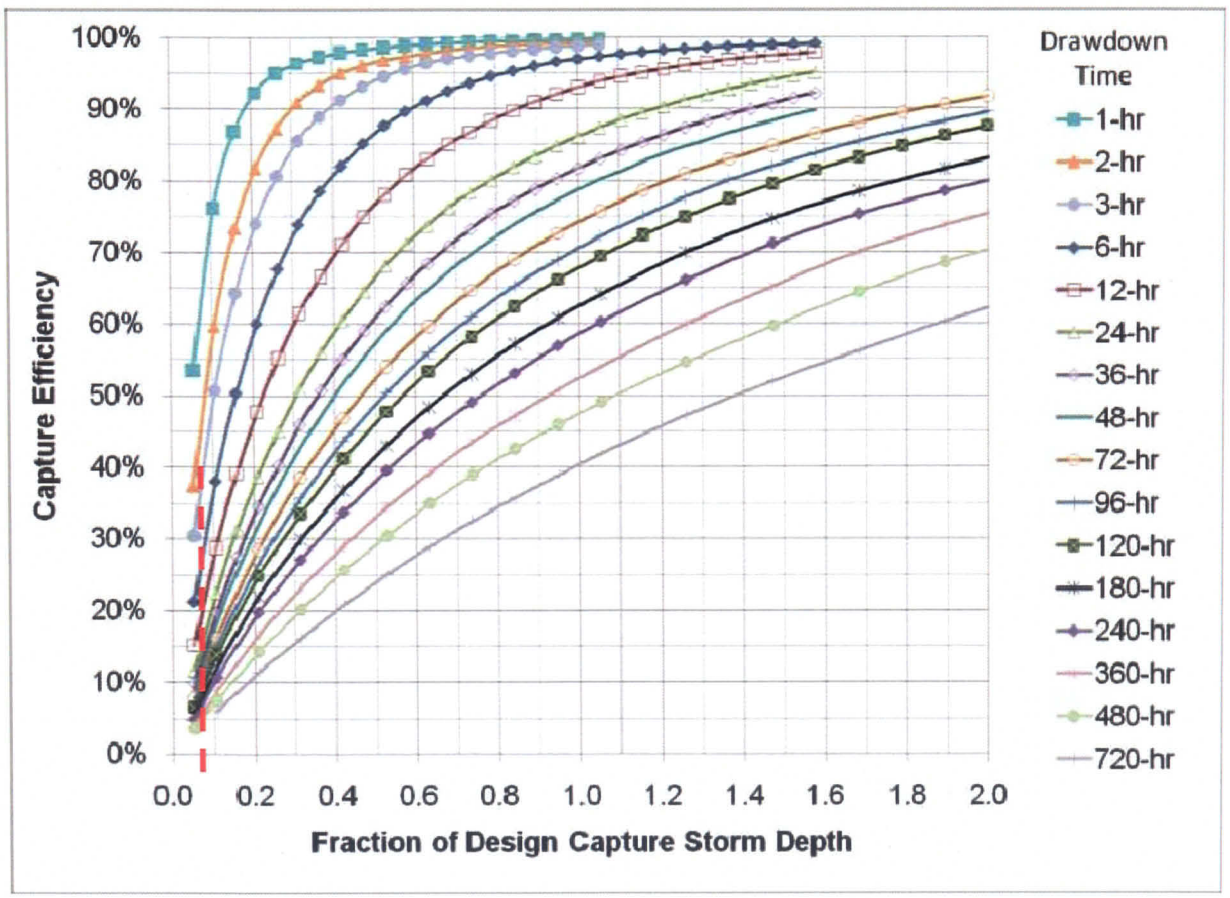
Describe system:	
370 ft2 total rain garden footprint *6" ponding depth; 2 ft media depth* *Treats 370 ft^3 in accordance w/ Fact Sheet BIO-1*	$d_{provided} = \frac{V\ (ft^3) \times 12\ in/ft}{C \times A\ (ac) \times 43{,}560\ ft^2/ac}$ $d_{provided} = \frac{370\ ft^3 \times 12\ in/ft}{0.83 \times 1.59 \times 43{,}560\ ft^2/ac} = 0.077$
Provide drawdown calculations per equations in applicable BMP Fact Sheet:	
$Drawdown\ Time\ (hr) = \frac{ponding\ depth\ (ft)}{K_{design}\ (\frac{in}{hr})} \times 12\ in/ft$ $Drawdown\ Time\ (hr) = \frac{0.5\ ft}{2.5\ (\frac{in}{hr})} \times 12 \frac{in}{ft} = 2.4\ hr$	
Graphical Operations	

Figure III.2. Capture Efficiency Nomograph for Constant Drawdown Systems in Orange County



Use this graph to provide the supporting graphical operations. See Example III.8.

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Filterra #1

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	T_c=	9.11	min
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1=	0.23	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	--	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	40%	
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2	I_2=	0.06	
6	Determine the design intensity that must be provided by BMP, $I_{design}= I_1-I_2$	I_{design}=	0.17	
Step 2: Calculate the design flowrate				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	1.59	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	90%	
3	Calculate runoff coefficient, $C= (0.75 \times imp) + 0.15$	C=	0.83	
4	Calculate design flowrate, $Q_{design}= (C \times i_{design} \times A)$	Q_{design}=	0.22	cfs

Supporting Calculations

Describe system:

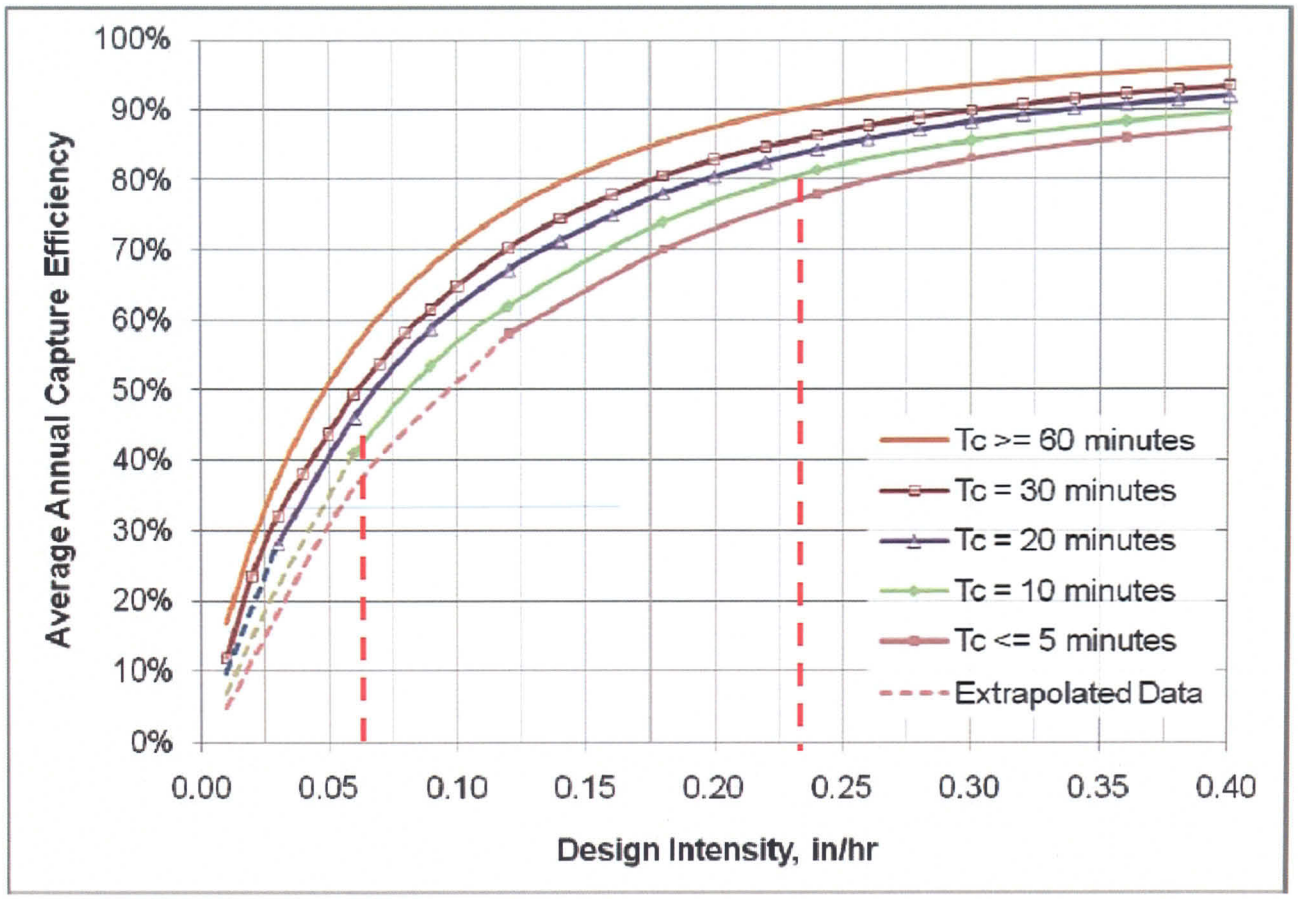
2 units 6' x 8' each – used in combination with upstream Rain Gardens. See Worksheet E.

Provide time of concentration assumptions:

9.11 minutes per 2-year hydrology map

Graphical Operations

Figure III.4. Capture Efficiency Nomograph for Off-line Flow-based Systems in Orange County



Provide supporting graphical operations. See Example III.7.

Worksheet F: Determining Capture Efficiency of a Flow-based BMP based on Treatment Capacity

Rain Gardens + Filterra #1
Combined Treatment Efficiency

Step 1: Determine the design intensity used for calculating design flowrate				
1	Determine the design flowrate of the BMP, *Q* (cfs)	Q=	0.224	cfs
2	Enter Project Imperviousness, *imp* (unitless)	imp=	90%	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.83	
4	Back calculate the equivalent intensity of rainfall treated in the BMP (cfs), $i_{provided}=Q/C$	$i_{provided}$=	0.17	in/hr
Step 2: Calculate the capture efficiency of theflow-based BMP				
1	Enter the time of concentration, T_c (min) (Section IV.2)	T_c=	9.11	min
2	Enter the effect of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	--	inches
3	Enter the upstream capture efficiency corresponding to d_{HSC} from Table III.1 (regionally based), Y_1 (Worksheet A)	Y_1=	40%	%
4	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_1), I_1	I_1=	0.06	in/hr
5	Determine the cumulative design intensity that is provided by upstream and project BMPs, $I_2 = I_{provided} + I_1$	I_2=	0.23	in/hr
6	Using Figure III.4, determine the capture efficiency corresponding to the total intensity captured (I_2) for time of concentration (T_c) for upstream and Project BMPs, Y_2	Y_2=	80%	%

Supporting Calculations

Describe system:

See Worksheets E and D

$$Q = C \times i \times A$$

$$i = \frac{Q}{C \times A}$$

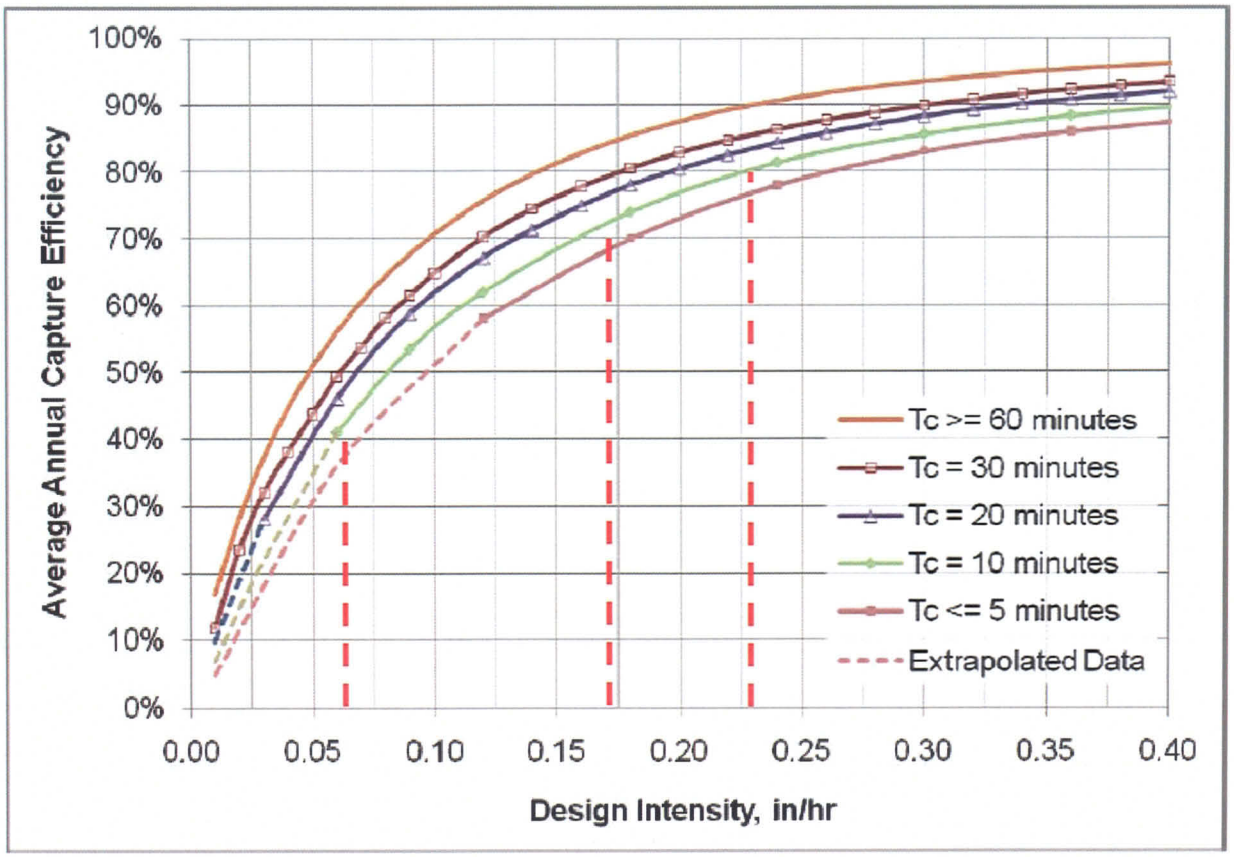
$$i = \frac{0.224}{0.83 \times 1.59} = 0.17$$

Provide time of concentration assumptions:

9.11 minutes per hydrology map

Graphical Operations

Figure III.4. Capture Efficiency Nomograph for Off-line Flow-based Systems in Orange County



Provide supporting graphical operations.

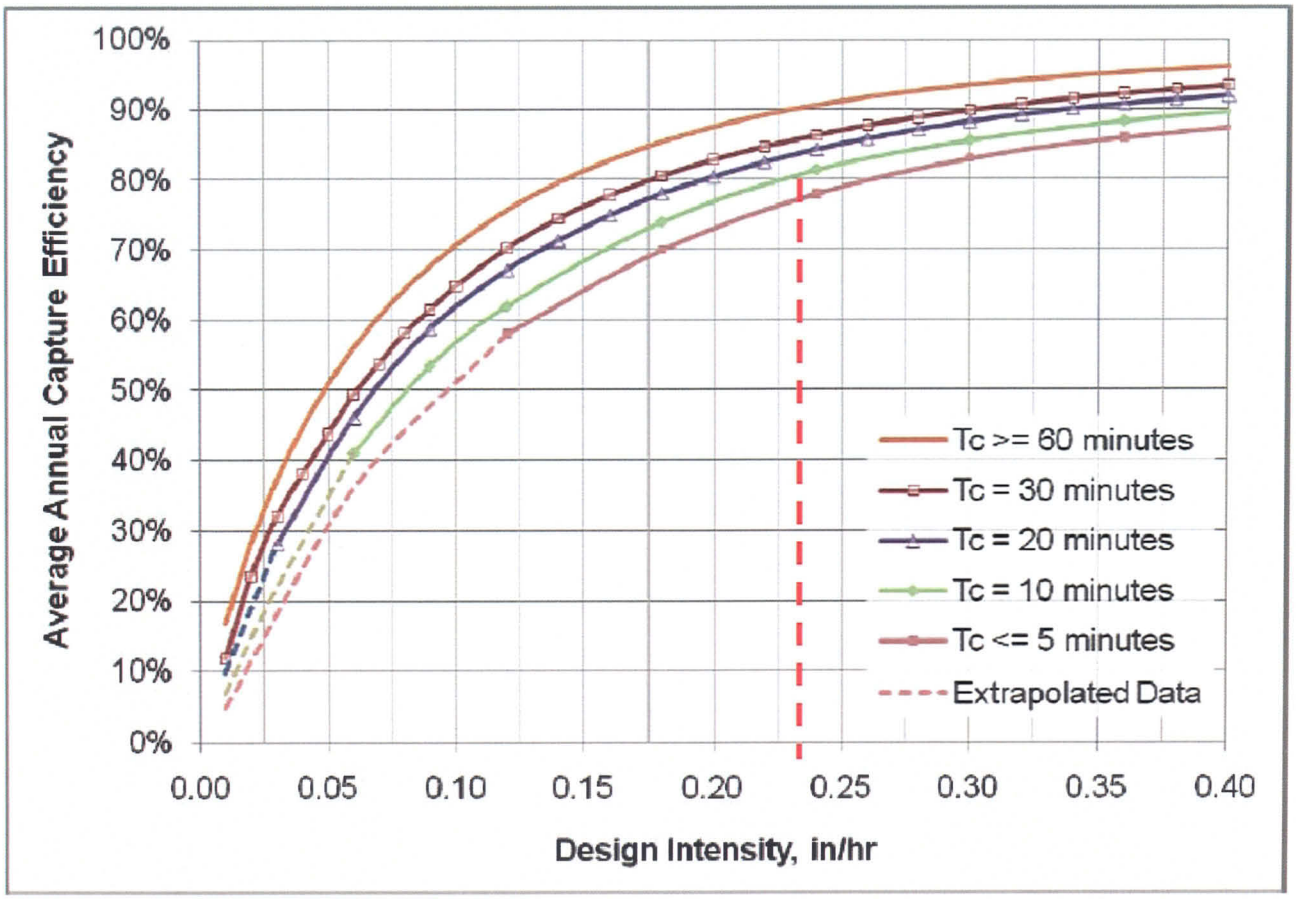
Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Filterra #2 (A3)

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	T_c=	9.21	min
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1=	0.23	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	--	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	--	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2	I_2=	--	
6	Determine the design intensity that must be provided by BMP, $I_{design}= I_1-I_2$	I_{design}=	0.23	
Step 2: Calculate the design flowrate				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	1.12	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	80%	
3	Calculate runoff coefficient, $C= (0.75 \times imp) + 0.15$	C=	0.75	
4	Calculate design flowrate, $Q_{design}= (C \times i_{design} \times A)$	Q_{design}=	0.19	cfs
Supporting Calculations				
Describe system: *2 units 6' x 8' each*				
Provide time of concentration assumptions: *9.21 minutes per 2-year hydrology map*				

Graphical Operations

Figure III.4. Capture Efficiency Nomograph for Off-line Flow-based Systems in Orange County



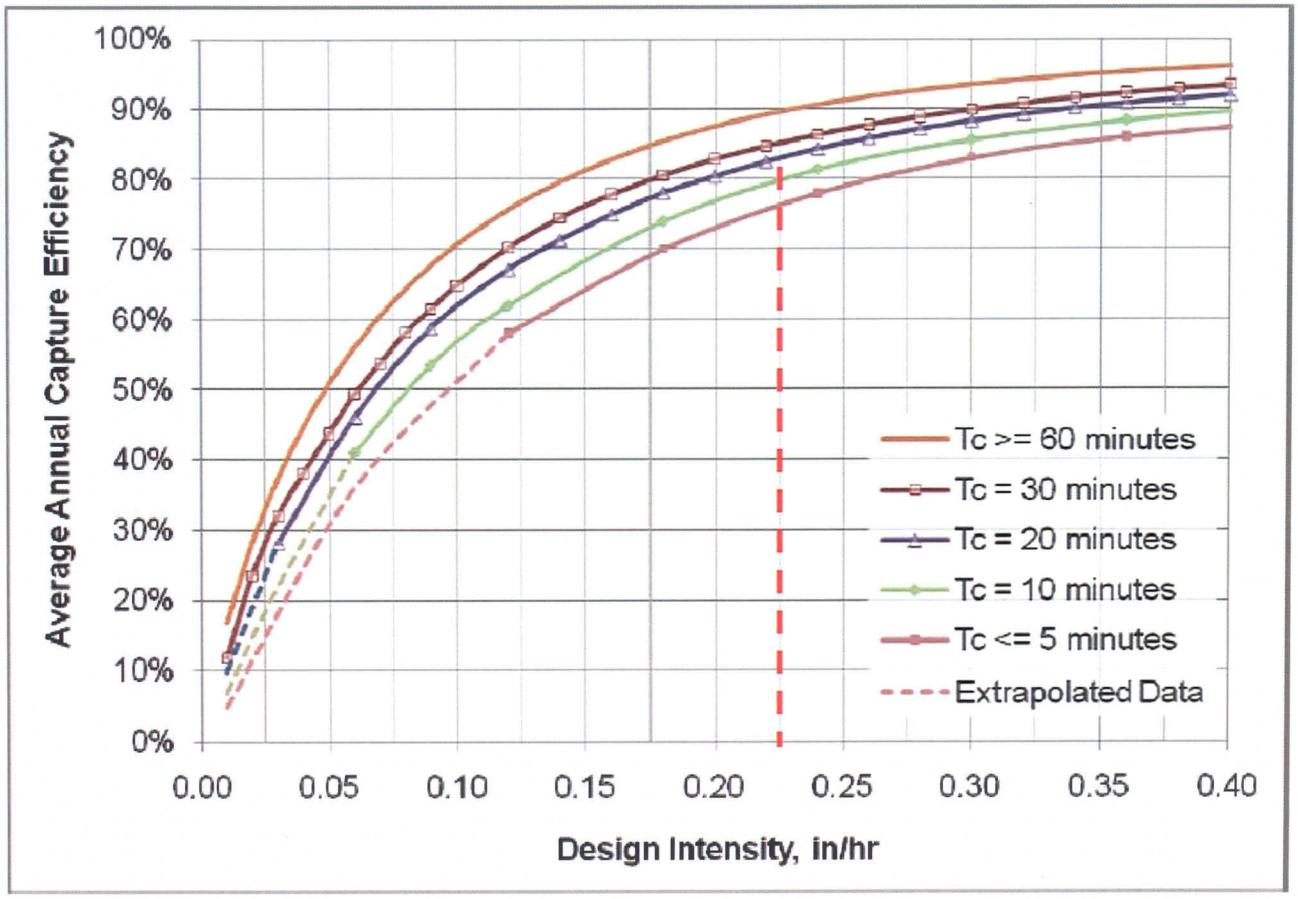
Provide supporting graphical operations. See Example III.7.

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Filterra #3 (A4)

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	T_c=	9.7	min
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1=	0.225	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	--	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	--	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2	I_2=	--	
6	Determine the design intensity that must be provided by BMP, $I_{design}= I_1-I_2$	I_{design}=	0.225	
Step 2: Calculate the design flowrate				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	1.65	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	85%	
3	Calculate runoff coefficient, $C= (0.75 \times imp) + 0.15$	C=	0.79	
4	Calculate design flowrate, $Q_{design}= (C \times i_{design} \times A)$	Q_{design}=	0.29	cfs
Supporting Calculations				
Describe system: *2 units 6' x 12' each*				
Provide time of concentration assumptions: *9.7 minutes per 2-year hydrology map*				

Figure III.4. Capture Efficiency Nomograph for Off-line Flow-based Systems in Orange County



Provide supporting graphical operations. See Example III.7.

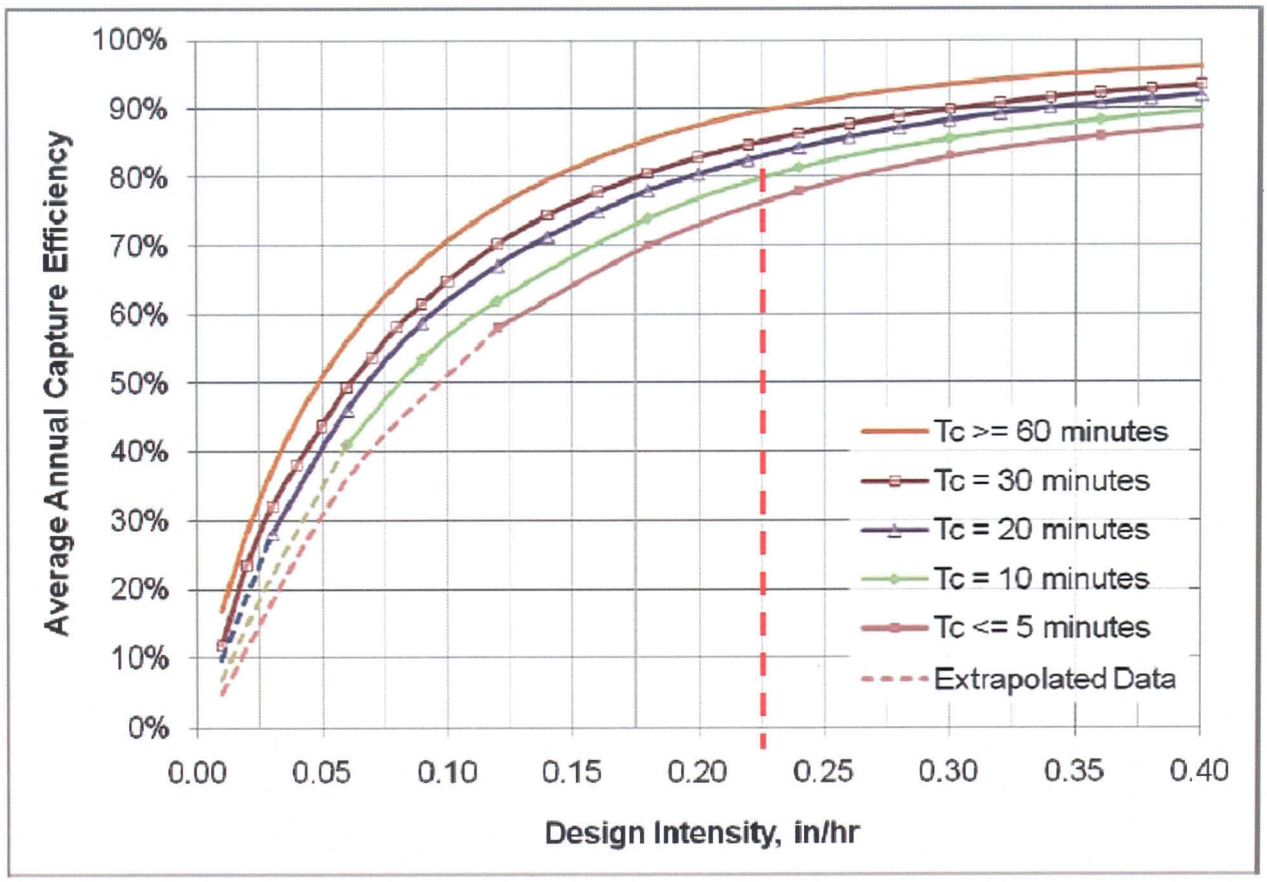
Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Filterra #4 (A6)

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	T_c=	10	min
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1=	0.225	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	--	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	--	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2	I_2=	--	
6	Determine the design intensity that must be provided by BMP, $I_{design}= I_1-I_2$	I_{design}=	0.225	
Step 2: Calculate the design flowrate				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	1.29	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	90%	
3	Calculate runoff coefficient, $C= (0.75 \times imp) + 0.15$	C=	0.83	
4	Calculate design flowrate, $Q_{design}= (C \times i_{design} \times A)$	Q_{design}=	0.24	cfs
Supporting Calculations				
Describe system: *2 units 6' x 10' each*				
Provide time of concentration assumptions: *10 minutes per hydrology map*				

Graphical Operations

Figure III.4. Capture Efficiency Nomograph for Off-line Flow-based Systems in Orange County



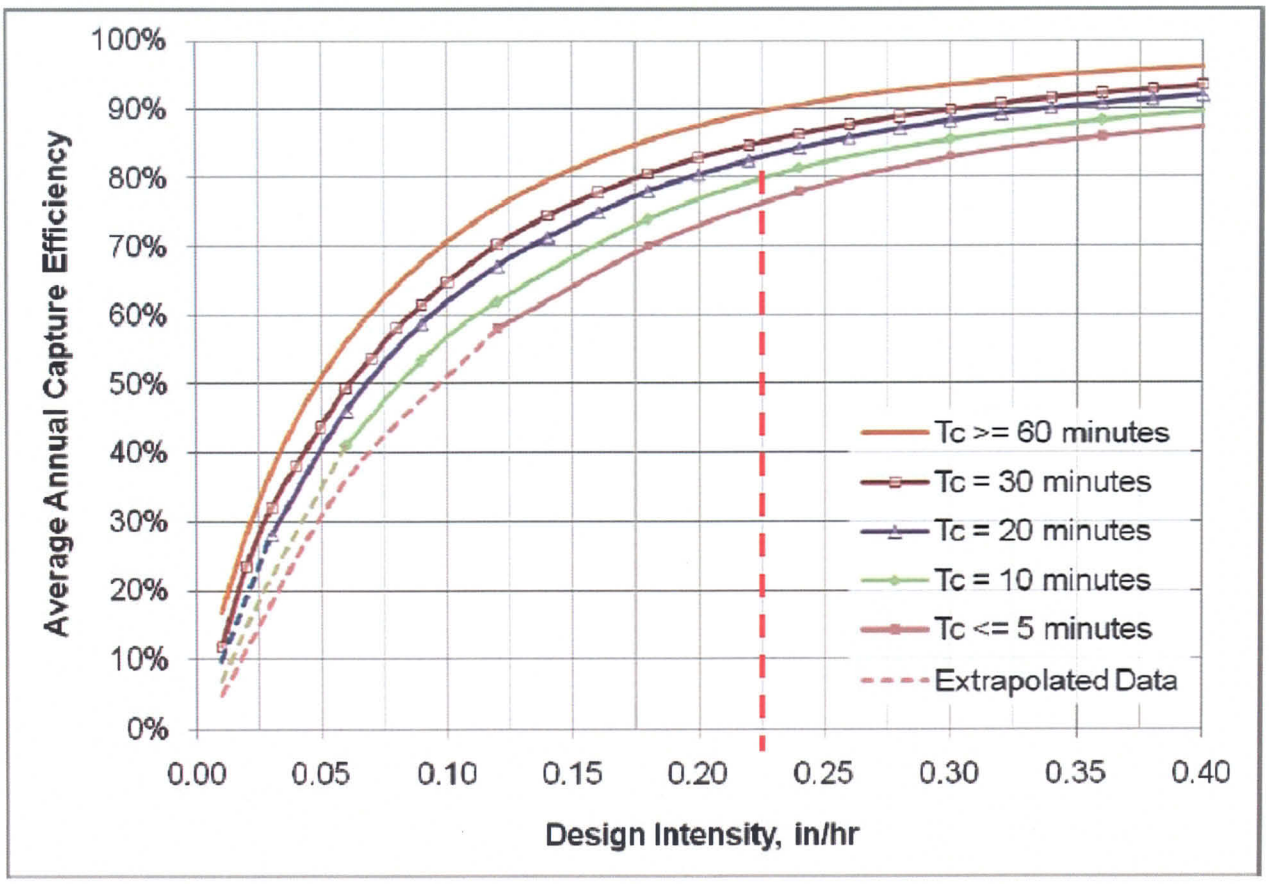
Provide supporting graphical operations. See Example III.7.

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Filterra #5 (A5 North)

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	T_c=	10	min
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1=	0.225	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	--	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	--	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2	I_2=	--	
6	Determine the design intensity that must be provided by BMP, $I_{design}= I_1-I_2$	I_{design}=	0.225	
Step 2: Calculate the design flowrate				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	1.25	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	85%	
3	Calculate runoff coefficient, $C= (0.75 \times imp) + 0.15$	C=	0.79	
4	Calculate design flowrate, $Q_{design}= (C \times i_{design} \times A)$	Q_{design}=	0.22	cfs
Supporting Calculations				
Describe system: *2 units 6' x 8' each*				
Provide time of concentration assumptions: *10 minutes per hydrology map*				

Figure III.4. Capture Efficiency Nomograph for Off-line Flow-based Systems in Orange County



Provide supporting graphical operations. See Example III.7.

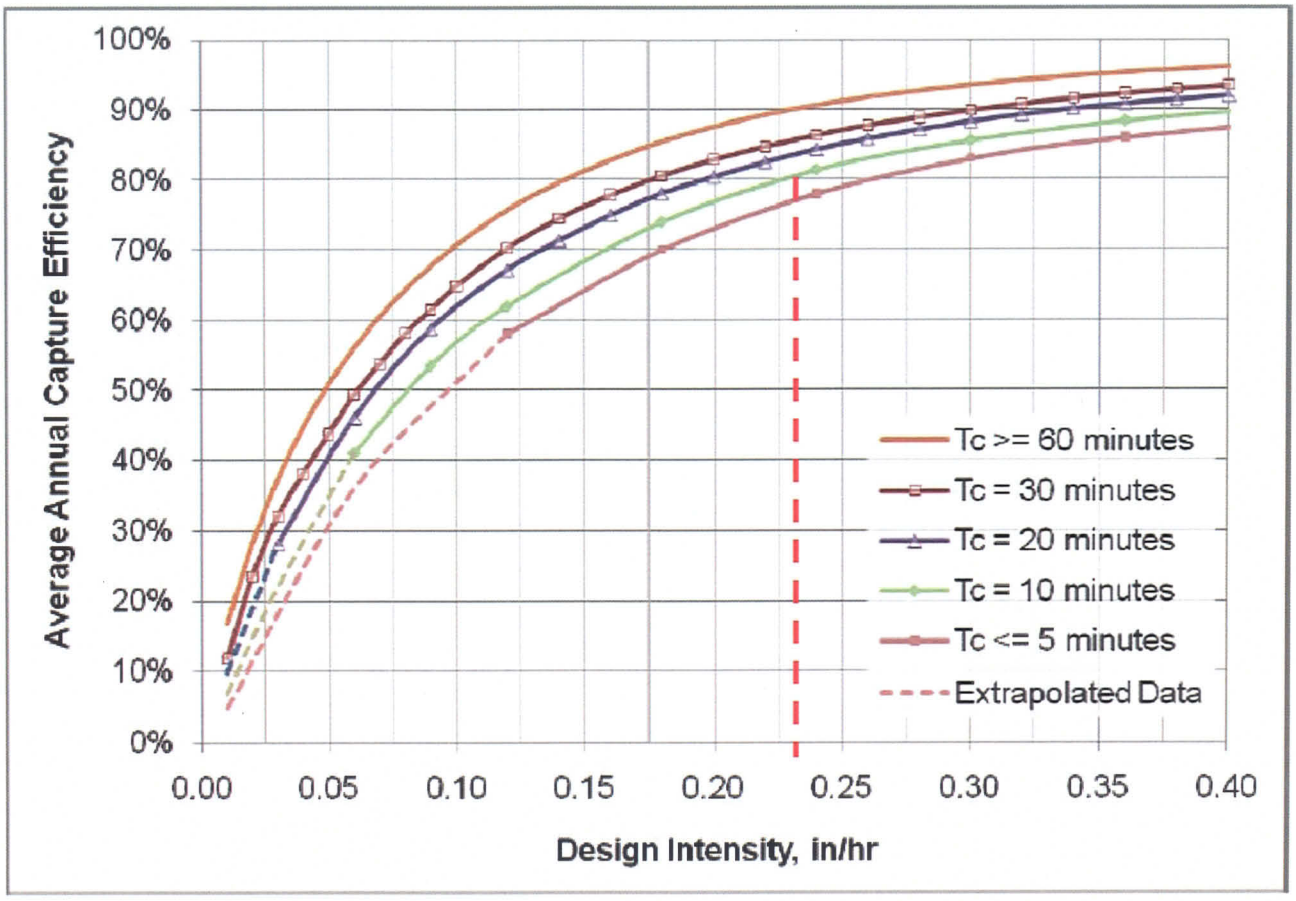
Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Filterra #6 (A5 South)

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	T_c=	9	min
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1=	0.23	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	--	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	--	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2	I_2=	--	
6	Determine the design intensity that must be provided by BMP, $I_{design}= I_1-I_2$	I_{design}=	0.23	
Step 2: Calculate the design flowrate				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	1.3	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	85%	
3	Calculate runoff coefficient, $C= (0.75 \times imp) + 0.15$	C=	0.79	
4	Calculate design flowrate, $Q_{design}= (C \times i_{design} \times A)$	Q_{design}=	0.24	cfs
Supporting Calculations				
Describe system: *2 units 6' x 10' each*				
Provide time of concentration assumptions: *9 minutes per hydrology map*				

Graphical Operations

Figure III.4. Capture Efficiency Nomograph for Off-line Flow-based Systems in Orange County



Provide supporting graphical operations. See Example III.7.

Harvest & Reuse Irrigation Demand Calculations

Storm Water Design Caputre Volume (SQDV)

Drainage Area / Land Use Type	% impervious	Runoff Coefficient	Rainfall Intensity (in)	Drainage Area (acres)	DCV (ft^3)	DCV (gal)
entire site	86.07%	0.80	0.95	8.200	**22,538.0**	**168,584**
		0.15			**0.0**	**0**
		0.15			**0.0**	**0**
		0.15			**0.0**	**0**
		0.15			**0.0**	**0**

	Eto
Irvine	3.00
Laguna Beach	2.75
Santa Ana	2.93

High-use Turf Landscaping

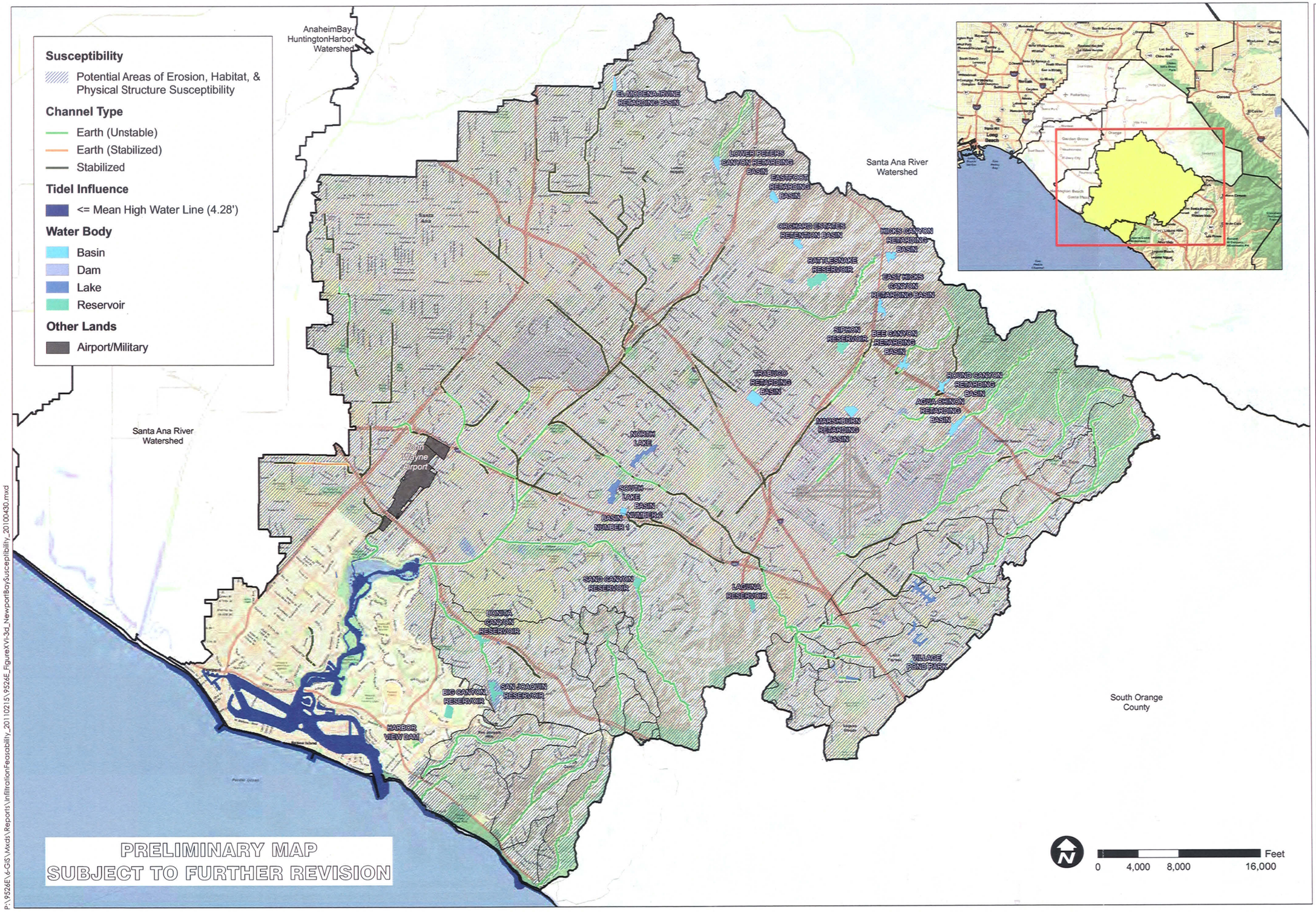
Drainage Area / Land Use Type	Total Area (ac)	Total Area (sf)	% Impervious	Impervious (sf)	Pervious / LA (sf)	Eto	KL	Modified EAWU	EAWU/ Impervious Acre	Minimum EAWU/ Impervious Acre (Table X.6)	Feasible?	EIATA	Minimum EIATA (Table X.8)	Drawdown (days)	Drawdown (hours)	% Capture (Fig. III.2)
entire site	8.200	357,192	86%	307,435	49,757	3	0.7	1,741.49	246.75	690	No	0.13	1.04	96.8	2,323	<40%
0	0.000	0	0%	0	0		0.7	0.00	#DIV/0!	690		#DIV/0!		#DIV/0!	#DIV/0!	
0	0.000	0	0%	0	0		0.7	0.00	#DIV/0!	690		#DIV/0!		#DIV/0!	#DIV/0!	
0	0.000	0	0%	0	0		0.7	0.00	#DIV/0!	690		#DIV/0!		#DIV/0!	#DIV/0!	
0	0.000	0	0%	0	0		0.7	0.00	#DIV/0!	690		#DIV/0!		#DIV/0!	#DIV/0!	
0	0.000	0	0%	0	0		0.7	0.00	#DIV/0!	690		#DIV/0!		#DIV/0!	#DIV/0!	

Low Water Use Landscaping

Drainage Area / Land Use Type	Total Area (ac)	Total Area (sf)	% Impervious	Impervious (sf)	Pervious / LA (sf)	Eto	KL	Modified EAWU	EAWU/ Impervious Acre	Minimum EAWU/ Impervious Acre (Table X.6)	Feasible?	EIATA	Minimum EIATA (Table X.8)	Drawdown (days)	Drawdown (hours)	% Capture (Fig. III.2)
entire site	8.200	357,192	86%	307,435	49,757	3	0.35	870.74	123.37	690	No	0.06	0.52	193.6	4,647	<40%
0	0.000	0	0%	0	0		0.35	0.00	#DIV/0!	690		#DIV/0!		#DIV/0!	#DIV/0!	
0	0.000	0	0%	0	0		0.35	0.00	#DIV/0!	690		#DIV/0!		#DIV/0!	#DIV/0!	
0	0.000	0	0%	0	0		0.35	0.00	#DIV/0!	690		#DIV/0!		#DIV/0!	#DIV/0!	
0	0.000	0	0%	0	0		0.35	0.00	#DIV/0!	690		#DIV/0!		#DIV/0!	#DIV/0!	
0	0.000	0	0%	0	0		0.35	0.00	#DIV/0!	690		#DIV/0!		#DIV/0!	#DIV/0!	

Blend of High-Use and Low-Use Landscaping

Drainage Area / Land Use Type	Total Area (ac)	Total Area (sf)	% Impervious	Impervious (sf)	Pervious / LA (sf)	Eto	KL	Modified EAWU	EAWU/ Impervious Acre	Minimum EAWU/ Impervious Acre (Table X.6)	Feasible?	EIATA	Minimum EIATA (extrapolated)	Drawdown (days)	Drawdown (hours)	% Capture (Fig. III.2)
entire site	8.200	357,192	86%	307,435	49,757	3	0.55	1,368.31	193.87	690	No	0.10	0.78	123.2	2,957	<40%
0	0.000	0	0%	0	0		0.55	0.00	#DIV/0!	690		#DIV/0!	0.00	#DIV/0!	#DIV/0!	
0	0.000	0	0%	0	0		0.55	0.00	#DIV/0!	690		#DIV/0!	0.00	#DIV/0!	#DIV/0!	
0	0.000	0	0%	0	0		0.55	0.00	#DIV/0!	690		#DIV/0!	0.00	#DIV/0!	#DIV/0!	
0	0.000	0	0%	0	0		0.55	0.00	#DIV/0!	690		#DIV/0!	0.00	#DIV/0!	#DIV/0!	
0	0.000	0	0%	0	0		0.55	0.00	#DIV/0!	690		#DIV/0!	0.00	#DIV/0!	#DIV/0!	



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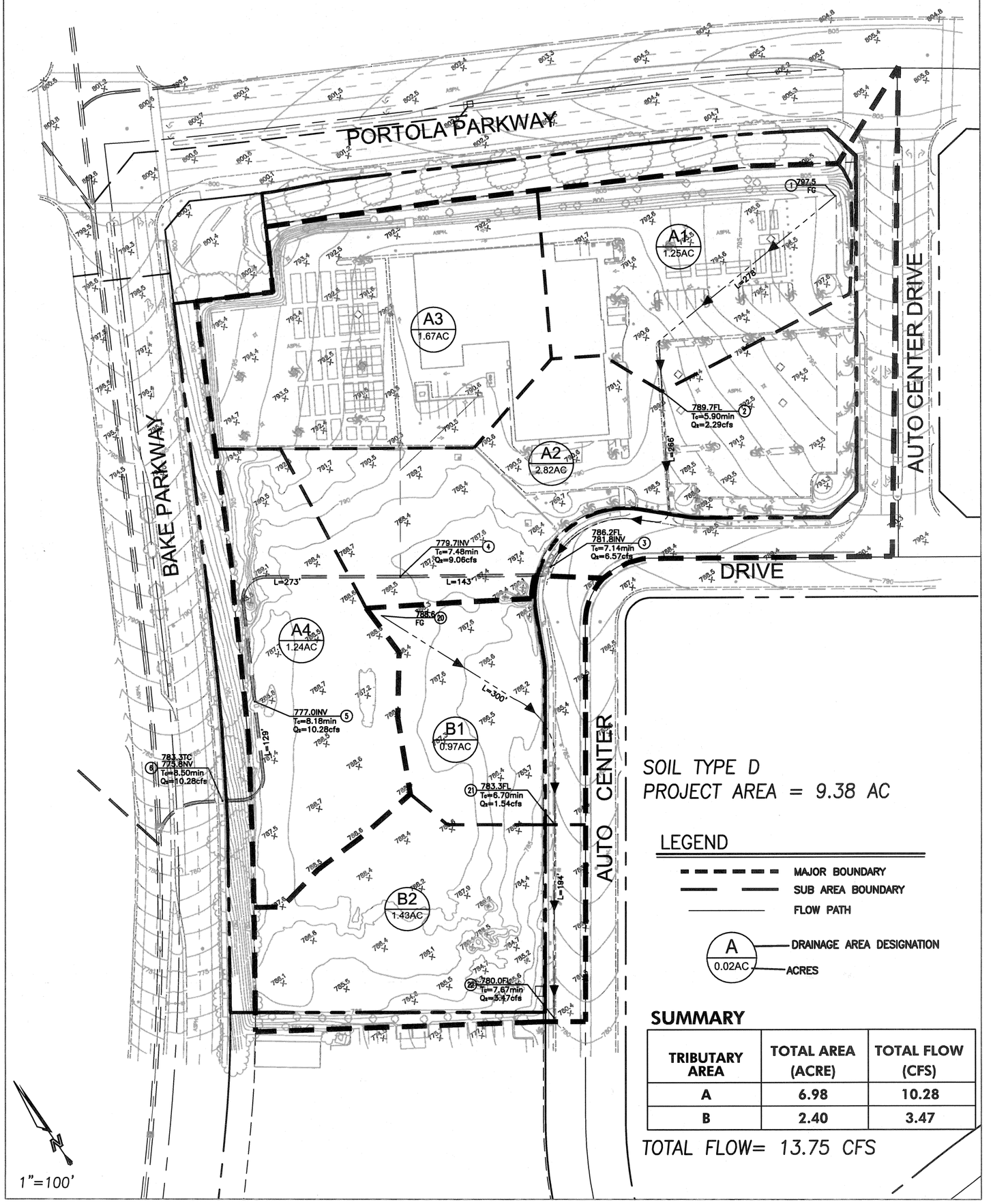
TITLE
SUSCEPTIBILITY ANALYIS
NEWPORT BAY-
NEWPORT COASTAL STREAMS

JOB
ORANGE COUNTY
WATERSHED
MASTER PLANNING
ORANGE CO. CA

SCALE	1" = 4000'
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/30/10
JOB NO.	9526-E

PACE
Advanced Water Engineering

FIGURE
XVI-3d



SOIL TYPE D
PROJECT AREA = 9.38 AC

LEGEND

- MAJOR BOUNDARY
- SUB AREA BOUNDARY
- FLOW PATH
- A / 0.02AC — DRAINAGE AREA DESIGNATION / ACRES

SUMMARY

TRIBUTARY AREA	TOTAL AREA (ACRE)	TOTAL FLOW (CFS)
A	6.98	10.28
B	2.40	3.47

TOTAL FLOW= 13.75 CFS

FOOTHILL RANCH TOWN CENTER
EX. HYDROLOGY MAP
LAKE FOREST, CALIFORNIA
APRIL 5, 2012

BROOKFIELD HOMES

FUSCOE ENGINEERING
16795 Von Karman, Suite 100
Irvine, California 92606
tel 949.474.1960 • fax 949.474.5315
www.fuscoe.com

P:\PROJECTS\308\44\ENG\EXHIBITS\HYDROLOGY\HYDROMOD\X30844-HYDROLOGY-EX-2YR.DWG (04-06-12 1:27:36PM) Plotted by: April McMillian

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              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
          (c) Copyright 1983-2010 Advanced Engineering Software (aes)
              Ver. 17.0  Release Date: 07/01/2010  License ID 1355

                          Analysis prepared by:

                        Fuscoe Engineering, Inc.
                     16795 Von Karman Ave. Ste. 100
                        Irvine, California 92606
                  PH: 949-474-1960    Fax: 949-474-5315

 ************************** DESCRIPTION OF STUDY **************************
* FOOHILL RANCH TOWN CENTER                                                *
* EX. 2 YR HYDROLOGY                                                       *
* 120327-SS                                                                *
 ***************************************************************************

  FILE NAME: 30844X2.DAT
  TIME/DATE OF STUDY: 14:04 03/27/2012
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *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.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   278.00
  ELEVATION DATA: UPSTREAM(FEET) =    797.50  DOWNSTREAM(FEET) =    789.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.900
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.058
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 D       1.25      0.20     0.100    57    5.90
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
```

```
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      2.29
  TOTAL AREA(ACRES) =      1.25   PEAK FLOW RATE(CFS) =      2.29

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    789.70  DOWNSTREAM(FEET) =    786.20
  CHANNEL LENGTH THRU SUBAREA(FEET) =   266.00   CHANNEL SLOPE =  0.0132
  CHANNEL BASE(FEET) =    1.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.846
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 D        2.08      0.20     0.100    57
  NATURAL POOR COVER
  "BARREN"                   D        0.74      0.20     1.000    83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.336
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.56
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.59
  AVERAGE FLOW DEPTH(FEET) =   0.31   TRAVEL TIME(MIN.) =   1.24
  Tc(MIN.) =    7.14
  SUBAREA AREA(ACRES) =     2.82       SUBAREA RUNOFF(CFS) =    4.51
  EFFECTIVE AREA(ACRES) =      4.07     AREA-AVERAGED Fm(INCH/HR) =   0.05
  AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.26
  TOTAL AREA(ACRES) =        4.1         PEAK FLOW RATE(CFS) =       6.57

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.36   FLOW VELOCITY(FEET/SEC.) =   3.90
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     544.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   781.80  DOWNSTREAM(FEET) =   779.70
  FLOW LENGTH(FEET) =   143.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.99
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.57
  PIPE TRAVEL TIME(MIN.) =   0.34    Tc(MIN.) =    7.48
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =     687.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    7.48
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.797
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 D        1.67      0.20     0.100    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.67      SUBAREA RUNOFF(CFS) =    2.67
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  EFFECTIVE AREA(ACRES) =       5.74   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.22
  TOTAL AREA(ACRES) =         5.7        PEAK FLOW RATE(CFS) =       9.06

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   779.70  DOWNSTREAM(FEET) =   777.00
  FLOW LENGTH(FEET) =   273.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  13.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.51
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.06
  PIPE TRAVEL TIME(MIN.) =   0.70    Tc(MIN.) =    8.18
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =     960.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      5.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    8.18
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.707
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "BARREN"                   D        1.24      0.20     1.000    83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    1.24      SUBAREA RUNOFF(CFS) =    1.68
  EFFECTIVE AREA(ACRES) =      6.98   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.36
  TOTAL AREA(ACRES) =         7.0        PEAK FLOW RATE(CFS) =      10.28

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   777.00  DOWNSTREAM(FEET) =   775.80
  FLOW LENGTH(FEET) =   129.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  12.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.68
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.28
  PIPE TRAVEL TIME(MIN.) =   0.32    Tc(MIN.) =    8.50
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.00 =    1089.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =    788.50  DOWNSTREAM(FEET) =    783.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.698
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.914
```

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SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
NATURAL POOR COVER
"BARREN"                    D        0.71      0.20      1.000    83   11.57
COMMERCIAL                  D        0.26      0.20      0.100    57    6.70
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.759
SUBAREA RUNOFF(CFS) =       1.54
TOTAL AREA(ACRES) =       0.97   PEAK FLOW RATE(CFS) =       1.54

****************************************************************************
FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =    783.30  DOWNSTREAM(FEET) =    780.00
CHANNEL LENGTH THRU SUBAREA(FEET) =   194.00   CHANNEL SLOPE =  0.0170
CHANNEL BASE(FEET) =    1.00   "Z" FACTOR =  10.000
MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
*   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.771
SUBAREA LOSS RATE DATA(AMC  I ):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
NATURAL POOR COVER
"BARREN"                    D        1.23      0.20      1.000    83
COMMERCIAL                  D        0.20      0.20      0.100    57
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.874
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.57
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.34
AVERAGE FLOW DEPTH(FEET) =   0.23   TRAVEL TIME(MIN.) =   0.97
Tc(MIN.) =    7.67
SUBAREA AREA(ACRES) =     1.43       SUBAREA RUNOFF(CFS) =    2.05
EFFECTIVE AREA(ACRES) =      2.40     AREA-AVERAGED Fm(INCH/HR) =   0.17
AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.83
TOTAL AREA(ACRES) =        2.4         PEAK FLOW RATE(CFS) =       3.47

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.26   FLOW VELOCITY(FEET/SEC.) =   3.65
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =     494.00 FEET.
============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)      =        2.4  TC(MIN.) =      7.67
EFFECTIVE AREA(ACRES) =      2.40  AREA-AVERAGED Fm(INCH/HR)=  0.17
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.827
PEAK FLOW RATE(CFS)   =       3.47
============================================================================
============================================================================
END OF RATIONAL METHOD ANALYSIS
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♀

LOSS CALCULATION - EXISTING 2 YR (120328-SS)

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*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

TOTAL 24-HOUR DURATION RAINFALL DEPTH = 2.05 (inches)

SOIL-COVER TYPE	AREA (Acres)	PERCENT OF PERVIOUS AREA	SCS CURVE NUMBER	LOSS RATE Fp(in./hr.)	YIELD
1	5.46	10.00	95.(AMC II)	0.200	0.847
2	3.92	100.00	83.(AMC II)	0.200	0.092

TOTAL AREA (Acres) = 9.38

AREA-AVERAGED LOSS RATE, $\overline{Fm}$ (in./hr.) = 0.095

AREA-AVERAGED LOW LOSS FRACTION, $\overline{Y}$ = 0.468

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VOLUME CALCULATION - 2 YR EXISTING (120328-SS)

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.93
TOTAL CATCHMENT AREA(ACRES) = 9.38
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.095
LOW LOSS FRACTION = 0.468
TIME OF CONCENTRATION(MIN.) = 8.50
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
RETURN FREQUENCY(YEARS) = 2
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.19
30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.40
1-HOUR POINT RAINFALL VALUE(INCHES) = 0.53
3-HOUR POINT RAINFALL VALUE(INCHES) = 0.89
6-HOUR POINT RAINFALL VALUE(INCHES) = 1.22
24-HOUR POINT RAINFALL VALUE(INCHES) = 2.05

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 0.90
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.70

****

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	5.0	10.0	15.0	20.0
0.13	0.0009	0.15	Q	.	.	.	.
0.28	0.0026	0.15	Q	.	.	.	.
0.42	0.0044	0.15	Q	.	.	.	.
0.56	0.0061	0.15	Q	.	.	.	.
0.70	0.0079	0.15	Q	.	.	.	.
0.84	0.0097	0.15	Q	.	.	.	.
0.98	0.0115	0.15	Q	.	.	.	.
1.12	0.0133	0.15	Q	.	.	.	.
1.27	0.0151	0.16	Q	.	.	.	.
1.41	0.0169	0.16	Q	.	.	.	.
1.55	0.0188	0.16	Q	.	.	.	.
1.69	0.0206	0.16	Q	.	.	.	.
1.83	0.0225	0.16	Q	.	.	.	.
1.98	0.0243	0.16	Q	.	.	.	.
2.12	0.0262	0.16	Q	.	.	.	.
2.26	0.0281	0.16	Q	.	.	.	.
2.40	0.0300	0.16	Q	.	.	.	.
2.54	0.0319	0.16	Q	.	.	.	.
2.68	0.0339	0.17	Q	.	.	.	.
2.83	0.0358	0.17	Q	.	.	.	.
2.97	0.0378	0.17	Q	.	.	.	.
3.11	0.0397	0.17	Q	.	.	.	.
3.25	0.0417	0.17	Q	.	.	.	.
3.39	0.0437	0.17	Q	.	.	.	.
3.53	0.0457	0.17	Q	.	.	.	.
3.67	0.0477	0.17	Q	.	.	.	.
3.82	0.0498	0.17	Q	.	.	.	.
3.96	0.0518	0.18	Q	.	.	.	.
4.10	0.0539	0.18	Q	.	.	.	.
4.24	0.0560	0.18	Q	.	.	.	.
4.38	0.0581	0.18	Q	.	.	.	.
4.53	0.0602	0.18	Q	.	.	.	.
4.67	0.0623	0.18	Q	.	.	.	.
4.81	0.0645	0.18	Q	.	.	.	.

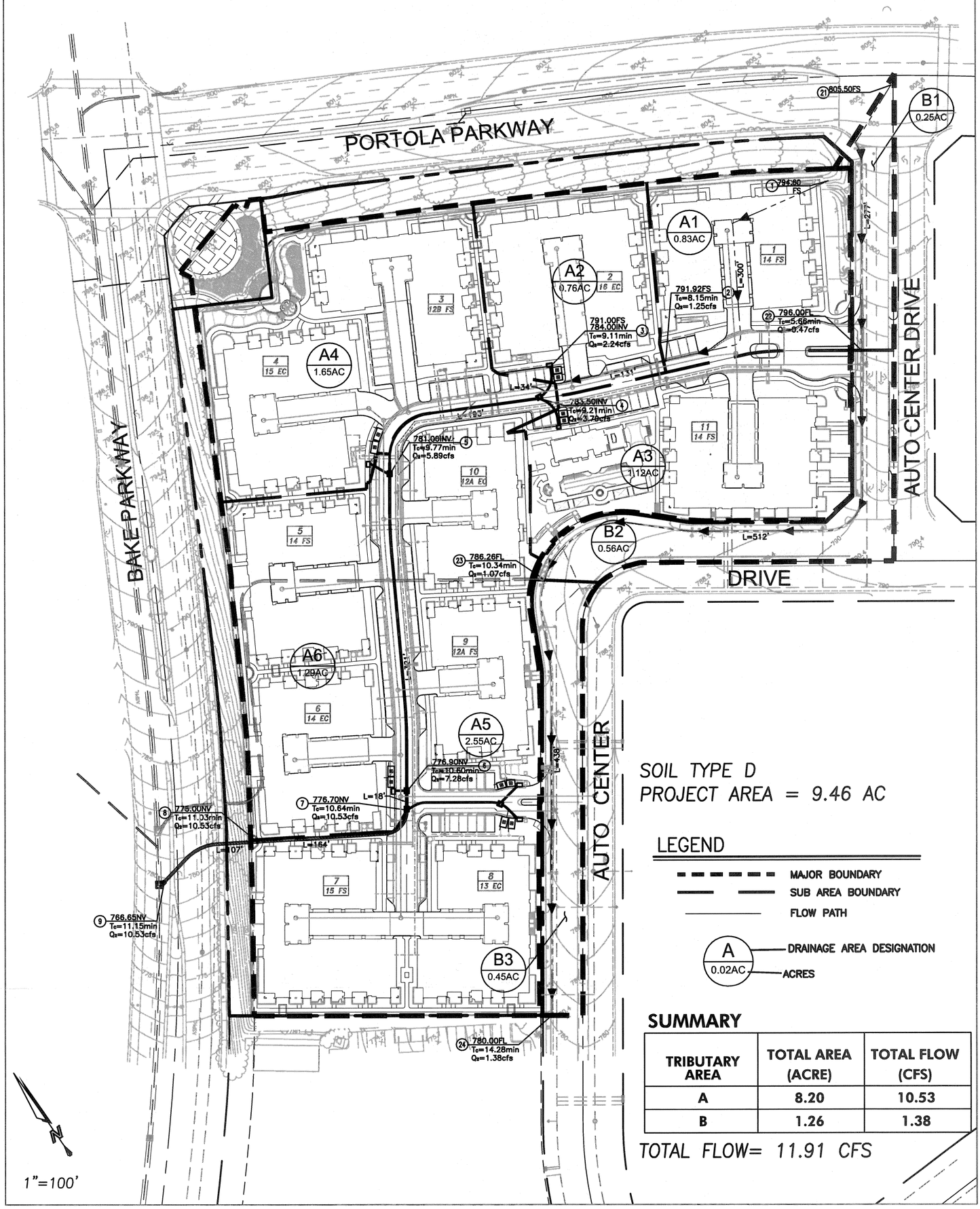
4.95	0.0667	0.19	Q	.	.	.	.
5.09	0.0688	0.19	Q	.	.	.	.
5.23	0.0710	0.19	Q	.	.	.	.
5.38	0.0733	0.19	Q	.	.	.	.
5.52	0.0755	0.19	Q	.	.	.	.
5.66	0.0778	0.19	Q	.	.	.	.
5.80	0.0800	0.19	Q	.	.	.	.
5.94	0.0823	0.20	Q	.	.	.	.
6.08	0.0846	0.20	Q	.	.	.	.
6.22	0.0870	0.20	Q	.	.	.	.
6.37	0.0893	0.20	Q	.	.	.	.
6.51	0.0917	0.20	Q	.	.	.	.
6.65	0.0941	0.21	Q	.	.	.	.
6.79	0.0965	0.21	Q	.	.	.	.
6.93	0.0990	0.21	Q	.	.	.	.
7.07	0.1014	0.21	Q	.	.	.	.
7.22	0.1039	0.21	Q	.	.	.	.
7.36	0.1065	0.22	Q	.	.	.	.
7.50	0.1090	0.22	Q	.	.	.	.
7.64	0.1116	0.22	Q	.	.	.	.
7.78	0.1142	0.22	Q	.	.	.	.
7.93	0.1168	0.23	Q	.	.	.	.
8.07	0.1195	0.23	Q	.	.	.	.
8.21	0.1221	0.23	Q	.	.	.	.
8.35	0.1249	0.23	Q	.	.	.	.
8.49	0.1276	0.24	Q	.	.	.	.
8.63	0.1304	0.24	Q	.	.	.	.
8.77	0.1332	0.24	Q	.	.	.	.
8.92	0.1360	0.24	Q	.	.	.	.
9.06	0.1389	0.25	Q	.	.	.	.
9.20	0.1418	0.25	Q	.	.	.	.
9.34	0.1448	0.25	Q	.	.	.	.
9.48	0.1478	0.26	Q	.	.	.	.
9.62	0.1508	0.26	Q	.	.	.	.
9.77	0.1539	0.26	Q	.	.	.	.
9.91	0.1570	0.27	Q	.	.	.	.
10.05	0.1602	0.27	Q	.	.	.	.
10.19	0.1634	0.28	Q	.	.	.	.
10.33	0.1666	0.28	Q	.	.	.	.
10.48	0.1699	0.29	Q	.	.	.	.
10.62	0.1733	0.29	Q	.	.	.	.
10.76	0.1767	0.29	Q	.	.	.	.
10.90	0.1802	0.30	Q	.	.	.	.
11.04	0.1837	0.31	Q	.	.	.	.
11.18	0.1873	0.31	Q	.	.	.	.
11.32	0.1910	0.32	Q	.	.	.	.
11.47	0.1947	0.32	Q	.	.	.	.
11.61	0.1985	0.33	Q	.	.	.	.
11.75	0.2024	0.33	Q	.	.	.	.
11.89	0.2063	0.34	Q	.	.	.	.
12.03	0.2103	0.35	Q	.	.	.	.
12.18	0.2149	0.43	Q	.	.	.	.
12.32	0.2200	0.44	Q	.	.	.	.
12.46	0.2253	0.45	Q	.	.	.	.
12.60	0.2306	0.46	Q	.	.	.	.
12.74	0.2360	0.47	Q	.	.	.	.
12.88	0.2416	0.48	Q	.	.	.	.
13.02	0.2473	0.50	Q	.	.	.	.
13.17	0.2532	0.50	.Q	.	.	.	.
13.31	0.2592	0.52	.Q	.	.	.	.
13.45	0.2654	0.53	.Q	.	.	.	.
13.59	0.2717	0.55	.Q	.	.	.	.
13.73	0.2783	0.57	.Q	.	.	.	.

13.88	0.2851	0.59	.Q
14.02	0.2921	0.61	.Q
14.16	0.2995	0.66	.Q
14.30	0.3073	0.68	.Q
14.44	0.3155	0.72	.Q
14.58	0.3240	0.74	.Q
14.73	0.3330	0.79	.Q
14.87	0.3425	0.82	.Q
15.01	0.3525	0.90	.Q
15.15	0.3633	0.94	.Q
15.29	0.3755	1.15	. Q
15.43	0.3897	1.27	. Q
15.57	0.4050	1.35	. Q
15.72	0.4224	1.63	. Q
15.86	0.4480	2.74	. Q
16.00	0.4877	4.04	. Q
16.14	0.5918	13.75	. Q
16.28	0.6843	2.06	. Q
16.42	0.7031	1.14	. Q
16.57	0.7159	1.04	. Q
16.71	0.7270	0.86	.Q
16.85	0.7365	0.77	.Q
16.99	0.7450	0.70	.Q
17.13	0.7528	0.63	.Q
17.27	0.7598	0.58	.Q
17.42	0.7664	0.54	.Q
17.56	0.7726	0.51	.Q
17.70	0.7784	0.49	Q
17.84	0.7840	0.47	Q
17.98	0.7893	0.45	Q
18.12	0.7942	0.38	Q
18.27	0.7984	0.34	Q
18.41	0.8022	0.32	Q
18.55	0.8060	0.31	Q
18.69	0.8096	0.30	Q
18.83	0.8130	0.29	Q
18.98	0.8164	0.28	Q
19.12	0.8197	0.27	Q
19.26	0.8228	0.27	Q
19.40	0.8259	0.26	Q
19.54	0.8289	0.25	Q
19.68	0.8318	0.25	Q
19.83	0.8346	0.24	Q
19.97	0.8374	0.23	Q
20.11	0.8401	0.23	Q
20.25	0.8428	0.22	Q
20.39	0.8454	0.22	Q
20.53	0.8479	0.22	Q
20.67	0.8504	0.21	Q
20.82	0.8529	0.21	Q
20.96	0.8553	0.20	Q
21.10	0.8576	0.20	Q
21.24	0.8599	0.20	Q
21.38	0.8622	0.19	Q
21.52	0.8645	0.19	Q
21.67	0.8667	0.19	Q
21.81	0.8688	0.18	Q
21.95	0.8710	0.18	Q
22.09	0.8731	0.18	Q
22.23	0.8751	0.18	Q
22.38	0.8772	0.17	Q
22.52	0.8792	0.17	Q
22.66	0.8812	0.17	Q

22.80	0.8831	0.17	Q	.	.	.	.
22.94	0.8850	0.16	Q	.	.	.	.
23.08	0.8870	0.16	Q	.	.	.	.
23.23	0.8888	0.16	Q	.	.	.	.
23.37	0.8907	0.16	Q	.	.	.	.
23.51	0.8925	0.16	Q	.	.	.	.
23.65	0.8943	0.15	Q	.	.	.	.
23.79	0.8961	0.15	Q	.	.	.	.
23.93	0.8979	0.15	Q	.	.	.	.
24.08	0.8997	0.15	Q	.	.	.	.
24.22	0.9005	0.00	Q	.	.	.	.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1445.0
10%	42.5
20%	17.0
30%	8.5
40%	8.5
50%	8.5
60%	8.5
70%	8.5
80%	8.5
90%	8.5



SOIL TYPE D
PROJECT AREA = 9.46 AC

LEGEND

- MAJOR BOUNDARY
- SUB AREA BOUNDARY
- FLOW PATH
- A — DRAINAGE AREA DESIGNATION
- 0.02AC — ACRES

SUMMARY

TRIBUTARY AREA	TOTAL AREA (ACRE)	TOTAL FLOW (CFS)
A	8.20	10.53
B	1.26	1.38

TOTAL FLOW= 11.91 CFS

FOOTHILL RANCH TOWN CENTER
PR. HYDROLOGY MAP
LAKE FOREST, CALIFORNIA
MARCH 28, 2012

BROOKFIELD HOMES

FUSCOE ENGINEERING
16795 Von Karman, Suite 100
Irvine, California 92606
tel 949.474.1960 • fax 949.474.5315
www.fuscoe.com

P:\PROJECTS\308\44\ENG\EXHIBITS\HYDROLOGY\HYDROMOD\X30844-HYDROLOGY-PR-2YR.DWG (04-06-12 1:28:25PM) Plotted by: April McMillian

```
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
          (c) Copyright 1983-2010 Advanced Engineering Software (aes)
              Ver. 17.0  Release Date: 07/01/2010  License ID 1355

                          Analysis prepared by:

                            Fuscoe Engineering, Inc.
                         16795 Von Karman Ave. Ste. 100
                            Irvine, California 92606
                     PH: 949-474-1960    Fax: 949-474-5315

 ************************** DESCRIPTION OF STUDY **************************
* LAKE FOREST TOWN CENTER                                                  *
* PROPOSED 2 YR HYDROLOGY                                                  *
* 120328-SS                                                                *
 ***************************************************************************

  FILE NAME: 30844P2.DAT
  TIME/DATE OF STUDY: 16:11 03/28/2012
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *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.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =    794.60  DOWNSTREAM(FEET) =    791.92

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.151
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.710
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 D        0.83      0.20     0.200    57    8.15
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
```

```
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.25
  TOTAL AREA(ACRES) =      0.83   PEAK FLOW RATE(CFS) =      1.25

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    791.92  DOWNSTREAM(FEET) =    791.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   131.00   CHANNEL SLOPE =  0.0070
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.604
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 D        0.76      0.20     0.200    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.78
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.28
  AVERAGE FLOW DEPTH(FEET) =   0.28   TRAVEL TIME(MIN.) =   0.96
  Tc(MIN.) =    9.11
  SUBAREA AREA(ACRES) =     0.76       SUBAREA RUNOFF(CFS) =    1.07
  EFFECTIVE AREA(ACRES) =      1.59     AREA-AVERAGED Fm(INCH/HR) =   0.04
  AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.20
  TOTAL AREA(ACRES) =        1.6         PEAK FLOW RATE(CFS) =       2.24

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.31   FLOW VELOCITY(FEET/SEC.) =   2.36
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     431.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   784.00  DOWNSTREAM(FEET) =   783.50
  FLOW LENGTH(FEET) =    34.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.45
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.24
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =    9.21
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =     465.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.21
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.594
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 D        1.12      0.20     0.200    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    1.12       SUBAREA RUNOFF(CFS) =    1.57
  EFFECTIVE AREA(ACRES) =      2.71   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
```

```
  TOTAL AREA(ACRES) =        2.7       PEAK FLOW RATE(CFS) =       3.79

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   783.50  DOWNSTREAM(FEET) =   781.00
  FLOW LENGTH(FEET) =   193.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   9.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.73
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.79
  PIPE TRAVEL TIME(MIN.) =   0.56    Tc(MIN.) =    9.77
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =     658.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      5.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.77
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.541
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 D       1.65      0.20      0.200    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    1.65      SUBAREA RUNOFF(CFS) =    2.23
  EFFECTIVE AREA(ACRES) =      4.36   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        4.4       PEAK FLOW RATE(CFS) =       5.89

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   781.00  DOWNSTREAM(FEET) =   776.90
  FLOW LENGTH(FEET) =   321.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.48
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.89
  PIPE TRAVEL TIME(MIN.) =   0.83    Tc(MIN.) =   10.60
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.00 =     979.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      6.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.60
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.471
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 D       1.29      0.20      0.200    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    1.29      SUBAREA RUNOFF(CFS) =    1.66
  EFFECTIVE AREA(ACRES) =      5.65   AREA-AVERAGED Fm(INCH/HR) =  0.04
```

```
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        5.7       PEAK FLOW RATE(CFS) =       7.28

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      7.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   776.90  DOWNSTREAM(FEET) =   776.70
  FLOW LENGTH(FEET) =    18.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.56
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.28
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =   10.64
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =     997.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.64
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.467
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 D        1.25      0.20      0.200    57
  APARTMENTS                 D        1.30      0.20      0.200    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    2.55      SUBAREA RUNOFF(CFS) =    3.28
  EFFECTIVE AREA(ACRES) =      8.20   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        8.2       PEAK FLOW RATE(CFS) =      10.53

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      8.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   776.70  DOWNSTREAM(FEET) =   775.00
  FLOW LENGTH(FEET) =   164.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  12.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.00
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.53
  PIPE TRAVEL TIME(MIN.) =   0.39    Tc(MIN.) =   11.03
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      8.00 =    1161.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      8.00 TO NODE      9.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   775.00  DOWNSTREAM(FEET) =   766.65
  FLOW LENGTH(FEET) =   107.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.98
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.53
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =   11.15
```

```
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      9.00 =    1268.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   277.00
 ELEVATION DATA: UPSTREAM(FEET) =    805.50  DOWNSTREAM(FEET) =    796.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.660
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.108
 SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                 D        0.25      0.20     0.100    57    5.66
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      0.47
 TOTAL AREA(ACRES) =      0.25   PEAK FLOW RATE(CFS) =      0.47

****************************************************************************
 FLOW PROCESS FROM NODE     22.00 TO NODE     23.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    796.00  DOWNSTREAM(FEET) =    786.26
 CHANNEL LENGTH THRU SUBAREA(FEET) =   512.00   CHANNEL SLOPE =  0.0190
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  50.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.492
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 D        0.56      0.20     0.100    57
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.85
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.82
 AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =   4.68
 Tc(MIN.) =   10.34
 SUBAREA AREA(ACRES) =     0.56       SUBAREA RUNOFF(CFS) =    0.74
 EFFECTIVE AREA(ACRES) =      0.81     AREA-AVERAGED Fm(INCH/HR) =   0.02
 AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.10
 TOTAL AREA(ACRES) =        0.8         PEAK FLOW RATE(CFS) =       1.07

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.10   FLOW VELOCITY(FEET/SEC.) =   1.99
 LONGEST FLOWPATH FROM NODE     21.00 TO NODE     23.00 =     789.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     23.00 TO NODE     24.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    786.26  DOWNSTREAM(FEET) =    780.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   438.00   CHANNEL SLOPE =  0.0143
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  50.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.239
 SUBAREA LOSS RATE DATA(AMC  I ):
```

```
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
COMMERCIAL                  D        0.45      0.20      0.100    57
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.32
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.85
AVERAGE FLOW DEPTH(FEET) =   0.12   TRAVEL TIME(MIN.) =   3.94
Tc(MIN.) =   14.28
SUBAREA AREA(ACRES) =     0.45       SUBAREA RUNOFF(CFS) =    0.49
EFFECTIVE AREA(ACRES) =      1.26     AREA-AVERAGED Fm(INCH/HR) =   0.02
AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.10
TOTAL AREA(ACRES) =        1.3         PEAK FLOW RATE(CFS) =       1.38

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   1.77
LONGEST FLOWPATH FROM NODE     21.00 TO NODE     24.00 =    1227.00 FEET.
============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)      =        1.3  TC(MIN.) =     14.28
EFFECTIVE AREA(ACRES) =      1.26  AREA-AVERAGED Fm(INCH/HR)=  0.02
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.100
PEAK FLOW RATE(CFS)    =       1.38
============================================================================
============================================================================
END OF RATIONAL METHOD ANALYSIS
```

♀

LOSS CALCULATION - PROPOSED 2 YR (120328-SS)

==========

*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

TOTAL 24-HOUR DURATION RAINFALL DEPTH = 2.05 (inches)

SOIL-COVER TYPE	AREA (Acres)	PERCENT OF PERVIOUS AREA	SCS CURVE NUMBER	LOSS RATE Fp(in./hr.)	YIELD
1	8.20	20.00	57.(AMC II)	0.200	0.712
2	1.26	10.00	95.(AMC II)	0.200	0.847

TOTAL AREA (Acres) = 9.46

AREA-AVERAGED LOSS RATE, $\overline{Fm}$ (in./hr.) = 0.037

AREA-AVERAGED LOW LOSS FRACTION, $\overline{Y}$ = 0.270

==========

VOLUME CALCULATION - PROPOSED 2 YR (120328-SS)

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA(ACRES) = 9.46
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.037
LOW LOSS FRACTION = 0.270
TIME OF CONCENTRATION(MIN.) = 11.03
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
RETURN FREQUENCY(YEARS) = 2
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.19
30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.40
1-HOUR POINT RAINFALL VALUE(INCHES) = 0.53
3-HOUR POINT RAINFALL VALUE(INCHES) = 0.89
6-HOUR POINT RAINFALL VALUE(INCHES) = 1.22
24-HOUR POINT RAINFALL VALUE(INCHES) = 2.05

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 1.15
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.47

****

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	5.0	10.0	15.0	20.0
0.01	0.0000	0.00	Q	.	.	.	.
0.19	0.0015	0.20	Q	.	.	.	.
0.37	0.0045	0.20	Q	.	.	.	.
0.56	0.0076	0.20	Q	.	.	.	.
0.74	0.0107	0.20	Q	.	.	.	.
0.93	0.0138	0.20	Q	.	.	.	.
1.11	0.0169	0.21	Q	.	.	.	.
1.29	0.0201	0.21	Q	.	.	.	.
1.48	0.0232	0.21	Q	.	.	.	.
1.66	0.0264	0.21	Q	.	.	.	.
1.84	0.0297	0.21	Q	.	.	.	.
2.03	0.0329	0.21	Q	.	.	.	.
2.21	0.0362	0.22	Q	.	.	.	.
2.40	0.0395	0.22	Q	.	.	.	.
2.58	0.0428	0.22	Q	.	.	.	.
2.76	0.0462	0.22	Q	.	.	.	.
2.95	0.0496	0.22	Q	.	.	.	.
3.13	0.0530	0.23	Q	.	.	.	.
3.32	0.0565	0.23	Q	.	.	.	.
3.50	0.0599	0.23	Q	.	.	.	.
3.68	0.0634	0.23	Q	.	.	.	.
3.87	0.0670	0.23	Q	.	.	.	.
4.05	0.0706	0.24	Q	.	.	.	.
4.23	0.0742	0.24	Q	.	.	.	.
4.42	0.0778	0.24	Q	.	.	.	.
4.60	0.0815	0.24	Q	.	.	.	.
4.79	0.0852	0.25	Q	.	.	.	.
4.97	0.0890	0.25	Q	.	.	.	.
5.15	0.0928	0.25	Q	.	.	.	.
5.34	0.0966	0.25	Q	.	.	.	.
5.52	0.1005	0.26	Q	.	.	.	.
5.71	0.1044	0.26	Q	.	.	.	.
5.89	0.1084	0.26	Q	.	.	.	.
6.07	0.1124	0.26	Q	.	.	.	.

6.26	0.1165	0.27	Q
6.44	0.1206	0.27	Q
6.62	0.1247	0.28	Q
6.81	0.1289	0.28	Q
6.99	0.1332	0.28	Q
7.18	0.1375	0.28	Q
7.36	0.1418	0.29	Q
7.54	0.1463	0.29	Q
7.73	0.1507	0.30	Q
7.91	0.1553	0.30	Q
8.10	0.1599	0.31	Q
8.28	0.1646	0.31	Q
8.46	0.1693	0.32	Q
8.65	0.1741	0.32	Q
8.83	0.1790	0.32	Q
9.01	0.1840	0.33	Q
9.20	0.1890	0.34	Q
9.38	0.1941	0.34	Q
9.57	0.1993	0.35	Q
9.75	0.2047	0.35	Q
9.93	0.2101	0.36	Q
10.12	0.2156	0.36	Q
10.30	0.2212	0.37	Q
10.49	0.2269	0.38	Q
10.67	0.2327	0.39	Q
10.85	0.2387	0.40	Q
11.04	0.2448	0.41	Q
11.22	0.2510	0.41	Q
11.40	0.2574	0.43	Q
11.59	0.2639	0.43	Q
11.77	0.2707	0.45	Q
11.96	0.2775	0.46	Q
12.14	0.2851	0.54	.Q
12.32	0.2937	0.59	.Q
12.51	0.3027	0.61	.Q
12.69	0.3120	0.62	.Q
12.87	0.3216	0.64	.Q
13.06	0.3315	0.66	.Q
13.24	0.3418	0.69	.Q
13.43	0.3523	0.70	.Q
13.61	0.3633	0.74	.Q
13.79	0.3747	0.76	.Q
13.98	0.3866	0.81	.Q
14.16	0.3992	0.84	.Q
14.35	0.4128	0.95	.Q
14.53	0.4277	1.00	. Q
14.71	0.4438	1.12	. Q
14.90	0.4614	1.19	. Q
15.08	0.4808	1.37	. Q
15.26	0.5024	1.48	. Q
15.45	0.5264	1.67	. Q
15.63	0.5523	1.74	. Q
15.82	0.5857	2.66	. Q
16.00	0.6345	3.76	. Q
16.18	0.7536	11.91	. Q
16.37	0.8598	2.07	. Q
16.55	0.8879	1.62	. Q
16.74	0.9099	1.27	. Q
16.92	0.9276	1.06	. Q
17.10	0.9425	0.91	.Q
17.29	0.9554	0.78	.Q
17.47	0.9668	0.72	.Q
17.65	0.9774	0.67	.Q

VOLUME-2YR-PR

17.84	0.9873	0.63	.Q	.	.	.	.
18.02	0.9967	0.60	.Q	.	.	.	.
18.21	1.0047	0.47	Q	.	.	.	.
18.39	1.0116	0.44	Q	.	.	.	.
18.57	1.0182	0.42	Q	.	.	.	.
18.76	1.0244	0.40	Q	.	.	.	.
18.94	1.0304	0.38	Q	.	.	.	.
19.13	1.0361	0.37	Q	.	.	.	.
19.31	1.0416	0.36	Q	.	.	.	.
19.49	1.0469	0.34	Q	.	.	.	.
19.68	1.0520	0.33	Q	.	.	.	.
19.86	1.0570	0.32	Q	.	.	.	.
20.04	1.0618	0.31	Q	.	.	.	.
20.23	1.0665	0.30	Q	.	.	.	.
20.41	1.0710	0.29	Q	.	.	.	.
20.60	1.0754	0.29	Q	.	.	.	.
20.78	1.0798	0.28	Q	.	.	.	.
20.96	1.0840	0.27	Q	.	.	.	.
21.15	1.0881	0.27	Q	.	.	.	.
21.33	1.0921	0.26	Q	.	.	.	.
21.52	1.0960	0.26	Q	.	.	.	.
21.70	1.0998	0.25	Q	.	.	.	.
21.88	1.1036	0.24	Q	.	.	.	.
22.07	1.1073	0.24	Q	.	.	.	.
22.25	1.1109	0.24	Q	.	.	.	.
22.43	1.1144	0.23	Q	.	.	.	.
22.62	1.1179	0.23	Q	.	.	.	.
22.80	1.1213	0.22	Q	.	.	.	.
22.99	1.1247	0.22	Q	.	.	.	.
23.17	1.1280	0.22	Q	.	.	.	.
23.35	1.1313	0.21	Q	.	.	.	.
23.54	1.1345	0.21	Q	.	.	.	.
23.72	1.1376	0.21	Q	.	.	.	.
23.90	1.1407	0.20	Q	.	.	.	.
24.09	1.1438	0.20	Q	.	.	.	.
24.27	1.1453	0.00	Q	.	.	.	.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1444.9
10%	110.3
20%	33.1
30%	22.1
40%	11.0
50%	11.0
60%	11.0
70%	11.0
80%	11.0
90%	11.0

Appendix B

Notice of Transfer of Responsibility

NOTICE OF TRANSFER OF RESPONSIBILITY

WATER QUALITY MANAGEMENT PLAN

The Village at Foothill Ranch
VTTM 17466

Submission of this Notice Of Transfer of Responsibility constitutes notice to the City of Lake Forest that responsibility for the Water Quality Management Plan ("WQMP") for the subject property identified below, and implementation of that plan, is being transferred from the Previous Owner (and his/her agent) of the site (or a portion thereof) to the New Owner, as further described below.

I. Previous Owner/ Previous Responsible Party Information

Company/ Individual Name:		Contact Person:	
Street Address:		Title:	
City:	State:	ZIP:	Phone:

II. Information about Site Transferred

Name of Project (if applicable):	
Title of WQMP Applicable to site:	
Street Address of Site (if applicable):	
Planning Area (PA) and/ or Tract Number(s) for Site:	Lot Numbers (if Site is a portion of a tract):
Date WQMP Prepared (and revised if applicable):	

III. New Owner/ New Responsible Party Information

Company/ Individual Name:		Contact Person:	
Street Address:		Title:	
City:	State:	ZIP:	Phone:

IV. Ownership Transfer Information

General Description of Site Transferred to New Owner:	General Description of Portion of Project/ Parcel Subject to WQMP Retained by Owner (if any):

Lot/ Tract Numbers of Site Transferred to New Owner:
Remaining Lot/ Tract Numbers Subject to WQMP Still Held by Owner (if any):
Date of Ownership Transfer:

Note: When the Previous Owner is transferring a Site that is a portion of a larger project/ parcel addressed by the WQMP, as opposed to the entire project/parcel addressed by the WQMP, the General Description of the Site transferred and the remainder of the project/ parcel no transferred shall be set forth as maps attached to this notice. These maps shall show those portions of a project/ parcel addressed by the WQMP that are transferred to the New Owner (the Transferred Site), those portions retained by the Previous Owner, and those portions previously transferred by Previous Owner. Those portions retained by Previous Owner shall be labeled as "Previously Transferred".

V. Purpose of Notice of Transfer

The purposes of this Notice of Transfer of Responsibility are: 1) to track transfer of responsibility for implementation and amendment of the WQMP when property to which the WQMP is transferred from the Previous Owner to the New Owner, and 2) to facilitate notification to a transferee of property subject to a WQMP that such New Order is now the Responsible Party of record for the WQMP for those portions of the site that it owns.

VI. Certifications

A. Previous Owner

I certify under penalty of law that I am no longer the owner of the Transferred Site as described in Section II above. I have provided the New Owner with a copy of the WQMP applicable to the Transferred Site that the New Owner is acquiring from the Previous Owner.

Printed Name of Previous Owner Representative:	Title:
Signature of Previous Owner Representative:	Date:

B. New Owner

I certify under penalty of law that I am the owner of the Transferred Site, as described in Section II above, that I have been provided a copy of the WQMP, and that I have informed myself and understand the New Owner's responsibilities related to the WQMP, its implementation, and Best Management Practices associated with it. I understand that by signing this notice, the New Owner is accepting all ongoing responsibilities for implementation and amendment of the WQMP for the Transferred Site, which the New Owner has acquired from the Previous Owner.

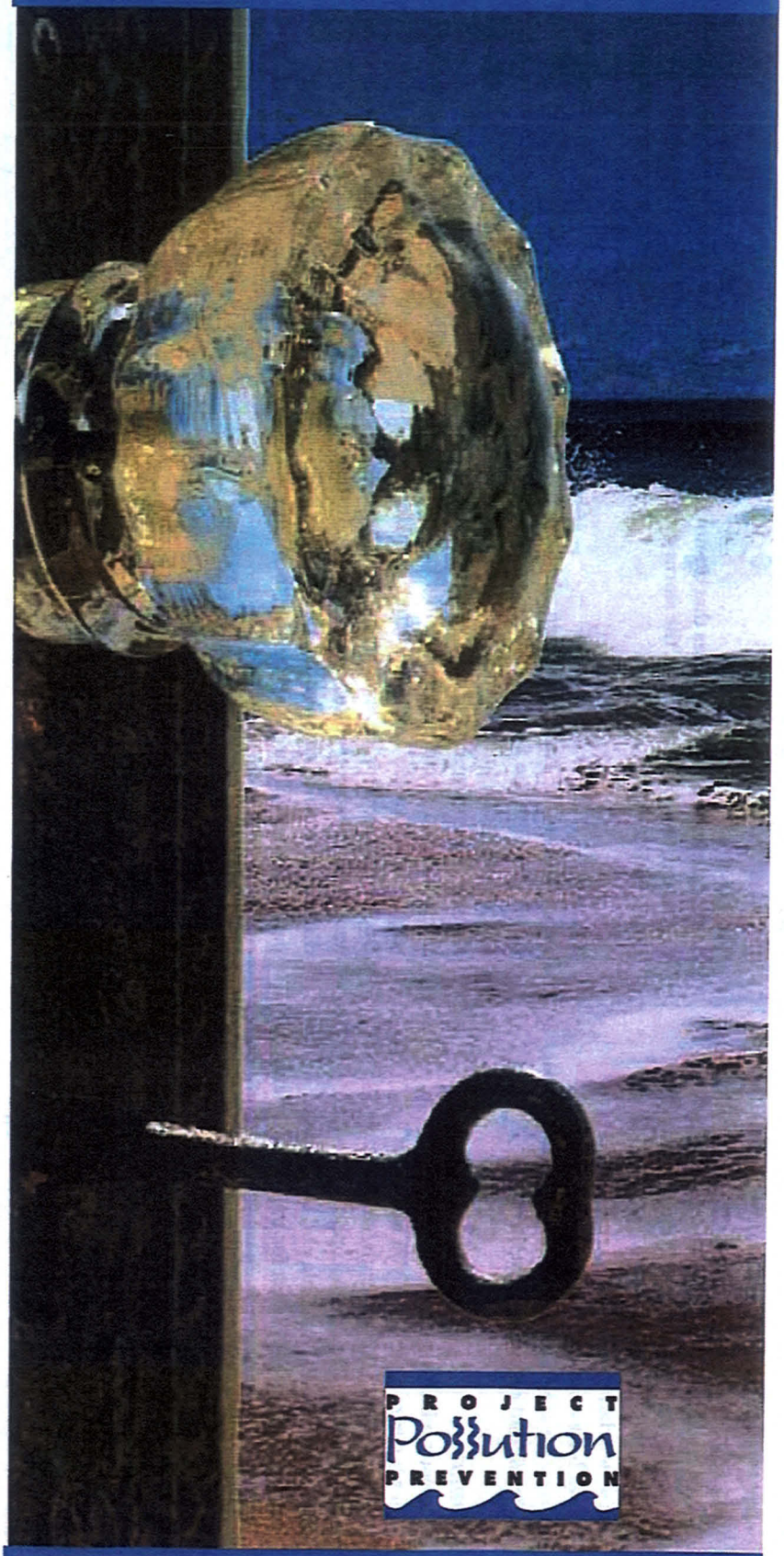
Printed Name of New Owner Representative:	Title:
Signature:	Date:

Appendix C

Appendix C

Educational Materials

The Ocean Begins at Your Front Door



Follow these simple steps to help reduce water pollution:

Household Activities

- Do not rinse spills with water. Use dry cleanup methods such as applying cat litter or another absorbent material, sweep and dispose of in the trash. Take items such as used or excess batteries, oven cleaners, automotive fluids, painting products and cathode ray tubes, like TVs and computer monitors, to a Household Hazardous Waste Collection Center (HHWCC).
- For a HHWCC near you call (714) 834-6752 or visit www.oclandfills.com.
- Do not hose down your driveway, sidewalk or patio to the street, gutter or storm drain. Sweep up debris and dispose of it in the trash.

Automotive

- Take your vehicle to a commercial car wash whenever possible. If you wash your vehicle at home, choose soaps, cleaners, or detergents labeled non-toxic, phosphate- free or biodegradable. Vegetable and citrus-based products are typically safest for the environment.
- Do not allow washwater from vehicle washing to drain into the street, gutter or storm drain. Excess washwater should be disposed of in the sanitary sewer (through a sink or toilet) or onto an absorbent surface like your lawn.
- Monitor your vehicles for leaks and place a pan under leaks. Keep your vehicles well maintained to stop and prevent leaks.
- Never pour oil or antifreeze in the street, gutter or storm drain. Recycle these substances at a service station, a waste oil collection center or used oil recycling center. For the nearest Used Oil Collection Center call 1-800-CLEANUP or visit www.1800cleanup.org.

Pool Maintenance

- Pool and spa water must be dechlorinated and free of excess acid, alkali or color to be allowed in the street, gutter or storm drain.
- When it is not raining, drain dechlorinated pool and spa water directly into the sanitary sewer.
- Some cities may have ordinances that do not allow pool water to be disposed of in the storm drain. Check with your city.

Landscape and Gardening

- Do not over-water. Water your lawn and garden by hand to control the amount of water you use or set irrigation systems to reflect seasonal water needs. If water flows off your yard onto your driveway or sidewalk, your system is over-watering. Periodically inspect and fix leaks and misdirected sprinklers.
- Do not rake or blow leaves, clippings or pruning waste into the street, gutter or storm drain. Instead, dispose of waste by composting, hauling it to a permitted landfill, or as green waste through your city's recycling program.
- Follow directions on pesticides and fertilizer, (measure, do not estimate amounts) and do not use if rain is predicted within 48 hours.
- Take unwanted pesticides to a HHWCC to be recycled. For locations and hours of HHWCC, call (714) 834-6752 or visit www.oclandfills.com.

Trash

- Place trash and litter that cannot be recycled in securely covered trash cans.
- Whenever possible, buy recycled products.
- Remember: Reduce, Reuse, Recycle.

Pet Care

- Always pick up after your pet. Flush waste down the toilet or dispose of it in the trash. Pet waste, if left outdoors, can wash into the street, gutter or storm drain.
- If possible, bathe your pets indoors. If you must bathe your pet outside, wash it on your lawn or another absorbent/permeable surface to keep the washwater from entering the street, gutter or storm drain.
- Follow directions for use of pet care products and dispose of any unused products at a HHWCC.

Common Pollutants

Home Maintenance

- Detergents, cleaners and solvents
- Oil and latex paint
- Swimming pool chemicals
- Outdoor trash and litter

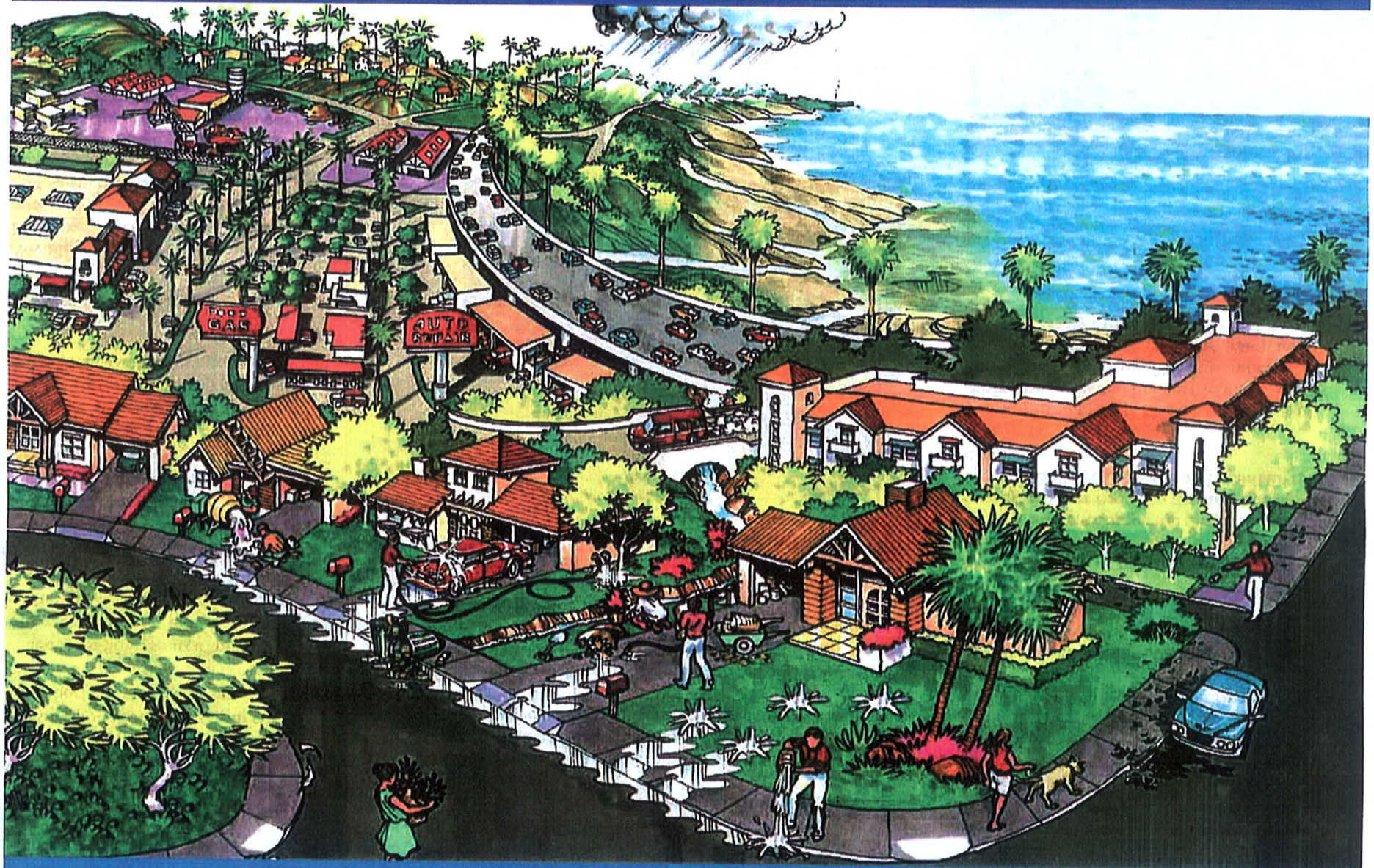
Lawn and Garden

- Pet and animal waste
- Pesticides
- Clippings, leaves and soil
- Fertilizer

Automobile

- Oil and grease
- Radiator fluids and antifreeze
- Cleaning chemicals
- Brake pad dust

The Ocean Begins at Your Front Door



Never allow pollutants to enter the street, gutter or storm drain!

Did You Know?

- Most people believe that the largest source of water pollution in urban areas comes from specific sources such as factories and sewage treatment plants. In fact, the largest source of water pollution comes from city streets, neighborhoods, construction sites and parking lots. This type of pollution is sometimes called "non-point source" pollution.
- There are two types of non-point source pollution: stormwater and urban runoff pollution.
- Stormwater runoff results from rainfall. When rainstorms cause large volumes of water to rinse the urban landscape, picking up pollutants along the way.
- Urban runoff can happen any time of the year when excessive water use from irrigation, vehicle washing and other sources carries trash, lawn clippings and other urban pollutants into storm drains.

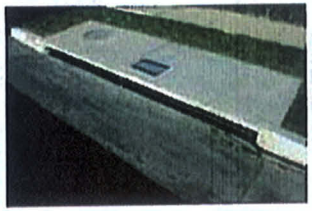
Where Does It Go?

- Anything we use outside homes, vehicles and businesses – like motor oil, paint, pesticides, fertilizers and cleaners – can be blown or washed into storm drains.
- A little water from a garden hose or rain can also send materials into storm drains.
- Storm drains are separate from our sanitary sewer systems; unlike water in sanitary sewers (from sinks or toilets), water in storm drains is not treated before entering our waterways.

Sources of Non-Point Source Pollution

- Automotive leaks and spills.
- Improper disposal of used oil and other engine fluids.
- Metals found in vehicle exhaust, weathered paint, rust, metal plating and tires.
- Pesticides and fertilizers from lawns, gardens and farms.
- Improper disposal of cleaners, paint and paint removers.
- Soil erosion and dust debris from landscape and construction activities.
- Litter, lawn clippings, animal waste, and other organic matter.
- Oil stains on parking lots and paved surfaces.

The Effect on the Ocean



Non-point source pollution can have a serious impact on water quality in Orange County. Pollutants from the storm drain system can harm marine life as well as coastal and wetland habitats. They can also degrade recreation areas such as beaches, harbors and bays.

Stormwater quality management programs have been developed throughout Orange County to educate and encourage the public to protect water quality, monitor runoff in the storm drain system, investigate illegal dumping and maintain storm drains.

Support from Orange County residents and businesses is needed to improve water quality and reduce urban runoff pollution. Proper use and disposal of materials will help stop pollution before it reaches the storm drain and the ocean.

For More Information

Orange County Stormwater Program

California Environmental Protection Agency
www.calepa.ca.gov

- **Air Resources Board**
  www.arb.ca.gov
- **Department of Pesticide Regulation**
  www.cdpr.ca.gov
- **Department of Toxic Substances Control**
  www.dtsc.ca.gov
- **Integrated Waste Management Board**
  www.ciwmb.ca.gov
- **Office of Environmental Health Hazard Assessment**
  www.oehha.ca.gov
- **State Water Resources Control Board**
  www.waterboards.ca.gov

Earth 911 - Community-Specific Environmental Information 1-800-cleanup or visit www.1800cleanup.org

Health Care Agency's Ocean and Bay Water Closure and Posting Hotline
(714) 433-6400 or visit www.ocbeachinfo.com

Integrated Waste Management Dept. of Orange County (714) 834-6752 or visit www.oclandfills.com for information on household hazardous waste collection centers, recycling centers and solid waste collection

O.C. Agriculture Commissioner
(714) 447-7100 or visit www.ocagcomm.com

Stormwater Best Management Practice Handbook
Visit www.cabmphandbooks.com

UC Master Gardener Hotline
(714) 708-1646 or visit www.uccemg.com

The Orange County Stormwater Program has created and moderates an electronic mailing list to facilitate communications, take questions and exchange ideas among its users about issues and topics related to stormwater and urban runoff and the implementation of program elements. To join the list, please send an email to ocstormwaterinfo-join@list.ocwatersheds.com

Aliso Viejo	(949)	425-2535
Anaheim Public Works Operations	(714)	765-6860
Brea Engineering	(714)	990-7666
Buena Park Public Works	(714)	562-3655
Costa Mesa Public Services	(714)	754-5323
Cypress Public Works	(714)	229-6740
Dana Point Public Works	(949)	248-3584
Fountain Valley Public Works	(714)	593-4441
Fullerton Engineering Dept.	(714)	738-6853
Garden Grove Public Works	(714)	741-5956
Huntington Beach Public Works	(714)	536-5431
Irvine Public Works	(949)	724-6315
La Habra Public Services	(562)	905-9792
La Palma Public Works	(714)	690-3310
Laguna Beach Water Quality	(949)	497-0378
Laguna Hills Public Services	(949)	707-2650
Laguna Niguel Public Works	(949)	362-4337
Laguna Woods Public Works	(949)	639-0500
Lake Forest Public Works	(949)	461-3480
Los Alamitos Community Dev.	(562)	431-3538
Mission Viejo Public Works	(949)	470-3056
Newport Beach, Code & Water Quality Enforcement	(949)	644-3215
Orange Public Works	(714)	532-6480
Placentia Public Works	(714)	993-8245
Rancho Santa Margarita	(949)	635-1800
San Clemente Environmental Programs	(949)	361-6143
San Juan Capistrano Engineering	(949)	234-4413
Santa Ana Public Works	(714)	647-3380
Seal Beach Engineering	(562)	431-2527 x317
Stanton Public Works	(714)	379-9222 x204
Tustin Public Works/Engineering	(714)	573-3150
Villa Park Engineering	(714)	998-1500
Westminster Public Works/Engineering	(714)	898-3311 x446
Yorba Linda Engineering	(714)	961-7138
Orange County Stormwater Program	(877)	897-7455

Orange County 24-Hour Water Pollution Problem Reporting Hotline
1-877-89-SPILL (1-877-897-7455)

On-line Water Pollution Problem Reporting Form
www.ocwatersheds.com

Printed on Recycled Paper