Repair and Maintenance**	❑ **Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to prevent run-on and runoff of stormwater.** ❑ **Show secondary containment for exterior work areas where motor oil, brake fluid, gasoline, diesel fuel, radiator fluid, acid-containing batteries or other hazardous materials or hazardous wastes are used or stored. Drains shall not be installed within the secondary containment areas.** ❑ **Add a note on the plans that states either (1) there are no floor drains, or (2) floor drains are connected to wastewater pretreatment systems prior to discharge to the sanitary sewer and an industrial waste discharge permit will be obtained.**	❑ **State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area.** ❑ **State that there are no floor drains or if there are floor drains, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.** ❑ **State that there are no tanks, containers or sinks to be used for parts cleaning or rinsing or, if there are, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.**	**In the Stormwater Control Plan, note that all of the following restrictions apply to use the site:** ❑ **No person shall dispose of, nor permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinsewater from parts cleaning into storm drains.** ❑ **No vehicle fluid removal shall be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building, except in such a manner as to ensure that any spilled fluid will be in an area of secondary containment. Leaking vehicle fluids shall be contained or drained from the vehicle immediately.** ❑ **No person shall leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment.** **Refer to "Automotive Maintenance & Car Care Best Management Practices for Auto Body Shops, Auto Repair Shops, Car Dealerships, Gas Stations and Fleet Service Operations". Brochure can be found at** http://rcflood.org/stormwater/ **Refer to Outdoor Cleaning Activities and Professional Mobile Service Providers for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at** http://rcflood.org/stormwater/

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ L. **Fuel Dispensing Areas**	❑ **Fueling areas[6] shall have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are: a) graded at the minimum slope necessary to prevent ponding; and b) separated from the rest of the site by a grade break that prevents run-on of stormwater to the maximum extent practicable.** ❑ **Fueling areas shall be covered by a canopy that extends a minimum of ten feet in each direction from each pump. [Alternative: The fueling area must be covered and the cover's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area[1].] The canopy [or cover] shall not drain onto the fueling area.**		❑ **The property owner shall dry sweep the fueling area routinely.** ❑ **See the Fact Sheet SD-30 , "Fueling Areas" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

[6] **The fueling area shall be defined as the area extending a minimum of 6.5 feet from the corner of each fuel dispenser or the length at which the hose and nozzle assembly may be operated plus a minimum of one foot, whichever is greater.**

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1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ M. **Loading Docks**	❑ **Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks shall be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts shall be positioned to direct stormwater away from the loading area. Water from loading dock areas shall be drained to the sanitary sewer, or diverted and collected for ultimate discharge to the sanitary sewer.** ❑ **Loading dock areas draining directly to the sanitary sewer shall be equipped with a spill control valve or equivalent device, which shall be kept closed during periods of operation.** ❑ **Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer.**		❑ **Move loaded and unloaded items indoors as soon as possible.** ❑ **See Fact Sheet SC-30, "Outdoor Loading and Unloading," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

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1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ N. **Fire Sprinkler Test Water**		❑ **Provide a means to drain fire sprinkler test water to the sanitary sewer.**	❑ **See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**
O. **Miscellaneous Drain or Wash Water or Other Sources** ❑ **Boiler drain lines** ❑ **Condensate drain lines** ❑ **Rooftop equipment** ❑ **Drainage sumps** ❑ **Roofing, gutters, and trim.** ❑ **Other sources**		❑ **Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system.** ❑ **Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system.** ❑ **Rooftop equipment with potential to produce pollutants shall be roofed and/or have secondary containment.** ❑ **Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water.** ❑ **Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.** ❑ **Include controls for other sources as specified by local reviewer.**	

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ P. **Plazas, sidewalks, and parking lots.**			❑ **Sweep plazas, sidewalks, and parking lots regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect washwater containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain.**

Appendix 9: O&M

Operation and Maintenance Plan and Documentation of Finance, Maintenance and Recording Mechanisms

OPERATION & MAINTENANCE (O&M) PLAN

Contents

1. INSPECTION AND MAINTENANCE LOG 1

2. INTRODUCTION 1

3. RESPONSIBILITY FOR MAINTENANCE

A. General 2
B. Safety Training Program 3
C. Records 4

4. SUMMARY OF DMA'S AND BMP'S 5

5. BMP DESIGN DOCUMENTATION 5

6. MAINTENANCE GUIDELINES & SCHEDULE 5

1. INSPECTION AND MAINTENANCE CHECKLIST

BMP Name:_____ Location:_____

Date of Inspection: _____ Time: _____AM/PM (circle)

Inspected by: _____ _____

Print Name Print Name

Signature: _____ _____

The designated Site Inspector shall use the following guidelines, Section VI of the WQMP and sheets in Appendix D for maintenance, inspection, and repair of BMPs identified in the WQMP. Include any comments in the box to the right, including reparations made or needed. If preparations are needed, please provide a follow up date. The completed checklist shall be filed in order to keep a record of what was inspected and maintained.

Best Management Practices	Inspection Frequency	Maintenance Frequency	Observations/Comments
Educate Operators, Tenants, Contractors or Employees	Annually in September (before rainy season)	N/A	_____ _____ _____
Activity Restrictions	Annually in September (before rainy season)	N/A	_____ _____ _____
Irrigation System and Landscape Maintenance	Monthly	As-needed based on Maintenance Indicators	_____ _____ _____
Common Area Litter Control	N/A	Routine Litter pick-up	_____ _____ _____
Street Sweeping of Parking	N/A	Bi-monthly (coordinate with the city street sweeping)	_____ _____ _____ _____
Drainage Facility Inspection and Maintenance	Before and after the rainy season	As-needed based on Maintenance Indicators	_____ _____ _____
Protect slopes and Channels	Annually in September (before rainy season)	As-needed planting of vegetation in eroded	_____ _____ _____ _____ _____ _____ _____

Trash Storage Areas	Weekly as-needed	N/A	_____ _____ _____ _____ _____
Porous Landscaped Detention	Semi-annually (before and after rainy season) and after major storms	Semi-annually (before and after rainy season) and after major storms	_____ _____ _____ _____ _____
Media Filter/inlet inserts	Semi-annually (before and after rainy season) and after major storms	Clean four times a year, Debris removal as necessary, and prior to and following rainy season and major storm	_____ _____ _____ _____ _____ _____ _____

Notes:

1. Do not blow lawn clippings or any waste into the Porous Landscape Detention Basin
2. Completed copies must be kept onsite to provide prove that the WQMP is being maintained and operated and must be available to the City and Regional Board upon request.
3. Runoff to the street caused by irrigation is prohibited and may result in monetary penalties. Adjust station timing and times per day as weather changes.
4. Keep lids closed.

2. INTRODUCTION

The project proposes to create 16 separate legal parcels with 13 buildings, occupied with varying shops such as specialty stores, fast food, casual dining, gas stations, a convenience store, and a hotel. There will be 19 users in total. At 100 percent buildout, the site will be more than 80 percent impervious. All impervious areas will drain to water quality basins, then to detention pipes onsite, then into a storm drain system, and finally draining to the existing drainage ditch along the east side of the project.

3. RESPONSIBILITY FOR MAINTENANCE

A. General

It shall be the responsibility of the owner to train all employees for the maintenance and operation of all BMPs, to achieve the maximum pollutant reduction, as addressed in the approved Project's WQMP. The following schedule of (O&M's) must be followed to satisfy the Conditions of Concern and the Pollutants of Concern as addressed in the approved Project's SWQMP and the City's SUSMP. This schedule shall include periodic inspections of all Source Control and Treatment Control BMP's. All maintenance records for training, inspection and maintenance shall be retained and provided to the city upon request.

All BMPs shall be inspected 30 days prior to October lst each year and certified to the City Engineering Department as to their readiness to receive runoff from the annual rainfall season.

The owner will also provide to the City, as part of the maintenance and operation agreement, an executed maintenance and access easement that shall be binding on the land throughout the life of the project. The DMA Exhibit in Attachment A of this report shall serve as a map showing the locations of BMPs to be maintained.

Responsible Party for O&M and For Training- Property Owner

CK 17, LP, A California Limited Partnership
Contact: Allan Davis
27890 Clinton Keith Road D-490
Murrieta, Ca 92562
Phone: (760)518-0660

B. Training

Training of Operation and Maintenance personnel is of primary importance to provide knowledge of the operation and maintenance of BMPs. Proper training shall provide information that will enable employees to have in place an effective preventive maintenance program as described in this O & M manual. The responsible party mentioned above should take the course provided by the "BULDING INDUSTRIES ASSOCIATION of San Diego COUNTY" to be trained in the purpose and use of BMPs and the maintenance thereof. Proper preventive maintenance will prevent environmental incidents that may be a health and safety hazard.

New employees should be trained as to the purpose and proper maintenance within the first week of their employment. Employee training shall include receiving a copy of this O & M manual; a discussion on the location and purpose of site specific BMPs, such as Source Control and Treatment Control BMPs; training on how to inspect and report maintenance problems and to whom they report to. Employees shall be trained in site specific Pollutants of Concern so that they can evaluate the functioning of all on-site BMPs. These Pollutants are identified in section F of the WQMP Report.

A log of all training and reported inspections and maintenance problems along with what was done to correct the problem shall be kept on the premises at all times.

Employees shall be periodically trained, at a minimum of once a year, to refresh their abilities to operate and maintain all on-site BMPs.

C. Records

BMP TRAINING LOG			
Date Mo/Day/Yr	**Type of Training**	**Personnel Trained**	**Trainer**

4. Summary of DMA's and BMP's

The project specific DMA & Source Control Exhibit is located in Attachment A of this report. This exhibit shows the location and type of each DMA and BMP on site

5. BMP Design Documentation

The As-built plans can be found in Attachement B of this report. The plans will specify elevations and details of all Structural BMP's onsite. All field changes will be documented on the As-built plans and will be included in this report for reference.

6. Maintenance Guidelines & Schedule

The following section will detail out project specific maintenance procedures.

Inspection Frequency

The facility will be inspected and inspection visits will be completely documented:

- Once a month at a minimum.
- After every large storm (after every storm monitored or these storms with more than 0.50 inch of precipitation.)
- On a weekly basis during extended periods of wet weather.

Inspect for proper irrigation and fertilizer use, and ensure that all landscaped areas have minimum of 80% coverage.

Aesthetic Maintenance

The following activities will be included in the aesthetic maintenance program:

Grass Trimming: Trimming of grass will be done on all landscaped areas, around fences, at the inlet and outlet structures, and sampling structures.
Weed Control. Weeds will be removed through mechanical means. Herbicide will not be used because these chemicals may impact the water quality monitoring.

Functional Maintenance

Functional maintenance has two components:

- Preventive maintenance
- Corrective maintenance

Preventive Maintenance

Preventive maintenance activities to be instituted for landscaped areas are:

- Grass Mowing: Vegetation seed, mix within the landscaped areas, are to be designed to be kept short to maintain adequate hydraulic functioning and to limit the development of faunal habitats.

- Trash and Debris: During each inspection and maintenance visit to the site, debris and trash removal will be conducted to reduce the potential for inlet and outlet structures and other components from becoming clogged and inoperable during storm events.
- Sediment Removal: Sediment accumulation, as part of the operation and maintenance program at of landscaped areas, will be monitored once a month during the dry season, after every large storm (0.50 inch), and monthly during the wet season. Specifically, if sediment reaches a level at or near plant height, or could interfere with flow or operation, the sediment shall be removed. If accumulation of debris or sediment is determined to be the cause of decline in design performance, prompt action (i.e., within ten working days) will be taken to restore the landscaped areas to design performance standards. Actions will include using additional vegetation and/or removing accumulated sediment to correct channeling or ponding. Characterization and Appropriate disposal of sediment will comply with applicable local, county, state, or federal requirements.
- Landscaped areas will be re-graded, if the flow gradient has been altered. This should be a sign that the BMP is failing and the soil matrix may need to be replaced.
- Removal of Standing Water: Standing water must be removed if it contributes to the development of aquatic plant communities or mosquito breeding areas.
- Fertilization and Irrigation: fertilization and irrigation is to be keep at a minimum.
- Elimination of Mosquito Breeding Habitats. The most effective mosquito control program is one that eliminates standing water over a period less than 96 hours.

Corrective Maintenance

Corrective maintenance is required on an emergency or non-routine basis to correct problems and to restore the intended operation and safe function of all landscaped areas.

Corrective maintenance activities include:

- Removal of Debris and Sediment: Sediment, debris, and trash, which impede the hydraulic functioning of landscaping and prevent vegetative growth, will be removed and properly disposed. Temporary arrangements will be made for handling the sediments until a permanent arrangement is made. Vegetation will be re-established after sediment removal.
- Structural Repairs: Once deemed necessary, repairs to structural components of landscaping will be done within l0 working days. Qualified individuals (i.e., the designers or contractors) will conduct repairs where structural damage has occurred.
- Embankment and Slope Repairs: Once deemed necessary, damage to the embankments and slopes of landscaped areas will be repaired within l0 working days.
- Erosion Repair: Where a reseeding program has been ineffective, or where other factors have created erosive conditions (i.e., pedestrian traffic, concentrated flow, etc.), corrective steps will be taken to prevent loss of soil and any subsequent danger to the performance and use of landscaped areas as BMPs. There are a number of corrective actions than can be taken.
- These include erosion control blankets, riprap, or reducing flow velocity.
- Consult with an engineer and contractor to address frequently occurring erosion problems.
- Elimination of Animal Burrows: animal burrows will be filled and steps taken to remove the animals if burrowing problems continue to occur (filling and compacting). If the problem persists, vector control specialists will be consulted regarding removal steps. This consulting is necessary as the threat of rabies in some areas may necessitate the animals being destroyed rather than relocated. If the BMP performance is affected, abatement will begin. Otherwise, abatement will be performed annually in September.
- General Facility Maintenance: In addition to the above elements of corrective maintenance,

general corrective maintenance will address the overall facility and its associated components. If corrective maintenance is being done to one component, other components will be inspected to see if maintenance is needed.

Maintenance Frequency

The maintenance indicators for selected BMPs are included on page 10 of this report.

Debris and Sediment Disposal

Waste generated onsite is ultimately the responsibility of the Owner. Disposal of sediments, debris, and trash will comply with applicable local, county, state, and federal waste control programs.

Hazardous Waste

Suspected hazardous wastes will be analyzed to determine disposal options. Hazardous wastes generated onsite will be handled and disposed of according to applicable local, state, and federal regulations. A solid or liquid waste is considered a hazardous waste if it exceeds the criteria listed in the CCR, Title 22, Article 1l.

a. Landscaping

Operational and maintenance needs include:

- Vegetation management to maintain adequate hydraulic functioning and to limit habitat for disease-carrying animals.
- Animal and vector control.
- Periodic sediment removal to optimize performance.
- Trash, debris, grass trimmings, tree pruning, dead vegetation collection and removal.
- Removal of standing water, which may contribute to the development of aquatic plant communities or mosquito breeding areas.
- Erosion and structural maintenance to prevent the loss of soil and maintain the performance of all landscaping.

b. **Irrigation System**

Inspection Frequency and Procedure

The Irrigation system shall be checked each week as a minimum. The following items shall be checked to insure that they are functioning properly:

- Shut-off devices.
- All piping and sprinkler heads to insure there are no leaks and that proper water spread is maintained.
- All flow reducers.
- Check for overspray/runoff

c. **Roof Drains**

All roof drains shall be inspected 30 days prior to October lst of each year to insure that they are clean

and free from trash and in good repair. They shall be flushed and any leaks or damages piping shall be either replaced or repaired. Where roof drains flow onto grass areas splash structures and or rock rip-rap shall be maintained so the flow from the roof drains do not cause erosion or damage to the grass area. During the rain season roof drains shall be inspected weekly and after each rain storm to insure that there is no trash and or silt build up that will restrict the run-off flow from the roof. All trash and/or silt build up shall be removed immediately.

d. **Trash Storage Areas**

- All trash storage areas shall be inspected daily to insure that they are clean from trash. Also the following shall be inspected annually 30 days prior to October lst of each year.
- Pavement is in good repair.
- Drainage will not run-off onto adjacent areas.
- That they remain screened or walled to prevent off-site transport of trash.
- That all lids are closed and/or awnings are in good repair to minimize direct recipitation.

e. **Storm Water Conveyance System Stenciling and Signing**

- Signage/stenciling are to be inspected for legibility and visual obstruction and shall be Repaired and cleared of any obstruction within 5 working day of inspection.
- Inspection Frequency: Semi-annually, 30 days prior to October lst each year, and monthly during rainy season.

f. **Bioretention**

Operational and maintenance needs include:

- Vegetation management to maintain adequate hydraulic functioning and to limit habitat for disease-carrying animals.
- Animal and vector control.
- Periodic sediment removal to optimize performance.
- Trash, debris, grass trimmings, tree pruning, dead vegetation collection and removal.
- Foot traffic or heavy equipment on the media surface should be avoided to minimize compaction.
- Removal of standing water, which may contribute to the development of aquatic plant communities or mosquito breeding areas.
- Erosion and structural maintenance to prevent the loss of soil and maintain the performance of all landscaping.
- Outlet maintenance: maintain trash free; remove silt; clear clogged outlets and standing Water after 96 hours.
- Typically maintenance can be performed with equipment normally carried by landscape maintenance crews.
- Access to all bioretention basins can be gained through parking lots adjacent the facilities.

g. Tree Wells

Tree Wells			
When	**Maintenance Task**	**Frequency**	**Time of the Year**
Initial maintenance during establishment period (First three years)	Inspect tree for health and establishment and report any changes to County	Three times during establishment; Every five years for life of tree	Spring lst Season Fall lst Season Fall 2nd Season
	Remove stakes and wires.	One time	One year after planting
	Water tree – first year	25 gallons Weekly via slow release device	April-October
	Water tree – second & third year	25 gallons Bi-Monthly via slow release device	April-October
Routine Maintenance	Remove weeds and trash	Quarterly inspection at minimum and maintenance as needed.	March-November
	Remove sediment and trash from any inlets and slot drains	Annually or as needed.	
As-Needed Maintenance	Mulch with 3 inches double ground shredded hardwood mulch. Place mulch in a ring to capture rain water. Mulch shall not be mounded around tree.	Annually or as needed.	Feb-April
	Inspect tree for damage, disease, or interference with utilities. Contact City if pruning is required.	Annually or as needed.	Broken branches should be pruned at any time. Most trees should be pruned in the winter or fall.

h. Outlet Structures

All outlet structures shall be kept functional at all times. Routine inspection and corrective maintenance shall include removal of trash sediment and debris and repair of any structural damage or clogging of orifice outlets. The minimum maintenance frequency shall be 30 days prior to October 1st each year, weekly during rainy season or within 24 hours prior to forecasts.

To clean lower orifice in the event of clogging

- This activity will require workers to open catch basin grates to remove debris from the lower orifice plate.
- Remove grate and visually inspect lower orifice plate and blockage
- Remove debris from inside of catch basin and around orifice plate
- Replace grate when orifice plate and inside of catch basin are free of debris
- Typically maintenance can be performed with equipment normally carried by landscape maintenance crews.
- Access to all bioretention basins can be gained though parking lots adjacent all facilities.

i. **Vector Management Control Requirements**

Due to Clean Water Act requirements and mandates imposed by the Water Quality Control Board, large quantities of stormwater will be detained onsite in above ground and underground storage facilities for treatment and storage. These storage facilities are required to dewater or discharge at a very small flow rate in order to comply with these requirements. The outlet structure for the underground storage and biofiltration facility had to be sized to a fraction of an inch in order to maintain the maximum allowed discharge flow. The facility was designed for the surface to dewater in less than 24 hours. However, due to its small size and if not properly maintained regularly, it is anticipated that the outlet might have a tendency to clog frequently. Consequently, the surface of the facility may not drain within 24 hours and possibly take substantially longer time. This creates an increased risk for onsite Vector Issues and bringing their potential for severe harm to human health. Any water that may remain within the gravel storage layer of the facility after 96 hours does not have a direct access to the surface and therefore does not pose any Vector Issues.

In order to implement vector controls including minimizing the risk for mosquito-borne disease transmission, **It is the responsibility of the Owner to regularly maintain the outlet structures and monitor the site after every storm event to ensure that the system (comprising of above ground storage facilities) is dewatered in less than 96 hours**. Otherwise the owner will be required to implement a vector control plan in accordance with California Department of Public Health.

j. FLoGard Catch Basin Insert Filter

Catch basin inlet filter helps prevent dirt and debris from clogging the drainage system. Adding a filter is a simple solution to keep water flowing through a drainage system and a cost-effective alternative to expensive repair or replacement. During the rainy season all inlets shall be inspected weekly and after each rain storm to insure that there is no trash and or silt build up that will restrict the run-off flow from the roof. All trash and/or silt build up shall be removed immediately.

PREVENTATIVE MAINTENANCE AND ROUTINE INSPECTION					
TYPE BMP	Routine Action	Maintenance Indicator	Maintenance Frequency	MAINTENANCE ACTIVITY	SITE-SPECIFIC REQUIREMENTS
Landscaping & irrigation	Proper irrigation & Fertilizer tablets use not granules.	Less than 80% coverage	30 days prior to October 1st each year and Monthly	Re-seed or Re-plant. Repair Irrigation system with-in 5-days.	All slopes and landscaped areas are to have a minimum coverage of 80%
Trash storage areas	Trash free and removal of silt	Visual Inspection	Daily inspection	Remove trash and silt Daily.	All trash storage areas to be free from trash and silt at all times
Roof drain	Trash free and removal of silt, sedimentation & Debris	Silt build-up of more than 1" no trash	30 days prior to October 1st each year and weekly during rainy season	Remove all trash and silt and repair any damage to roof drains,	All Roof to be free from trash and silt and in good repair
Bioretention	Trash free and removal of silt. Clear Clogged outlets and Standing Water.	Silt build-up of more than 2" no trash, Exposed soils, dead vegetation, ponded water, and excessive vegetation (see TC-32)	30 days prior to October 1st each year, monthly during rainy season, and after Storm Event	Remove trash and silt –repair and reseed exposed areas, maintain grass height so as not be shorter than 2" or higher than 5" remove all ponded water weekly inspections, (See TC-32)	All bio-filters to be free from trash and silt at all times, grass area to be free from exposed soil and maintained to proper height, ponding of water for more than 72 hours maintenance will be required
Tree well	Trash free and removal of silt. Clear Clogged outlets and Standing Water.	Weeds and trash, tree damage, disease or interference with utilities.	April –October and as needed.	Mulch with 3 inches double ground shredded hardwood mulch. Place mulch in a ring to capture rain water. Mulch shall not be mounded around tree.	Broken branches should be pruned at any time. Most trees should be pruned in the winter or fall.
Storm Water Conveyance system Stenciling & Signing	Must be legible at all times and have a clear view.	Fading of paint or illegible letters or	Semi-annually, 30 days prior to October 1st each year & monthly during rainy season	Repaint stenciling and/or replace signs 30 days prior to October 1st.	Applicable to all stenciling and signs
Outlet Structures	Must be kept functional at all times. Clear Clogged outlets and Standing Water.	Silt, debris, trash accumulation, Ponding Water	30 days prior to October 1st each year and weekly during rainy season or within 24 hours prior to rain forecasts.	Silt, debris, trash accumulation and repair any structural damage to the outlet structures.	All outlet structures shall be kept functional at all times.

Annual Estimate to Maintain all BMPs Landscaping & Bioretention	**Annual***	**10-Year***
Maintenance of landscaping and bio-filters is already included in the property management responsibilities. Additional cost:	$200	$12 /SF
Irrigation System: Inspection and maintenance of the irrigation system is already included in the property management responsibilities	$100	$1,000
Roof Drains: Roof drain inspection and maintenance is already included in the property management responsibilities.	$58	$580
Flogard inlet filter Flogard is a catchbasin insert that provides physical screening of pollutants	$135	$1350
Training: Once a year & training of new employees within their first week of employment. *Maintenance costs shown here are estimated on a per lot basis.	$100	$1,000

Total Estimated Annual Cost to Maintain BMPs

RECORDING REQUESTED BY AND
WHEN RECORDED RETURN TO:

Insert entity and address
(include a recorded copy in the Final WQMP and provide the City with a copy)

Above Space for Recorder's Use

DECLARATION OF WATER QUALITY MANAGEMENT PLAN RESTRICTIVE COVENANT

This Declaration of Water Quality Management Plan Restrictive Covenant (this "Covenant") is made this _____ day of _____, 2018 by CK 17, LP, A California Limited Partnership ("Owner")

A. The Owner of that certain real property (the "Property") located in the City of Murrieta, California ("City"), more particularly described in Exhibit "A" attached hereto and incorporated herein by this reference and has proposed that the Property be developed by Owner in accordance with the governmental approvals issued by the City and other governmental or quasi-governmental agencies having jurisdiction over the Property.

B. In accordance with the Murrieta Municipal Code, applicable State of California statutes, and other ordinances and regulations (collectively, the "Stormwater Laws") of City and the State of California which regulate land development and urban runoff, the Owners have prepared and submitted to the City a Final Water Quality Management Plan ("WQMP"), which is on file with City's Engineering Department and a copy of which is required to be kept on the Property. The WQMP proposes that stormwater runoff from the Property be managed by the use of the stormwater management facilities, which are identified in the WQMP as "Best Management Practices" or "BMP's." The precise location(s) and extent of the BMP's are indicated within the WQMP. The WQMP specifies the manner and standards by which the BMP's must be repaired and maintained in order to retain their effectiveness.

C. The purpose of this Covenant is to assure that the BMP's are adequately maintained by creating obligations which are enforceable against the Owner and its successors in interest in the Property. The Owner intends that these obligations be enforceable notwithstanding other provisions related to BMP maintenance which are provided by law.

COVENANT TERMS, CONDITIONS, AND RESTRICTIONS

In consideration of the above recitals and the mutual covenants, terms, conditions and restrictions contained herein, and pursuant to the laws of the United States, the State of California and the City of Murrieta Municipal Code, Owner hereby declares the Property shall be held, transferred, conveyed, leased, occupied or otherwise disposed of and used subject to the following restrictive covenants (and incorporating the above recitals herein by reference), which shall run with the land and be binding on the Owner's heirs, successors in interest, administrators, assigns, lessees or other occupiers and users (collectively "Successors") of the Property or any portion thereof.

1. Maintenance of Stormwater Management Facilities.

1.1. Owner agrees, for themselves and their successors in interest to all or any portion of the Property, to comply in all respects with the requirements of the Stormwater Laws and the WQMP with regards to the construction and maintenance of BMP's designated in the WQMP. The Owner and its Successors, in particular agree to perform, at its sole cost, expense and liability, all inspections, cleaning, repairs, servicing, and maintenance with respect to all of the BMP's listed in Exhibit "B" attached hereto and incorporated herein by this reference (the "Maintenance Activities"). The Owner and its Successors shall initiate, perform and complete all Maintenance Activities at the required time, without request or demand from the City, or any other agency. Owner and its Successors shall keep a report of any inspections and/or maintenance of the BMP's for review at any time by City or the Water Quality Board for the region. The Owner and its Successors further agree that Maintenance Activities shall include replacement or modification of the BMP's in the event of failure. Replacement shall be with an identical type, size and model of BMP subject to applicable Stormwater Laws, except that:

A. The City Engineer may authorize substitution of an alternative BMP if he or she determines that it will function as well as the failed BMP; or

B. If the failure of the BMP, in the reasonable judgment of the City Engineer indicates that the BMP in use is inappropriate or inadequate to the circumstances, the BMP must be modified or replaced with an upgraded BMP to prevent future failure.

1.2. The Owner and its Successors shall, at all times, be subject to the Stormwater Laws with respect to the City's right of entry, inspection and maintenance or abatement.

2. Covenant Binds Successors and Runs with the Property. It is understood and agreed that the terms, covenants and conditions herein contained shall constitute covenants running with the land and shall be binding upon the heirs, executors, administrators, successors and assigns of the Owner and its Successors, and shall be deemed to be for the benefit of all persons owning any interest in the Property. It is the intent of the Owner that this Covenant may be recorded and shall be binding upon all persons purchasing or otherwise

acquiring all or any lot, unit or other portion of the Property who shall be deemed to have consented to and become bound by all the provisions hereof.

3. Amendment and Release. The terms of this Covenant may be modified only by a written amendment approved and signed by City and by the Owner or its Successors in interest. This Covenant may be terminated and Owner and its Successors released from the covenants set forth herein by a written release which City may execute if it determines that another mechanism will assure the ongoing maintenance of the BMP's and transfers of ownership, or that it is no longer necessary to assure such maintenance and transfers of ownership.

4. Governing Law and Severability. This Covenant shall be governed by the laws of the State of California. Venue in any action related to this Covenant shall be in the Superior Court of the State of California, County of Riverside. In the event that any of the provisions of this Covenant are held to be unenforceable or invalid by any court of competent jurisdiction, the validity, and enforceability of the remaining provisions shall not be affected thereby.

[SIGNATURES FOLLOW ON NEXT PAGE]

IN WITNESS WHEREOF, the Owner has executed this Covenant on the day and year first written above.

"OWNER":

CK 17, LP, A California Limited Partnership,
a California limited liability company

By:_____
Name:_____
Its:_____

Signature must be notarized. Attach notary acknowledgment

EXHIBIT “A”

PROPERTY

The land referred to in this survey is in the State of California, County of Riverside, City of Murrieta and is described at follows:

Portion of parcels 2 & 4 of Parcel Map 16499, as shown by parcel map on file in Book 96, Page 28, of parcel maps, records of Riverside County, California.

APN: 392-290-026 and 392-290-029

EXHIBIT “B”

BEST MANAGEMENT PRACTICES

Please refer to the Final Water Quality Management Plan for a complete description of the operation and maintenance procedures. An up to date copy is required to be kept on the property at all times.

Appendix 10: Educational Materials

BMP Fact Sheets, Maintenance Guidelines and Other End-User BMP Information

Spill Prevention, Control & Cleanup SC-11



Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Description

Spills and leaks, if not properly controlled, can adversely impact the storm drain system and receiving waters. Due to the type of work or the materials involved, many activities that occur either at a municipal facility or as a part of municipal field programs have the potential for accidental spills and leaks. Proper spill response planning and preparation can enable municipal employees to effectively respond to problems when they occur and minimize the discharge of pollutants to the environment.

Targeted Constituents

Sediment	
Nutrients	☑
Trash	
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑
Oxygen Demanding	☑

Approach

- An effective spill response and control plan should include:
  - Spill/leak prevention measures;
  - Spill response procedures;
  - Spill cleanup procedures;
  - Reporting; and
  - Training
- A well thought out and implemented plan can prevent pollutants from entering the storm drainage system and can be used as a tool for training personnel to prevent and control future spills as well.

Pollution Prevention

- Develop and implement a Spill Prevention Control and Response Plan. The plan should include:

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

- A description of the facility, the address, activities and materials involved
- Identification of key spill response personnel
- Identification of the potential spill areas or operations prone to spills/leaks
- Identification of which areas should be or are bermed to contain spills/leaks
- Facility map identifying the key locations of areas, activities, materials, structural BMPs, etc.
- Material handling procedures
- Spill response procedures including:
    - Assessment of the site and potential impacts
    - Containment of the material
    - Notification of the proper personnel and evacuation procedures
    - Clean up of the site
    - Disposal of the waste material and
    - Proper record keeping

- Product substitution – use less toxic materials (i.e. use water based paints instead of oil based paints)
- Recycle, reclaim, or reuse materials whenever possible. This will reduce the amount of materials that are brought into the facility or into the field.

Suggested Protocols

Spill/Leak Prevention Measures

- If possible, move material handling indoors, under cover, or away from storm drains or sensitive water bodies.
- Properly label all containers so that the contents are easily identifiable.
- Berm storage areas so that if a spill or leak occurs, the material is contained.
- Cover outside storage areas either with a permanent structure or with a seasonal one such as a tarp so that rain can not come into contact with the materials.
- Check containers (and any containment sumps) often for leaks and spills. Replace containers that are leaking, corroded, or otherwise deteriorating with containers in good condition. Collect all spilled liquids and properly dispose of them.

- Store, contain and transfer liquid materials in such a manner that if the container is ruptured or the contents spilled, they will not discharge, flow or be washed into the storm drainage system, surface waters, or groundwater.

- Place drip pans or absorbent materials beneath all mounted taps and at all potential drip and spill locations during the filling and unloading of containers. Any collected liquids or soiled absorbent materials should be reused/recycled or properly disposed of.

- For field programs, only transport the minimum amount of material needed for the daily activities and transfer materials between containers at a municipal yard where leaks and spill are easier to control.

- If paved, sweep and clean storage areas monthly, do not use water to hose down the area unless all of the water will be collected and disposed of properly.

- Install a spill control device (such as a tee section) in any catch basins that collect runoff from any storage areas if the materials stored are oil, gas, or other materials that separate from and float on water. This will allow for easier cleanup if a spill occurs.

- If necessary, protect catch basins while conducting field activities so that if a spill occurs, the material will be contained.

Training

- Educate employees about spill prevention, spill response and cleanup on a routine basis.

- Well-trained employees can reduce human errors that lead to accidental releases or spills:

  - The employees should have the tools and knowledge to immediately begin cleaning up a spill if one should occur.

  - Employees should be familiar with the Spill Prevention Control and Countermeasure Plan if one is available.

- Training of staff from all municipal departments should focus on recognizing and reporting potential or current spills/leaks and who they should contact.

- Employees responsible for aboveground storage tanks and liquid transfers for large bulk containers should be thoroughly familiar with the Spill Prevention Control and Countermeasure Plan and the plan should be readily available.

Spill Response and Prevention

- Identify key spill response personnel and train employees on who they are.

- Store and maintain appropriate spill cleanup materials in a clearly marked location near storage areas; and train employees to ensure familiarity with the site's spill control plan and/or proper spill cleanup procedures.

- Locate spill cleanup materials, such as absorbents, where they will be readily accessible (e.g. near storage and maintenance areas, on field trucks).

SC-11 Spill Prevention, Control & Cleanup

- Follow the Spill Prevention Control and Countermeasure Plan if one is available.
- If a spill occurs, notify the key spill response personnel immediately. If the material is unknown or hazardous, the local fire department may also need to be contacted.
- If safe to do so, attempt to contain the material and block the nearby storm drains so that the area impacted is minimized. If the material is unknown or hazardous wait for properly trained personnel to contain the materials.
- Perform an assessment of the area where the spill occurred and the downstream area that it could impact. Relay this information to the key spill response and clean up personnel.

Spill Cleanup Procedures

- Small non-hazardous spills
  - Use a rag, damp cloth or absorbent materials for general clean up of liquids
  - Use brooms or shovels for the general clean up of dry materials
  - If water is used, it must be collected and properly disposed of. The wash water can not be allowed to enter the storm drain.
  - Dispose of any waste materials properly
  - Clean or dispose of any equipment used to clean up the spill properly
- Large non-hazardous spills
  - Use absorbent materials for general clean up of liquids
  - Use brooms, shovels or street sweepers for the general clean up of dry materials
  - If water is used, it must be collected and properly disposed of. The wash water can not be allowed to enter the storm drain.
  - Dispose of any waste materials properly
  - Clean or dispose of any equipment used to clean up the spill properly
- For hazardous or very large spills, a private cleanup company or Hazmat team may need to be contacted to assess the situation and conduct the cleanup and disposal of the materials.
- Chemical cleanups of material can be achieved with the use of absorbents, gels, and foams. Remove the adsorbent materials promptly and dispose of according to regulations.
- If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to a certified laundry (rags) or disposed of as hazardous waste.

Reporting

- Report any spills immediately to the identified key municipal spill response personnel.

- Report spills in accordance with applicable reporting laws. Spills that pose an immediate threat to human health or the environment must be reported immediately to the Office of Emergency Service (OES)

- Spills that pose an immediate threat to human health or the environment may also need to be reported within 24 hours to the Regional Water Quality Control Board.

- Federal regulations require that any oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hour)

- After the spill has been contained and cleaned up, a detailed report about the incident should be generated and kept on file (see the section on Reporting below). The incident may also be used in briefing staff about proper procedures

Other Considerations

- State regulations exist for facilities with a storage capacity of 10,000 gallons or more of petroleum to prepare a Spill Prevention Control and Countermeasure Plan (SPCC) Plan (Health & Safety Code Chapter 6.67).

- State regulations also exist for storage of hazardous materials (Health & Safety Code Chapter 6.95), including the preparation of area and business plans for emergency response to the releases or threatened releases.

- Consider requiring smaller secondary containment areas (less than 200 sq. ft.) to be connected to the sanitary sewer, if permitted to do so, prohibiting any hard connections to the storm drain.

Requirements

Costs

- Will vary depending on the size of the facility and the necessary controls.

- Prevention of leaks and spills is inexpensive. Treatment and/or disposal of wastes, contaminated soil and water is very expensive

Maintenance

- This BMP has no major administrative or staffing requirements. However, extra time is needed to properly handle and dispose of spills, which results in increased labor costs

Supplemental Information

Further Detail of the BMP

Reporting

Record keeping and internal reporting represent good operating practices because they can increase the efficiency of the response and containment of a spill. A good record keeping system helps the municipality minimize incident recurrence, correctly respond with appropriate containment and cleanup activities, and comply with legal requirements.

A record keeping and reporting system should be set up for documenting spills, leaks, and other discharges, including discharges of hazardous substances in reportable quantities. Incident records describe the quality and quantity of non-stormwater discharges to the storm drain.

These records should contain the following information:

- Date and time of the incident
- Weather conditions
- Duration of the spill/leak/discharge
- Cause of the spill/leak/discharge
- Response procedures implemented
- Persons notified
- Environmental problems associated with the spill/leak/discharge

Separate record keeping systems should be established to document housekeeping and preventive maintenance inspections, and training activities. All housekeeping and preventive maintenance inspections should be documented. Inspection documentation should contain the following information:

- The date and time the inspection was performed
- Name of the inspector
- Items inspected
- Problems noted
- Corrective action required
- Date corrective action was taken

Other means to document and record inspection results are field notes, timed and dated photographs, videotapes, and drawings and maps.

Examples

The City of Palo Alto includes spill prevention and control as a major element of its highly effective program for municipal vehicle maintenance shops.

References and Resources

King County Stormwater Pollution Control Manual - http://dnr.metrokc.gov/wlr/dss/spcm.htm

Orange County Stormwater Program
http://www.ocwatersheds.com/stormwater/swp_introduction.asp

San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Program (URMP)
http://www.projectcleanwater.org/pdf/Model%20Program%20Municipal%20Facilities.pdf

Vehicle and Equipment Fueling SC-20



Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize

Targeted Constituents

Sediment	
Nutrients	
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑
Oxygen Demanding	

Description

Spills and leaks that occur during vehicle and equipment fueling can contribute hydrocarbons, oil and grease, as well as heavy metals to stormwater runoff. Implementing the following management practices can help prevent fuel spills and leaks.

Approach

Reduce potential for pollutant discharge through source control pollution prevention and BMP implementation. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

Pollution Prevention

- Use properly maintained offsite fueling stations whenever possible. These businesses are better equipped to handle fuel and spills properly.
- Educate employees about pollution prevention measures and goals
- Focus pollution prevention activities on containment of spills and leaks, most of which may occur during liquid transfers.

Suggested Protocols

General

- "Spot clean" leaks and drips routinely. Leaks are not cleaned up until the absorbent is picked up and disposed of properly.

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- Label drains within the facility boundary, by paint/stencil (or equivalent), to indicate whether they flow to an oil/water separator, directly to the sewer, or to a storm drain. Labels are not necessary for plumbing fixtures directly connected to the sanitary sewer but may be useful to help eliminate confusion about where the drain leads.
- Post signs to remind employees not to top off the fuel tank when filling and signs that ban employees from changing engine oil or other fluids at that location.
- Report leaking vehicles to fleet maintenance.
- Install inlet catch basin equipped with a small sedimentation basin or grit chamber to remove large particles from stormwater in highly impervious areas. Proper maintenance of these devices is necessary.
- Accumulated non-contaminated stormwater (e.g., in a secondary containment) should be released prior to next storm.
- Ensure the following safeguards are in place:
  - Overflow protection devices on tank systems to warn the operator to automatically shutdown transfer pumps when the tank reaches full capacity.
  - Protective guards around tanks and piping to prevent vehicle or forklift damage.
  - Clearly tagging or labeling all valves to reduce human error.
  - Automatic shut off for severed fuel hoses.

Fuel Dispensing Areas

- Maintain clean fuel-dispensing areas using dry cleanup methods such as sweeping for removal of litter and debris, or use of rags and absorbents for leaks and spills. Do not wash down areas with water.
- Fit underground storage tanks with spill containment and overfill prevention systems meeting the requirements of Section 2635(b) of Title 23 of the California Code of Regulations.
- Fit fuel dispensing nozzles with "hold-open latches" (automatic shutoffs) except where prohibited by local fire departments.
- Post signs at the fuel dispenser or fuel island warning vehicle owners/operators against "topping off" of vehicle fuel tanks.
- Design fueling area to prevent stormwater runoff and spills.
- Cover fueling area with an overhanging roof structure or canopy so that precipitation cannot come in contact with the fueling area and if possible use a perimeter drain or slope pavement inward with drainage to a blind sump (must be properly maintained and water properly disposed of); pave area with concrete rather than asphalt.

- Apply a suitable sealant that protects the asphalt from spilled fuels in areas where covering is infeasible and the fuel island is surrounded by pavement.
- Install vapor recovery nozzles to help control drips as well as air pollution.
- Use secondary containment when transferring fuel from the tank truck to the fuel tank.
- Cover storm drains in the vicinity during transfer.

Outdoor Waste Receptacle Area

- Spot clean leaks and drips routinely to prevent runoff of spillage.
- Minimize the possibility of stormwater pollution from outside waste receptacles by using an effective combination of the following:
  - use only watertight waste receptacle(s) and keep the lid(s) closed, or
  - grade and pave the waste receptacle area to prevent runon of stormwater, or
  - install a roof over the waste receptacle area, or
  - install a low containment berm around the waste receptacle area, or
  - use and maintain drip pans under waste receptacles. Containment areas and drip pans must be properly maintained and collected water disposed of properly (e.g., to sanitary sewer). Several drip pans should be stored in a covered location near outdoor waste receptacle area so that they are always available, yet protected from precipitation when not in use.
- Post "no littering" signs.

Air/Water Supply Area

- Minimize the possibility of stormwater pollution from air/water supply areas by implementing an effective combination of the following:
  - spot clean leaks and drips routinely to prevent runoff of spillage, or
  - grade and pave the air/water supply area to prevent runon of stormwater, or
  - install a roof over the air/water supply area, or
  - install a low containment berm around the air/water supply area. Maintain containment areas and dispose of contaminated water properly (e.g., to sanitary sewer).

Inspection

- Aboveground Tank Leak and Spill Control:
  - Check for external corrosion and structural failure.

- Check for spills and overfills due to operator error.
- Check for failure of piping system.
- Check for leaks or spills during pumping of liquids or gases from truck or rail car to a storage facility or vice versa.
- Visually inspect new tank or container installation for loose fittings, poor welding, and improper or poorly fitted gaskets.
- Inspect tank foundations, connections, coatings, and tank walls and piping system. Look for corrosion, leaks, cracks, scratches, and other physical damage that may weaken the tank or container system.
- Periodically, integrity testing should be conducted by a qualified professional.

- Inspect and clean, if necessary, storm drain inlets and catch basins within the facility boundary before October 1 each year.

Training

- Train all employees upon hiring and annually thereafter on proper methods for handling and disposing of waste. Make sure that all employees understand stormwater discharge prohibitions, wastewater discharge requirements, and these best management practices.
- Train employees on proper fueling and cleanup procedures.
- Use a training log or similar method to document training.
- Ensure that employees are familiar with the site's spill control plan and/or proper spill cleanup procedures.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Place stockpiles of spill cleanup materials where they are readily accessible.
- Use adsorbent materials on small spills and general cleaning rather than hosing down the area. Remove the adsorbent materials promptly and dispose properly.
- Store portable absorbent booms (long flexible shafts or barriers made of absorbent material) in unbermed fueling areas.
- Report spills promptly.
- Install an oil/water separator and connect to the sanitary sewer (if allowed), if a dead-end sump is not used to collect spills.

Other Considerations

- Carry out all federal and state requirements regarding underground storage tanks, or install above ground tanks.

Requirements

Costs

- The retrofitting of existing fueling areas to minimize stormwater exposure or spill runoff can be expensive. Good design must occur during the initial installation.
- Extruded curb along the "upstream" side of the fueling area to prevent stormwater runon is of modest cost.

Maintenance

- Clean oil/water separators at appropriate intervals.
- Keep ample supplies of spill cleanup materials onsite.
- Inspect fueling areas, storage tanks, catch basin inserts, containment areas, and drip pans on a regular schedule.

Supplemental Information

Design Considerations

Designing New Installations

The elements listed below should be included in the design and construction of new or substantially remodeled facilities.

Fuel Dispensing Areas

- Fuel dispensing areas must be paved with Portland cement concrete (or, equivalent smooth impervious surface), with a 2% to 4% slope to prevent ponding, and must be separated from the rest of the site by a grade break that prevents runon of stormwater to the extent practicable. The fuel dispensing area is defined as extending 6.5 feet from the corner of each fuel dispenser or the length at which the hose and nozzle assembly may be operated plus 1 foot, whichever is less. The paving around the fuel dispensing area may exceed the minimum dimensions of the "fuel dispensing area" stated above.
- The fuel dispensing area must be covered, and the cover's minimum dimensions must be equal to or greater than the area within the grade break or the fuel dispensing area, as defined above. The cover must not drain onto the fuel dispensing area.
- If necessary install and maintain an oil control device in the appropriate catch basin(s) to treat runoff from the fueling area.

Outdoor Waste Receptacle Area

- Grade and pave the outdoor waste receptacle area to prevent runon of stormwater to the extent practicable.

Air/Water Supply Area

- Grade and pave the air/water supply area to prevent runon of stormwater to the extent practicable.

Designated Fueling Area

- If your facility has large numbers of mobile equipment working throughout the site and you currently fuel them with a mobile fuel truck, consider establishing a designated fueling area. With the exception of tracked equipment such as bulldozers and perhaps small forklifts, most vehicles should be able to travel to a designated area with little lost time. Place temporary "caps" over nearby catch basins or manhole covers so that if a spill occurs it is prevented from entering the storm drain.

Examples

The Spill Prevention Control and Countermeasure (SPCC) Plan, which is required by law for some facilities, is an effective program to reduce the number of accidental spills and minimize contamination of stormwater runoff.

The City of Palo Alto has an effective program for commercial vehicle service facilities. Many of the program's elements, including specific BMP guidance and lists of equipment suppliers, are also applicable to industrial facilities.

References and Resources

Best Management Practice Guide for Retail Gasoline Outlets, California Stormwater Quality Task Force. 1997.

King County Stormwater Pollution Control Manual – http//www.dnr.metrokc.gov/wlr/dss/spcm.htm

Orange County Stormwater Program http://www.ocwatersheds.com/StormWater/swp_introduction.asp

San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Program (URMP)

Plaza and Sidewalk Cleaning SC-71



Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑
Oxygen Demanding	☑

Description

Pollutants on sidewalks and other pedestrian traffic areas and plazas are typically due to littering and vehicle use. This fact sheet describes good housekeeping practices that can be incorporated into the municipality's existing cleaning and maintenance program.

Approach

Pollution Prevention

- Use dry cleaning methods whenever practical for surface cleaning activities.
- Use the least toxic materials available (e.g. water based paints, gels or sprays for graffiti removal).

Suggested Protocols

Surface Cleaning

- Regularly broom (dry) sweep sidewalk, plaza and parking lot areas to minimize cleaning with water.
- Dry cleanup first (sweep, collect, and dispose of debris and trash) when cleaning sidewalks or plazas, then wash with or without soap.
- Block the storm drain or contain runoff when cleaning with water. Discharge wash water to landscaping or collect water and pump to a tank or discharge to sanitary sewer if allowed. (Permission may be required from local sanitation district.)

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- Block the storm drain or contain runoff when washing parking areas, driveways or drive-throughs. Use absorbents to pick up oil; then dry sweep. Clean with or without soap. Collect water and pump to a tank or discharge to sanitary sewer if allowed. Street Repair and Maintenance.

Graffiti Removal

- Avoid graffiti abatement activities during rain events.
- Implement the procedures under Painting and Paint Removal in SC-70 Roads, Streets, and Highway Operation and Maintenance fact sheet when graffiti is removed by painting over.
- Direct runoff from sand blasting and high pressure washing (with no cleaning agents) into a dirt or landscaped area after treating with an appropriate filtering device.
- Plug nearby storm drain inlets and vacuum/pump wash water to the sanitary sewer if authorized to do so if a graffiti abatement method generates wash water containing a cleaning compound (such as high pressure washing with a cleaning compound). Ensure that a non-hazardous cleaning compound is used or dispose as hazardous waste, as appropriate.

Surface Removal and Repair

- Schedule surface removal activities for dry weather if possible.
- Avoid creating excess dust when breaking asphalt or concrete.
- Take measures to protect nearby storm drain inlets prior to breaking up asphalt or concrete (e.g. place hay bales or sand bags around inlets). Clean afterwards by sweeping up as much material as possible.
- Designate an area for clean up and proper disposal of excess materials.
- Remove and recycle as much of the broken pavement as possible to avoid contact with rainfall and stormwater runoff.
- When making saw cuts in pavement, use as little water as possible. Cover each storm drain inlet completely with filter fabric during the sawing operation and contain the slurry by placing straw bales, sandbags, or gravel dams around the inlets. After the liquid drains or evaporates, shovel or vacuum the slurry residue from the pavement or gutter and remove from site.
- Always dry sweep first to clean up tracked dirt. Use a street sweeper or vacuum truck. Do not dump vacuumed liquid in storm drains. Once dry sweeping is complete, the area may be hosed down if needed. Wash water should be directed to landscaping or collected and pumped to the sanitary sewer if allowed.

Concrete Installation and Repair

- Schedule asphalt and concrete activities for dry weather.

- Take measures to protect any nearby storm drain inlets and adjacent watercourses, prior to breaking up asphalt or concrete (e.g. place san bags around inlets or work areas).
- Limit the amount of fresh concrete or cement mortar mixed, mix only what is needed for the job.
- Store concrete materials under cover, away from drainage areas. Secure bags of cement after they are open. Be sure to keep wind-blown cement powder away from streets, gutters, storm drains, rainfall, and runoff.
- Return leftover materials to the transit mixer. Dispose of small amounts of hardened excess concrete, grout, and mortar in the trash.
- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile, or dispose in the trash.
- Protect applications of fresh concrete from rainfall and runoff until the material has dried.
- Do not allow excess concrete to be dumped onsite, except in designated areas.
- Wash concrete trucks off site or in designated areas on site designed to preclude discharge of wash water to drainage system.

Controlling Litter

- Post "No Littering" signs and enforce anti-litter laws.
- Provide litter receptacles in busy, high pedestrian traffic areas of the community, at recreational facilities, and at community events.
- Cover litter receptacles and clean out frequently to prevent leaking/spillage or overflow.
- Clean parking lots on a regular basis with a street sweeper.

Training

- Provide regular training to field employees and/or contractors regarding surface cleaning and proper operation of equipment.
- Train employee and contractors in proper techniques for spill containment and cleanup.
- Use a training log or similar method to document training.

Spill Response and Prevention

- Refer to SC-11, Spill Prevention, Control & Cleanup.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

Other Considerations

- Limitations related to sweeping activities at large parking facilities may include current sweeper technology to remove oil and grease.
- Surface cleaning activities that require discharges to the local sewering agency will require coordination with the agency.
- Arrangements for disposal of the swept material collected must be made, as well as accurate tracking of the areas swept and the frequency of sweeping.

Requirements

Costs

- The largest expenditures for sweeping and cleaning of sidewalks, plazas, and parking lots are in staffing and equipment. Sweeping of these areas should be incorporated into street sweeping programs to reduce costs.

Maintenance

Not applicable

Supplemental Information

Further Detail of the BMP

Community education, such as informing residents about their options for recycling and waste disposal, as well as the consequences of littering, can instill a sense of citizen responsibility and potentially reduce the amount of maintenance required by the municipality.

Additional BMPs that should be considered for parking lot areas include:

- Allow sheet runoff to flow into biofilters (vegetated strip and swale) and infiltration devices.
- Utilize sand filters or oleophilic collectors for oily waste in low concentrations.
- Arrange rooftop drains to prevent drainage directly onto paved surfaces.
- Design lot to include semi-permeable hardscape.
- Structural BMPs such as storm drain inlet filters can be very effective in reducing the amount of pollutants discharged from parking facilities during periods of rain.

References and Resources

Bay Area Stormwater Management Agencies Association (BASMAA). 1996. Pollution From Surface Cleaning Folder http://www.basmaa.org

Model Urban Runoff Program: A How-To Guide for Developing Urban Runoff Programs for Small Municipalities. Prepared by City of Monterey, City of Santa Cruz, California Coastal Commission, Monterey Bay National Marine Sanctuary, Association of Monterey Bay Area Governments, Woodward-Clyde, Central Coast Regional Water Quality Control Board. July. 1998.

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

Orange County Stormwater Program
http://www.ocwatersheds.com/stormwater/swp_introduction.asp

Santa Clara Valley Urban Runoff Pollution Prevention Program. 1997 Urban Runoff Management Plan. September 1997, updated October 2000.

Santa Clara Valley Urban Runoff Pollution Prevention Program. Maintenance Best Management Practices for the Construction Industry. Brochures: Landscaping, Gardening, and Pool; Roadwork and Paving; and Fresh Concrete and Mortar Application. June 2001.

San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Plan. 2001. Municipal Activities Model Program Guidance. November.

Water & Sewer Utility Maintenance SC-76



Objectives

- Contain
- Educate
- Reduce/Minimize

Description

Although the operation and maintenance of public utilities are not considered chronic sources of stormwater pollution, some activities and accidents can result in the discharge of pollutants that can pose a threat to both human health and the quality of receiving waters if they enter the storm drain system. Sewage incident response and investigation may involve a coordinated effort between staff from a number of different departments/agencies. Cities that do not provide maintenance of water and sewer utilities must coordinate with the contracting agency responsible for these activities and ensure that these model procedures are followed.

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	
Metals	
Bacteria	☑
Oil and Grease	☑
Organics	☑
Oxygen Demanding	☑

Approach

Pollution Prevention

Inspect potential non-stormwater discharge flow paths and clear/cleanup any debris or pollutants found (i.e. remove trash, leaves, sediment, and wipe up liquids, including oil spills).

Suggested Protocols

Water Line Maintenance and Cleaning

Procedures can be employed to reduce pollutants from discharges associated with water utility operation and maintenance activities. Planned discharges may include fire hydrant testing, flushing water supply mains after new construction, flushing lines due to complaints of taste and odor, dewatering mains for maintenance work. Unplanned discharges from treated, recycled water, raw water, and groundwater systems operation and maintenance activities can occur from water main

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breaks, sheared fire hydrants, equipment malfunction, and operator error.

Planned discharges

- Identify a suitable discharge option in the following order of preference:
  - Apply to the land.
  - Reuse water for dust suppression, irrigation, or construction compaction.
  - Discharge to a sanitary sewer system with approval.
  - Discharge to the storm drain system using applicable pollution control measures. (Only available to clean water discharges such as water main/ water storage tank/water hydrant flushing).
- If water is discharged to a storm drain, control measures must be put in place to control potential pollutants (i.e. sediment, chlorine, etc.). Examples of some storm drain protection options include:
  - Silt fence – appropriate where the inlet drains a relatively flat area.
  - Gravel and wire mesh sediment filter – Appropriate where concentrated flows are expected.
  - Wooden weir and fabric – use at curb inlets where a compact installation is desired.
- Prior to discharge, inspect discharge flow path and clear/cleanup any debris or pollutants found (i.e. remove trash, leaves, sediment, and wipe up liquids, including oil spills).
- General Design considerations for inlet protection devices include the following:
  - The device should be constructed such that cleaning and disposal of trapped sediment is made easy, while minimizing interference with discharge activities.
  - Devices should be constructed so that any standing water resulting from the discharge will not cause excessive inconvenience or flooding/damage to adjacent land or structures.
- The effectiveness of control devices must be monitored during the discharge period and any necessary repairs or modifications made.

Unplanned Discharges

- Stop the discharge as quickly as possible.
- Inspect flow path of the discharged water:
  - Identify erodible areas which may need to be repaired or protected during subsequent repairs or corrective actions

- Identify the potential for pollutants to be washed into the waterway

- If repairs or corrective action will cause additional discharges of water, select the appropriate procedures for erosion control, chlorine residual, turbidity, and chemical additives. Prevent potential pollutants from entering the flow path.

Sanitary Sewer Maintenance

Applicable to municipalities who own and operated a sewage collection system. Facilities that are covered under this program include sanitary sewer pipes and pump stations owned and operated by a municipality. The owner of the sanitary sewer facilities is the entity responsible for carrying out this prevention and response program.

- Clean sewer lines on a regular basis to remove grease, grit, and other debris that may lead to sewer backups.

- Establish routine maintenance program. Cleaning should be conducted at an established minimum frequency and more frequently for problem areas such as restaurants that are identified

- Cleaning activities may require removal of tree roots and other identified obstructions.

- During routine maintenance and inspection note the condition of sanitary sewer structures and identify areas that need repair or maintenance. Items to note may include the following:

  - Cracked/deteriorating pipes

  - Leaking joints/seals at manhole

  - Frequent line plugs

  - Line generally flows at or near capacity

  - Suspected infiltration or exfiltration.

- Prioritize repairs based on the nature and severity of the problem. Immediate clearing of blockage or repair is required where an overflow is currently occurring or for urgent problems that may cause an imminent overflow (e.g. pump station failures, sewer line ruptures, sewer line blockages). These repairs may be temporary until scheduled or capital improvements can be completed.

- Review previous sewer maintenance records to help identify “hot spots” or areas with frequent maintenance problems and locations of potential system failure.

Spills and Overflows

- Identify and track sanitary sewer discharges. Identify dry weather infiltration and inflow first. Wet weather overflow connections are very difficult to locate.

- Locate wet weather overflows and leaking sanitary sewers using conventional source identification techniques such as monitoring and field screening. Techniques used to identify other illicit connection sources can also be used for sewer system evaluation surveys (see SC74 Drainage System Operation and Maintenance).

- Implement community awareness programs for monitoring sanitary sewer wet weather overflows. A citizen's hotline for reporting observed overflow conditions should be established to supplement field screening efforts.

- Establish lead department/agency responsible for spill response and containment. Provide coordination within departments.

- When a spill, leak, and/or overflow occurs and when disinfecting a sewage contaminated area, take every effort to ensure that the sewage, disinfectant and/or sewage treated with the disinfectant is not discharged to the storm drain system or receiving waters. Methods may include:

  - Blocking storm drain inlets and catch basins

  - Containing and diverting sewage and disinfectant away from open channels and other storm drain fixtures (using sandbags, inflatable dams, etc.)

  - Removing the material with vacuum equipment

- Record required information at the spill site.

- Perform field tests as necessary to determine the source of the spill.

- Develop notification procedures regarding spill reporting.

Septic Systems

- Ensure that homeowners, installers, and inspectors are educated in proper maintenance of septic systems. This may require coordination with staff from other departments. Outreach to homeowners should include inspection reminders informing then that inspection and perhaps maintenance is due for their systems. Recommend that the system be inspected annually and pumped-out regularly.

- Programs which seek to address failing septic systems should consider using field screening to pinpoint areas where more detailed onsite inspection surveys are warranted.

Training

- Conduct annual training of water utility personnel and service contractors. (field screening, sampling, smoke/dye testing, TV inspection).

- OSHA-required Health and Safety Training 29 CFR 1910.120 plus annual Refresher Training (as needed).

- OSHA Confined Space Entry training (Cal-OSHA Confined Space, Title 8 and federal OSHA 29 CFR 1910.146).

Spill Response and Prevention

- See previous section regarding spills and overflows.
- Refer to SC-11, Spill Prevention, Control & Cleanup.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

Other Considerations

- Enact ordinance granting "right-of-entry" to locate potentially responsible parties for sewer overflows.
- Reliance on individual onsite inspection to detect failed septic systems can be a major limitation. The individual onsite inspection is very labor-intensive and requires access to private property to pinpoint the exact location of the failing system.
- A significant limitation to correcting failing septic systems is the lack of techniques available for detecting individual failed septic systems.

Requirements

Costs

- Departmental cooperation recommended for sharing or borrowing staff resources and equipment from municipal wastewater department.
- Infiltration, inflow, and wet weather overflows from sanitary sewers are very labor and equipment intensive to locate.
- The costs associated with detecting and correcting septic system failures are subject to a number of factors, including availability of trained personnel, cost of materials, and the level of follow-up required to fix the system problems.

Maintenance

- Minimum 2-person teams to perform field screening and associated sampling.
- Larger teams required for implementing other techniques (i.e. zinc chloride smoke testing, fluorometric dye testing, television camera inspection and physical inspection with confined space entry) to identify sewer system leaks.
- Program coordination required for handling emergencies, record keeping, etc.
- Many of the problems associated with improper use of septic systems may be attributed to lack of user knowledge on operation and maintenance. Educational materials for homeowners and training courses for installers and inspectors can reduce the incidence of pollution from these widespread and commonly used pollution control devices.

SC-76 Water & Sewer Utility Maintenance

Supplemental Information

Further Detail of the BMP

Onsite Sewage Disposal Systems

New onsite sewage disposal systems should be designed, located, and installed away from open waterbodies and sensitive resources such as wetlands and floodplains. A protective separation between the OSDS and groundwater should also be established. OSDSs should be operated and maintained to prevent surface water discharges and reduce pollutant loadings to groundwater. Inspection of OSDSs should occur regularly and repairs made immediately. New or replacement plumbing fixtures should be of the high efficiency type.

Typical Sanitary Sewer Problems

- Old and deteriorated main and lateral pipes - Sewers range in age from 30 to 100 years with an average age of 50 years.
- Cracked sewer pipes - Existing sewers are mostly clay pipes which can crack as they deteriorate with age and also by earth movement.
- Misaligned and open pipe joints - Most of the mortar used to seal the joints between sections of clay pipe has deteriorated.
- Undersized sewer pipe - The existing sewer system is overloaded due to new sewer hook-ups, underground water infiltration, and illegal roof and/or yard drain connections.
- Defective manholes - Old manholes are made of bricks. Typical problems associated with brick manholes are loose bricks, missing bricks, and misaligned manholes.
- Missing and/or unrecorded sewer pipes and manholes - This problem is typical in the easement/backline sewer. Sewer pipe locations shown on the sewer record map are different from the actual sewer location.
- Sewer main under houses and other improvements - Complaints of sewer main alignment crossing the house and other improvements. A solution to this problem requires an agreement with the property owner for a new sewer easement at a relocated line.

Causes of Sanitary Sewer Backups

- Root infiltration - Tree roots are a major cause of backups.
- Water inflow/infiltration - Rain water entering the sewer pipe causes overflows.
- Solids - Typical solids that buildup in the pipe and cause backups are grease, dirt, bones, tampons, paper towels, diapers, broken dishware, garbage, concrete, and debris.
- Structural defects in pipes and manholes - Sags in the line, cracks, holes, protruding laterals, misaligned pipe, offset joints are all possible causes of backups.

Design Considerations

Sanitary sewer overflows can often be reduced or eliminated by a number of practices, in addition to sewer system cleaning and maintenance, including the following:

- Reducing infiltration and inflow through rehabilitation and repair of broken or leaking sewer lines.
- Enlarging or upgrading the capacity of sewer lines, pump stations, or sewage treatment plants.
- Constructing wet weather storage and treatment facilities to treat excess flows.
- Addressing SSOs during sewer system master planning and facilities planning.

Septic Systems

Two field screening techniques that have been used with success at identifying possible locations of failing septic systems are the brightener test and color infrared (CIR) aerial photography. The first involves the use of specific phosphorus-based elements found in many laundry products, often called brighteners, as an indicator of the presence of failing onsite wastewater systems. The second technique uses color infrared (CIR) aerial photography to characterize the performance of septic systems. This method has been found to be a quick and cost-effective method for assessing the potential impacts of failing systems and uses variations in vegetative growth or stress patterns over septic system field lines to identify those systems that may potentially be malfunctioning. Then a more detailed onsite visual and physical inspection will confirm whether the system has truly failed and the extent of the repairs needed. These inspections may be carried out by county health departments or other authorized personnel.

References and Resources

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