CITY OF COSTA MESA CALIFORNIA
INCORPORATED 1953

APPENDIX E

Hydrology Report and WQMP

CA ENGINEERING, INC.
Planning • Engineering • Surveying

PRELIMINARY HYDROLOGY & HYDRAULICS REPORT

FOR

T.T.M. 19351

220 – 236 Victoria St.

City of Costa Mesa, CA

Date: January 6, 2025
Revised: February 11, 2025
Revised: March 6, 2025

REGISTERED PROFESSIONAL ENGINEER
FRED CORNWELL
NO. 45591
CIVIL
STATE OF CALIFORNIA

PLANS PREPARED UNDER THE SUPERVISION OF:

3-6-25

Fred Cornwell, P.E. - R.C.E 45591 Date

Table of Contents

1.0 INTRODUCTION

The purpose of this report is to present the hydrology analysis and drainage calculations for a proposed residential development located 220 – 236 Victoria Street, in the City of Costa Mesa, California. The site proposes to construct 40 townhomes and related improvements on approximately 1.7 acres. This report will determine the existing and proposed storm water runoff rates from the project site and determine the impact on the existing surrounding drainage facilities,

2.0 EXISTING DRAINAGE CONDITIONS

The project site is located in the City of Costa Mesa, California, and is comprised of approximately 1.7 acres. The site currently has a boat storage facility, Allied Lighting building, Suburban Plumbing building, a house & Battery Mart building. There are no runoff flows from the neighboring sites, and all flows flow to the existing street.

3.0 PROPOSED DRAINAGE CONDITIONS

The drainage for the proposed project generally follows the existing flow characteristics. The site flows from north to south and the proposed site will also flow from the north to the south. The on-site flows will be picked up in drain inlets and conveyed southerly via an on-site drainage system. The on-site drainage system will convey the flows to a proposed Modular Wetlands System (MWS) that will treat the low flows, and will contain a bypass for the greater storm flows.

Once the flows are treated they will be conveyed to a proposed curb opening catch basin in Victoria Place. From there the flows will connect via a proposed 18” concrete pipe to the existing public storm drain system. The proposed improvements are shown on the Conceptual Grading Plan included as Exhibit D.

4.0 METHODOLOGY

The hydrology calculations for the study were completed using AES software based on the Orange County Hydrology Manual methodology. The Rational Method was used to determine the peak discharges for the pre-and post-developed conditions and can be found in Appendix “A” (existing) & Appendix “B” (proposed).

These peak flow rates for the 2, 10, 25 and 100 year storm events will be compared in the results section of this report found below. The hydrologic sub areas and flow paths that produce these rates are shown on the Existing (Exhibit A) & Proposed (Exhibit B) hydrology maps.

The on-site drainage will be analyzed for surface flows only, and will not model the low flow inlets for the existing or proposed condition. Since the site is flat and has low ponding areas for both the existing and proposed condition, a surface flow path slope of 0.002 will be implemented for both the existing and proposed condition. This will accurately model the pre and post development flow comparison.

The proposed curb opening catch basin and 18” outlet pipe located in Victoria Place will also be analyzed for adequate capacity.

5.0 HYDRAULICS

5.1 CATCH BASIN CALCULATIONS

The Tables below show the sizing of the proposed grated & curb inlet catch basins.
Flow values from the Proposed Hydrology for the catch basins.

GRATED BASINS: Q = (P) (3.0) (H)3/2
(From Bureau of Public Rds.)
INPUT: "Q" (cfs)
"P" = Effective Perimeter of Basin (ft)
(Assumes 50% clogging)

Grated Basins						
Catch Basin #	**Node #**	**Q100 (CFS)**	**Basin Size**	**Perimeter**	**50% P**	**Depth (H)**
1	2	0.9	18”	6’	3’	0.26’
2	3	1.65	24”	8’	4'	0.26’
3	5	1.60	24”	8’	4'	0.26’
4	11	0.91	18”	6’	3’	0.26’
5	12	1.65	24”	8’	4'	0.26’
6	14	1.60	24”	8’	4'	0.26’

Note – The proposed catch basins will have filter inserts that will treat the first flush flow amounts.

The inlets will allow the proposed flows into the system with a maximum ponding of approximately 3” during a 100-year storm event. Once the flows enter the system they will be conveyed to the modular wetlands where the flow will be treated and then discharged into the existing storm drain system.

5.2 Pipe Flows & Weir Calculations:

There will be low flow pipes installed in both drive aisles to convey flows to the Modular Wetlands unit. The pipes have a maximum capacity of 1.33 cfs (Appendix “D”) which is greater than the flows that need to be treated but are less than the total flows tributary to the inlets. The excess flows greater than the pipe capacities will flow down the drive aisles to Victoria St. which is how the hydrology calculations were modeled.

There are a couple of high points in the drive aisles that will act as a weir if the pipe system fails. To determine the depth of flow over the high points, the weir equation from King’s Handbook of Hydraulics will be implemented.
Q=CLH^1.5 : H=(Q/CL)^0.666
C=2.68
L = 25’
Q = 2.5 cfs (As shown on the piping hydrology map – 1st confluence)

H=(2.5/2.68*25)^0.6666 = 0.11’

The average depth of 0.11’ will have no adverse effect on the proposed development.

5.3 OFFSITE CATCH BASIN

The project proposes upgrading the existing grated inlet located on Victoria Place in an existing ribbon gutter near the Southeast corner of the site. The Grated inlet will be replaced with a curb opening catch basin. The catch basin will capture the existing tributary flows, and convey the treated onsite flows into the existing public storm drain system. The Tables below show the sizing of the proposed curb inlet catch basin on Victoria Place.

Sump Basins: Q = (3.087) (L) (a + y)3/2
(From "Green Book")
INPUT: "Q" (cfs)
"a" = Gutter Depression (in)
"y" = Flow Depth in Gutter (ft)
MAX (a+y) =0.625’
"L" = Length

Sump Basin					
Catch Basin #	**Inlet Q100 (cfs)**	**Depth (ft)**	**L (Required) (ft)**	**C.B. Length**	**C.B. Type**
1	7.41	0.625	4.86	5'	CURB INLET

One 5 foot catch basin will be used to capture the 100 year flows tributary from the subject site and a parcel to the West as shown on Exhibit A. Since the proposed project is reducing the flows, to be conservative the existing tributary flows (7.41 cfs) were used to size the proposed catch basin.

5.4 OFFSITE OUTLET PIPE CALCULATIONS

Outlet Pipe Calculations					
Pipe	**100 Year Storm Flow (cfs)**	**HDPE/PVC Pipe Lateral Size (in.)**	**Slope (ft/ft)**	**Pipe Capacity (cfs)**	**Pipe Capacity >= 100 Year Flow**
Outlet Pipe	7.41	18	0.020	15.98	Yes

As shown in the table above, the proposed 18” outlet pipe will have enough capacity to convey the tributary flows to the existing storm drain system. Hydraulic calculations for the pipe are included in Appendix "D".

6.0 WATER QUALITY

The BMP facilities will be sized to capture and treat the Design Flow Rate (DFR) per the Technical Guidance Document as published by the County of Orange. More information about the water quality and BMP sizing can be found in the Water Quality Management Plan (WQMP) Site plan (Exhibit E).

Since there are no Hydraulic Conditions of Concern (HCOC’s), the flows will not have to be detained.

7.0 FLOOD PLAIN DESIGNATION

The site falls within a Zone "X" designation under the FEMA Map 06059C0268J, dated December 3, 2009. Zone X (Shaded Orange Area) represents areas determined 0.2% annual chance flood hazard, area of 1% annual chance flood with average depth less than one foot or with drainage areas less than one square mile.

8.0 RESULTS

The results of the Existing and Proposed (overall hydrology map) conditions for the existing site outlet location as shown on the hydrology maps are as follows:

	Existing Condition	Tc (min)	Proposed Condition	Tc (min)	Increase (Decrease)
2 Year Storm	2.02 CFS	13.31	1.88 CFS	14.70	**(0.14) CFS**
10 Year Storm	3.72 CFS	12.94	3.45 CFS	14.47	**(0.27) CFS**
25 Year Storm	4.47 CFS	12.84	4.16 CFS	14.38	**(0.31) CFS**
100 Year Storm	5.75 CFS	12.69	5.34 CFS	14.26	**(0.41) CFS**

During a 100-year storm event, existing flows (5.75 CFS) will be decreased by 0.41 CFS under proposed conditions (5.34 CFS). For the 25-year storm event, existing flows (4.47 CFS) will be decreased 0.31 CFS under proposed conditions (4.16 CFS). For the 10-year storm event, existing flows (3.72 CFS) will be decreased 0.27 CFS under proposed conditions (3.45 CFS). For the 2-year storm event, existing flows (2.02 CFS) will be decreased by 0.14 CFS under proposed conditions (1.88 CFS).

9.0 CONCLUSION

To meet water quality requirements, the DFR will be captured onsite with grated inlet catch basins and conveyed to the MWS. During larger storm events, as with existing conditions, drainage for the proposed project will outlet onto Victoria Pl. The drainage will then flow into the proposed curb inlet catch basin, and outlet into the existing public storm drain system via a proposed 18" concrete pipe.

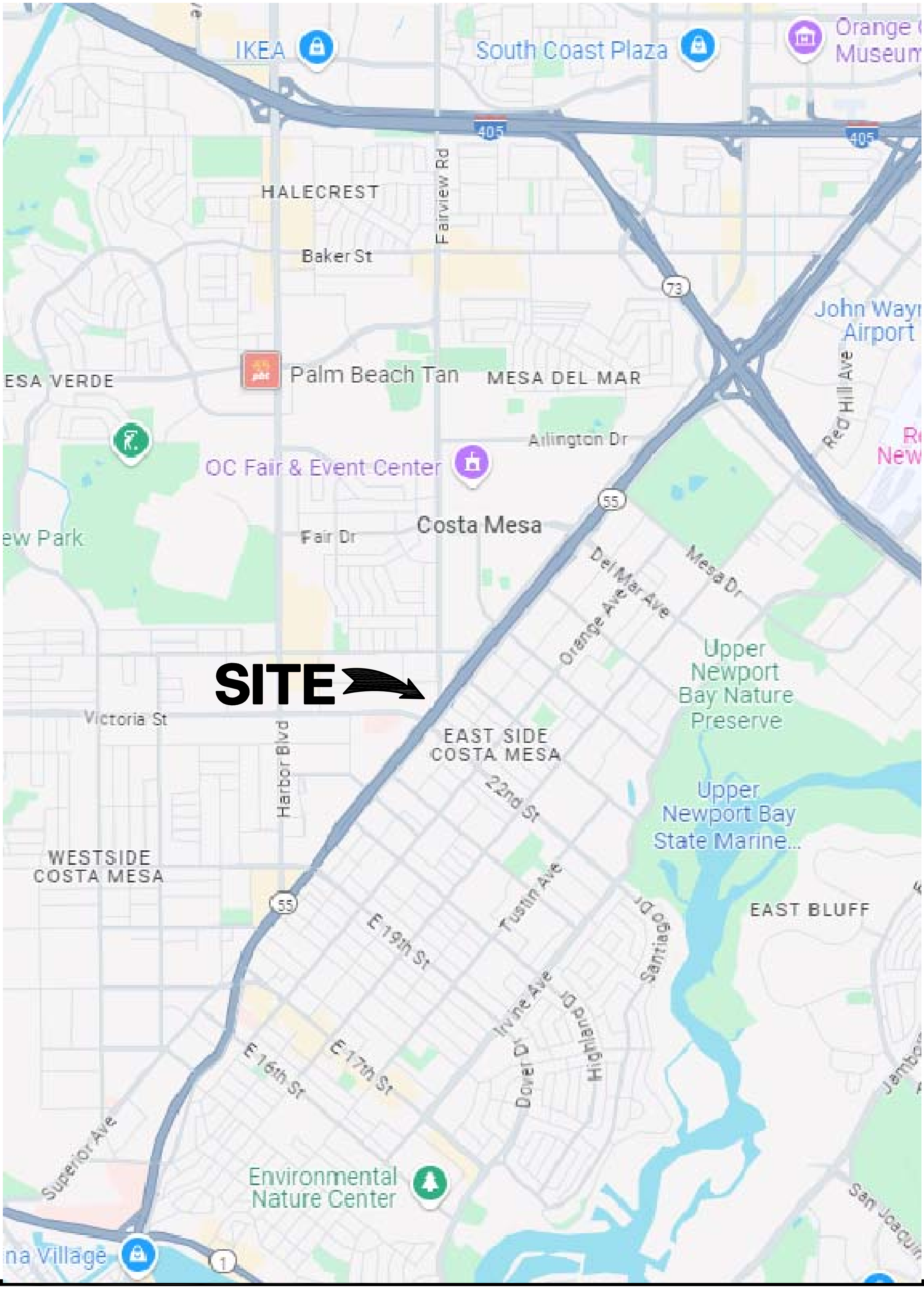
During normal storm conditions no onsite ponding will occur. However, in the event of a 100 year storm event or a clogged drainage system, there will be approximately 3" of ponding as shown in the inlet & weir calculations. As depicted on the proposed Hydrology Map (Exhibit B), the ponding will be contained in the private drive aisles and kept away from the building pad areas. To prevent the onsite drainage system from clogging, routine maintenance of the curb inlets, inlet filters, and onsite storm drain will take place as detailed on the project's WQMP.

The proposed project will decrease the peak flows due to the reduction of impervious area. In addition, the existing site has low ponding points, and very little fall. The implementation of drainage devices will improve the drainage for the site, and resolve both of these issues.

10.0 VICINITY MAP

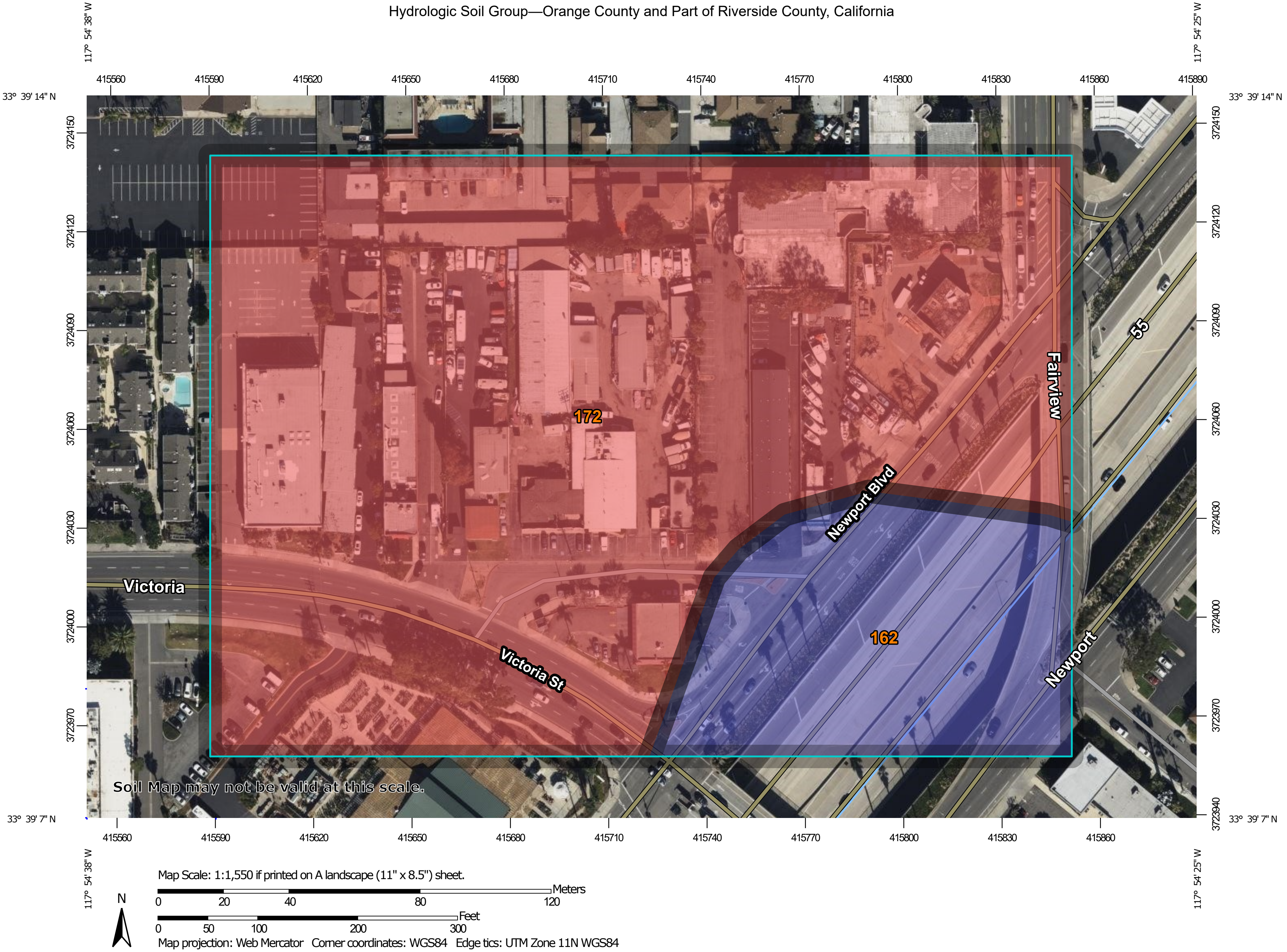
VICINITY MAP

N.T.S.



11.0 SOIL MAP

Hydrologic Soil Group—Orange County and Part of Riverside County, California



Map Scale: 1:1,550 if printed on A landscape (11" x 8.5") sheet.

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 1:24,000.

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: Orange County and Part of Riverside County, California
Survey Area Data: Version 17, Aug 30, 2023

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

Date(s) aerial images were photographed: Jan 17, 2023—Feb 8, 2023

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
162	Marina loamy sand, 2 to 9 percent slopes	B	2.1	18.0%
172	Myford sandy loam, 0 to 2 percent slopes	D	9.8	82.0%
Totals for Area of Interest			**11.9**	**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

APPENDICES

APPENDIX A: EXISTING RATIONAL METHOD, 2, 10, 25 & 100 YEAR STORM FREQUENCY OUTPUT FILES.

```
 ****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
          (c) Copyright 1983-2008 Advanced Engineering Software (aes)
              Ver. 15.0  Release Date: 04/01/2008  License ID 1420

                            Analysis prepared by:

                                CA Engineering
                         13821 Newport Ave., Ste 110
                              Tustin, Ca. 92780


  ************************** DESCRIPTION OF STUDY **************************
 * EXISTING CONDITION                                                        *
 * 2 YR STORM                                                                *
 *                                                                           *
  **************************************************************************

   FILE NAME: 727-6EX.DAT
   TIME/DATE OF STUDY: 18:27 02/05/2025
 ============================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ============================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =    2.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
   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) =   292.00
   ELEVATION DATA: UPSTREAM(FEET) =     84.63  DOWNSTREAM(FEET) =     84.05

   Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
```

```
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.219
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.502
  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        0.90      0.20     0.100    57   10.22
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      1.20
  TOTAL AREA(ACRES) =      0.90   PEAK FLOW RATE(CFS) =      1.20

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =     84.05
  DOWNSTREAM NODE ELEVATION(FEET) =     83.72
  CHANNEL LENGTH THRU SUBAREA(FEET) =   161.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   2.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.290
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 D        0.87      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) =      1.70
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.87
  AVERAGE FLOW DEPTH(FEET) =   0.17   FLOOD WIDTH(FEET) =   27.17
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   3.09   Tc(MIN.) =   13.31
  SUBAREA AREA(ACRES) =    0.87       SUBAREA RUNOFF(CFS) =    0.99
  EFFECTIVE AREA(ACRES) =    1.77     AREA-AVERAGED Fm(INCH/HR) =   0.02
  AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.10
  TOTAL AREA(ACRES) =        1.8         PEAK FLOW RATE(CFS) =       2.02

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.18   FLOOD WIDTH(FEET) =   29.06
  FLOW VELOCITY(FEET/SEC.) =   0.91   DEPTH*VELOCITY(FT*FT/SEC) =   0.16
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     453.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.8  TC(MIN.) =     13.31
  EFFECTIVE AREA(ACRES) =      1.77  AREA-AVERAGED Fm(INCH/HR)=  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =       2.02
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
         (c) Copyright 1983-2008 Advanced Engineering Software (aes)
             Ver. 15.0  Release Date: 04/01/2008  License ID 1420

                           Analysis prepared by:

                               CA Engineering
                        13821 Newport Ave., Ste 110
                             Tustin, Ca. 92780


 ************************** DESCRIPTION OF STUDY **************************
* EXISTING CONDITION                                                       *
* 10 YR STORM                                                              *
*                                                                          *
 **************************************************************************

  FILE NAME: 727-6EX.DAT
  TIME/DATE OF STUDY: 18:26 02/05/2025
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II 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) =   292.00
  ELEVATION DATA: UPSTREAM(FEET) =     84.63  DOWNSTREAM(FEET) =     84.05

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.219
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.695
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
```

```
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                D        0.90      0.20     0.100    75   10.22
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      2.17
  TOTAL AREA(ACRES) =      0.90   PEAK FLOW RATE(CFS) =      2.17

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =     84.05
  DOWNSTREAM NODE ELEVATION(FEET) =     83.72
  CHANNEL LENGTH THRU SUBAREA(FEET) =   161.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   2.00
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.354
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                D        0.87      0.20     0.100    75
  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) =      3.08
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.98
  AVERAGE FLOW DEPTH(FEET) =   0.21   FLOOD WIDTH(FEET) =   34.74
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   2.73   Tc(MIN.) =   12.94
  SUBAREA AREA(ACRES) =    0.87       SUBAREA RUNOFF(CFS) =    1.83
  EFFECTIVE AREA(ACRES) =    1.77     AREA-AVERAGED Fm(INCH/HR) =   0.02
  AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.10
  TOTAL AREA(ACRES) =        1.8         PEAK FLOW RATE(CFS) =       3.72

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.22   FLOOD WIDTH(FEET) =   37.40
  FLOW VELOCITY(FEET/SEC.) =   1.03   DEPTH*VELOCITY(FT*FT/SEC) =   0.23
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     453.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.8  TC(MIN.) =     12.94
  EFFECTIVE AREA(ACRES) =      1.77  AREA-AVERAGED Fm(INCH/HR)=  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =       3.72
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
         (c) Copyright 1983-2008 Advanced Engineering Software (aes)
             Ver. 15.0  Release Date: 04/01/2008  License ID 1420

                           Analysis prepared by:

                               CA Engineering
                        13821 Newport Ave., Ste 110
                             Tustin, Ca. 92780


 ************************** DESCRIPTION OF STUDY **************************
 * EXISTING CONDITION                                                     *
 * 25 YR STORM                                                            *
 *                                                                        *
 **************************************************************************

  FILE NAME: 727-6EX.DAT
  TIME/DATE OF STUDY: 18:25 02/05/2025
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II 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) =   292.00
  ELEVATION DATA: UPSTREAM(FEET) =     84.63  DOWNSTREAM(FEET) =     84.05

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.219
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.219
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  COMMERCIAL                 D        0.90      0.20     0.100    75   10.22
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      2.59
  TOTAL AREA(ACRES) =      0.90   PEAK FLOW RATE(CFS) =      2.59

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =     84.05
  DOWNSTREAM NODE ELEVATION(FEET) =     83.72
  CHANNEL LENGTH THRU SUBAREA(FEET) =   161.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   2.00
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.828
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 D        0.87      0.20     0.100    75
  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) =      3.69
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.02
  AVERAGE FLOW DEPTH(FEET) =   0.22   FLOOD WIDTH(FEET) =   37.40
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   2.62   Tc(MIN.) =   12.84
  SUBAREA AREA(ACRES) =    0.87       SUBAREA RUNOFF(CFS) =    2.20
  EFFECTIVE AREA(ACRES) =    1.77     AREA-AVERAGED Fm(INCH/HR) =   0.02
  AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.10
  TOTAL AREA(ACRES) =        1.8         PEAK FLOW RATE(CFS) =       4.47

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.24   FLOOD WIDTH(FEET) =   40.43
  FLOW VELOCITY(FEET/SEC.) =   1.07   DEPTH*VELOCITY(FT*FT/SEC) =   0.25
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     453.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.8  TC(MIN.) =     12.84
  EFFECTIVE AREA(ACRES) =      1.77  AREA-AVERAGED Fm(INCH/HR)=  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =       4.47
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
          (c) Copyright 1983-2008 Advanced Engineering Software (aes)
              Ver. 15.0  Release Date: 04/01/2008  License ID 1420

                            Analysis prepared by:

                                CA Engineering
                         13821 Newport Ave., Ste 110
                              Tustin, Ca. 92780


 ************************** DESCRIPTION OF STUDY **************************
 * EXISTING CONDITION                                                       *
 * 100 YR STORM                                                             *
 *                                                                          *
 **************************************************************************

  FILE NAME: 727-6EX.DAT
  TIME/DATE OF STUDY: 18:25 02/05/2025
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) III 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) =   292.00
  ELEVATION DATA: UPSTREAM(FEET) =     84.63  DOWNSTREAM(FEET) =     84.05

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.219
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.108
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  COMMERCIAL                 D        0.90      0.20     0.100    91   10.22
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      3.31
  TOTAL AREA(ACRES) =      0.90   PEAK FLOW RATE(CFS) =      3.31

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =     84.05
  DOWNSTREAM NODE ELEVATION(FEET) =     83.72
  CHANNEL LENGTH THRU SUBAREA(FEET) =   161.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   2.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.628
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 D        0.87      0.20     0.100    91
  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) =      4.73
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.09
  AVERAGE FLOW DEPTH(FEET) =   0.24   FLOOD WIDTH(FEET) =   41.19
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   2.47   Tc(MIN.) =   12.69
  SUBAREA AREA(ACRES) =    0.87       SUBAREA RUNOFF(CFS) =    2.83
  EFFECTIVE AREA(ACRES) =    1.77     AREA-AVERAGED Fm(INCH/HR) =   0.02
  AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.10
  TOTAL AREA(ACRES) =        1.8         PEAK FLOW RATE(CFS) =       5.75

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.26   FLOOD WIDTH(FEET) =   44.60
  FLOW VELOCITY(FEET/SEC.) =   1.13   DEPTH*VELOCITY(FT*FT/SEC) =   0.29
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     453.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.8  TC(MIN.) =     12.69
  EFFECTIVE AREA(ACRES) =      1.77  AREA-AVERAGED Fm(INCH/HR)=  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =       5.75
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

<u>APPENDIX B</u>: PROPOSED RATIONAL METHOD, 2, 10, 25 & 100 YEAR STORM FREQUENCY OUTPUT FILES. (OVERALL CONDITION)

```
 ****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
          (c) Copyright 1983-2008 Advanced Engineering Software (aes)
              Ver. 15.0  Release Date: 04/01/2008  License ID 1420

                            Analysis prepared by:

                                CA Engineering
                         13821 Newport Ave., Ste 110
                               Tustin, Ca. 92780


  ************************** DESCRIPTION OF STUDY **************************
 * PROPOSED CONDITION                                                       *
 * 2 YR STORM                                                               *
 *                                                                          *
  **************************************************************************

   FILE NAME: 727-6PR.DAT
   TIME/DATE OF STUDY: 18:24 02/05/2025
 ============================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ============================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =    2.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
   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) =   291.00
   ELEVATION DATA: UPSTREAM(FEET) =     85.50  DOWNSTREAM(FEET) =     84.90

   Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
```

```
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.796
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.455
  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        0.61      0.20     0.200    57   10.80
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.78
  TOTAL AREA(ACRES) =      0.61   PEAK FLOW RATE(CFS) =      0.78

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =     84.90
  DOWNSTREAM NODE ELEVATION(FEET) =     84.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   276.00
  "V" GUTTER WIDTH(FEET) =   3.00   GUTTER HIKE(FEET) =  0.120
  PAVEMENT LIP(FEET) =  0.050   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   0.50
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.219
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 D        1.16      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) =      1.39
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.18
  AVERAGE FLOW DEPTH(FEET) =   0.27   FLOOD WIDTH(FEET) =   13.38
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   3.90   Tc(MIN.) =   14.70
  SUBAREA AREA(ACRES) =    1.16       SUBAREA RUNOFF(CFS) =    1.23
  EFFECTIVE AREA(ACRES) =    1.77     AREA-AVERAGED Fm(INCH/HR) =   0.04
  AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.20
  TOTAL AREA(ACRES) =        1.8         PEAK FLOW RATE(CFS) =       1.88

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.30   FLOOD WIDTH(FEET) =   15.96
  FLOW VELOCITY(FEET/SEC.) =   1.21   DEPTH*VELOCITY(FT*FT/SEC) =   0.36
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     567.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.8  TC(MIN.) =     14.70
  EFFECTIVE AREA(ACRES) =      1.77  AREA-AVERAGED Fm(INCH/HR)=  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.200
  PEAK FLOW RATE(CFS)   =       1.88
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
          (c) Copyright 1983-2008 Advanced Engineering Software (aes)
              Ver. 15.0  Release Date: 04/01/2008  License ID 1420

                            Analysis prepared by:

                                CA Engineering
                          13821 Newport Ave., Ste 110
                               Tustin, Ca. 92780


 ************************** DESCRIPTION OF STUDY **************************
* PROPOSED CONDITION                                                       *
* 10 YR STORM                                                              *
*                                                                          *
 **************************************************************************

  FILE NAME: 727-6PR.DAT
  TIME/DATE OF STUDY: 18:23 02/05/2025
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II 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) =   291.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.50  DOWNSTREAM(FEET) =     84.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.796
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.612
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  APARTMENTS                 D        0.61      0.20     0.200    75   10.80
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.41
  TOTAL AREA(ACRES) =      0.61   PEAK FLOW RATE(CFS) =      1.41

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =     84.90
  DOWNSTREAM NODE ELEVATION(FEET) =     84.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   276.00
  "V" GUTTER WIDTH(FEET) =   3.00   GUTTER HIKE(FEET) =  0.120
  PAVEMENT LIP(FEET) =  0.050   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   0.50
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.209
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 D        1.16      0.20     0.200    75
  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) =      2.54
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.25
  AVERAGE FLOW DEPTH(FEET) =   0.33   FLOOD WIDTH(FEET) =   18.66
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   3.67   Tc(MIN.) =   14.47
  SUBAREA AREA(ACRES) =    1.16       SUBAREA RUNOFF(CFS) =    2.26
  EFFECTIVE AREA(ACRES) =    1.77     AREA-AVERAGED Fm(INCH/HR) =   0.04
  AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.20
  TOTAL AREA(ACRES) =        1.8        PEAK FLOW RATE(CFS) =       3.45

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.36   FLOOD WIDTH(FEET) =   21.76
  FLOW VELOCITY(FEET/SEC.) =   1.30   DEPTH*VELOCITY(FT*FT/SEC) =   0.47
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     567.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.8  TC(MIN.) =     14.47
  EFFECTIVE AREA(ACRES) =      1.77  AREA-AVERAGED Fm(INCH/HR)=  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.200
  PEAK FLOW RATE(CFS)   =       3.45
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
         (c) Copyright 1983-2008 Advanced Engineering Software (aes)
             Ver. 15.0  Release Date: 04/01/2008  License ID 1420

                           Analysis prepared by:

                               CA Engineering
                        13821 Newport Ave., Ste 110
                             Tustin, Ca. 92780


 ************************** DESCRIPTION OF STUDY **************************
* PROPOSED CONDITION                                                        *
* 25 YR STORM                                                               *
*                                                                           *
 **************************************************************************

  FILE NAME: 727-6PR.DAT
  TIME/DATE OF STUDY: 18:22 02/05/2025
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II 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) =   291.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.50  DOWNSTREAM(FEET) =     84.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.796
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.120
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  APARTMENTS                 D        0.61      0.20     0.200    75   10.80
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.69
  TOTAL AREA(ACRES) =      0.61   PEAK FLOW RATE(CFS) =      1.69

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =     84.90
  DOWNSTREAM NODE ELEVATION(FEET) =     84.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   276.00
  "V" GUTTER WIDTH(FEET) =   3.00   GUTTER HIKE(FEET) =  0.120
  PAVEMENT LIP(FEET) =  0.050   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   0.50
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.652
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 D        1.16      0.20     0.200    75
  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) =      3.05
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.28
  AVERAGE FLOW DEPTH(FEET) =   0.34   FLOOD WIDTH(FEET) =   20.47
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   3.59   Tc(MIN.) =   14.38
  SUBAREA AREA(ACRES) =    1.16       SUBAREA RUNOFF(CFS) =    2.73
  EFFECTIVE AREA(ACRES) =    1.77     AREA-AVERAGED Fm(INCH/HR) =   0.04
  AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.20
  TOTAL AREA(ACRES) =        1.8         PEAK FLOW RATE(CFS) =       4.16

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.38   FLOOD WIDTH(FEET) =   23.69
  FLOW VELOCITY(FEET/SEC.) =   1.35   DEPTH*VELOCITY(FT*FT/SEC) =   0.51
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     567.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.8  TC(MIN.) =     14.38
  EFFECTIVE AREA(ACRES) =      1.77  AREA-AVERAGED Fm(INCH/HR)=  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.200
  PEAK FLOW RATE(CFS)   =       4.16
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
         (c) Copyright 1983-2008 Advanced Engineering Software (aes)
             Ver. 15.0  Release Date: 04/01/2008  License ID 1420

                           Analysis prepared by:

                               CA Engineering
                        13821 Newport Ave., Ste 110
                             Tustin, Ca. 92780


 ************************** DESCRIPTION OF STUDY **************************
* PROPOSED CONDITION                                                       *
* 100 YR STORM                                                             *
*                                                                          *
 **************************************************************************

  FILE NAME: 727-6PR.DAT
  TIME/DATE OF STUDY: 18:21 02/05/2025
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) III 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) =   291.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.50  DOWNSTREAM(FEET) =     84.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.796
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.981
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  APARTMENTS                 D        0.61      0.20     0.200    91   10.80
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      2.16
  TOTAL AREA(ACRES) =      0.61   PEAK FLOW RATE(CFS) =      2.16

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =     84.90
  DOWNSTREAM NODE ELEVATION(FEET) =     84.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   276.00
  "V" GUTTER WIDTH(FEET) =   3.00   GUTTER HIKE(FEET) =  0.120
  PAVEMENT LIP(FEET) =  0.050   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   0.50
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.394
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 D        1.16      0.20     0.200    91
  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) =      3.91
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.33
  AVERAGE FLOW DEPTH(FEET) =   0.37   FLOOD WIDTH(FEET) =   23.04
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   3.46   Tc(MIN.) =   14.26
  SUBAREA AREA(ACRES) =    1.16       SUBAREA RUNOFF(CFS) =    3.50
  EFFECTIVE AREA(ACRES) =    1.77     AREA-AVERAGED Fm(INCH/HR) =   0.04
  AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.20
  TOTAL AREA(ACRES) =        1.8        PEAK FLOW RATE(CFS) =       5.34

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.41   FLOOD WIDTH(FEET) =   26.53
  FLOW VELOCITY(FEET/SEC.) =   1.41   DEPTH*VELOCITY(FT*FT/SEC) =   0.57
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     567.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.8  TC(MIN.) =     14.26
  EFFECTIVE AREA(ACRES) =      1.77  AREA-AVERAGED Fm(INCH/HR)=  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.200
  PEAK FLOW RATE(CFS)   =       5.34
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

APPENDIX C: PROPOSED RATIONAL METHOD, 2, 10, 25 & 100 YEAR STORM FREQUENCY OUTPUT FILES. (CATCH BASINS)

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
         (c) Copyright 1983-2008 Advanced Engineering Software (aes)
             Ver. 15.0  Release Date: 04/01/2008  License ID 1420

                           Analysis prepared by:

                               CA Engineering
                         13821 Newport Ave., Ste 110
                             Tustin, Ca. 92780


 ************************** DESCRIPTION OF STUDY **************************
 * PROPOSED CONDITION                                                       *
 * 2 YR STORM                                                               *
 * CATCH BASINS                                                             *
 **************************************************************************

  FILE NAME: 727-6PR.DAT
  TIME/DATE OF STUDY: 14:52 09/24/2024
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  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) =   128.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.50  DOWNSTREAM(FEET) =     84.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
```

```
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.595
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.931
  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        0.19      0.20     0.200    57    6.60
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.19   PEAK FLOW RATE(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    82.40  DOWNSTREAM(FEET) =    81.80
  FLOW LENGTH(FEET) =   112.80   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   2.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.22
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.32
  PIPE TRAVEL TIME(MIN.) =   0.85    Tc(MIN.) =    7.44
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     240.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 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.) =    7.44
  RAINFALL INTENSITY(INCH/HR) =   1.80
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.19
  TOTAL STREAM AREA(ACRES) =       0.19
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.32

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      3.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   117.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.40  DOWNSTREAM(FEET) =     84.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.249
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.992
  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        0.34      0.20     0.200    57    6.25
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.60
  TOTAL AREA(ACRES) =      0.34   PEAK FLOW RATE(CFS) =      0.60
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 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.) =    6.25
  RAINFALL INTENSITY(INCH/HR) =   1.99
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.34
  TOTAL STREAM AREA(ACRES) =       0.34
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.60

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        0.32    7.44    1.802  0.20( 0.04) 0.20       0.2       1.00
      2        0.60    6.25    1.992  0.20( 0.04) 0.20       0.3       4.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        0.90    6.25    1.992  0.20( 0.04) 0.20       0.5       4.00
      2        0.86    7.44    1.802  0.20( 0.04) 0.20       0.5       1.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       0.90    Tc(MIN.) =     6.25
  EFFECTIVE AREA(ACRES) =       0.50   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        0.5
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     240.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 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) =    81.80  DOWNSTREAM(FEET) =    81.00
  FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.89
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.90
  PIPE TRAVEL TIME(MIN.) =   0.92    Tc(MIN.) =    7.17
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =     400.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      5.00 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.) =    7.17
  RAINFALL INTENSITY(INCH/HR) =   1.84
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.50
  TOTAL STREAM AREA(ACRES) =       0.53
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.90

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      5.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   160.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.20  DOWNSTREAM(FEET) =     84.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.953
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.873
  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        0.35      0.20     0.200    57    6.95
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.58
  TOTAL AREA(ACRES) =      0.35   PEAK FLOW RATE(CFS) =      0.58

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      5.00 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.) =    6.95
  RAINFALL INTENSITY(INCH/HR) =   1.87
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.35
  TOTAL STREAM AREA(ACRES) =       0.35
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.58

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        0.90    7.17    1.840  0.20( 0.04) 0.20       0.5       4.00
      1        0.86    8.38    1.683  0.20( 0.04) 0.20       0.5       1.00
      2        0.58    6.95    1.873  0.20( 0.04) 0.20       0.3       6.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        1.46    6.95    1.873  0.20( 0.04) 0.20       0.8       6.00
      2        1.47    7.17    1.840  0.20( 0.04) 0.20       0.8       4.00
      3        1.38    8.38    1.683  0.20( 0.04) 0.20       0.9       1.00
```

```
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       1.47    Tc(MIN.) =     7.17
  EFFECTIVE AREA(ACRES) =       0.85   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        0.9
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =     400.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 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) =    81.00  DOWNSTREAM(FEET) =    79.70
  FLOW LENGTH(FEET) =   142.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.10
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.47
  PIPE TRAVEL TIME(MIN.) =   0.58    Tc(MIN.) =    7.75
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =     542.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   128.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.50  DOWNSTREAM(FEET) =     84.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.395
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.965
  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       0.19      0.20     0.200    57    6.40
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.33
  TOTAL AREA(ACRES) =      0.19   PEAK FLOW RATE(CFS) =      0.33

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    81.30  DOWNSTREAM(FEET) =    80.70
  FLOW LENGTH(FEET) =   113.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   2.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.21
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
```

```
  PIPE-FLOW(CFS) =       0.33
  PIPE TRAVEL TIME(MIN.) =   0.85    Tc(MIN.) =    7.25
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     241.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 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.) =    7.25
  RAINFALL INTENSITY(INCH/HR) =   1.83
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.19
  TOTAL STREAM AREA(ACRES) =       0.19
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.33

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     12.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   117.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.40  DOWNSTREAM(FEET) =     84.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.249
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.992
  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        0.34      0.20     0.200    57    6.25
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.60
  TOTAL AREA(ACRES) =      0.34   PEAK FLOW RATE(CFS) =      0.60

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 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.) =    6.25
  RAINFALL INTENSITY(INCH/HR) =   1.99
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.34
  TOTAL STREAM AREA(ACRES) =       0.34
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.60

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        0.33    7.25    1.829  0.20( 0.04) 0.20       0.2      10.00
      2        0.60    6.25    1.992  0.20( 0.04) 0.20       0.3      13.00
```

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        0.91    6.25    1.992  0.20( 0.04) 0.20       0.5      13.00
      2        0.88    7.25    1.829  0.20( 0.04) 0.20       0.5      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       0.91    Tc(MIN.) =     6.25
  EFFECTIVE AREA(ACRES) =       0.50   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        0.5
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     241.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     14.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    80.70  DOWNSTREAM(FEET) =    79.90
  FLOW LENGTH(FEET) =   159.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.89
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.91
  PIPE TRAVEL TIME(MIN.) =   0.92    Tc(MIN.) =    7.16
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     14.00 =     400.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     14.00 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.) =    7.16
  RAINFALL INTENSITY(INCH/HR) =   1.84
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.50
  TOTAL STREAM AREA(ACRES) =       0.53
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.91

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     14.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   160.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.20  DOWNSTREAM(FEET) =     84.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.953
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.873
  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        0.35      0.20     0.200    57    6.95
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.58
  TOTAL AREA(ACRES) =      0.35   PEAK FLOW RATE(CFS) =      0.58

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     14.00 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.) =    6.95
  RAINFALL INTENSITY(INCH/HR) =   1.87
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.35
  TOTAL STREAM AREA(ACRES) =       0.35
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.58

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        0.91    7.16    1.841  0.20( 0.04) 0.20       0.5      13.00
      1        0.88    8.17    1.708  0.20( 0.04) 0.20       0.5      10.00
      2        0.58    6.95    1.873  0.20( 0.04) 0.20       0.3      15.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        1.47    6.95    1.873  0.20( 0.04) 0.20       0.8      15.00
      2        1.47    7.16    1.841  0.20( 0.04) 0.20       0.9      13.00
      3        1.40    8.17    1.708  0.20( 0.04) 0.20       0.9      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       1.47    Tc(MIN.) =     7.16
  EFFECTIVE AREA(ACRES) =       0.85   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =       0.9
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     14.00 =     400.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 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) =    79.90  DOWNSTREAM(FEET) =    79.70
  FLOW LENGTH(FEET) =    20.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.23
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.47
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =    7.24
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE      7.00 =     420.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        1.47    7.03    1.861  0.20( 0.04) 0.20       0.8      15.00
      2        1.47    7.24    1.830  0.20( 0.04) 0.20       0.9      13.00
      3        1.40    8.25    1.698  0.20( 0.04) 0.20       0.9      10.00
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE      7.00 =    420.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        1.46    7.53    1.790  0.20( 0.04) 0.20       0.8       6.00
      2        1.47    7.75    1.760  0.20( 0.04) 0.20       0.8       4.00
      3        1.38    8.96    1.619  0.20( 0.04) 0.20       0.9       1.00
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =    542.80 FEET.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        2.90    7.03    1.861  0.20( 0.04) 0.20       1.6      15.00
      2        2.92    7.24    1.830  0.20( 0.04) 0.20       1.7      13.00
      3        2.92    7.53    1.790  0.20( 0.04) 0.20       1.7       6.00
      4        2.90    7.75    1.760  0.20( 0.04) 0.20       1.7       4.00
      5        2.83    8.25    1.698  0.20( 0.04) 0.20       1.7      10.00
      6        2.72    8.96    1.619  0.20( 0.04) 0.20       1.8       1.00
    TOTAL AREA(ACRES) =         1.8

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =        2.92  Tc(MIN.) =    7.530
  EFFECTIVE AREA(ACRES) =      1.70  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        1.8
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =    542.80 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.8  TC(MIN.) =      7.53
  EFFECTIVE AREA(ACRES) =      1.70  AREA-AVERAGED Fm(INCH/HR)=  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.200
  PEAK FLOW RATE(CFS)   =       2.92

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        2.90    7.03    1.861  0.20( 0.04) 0.20       1.6      15.00
      2        2.92    7.24    1.830  0.20( 0.04) 0.20       1.7      13.00
      3        2.92    7.53    1.790  0.20( 0.04) 0.20       1.7       6.00
      4        2.90    7.75    1.760  0.20( 0.04) 0.20       1.7       4.00
      5        2.83    8.25    1.698  0.20( 0.04) 0.20       1.7      10.00
      6        2.72    8.96    1.619  0.20( 0.04) 0.20       1.8       1.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
          (c) Copyright 1983-2008 Advanced Engineering Software (aes)
              Ver. 15.0  Release Date: 04/01/2008  License ID 1420

                            Analysis prepared by:

                                CA Engineering
                         13821 Newport Ave., Ste 110
                              Tustin, Ca. 92780


 ************************** DESCRIPTION OF STUDY **************************
* PROPOSED CONDITION                                                       *
* 10 YR STORM                                                              *
* CATCH BASINS                                                             *
 **************************************************************************

  FILE NAME: 727-6PR.DAT
  TIME/DATE OF STUDY: 16:01 09/24/2024
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II 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) =   128.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.50  DOWNSTREAM(FEET) =     84.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.595
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.464
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  APARTMENTS                 D        0.19      0.20     0.200    75    6.60
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.59
  TOTAL AREA(ACRES) =      0.19   PEAK FLOW RATE(CFS) =      0.59

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    82.40  DOWNSTREAM(FEET) =    81.80
  FLOW LENGTH(FEET) =   112.80   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   3.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.61
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.59
  PIPE TRAVEL TIME(MIN.) =   0.72    Tc(MIN.) =    7.32
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     240.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 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.) =    7.32
  RAINFALL INTENSITY(INCH/HR) =   3.26
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.19
  TOTAL STREAM AREA(ACRES) =       0.19
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.59

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      3.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   117.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.40  DOWNSTREAM(FEET) =     84.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.249
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.573
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 D        0.34      0.20     0.200    75    6.25
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.08
  TOTAL AREA(ACRES) =      0.34   PEAK FLOW RATE(CFS) =      1.08

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 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.) =    6.25
  RAINFALL INTENSITY(INCH/HR) =   3.57
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.34
  TOTAL STREAM AREA(ACRES) =       0.34
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.08

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        0.59    7.32    3.264  0.20( 0.04) 0.20       0.2       1.00
      2        1.08    6.25    3.573  0.20( 0.04) 0.20       0.3       4.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        1.63    6.25    3.573  0.20( 0.04) 0.20       0.5       4.00
      2        1.57    7.32    3.264  0.20( 0.04) 0.20       0.5       1.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       1.63    Tc(MIN.) =     6.25
  EFFECTIVE AREA(ACRES) =       0.50   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        0.5
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     240.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 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) =    81.80  DOWNSTREAM(FEET) =    81.00
  FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.35
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.63
  PIPE TRAVEL TIME(MIN.) =   0.80    Tc(MIN.) =    7.05
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =     400.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      5.00 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.) =    7.05
  RAINFALL INTENSITY(INCH/HR) =   3.34
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.50
```

```
  TOTAL STREAM AREA(ACRES) =       0.53
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.63

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      5.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   160.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.20  DOWNSTREAM(FEET) =     84.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.953
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.361
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 D        0.35      0.20     0.200    75    6.95
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.05
  TOTAL AREA(ACRES) =      0.35   PEAK FLOW RATE(CFS) =      1.05

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      5.00 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.) =    6.95
  RAINFALL INTENSITY(INCH/HR) =   3.36
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.35
  TOTAL STREAM AREA(ACRES) =       0.35
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.05

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        1.63    7.05    3.335  0.20( 0.04) 0.20       0.5       4.00
      1        1.57    8.12    3.075  0.20( 0.04) 0.20       0.5       1.00
      2        1.05    6.95    3.361  0.20( 0.04) 0.20       0.3       6.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        2.67    6.95    3.361  0.20( 0.04) 0.20       0.8       6.00
      2        2.67    7.05    3.335  0.20( 0.04) 0.20       0.9       4.00
      3        2.53    8.12    3.075  0.20( 0.04) 0.20       0.9       1.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       2.67    Tc(MIN.) =     7.05
  EFFECTIVE AREA(ACRES) =       0.85   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        0.9
```

```
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =     400.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 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) =    81.00  DOWNSTREAM(FEET) =    79.70
  FLOW LENGTH(FEET) =   142.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   8.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.70
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.67
  PIPE TRAVEL TIME(MIN.) =   0.50    Tc(MIN.) =    7.55
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =     542.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   128.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.50  DOWNSTREAM(FEET) =     84.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.395
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.526
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 D        0.19      0.20     0.200    75    6.40
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.60
  TOTAL AREA(ACRES) =      0.19   PEAK FLOW RATE(CFS) =      0.60

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    81.30  DOWNSTREAM(FEET) =    80.70
  FLOW LENGTH(FEET) =   113.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   4.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.63
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.60
  PIPE TRAVEL TIME(MIN.) =   0.72    Tc(MIN.) =    7.11
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     241.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 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.) =    7.11
  RAINFALL INTENSITY(INCH/HR) =   3.32
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.19
  TOTAL STREAM AREA(ACRES) =       0.19
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.60

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     12.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   117.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.40  DOWNSTREAM(FEET) =     84.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.249
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.573
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 D        0.34      0.20     0.200    75    6.25
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.08
  TOTAL AREA(ACRES) =      0.34   PEAK FLOW RATE(CFS) =      1.08

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 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.) =    6.25
  RAINFALL INTENSITY(INCH/HR) =   3.57
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.34
  TOTAL STREAM AREA(ACRES) =       0.34
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.08

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        0.60    7.11    3.318  0.20( 0.04) 0.20       0.2      10.00
      2        1.08    6.25    3.573  0.20( 0.04) 0.20       0.3      13.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
```

```
     1        1.65    6.25    3.573  0.20( 0.04) 0.20       0.5      13.00
     2        1.60    7.11    3.318  0.20( 0.04) 0.20       0.5      10.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       1.65    Tc(MIN.) =     6.25
 EFFECTIVE AREA(ACRES) =       0.51   AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
 TOTAL AREA(ACRES) =        0.5
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     241.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     12.00 TO NODE     14.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    80.70  DOWNSTREAM(FEET) =    79.90
 FLOW LENGTH(FEET) =   159.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   3.35
 ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       1.65
 PIPE TRAVEL TIME(MIN.) =   0.79    Tc(MIN.) =    7.04
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     14.00 =     400.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     14.00 TO NODE     14.00 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.) =    7.04
 RAINFALL INTENSITY(INCH/HR) =   3.34
 AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.20
 EFFECTIVE STREAM AREA(ACRES) =       0.51
 TOTAL STREAM AREA(ACRES) =       0.53
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.65

****************************************************************************
 FLOW PROCESS FROM NODE     15.00 TO NODE     14.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   160.00
 ELEVATION DATA: UPSTREAM(FEET) =     85.20  DOWNSTREAM(FEET) =     84.30

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.953
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.361
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 APARTMENTS                 D        0.35      0.20     0.200    75    6.95
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
 SUBAREA RUNOFF(CFS) =      1.05
 TOTAL AREA(ACRES) =      0.35   PEAK FLOW RATE(CFS) =      1.05

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

```
  FLOW PROCESS FROM NODE     14.00 TO NODE     14.00 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.) =    6.95
  RAINFALL INTENSITY(INCH/HR) =   3.36
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.35
  TOTAL STREAM AREA(ACRES) =       0.35
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.05

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        1.65    7.04    3.337  0.20( 0.04) 0.20       0.5      13.00
      1        1.60    7.91    3.122  0.20( 0.04) 0.20       0.5      10.00
      2        1.05    6.95    3.361  0.20( 0.04) 0.20       0.3      15.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        2.68    6.95    3.361  0.20( 0.04) 0.20       0.9      15.00
      2        2.68    7.04    3.337  0.20( 0.04) 0.20       0.9      13.00
      3        2.57    7.91    3.122  0.20( 0.04) 0.20       0.9      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       2.68    Tc(MIN.) =     7.04
  EFFECTIVE AREA(ACRES) =       0.86   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        0.9
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     14.00 =     400.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 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) =    79.90  DOWNSTREAM(FEET) =    79.70
  FLOW LENGTH(FEET) =    20.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.88
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.68
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =    7.11
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE      7.00 =     420.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
```

```
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
    1        2.68    7.02    3.342  0.20( 0.04) 0.20       0.9      15.00
    2        2.68    7.11    3.319  0.20( 0.04) 0.20       0.9      13.00
    3        2.57    7.98    3.107  0.20( 0.04) 0.20       0.9      10.00
LONGEST FLOWPATH FROM NODE     10.00 TO NODE      7.00 =     420.00 FEET.

** MEMORY BANK #  1 CONFLUENCE DATA **
 STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
    1        2.67    7.46    3.229  0.20( 0.04) 0.20       0.8       6.00
    2        2.67    7.55    3.206  0.20( 0.04) 0.20       0.9       4.00
    3        2.53    8.63    2.970  0.20( 0.04) 0.20       0.9       1.00
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =     542.80 FEET.

** PEAK FLOW RATE TABLE **
 STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
    1        5.28    7.02    3.342  0.20( 0.04) 0.20       1.6      15.00
    2        5.30    7.11    3.319  0.20( 0.04) 0.20       1.7      13.00
    3        5.30    7.46    3.229  0.20( 0.04) 0.20       1.7       6.00
    4        5.29    7.55    3.206  0.20( 0.04) 0.20       1.7       4.00
    5        5.18    7.98    3.107  0.20( 0.04) 0.20       1.7      10.00
    6        4.98    8.63    2.970  0.20( 0.04) 0.20       1.8       1.00
  TOTAL AREA(ACRES) =         1.8

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =        5.30  Tc(MIN.) =    7.456
EFFECTIVE AREA(ACRES) =      1.71  AREA-AVERAGED Fm(INCH/HR) =  0.04
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
TOTAL AREA(ACRES) =        1.8
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =     542.80 FEET.
============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)     =        1.8  TC(MIN.) =      7.46
EFFECTIVE AREA(ACRES) =      1.71  AREA-AVERAGED Fm(INCH/HR)=  0.04
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.200
PEAK FLOW RATE(CFS)   =       5.30

** PEAK FLOW RATE TABLE **
 STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
    1        5.28    7.02    3.342  0.20( 0.04) 0.20       1.6      15.00
    2        5.30    7.11    3.319  0.20( 0.04) 0.20       1.7      13.00
    3        5.30    7.46    3.229  0.20( 0.04) 0.20       1.7       6.00
    4        5.29    7.55    3.206  0.20( 0.04) 0.20       1.7       4.00
    5        5.18    7.98    3.107  0.20( 0.04) 0.20       1.7      10.00
    6        4.98    8.63    2.970  0.20( 0.04) 0.20       1.8       1.00
============================================================================
============================================================================
END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
         (c) Copyright 1983-2008 Advanced Engineering Software (aes)
             Ver. 15.0  Release Date: 04/01/2008  License ID 1420

                           Analysis prepared by:

                               CA Engineering
                        13821 Newport Ave., Ste 110
                             Tustin, Ca. 92780


 ************************** DESCRIPTION OF STUDY **************************
* PROPOSED CONDITION                                                        *
* 100 YR STORM                                                              *
* CATCH BASINS                                                              *
  *************************************************************************

  FILE NAME: 727-6PR.DAT
  TIME/DATE OF STUDY: 16:02 09/24/2024
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) III 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) =   128.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.50  DOWNSTREAM(FEET) =     84.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.595
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.279
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  APARTMENTS                 D        0.19      0.20     0.200    91    6.60
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.90
  TOTAL AREA(ACRES) =      0.19   PEAK FLOW RATE(CFS) =      0.90

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    82.40  DOWNSTREAM(FEET) =    81.80
  FLOW LENGTH(FEET) =   112.80   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   4.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.94
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.90
  PIPE TRAVEL TIME(MIN.) =   0.64    Tc(MIN.) =    7.23
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     240.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 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.) =    7.23
  RAINFALL INTENSITY(INCH/HR) =   5.01
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.19
  TOTAL STREAM AREA(ACRES) =       0.19
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.90

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      3.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   117.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.40  DOWNSTREAM(FEET) =     84.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.249
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.445
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 D        0.34      0.20     0.200    91    6.25
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.65
  TOTAL AREA(ACRES) =      0.34   PEAK FLOW RATE(CFS) =      1.65

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 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.) =    6.25
  RAINFALL INTENSITY(INCH/HR) =   5.45
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.34
  TOTAL STREAM AREA(ACRES) =       0.34
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.65

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        0.90    7.23    5.007  0.20( 0.04) 0.20       0.2       1.00
      2        1.65    6.25    5.445  0.20( 0.04) 0.20       0.3       4.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        2.50    6.25    5.445  0.20( 0.04) 0.20       0.5       4.00
      2        2.42    7.23    5.007  0.20( 0.04) 0.20       0.5       1.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       2.50    Tc(MIN.) =     6.25
  EFFECTIVE AREA(ACRES) =       0.50   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        0.5
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     240.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 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) =    81.80  DOWNSTREAM(FEET) =    81.00
  FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.74
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.50
  PIPE TRAVEL TIME(MIN.) =   0.71    Tc(MIN.) =    6.96
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =     400.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      5.00 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.) =    6.96
  RAINFALL INTENSITY(INCH/HR) =   5.12
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.50
```

```
  TOTAL STREAM AREA(ACRES) =       0.53
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.50

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      5.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   160.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.20  DOWNSTREAM(FEET) =     84.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.953
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.122
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 D        0.35      0.20     0.200    91    6.95
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.60
  TOTAL AREA(ACRES) =      0.35   PEAK FLOW RATE(CFS) =      1.60

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      5.00 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.) =    6.95
  RAINFALL INTENSITY(INCH/HR) =   5.12
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.35
  TOTAL STREAM AREA(ACRES) =       0.35
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.60

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        2.50    6.96    5.118  0.20( 0.04) 0.20       0.5       4.00
      1        2.42    7.98    4.732  0.20( 0.04) 0.20       0.5       1.00
      2        1.60    6.95    5.122  0.20( 0.04) 0.20       0.3       6.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        4.10    6.95    5.122  0.20( 0.04) 0.20       0.9       6.00
      2        4.10    6.96    5.118  0.20( 0.04) 0.20       0.9       4.00
      3        3.89    7.98    4.732  0.20( 0.04) 0.20       0.9       1.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       4.10    Tc(MIN.) =     6.96
  EFFECTIVE AREA(ACRES) =       0.85   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =       0.9
```

```
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =     400.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 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) =    81.00  DOWNSTREAM(FEET) =    79.70
  FLOW LENGTH(FEET) =   142.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   9.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.28
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.10
  PIPE TRAVEL TIME(MIN.) =   0.45    Tc(MIN.) =    7.41
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =     542.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   128.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.50  DOWNSTREAM(FEET) =     84.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.395
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.373
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 D        0.19      0.20     0.200    91    6.40
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.91
  TOTAL AREA(ACRES) =      0.19   PEAK FLOW RATE(CFS) =      0.91

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    81.30  DOWNSTREAM(FEET) =    80.70
  FLOW LENGTH(FEET) =   113.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.97
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.91
  PIPE TRAVEL TIME(MIN.) =   0.63    Tc(MIN.) =    7.03
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     241.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 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.) =    7.03
  RAINFALL INTENSITY(INCH/HR) =   5.09
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.19
  TOTAL STREAM AREA(ACRES) =       0.19
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.91

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     12.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   117.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.40  DOWNSTREAM(FEET) =     84.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.249
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.445
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 D        0.34      0.20     0.200    91    6.25
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.65
  TOTAL AREA(ACRES) =      0.34   PEAK FLOW RATE(CFS) =      1.65

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 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.) =    6.25
  RAINFALL INTENSITY(INCH/HR) =   5.45
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.34
  TOTAL STREAM AREA(ACRES) =       0.34
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.65

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        0.91    7.03    5.090  0.20( 0.04) 0.20       0.2      10.00
      2        1.65    6.25    5.445  0.20( 0.04) 0.20       0.3      13.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
```

```
     1        2.52    6.25    5.445  0.20( 0.04) 0.20       0.5      13.00
     2        2.46    7.03    5.090  0.20( 0.04) 0.20       0.5      10.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       2.52    Tc(MIN.) =     6.25
 EFFECTIVE AREA(ACRES) =       0.51   AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
 TOTAL AREA(ACRES) =        0.5
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     241.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     12.00 TO NODE     14.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    80.70  DOWNSTREAM(FEET) =    79.90
 FLOW LENGTH(FEET) =   159.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   3.75
 ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       2.52
 PIPE TRAVEL TIME(MIN.) =   0.71    Tc(MIN.) =    6.96
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     14.00 =     400.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     14.00 TO NODE     14.00 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.) =    6.96
 RAINFALL INTENSITY(INCH/HR) =   5.12
 AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.20
 EFFECTIVE STREAM AREA(ACRES) =       0.51
 TOTAL STREAM AREA(ACRES) =       0.53
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.52

****************************************************************************
 FLOW PROCESS FROM NODE     15.00 TO NODE     14.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   160.00
 ELEVATION DATA: UPSTREAM(FEET) =     85.20  DOWNSTREAM(FEET) =     84.30

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.953
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.122
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 APARTMENTS                 D        0.35      0.20     0.200    91    6.95
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
 SUBAREA RUNOFF(CFS) =      1.60
 TOTAL AREA(ACRES) =      0.35   PEAK FLOW RATE(CFS) =      1.60

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

```
  FLOW PROCESS FROM NODE     14.00 TO NODE     14.00 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.) =    6.95
  RAINFALL INTENSITY(INCH/HR) =   5.12
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.35
  TOTAL STREAM AREA(ACRES) =       0.35
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.60

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        2.52    6.96    5.121  0.20( 0.04) 0.20       0.5      13.00
      1        2.46    7.77    4.806  0.20( 0.04) 0.20       0.5      10.00
      2        1.60    6.95    5.122  0.20( 0.04) 0.20       0.3      15.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        4.12    6.95    5.122  0.20( 0.04) 0.20       0.9      15.00
      2        4.12    6.96    5.121  0.20( 0.04) 0.20       0.9      13.00
      3        3.96    7.77    4.806  0.20( 0.04) 0.20       0.9      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       4.12    Tc(MIN.) =     6.96
  EFFECTIVE AREA(ACRES) =       0.86   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        0.9
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     14.00 =     400.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 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) =    79.90  DOWNSTREAM(FEET) =    79.70
  FLOW LENGTH(FEET) =    20.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.47
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.12
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    7.02
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE      7.00 =     420.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
```

```
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
    1        4.12    7.01    5.097  0.20( 0.04) 0.20       0.9      15.00
    2        4.12    7.02    5.096  0.20( 0.04) 0.20       0.9      13.00
    3        3.96    7.83    4.785  0.20( 0.04) 0.20       0.9      10.00
LONGEST FLOWPATH FROM NODE     10.00 TO NODE      7.00 =     420.00 FEET.

** MEMORY BANK #  1 CONFLUENCE DATA **
 STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
    1        4.10    7.40    4.942  0.20( 0.04) 0.20       0.9       6.00
    2        4.10    7.41    4.938  0.20( 0.04) 0.20       0.9       4.00
    3        3.89    8.44    4.585  0.20( 0.04) 0.20       0.9       1.00
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =     542.80 FEET.

** PEAK FLOW RATE TABLE **
 STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
    1        8.13    7.01    5.097  0.20( 0.04) 0.20       1.7      15.00
    2        8.13    7.02    5.096  0.20( 0.04) 0.20       1.7      13.00
    3        8.14    7.40    4.942  0.20( 0.04) 0.20       1.7       6.00
    4        8.14    7.41    4.938  0.20( 0.04) 0.20       1.7       4.00
    5        7.97    7.83    4.785  0.20( 0.04) 0.20       1.7      10.00
    6        7.69    8.44    4.585  0.20( 0.04) 0.20       1.8       1.00
  TOTAL AREA(ACRES) =         1.8

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =        8.14  Tc(MIN.) =    7.402
EFFECTIVE AREA(ACRES) =      1.72  AREA-AVERAGED Fm(INCH/HR) =  0.04
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
TOTAL AREA(ACRES) =        1.8
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =     542.80 FEET.
============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)     =        1.8  TC(MIN.) =      7.40
EFFECTIVE AREA(ACRES) =      1.72  AREA-AVERAGED Fm(INCH/HR)=  0.04
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.200
PEAK FLOW RATE(CFS)   =       8.14

** PEAK FLOW RATE TABLE **
 STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
    1        8.13    7.01    5.097  0.20( 0.04) 0.20       1.7      15.00
    2        8.13    7.02    5.096  0.20( 0.04) 0.20       1.7      13.00
    3        8.14    7.40    4.942  0.20( 0.04) 0.20       1.7       6.00
    4        8.14    7.41    4.938  0.20( 0.04) 0.20       1.7       4.00
    5        7.97    7.83    4.785  0.20( 0.04) 0.20       1.7      10.00
    6        7.69    8.44    4.585  0.20( 0.04) 0.20       1.8       1.00
============================================================================
============================================================================
END OF RATIONAL METHOD ANALYSIS
```

APPENDIX D: PIPE CALCULATIONS

8" pipe
Worksheet for Circular Channel

Project Description	
Project File	c:\program files\haestad\fmw\8 in pip.fm2
Worksheet	8" pipe
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.009	
Channel Slope	0.005000	ft/ft
Depth	0.67	ft
Diameter	8.00	in

Results		
Discharge	1.24	cfs
Flow Area	0.35	ft²
Wetted Perimeter	2.09	ft
Top Width	0.42e-2	ft
Critical Depth	0.53	ft
Percent Full	100.00	
Critical Slope	0.005391	ft/ft
Velocity	3.54	ft/s
Velocity Head	0.19	ft
Specific Energy	0.86	ft
Froude Number	0.07	
Maximum Discharge	1.33	cfs
Full Flow Capacity	1.23	cfs
Full Flow Slope	0.005013	ft/ft
Flow is subcritical.		

18" outlet pipe
Worksheet for Circular Channel

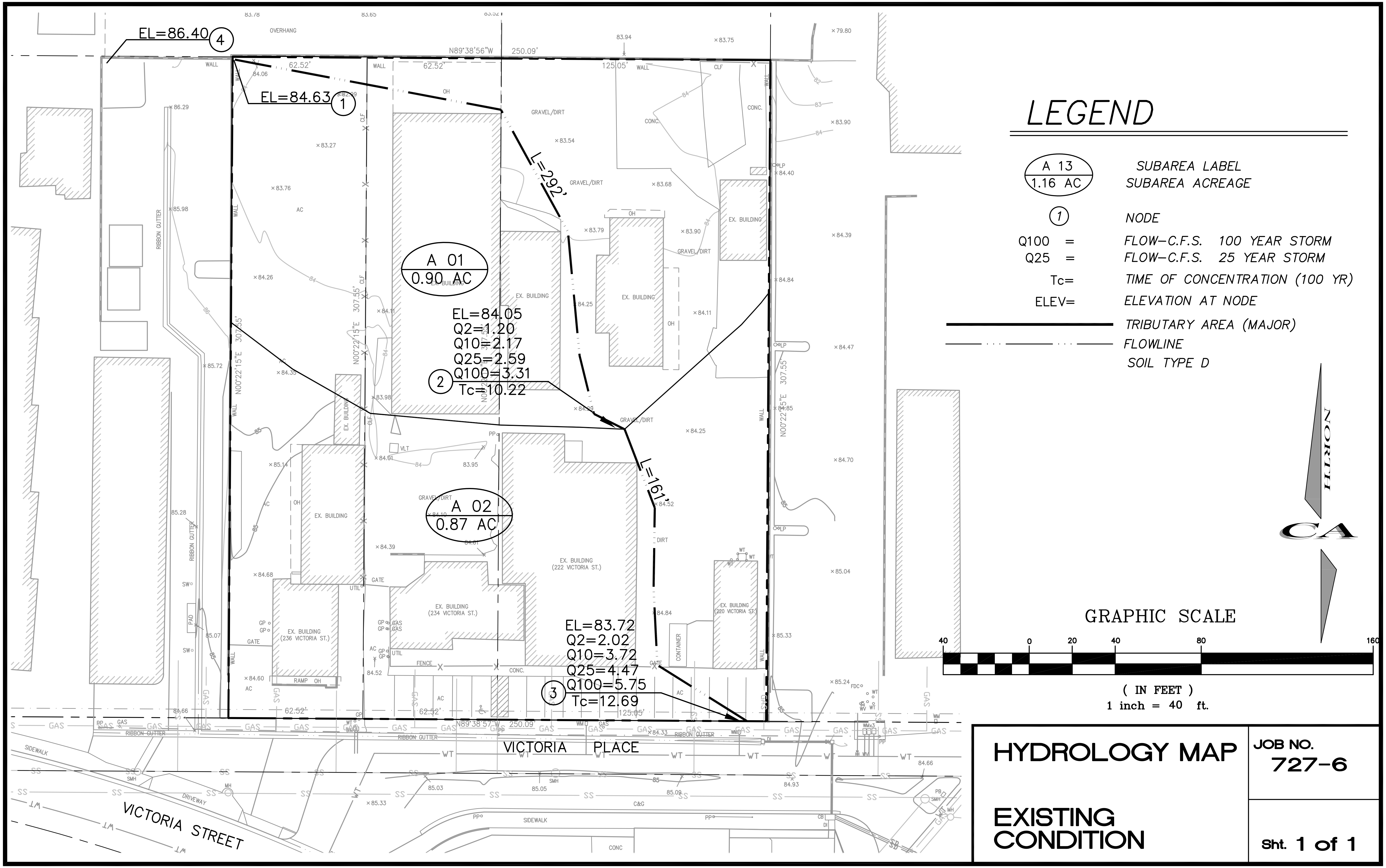
Project Description	
Project File	untitled.fm2
Worksheet	487-5 Brea Plaza Sewer Study (02 18 24)
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.0200	ft/ft
Diameter	18.00	in
Discharge	7.410	cfs

Results		
Depth	0.75	ft
Flow Area	0.88	ft²
Wetted Perimeter	2.35	ft
Top Width	1.50	ft
Critical Depth	1.05	ft
Percent Full	49.93	
Critical Slope	0.007021	ft/ft
Velocity	8.40	ft/s
Velocity Head	1.10	ft
Specific Energy	1.85	ft
Froude Number	1.93	
Maximum Discharge	15.98	cfs
Full Flow Capacity	14.85	cfs
Full Flow Slope	0.004977	ft/ft
Flow is supercritical.		

EXHIBITS

EXHIBIT A: EXISTING CONDITION HYDROLOGY MAP

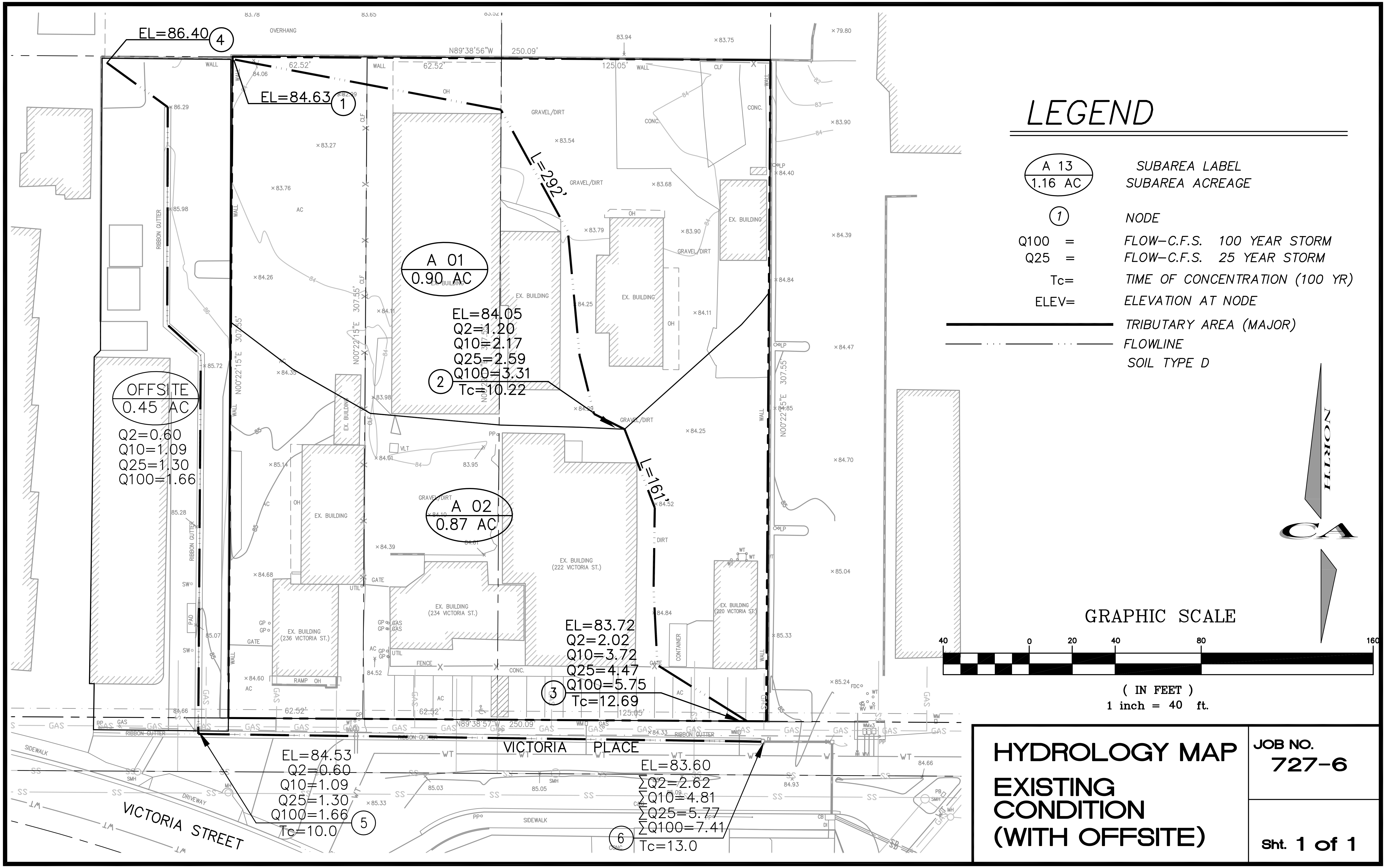


HYDROLOGY MAP

JOB NO.
727-6

EXISTING CONDITION

Sht. 1 of 1



HYDROLOGY MAP

EXISTING CONDITION (WITH OFFSITE)

JOB NO.
727-6

Sht. 1 of 1

EXHIBIT B: PROPOSED CONDITION HYDROLOGY MAP

LEGEND

A 13	SUBAREA LABEL
1.16 AC	SUBAREA ACREAGE
①	NODE
Q100 =	FLOW—C.F.S. 100 YEAR STORM
Q25 =	FLOW—C.F.S. 25 YEAR STORM
Tc=	TIME OF CONCENTRATION (100 YR)
ELEV=	ELEVATION AT NODE
━━━━	TRIBUTARY AREA (MAJOR)
— · · · —	FLOWLINE
	SOIL TYPE D

NORTH

GRAPHIC SCALE

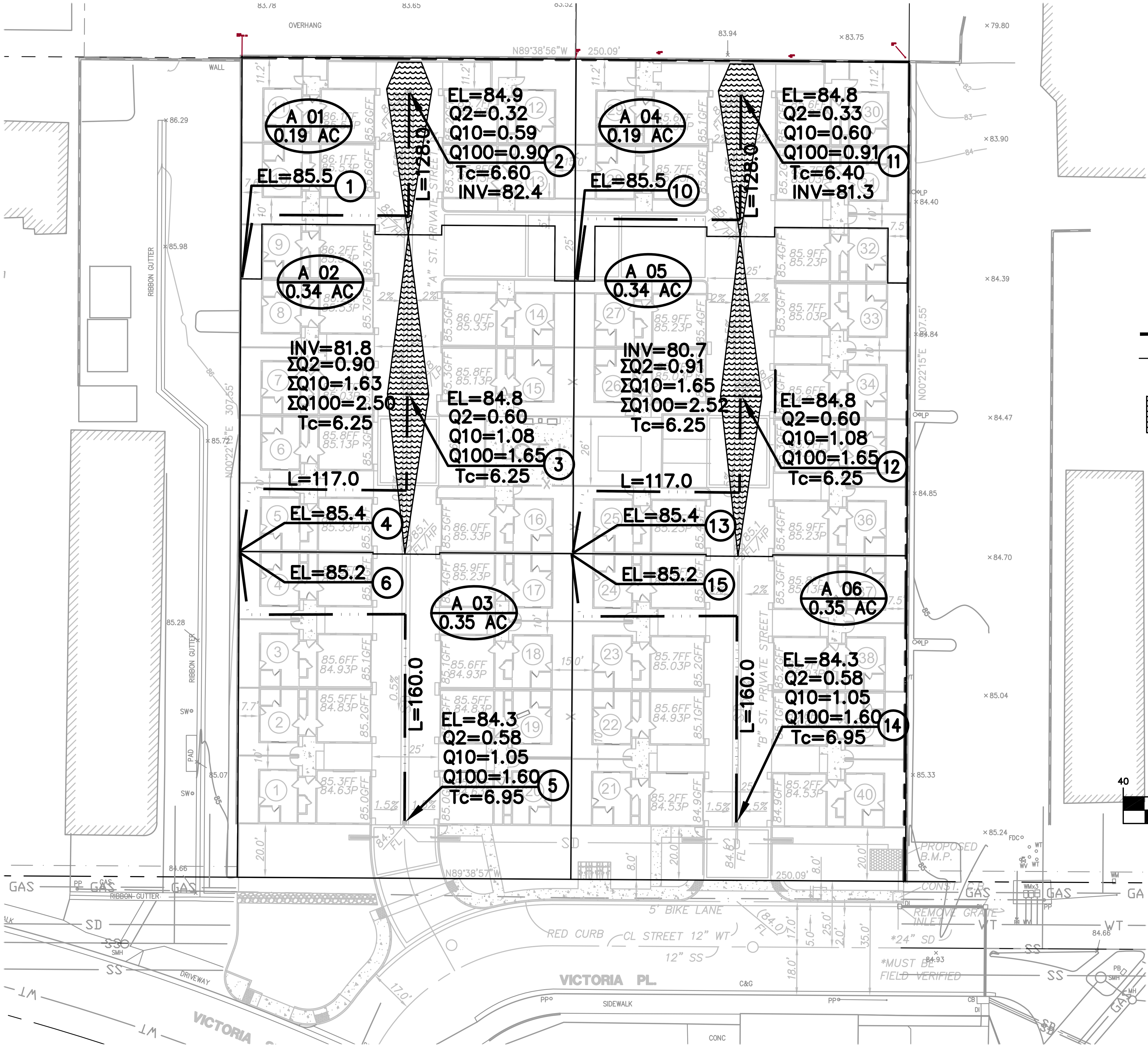
40 0 20 40 80 160

(IN FEET)
1 inch = 40 ft.

HYDROLOGY MAP PROPOSED CONDITION OVERALL FLOWS

JOB NO.
727-6

Sht. 1 of 1



LEGEND

A 13 1.16 AC	SUBAREA LABEL SUBAREA ACREAGE
①	NODE
Q100 =	FLOW–C.F.S. 100 YEAR STORM
Q25 =	FLOW–C.F.S. 25 YEAR STORM
Tc=	TIME OF CONCENTRATION (100 YR)
ELEV=	ELEVATION AT NODE
———	TRIBUTARY AREA (MAJOR)
— · · · —	FLOWLINE
	SOIL TYPE D
▨	PONDING LIMITS

GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)
1 inch = 40 ft.

HYDROLOGY MAP
PROPOSED CONDITION CATCH BASINS

JOB NO.
727–6

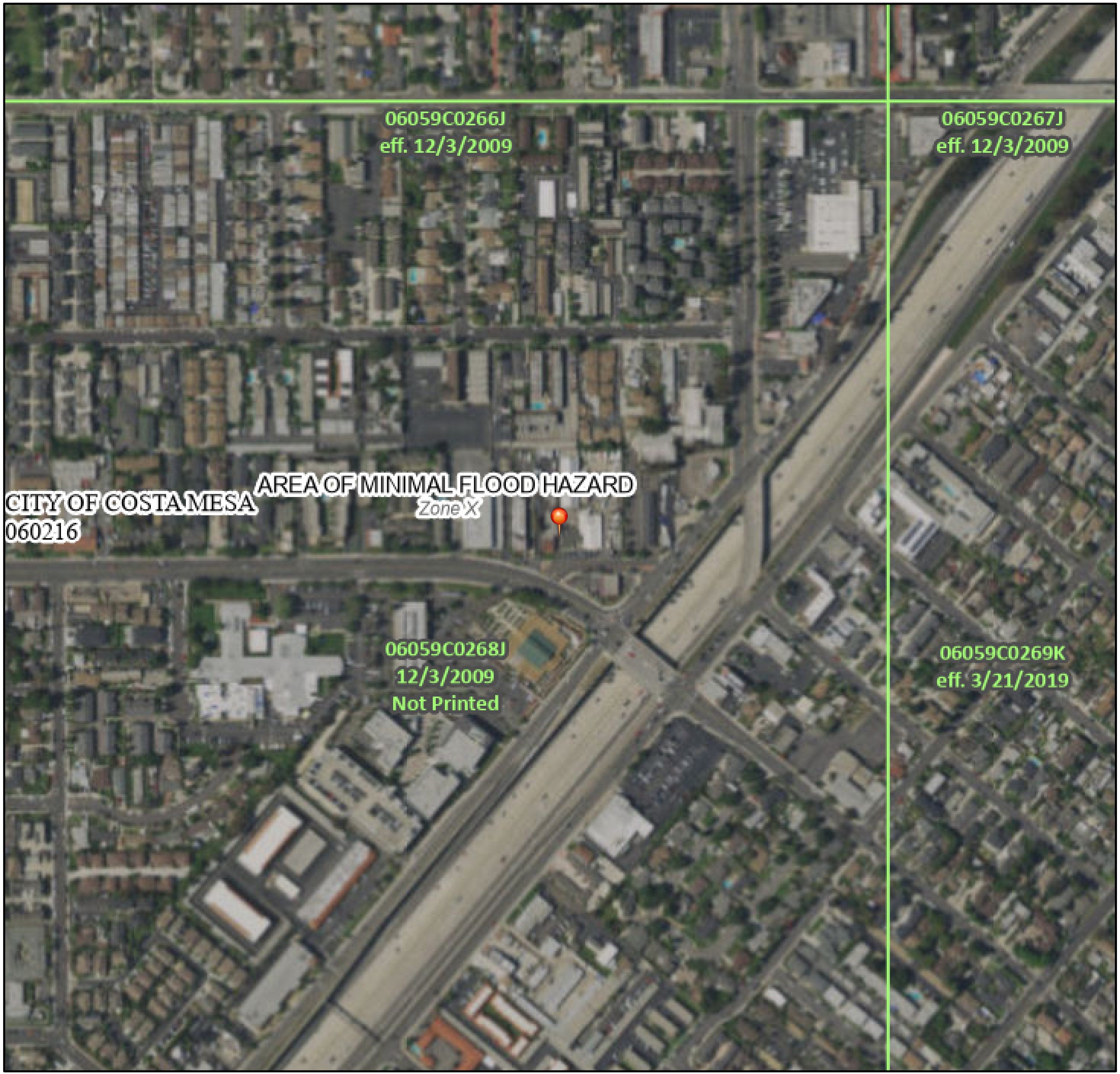
Sht. 1 of 1

EXHIBIT C: FIRM MAP

National Flood Hazard Layer FIRMette

FEMA

117°54'52"W 33°39'25"N



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

1:6,000

117°54'15"W 33°38'55"N

Basemap Imagery Source: USGS National Map 2023

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 *Zone AE, AO, AH, VE, AR*
	▨	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	■	0.2% Annual Chance Flood Hazard, Areas 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 D*
GENERAL STRUCTURES	— — —	Channel, Culvert, or Storm Sewer
	IIIIIII	Levee, Dike, or Floodwall
OTHER FEATURES	B 20.2 17.5	Cross Sections with 1% Annual Chance Water Surface Elevation
	8 — — —	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

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

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

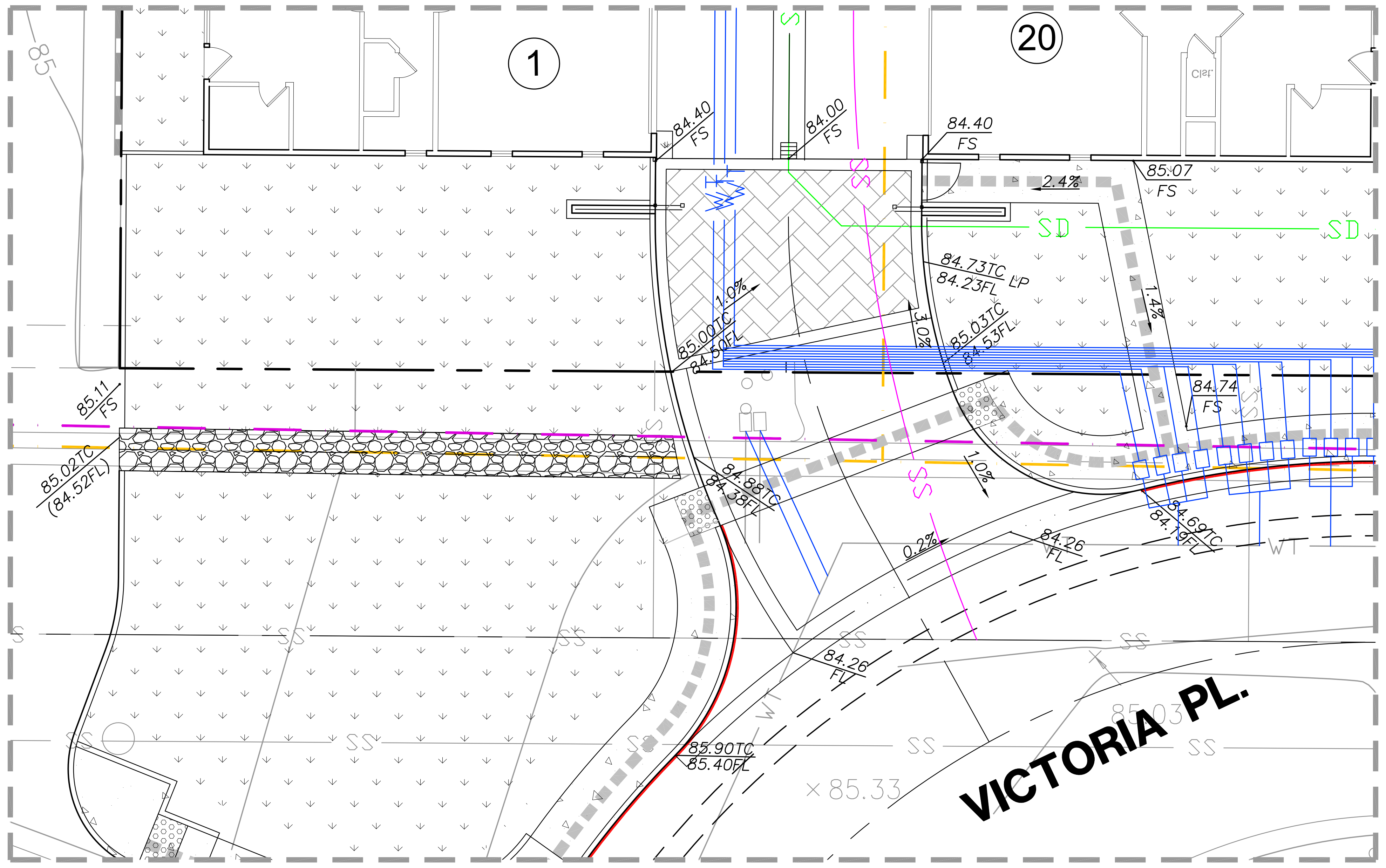
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/1/2024 at 2:15 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap 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.

EXHIBIT D: CONCEPTUAL GRADING PLAN

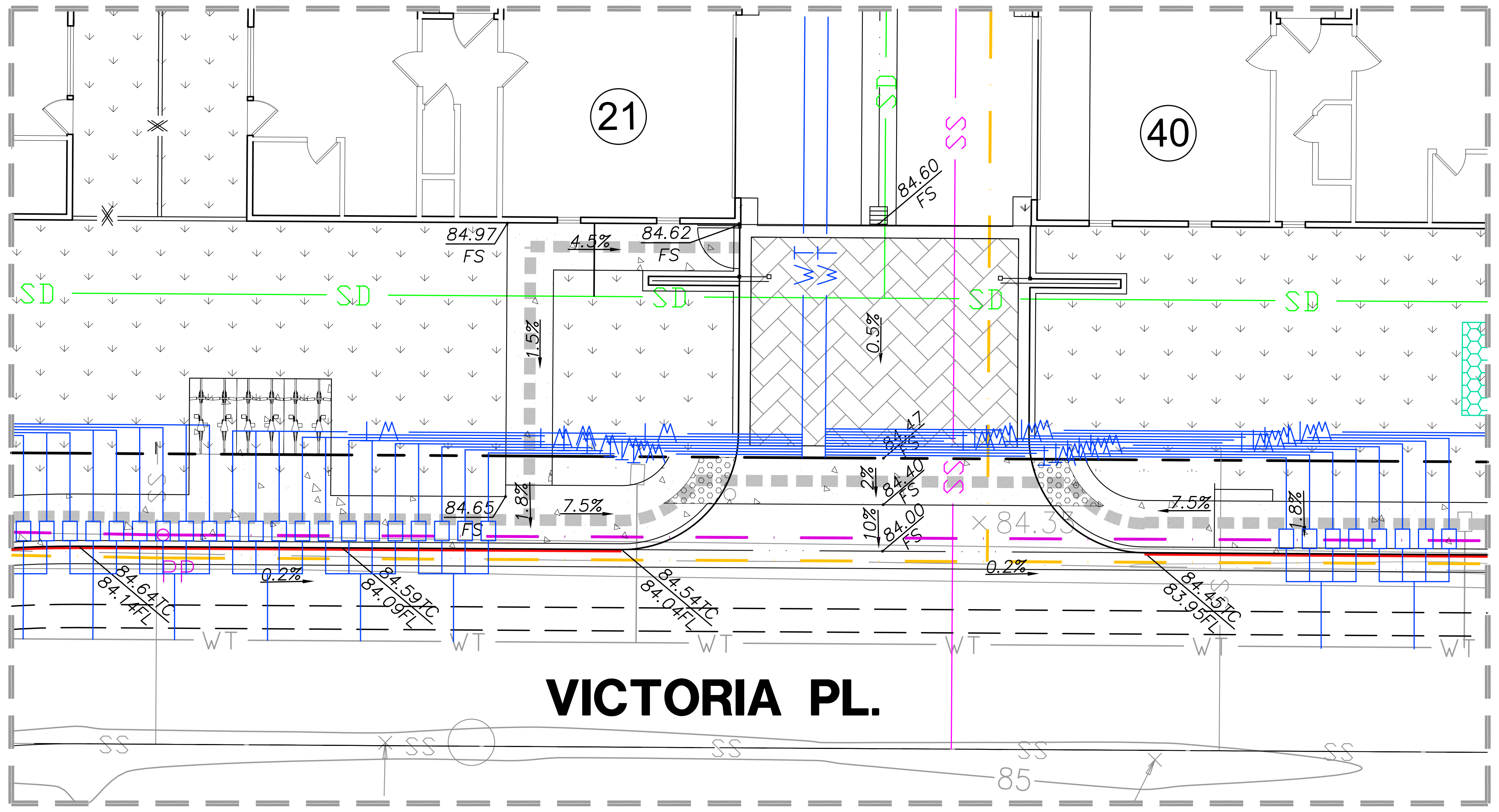
CONCEPTUAL GRADING AND UTILITY PLAN

Victoria Place, Costa Mesa, CA



DETAIL "A"

SCALE : 1"=10'



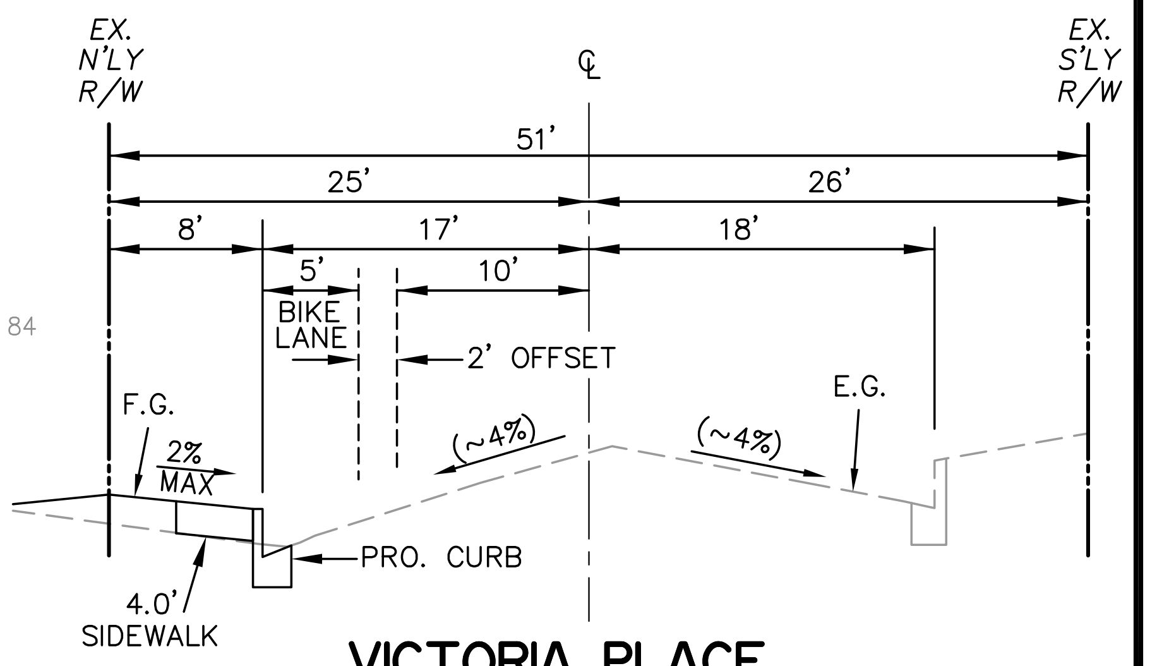
DETAIL "B"

SCALE : 1"=10'

LEGEND

BOUNDARY LINE	━━ - - ━━
PROP. CURB	═══
EX. CURB	───
PROPOSED SEWER	── SS ── SS ──
EXISTING SEWER	── SS ── SS ──
PROPOSED WATER	── WT ── WT ──
PROPOSED WATER METER	──□──
EXISTING WATER	── WT ── WT ──
PROPOSED STORM DRAIN	── SD ── SD ──
EXISTING STORM DRAIN	── SD ── SD ──
RED CURB	🟥
ADA PATH	▪ ▪ ▪ ▪
PROPOSED EDISON CONDUIT	— · — · —
EXISTING EDISON ABOVE GROUND	— · — · —
MODULAR WETLANDS	▨
UNIT NUMBER	㊳

FL — FLOW LINE
P — PAD ELEVATION
FF — FINISH FLOOR
FS — FINISH SURFACE
GFF — GARAGE FINISH FLOOR
HP — HIGH POINT
LP — LOW POINT



VICTORIA PLACE TYPICAL STREET SECTION

SCALE: HORIZ. 1"=10'; VERT. 1"=2'

LEGAL DESCRIPTION

THE EASTERLY ONE HALF OF LOT 71 OF TRACT NO. 57, AS PER MAP RECORDED IN BOOK 10, PAGE 3, MISCELLANEOUS MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF ORANGE COUNTY.

LOT 72 OF TRACT NO. 57, AS PER MAP RECORDED IN BOOK 10, PAGE 3, MISCELLANEOUS MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF ORANGE COUNTY.

APN: 419–111–19 & 20

GENERAL NOTES

1. EXISTING LAND USE: GENERAL COMMERCIAL
2. EXISTING ZONING: C–2 GENERAL BUSINESS
3. PROPOSED ZONING: RESIDENTIAL INCENTIVE OVERLAY DISTRICT (RIOD)
4. WATER SERVICE PROVIDED BY: MESA WATER DISTRICT
5. ELECTRIC SERVICE PROVIDED BY: SOUTHERN CALIFORNIA EDISON COMPANY
6. SEWER SERVICE PROVIDED BY: COSTA MESA SANITARY DISTRICT
7. NATURAL GAS SERVICE PROVIDED BY: THE GAS COMPANY
8. FEMA FLOOD ZONE: ZONE X – FLOOD MAP 06059 C0268J
9. GROSS AREA 1.77 AC. / NET AREA 1.77 AC.
10. SEE PWQMP FOR WATER QUALITY BMP's
11. STORM DRAINS, STREET AND LANDSCAPING SHALL BE MAINTAINED BY THE H.O.A.
12. TOTAL NUMBER OF UNITS = 40

NORTH

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

FRED CORNWELL
No. 45591
Exp. 12/31/24

ADDRESS

220, 222, 234 & 236 Victoria Street
Costa Mesa , CA 92626
A.P.N. 419–111–19, 20, & 21

SUBDIVIDER/OWNER

WMC, L.L.C.
1024 Bayside Dr., #109
Newport Beach, CA 90660
(714) 329–2405
Contact: Tony Weeda

PREPARED BY:

CA ENGINEERING, INC.
Planning Engineering • Surveying
4101 BIRCH ST., STE 140
NEWPORT BEACH, CA 92660
949-724-9480

S:\727–6 Victoria Place, Costa Mesa,\CON GRADE\727–6 CON GRADE 6.dwg Last Modified: 05 Mar 2025 – 3:52pm
Plotted on: 06 Mar 2025 – 4:15pm by cward

EXHIBIT E: WQMP SITE PLAN

LEGEND: STRUCTURAL / TREATMENT BMPS

- 🟩 LANDSCAPE AREA EFFICIENT IRRIGATION / LANDSCAPE AREA RUNOFF–MINIMIZING DESIGN
- ▨ MODULAR WETLANDS
- ← FLOW PATTERN
- ▬ DRAINAGE AREAS **A1**
- ▦ BUILDING PAD AREAS
- ▢ CONCRETE (DRIVEWAY/GUTTERS/SIDEWALKS)
- ▢ ASPHALT CONCRETE DRIVE AISLES
- ▨ ENHANCED PAVING
- ■ CATCH BASINS W/ INSERT FILTERS & STENCIL SIGNAGE
- —SS—SS— SEWER
- —WT—WT— WATER
- —SD—SD— STORM DRAIN

PROJECT DATA:

TOTAL SITE AREA OF PROPOSED
DEVELOPMENT: 1.77 AC (76,916 SF)

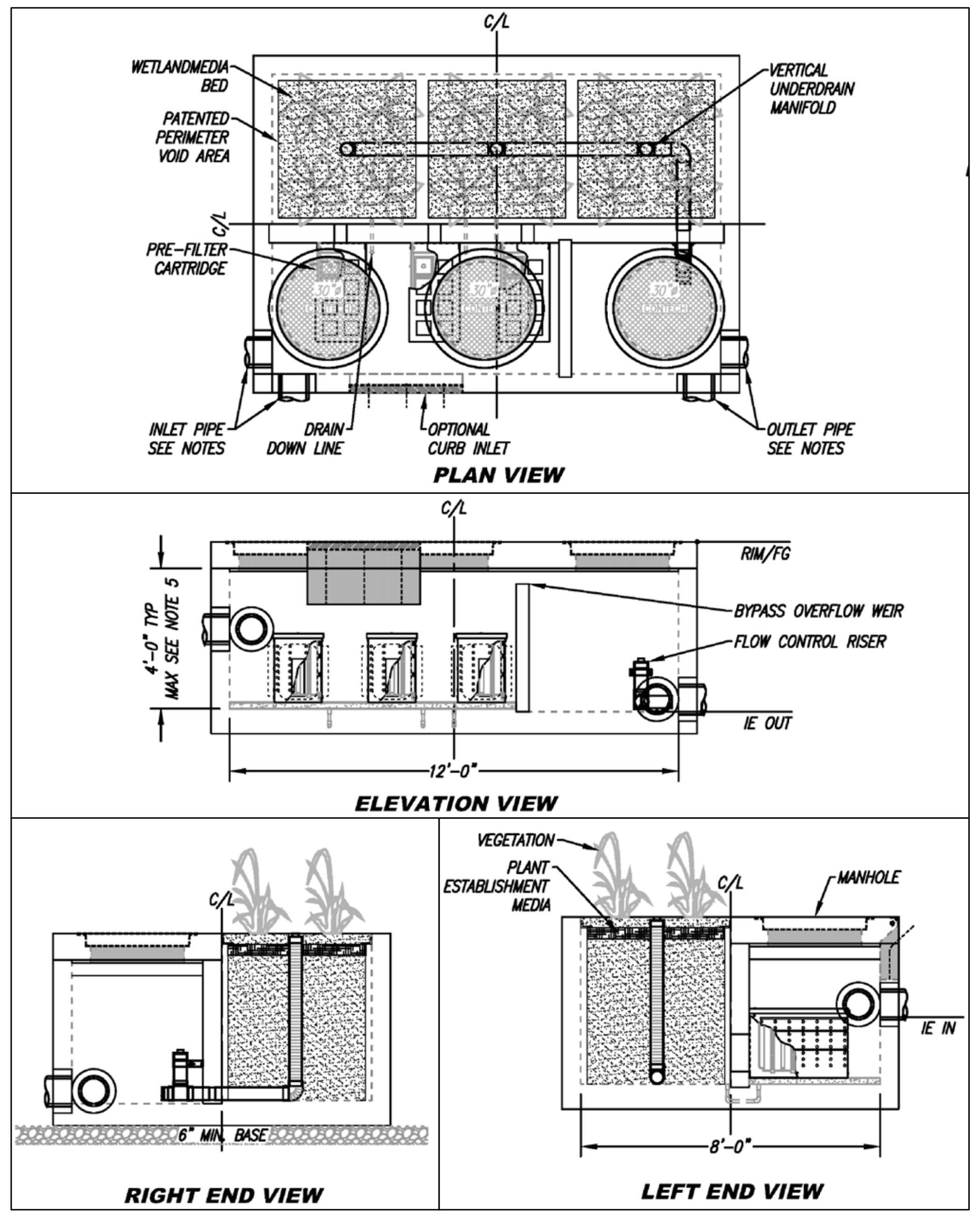
BUILDING FOOTPRINT: 34,036 SF
DRIVE AISLES & LOADING AREA: 18,798 SF
CONCRETE HARDSCAPE/OTHER: 8,257 SF

15,825 SF LANDSCAPING
(20.6% PERVIOUS AREA)

CURRENT USE: COMMERCIAL
PROPOSED USE: RESIDENTIAL

WATERSHED:
NEWPORT BAY–NEWPORT COASTAL STREAMS WATERSHED

MODULAR WETLANDS (MWS-L-8-12-V-HC) DETAIL



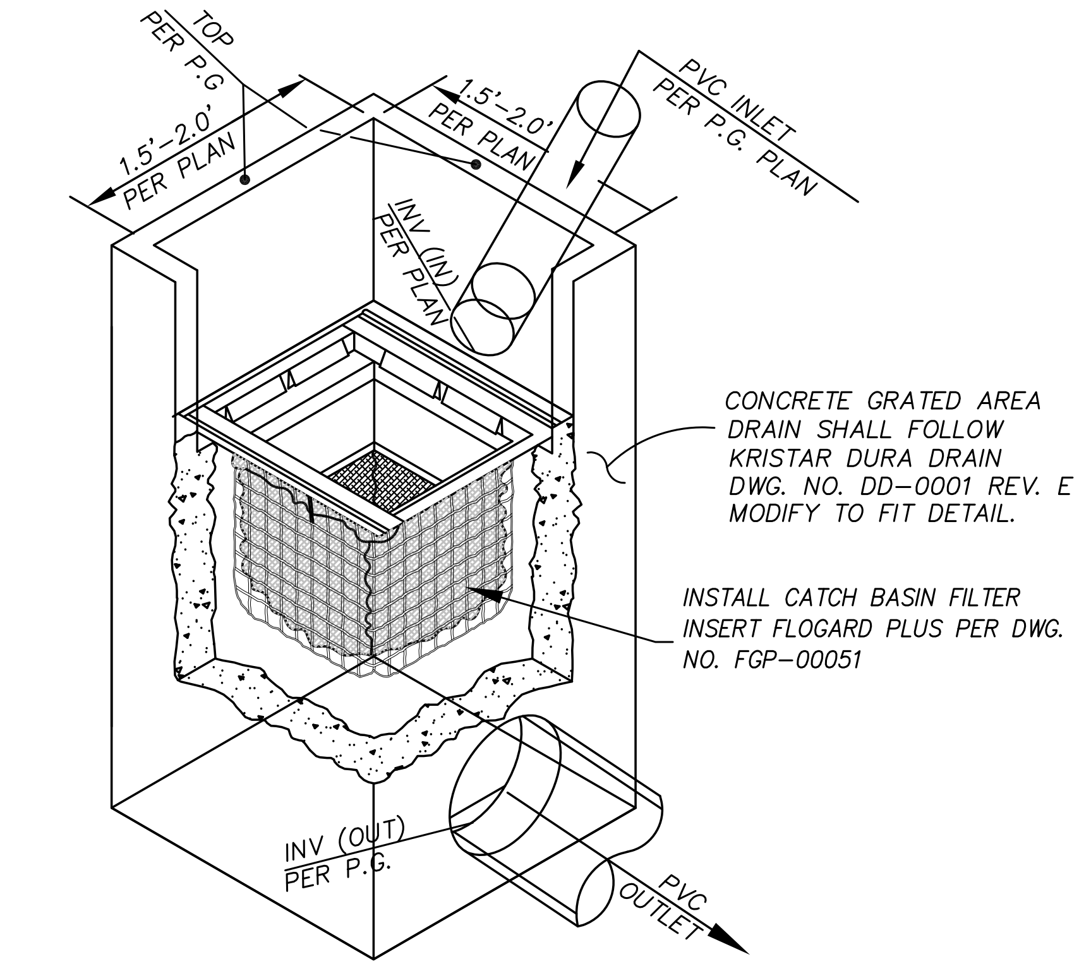
WATER QUALITY CALCULATIONS
AREA 1: MODULAR WETLANDS UNIT SIZING

AREA 1 – 76,916 SF / 1.77 AC (79.4% IMPERVIOUS)
DESIGN FLOWRATE (Qd) = C * DI * DA * 43,560 / (12in/ft x 3600sec/hr)
RUNOFF COEFFICIENT (C) = 0.75 * Imp% + 0.15 = 0.75 * 0.794 + 0.15 = 0.75
DI = DESIGN INTENSITY (in/hr) = 0.26 in/hr
DA = DRAINAGE AREA: 1.77 AC
DESIGN FLOWRATE (Qd) = 0.75 * 0.26in/hr * 1.77 AC * 43,560 / (12in/ft x 3600sec/hr)
= 0.348 cfs

MODULAR WETLANDS SELECTED SIZING : MWS–L–8–12–V–HC (8' x 12' BOX)
HIGH CAPACITY MODEL – 3.50
TREATMENT FLOW RATE (Qf) = 0.357 cfs
TREATMENT FLOW RATE (Qf) > DESIGN FLOWRATE (Qd)
0.357 cfs > 0.348 cfs

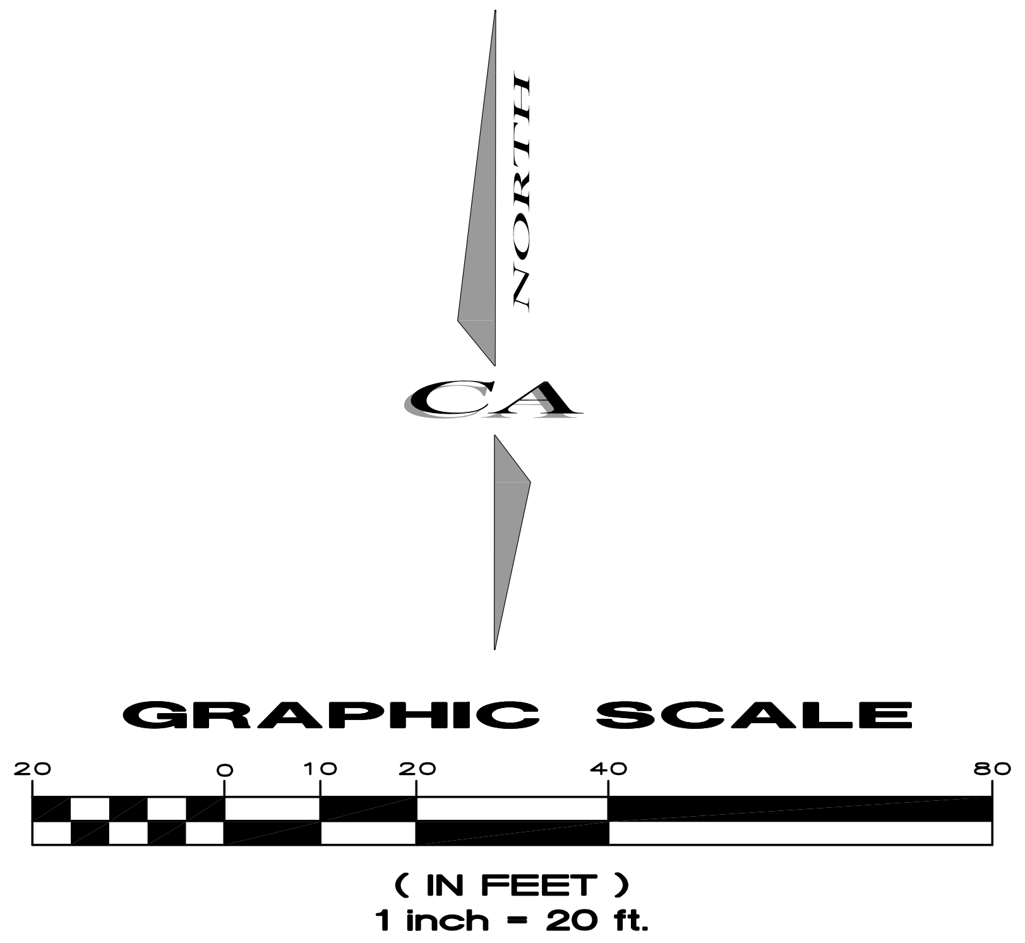
BMP LOCATIONS

BMP#1 – MWS (LAT: 33.652724° / LONG: –117.908822°)



CATCH BASIN FILTER INSERT DETAIL
GRATED INLET

FILTER PER FLOGARD PLUS, DWG. NO. FGP–00051



PREPARED BY:

CA ENGINEERING, INC.
Planning · Engineering · Surveying
4101 BIRCH ST., STE 140
NEWPORT BEACH, CA 92660
949-724-9480 949-724-9484 FAX

OWNER:

WMC, L.L.C.
1024 Bayside Dr., #109
Newport Beach, CA 90660
Contact: Tony Weeda
(714) 329-2405

Mar 06 2025

WATER QUALITY MANAGEMENT PLAN
BMP EXIBIT (SITE PLAN)
A.P.N. 419-111-19, 20, & 21
220, 222, 234 & 236 Victoria Street
Costa Mesa , CA 92626

SHEET 1 OF 1

\\CA–SVR1\Shared\727–6 Victoria Place, Costa Mesa,\WQMP\727–6 WQMP SITE PLAN.dwg Last Modified: 11 Feb 2025 – 5:50pm
Plotted on: 06 Mar 2025 – 6:23pm by cward

VICTORIA STREET TOWNHOME PROJECT
(TR 19351)

220, 222, 234 & 236 VICTORIA STREET
COSTA MESA, CA 92626

Preliminary Water Quality Management Plan

Prepared By:

CA Engineering, Inc.
4101 Birch Street, Suite 140
Newport Beach, CA 92660
949.724.9480 / fcornwell@ca-eng.net

Prepared For:

WMC, LLC
1024 Bayside Drive, Suite 109
Newport Beach, CA 92660
714.329.2405

Date Prepared: December 6, 2024
Date Revised: February 12, 2025

County of Orange/Santa Ana Region
Priority Project

Preliminary Water Quality Management Plan
(P-WQMP)

Project Name:

VICTORIA STREET TOWNHOME PROJECT (TR 19351)

APN 419-111-19, 20 & 21

220, 222, 234 & 236 VICTORIA STREET
COSTA MESA, CA 92626

Prepared for:
WMC, LLC
1024 Bayside Drive, Suite 109
Newport Beach, CA 92660
714-329-2405

Prepared by:
CA Engineering, Inc.
Fred Cornwell, P.E.
4101 Birch Street, Suite 140
Newport Beach, CA 92660
949-724-9480 (x2012) / fcornwell@ca-eng.net

Date Prepared: December 6, 2024
Date Revised: February 12, 2025

Fred Cornwell, RCE #45591

REGISTERED PROFESSIONAL ENGINEER
FRED CORNWELL
NO. 45591
CIVIL
STATE OF CALIFORNIA

Project Owner's Certification

Planning Application No. (If applicable)	**PGPA-24-0001**	Grading Permit No.	**Not Issued Yet**
Tract/Parcel Map and Lot(s) No.	**TTM 19351**	Building Permit No.	**Not Issued Yet**
Address of Project Site and APN (If no address, specify Tract/Parcel Map and Lot Numbers)			**220, 222, 234 & 236 Victoria Street Costa Mesa, CA 92626** **APN 419-111-19, 20 & 21**

This Water Quality Management Plan (WQMP) has been prepared for WMC, LLC by CA Engineering, Inc. The WQMP is intended to comply with the requirements of the County of Orange NPDES Stormwater Program requiring the preparation of the plan.

The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan , including the ongoing operation and maintenance of all best management practices (BMPs), and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with the current Orange County Drainage Area Management Plan (DAMP) and the intent of the non-point source NPDES Permit for Waste Discharge Requirements for the County of Orange, Orange County Flood Control District and the incorporated Cities of Orange County within the Santa Ana Region. Once the undersigned transfers its interest in the property, its successors-in-interest shall bear the aforementioned responsibility to implement and amend the WQMP. An appropriate number of approved and signed copies of this document shall be available on the subject site in perpetuity.

Owner:	**WMC, LLC**		
Name / Title	Tony Weeda / Authorized Signatory		
Company	WMC, LLC		
Address	1024 Bayside Drive, Suite 109, Newport Beach, California 92660		
Email	tweeda@sbcglobal.net		
Telephone #	714-329-2405		
I understand my responsibility to implement the provisions of this WQMP including the ongoing operation and maintenance of the best management practices (BMPs) described herein.			
Owner Signature		Date	

Preparer (Engineer): Fred Cornwell, P.E.

Title	Principal	PE Registration #	45591
Company	CA Engineering, Inc.		
Address	4101 Birch Street, Suite 140, Newport Beach, CA 92660		
Email	fcornwell@ca-eng.net		
Telephone #	949-724-9480 (x2012)		

I hereby certify that this Water Quality Management Plan is in compliance with, and meets the requirements set forth in, Order No. R8-2009-0030/NPDES No. CAS618030, of the Santa Ana Regional Water Quality Control Board.

Preparer Signature		Date	2-12-2025
Place Stamp Here	REGISTERED PROFESSIONAL ENGINEER FRED CORNWELL NO. 45591 CIVIL STATE OF CALIFORNIA		

TABLE OF CONTENTS

Appendices

Exhibits and Attachments Included in Section VI:

Section I Permit(s) and Water Quality Conditions of Approval or Issuance

Project Infomation			
Permit/Application No. (If applicable)	**PGPA-24-0001**	Grading or Building Permit No. (If applicable)	**Not Issued Yet**
Address of Project Site (or Tract Map and Lot Number if no address) and APN	**220, 222, 234 & 236 Victoria Street, Costa Mesa, CA 92626** **TTM 19351** **APN 419-111-19, 20 & 21**		
Water Quality Conditions of Approval or Issuance			
Water Quality Conditions of Approval or Issuance applied to this project. (Please list verbatim.)	**No Conditions of Approval for the Project have been issued yet.**		
Was a Conceptual Water Quality Management Plan previously approved for this project?	**No. This document is the Preliminary WQMP for the Project.**		
Watershed-Based Plan Conditions			
Applicable Watershed	**Newport Bay-Newport Coastal Streams Watershed**		
Provide applicable conditions from watershed - based plans including WIHMPs and TMDLS.	**There are no approved WIHMPs for the Newport Bay-Newport Coastal Streams Watershed. TMDLS have been established for Indicator Bacteria, Nutrients, Chlordane, PCBs, and DDT for the Lower Newport Bay.**		

Section II Project Description

II.1 Project Description

Description of Proposed Project	
Development Category (From Model WQMP, Table 7.11-2; or -3):	**Significant Redevelopment Project.** Development Category No. 8 from Table 7.II-2 of the Model WQMP defines the following as a priority project for the North Orange County Permit Area: "All significant redevelopment projects, where significant redevelopment is defined as the addition or replacement of 5,000 or more square feet of impervious surface on an already developed site. Redevelopment does not include routine maintenance activities that are conducted to maintain original line and grade, hydraulic capacity, original purpose of the facility, or emergency redevelopment activity required to protect public health and safety. If the redevelopment results in the addition or replacement of less than 50 percent of the impervious area on-site and the existing development was not subject to WQMP requirement, the numeric sizing criteria discussed in Section 7.II-2.0 only applies to the addition or replacement area. If the addition or replacement accounts for 50 percent or more of the impervious area, the Project WQMP requirements apply to the entire development." **The project site is approximately 1.77 acres and is located in an existing mixed residential and commercial development area with a proposed residential use. The site is currently occupied by ten single-story buildings, concrete areas, asphalt paving, gravel, and minimal landscaping. The proposed project will include demolition of all existing improvements at the site and the construction of 40 townhomes, as well as associated drive aisles, guest parking stalls, a common recreation area, a common use flex area, walkways, landscaping, and utility improvements. As described in greater detail below, the proposed project will add and/or replace 5,000 or more square feet of impervious surface on an already developed site, and the work will result in the addition or replacement of more than 50% of the impervious area on the entire site. Accordingly, the proposed development is a Priority Project, and the numeric sizing criteria applies to the entire project area.**

Land Use	**Attached Residential Development**			
Project Area (ft^2): 76,916	Number of Dwelling Units: 40		SIC Code: **N/A**	
Project Area	Pervious		Impervious	
	Area (acres or sq ft)	Percentage	Area (acres or sq ft)	Percentage
Pre-Project Conditions	**2,250 sq. ft.**	**2.9%**	**74,666 sq. ft.**	**97.1%**
Post-Project Conditions	**15,825 sq. ft.**	**20.6%**	**61,091 sq. ft.**	**79.4%**
Drainage Patterns/Connections	The project site is rectangular in shape and has very flat topography with elevations ranging from approximately 84.8 to 83.5 feet above mean sea level (msl). Surface drainage is directed southerly to Victoria Street where it is collected in a concrete ribbon gutter and conveyed to the storm drain via a drainage inlet. There are no off-site flows flowing onto the property from neighboring sites. The drainage for the proposed project generally follows the existing flow characteristics. The project will have one drainage area, measuring 1.77 acres, which will be designed to convey, via ribbon gutters, the storm water flows to catch basins with proprietary filter inserts. The new on-site drainage system will convey the flows southerly to a Modular Wetlands System ("MWS") unit (a BIO-7: Proprietary Biotreatment BMP). The MWS unit will act as the project's LID BMP and will be installed in a landscaped area at the southeast corner of the site as shown on the BMP Exhibit (Site Plan), a copy of which is included in Section VI of this P-WQMP. After the MWS unit treats the design storm flows, they will be conveyed to the existing storm drain in Victoria Street. Storm flows in excess of the design storm flows will bypass the MWS unit and be conveyed directly to the existing storm drain in Victoria Street. The proposed MWS unit will be sized to treat the project design flow rate of 0.348 cfs. In addition to LID treatment, Oldcastle FloGard +PLUS catch basin inserts will be provided to serve as the project's trash treatment control devices.			

	The Amendment to the Water Quality Control Plan for Ocean Waters of California to Control Trash, and Part 1 Trash Provisions of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California adopted by the State Water Board, dictate that trash shall not be present in ocean waters or along shorelines, and prohibit the discharge of trash into surface waters of the state (the "Trash Provisions"). Pursuant to the Trash Provisions, all trash treatment control devices shall meet the Full Capture System definition and be certified by the State Water Resources Control Board. In compliance with the Trash Provisions, the proprietary catch basin insert filters that have been proposed for the project are listed on the State Water Resources Control Board's Certified Full Capture System List of Trash Treatment Control Devices (Updated May 2021), a copy of which is included in Section VI of this P-WQMP. The site's storm water flows are directed by the storm drain to Lower Newport Bay which outlets to the Pacific Ocean. No Hydrologic Conditions of Concern exist for the project since all of the downstream conveyance channels that will receive runoff from the project are engineered, hardened, and regularly maintained to ensure design flow capacity, and no sensitive stream habitat areas will be affected. (See Section II.3 of this P-WQMP.)
Narrative Project Description: (Use as much space as necessary.)	The project site is approximately 1.77 acres (76,916 square feet), and is located in an existing mixed residential and commercial development area with a proposed residential use. The site is bounded by residential buildings to the north and east, an auto service center to the west, and Victoria Street to the south (with a Jiffy Lube beyond). The site is currently occupied by ten single-story buildings, concrete areas, asphalt paving, gravel, and minimal landscaping. The proposed project will include demolition of all existing improvements at the site and the construction of 40 townhomes, as well as associated drive aisles, guest parking stalls, a common recreation area, a common use flex area, walkways, landscaping, and utility improvements.

	The existing site contains ten buildings with a total footprint of approximately 24,212 square feet, and concrete/paved areas of approximately 50,454 square feet, for a total impervious area of 74,666 square feet (97.1% of the project area), and 2,250 square feet of landscaping/pervious area (2.9% of the project area), for a total project site of 76,916 square feet. The proposed development will contain 40 three-story townhomes with a total building footprint area of 34,036 square feet. In addition, the proposed development will contain 8,257 square feet of concrete walkways and other hardscape, and 18,798 square feet of asphalt drive aisles and parking areas, for a total impervious area of 61,091 square feet, or 79.4% of the project area. The balance of the project site will contain 15,825 square feet of landscaping, or 20.6% of the project area, for a total project site of 76,916 square feet. The only community "facilities" at the proposed development will be a recreation area located near the center of the site, and a common use flex area located north of the recreation area. The area of these "facilities" is included in the concrete/hardscape square footage figure above. The asphalt drive aisles contained within the proposed development are the only streets, roads, or highway projects planned to be constructed as part of this WQMP. There are no known materials or wastes that are anticipated to be used or produced at the proposed residential development that would be classified as "hazardous." Further, none of the materials to be used at the proposed residential development will be stored outside. The project will not violate any water quality standards because the project will be required to meet the City's NPDES permit discharge requirements.

II.2 Potential Stormwater Pollutants

Urban runoff from a developed site and storm water pollution associated with the runoff has the potential to contribute pollutants to the municipal storm drain system and ultimately to the tributary receiving waters. Pollutants that are commonly associated with urban development include suspended solids/sediment, nutrients, metals, microbial pathogens, oil and grease, toxic organic compounds, and trash and debris. The pollutants of concern for a specific project are based upon the pollutants identified by regulatory agencies as impairing receiving waters, and pollutants that are anticipated or potentially could be generated by the project based on the proposed land uses. Identifying the anticipated/potential pollutants will allow the project WQMP to appropriately assign BMPs to effectively mitigate storm water pollution prior to the runoff discharging off-site.

Table 2.1 of the Orange County Technical Guidance Document("TGD"), dated December 20, 2013, lists the pollutants of concern generated by various land uses and is reprinted below:

Priority Project Categories and/or Project Features	**General Pollutant Categories**							
	Suspended Solid/ Sediments	**Nutrients**	**Heavy Metals**	**Pathogens (Bacteria/ Virus)**	**Pesticides**	**Oil & Grease**	**Toxic Organic Compounds**	**Trash & Debris**
Detached Residential Development	E	E	N	E	E	E	N	E
Attached Residential Development	E	E	N	E	E	E(2)	N	E
Commercial/ Industrial Development	E(1)	E(1)	E(5)	E(3)	E(1)	E	E	E
Automotive Repair Shops	N	N	E	N	N	E	E	E
Restaurants	E(1)(2)	E(1)	E(2)	E	E(1)	E	N	E
Hillside Development >5,000 ft^2	E	E	N	E	E	E	N	E
Parking Lots	E	E(1)	E	E(4)	E(1)	E	E	E
Streets, Highways, & Freeways	E	E (1)	E	E(4)	E(1)	E	E	E
Retail Gasoline Outlets	N	N	E	N	N	E	E	E

E = expected to be of concern
N = not expected to be of concern

(1) Expected pollutant if landscaping exists on-site, otherwise not expected.
(2) Expected pollutant if the project includes uncovered parking areas, otherwise not expected.
(3) Expected pollutant if land use involves food or animal waste products, otherwise not expected.
(4) Bacterial indicators are routinely detected in pavement runoff.
(5) Expected if outdoor storage or metal roofs, otherwise not expected.

The table below identifies the potential pollutants of concern for the proposed Victoria Street Townhome Project, as set forth in Table 2.1 of the Technical Guidance Document under "Attached Residential Development" and "Parking Lots:"

Pollutants of Concern

Pollutant	Check One for each: E=Expected to be of concern N=Not Expected to be of concern		Additional Information and Comments
Suspended-Solid/ Sediment	**E**		Identified as an anticipated and/or potential pollutant for Attached Residential Development and Parking Lots in Table 2.1 of the TGD.
Nutrients	**E**		Identified as an anticipated and/or potential pollutant for Attached Residential Development and Parking Lots in Table 2.1 of the TGD.
Heavy Metals	**E**		Identified as an anticipated and/or potential pollutant for Attached Residential Development and Parking Lots in Table 2.1 of the TGD.
Pathogens (Bacteria/Virus)	**E**		Identified as an anticipated and/or potential pollutant for Attached Residential Development and Parking Lots in Table 2.1 of the TGD.
Pesticides	**E**		Identified as an anticipated and/or potential pollutant for Attached Residential Development and Parking Lots in Table 2.1 of the TGD.
Oil and Grease	**E**		Identified as an anticipated and/or potential pollutant for Attached Residential Development and Parking Lots in Table 2.1 of the TGD.

Toxic Organic Compounds	**E**		Identified as an anticipated and/or potential pollutant for Attached Residential Development and Parking Lots in Table 2.1 of the TGD.
Trash and Debris	**E**		Identified as an anticipated and/or potential pollutant for Attached Residential Development and Parking Lots in Table 2.1 of the TGD.

Suspended Solids / Sediment consist of soils or other surficial materials that are eroded and then transported or deposited by wind, water, or gravity. Excessive sedimentation can increase turbidity, clog fish gills, reduce spawning habitat, lower young aquatic organisms survival rates, smother bottom dwelling organisms, and suppress aquatic vegetation growth. Sediments in runoff also transport other pollutants that adhere to them, including trace metals, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and phosphorus. The largest source of suspended solids/sediment is typically erosion from disturbed soils.

Nutrients include the macro-nutrients nitrogen and phosphorus. They commonly exist in the form of mineral salts dissolved or suspended in water and as particulate organic matter transported by storm water. Excessive discharge of nutrients to water bodies and streams can cause eutrophication, including excessive aquatic algae and plant growth, loss of dissolved oxygen, release of toxins in sediment, and significant swings in hydrogen ion concentration (pH). Primary sources of nutrients in urban runoff are fertilizers, trash and debris, and eroded soils. Urban areas with improperly managed landscapes can be substantial sources.

Heavy Metals include certain metals that can be toxic to aquatic life if concentrations become high enough to stress natural processes. Metals of concern include cadmium, chromium, copper, lead, mercury, and zinc. Lead and chromium have been used as corrosion inhibitors in primer coatings and are also raw material components in non-metal products such as fuels, adhesives, paints, and other coatings. Copper and zinc are typically associated with building materials, including galvanized metal and ornamental copper, and automotive products, including tires and brake pads. Humans can be impacted from contaminated groundwater resources, and bioaccumulation of metals in fish and shellfish. Environmental concerns regarding the potential for release of metals to the environment have already led to restricted metal usage in certain applications, for example lead additives in gasoline. The primary source of metals in urban storm water is typically commercially available metal products and automobiles.

Pathogens (Bacteria / Viruses) include bacteria and viruses, which are ubiquitous microorganisms that thrive under a range of environmental conditions. Water containing excessive pathogenic bacteria and viruses can create a harmful environment for humans and aquatic life. The source of pathogenic bacteria and viruses is typically the transport of animal or human fecal wastes from the watershed, but pathogenic organisms do occur in the natural environment.

Pesticides include pesticides and herbicides comprised of chemical compounds commonly used to control nuisance growth or prevalence of organisms. Water containing excessive pesticides and herbicides can constitute a hazard to humans and aquatic life. Areas with improperly managed landscapes, including excessive or improper application of pesticides and/or herbicides, can be a substantial source.

Oil and Grease are characterized as high-molecular weight organic compounds. Elevated oil and grease content can decrease the aesthetic value of the water body, as well as the water quality. Introduction of these pollutants to water bodies may occur due to the wide uses and applications of some of these products in municipal, residential, commercial, industrial, and construction areas. Primary sources of oil and grease are petroleum hydrocarbon products, motor products from leaking vehicles, esters, oils, fats, waxes, and high molecular-weight fatty acids.

Toxic Organic Compounds include organic compounds (pesticides, solvents, hydrocarbons) which at toxic concentrations constitute a hazard to humans and aquatic organisms. Storm water coming into contact with organic compounds can transport excessive levels of organics to receiving waters. Dirt, grease, and grime retained in cleaning fluid or rinse water may also adsorb levels of organic compounds that are harmful or hazardous to aquatic life. Sources of organic compounds include landscape maintenance areas, vehicle maintenance areas, waste handling areas, and potentially most other urban areas.

Trash and Debris includes trash, such as paper, plastic, and various waste materials, that can typically be found throughout the urban landscape, and debris which includes waste products of natural origin which are not naturally discharged to water bodies such as landscaping waste, woody debris, etc. The presence of trash and debris may have a significant impact on the recreational value of a water body and upon the health of aquatic habitat.

II.3 Hydrologic Conditions of Concern

☒ No – Show map (and see discussion below)

☐ Yes – Describe applicable hydrologic conditions of concern below. *Refer to Section 2.2.3 in the TGD.*

In the North Orange County permit area, where the Victoria Street Townhome Project is located, downstream channels are considered not susceptible to hydromodification, and therefore projects do not have the potential for an HCOC, if "[a]ll downstream conveyance channels that will receive runoff from the project are engineered, hardened, and regularly maintained to ensure design flow capacity, and no sensitive stream habitat areas will be affected." (See Section 7.II-2.3.3 of the Model WQMP.)

With respect to the proposed Victoria Street Townhome Project, the storm water runoff will be conveyed (via a private storm drain system) to the City storm drain system, which discharges to Lower Newport Bay which outlets to the Pacific Ocean. The City storm drain system that the project runoff is conveyed to is a 36" reinforced concrete pipe. **(See the County of Orange Stormwater Network Map attached hereto as Appendix C.)** No Hydrologic Conditions of Concern exist for the project since all of the downstream conveyance channels that will receive runoff from the project are engineered, hardened, and regularly maintained to ensure design flow capacity, and no sensitive stream habitat areas will be affected. **(See the Susceptibility Analysis Map for Newport Bay-Newport Coastal Streams Watershed, Figure 4 of Appendix XVI.3 of the Technical Guidance Document, a copy of which is attached to this P-WQMP as Appendix C.)**

II.4 Post Development Drainage Characteristics

The project site is rectangular in shape and has very flat topography with elevations ranging from approximately 84.8 to 83.5 feet above mean sea level (msl). Surface drainage is directed southerly to Victoria Street where it is collected in a concrete ribbon gutter and conveyed to the storm drain via a drainage inlet. There are no off-site flows flowing onto the property from neighboring sites.

The drainage for the proposed project generally follows the existing flow characteristics. The project will have one drainage area, measuring 1.77 acres, which will be designed to convey, via ribbon gutters, the storm water flows to catch basins with proprietary filter inserts.

The new on-site drainage system will convey the flows southerly to a Modular Wetlands System (“MWS”) unit (a BIO-7: Proprietary Biotreatment BMP). The MWS unit will act as the project’s LID BMP, and will be installed in a landscaped area at the southeast corner of the site as shown on the BMP Exhibit (Site Plan), a copy of which is included in Section VI of this P-WQMP. After the MWS unit treats the design storm flows, they will be conveyed to the existing storm drain in Victoria Street. Storm flows in excess of the design storm flows will bypass the MWS unit and be conveyed directly to the existing storm drain in Victoria Street.

The proposed MWS unit will be sized to treat the project design flow rate of 0.348 cfs. In addition to LID treatment, Oldcastle FloGard +PLUS catch basin inserts will be provided to serve as the project’s trash treatment control devices.

The Amendment to the Water Quality Control Plan for Ocean Waters of California to Control Trash, and Part 1 Trash Provisions of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California adopted by the State Water Board, dictate that trash shall not be present in ocean waters or along shorelines, and prohibit the discharge of trash into surface waters of the state (the “Trash Provisions”). Pursuant to the Trash Provisions, all trash treatment control devices shall meet the Full Capture System definition and be certified by the State Water Resources Control Board. In compliance with the Trash Provisions, the proprietary catch basin insert filters that have been proposed for the project are listed on the State Water Resources Control Board’s Certified Full Capture System List of Trash Treatment Control Devices (Updated May 2021), a copy of which is included in Section VI of this P-WQMP.

The site’s storm water flows are directed by the storm drain to Lower Newport Bay which outlets to the Pacific Ocean. No Hydrologic Conditions of Concern exist for the project since all of the downstream conveyance channels that will receive runoff from the project are engineered, hardened, and regularly maintained to ensure design flow capacity, and no sensitive stream habitat areas will be affected. (See Section II.3 of this P-WQMP.)

II.5 Property Ownership/Management

All portions of the project and site are owned by WMC, LLC. The individual at WMC, LLC responsible for this project and all related water quality issues is Tony Weeda. Mr. Weeda's contact information is as follows: 1024 Bayside Drive, Suite 109, Newport Beach, California 92660; phone number (714) 329-2405; email address tweeda@sbcglobal.net. All maintenance responsibilities, including the implementation and maintenance of BMPs for the Victoria Street Townhome Project, shall be performed by WMC, LLC.

Section III Site Description

III.1 Physical Setting

Name of Planned Community/Planning Area (if applicable)	**N/A**
Location/Address	**220, 222, 234 & 236 Victoria Street, Costa Mesa, CA 92626**
General Plan Land Use Designation	**General Commercial**
Zoning	**Current: C2 - General Business** **Proposed: Residential Incentive Overlay District (RIOD)**
Acreage of Project Site	**1.77 acres**
Predominant Soil Type	**The project area is underlain by a thin layer of top soils/fill mantel extending to depths of 1 to 2 feet below the existing site grades. The fill soils consist of light brown to dark gray, fine to medium grained sand/silty sand, moist top soil, underlain by clayey sand/sandy silt and clayey layers. At depths between 9-12 feet, a layer of white to yellowish sandy clay with sea shell fragments was encountered.** **(See page 10 of Soil Pacific Inc.'s Soil and Foundation Evaluation Report, Proposed Multi-Tenant Building Complex, 220, 222, and 234 Victoria Street, Costa Mesa, California, dated September 19, 2024 (the "Geotechnical Report"), a copy of which is attached to this P-WQMP as Appendix F.)** **The soils in the project area are classified as HSG D. (See the Hydrologic Soil Group Type D NRCS Soil Survey Map for Orange County, Figure XVI-2b of the Technical Guidance Document, a copy of which is attached to this P-WQMP as Appendix E.)**

III.2 Site Characteristics

Site Characteristics	
Precipitation Zone	**0.75 inches** **(See Appendix D of this P-WQMP—Rainfall Zone Map for Orange County, Figure XVI-1, TGD)**
Topography	**Flat**
Drainage Patterns/Connections	The project site is rectangular in shape and has very flat topography with elevations ranging from approximately 84.8 to 83.5 feet above mean sea level (msl). Surface drainage is directed southerly to Victoria Street where it is collected in a concrete ribbon gutter and conveyed to the storm drain via a drainage inlet. There are no off-site flows flowing onto the property from neighboring sites. The drainage for the proposed project generally follows the existing flow characteristics. The project will have one drainage area, measuring 1.77 acres, which will be designed to convey, via ribbon gutters, the storm water flows to catch basins with proprietary filter inserts. The new on-site drainage system will convey the flows southerly to a Modular Wetlands System (“MWS”) unit (a BIO-7: Proprietary Biotreatment BMP). The MWS unit will act as the project’s LID BMP, and will be installed in a landscaped area at the southeast corner of the site as shown on the BMP Exhibit (Site Plan), a copy of which is included in Section VI of this P-WQMP. After the MWS unit treats the design storm flows, they will be conveyed to the existing storm drain in Victoria Street. Storm flows in excess of the design storm flows will bypass the MWS unit and be conveyed directly to the existing storm drain in Victoria Street. The proposed MWS unit will be sized to treat the project design flow rate of 0.348 cfs. In addition to LID treatment, Oldcastle FloGard +PLUS catch basin inserts will be provided to serve as the project’s trash treatment control devices.

	The Amendment to the Water Quality Control Plan for Ocean Waters of California to Control Trash, and Part 1 Trash Provisions of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California adopted by the State Water Board, dictate that trash shall not be present in ocean waters or along shorelines, and prohibit the discharge of trash into surface waters of the state (the "Trash Provisions"). Pursuant to the Trash Provisions, all trash treatment control devices shall meet the Full Capture System definition and be certified by the State Water Resources Control Board. In compliance with the Trash Provisions, the proprietary catch basin insert filters that have been proposed for the project are listed on the State Water Resources Control Board's Certified Full Capture System List of Trash Treatment Control Devices (Updated May 2021), a copy of which is included in Section VI of this P-WQMP. The site's storm water flows are directed by the storm drain to Lower Newport Bay which outlets to the Pacific Ocean. No Hydrologic Conditions of Concern exist for the project since all of the downstream conveyance channels that will receive runoff from the project are engineered, hardened, and regularly maintained to ensure design flow capacity, and no sensitive stream habitat areas will be affected. (See Section II.3 of this P-WQMP.)
Soil Type, Geology, and Infiltration Properties	**The project area is underlain by a thin layer of topsoils/fill mantel extending to depths of 1 to 2 feet below the existing site grades. The fill soils consist of light brown to dark gray, fine to medium grained sand/silty sand, moist topsoil, underlain by clayey sand/sandy silt and clayey layers. At depths between 9-12 feet, a layer of white to yellowish sandy clay with seashell fragments was encountered. (See page 10 of the Geotechnical Report attached to this P-WQMP as Appendix F.) The soils in the project area are classified as HSG D. (See the Hydrologic Soil Group Type D NRCS Soil Survey Map for Orange County, Figure XVI-2b of the Technical Guidance Document, a copy of which is attached to this P-WQMP as Appendix E.)** **Per the results of the geotechnical engineer's percolation testing, infiltration at the site is not feasible. The infiltration rate at the site is 0.2 inches per hour or less. (See Soil Pacific Inc.'s Clarification Letter Regarding Infiltration Feasibility at 220, 222, and 234 Victoria Street, Costa Mesa, California, dated December 6, 2024 (the**

	"Infiltration Letter"), a copy of which is attached to this P-WQMP as Appendix F.)
Hydrogeologic (Groundwater) Conditions	**Groundwater was not encountered during the geotechnical engineer's borings which extended to a maximum depth of 12 feet. (See page 11 of the Geotechnical Report attached to this P-WQMP as Appendix F.)**
Geotechnical Conditions (relevant to infiltration)	**Infiltration at the site is infeasible due to the impermeable soils (Type D) and low infiltration rate of 0.2 inches per hour or less. (See the Infiltration Letter attached to this P-WQMP as Appendix F.)**
Off-Site Drainage	**There are no off-site flows that will flow onto the site.**
Utility and Infrastructure Information	**The only utilities associated with the proposed development are the water, sewer, storm drain, gas and electrical connections. These laterals will supply the necessary utility connections for the proposed development. There are no main lines contained on the site. The proposed Modular Wetlands System unit will not interfere with any on-site utilities.**

III.3 Watershed Description

Receiving Waters	**The storm water flows from the project site drain to the City storm drain system which discharges to Lower Newport Bay which outlets to the Pacific Ocean.**
303(d) Listed Impairments	**Lower Newport Bay: Chlordane, Copper, DDT, Indicator Bacteria, Nutrients, PCBs, and Toxicity**
Applicable TMDLs	**Lower Newport Bay: TMDLS have been established for Indicator Bacteria, Nutrients, Chlordane, PCBs, and DDT**
Pollutants of Concern for the Project	**Suspended Solids/Sediment, Nutrients, Pathogens (Bacteria / Viruses), Pesticides, Oil & Grease, and Trash & Debris**
Environmentally Sensitive and Special Biological Significant Areas	**The proposed project does not directly discharge to, and is not within or adjacent to, an ESA.**

Section IV Best Management Practices (BMPs)

IV. 1 Project Performance Criteria

(NOC Permit Area only) Is there an approved WIHMP or equivalent for the project area that includes more stringent LID feasibility criteria or if there are opportunities identified for implementing LID on regional or sub-regional basis?	YES ☐	NO **X**
If yes, describe WIHMP feasibility criteria or regional/sub-regional LID opportunities.	**Not applicable. There is currently no approved WIHMP for the Newport Bay-Newport Coastal Streams Watershed.**	

Project Performance Criteria	
If HCOC exists, list applicable hydromodification control performance criteria (Section 7.II-2.4.2.2 in MWQMP)	**No HCOCs exist. (See Section II.3 of this P-WQMP.)**

<table>
<tr><td>List applicable LID performance criteria (Section 7.II-2.4.3 from MWQMP)</td><td>Priority Projects must infiltrate, harvest and use, evapotranspire, or biotreat/biofilter the 85th percentile of the 24-hour storm event (Design Capture Volume).</td></tr>
<tr><td>List applicable treatment control BMP performance criteria (Section 7.II-3.2.2 from MWQMP)</td><td>Capture and treat runoff from the 24-hour, 85th percentile storm event, and drawdown the captured/treated volume in 48 hours following end of event.</td></tr>
<tr><td>Calculate LID design storm capture volume for Project.</td><td>The project site contains one drainage area (Drainage Area A1). A new on-site drainage system will be constructed that will convey the design storm flows to an MWS unit that will act as the project’s LID BMP. The Design Storm Capture Volume (DCV) and the Design Flow Rate for the project area have been calculated as set forth below. The detailed calculations used to determine the DCV and the Design Flow Rate are set forth in Section IV.3.4 of this WQMP.
<table>
<tr><th>DRAINAGE AREA</th><th>ACREAGE OF DRAINAGE AREA</th><th>DCV (CF)</th><th>DESIGN FLOW RATE (CFS)</th></tr>
<tr><td>A1</td><td>1.77 AC</td><td>3,614</td><td>0.348</td></tr>
</table>
</td></tr>
</table>

IV.2. Site Design and Drainage

The project site is rectangular in shape and has very flat topography with elevations ranging from approximately 84.8 to 83.5 feet above mean sea level (msl). Surface drainage is directed southerly to Victoria Street where it is collected in a concrete ribbon gutter and conveyed to the storm drain via a drainage inlet. There are no off-site flows flowing onto the property from neighboring sites.

The drainage for the proposed project generally follows the existing flow characteristics. The project will have one drainage area, measuring 1.77 acres, which will be designed to convey, via ribbon gutters, the storm water flows to catch basins with proprietary filter inserts.

The new on-site drainage system will convey the flows southerly to a Modular Wetlands System ("MWS") unit (a BIO-7: Proprietary Biotreatment BMP). The MWS unit will act as the project's LID BMP, and will be installed in a landscaped area at the southeast corner of the site as shown on the BMP Exhibit (Site Plan), a copy of which is included in Section VI of this P-WQMP. After the MWS unit treats the design storm flows, they will be conveyed to the existing storm drain in Victoria Street. Storm flows in excess of the design storm flows will bypass the MWS unit and be conveyed directly to the existing storm drain in Victoria Street.

The proposed MWS unit will be sized to treat the project design flow rate of 0.348 cfs. In addition to LID treatment, Oldcastle FloGard +PLUS catch basin inserts will be provided to serve as the project's trash treatment control devices.

The Amendment to the Water Quality Control Plan for Ocean Waters of California to Control Trash, and Part 1 Trash Provisions of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California adopted by the State Water Board, dictate that trash shall not be present in ocean waters or along shorelines, and prohibit the discharge of trash into surface waters of the state (the "Trash Provisions"). Pursuant to the Trash Provisions, all trash treatment control devices shall meet the Full Capture System definition and be certified by the State Water Resources Control Board. In compliance with the Trash Provisions, the proprietary catch basin insert filters that have been proposed for the project are listed on the State Water Resources Control Board's Certified Full Capture System List of Trash Treatment Control Devices (Updated May 2021), a copy of which is included in Section VI of this P-WQMP.

A proprietary biotreatment device was selected as the project's LID BMP because infiltration at the site is infeasible due to the impermeable soils (Type D) and low measured infiltration rate, and because there is insufficient available space to construct a traditional biotreatment planter.

The site's storm water flows are directed by the storm drain to Lower Newport Bay which outlets to the Pacific Ocean. No Hydrologic Conditions of Concern exist for the project since all of the downstream conveyance channels that will receive runoff from the project are engineered, hardened, and regularly maintained to ensure design flow capacity, and no sensitive stream habitat areas will be affected. (See Section II.3 of this P-WQMP.)

IV.3 LID BMP Selection and Project Conformance Analysis

Each sub-section below documents that the proposed design features conform to the applicable project performance criteria via check boxes, tables, calculations, narratives, and/or references to worksheets.

IV.3.1 Hydrologic Source Controls (HSCs)

Name	Included?
Localized on-lot infiltration	**No**
Impervious area dispersion (e.g. roof top disconnection)	**No**
Street trees (canopy interception)	**No**
Residential rain barrels (not actively managed)	**No**
Green roofs/Brown roofs	**No**
Blue roofs	**No**
Impervious area reduction (e.g. permeable pavers, site design)	**No**

The proposed BMP, BIO-7: Proprietary Biotreatment (Modular Wetlands System), will biotreat the entire LID Design Storm Capture Volume. Therefore, Hydrologic Source Controls are not required for the proposed Victoria Street Townhome Project.

IV.3.2 Infiltration BMPs

Name	Included?
Bioretention without underdrains	**No**
Rain gardens	**No**
Porous landscaping	**No**
Infiltration planters	**No**
Retention swales	**No**
Infiltration trenches	**No**
Infiltration basins	**No**
Drywells	**No**
Subsurface infiltration galleries	**No**
French drains	**No**
Permeable asphalt	**No**
Permeable concrete	**No**
Permeable concrete pavers	**No**

It is infeasible to infiltrate the LID Design Storm Capture Volume at the project site due to the impermeable soils (Type D) and low measured infiltration rate.

The proposed LID BMP, BIO-7: Proprietary Biotreatment (Modular Wetlands System), will be utilized to biotreat the entire LID Design Storm Capture Volume.

See also Table 2.7 from the Technical Guidance Document below.

Table 2.7: Infiltration BMP Feasibility Worksheet

	Infeasibility Criteria	***Yes***	***No***
1	**Would Infiltration BMPs pose significant risk for groundwater related concerns?** Refer to Appendix VIII (Worksheet I) for guidance on groundwater-related Infiltration feasibility criteria.		**X**
Provide basis: Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
2	Would Infiltration BMPs **pose significant risk of increasing risk of geotechnical hazards that cannot be mitigated to an acceptable level?** (Yes if the answer to any of the following questions is yes, as established by a geotechnical expert): • The BMP can only be located less than 50 feet away from slopes steeper than 15 percent. • The BMP can only be located less than eight feet from building foundations or an alternative setback. • A study prepared by a geotechnical professional or an available watershed study substantiates that storm water infiltration would potentially result in significantly increased risks of geotechnical hazards that cannot be mitigated to an acceptable level.		**X**
Provide basis: Summarize findings of studies, provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
3	Would infiltration of the DCV from drainage area **violate downstream water rights?**		**X**
Provide basis: Summarize findings of studies, provide reference to studies, calculations, maps, data sources, etc.			
	Partial Infeasibility Criteria	***Yes***	***No***
4	Is proposed infiltration facility **located on HSG D soils** or the site geotechnical investigation identifies presence of soil characteristics which support categorization as D soils?	**X**	
Provide basis:			

<table>
<tr><td colspan="4">The soils in the project area are classified as HSG D. (See the Hydrologic Soil Group Type D NRCS Soil Survey Map for Orange County, Figure XVI-2b of the Technical Guidance Document, a copy of which is attached to this P-WQMP as Appendix E.)
Summarize findings of studies, provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>5</td><td>Is measured infiltration rate below proposed facility less than 0.3 inches per hour? This calculation shall be based on the methods described in Appendix VII.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:
It is infeasible to infiltrate the LID Design Storm Capture Volume at the project site due to the impermeable soils (Type D) and low measured infiltration rate of 0.2 inches per hour or less. (See the Infiltration Letter attached to this P-WQMP as Appendix F.)
Summarize findings of studies, provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>6</td><td>Would reduction of over predeveloped conditions cause impairments to downstream beneficial uses, such as change of seasonality of ephemeral washes or increased discharge of contaminated groundwater to surface waters?</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible:
Summarize findings of studies, provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>7</td><td>Would an increase in infiltration over predeveloped conditions cause impairments to downstream beneficial uses, such as change of seasonality of ephemeral washes or increased discharge of contaminated groundwater to surface waters?</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible:
Summarize findings of studies, provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td colspan="4">Infiltration Screening Results (check box corresponding to result):</td></tr>
<tr><td></td><td>Is there substantial evidence that infiltration from the project would result in a significant increase in I & I to the sanitary sewer that cannot be sufficiently mitigated? (See Appendix</td><td></td><td>X</td></tr>
</table>

8	XVII) Provide narrative discussion and supporting evidence: Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability. **The referenced document is not attached to the current version of the TGD.**		
9	**If any answer from row 1-3 is yes**: infiltration of any volume Is not feasible within the DMA or equivalent. Provide basis: Summarize findings of infeasibility screening		**X**
10	**If any answer from row 4-7 is yes**, infiltration is permissible but is not presumed to be feasible for the entire DCV. Criteria for designing biotreatment BMPs to achieve the maximum feasible infiltration and ET shall apply. Provide basis: Summarize findings of infeasibility screening	**X**	
11	If all answers to rows 1 through 11 are no, infiltration of the full DCV is potentially feasible, BMPs must be designed to infiltrate the full DCV to the maximum extent practicable.	**N/A**	

IV.3.3 Evapotranspiration, Rainwater Harvesting BMPs

Name	Included?
All HSCs; *See Section IV.3.1*	**No**
Surface-based infiltration BMPs	**No**
Biotreatment BMPs	**No**
Above-ground cisterns and basins	**No**
Underground detention	**No**

The proposed BMP, BIO-7: Proprietary Biotreatment (Modular Wetlands System), will biotreat the entire LID Design Storm Capture Volume. Therefore, no other evapotranspiration or rainwater harvesting BMPs will be utilized at the site.

IV.3.4 Biotreatment BMPs

Name	**Included?**
Bioretention with underdrains	**No**
Stormwater planter boxes with underdrains	**No**
Rain gardens with underdrains	**No**
Constructed wetlands	**No**
Vegetated swales	**No**
Vegetated filter strips	**No**
Proprietary biotreatment systems	**Yes**
Wet extended detention basin	**No**
Dry extended detention basins	**No**

The proposed BIO-7: Proprietary Biotreatment BMP (Modular Wetlands System) will biotreat the entire LID Design Storm Flows for the project area.

The required design flowrate for the project area is 0.348 cfs. Pursuant to the MWS Linear 2.0 HGL Sizing Calculations table, a copy of which is included in Section VI of this P-WQMP, the proposed Modular Wetlands System unit (Model #MWS-L-8-12-V-High Capacity Model 3.50) has a treatment flowrate of 0.357 cfs.

Therefore, the treatment flowrate of the selected BIO-7: Proprietary Biotreatment BMP (Modular Wetlands System unit) exceeds the design flowrate for the project area.

DRAINAGE AREA A1

Worksheet B: Simple Design Capture Volume Sizing Method

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.75	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0.00	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.75	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	1.77	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.794	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.75	
4	Calculate runoff volume, V_{design}= *(C x* $d_{remainder}$ *x A x 43560 x (1/12))*	V_{design}=	3,614	cu-ft

Flow-based Proprietary BMP Sizing (TGD Appendix III.3.3)

$Q = C \times i \times A \times 43{,}560\ ft^2/ac / (12\ in/ft \times 3600\ sec/hr)$

For the project area:

Q = design flowrate, cfs

C = runoff coefficient = 0.75 (see Worksheet B above)

i = design intensity (inches) = 0.26 in/hr

A = tributary area (acres) = 1.77 acres

Q = 0.75 x 0.26 in/hr x 1.77 ac x 43,560 ft^2/ac / (12 in/ft x 3600 sec/hr) = 0.348 cfs

IV.3.5 Hydromodification Control BMPs

<table>
<tr><th colspan="2">Hydromodification Control BMPs</th></tr>
<tr><th>BMP Name</th><th>BMP Description</th></tr>
<tr><td colspan="2">The storm water runoff from the proposed Victoria Street Townhome Project will be conveyed (via a private storm drain system) to the City storm drain system, which discharges to Lower Newport Bay which outlets to the Pacific Ocean. No Hydrologic Conditions of Concern exist for the project since all of the downstream conveyance channels that will receive runoff from the project are engineered, hardened, and regularly maintained to ensure design flow capacity, and no sensitive stream habitat areas will be affected. (See the Susceptibility Analysis Map for Newport Bay-Newport Coastal Streams Watershed, Figure 4 of Appendix XVI.3 of the Technical Guidance Document, a copy of which is attached to this P-WQMP as Appendix C.) Therefore, no Hydromodification Control BMPs are required.</td></tr>
</table>

IV.3.6 Regional/Sub-Regional LID BMPs

Regional/Sub-Regional LID BMPs
The proposed BMP, BIO-7: Proprietary Biotreatment (Modular Wetlands System), will biotreat the entire LID Design Storm Capture Volume. Therefore, no Regional/Sub-Regional LID BMPs will be utilized at the site.

IV.3.7 Treatment Control BMPs

<table>
<tr><th colspan="2">Treatment Control BMPs</th></tr>
<tr><th>BMP Name</th><th>BMP Description</th></tr>
<tr><td colspan="2">The proposed LID BMP, BIO-7: Proprietary Biotreatment (Modular Wetlands System), will biotreat the entire LID Design Storm Capture Volume.
In addition, the proposed Modular Wetlands System unit and the proposed filters for the grated inlets (Oldcastle FloGard +Plus Insert Filters) have been certified by the State Water Resources Control Board as trash treatment control devices that meet the Full Capture System definition. (See the State Water Resources Control Board's Certified Full Capture System List of Trash Treatment Control Devices (Updated May 2021), a copy of which is included in Section VI of this P-WQMP.) There are six catch basin insert filters proposed for the project, and they will be located as identified on the BMP Exhibit (Site Plan) included in Section VI of this P-WQMP.
No other Treatment Control BMPs will be utilized at the site.</td></tr>
</table>

IV.3.8 Non-Structural Source Control BMPs

Non-Structural Source Control BMPs				
Identifier	**Name**	**Check One**		**If not applicable, state brief reason**
		Included	**Not Applicable**	
N1	Education for Property Owners, Tenants and Occupants	X		
N2	Activity Restrictions	X		
N3	Common Area Landscape Management	X		
N4	BMP Maintenance	X		
N5	Title 22 CCR Compliance (How development will comply)		X	Not applicable. The project site will not require Title 22 CCR compliance since the operation of the project site will not generate hazardous wastes as part of its routine operations.
N6	Local Industrial Permit Compliance		X	Not applicable.
N7	Spill Contingency Plan		X	Not applicable. This site does not mandate the stockpiling of cleanup materials; therefore, it does not require a spill contingency plan.
N8	Underground Storage Tank Compliance		X	Not applicable. There are no underground storage tanks proposed for the project site.
N9	Hazardous Materials Disclosure Compliance		X	Not applicable. The project site will not handle or dispose of hazardous materials as part of its routine operations.
N10	Uniform Fire Code Implementation		X	Not applicable. The project site will not handle or dispose of hazardous materials as part of its routine operations.
N11	Common Area Litter Control	X		
N12	Employee Training	X		
N13	Housekeeping of Loading Docks		X	Not applicable. No loading docks are proposed.

N14	Common Area Catch Basin Inspection	X		
N15	Street Sweeping Private Streets and Parking Lots	X		
N16	Retail Gasoline Outlets		X	Not applicable. No retail gasoline outlets are proposed.

N1 Property Owner Education

The Owner will review the environmental awareness educational materials and BMP Fact Sheets included in Appendices A and B of this Project WQMP prior to or during the commencement of operations at the Victoria Street Townhome Project. Among other things, these materials will inform the Owner of the impacts of dumping oil, paints, solvents or other potentially harmful chemicals into the storm drain; the proper use and management of fertilizers, pesticides and herbicides in landscaping practices; the impacts of littering and improper watering; and proper maintenance practices for the business.

N2 Activity Restrictions

The Owner shall identify surface water quality protection requirements to ensure that surface water quality activities shall be conducted in conformance with the Project WQMP as it relates to the handling and disposal of contaminants and, through the use of employee training manuals or another equally effective method, shall develop corresponding use restrictions. The use restrictions shall include, but not be limited to, the following:

(a) The Owner shall periodically provide to his employees environmental awareness education materials made available by the local municipalities. These materials will describe the use of chemicals (including car wash chemicals, pesticides and fertilizers) that should be limited to the covered property with no discharge of specified wastes via hosing or other direct discharge to gutter, catch basins, settling basins and storm drains.

(b) The Owner shall require the use of fertilizers and pesticides to be in strict conformance with City and County guidelines.

(c) The Owner shall prohibit the discharge of leaf litter, grass clippings, trash, animal wastes, paint, or masonry wastes to streets or storm drain systems.

(d) The Owner shall prohibit hosing down any paved surface where the result would be the flow of non-storm water into the street or storm drains.

(e) The Owner shall prohibit oil changing or other auto repairs that could discharge pollutants.

N3 Common Area Landscape Management

Management programs will be designed and implemented by the Owner to maintain all of the landscaped areas within the project site. These programs will include how to mitigate the potential dangers of fertilizer and pesticide usage, require that fertilizer and pesticide usage shall be consistent with City and County guidelines, discuss utilization of water-efficient landscaping practices, require that maintenance be consistent with the County Water Conservation Resolution or the City equivalent, and detail the proper disposal of landscape wastes.

The Owner shall implement irrigation and landscaping which will utilize moisture sensors, smart timers, rain shut-off valves and the grouping of plants with similar water requirements in order to prevent excess irrigation and its corresponding runoff. The Owner shall also maintain erosion control devices on the property until adequate vegetation coverage has been achieved following establishment of the landscape plantings.

The Owner shall also perform periodic inspection and adjustment of the automatic irrigation system for valve and sprinkler operation and irrigation spray heads for damage as necessary to ensure adequate moisture delivery without allowing overspray or excessive watering that would lead to unnecessary runoff.

N4 BMP Maintenance

The Owner shall be responsible for implementation of each applicable non-structural BMP as well as scheduling inspection and maintenance cleaning of all applicable structural BMP facilities. The Owner, through its landscape or other maintenance contractor, will be responsible for inspection and maintenance activities in landscape areas. Debris and other water pollutants will be controlled, contained and disposed of in a proper manner by the maintenance contractor. Refer to Section V.

N11 Common Area Litter Control

The Owner will be responsible to provide or arrange for weekly sweeping and trash pick-up at the site. The Owner may contract with its landscape or other maintenance contractor to perform these duties, as well as to conduct weekly inspections of all trash receptacles to make sure lids are closed and pick-up of any excess trash on the ground has occurred, and to note and investigate any trash disposal violations.

N12 Employee Training

The Owner shall establish an education program for his employees and/or contractors to inform and train personnel engaged in maintenance activities regarding the impact of dumping oil, paints, solvents or other potentially harmful chemicals into the storm drain; the proper use of fertilizers and pesticides in landscaping maintenance practices; and the impacts of littering and improper water disposal.

N14 Common Area Catch Basin Inspection

All catch basin inlets will be inspected and maintained by Owner at least once a year, prior to the rainy season (no later than October 1st of each year), and before and after all major storms

N15 Parking Lot Sweeping

The Owner, through his employees and/or landscaping or other maintenance contractor, shall sweep all parking areas and drive aisles within the project at least once a month, or more often if needed. Debris, sediment and trash picked up during sweeping operations will be deposited in the trash receptacles.

IV.3.9 Structural Source Control BMPs

Structural Source Control BMPs				
Identifier	**Name**	**Check One**		**If not applicable, state brief reason**
		Included	**Not Applicable**	
S1	Provide storm drain system stenciling and signage	X		
S2	Design and construct outdoor material storage areas to reduce pollution introduction		X	Not applicable. No outdoor material storage areas are proposed.
S3	Design and construct trash and waste storage areas to reduce pollution introduction		X	Not applicable. No trash and waste storage areas are proposed.
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	X		
S5	Protect slopes and channels and provide energy dissipation		X	Not applicable. The project site has no slopes or channels.
	Incorporate requirements applicable to individual priority project categories (from SDRWQCB NPDES Permit)			
S6	Dock areas		X	Not applicable. No dock areas are proposed.
S7	Maintenance bays		X	Not applicable. No maintenance bays are proposed.
S8	Vehicle wash areas		X	Not applicable. No vehicle wash areas are proposed.
S9	Outdoor processing areas		X	Not applicable. No outdoor processing areas are proposed.
S10	Equipment wash areas		X	Not applicable. No equipment wash areas are proposed.
S11	Fueling areas		X	Not applicable. No fueling areas are proposed.
S12	Hillside landscaping		X	Not applicable. No hillside landscaping is proposed.
S13	Wash water control for food preparation areas		X	Not applicable. No food preparation areas are proposed.
S14	Community car wash racks		X	Not applicable. No community car wash racks are proposed.

Structural BMPs shall be installed by the Owner at the Victoria Street Townhome Project through the construction and development of the project. For instance, irrigation systems shall be designed by a licensed landscape architect and installed by a qualified contractor to the specifications and standards of the City of Costa Mesa and the County of Orange. Thereafter, these structural source control BMPs shall be maintained by the Owner.

S1 Provide Storm Drain System Stenciling and Signage (CASQA SD-13)

The Owner is responsible for labeling all of the project's storm drain inlets and catch basins with the phrase, "NO DUMPING! DRAINS TO OCEAN," or an equally effective phrase, to alert the public to the destination of pollutants discharged into storm water. This signage is to be included on the project plans. The signage and stenciling shall be maintained for legibility by the Owner.

S4 Use Efficient Irrigation Systems and Landscape Design (CASQA SD-12)

The Owner shall direct its landscaping architect to design the timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the municipal storm drain system. The following methods to reduce excessive irrigation runoff shall be incorporated where determined applicable and feasible:

1. Employing rain shutoff devices to prevent irrigation after precipitation.

2. Designing irrigation systems to each landscape area's specific water requirements.

3. Using flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.

4. Implementing a landscape plan consistent with County Water Conservation Resolution or city equivalent, which may include provision of water sensors, programmable irrigation times (for short cycles), etc.

5. The timing and application methods of irrigation water shall be designed to minimize the runoff of excess irrigation water into the municipal storm drain system.

6. Employing other comparable, equally effective, methods to reduce irrigation water runoff.

7. Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements (for example, native or drought tolerant species). Consider other design features, such as:

   (a) Use mulches (such as wood chips or shredded wood products) in planter areas without ground cover to minimize sediment in runoff.

   (b) Install appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant material where possible and/or as recommended by the landscape architect.

(c) Leave a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible.

(d) Choose plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth.

The Owner shall be responsible for implementing and maintaining efficient irrigation systems for all landscaping including but not limited to provisions for water sensors, programmable irrigation cycles, and rain shutoff devices. The irrigation systems shall comply with local and statewide ordinances related to irrigation efficiency. The Owner shall also be responsible for the installation and maintenance of all landscape areas utilizing similar planting materials with similar water requirements to reduce excess irrigation runoff.

IV.4 Alternative Compliance Plan (If Applicable)

The proposed BMP, BIO-7: Proprietary Biotreatment (Modular Wetlands System), will biotreat the entire LID Design Storm Capture Volume. Therefore, no Alternative Compliance Plan will be utilized at the site.

IV.4.1 Water Quality Credits

<table>
<tr><th colspan="6">Description of Proposed Project</th></tr>
<tr><td colspan="6">Project Types that Qualify for Water Quality Credits (Select all that apply):</td></tr>
<tr><td>☐ Redevelopment projects that reduce the overall impervious footprint of the project site.</td><td colspan="3">☐Brownfield redevelopment, meaning redevelopment, expansion, or reuse of real property which may be complicated by the presence or potential presence of hazardous substances, pollutants or contaminants, and which have the potential to contribute to adverse ground or surface WQ if not redeveloped.</td><td colspan="2">☐ Higher density development projects which include two distinct categories (credits can only be taken for one category): those with more than seven units per acre of development (lower credit allowance); vertical density developments, for example, those with a Floor to Area Ratio (FAR) of 2 or those having more than 18 units per acre (greater credit allowance).</td></tr>
<tr><td colspan="2">☐ Mixed use development, such as a combination of residential, commercial, industrial, office, institutional, or other land uses which incorporate design principles that can demonstrate environmental benefits that would not be realized through single use projects (e.g. reduced vehicle trip traffic with the potential to reduce sources of water or air pollution).</td><td colspan="3">☐ Transit-oriented developments, such as a mixed use residential or commercial area designed to maximize access to public transportation; similar to above criterion, but where the development center is within one half mile of a mass transit center (e.g. bus, rail, light rail or commuter train station). Such projects would not be able to take credit for both categories, but may have greater credit assigned</td><td>☐ Redevelopment projects in an established historic district, historic preservation area, or similar significant city area including core City Center areas (to be defined through mapping).</td></tr>
<tr><td>☐Developments with dedication of undeveloped portions to parks, preservation areas and other pervious uses.</td><td>☐ Developments in a city center area.</td><td>☐ Developments in historic districts or historic preservation areas.</td><td colspan="2">☐ Live-work developments, a variety of developments designed to support residential and vocational needs together – similar to criteria to mixed use development; would not be able to take credit for both categories.</td><td>☐ In-fill projects, the conversion of empty lots and other underused spaces into more beneficially used spaces, such as residential or commercial areas.</td></tr>
<tr><td>Calculation of Water Quality Credits (if applicable)</td><td colspan="5">The proposed BMP, BIO-7: Proprietary Biotreatment (Modular Wetlands System), will biotreat the entire LID Design Storm Capture Volume. Therefore, no Water Quality Credits will be claimed for the Project WQMP.</td></tr>
</table>

IV.4.2 Alternative Compliance Plan Information

The proposed BMP, BIO-7: Proprietary Biotreatment (Modular Wetlands System), will biotreat the entire LID Design Storm Capture Volume. Therefore, no Alternative Compliance Plan will be utilized at the site.

Section V Inspection/Maintenance Responsibility for BMPs

WMC, LLC (the owner of the project), shall assume all BMP inspection and maintenance responsibilities for the Victoria Street Townhome Project located in Costa Mesa, California.

CONTACT NAME	**Tony Weeda**
COMPANY	**WMC, LLC**
ADDRESS	**1024 Bayside Drive, Suite 109** **Newport Beach, California 92660**
PHONE /EMAIL	**(714) 329-2405 / tweeda@sbcglobal.net**

A copy of the Operation and Maintenance Plan is attached to the Project WQMP as Appendix G.

A Maintenance Covenant and Agreement (with copies of the Operation and Maintenance Plan and WQMP Site Plan attached) will be recorded in the County Recorder's Office with respect to the Project Property prior to approval of the Final WQMP.

Should the maintenance responsibility be transferred at any time during the operational life of the Victoria Street Townhome Project, a formal notice of transfer shall be submitted to the City of Costa Mesa at the time the maintenance responsibility of the property subject to this WQMP is transferred. A Notice of Transfer of Responsibility form is included in Appendix K. The transfer of responsibility shall be incorporated into this WQMP as an amendment.

ANNUAL CERTIFICATION OF BMP MAINTENANCE

The Owner (until the HOA is formed) shall verify BMP implementation and ongoing maintenance through inspection, self- certification, survey, or other equally effective measure. The certification shall verify, at a minimum, the inspection and maintenance of all structural BMPs including inspection and performance of any required maintenance in the late summer/early fall, prior to the start of the rainy season. The forms that will be used to record the implementation, maintenance, and inspection of BMPs are included in Appendices H and I. A form that may be utilized to prepare the Annual Certificate of Compliance for BMP maintenance to be submitted to the City is included in Appendix J.

The Annual Certificate of Compliance for BMP maintenance is required to be submitted to the City by July 1st of every year.

The Owner (until the HOA is formed) shall retain operations, inspections and maintenance records of these BMPs and they will be made available to the City or County upon request. All records must be maintained for at least five (5) years after the recorded inspection date for the lifetime of the project.

LONG-TERM FUNDING FOR BMP MAINTENANCE

The Owner shall be responsible for long-term funding for BMP maintenance. BMPs shall be maintained throughout the year, and inspection and maintenance activities shall be documented in this WQMP.

ACCESS EASEMENT FOR CITY / COUNTY INSPECTION

None. The City of Costa Mesa may conduct verifications to assure that implementation and appropriate maintenance of structural and non-structural BMPs prescribed within this WQMP are taking place at the project site.

The table below identifies the party responsible for performing the inspection and maintenance of each BMP for the Victoria Street Townhome Project and details the maintenance and inspection activities to be performed and the frequency with which each shall be performed.

BMP Inspection/Maintenance			
BMP	**Reponsible Party(s)**	**Inspection/ Maintenance Activities Required**	**Minimum Frequency of Activities**
N1. Education for Property Owners, Tenants and Occupants (Non-Structural Source Control BMP)	**WMC, LLC** **(Owner)** **1024 Bayside Drive, Suite 109** **Newport Beach, CA 92660** **Contact: Tony Weeda** **tweeda@sbcglobal.net**	Educational materials shall be reviewed and made available to purchasers of the Victoria Street Townhomes. Refer to Appendices A and B of the Project WQMP for a list of applicable educational materials and BMP Fact Sheets.	Upon occupancy, and annually thereafter
N2. Activity Restrictions (Non-Structural Source Control BMP)	**WMC, LLC** **(Owner)** **1024 Bayside Drive, Suite 109** **Newport Beach, CA 92660** **Contact: Tony Weeda** **tweeda@sbcglobal.net**	The owner shall include appropriate on-site activity restrictions in the CCRs for the project. These will include, but are not limited to, use of pesticides and fertilizers consistent with City and County guidelines, prohibiting washing or hosing of walkways and driveways, and prohibiting the washing of cars on the property.	Continuous

BMP Inspection/Maintenance			
BMP	**Reponsible Party(s)**	**Inspection/ Maintenance Activities Required**	**Minimum Frequency of Activities**
N3. Common Area Landscape Management (Non-Structural Source Control BMP)	**WMC, LLC** **(Owner)** **1024 Bayside Drive, Suite 109** **Newport Beach, CA 92660** **Contact: Tony Weeda** **tweeda@sbcglobal.net**	Ongoing maintenance must be consistent with the City's adopted water conservation ordinance, plus fertilizer and pesticide usage consistent with the "County Management Guidelines for Use of Fertilizers and Pesticides." Landscaping irrigation systems shall be adjusted and properly maintained to prevent over spray runoffs. Green waste shall not be blown or swept into, or disposed of, in the street, gutter, public right-of-way, or storm drain catch basins or inlets. Leaf blowers, if used, shall be used to move green waste into piles so they can be swept and picked up and disposed of in green waste recycling containers.	Weekly

BMP Inspection/Maintenance			
BMP	**Reponsible Party(s)**	**Inspection/ Maintenance Activities Required**	**Minimum Frequency of Activities**
N4. BMP Maintenance (Non-Structural Source Control BMP)	**WMC, LLC** **(Owner)** **1024 Bayside Drive, Suite 109** **Newport Beach, CA 92660** **Contact: Tony Weeda** **tweeda@sbcglobal.net**	Owner shall be responsible for implementation of each non- structural BMP and regularly scheduled cleaning of all BMP structural facilities. Records of inspections and BMP maintenance shall be maintained by the owner and shall be available for review upon request.	Continuous
N11. Common Area Litter Control (Non-Structural Source Control BMP)	**WMC, LLC** **(Owner)** **1024 Bayside Drive, Suite 109** **Newport Beach, CA 92660** **Contact: Tony Weeda** **tweeda@sbcglobal.net**	An adequate number of trash receptacles shall be provided at the site. Litter patrol, emptying of trash receptacles at the facility, violation investigation, reporting and other litter control activities shall be performed in conjunction with maintenance activities.	Weekly

BMP Inspection/Maintenance			
BMP	**Reponsible Party(s)**	**Inspection/ Maintenance Activities Required**	**Minimum Frequency of Activities**
N12. Employee Training (Non-Structural Source Control BMP)	**WMC, LLC** **(Owner)** **1024 Bayside Drive, Suite 109** **Newport Beach, CA 92660** **Contact: Tony Weeda** **tweeda@sbcglobal.net**	The owner shall educate all new employees/managers on storm water pollution prevention, particularly good housekeeping practices prior to the start of the rainy season (October 1st). Refresher courses shall be conducted on an as needed basis.	Upon hire, and annually thereafter

BMP Inspection/Maintenance

BMP	Reponsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities
N14. Common Area Catch Basin Inspection (Non-Structural Source Control BMP)	**WMC, LLC** **(Owner)** **1024 Bayside Drive, Suite 109** **Newport Beach, CA 92660** **Contact: Tony Weeda** **tweeda@sbcglobal.net**	Catch basin inlets shall be inspected and, if necessary, cleaned prior to the storm season by October 1st each year and after all major storm events.	Annually, and before and after all major storms
N15. Street Sweeping Private Streets and Parking Lots (Non-Structural Source Control BMP)	**WMC, LLC** **(Owner)** **1024 Bayside Drive, Suite 109** **Newport Beach, CA 92660** **Contact: Tony Weeda** **tweeda@sbcglobal.net**	Parking lots and drive aisles must be swept every two weeks or more often if needed, including prior to the start of the rainy season (October 1st). Sweeping shall be done with a vacuum-type sweeper. Under no circumstances are outdoor areas/lots to be rinsed or washed with water unless said rinse/wash water is collected and disposed of properly (i.e. into the sewer).	Biweekly or More Often if Needed

BMP Inspection/Maintenance

BMP	Reponsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities
S1. Provide Storm Drain System Stenciling and Signage (Structural Source Control BMP)	**WMC, LLC (Owner) 1024 Bayside Drive, Suite 109 Newport Beach, CA 92660 Contact: Tony Weeda tweeda@sbcglobal.net**	Storm drain stencils shall be inspected for legibility, at a minimum, once prior to the storm season, and no later than October 1st of each year. Those signs determined to be illegible will be re-stenciled as soon as possible.	Annually
S4. Use Efficient Irrigation Systems & Landscape Design (Structural Source Control BMP)	**WMC, LLC (Owner) 1024 Bayside Drive, Suite 109 Newport Beach, CA 92660 Contact: Tony Weeda tweeda@sbcglobal.net**	Ongoing maintenance must be consistent with the City's adopted water conservation ord., and fertilizer and pesticide usage consistent with the "County Guidelines for Use of Fertilizers and Pesticides." Maintain all common landscape areas utilizing planting materials with similar watering requirements to reduce excess irrigation runoff. Inspect and maintain the efficient irrigation systems installed for the common area landscaping to ensure the proper functioning of all water sensors, programmable irrigation cycles and rain shutoff valves.	Monthly

BMP Inspection/Maintenance

BMP	Reponsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities
Pretreatment BMP #1 Proprietary Catch Basin Insert Filters (Oldcastle FloGard +Plus Insert Filters or Approved Equivalent) (Pretreatment for Biotreatment)	**WMC, LLC** **(Owner)** **1024 Bayside Drive, Suite 109** **Newport Beach, CA 92660** **Contact: Tony Weeda** **tweeda@sbcglobal.net**	Twice a year, prior to and after the rainy season, and after major storm events, the catch basin insert filters shall be visually inspected for damage, have all sediment and debris removed, and the filter medium pouches shall be replaced if necessary. The owner may conduct this maintenance himself or may enter into a service contract for the maintenance of the insert filters as detailed in the Oldcastle FloGard +Plus Specs/Maintenance Requirements brochure, located in Section VI hereof.	Every Six Months (Approximately April 1st and October 1st) and Immediately After Major Storm Events

BMP Inspection/Maintenance			
BMP	**Reponsible Party(s)**	**Inspection/ Maintenance Activities Required**	**Minimum Frequency of Activities**
LID BMP # 1 (Biotreatment) Modular Wetlands System (BIO-7: Proprietary Biotreatment)	**WMC, LLC** **(Owner)** **1024 Bayside Drive, Suite 109** **Newport Beach, CA 92660** **Contact: Tony Weeda** **tweeda@sbcglobal.net**	The Modular Wetlands System is to be maintained monthly as part of routine landscape maintenance activities and shall be visually inspected monthly and immediately after major storm events to remove collected litter and foreign debris from the screening device. Every 12 to 24 months, the following maintenance should be performed: remove sediment from the Separation Chamber, replace the Cartridge Filter Media, and replace the Drain Down Filter Media. Additional/detailed maintenance instructions for the Modular Wetlands System are contained in the "Maintenance Guidelines for Modular Wetlands System," a copy of which is included in Section VI of the project WQMP.	Screening Device Maintenance: Monthly And Immediately After Major Storm Events Separation Chamber, Cartridge Filter Media, and Drain Down Filter Media Maintenance: Every 12 to 24 Months

Section VI BMP Exhibit (Site Plan)

VI.1 BMP Exhibit (Site Plan)

The following documents are included in this section of the WQMP:

- **Vicinity Map**
- **BMP Exhibit (Site Plan)**
- **Oldcastle FloGard +PLUS Catch Basin Insert Filter Specifications and Inspection and Maintenance Guide**
- **BMP Fact Sheet—BIO-7: Proprietary Biotreatment**
- **Modular Wetlands System Stormwater Biofiltration Guide (Specifications and Sizing Options) / MWS Linear 2.0 HGL Sizing Calculations Table**
- **Standard Detail for Proposed Modular Wetlands System Unit (MWS-L-8-12-V-High Capacity Model 3.50)**
- **Maintenance Guidelines for Modular Wetlands System**
- **State Water Resources Control Board's Certified Full Capture System List of Trash Treatment Control Devices (Updated May 2021)**

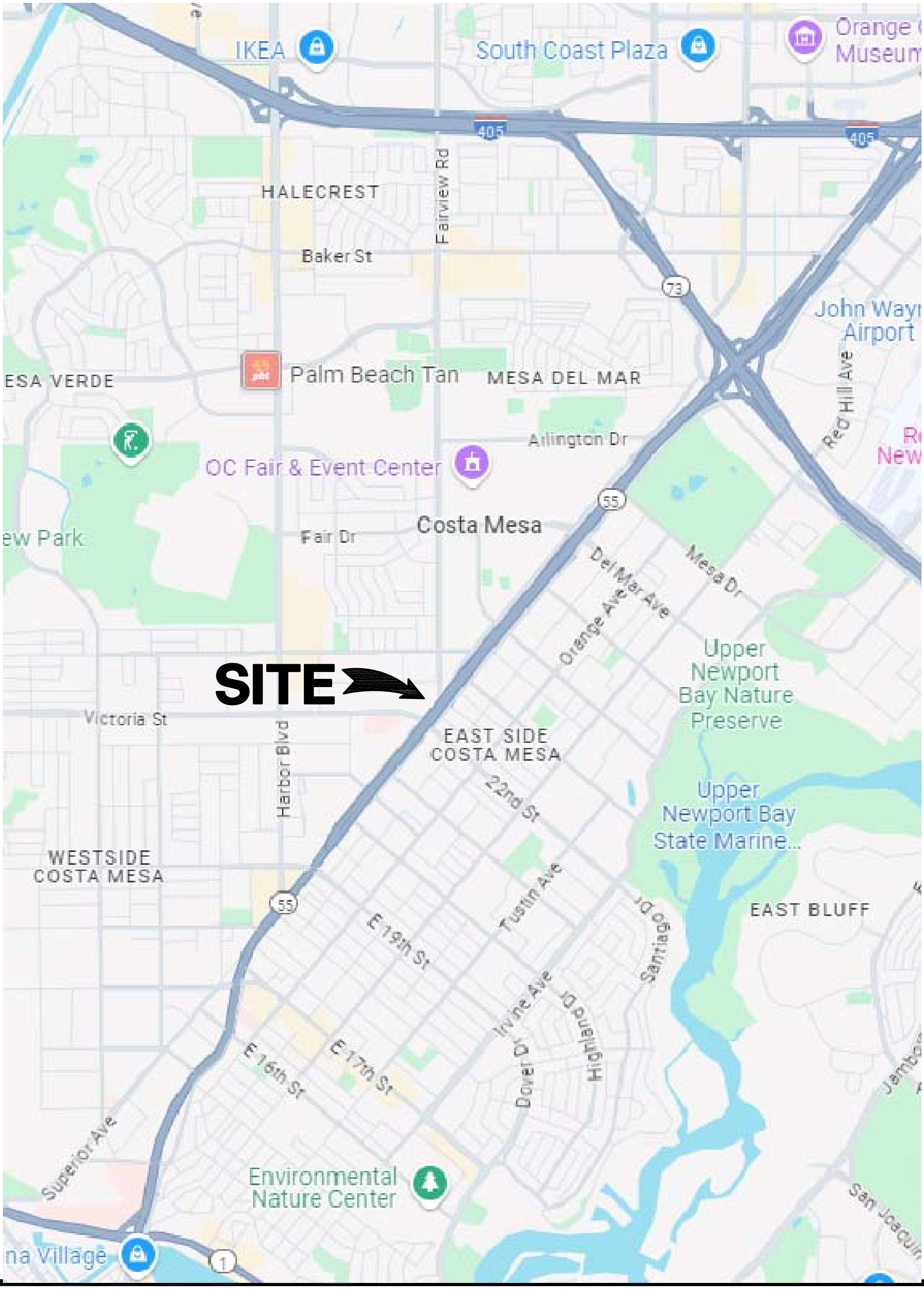
VI.2 Submittal and Recordation of Water Quality Management Plan

Following approval of the Final Project-Specific WQMP, the approved WQMP (including BMP Exhibit, Operations and Maintenance (O&M) Plan, and Appendices) shall be recorded in the Orange County Clerk-Recorder's Office prior to close-out of grading and/or building permit. Educational Materials are not required to be included.

VICINITY MAP

VICINITY MAP

N.T.S.



SITE ADDRESS: 220-236 VICTORIA STREET, COSTA MESA, CA 92626

BMP EXHIBIT (SITE PLAN)

LEGEND: STRUCTURAL / TREATMENT BMPS

- 🟩 — LANDSCAPE AREA EFFICIENT IRRIGATION / LANDSCAPE AREA RUNOFF–MINIMIZING DESIGN
- ▨ — MODULAR WETLANDS
- ← — FLOW PATTERN
- ▬ — DRAINAGE AREAS **A1**
- ▦ — BUILDING PAD AREAS
- ☐ — CONCRETE (DRIVEWAY/GUTTERS/SIDEWALKS)
- ☐ — ASPHALT CONCRETE DRIVE AISLES
- ▨ — ENHANCED PAVING
- ■ — CATCH BASINS W/ INSERT FILTERS & STENCIL SIGNAGE
- —SS—SS— — SEWER
- —WT—WT— — WATER
- —SD—SD— — STORM DRAIN

PROJECT DATA:

TOTAL SITE AREA OF PROPOSED
DEVELOPMENT: 1.77 AC (76,916 SF)

BUILDING FOOTPRINT: 34,036 SF
DRIVE AISLES & LOADING AREA: 18,798 SF
CONCRETE HARDSCAPE/OTHER: 8,257 SF

15,825 SF LANDSCAPING
(20.6% PERVIOUS AREA)

CURRENT USE: COMMERCIAL
PROPOSED USE: RESIDENTIAL

WATERSHED:
NEWPORT BAY–NEWPORT COASTAL STREAMS WATERSHED

WATER QUALITY CALCULATIONS
AREA 1: MODULAR WETLANDS UNIT SIZING

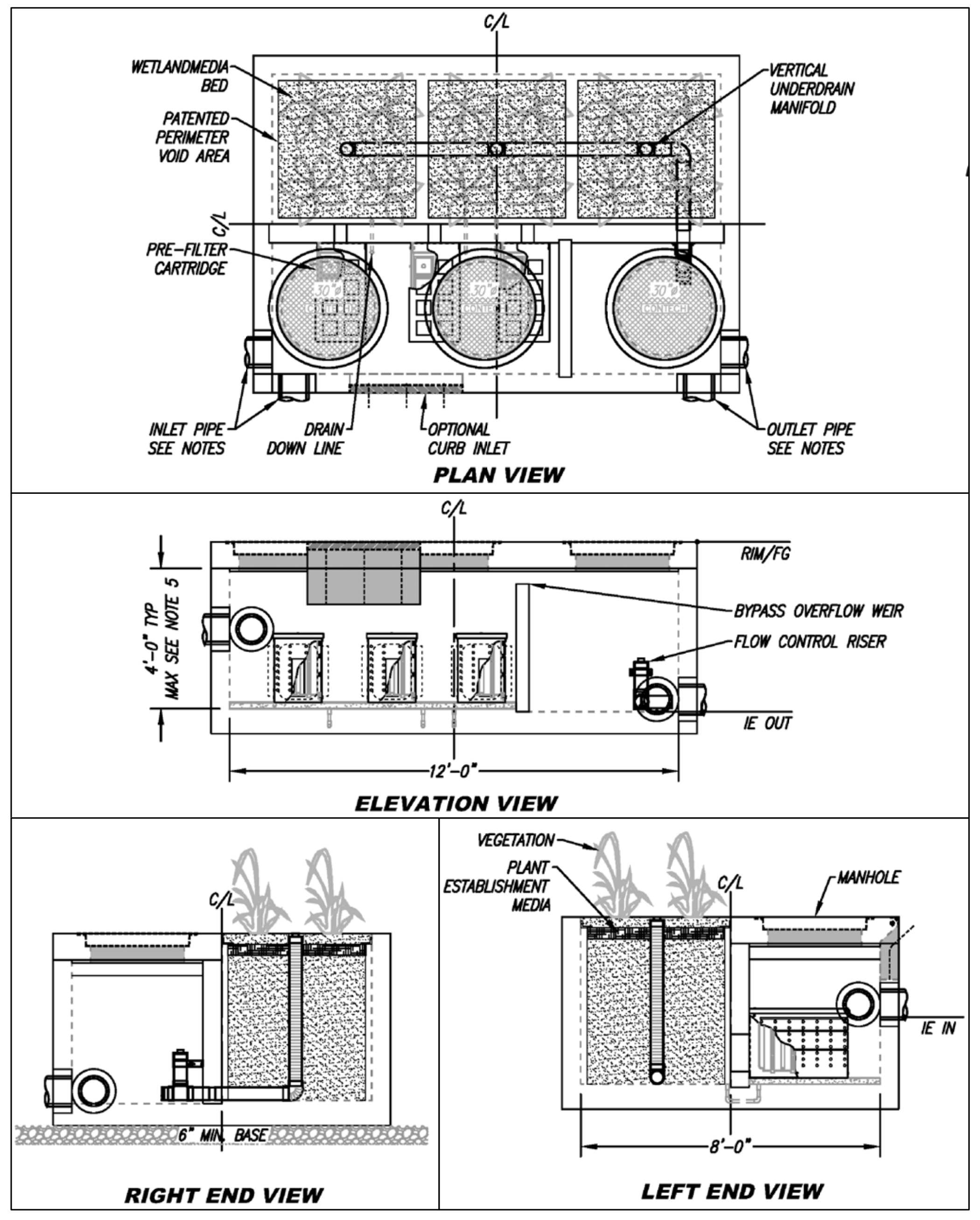
AREA 1 – 76,916 SF / 1.77 AC (79.4% IMPERVIOUS)
DESIGN FLOWRATE (Qd) = C * DI * DA * 43,560 / (12in/ft x 3600sec/hr)
RUNOFF COEFFICIENT (C) = 0.75 * Imp% + 0.15 = 0.75 * 0.794 + 0.15 = 0.75
DI = DESIGN INTENSITY (in/hr) = 0.26 in/hr
DA = DRAINAGE AREA: 1.77 AC
DESIGN FLOWRATE (Qd) = 0.75 * 0.26in/hr * 1.77 AC * 43,560 / (12in/ft x 3600sec/hr)
= 0.348 cfs

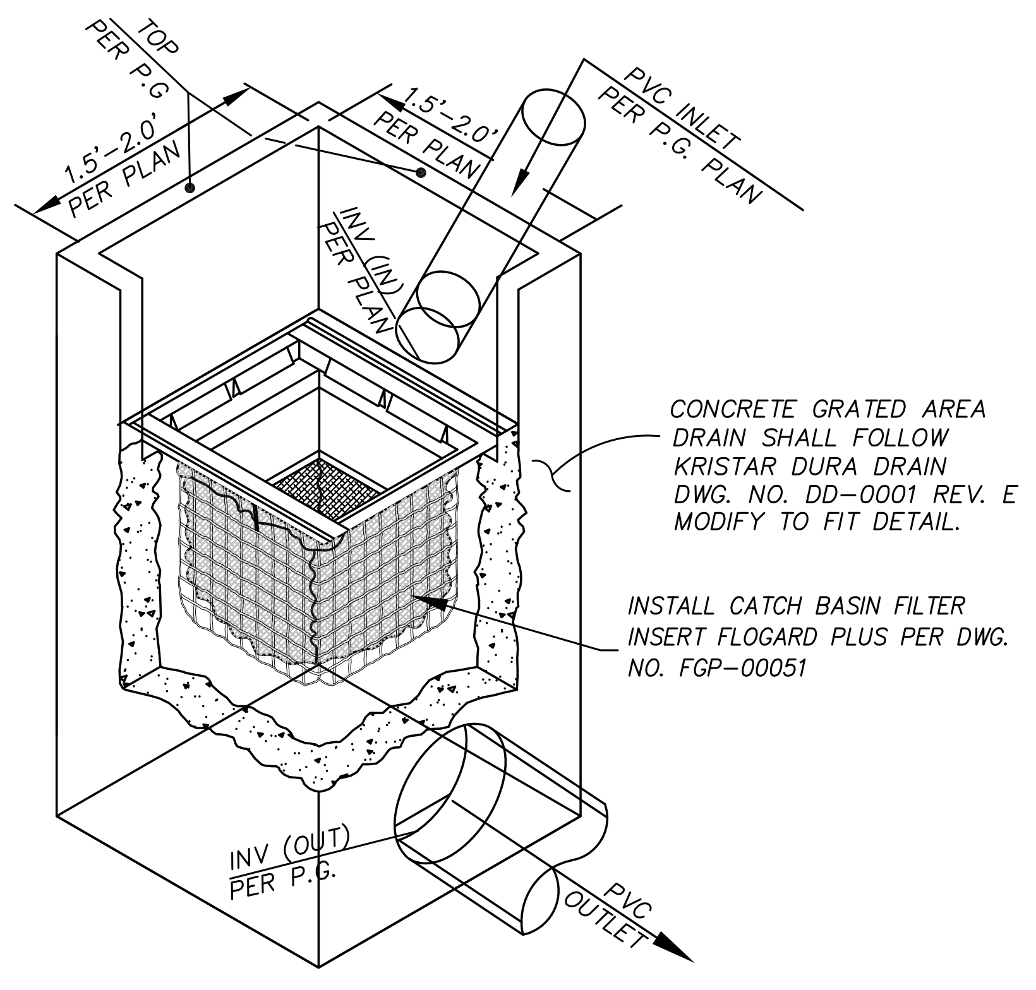
MODULAR WETLANDS SELECTED SIZING : MWS–L–8–12–V–HC (8' x 12' BOX)
HIGH CAPACITY MODEL – 3.50
TREATMENT FLOW RATE (Qf) = 0.357 cfs
TREATMENT FLOW RATE (Qf) > DESIGN FLOWRATE (Qd)
0.357 cfs > 0.348 cfs

BMP LOCATIONS

BMP#1 – MWS (LAT: 33.652724° / LONG: –117.908822°)

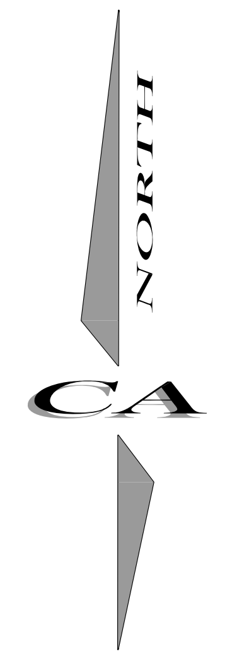
MODULAR WETLANDS (MWS-L-8-12-V-HC) DETAIL

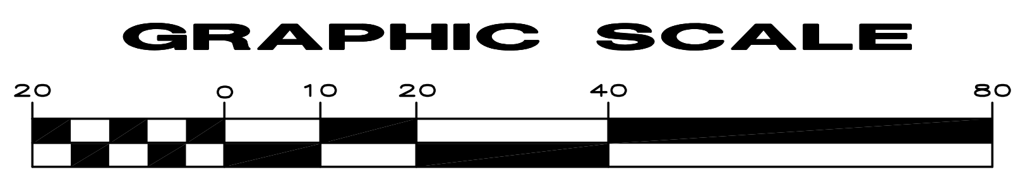




CATCH BASIN FILTER INSERT DETAIL
GRATED INLET

FILTER PER FLOGARD PLUS, DWG. NO. FGP–00051





(IN FEET)
1 inch = 20 ft.

PREPARED BY:

CA ENGINEERING, INC.
Planning • Engineering • Surveying
4101 BIRCH ST., STE 140
NEWPORT BEACH, CA 92660
949-724-9480 949-724-9484 FAX

OWNER:

WMC, L.L.C.
1024 Bayside Dr., #109
Newport Beach, CA 90660
Contact: Tony Weeda
(714) 329-2405

Feb 11 2025

WATER QUALITY MANAGEMENT PLAN
BMP EXIBIT (SITE PLAN)
A.P.N. 419-111-19, 20, & 21
220, 222, 234 & 236 Victoria Street
Costa Mesa , CA 92626

SHEET 1 OF 1

S:\727-6 Victoria Place, Costa Mesa\WQMP\727-6 WQMP SITE PLAN.dwg Last Modified: 11 Feb 2025 - 3:39pm
Plotted on: 11 Feb 2025 - 4:56pm by cward

OLDCASTLE FLOGARD +PLUS CATCH BASIN INSERT FILTER SPECIFICATIONS AND INSPECTION AND MAINTENANCE GUIDE

PUT A STOP
to TSS

Removes Pollutants from Runoff Prior to Entering Waterways

Efficient System
Catches pollutants where they are easiest to catch, at the inlet.

Variable Design
Able to be retrofitted or used in new projects.

Treatment Train
Can be incorporated as part of a “Treatment Train”.

No Standing Water
Helps to minimize bacteria and odor problems.

Focused Treatment
Removes petroleum hydrocarbons, trash and Total Suspended Solids (TSS).

Maximum Flexibility
Available in a variety of standard sizes to fit round and square inlets.

Economical
Earn a higher return on system investment.

Two-part stainless-steel insert to filter solids and oils/grease.

Easy to install, inspect and maintain, even on small and confined sites.

By the Numbers*:
Filter will remove up to 80% of Total Suspended Solids (TSS), at least 70% of oils and grease, and up to 40% of Total Phosphorus (TP) associated with organic debris as well as Polycyclic Aromatic Hydrocarbons (PAH) from oil leaks and spills.

*Approximate for urban street application.

CATCH BASIN FILTER TEST RESULTS SUMMARY

Testing Agency	% TSS Removal	% Oil & Grease Removal	% PAH Removal
UCLA	80	70 to 80	
U of Auckland Tonking & Taylor, Ltd (for City of Auckland)	78 to 95		
U of Hawaii (for City of Honolulu)	80		20 to 40

Oldcastle Infrastructure™
A CRH COMPANY

PUT A STOP
to TSS

Multi-Purpose Catch Basin Insert Retains Sediment, Debris, Trash and Oils/Grease

FloGard® catch basin insert filters are recommended for areas subject to silt and debris as well as low-to-moderate levels of petroleum hydrocarbons (oils and grease). Examples of such areas include vehicle parking lots, aircraft ramps, truck and bus storage yards, business parks, residential and public streets.

CATCH BASIN FILTER COMPETITIVE FEATURE COMPARISON

Evaluation of Catch Basin Filters (Based on flow-comparable units) (Scale 1-10)	Oldcastle	Other Insert Filter Types**
Flow Rate	10	7
Removal Efficiency*	80%	45%
Capacity - Sludge & Oil	7	7
Service Life	10	3
Installation - Ease of Handling / Installation	8	6
Ease of Inspections & Maintenance	7	7
Value	10	2

*Approximate, based on field sediment removal testing in urban street application **Average

Long-Term Value Comparison (Based on flow-comparable units) (Scale 1-10)	Oldcastle	Other Insert Filter Types**
Unit Value - Initial ($/cfs treated)	10	4
Installation Value ($/cfs treated)	10	7
Absorbent Replacement (annual avg ($/cfs treated)	10	2
Materials Replacement Value (annual avg ($/cfs treated)	10	10
Maintenance Value (annual avg ($/cfs treated)	10	7
Total First Year ROI ($/cfs treated)	10	5
Total Annual Avg Value ($/cfs treated, avg over 20 yrs)*	10	5

Captured debris from FloGard catch basin insert filter in Dana Point, California.

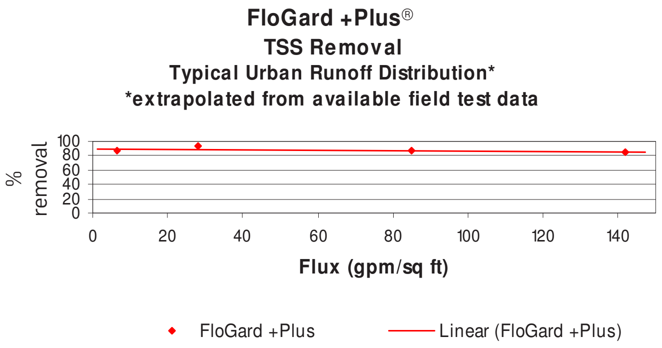
Combination Inlet

Flat-Grated Inlet

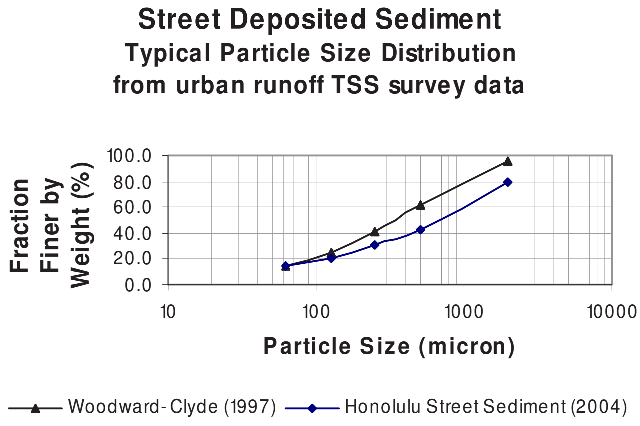
Circular Frame Inlet

FLOGARD +PLUS®

Independent field tests conducted in Hawaii and New Zealand on FloGard +PLUS® Catch Basin Insert Filters to determine removal efficiency of Total Suspended Solids (TSS). Results were extrapolated to a typical street deposited sediment particle size. Removal efficiencies were plotted and reflect effective TSS removal over a typical range of operating flow rates. Results are shown below as a function of unit internal surface area.



FloGard +Plus®
TSS Removal
Typical Urban Runoff Distribution*
***extrapolated from available field test data**



Street Deposited Sediment
Typical Particle Size Distribution
from urban runoff TSS survey data

FloGard +PLUS® Catch Basin Insert Filter is an efficient inlet prefilter designed to remove suspended sediment and floatable trash and hydrocarbons from stormwater runoff in new or retrofit applications. It is ideally suited for removal of primary pollutants from paved surfaces in commercial and residential areas, or may form part of a treatment train. The device features a unique dual-bypass design, durable components, flexible installation options and easy maintenance access.

Units are sized to fit most common styles of drainage inlet grate frames or inlet widths. Rated filtered flow capacities for each model typically exceed the required "first flush" treatment flow rate, and account for reduction in capacity as the unit accumulates suspended pollutants. Rated bypass capacity for each model also typically exceeds the inlet capacity of the catch basin.

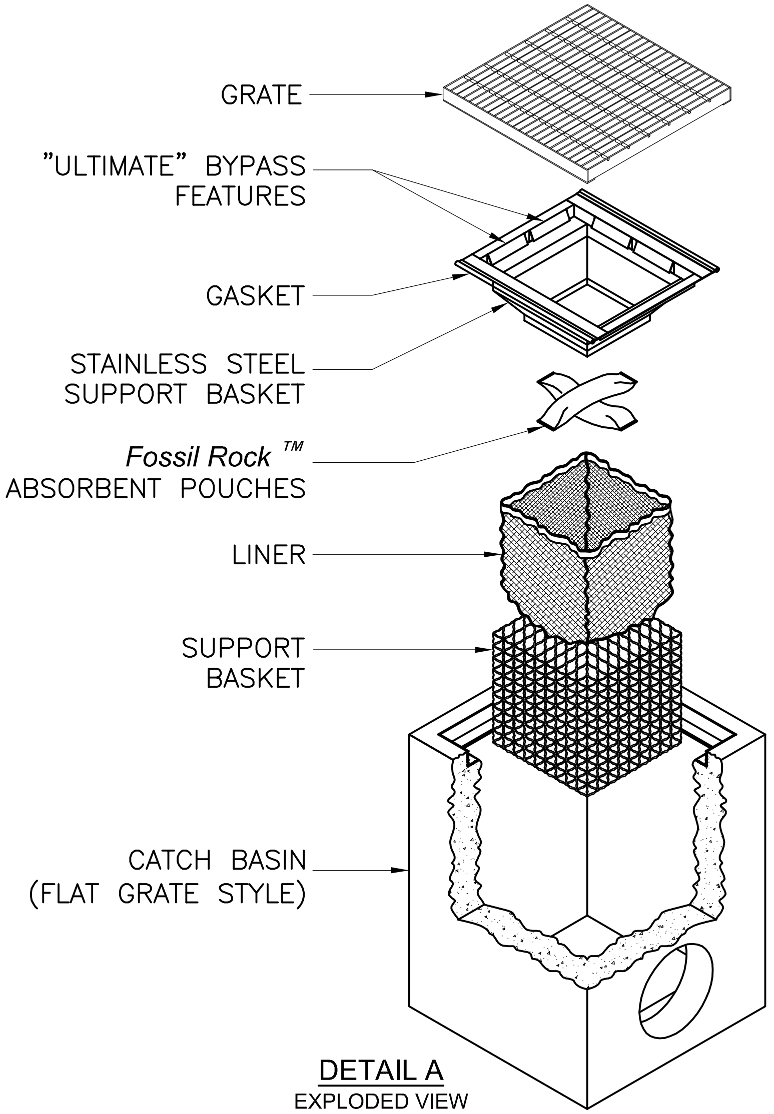
FloGard +PLUS® Test Results Summary

Testing Agency	%TSS Removal	% Oil & Grease Removal
UCLA	80*	70-80
U of Auckland Tonkin & Taylor LTD (City of Auckland)	95** 78-86***	
U of Hawaii (City of Honolulu)	80***	

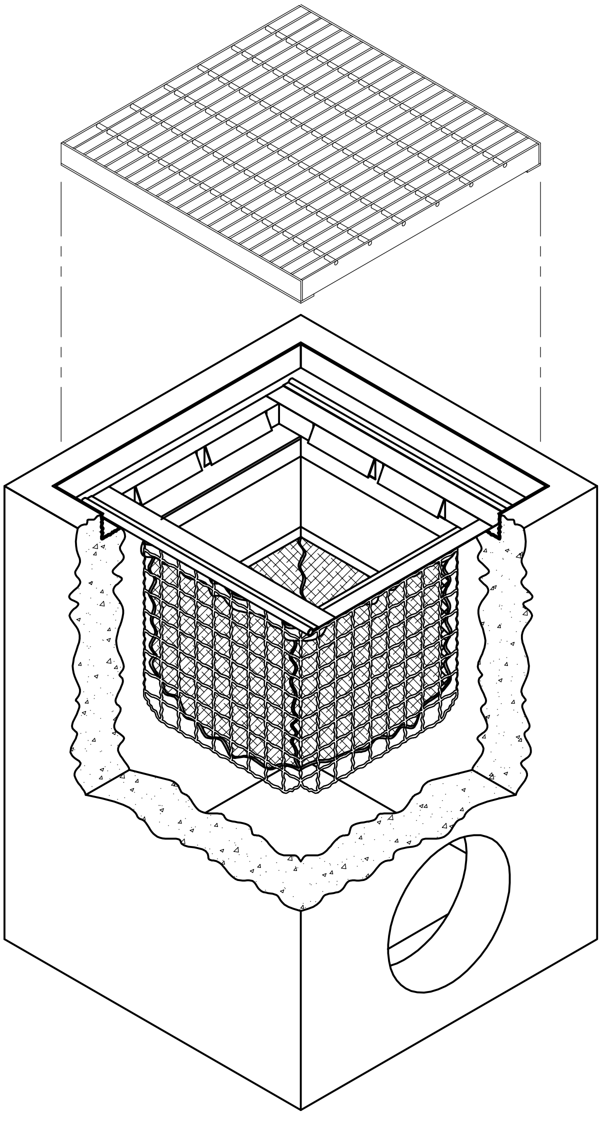
*Sand larger than ~ 575 μm
**Sand distribution ~ 100-1000 μm
***Local street sweep material (distribution consistent with NURP)

See product specifications for standard model details.

FGP-0001



DETAIL A
EXPLODED VIEW



FloGard® FILTER
-INSTALLED INTO CATCH BASIN-

NOTES:

1. Filter insert shall have a high flow bypass feature.

2. Filter support frame shall be constructed from stainless steel Type 304.

3. Filter medium shall be *Fossil Rock* ™, installed and maintained in accordance with manufacturer specifications.

4. Storage capacity reflects 80% of maximum solids collection prior to impeding filtering bypass.

U.S. PATENT # 6,00,023 & 6,877,029

Inlet
Filtration

FloGard®

Catch Basin Insert Filter

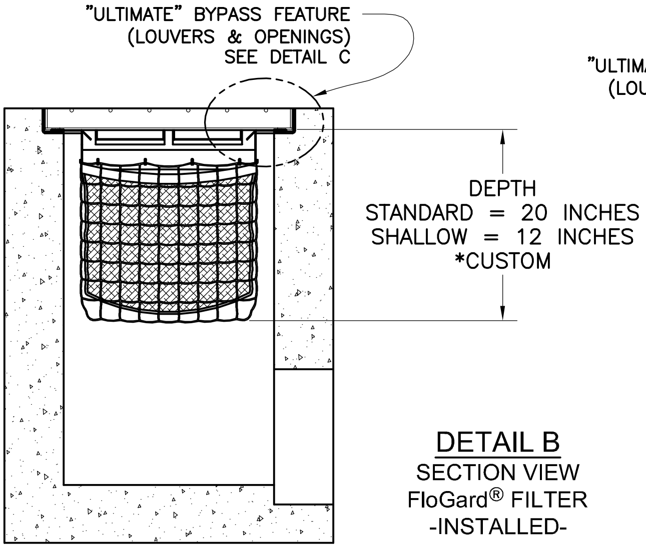
Grated Inlet Style

Oldcastle®
Stormwater Solutions
7921 Southpark Plaza, Suite 200 | Littleton, CO | 80120 | Ph: 800.579.8819 | oldcastlestormwater.com

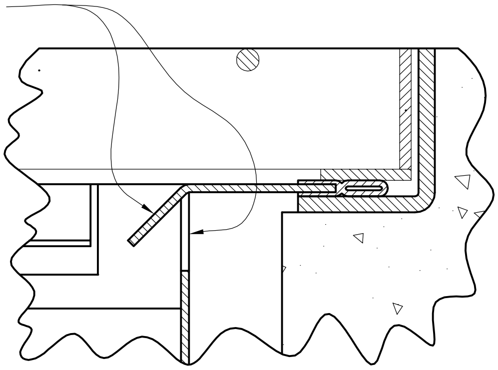
DRAWING NO.	REV	ECO	DATE	
FGP-0001	G	ECO-0142 JPR 7/13/16	JPR 11/3/06	SHEET 1 OF 2

FGP-0001

U.S. PATENT # 6,00,023 & 6,877,029



DETAIL B
SECTION VIEW
FloGard® FILTER
-INSTALLED-



DETAIL C
"ULTIMATE"
BYPASS FEATURES

* MANY OTHER STANDARD & CUSTOM SIZES & DEPTHS AVAILABLE UPON REQUEST.

SPECIFIER CHART

MODEL NO. STANDARD DEPTH	STANDARD & SHALLOW DEPTH (Data in these columes is the same for both STANDARD & SHALLOW versions)			STANDARD DEPTH -20 Inches-		MODEL NO. SHALLOW DEPTH	SHALLOW DEPTH -12 Inches-	
	INLET ID Inside Dimension (inch x inch)	GRATE OD Outside Dimension (inch x inch)	TOTAL BYPASS CAPACITY (cu. ft. / sec.)	SOLIDS STORAGE CAPACITY (cu. ft.)	FILTERED FLOW (cu. ft. / sec.)		SOLIDS STORAGE CAPACITY (cu. ft.)	FILTERED FLOW (cu. ft. / sec.)
FGP-12F	12 X 12	12 X 14	2.8	0.3	0.4	FGP-12F8	.15	.25
FGP-16F	16 X 16	16 X 19	4.7	0.8	0.7	FGP-16F8	.45	.4
FGP-18F	18 X 18	18 X 20	4.7	0.8	0.7	FGP-18F8	.45	.4
FGP-1824F	16 X 22	18 X 24	5.0	1.5	1.2	FGP-1824F8	.85	.7
FGP-1836F	18 X 36	18 X 40	6.9	2.3	1.6	FGP-1836F8	1.3	.9
FGP-2024F	18 X 22	20 X 24	5.9	1.2	1.0	FGP-2024F8	.7	.55
FGP-21F	22 X 22	22 X 24	6.1	2.2	1.5	FGP-21F8	1.25	.85
FGP-24F	24 X 24	24 X 27	6.1	2.2	1.5	FGP-24F8	1.25	.85
FGP-2430F	24 X 30	26 X 30	7.0	2.8	1.8	FGP-2430F8	1.6	1.05
FGP-2436F	24 X 36	24 X 40	8.0	3.4	2.0	FGP-2436F8	1.95	1.15
FGP-2448F	24 X 48	26 X 48	9.3	4.4	2.4	FGP-2448F8	2.5	1.35
FGP-28F	28 X 28	32 X 32	6.3	2.2	1.5	FGP-28F8	1.25	.85
FGP-30F	30 X 30	30 X 34	8.1	3.6	2.0	FGP-30F8	2.05	1.15
FGP-36F	36 X 36	36 X 40	9.1	4.6	2.4	FGP-36F8	2.65	1.35
FGP-3648F	36 X 48	40 X 48	11.5	6.8	3.2	FGP-3648F8	3.9	1.85
FGP-48F	48 X 48	48 X 54	13.2	9.5	3.9	FGP-48F8	5.45	2.25
FGP-SD24F	24 X 24	28 X 28	6.1	2.2	1.5	FGP-SD24F8	1.25	.85

Inlet
Filtration

FloGard®

Catch Basin Insert Filter

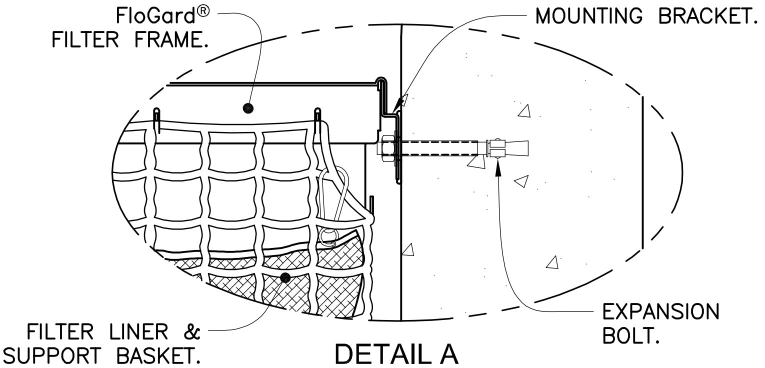
Grated Inlet Style

Oldcastle®
Stormwater Solutions

7921 Southpark Plaza, Suite 200 | Littleton, CO | 80120 | Ph: 800.579.8819 | oldcastlestormwater.com

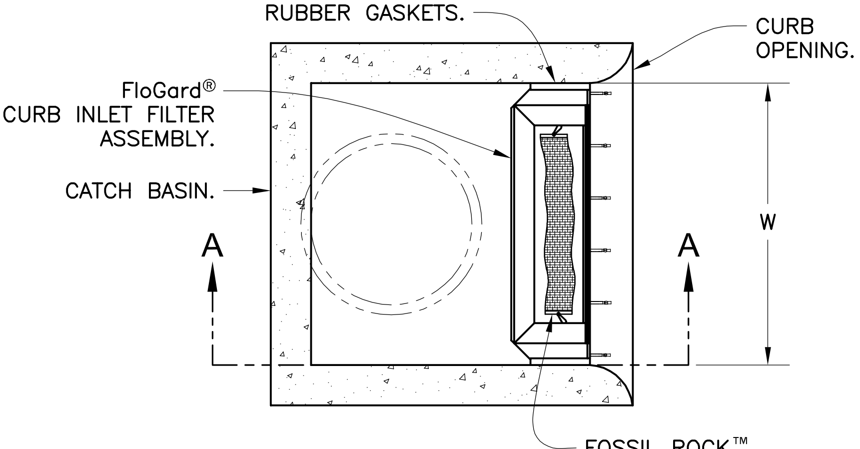
DRAWING NO.	REV	ECO	DATE	
FGP-0001	G	ECO-0142 JPR 7/13/16	JPR 11/3/06	SHEET 2 OF 2

FGP-0002



DETAIL A

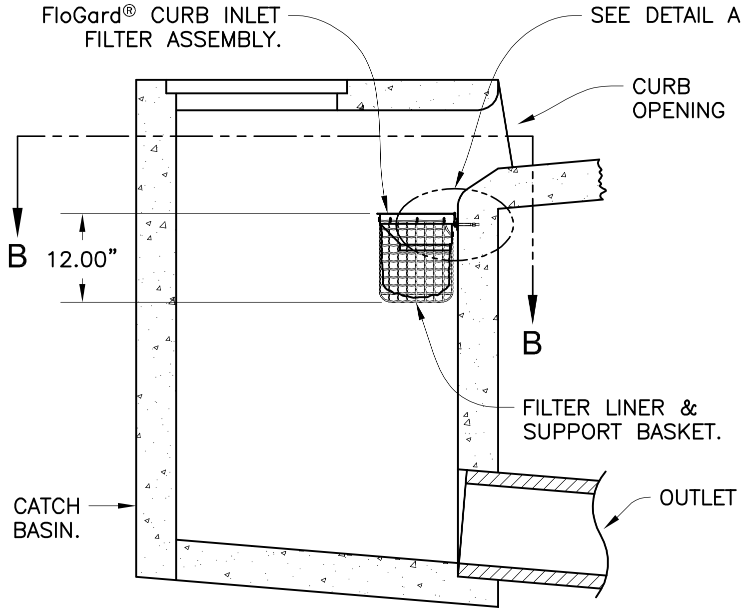
MOUNTING BRACKET & EXPANSION BOLTS
SEE NOTE 2
SCALE: 6X



SECTION B-B

TOP VIEW
SCALE: 1X

SPECIFIER CHART				
MODEL NO.	Curb Opening Width - W -	Storage Capacity - Cu. Ft. -	Filtered Flow Rate - GPM/CFS -	Bypass Flow Rate - GPM/CFS -
FGP-24CI	2.0' (24")	.95	338 / .75	2,513 / 5.6
FGP-30CI	2.5' (30")	1.20	450 / 1.00	3,008 / 6.7
FGP-36CI	3.0' (36")	1.50	563 / 1.25	3,547 / 7.9
FGP-42CI	3.5' (42")	1.80	675 / 1.50	3,951 / 8.8
FGP-48CI	4.0' (48")	2.10	768 / 1.76	4,445 / 9.9
FGP-5.0CI	5.0' (60")	2.40	900 / 2.00	5,208 / 11.6
FGP-6.0CI	6.0' (72")	3.05	1,126 / 2.51	6,196 / 13.8
FGP-7.0CI	7.0' (84")	3.65	1,350 / 3.01	7,139 / 15.9
FGP-8.0CI	8.0' (96")	4.25	1,576 / 3.51	8,082 / 18.0
FGP-10.0CI	10.0' (120")	4.85	1,800 / 4.01	9,833 / 21.9
FGP-12.0CI	12.0' (144")	6.10	2,252 / 5.02	11,764 / 26.2
FGP-14.0CI	14.0' (168")	7.30	2,700 / 6.02	13,515 / 30.1
FGP-16.0CI	16.0' (192")	8.55	3.152 / 7.02	15,446 / 34.4
FGP-18.0CI	18.0' (216")	9.45	3,490 / 7.78	17,152 / 38.2
FGP-21.0CI	21.0' (252")	10.95	4,050 / 9.02	19,891 / 44.3
FGP-28.0CI	28.0 (336")	14.60	5,400 / 12.03	26,311 / 58.6



SECTION A-A

SIDE VIEW
SCALE: 1X

NOTES:

1. Filter insert shall have a high flow bypass feature.
2. Filter support frame shall be constructed from stainless steel Type 304.
3. Filter medium shall be *Fossil Rock* ™, installed and maintained in accordance with manufacturer specifications.
4. Storage capacity reflects 80% of maximum solids collection prior to impeding filtering bypass.

Inlet
Filtration

FloGard®

Catch Basin Insert Filter

Curb Inlet Style

Oldcastle®
Stormwater Solutions
7921 Southpark Plaza, Suite 200 | Littleton, CO | 80120 | Ph: 800.579.8819 | oldcastlestormwater.com

DRAWING NO.	REV	ECO	DATE	
FGP-0002	E	ECO-0127 JPR 5/18/15	JPR 1/3/06	SHEET 1 OF 1

Oldcastle Infrastructure™
A CRH COMPANY

FLOGARD+PLUS®
CATCH BASIN INSERT FILTER

Inspection and Maintenance Guide

DRAINAGE PROTECTION SYSTEMS
DPS
A division of Oldcastle Infrastructure

Water

SCOPE:

Federal, State and Local Clean Water Act regulations and those of insurance carriers require that stormwater filtration systems be maintained and serviced on a recurring basis. The intent of the regulations is to ensure that the systems, on a continuing basis, efficiently remove pollutants from stormwater runoff thereby preventing pollution of the nation's water resources. These specifications apply to the FloGard+Plus® Catch Basin Insert Filter.

RECOMMENDED FREQUENCY OF SERVICE:

Drainage Protection Systems (DPS) recommends that installed FloGard+Plus Catch Basin Insert Filters be serviced on a recurring basis. Ultimately, the frequency depends on the amount of runoff, pollutant loading and interference from debris (leaves, vegetation, cans, paper, etc.); however, it is recommended that each installation be serviced a minimum of three times per year, with a change of filter medium once per year. DPS technicians are available to do an on-site evaluation, upon request.

RECOMMENDED TIMING OF SERVICE:

DPS guidelines for the timing of service are as follows:

1. For areas with a definite rainy season: Prior to, during and following the rainy season.
2. For areas subject to year-round rainfall: On a recurring basis (at least three times per year).
3. For areas with winter snow and summer rain: Prior to and just after the snow season and during the summer rain season.
4. For installed devices not subject to the elements (wash racks, parking garages, etc.): On a recurring basis (no less than three times per year).

SERVICE PROCEDURES:

1. The catch basin grate shall be removed and set to one side. The catch basin shall be visually inspected for defects and possible illegal dumping. If illegal dumping has occurred, the proper authorities and property owner representative shall be notified as soon as practicable.
2. Using an industrial vacuum, the collected materials shall be removed from the liner. (Note: DPS uses a truck-mounted vacuum for servicing FloGard+Plus catch basin inserts).
3. When all of the collected materials have been removed, the filter medium pouches shall be removed by unsnapping the tether from the D-ring and set to one side. The filter liner, gaskets, stainless steel frame and mounting brackets, etc., shall be inspected for continued serviceability. Minor damage or defects found shall be corrected on-the-spot and a notation made on the Maintenance Record. More extensive deficiencies that affect the efficiency of the filter (torn liner, etc.), if approved by the customer representative, will be corrected and an invoice submitted to the representative along with the Maintenance Record.
4. The filter medium pouches shall be inspected for defects and continued serviceability and replaced as necessary, and the pouch tethers re-attached to the liner's D-ring.
5. The grate shall be replaced.

REPLACEMENT AND DISPOSAL OF EXPOSED FILTER MEDIUM AND COLLECTED DEBRIS

The frequency of filter medium exchange will be in accordance with the existing DPS-Customer Maintenance Contract. DPS recommends that the medium be changed at least once per year. During the appropriate service, or if so determined by the service technician during a non-scheduled service, the filter medium will be replaced with new material. Once the exposed pouches and debris have been removed, DPS has possession and must dispose of it in accordance with local, state and federal agency requirements.

DPS also has the capability of servicing all manner of storm drain filters, catch basin inserts and catch basins without inserts, underground oil/water separators, stormwater interceptors and other such devices. All DPS personnel are highly qualified technicians and are confined-space trained and certified. Call us at (888) 950-8826 for further information and assistance.

FLOGARD+PLUS®
CATCH BASIN INSERT FILTER

OUR MARKETS

BUILDING STRUCTURES

COMMUNICATIONS

WATER

ENERGY

TRANSPORTATION

Oldcastle Infrastructure™
A CRH COMPANY

www.oldcastleinfrastructure.com
800-579-8819

Water
February 2019 v.1

BMP FACT SHEET—

BIO-7: PROPRIETARY BIOTREATMENT

BIO-7: Proprietary Biotreatment

Proprietary biotreatment devices are devices that are manufactured to mimic natural systems such as bioretention areas by incorporating plants, soil, and microbes engineered to provide treatment at higher flow rates or volumes and with smaller footprints than their natural counterparts. Incoming flows are typically filtered through a planting media (mulch, compost, soil, plants, microbes, etc.) and either infiltrated or collected by an underdrain and delivered to the storm water conveyance system. Tree box filters are an increasingly common type of proprietary biotreatment device that are installed at curb level and filled with a bioretention type soil. For low to moderate flows they operate similarly to bioretention systems and are bypassed during high flows. Tree box filters are highly adaptable solutions that can be used in all types of development and in all types of soils but are especially applicable to dense urban parking lots, street, and roadways.

Also known as:

- *Catch basin planter box*
- *Bioretention vault*
- *Tree box filter*

Proprietary biotreatment
Source:
http://www.americastusa.com /index.php/filterra/

Feasibility Screening Considerations

- Proprietary biotreatment devices that are unlined may cause incidental infiltration. Therefore, an evaluation of site conditions should be conducted to evaluate whether the BMP should include an impermeable liner to avoid infiltration into the subsurface.

Opportunity Criteria

- Drainage areas of 0.25 to 1.0 acres.
- Land use may include commercial, residential, mixed use, institutional, and subdivisions. Proprietary biotreatment facilities may also be applied in parking lot islands, traffic circles, road shoulders, and road medians.
- Must not adversely affect the level of flood protection provided by the drainage system.

OC-Specific Design Criteria and Considerations

☐ Frequent maintenance and the use of screens and grates to keep trash out may decrease the likelihood of clogging and prevent obstruction and bypass of incoming flows.

☐ Consult proprietors for specific criteria concerning the design and performance.

☐ Proprietary biotreatment may include specific media to address pollutants of concern. However, for proprietary device to be considered a biotreatment device the media must be capable of supporting rigorous growth of vegetation.

☐ Proprietary systems must be acceptable to the reviewing agency. Reviewing agencies shall have the discretion to request performance information. Reviewing agencies shall have the discretion to deny the use of a proprietary BMP on the grounds of performance, maintenance considerations, or other relevant factors.

☐ In right of way areas, plant selection should not impair traffic lines of site. Local jurisdictions may also limit plant selection in keeping with landscaping themes.

Computing Sizing Criteria for Proprietary Biotreatment Device

- Proprietary biotreatment devices can be volume based or flow-based BMPs.
- Volume-based proprietary devices should be sized using the Simple Design Capture Volume Sizing Method described in **Appendix III.3.1** or the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs described in **Appendix III.3.2**.
- The required design flowrate for flow-based proprietary devices should be computed using the Capture Efficiency Method for Flow-based BMPs described in **Appendix III.3.3**).

In South Orange County, the provided ponding plus pore volume must be checked to demonstrate that it is greater than 0.75 of the remaining DCV that this BMP is designed to address. Many proprietary biotreatment BMPs will not be able to meet the definition of "biofiltration" that applies in South Orange County. See Section III.7 and Worksheet SOC-1.

Additional References for Design Guidance

- Los Angeles Unified School District (LAUSD) Stormwater Technical Manual, Chapter 4: http://www.laschools.org/employee/design/fs-studies-and-reports/download/white_paper_report_material/Storm_Water_Technical_Manual_2009-opt-red.pdf?version_id=76975850
- Los Angeles County Stormwater BMP Design and Maintenance Manual, Chapter 9: http://dpw.lacounty.gov/DES/design_manuals/StormwaterBMPDesignandMaintenance.pdf
- Santa Barbara BMP Guidance Manual, Chapter 6: http://www.santabarbaraca.gov/NR/rdonlyres/91D1FA75-C185-491E-A882-49EE17789DF8/0/Manual_071008_Final.pdf

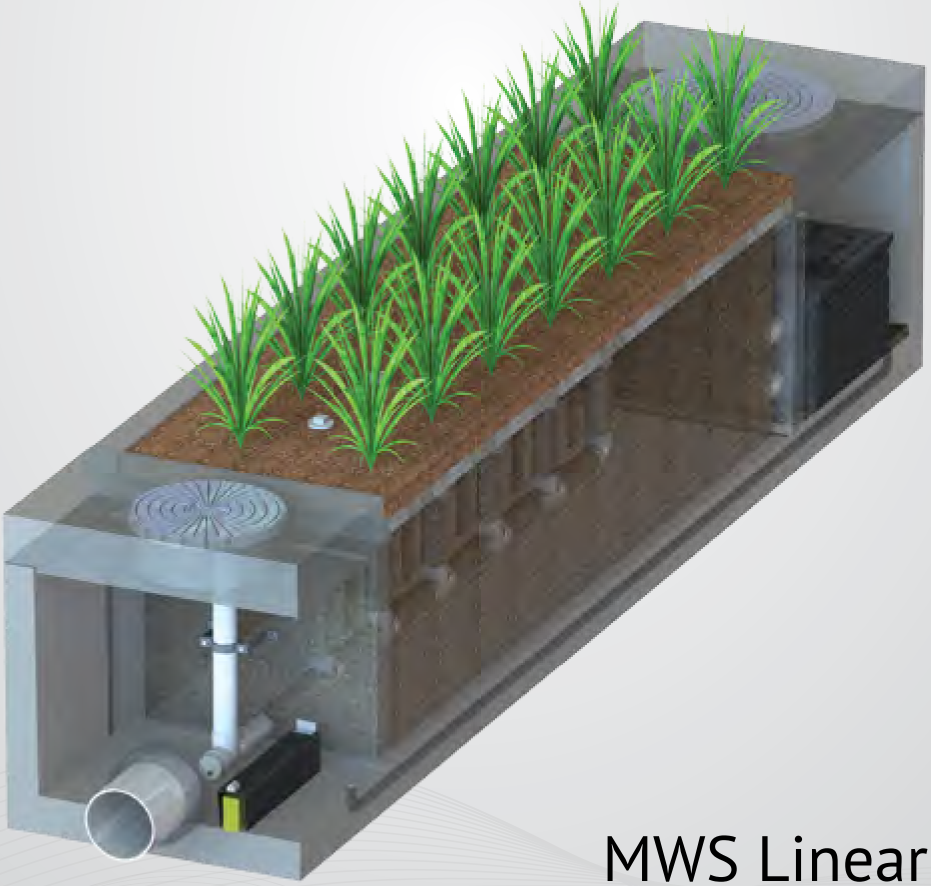
MODULAR WETLANDS SYSTEM STORMWATER BIOFILTRATION GUIDE

(SPECIFICATIONS AND SIZING OPTIONS) /

MWS LINEAR 2.0 HGL SIZING CALCULATIONS TABLE

MODULAR WETLANDS™

Advanced **Stormwater** Biofiltration



MWS Linear

Contents

The Urban Impact

For hundreds of years natural wetlands surrounding our shores have played an integral role as nature's stormwater treatment system. But as our cities grow and develop, these natural wetlands have perished under countless roads, rooftops, and parking lots.

Plant A Wetland

Without natural wetlands our cities are deprived of water purification, flood control, and land stability. Modular Wetlands and the MWS Linear re-establish nature's presence and rejuvenate water ways in urban areas.

MWS Linear

The Modular Wetland System Linear represents a pioneering breakthrough in stormwater technology as the only biofiltration system to utilize patented horizontal flow, allowing for a smaller footprint and higher treatment capacity. While most biofilters use little or no pre-treatment, the MWS Linear incorporates an advanced pre-treatment chamber that includes separation and pre-filter cartridges. In this chamber sediment and hydrocarbons are removed from runoff before it enters the biofiltration chamber, in turn reducing maintenance costs and improving performance.

Applications

The MWS Linear has been successfully used on numerous new construction and retrofit projects. The system's superior versatility makes it beneficial for a wide range of stormwater and waste water applications - treating rooftops, streetscapes, parking lots, and industrial sites.

Industrial

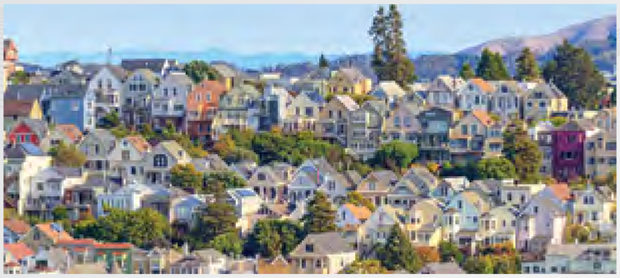
Many states enforce strict regulations for discharges from industrial sites. The MWS Linear has helped various sites meet difficult EPA mandated effluent limits for dissolved metals and other pollutants.

Streets

Street applications can be challenging due to limited space. The MWS Linear is very adaptable, and offers the smallest footprint to work around the constraints of existing utilities on retrofit projects.

Commercial

Compared to bioretention systems, the MWS Linear can treat far more area in less space - meeting treatment and volume control requirements.



Residential

Low to high density developments can benefit from the versatile design of the MWS Linear. The system can be used in both decentralized LID design and cost-effective end-of-the-line configurations.

Parking Lots

Parking lots are designed to maximize space and the MWS Linear's 4 ft. standard planter width allows for easy integration into parking lot islands and other landscape medians.

Mixed Use

The MWS Linear can be installed as a raised planter to treat runoff from rooftops or patios, making it perfect for sustainable "live-work" spaces.

More applications are available on our website: www.ModularWetlands.com/Applications

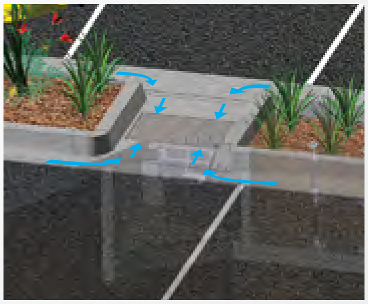
- Agriculture
- Reuse
- Low Impact Development
- Waste Water

Configurations

The MWS Linear is the preferred biofiltration system of Civil Engineers across the country due to its versatile design. This highly versatile system has available "pipe-in" options on most models, along with built-in curb or grated inlets for simple integration into your stormdrain design.

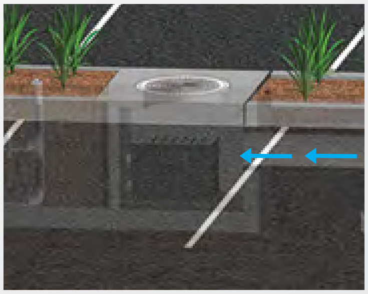
Curb Type

The *Curb Type* configuration accepts sheet flow through a curb opening and is commonly used along road ways and parking lots. It can be used in sump or flow by conditions. Length of curb opening varies based on model and size.



Grate Type

The *Grate Type* configuration offers the same features and benefits as the *Curb Type* but with a grated/drop inlet above the systems pre-treatment chamber. It has the added benefit of allowing for pedestrian access over the inlet. ADA compliant grates are available to assure easy and safe access. The *Grate Type* can also be used in scenarios where runoff needs to be intercepted on both sides of landscape islands.



Vault Type

The system's patented horizontal flow biofilter is able to accept inflow pipes directly into the pre-treatment chamber, meaning the MWS Linear can be used in end-of-the-line installations. This greatly improves feasibility over typical decentralized designs that are required with other biofiltration/bioretention systems. Another benefit of the "pipe in" design is the ability to install the system downstream of underground detention systems to meet water quality volume requirements.

Downspout Type

The *Downspout Type* is a variation of the *Vault Type* and is designed to accept a vertical downspout pipe from roof top and podium areas. Some models have the option of utilizing an internal bypass, simplifying the overall design. The system can be installed as a raised planter and the exterior can be stuccoed or covered with other finishes to match the look of adjacent buildings.

Advantages & Operation

The MWS Linear is the most efficient and versatile biofiltration system on the market, and the only system with horizontal flow which improves performance, reduces footprint, and minimizes maintenance. Figure-1 and Figure-2 illustrate the invaluable benefits of horizontal flow and the multiple treatment stages.

Featured Advantages

- Horizontal Flow Biofiltration
- Greater Filter Surface Area
- Pre-Treatment Chamber
- Patented Perimeter Void Area
- Flow Control
- No Depressed Planter Area

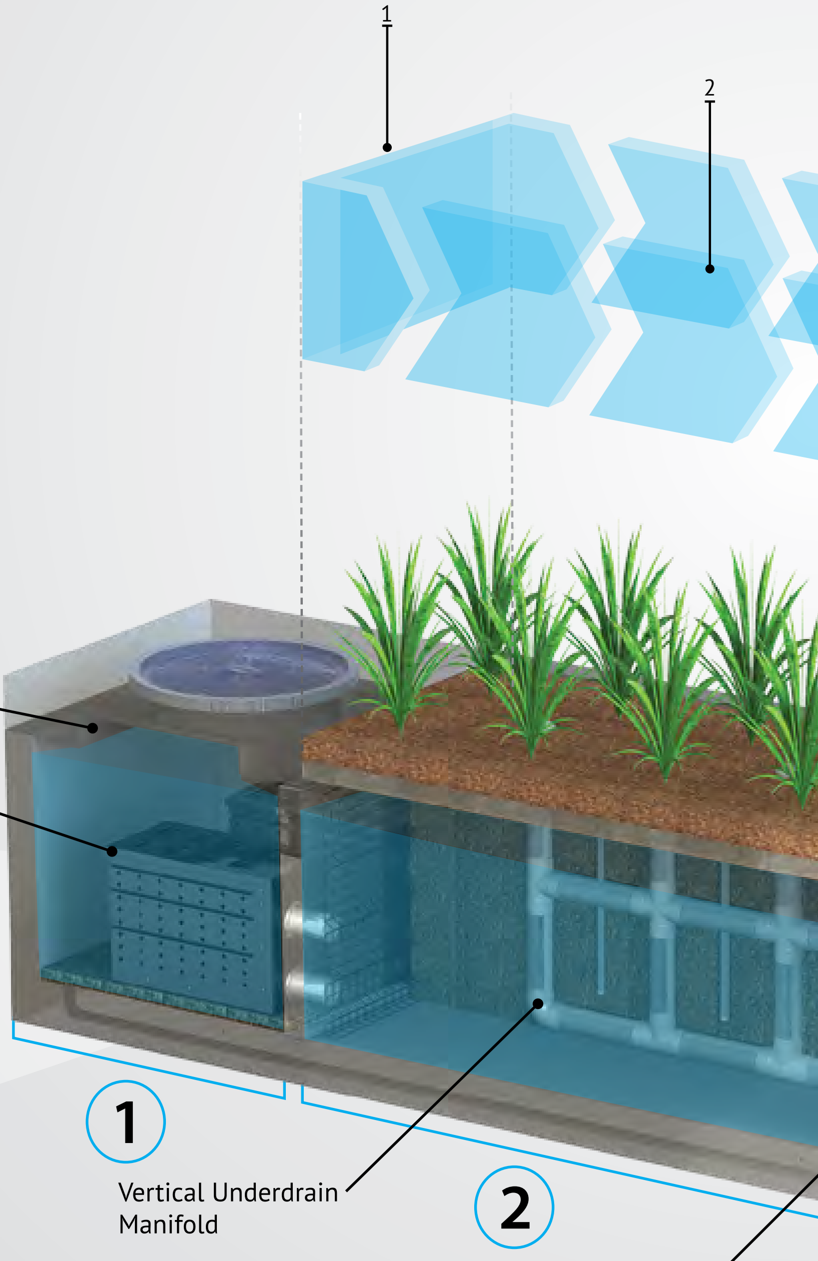
1 Pre-Treatment

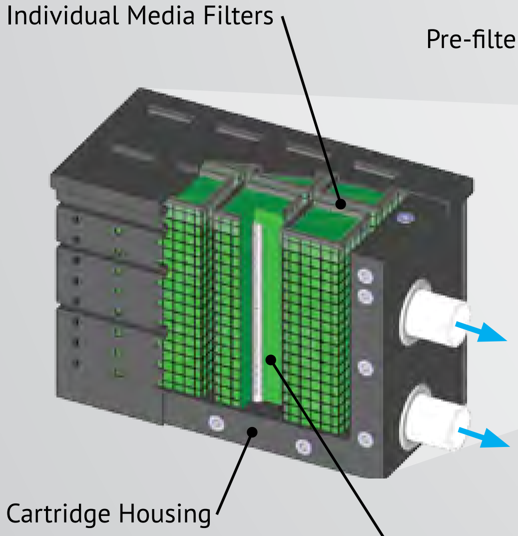
Separation

- Trash, sediment, and debris are separated before entering the pre-filter cartridges
- Designed for easy maintenance access

Pre-Filter Cartridges

- Over 25 ft^2 of surface area per cartridge
- Utilizes BioMediaGREEN filter material
- Removes over 80% of TSS & 90% of hydrocarbons
- Prevents pollutants that cause clogging from migrating to the biofiltration chamber





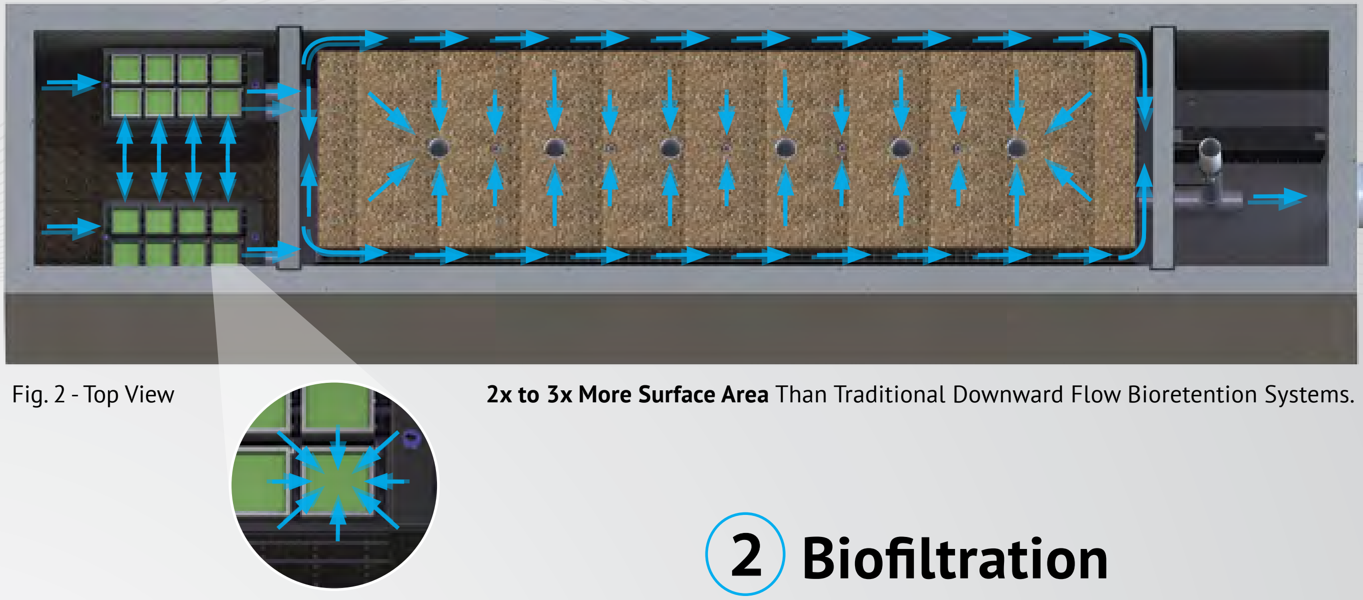


Fig. 2 - Top View

2x to 3x More Surface Area Than Traditional Downward Flow Bioretention Systems.

2 Biofiltration

Horizontal Flow

- Less clogging than downward flow biofilters
- Water flow is subsurface
- Improves biological filtration

Patented Perimeter Void Area

- Vertically extends void area between the walls and the WetlandMEDIA on all four sides.
- Maximizes surface area of the media for higher treatment capacity

WetlandMEDIA

- Contains no organics and removes phosphorus
- Greater surface area and 48% void space
- Maximum evapotranspiration
- High ion exchange capacity and light weight

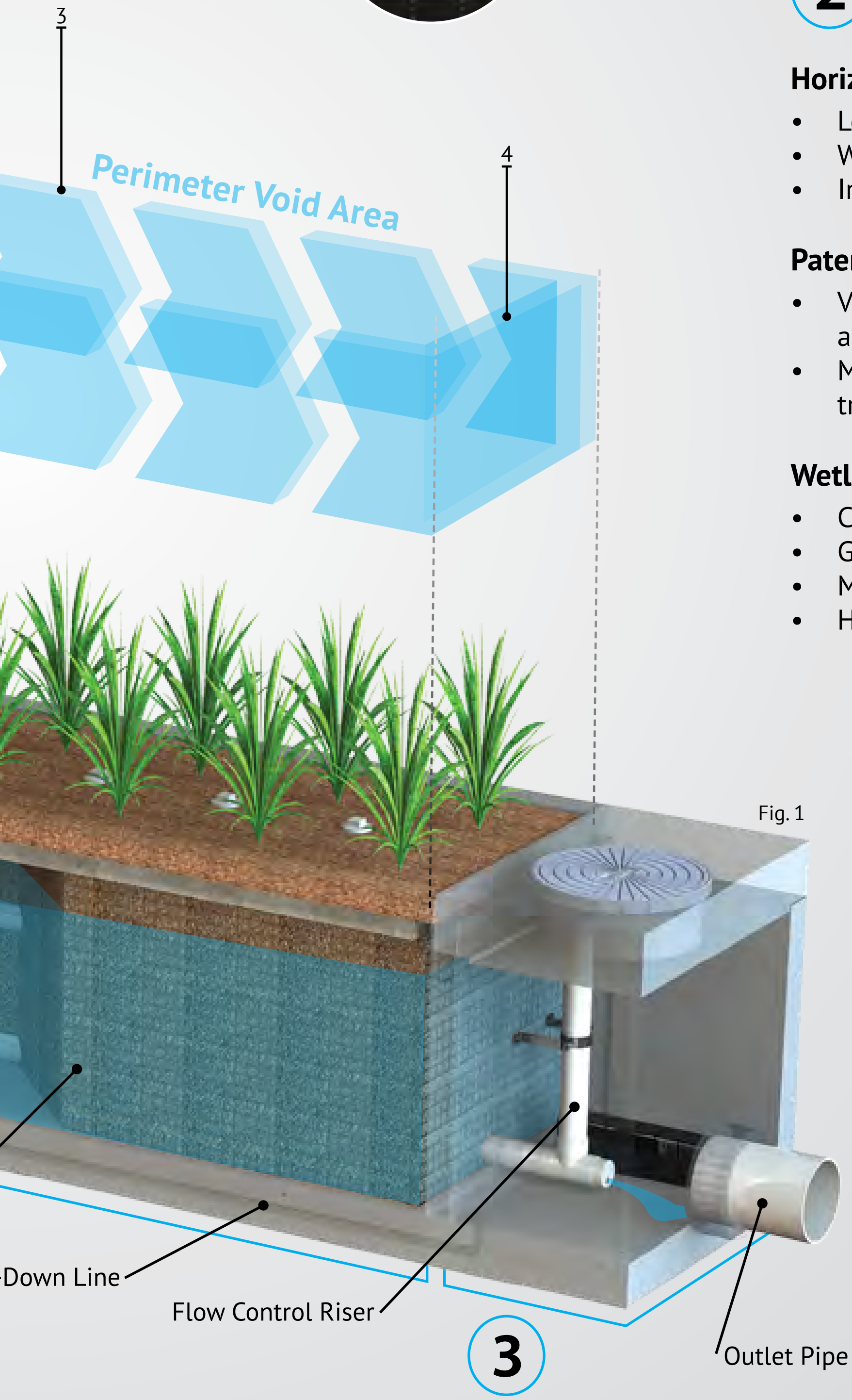


Fig. 1

3 Discharge

Flow Control

- Orifice plate controls flow of water through WetlandMEDIA to a level lower than the media's capacity.
- Extends the life of the media and improves performance

Drain-Down Filter

- The Drain-Down is an optional feature that completely drains the pre-treatment chamber
- Water that drains from the pre-treatment chamber between storm events will be treated

Orientations

Side-By-Side

The *Side-By-Side* orientation places the pre-treatment and discharge chamber adjacent to one another with the biofiltration chamber running parallel on either side. This minimizes the system length, providing a highly compact footprint. It has been proven useful in situations such as streets with directly adjacent sidewalks, as half of the system can be placed under that sidewalk. This orientation also offers internal bypass options as discussed below.

End-To-End

The *End-To-End* orientation places the pre-treatment and discharge chambers on opposite ends of the biofiltration chamber therefore minimizing the width of the system to 5 ft (outside dimension). This orientation is perfect for linear projects and street retrofits where existing utilities and sidewalks limit the amount of space available for installation. One limitation of this orientation is bypass must be external.

Bypass

Internal Bypass Weir (Side-by-Side Only)

The *Side-By-Side* orientation places the pre-treatment and discharge chambers adjacent to one another allowing for integration of internal bypass. The wall between these chambers can act as a bypass weir when flows exceed the system's treatment capacity, thus allowing bypass from the pre-treatment chamber directly to the discharge chamber.

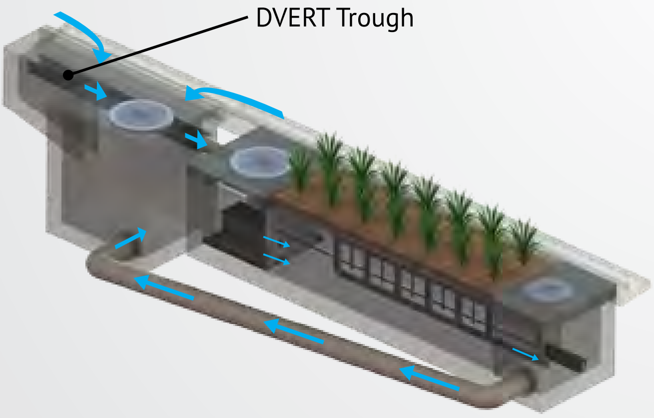
External Diversion Weir Structure

This traditional offline diversion method can be used with the MWS Linear in scenarios where runoff is being piped to the system. These simple and effective structures are generally configured with two outflow pipes. The first is a smaller pipe on the upstream side of the diversion weir - to divert low flows over to the MWS Linear for treatment. The second is the main pipe that receives water once the system has exceeded treatment capacity and water flows over the weir.

Flow By Design

This method is one in which the system is placed just upstream of a standard curb or grate inlet to intercept the first flush. Higher flows simply pass by the MWS Linear and into the standard inlet downstream.

DVERT Low Flow Diversion



This simple yet innovative diversion trough can be installed in existing or new curb and grate inlets to divert the first flush to the MWS Linear via pipe. It works similar to a rain gutter and is installed just below the opening into the inlet. It captures the low flows and channels them over to a connecting pipe exiting out the wall of the inlet and leading to the MWS Linear. The DVERT is perfect for retrofit and green street applications that allows the MWS Linear to be installed anywhere space is available.

Performance

The MWS Linear continues to outperform other treatment methods with superior pollutant removal for TSS, heavy metals, nutrients, hydrocarbons and bacteria. Since 2007 the MWS Linear has been field tested on numerous sites across the country. With it's advanced pre-treatment chamber and innovative horizontal flow biofilter, the system is able to effectively remove pollutants through a combination of physical, chemical, and biological filtration processes. With the same biological processes found in natural wetlands, the MWS Linear harnesses natures ability to process, transform, and remove even the most harmful pollutants.

Approvals

The MWS Linear has successfully met years of challenging technical reviews and testing from some of the most prestigious and demanding agencies in the nation, and perhaps the world.

Washington State DOE Approved

The MWS Linear is approved for General Use Level Designation (GULD) for Basic, Enhanced, and Phosphorus treatment at 1 gpm/ft^2 loading rate. The highest performing BMP on the market for all main pollutant categories.

TSS	Total Phosphorus	Ortho Phosphorus	Nitrogen	Dissolved Zinc	Dissolved Copper	Total Zinc	Total Copper	Motor Oil
85%	64%	67%	45%	66%	38%	69%	50%	95%

DEQ Assignment

The Virginia Department of Environmental Quality assigned the MWS Linear, the highest phosphorus removal rating for manufactured treatment devices to meet the new Virginia Stormwater Management Program (VSMP) Technical Criteria.

MASTEP Evaluation

The University of Massachusetts at Amherst – Water Resources Research Center, issued a technical evaluation report noting removal rates up to 84% TSS, 70% Total Phosphorus, 68.5% Total Zinc, and more.

Rhode Island DEM Approved

Approved as an authorized BMP and noted to achieve the following minimum removal efficiencies: 85% TSS, 60% Pathogens, 30% Total Phosphorus for discharges to freshwater systems, and 30% Total Nitrogen for discharges to saltwater or tidal systems.

Flow Based Sizing

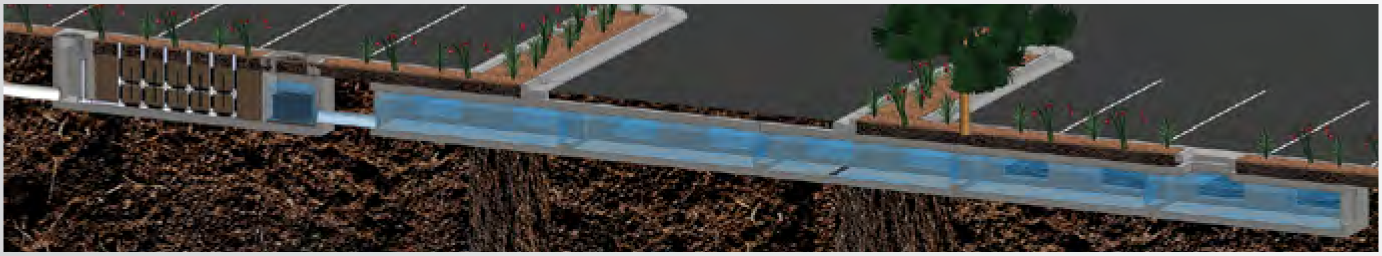
The MWS Linear can be used in stand alone applications to meet treatment flow requirements. Since the MWS Linear is the only biofiltration system that can accept inflow pipes several feet below the surface it can be used not only in decentralized design applications but also as a large central end-of-the-line application for maximum feasibility.

Treatment Flow Sizing Table

Model #	Dimensions	WetlandMedia Surface Area	Treatment Flow Rate (cfs)
MWS-L-4-4	4' x 4'	23 ft^2	0.052
MWS-L-4-6	4' x 6'	32 ft^2	0.073
MWS-L-4-8	4' x 8'	50 ft^2	0.115
MWS-L-4-13	4' x 13'	63 ft^2	0.144
MWS-L-4-15	4' x 15'	76 ft^2	0.175
MWS-L-4-17	4' x 17'	90 ft^2	0.206
MWS-L-4-19	4' x 19'	103 ft^2	0.237
MWS-L-4-21	4' x 21'	117 ft^2	0.268
MWS-L-8-8	8' x 8'	100 ft^2	0.230
MWS-L-8-12	8' x 12'	151 ft^2	0.346
MWS-L-8-16	8' x 16'	201 ft^2	0.462

Volume Based Sizing

Many states require treatment of a water quality volume and do not offer the option of flow based design. The MWS Linear and its unique horizontal flow makes it the only biofilter that can be used in volume based design installed downstream of ponds, detention basins, and underground storage systems.



Treatment Volume Sizing Table

Model #	Treatment Capacity (cu. ft.) @ 24-Hour Drain Down	Treatment Capacity (cu. ft.) @ 48-Hour Drain Down
MWS-L-4-4	1140	2280
MWS-L-4-6	1600	3200
MWS-L-4-8	2518	5036
MWS-L-4-13	3131	6261
MWS-L-4-15	3811	7623
MWS-L-4-17	4492	8984
MWS-L-4-19	5172	10345
MWS-L-4-21	5853	11706
MWS-L-8-8	5036	10072
MWS-L-8-12	7554	15109
MWS-L-8-16	10073	20145

Installation

The MWS Linear is simple, easy to install, and has a space efficient design that offers lower excavation and installation costs compared to traditional tree-box type systems. The structure of the system resembles pre-cast catch basin or utility vaults and is installed in a similar fashion.

The system is delivered fully assembled for quick installation. Generally, the structure can be unloaded and set in place in 15 minutes. Our experienced team of field technicians are available to supervise installations and provide technical support.

Maintenance

Reduce your maintenance costs, man hours, and materials with the MWS Linear. Unlike other biofiltration systems that provide no pre-treatment, the MWS Linear is a self-contained treatment train which incorporates simple and effective pre-treatment.

Maintenance requirements for the biofilter itself are almost completely eliminated, as the pre-treatment chamber removes and isolates trash, sediments, and hydrocarbons. What's left is the simple maintenance of an easily accessible pre-treatment chamber that can be cleaned by hand or with a standard vac truck. Only periodic replacement of low-cost media in the pre-filter cartridges is required for long term operation and there is absolutely no need to replace expensive biofiltration media.

Plant Selection

Abundant plants, trees, and grasses bring value and an aesthetic benefit to any urban setting, but those in the MWS Linear do even more - they increase pollutant removal. What's not seen, but very important, is that below grade the stormwater runoff/flow is being subjected to nature's secret weapon: a dynamic physical, chemical, and biological process working to break down and remove non-point source pollutants. The flow rate is controlled in the MWS Linear, giving the plants more "contact time" so that pollutants are more successfully decomposed, volatilized and incorporated into the biomass of The MWS Linear's micro/macro flora and fauna.

A wide range of plants are suitable for use in the MWS Linear, but selections vary by location and climate. View suitable plants by selecting the list relative to your project location's hardy zone.

Please visit www.ModularWetlands.com/Plants for more information and various plant lists.

MWS LINEAR 2.0 HGL SIZING CALCULATIONS

			HGL HEIGHT																													
			SHALLOW MODELS																				STANDARD HEIGHT MODEL	HIGH CAPACITY MODELS								
MWS MODEL SIZE	WETLAND PERMITER LENGTH	LOADING RATE GPM/SF	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	**3.4**	3.5	3.6	3.65	3.70	3.75	3.80	3.85	3.90	3.95
MWS-L-4-4	6.70	1.0	0.022	0.023	0.025	0.026	0.028	0.029	0.031	0.032	0.034	0.035	0.037	0.038	0.040	0.042	0.043	0.045	0.046	0.048	0.049	0.051	**0.052**	0.054	0.055	0.056	0.057	0.058	0.058	0.059	0.060	0.061
MWS-L-3-6	10.06	1.0	0.032	0.035	0.037	0.039	0.042	0.044	0.046	0.048	0.051	0.053	0.055	0.058	0.060	0.062	0.065	0.067	0.069	0.072	0.074	0.076	**0.078**	0.081	0.083	0.084	0.085	0.087	0.088	0.089	0.090	0.091
MWS-L-4-6	9.30	1.0	0.030	0.032	0.034	0.036	0.038	0.041	0.043	0.045	0.047	0.049	0.051	0.053	0.055	0.058	0.060	0.062	0.064	0.066	0.068	0.070	**0.073**	0.075	0.077	0.078	0.079	0.080	0.081	0.082	0.083	0.084
MWS-L-4-8	14.80	1.0	0.048	0.051	0.054	0.058	0.061	0.065	0.068	0.071	0.075	0.078	0.082	0.085	0.088	0.092	0.095	0.099	0.102	0.105	0.109	0.112	**0.115**	0.119	0.122	0.124	0.126	0.127	0.129	0.131	0.132	0.134
MWS-L-4-13	18.40	1.0	0.059	0.063	0.068	0.072	0.076	0.080	0.084	0.089	0.093	0.097	0.101	0.106	0.110	0.114	0.118	0.122	0.127	0.131	0.135	0.139	**0.144**	0.148	0.152	0.154	0.156	0.158	0.160	0.163	0.165	0.167
MWS-L-4-15	22.40	1.0	0.072	0.077	0.082	0.087	0.093	0.098	0.103	0.108	0.113	0.118	0.123	0.129	0.134	0.139	0.144	0.149	0.154	0.159	0.165	0.170	**0.175**	0.180	0.185	0.188	0.190	0.193	0.195	0.198	0.200	0.203
MWS-L-4-17	26.40	1.0	0.085	0.091	0.097	0.103	0.109	0.115	0.121	0.127	0.133	0.139	0.145	0.151	0.158	0.164	0.170	0.176	0.182	0.188	0.194	0.200	**0.206**	0.212	0.218	0.221	0.224	0.227	0.230	0.233	0.236	0.239
MWS-L-4-19	30.40	1.0	0.098	0.105	0.112	0.119	0.126	0.133	0.140	0.147	0.153	0.160	0.167	0.174	0.181	0.188	0.195	0.202	0.209	0.216	0.223	0.230	**0.237**	0.244	0.251	0.255	0.258	0.262	0.265	0.269	0.272	0.276
MWS-L-4-21	34.40	1.0	0.111	0.118	0.126	0.134	0.142	0.150	0.158	0.166	0.174	0.182	0.189	0.197	0.205	0.213	0.221	0.229	0.237	0.245	0.253	0.261	**0.268**	0.276	0.284	0.288	0.292	0.296	0.300	0.304	0.308	0.312
MWS-L-6-8	18.80	1.0	0.060	0.065	0.069	0.073	0.078	0.082	0.086	0.091	0.095	0.099	0.104	0.108	0.112	0.116	0.121	0.125	0.129	0.134	0.138	0.142	**0.147**	0.151	0.155	0.157	0.160	0.162	0.164	0.166	0.168	0.170
MWS-L-8-8	29.60	1.0	0.095	0.102	0.109	0.115	0.122	0.129	0.136	0.143	0.149	0.156	0.163	0.170	0.177	0.183	0.190	0.197	0.204	0.211	0.217	0.224	**0.231**	0.238	0.245	0.248	0.251	0.255	0.258	0.262	0.265	0.268
MWS-L-8-12	44.40	1.0	0.143	0.153	0.163	0.173	0.183	0.194	0.204	0.214	0.224	0.234	0.245	0.255	0.265	0.275	0.285	0.296	0.306	0.316	0.326	0.336	**0.346**	0.357	0.367	0.372	0.377	0.382	0.387	0.392	0.397	0.402
MWS-L-8-16	59.20	1.0	0.190	0.204	0.217	0.231	0.245	0.258	0.272	0.285	0.299	0.312	0.326	0.340	0.353	0.367	0.380	0.394	0.408	0.421	0.435	0.448	**0.462**	0.476	0.489	0.496	0.503	0.509	0.516	0.523	0.530	0.537
MWS-L-8-20	74.00	1.0	0.238	0.255	0.272	0.289	0.306	0.323	0.340	0.357	0.374	0.391	0.408	0.425	0.442	0.459	0.476	0.493	0.509	0.526	0.543	0.560	**0.577**	0.594	0.611	0.620	0.628	0.637	0.645	0.654	0.662	0.671
MWS-L-10-20 or MWS-L-8-24	88.80	1.0	0.285	0.306	0.326	0.346	0.367	0.387	0.408	0.428	0.448	0.469	0.489	0.509	0.530	0.550	0.571	0.591	0.611	0.632	0.652	0.673	**0.693**	0.713	0.734	0.744	0.754	0.764	0.774	0.785	0.795	0.805
4'x'4 media cage	14.80	1.0	0.048	0.051	0.054	0.058	0.061	0.065	0.068	0.071	0.075	0.078	0.082	0.085	0.088	0.092	0.095	0.099	0.102	0.105	0.109	0.112	**0.115**	0.119	0.122	0.124						

STANDARD DETAIL FOR PROPOSED MODULAR WETLANDS SYSTEM UNIT

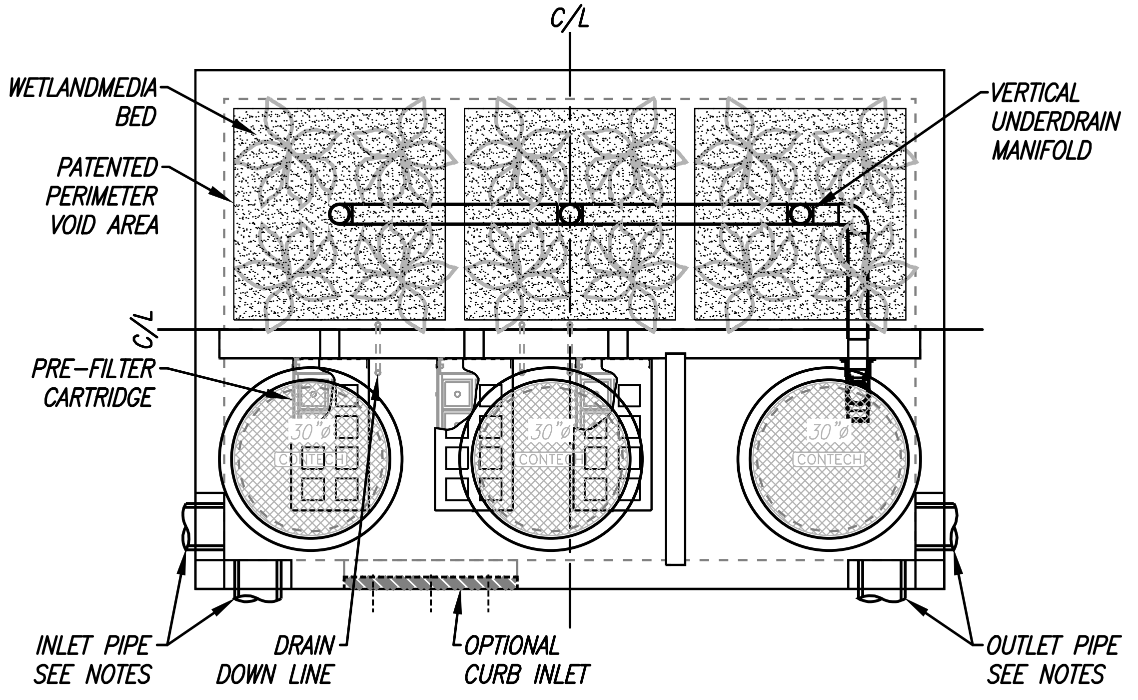
(MWS-L-8-12-V-

HIGH CAPACITY MODEL 3.50)

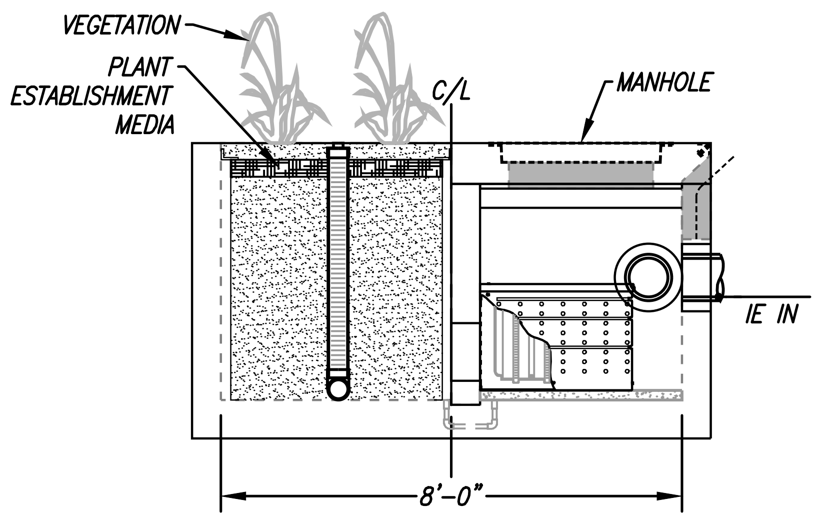
SITE SPECIFIC DATA

PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
TREATMENT FLOW (CFS)			
PRETREATMENT LOADING RATE (GPM/SF)			2.1 GPM/SF
WETLAND MEDIA LOADING RATE (GPM/SF)			1.0
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			____ (CFS)
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PEDESTRIAN		
NOTES:			

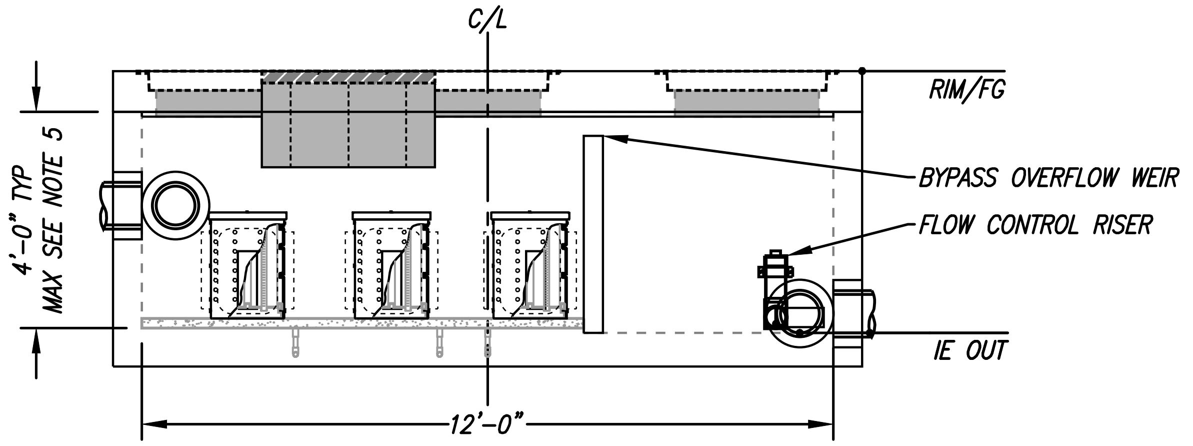
* PRELIMINARY ONLY - NOT FOR CONSTRUCTION



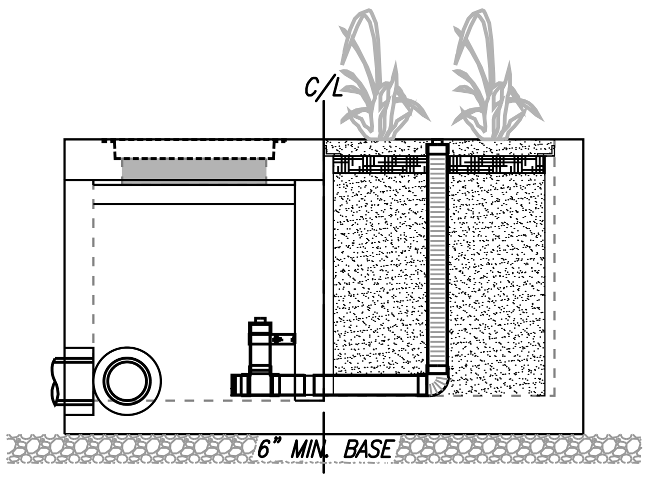
PLAN VIEW



LEFT END VIEW



ELEVATION VIEW



RIGHT END VIEW

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE FOR VERIFYING PROJECT ENGINEER'S RECOMMENDED BASE SPECIFICATIONS.
3. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL PIPES SHALL BE SEALED WATERTIGHT PER MANUFACTURER'S STANDARD CONNECTION DETAIL.
4. CONTRACTOR RESPONSIBLE FOR CONTACTING CONTECH FOR ACTIVATION OF UNIT. MANUFACTURER'S WARRANTY IS VOID WITHOUT PROPER ACTIVATION BY A CONTECH REPRESENTATIVE.
5. VERTICAL HEIGHT VARIES BASED ON SITE SPECIFIC REQUIREMENTS.

8/14/23SCOTT SERTICH

MODULAR WETLANDS
FOR PATENT INFORMATION, GO TO www.ContechES.com/IP

PROPRIETARY AND CONFIDENTIAL:

THE INFORMATION CONTAINED IN THIS DOCUMENT IS THE SOLE PROPERTY OF CONTECH AND ITS COMPANIES. THIS DOCUMENT, NOR ANY PART THEREOF, MAY BE USED, REPRODUCED OR MODIFIED IN ANY MANNER WITH OUT THE WRITTEN CONSENT OF CONTECH.

CONTECH®
ENGINEERED SOLUTIONS LLC
www.ContechES.com

MWS-L-8-12-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

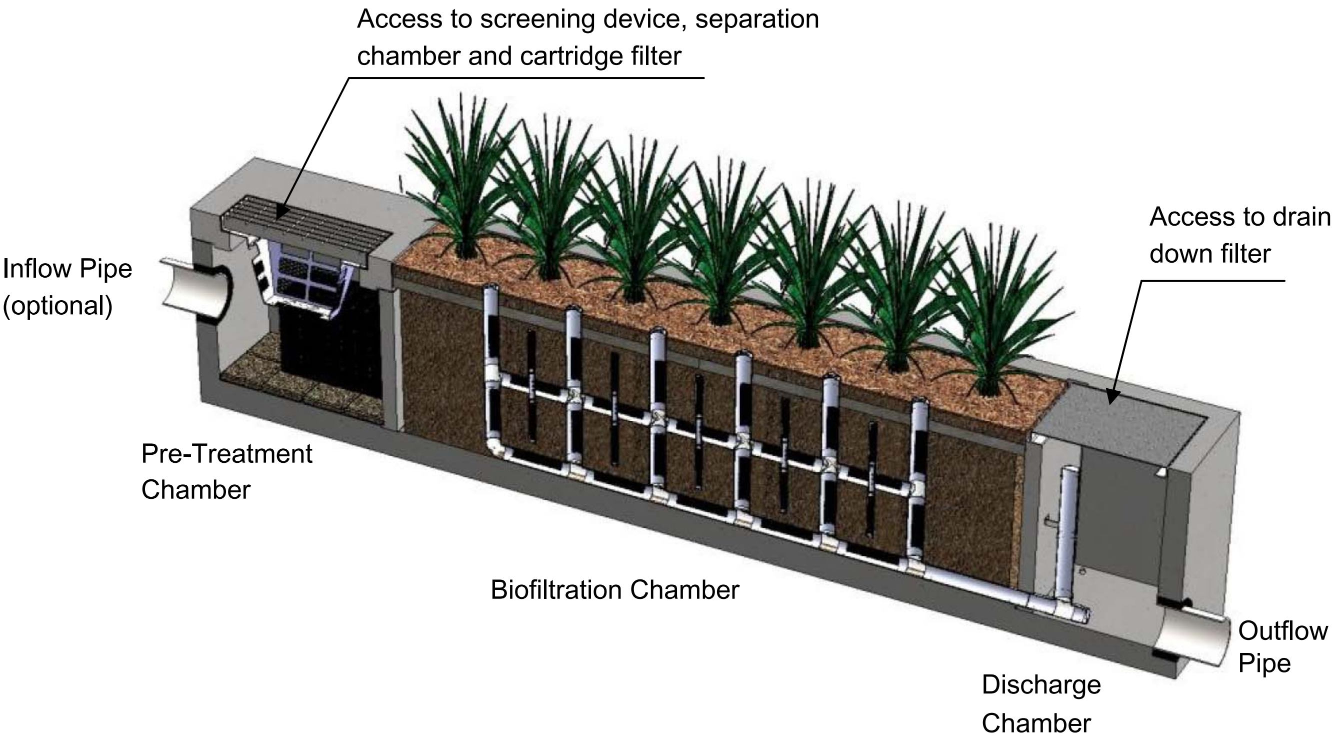
MAINTENANCE GUIDELINES FOR MODULAR WETLANDS SYSTEM

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 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.

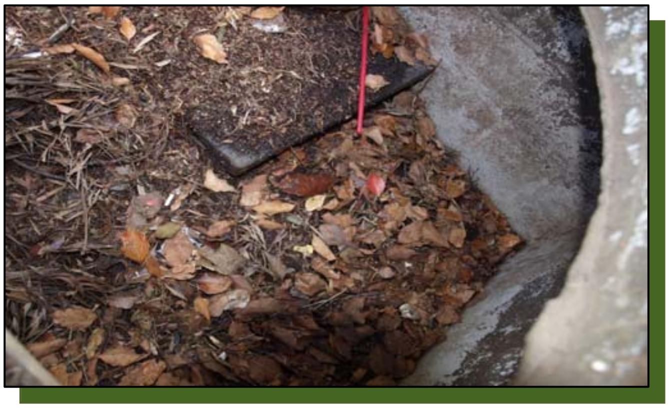
Maintenance Procedure Illustration

Screening Device

The screening device is located directly under the manhole or grate over the Pre-Treatment Chamber. It's mounted directly underneath for easy access and cleaning. Device can be cleaned by hand or with a vacuum truck.

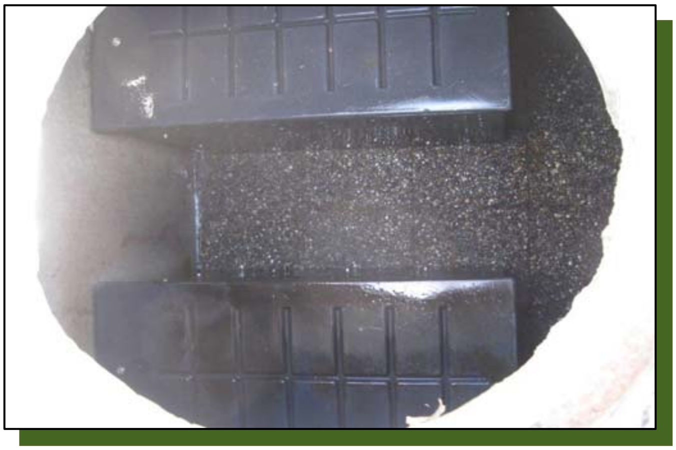
Separation Chamber

The separation chamber is located directly beneath the screening device. It can be quickly cleaned using a vacuum truck or by hand. A pressure washer is useful to assist in the cleaning process.



Cartridge Filters

The cartridge filters are located in the Pre-Treatment chamber connected to the wall adjacent to the biofiltration chamber. The cartridges have removable tops to access the individual media filters. Once the cartridge is open media can be easily removed and replaced by hand or a vacuum truck.



Drain Down Filter

The drain down filter is located in the Discharge Chamber. The drain filter unlocks from the wall mount and hinges up. Remove filter block and replace with new block.

Trim Vegetation

Vegetation should be maintained in the same manner as surrounding vegetation and trimmed as needed. No fertilizer shall be used on the plants. Irrigation per the recommendation of the manufacturer and or landscape architect. Different types of vegetation requires different amounts of irrigation.

Inspection Form

Modular Wetland System, Inc.
P. 760.433-7640
F. 760-433-3176
E. Info@modularwetlands.com

www.modularwetlands.com

Inspection Report
Modular Wetlands System

Project Name

Project Address (city) (Zip Code)

Owner / Management Company

Contact

Phone ( ) –

Inspector Name

Date / /

Time AM / PM

For Office Use Only

(Reviewed By)

(Date)

Office personnel to complete section to the left.

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm

Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition

Additional Notes

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 Report

Modular Wetland System, Inc.
P. 760.433-7640
F. 760-433-3176
E. Info@modularwetlands.com

www.modularwetlands.com

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 ______________________________

For Office Use Only

(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:

STATE WATER RESOURCES CONTROL BOARD'S CERTIFIED FULL CAPTURE SYSTEM LIST OF TRASH TREATMENT CONTROL DEVICES (UPDATED MAY 2021)

CALIFORNIA
Water Boards

Gavin Newsom
Governor

Jared Blumenfeld
Secretary for
Environmental Protection

State Water Resources Control Board

CERTIFIED FULL CAPTURE SYSTEM LIST OF TRASH TREATMENT CONTROL DEVICES
(Updated May 2021)

Trash Provisions

In accordance with the Trash Provisions[1], all trash treatment control devices (Devices) installed after December 2, 2015 shall meet the Full Capture System definition[2] and be certified by the State Water Resources Control Board (State Water Board) Executive Director, or designee, prior to installation. The Devices included on this list are either: 1) new Devices certified by the State Water Board, or 2) grandfathered Devices from a list maintained by the San Francisco Regional Water Board prior to the adoption of the Trash Amendments. All new Device installations shall be designed according to the following criteria:

1. Appropriately sized to treat not less than the peak flowrate resulting from a 1-year, 1-hour storm event (design storm) or at least the same peak flows from the corresponding storm drain;
2. Do not bypass trash below the design storm under maximum operational loading conditions; and
3. Trap all particles that are 5 mm or greater up to the design flow[3] or at least the same peak flows from the corresponding storm drain; and do not have a

---

[1] Amendment to the Water Quality Control Plan for Ocean Waters of California to Control Trash and Part 1 Trash Provisions of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, And Estuaries of California adopted by the State Water Board.

[2] A Full Capture System is a treatment control, or series of treatment controls, including but not limited to, a multi-benefit project or a low-impact development control that traps all particles that are 5 mm or greater, and has a design treatment capacity that is either: of not less than the peak flow rate, Q, resulting from a one-year, one-hour storm in the subdrainage area, or b) appropriately sized to, and designed to carry at least the same flows as, the corresponding storm drain.

[3] The region specific one-year, one-hour storm (or design flow) may be obtained from the National Oceanic and Atmospheric Precipitation Estimates.
https://www.weather.gov/media/owp/oh/hdsc/docs/Atlas14_Volume6.pdf

diversion structure present upstream such that a portion of the peak flow is not treated to trap all particles 5 mm or greater.

Vector Control Accessibility

According to the California Health and Safety Code[4], Landowners in California are legally responsible to abate (eliminate the source of) a public nuisance arising from their property, including mosquitoes. Mosquito vector control districts have substantial authority to access public and private property, inspect known or suspected sources of mosquitoes, abate mosquito sources, and charge the landowner for work performed and/or charge fees if a landowner is unwilling or unable to address a mosquito source arising from their property.

Depending on the its design, certain Devices may impede the mosquito vector control district's ability to (1) visually inspect the Device and/or storm vault for mosquito breeding, and (2) apply the appropriate chemical treatment. Moreover, some devices may create a habitat for mosquitoes. Prior to installation of any certified Device, the local mosquito vector control district should be contacted to ensure the installation conforms to the District's visual inspection, treatment, and vector breeding minimizing guidelines. The Mosquito Vector Control Association of California Review Team may also be contacted via email at: (Trashtreatment@mvcac.org).

New Device Certification or Fact Sheet Update

To apply for certification of a new Device, or to update a grandfathered Device fact sheet, the Device owner shall submit an application/fact sheet in accordance with the *Trash Treatment Control Device Certification and Fact Sheet Update Requirements.* Upon determining that a Device application is complete and meets the definition of a trash full capture system and is approved by the Mosquito Vector Control Association of California, the Executive Director Designee will place the Device on the State Water Board's *Certified Full Capture System List of Trash Treatment Control Devices*. This list will also identify updates to grandfathered Device fact sheets that satisfy the requirements.

The *Trash Treatment Control Device Certification and Fact Sheet Update Requirements* is found on the Trash Implementation Program webpage (https://www.waterboards.ca.gov/water_issues/programs/stormwater/trash_implementation.html).

Listing of any Device does not constitute an endorsement by the State Water Board. The Executive Director reserves the right to de-certify and remove any Device from this list that does not satisfy the requirements of the Trash Provisions, such as but not limited to when a Device is discontinued or is not approved by Mosquito Vector Control Association of California Review Team.

---

[4] Health & Safety Code sections 2001- 4(d); 2002; 2060 (b) and Health & Safety Code sections 2060-2067, 100170, and 100175.

CERTIFIED FULL CAPTURE SYSTEM LIST OF TRASH TREATMENT CONTROL DEVICES

To obtain a copy of the applications or fact sheets listed in Table 1 or Table 2 below, or to address questions regarding certification please contact Leo Cosentini at (916) 341-5524 or email address (leo.cosentini@waterboards.ca.gov)

CERTIFIED FULL CAPTURE SYSTEM LIST OF TRASH TREATMENT CONTROL DEVICES

TABLE 1 - CATCH BASIN INSERTS AND OTHER DEVICES

Owner / Website	Full Capture System Trash Device Brand Name	Date Application Certified or Fact Sheet Updated	Date Vector Control Accessibility Verified
AbTech, Industries Internet site (https://www.abtechindustries.com/)	**Ultra Urban Filter Curb Opening and Drop-In**	**Application 25** **05/1/20**	**4/8/20**
Advanced Drainage Systems, Inc. FLEXSTORM Division internet site (http://www.inletfilters.com/)	**FLEXSTORM** **Full Trash Capture Inserts**	**Application 3** **03/15/18**	**None**
Advanced Drainage Systems, Inc. FLEXSTORM Division internet site (http://www.inletfilters.com/)	**FLEXSTORM** **Connector Pipe Screen**	**ADS-1** **Not Updated**	**None**
Bio Clean® Environmental Services, Inc. Internet site (http://www.biocleanenvironmental.com/products/)	**Curb Inlet and Grate Inlet Filters**	**Application 4** **03/15/18**	**None**
Bio Clean® Environmental Services, Inc. Internet site (http://www.biocleanenvironmental.com/products/)	**Modular Connector Pipe Trash Screen**	**BC-3** **Updated 4/30/20**	**3/10/20**
BrightWater™ Internet site (www.wearebrightwater.com/)	**Connector Pipe Screen**	**Application 29** **12/28/20**	**11/19/20**
BrightWater™ Internet site (www.wearebrightwater.com/)	**Curb Inlet Filter**	**Application 26** **6/30/20**	**4/17/20**
CleanWay® Environmental Partners, Inc. Internet site (http://Cleanwayusa.com/)	**CleanWay Curb Inlet Filtration System**	**Application 7** **03/15/18**	**None**

CERTIFIED FULL CAPTURE SYSTEM LIST OF TRASH TREATMENT CONTROL DEVICES

Owner / Website	Full Capture System Trash Device Brand Name	Date Application Certified or Fact Sheet Updated	Date Vector Control Accessibility Verified
CleanWay® Environmental Partners, Inc. Internet site (http://Cleanwayusa.com/)	**CleanWay Drop Inlet**	**Application 8** **03/15/18**	**None**
Coanda Inc. Internet site (http://www.coanda.com/)	**Coanda Trash Screen and Debris Fence**	**COA-1** **No Update**	**None**
Ecology Control Industries Internet site (http://www.ecologycontrol.com/)	**Debris Dam - Catch Basin Insert for Curb Inlet Design**	**ECI-1** **Updated 06/17/20**	**04/29/20**
Enviropod International: A Stormwater360 Group Company Internet site (https://www.enviropod.com/products/enviropod-littatrap-full-capture/)	**Enviropod® LittaTrap™ Full Capture**	**Application 27** **10/15/20**	**07/20/20**
Filtrexx Sustainable Technologies Internet site (https://www.filtrexx.com/en/products/stormexx/)	**StormExx® Clean**	**Application 16** **08/10/18** **Updated 11/25/19**	**12/06/19**
Frog Creek Partners, LLC Internet site (https://frogcreek.partners/)	**Gutter Bin® Channel Filtration System & Mundus Bag® Water Filter**	**Application 22** **06/26/19**	**04/19/19**
Frog Creek Partners, LLC Internet site (https://frogcreek.partners/)	**Gutter Bin® Eco Drop Inlet Filter (DIF & DIF-C) & Mundus Bag® Water Filter**	**Application 24** **02/18/20**	**12/06/19**

CERTIFIED FULL CAPTURE SYSTEM LIST OF TRASH TREATMENT CONTROL DEVICES

Owner / Website	Full Capture System Trash Device Brand Name	Date Application Certified or Fact Sheet Updated	Date Vector Control Accessibility Verified
Frog Creek Partners, LLC Internet site (https://frogcreek.partners/)	**Gutter Bin® Eco Curb Inlet Filter & Mundus Bag® Water Filter**	**Application 23** **02/18/20**	**10/11/19**
G2 Construction, Inc. Internet site (http://www.g2construction.com/products/)	**G2 CPS-Mod™ and Removable CPS-Mod™ Screen**	**Application 18** **06/26/19**	**03/15/19**
G2 Construction, Inc. Internet site (http://www.g2construction.com/products/)	**G2 Grated Inlet Trash Screen**	**Application 19** **06/26/19**	**04/10/19**
Inventive Resources, Inc. Internet site (http://www.IRIproducts.com/)	**Water Decontaminator**	**Application 2** **03/15/18**	**4/20/20**
Oldcastle Infrastructure™ Internet site (https://oldcastleinfrastructure.com/brands/)	**Flo Guard Curb Inlet Basket**	**OI-1** **No Update**	**04/30/21**
Oldcastle Infrastructure™ Internet site (https://oldcastleinfrastructure.com/brands/)	**Flo Guard Grate Inlet Basket**	**OI-2** **No Update**	**04/30/21**
Oldcastle Infrastructure™ Internet site (https://oldcastleinfrastructure.com/brands/)	**Flo Guard Outlet Trash Screen**	**OI-3** **Updated 11/29/19**	**12/06/19**

CERTIFIED FULL CAPTURE SYSTEM LIST OF TRASH TREATMENT CONTROL DEVICES

Owner / Website	Full Capture System Trash Device Brand Name	Date Application Certified or Fact Sheet Updated	Date Vector Control Accessibility Verified
Revel Environmental Manufacturing, Inc. Internet site (http://www.remfilters.com/)	**Triton™ Bioflex Inlet Trash Guard Catchbasin Polyester Fiber Mesh Trash Filter Insert**	**REM-1** **No Update**	**None**
Revel Environmental Manufacturing, Inc. Internet site (http://www.remfilters.com/)	**Triton™ Crescent Pipe Screen**	**Application 12** **07/10/18**	**03/15/19**
Revel Environmental Manufacturing, Inc. Internet site (http://www.remfilters.com/)	**Triton Perf-Full Trash Capture Insert**	**Application 13** **07/10/18**	**03/15/19**
Safe Drain Stormwater Holdings Inc. Internet site (http://www.safedrainusa.com/)	**Storm Vector Guard**	**Application 30** **02/11/21**	**12/17/20**
Stormtek Internet site (https://swimsclean.com/stormtek/) [formerly Advanced Solutions]	**Stormtek ST3 & STEG Catchbasin Connector Pipe**	**AS-1, A1S-2** **No Update**	**None**
United Stormwater, Inc. Internet site (http://www.unitedstormwater.com/)	**Connector Pipe Trash Screen**	**USW-1** **No Update**	**None**

TABLE 2 - HIGH FLOW CAPACITY TRASH DEVICES

Owner / Website	Full Capture System Trash Device Brand Name	Date Application Certified or Fact Sheet Updated	Date Vector Control Accessibility Verified
AquaShield™, Inc. Internet site (http://www.aquashieldinc.com/-aqua-swirl.html)	**Aqua-Swirl® Stormwater Treatment System**	**Application 1** **08/04/17** **Updated 11/06/20**	**12/03/20**
BaySaver Technologies® LLC/Advanced Drainage Systems Inc. Internet site (https://baysaver.com/products/barracuda/)	**Barracuda Hydrodynamic Separator**	**Application 21** **06/26/19**	**03/15/19**
Bio Clean® Environmental Services, Inc. Internet site (http://www.biocleanenvironmental.com/products/)	**Debris Separating Baffle Box**	**Application 6** **03/15/18**	**07/28/20**
Bio Clean® Environmental Services, Inc. Internet site (http://www.biocleanenvironmental.com/products/)	**BioClean DeflectiveScreening Device**	**Application 20** **06/26/19**	**07/28/20**
Bio Clean® Environmental Services, Inc. Internet site (http://www.biocleanenvironmental.com/products/)	**Modular Wetland System®**	**Application 15** **07/10/18**	**03/15/19**
Contech® Construction Products Internet site (http://www.conteches.com/products/stormwater-management/treatment/cds/)	**Continuous Deflective Separator Hydrodynamic Separator**	**CCP-1HF** **No Update**	**None**

CERTIFIED FULL CAPTURE SYSTEM LIST OF TRASH TREATMENT CONTROL DEVICES

Owner / Website	Full Capture System Trash Device Brand Name	Date Application Certified or Fact Sheet Updated	Date Vector Control Accessibility Verified
Jensen® Stormwater Systems Internet site (http://www.jensenengineeredsystems.com/)	**Jensen® Deflective Separators**	**Application 5** **03/15/18**	**12/06/19**
Hydro International® Internet site (https://www.hydro-int.com/)	**Downstream Defender (In-Line and Off-Line Configurations)**	**Application 14** **07/10/18**	**03/16/20**
Hydro International® Internet site (https://www.hydro-int.com/)	**First Defense® High-Capacity Full Trash Capture Device**	**Application 28** **10/30/20**	**08/20/20**
Hydro International® Internet site (https://www.hydro-int.com/)	**Hydro Up-Flo Filter®**	**Application 11** **07/18/18**	**03/16/20**
Hydro International® Internet site (https://www.hydro-Int.com/)	**Hydro DryScreen**	**Application 10** **07/10/18** **Updated 05/05/21**	**04/29/21**
Oldcastle Infrastructure™ Internet site (https://oldcastleinfrastructure.com/brands/)	**FloGard® NetTech**	**OI-11HF** **Updated 12/08/20**	**12/03/20**

Owner / Website	Full Capture System Trash Device Brand Name	Date Application Certified or Fact Sheet Updated	Date Vector Control Accessibility Verified
Oldcastle Infrastructure™ Internet site (https://oldcastleinfrastructure.com/brands/)	**Nutrient Separating Baffle Box®**	**Application 17** **10/12/18** **Updated 07/21/20**	**05/01/20**
Roscoe Moss Company Internet site (https://roscoemoss.com/products/stormwater-gross-solids-removal-device/)	**Storm Flo® Trash Screen – Linear Radial Gross Solids Removal Device**	**RMC-1HF** **No Update**	**None**
StormTrap® Modular Concrete Stormwater Management Internet site (http://stormtrap.com/)	**Inline Netting Trash Trap – Inline Pipe Net with Trash Screen**	**FCT-1HF** **No Update**	**None**
StormTrap® Modular Concrete Stormwater Management Internet site (http://stormtrap.com/)	**End of Pipe Netting Trash Trap –End of Pipe Net with Trash Screen**	**FCT-2HF** **No Update**	**None**
StormTrap® Modular Concrete Stormwater Management Internet site (http://stormtrap.com/)	**SiteSaver®**	**Application 9**	**03/18/21**

Section VII Educational Materials

Education Materials

Residential Material (http://www.ocwatersheds.com)	Check If Applicable	Business Material (http://www.ocwatersheds.com)	Check If Applicable
The Ocean Begins at Your Front Door	X	Tips for the Automotive Industry	
Tips for Car Wash Fund-raisers		Tips for Using Concrete and Mortar	
Tips for the Home Mechanic	X	Tips for the Food Service Industry	
Homeowners Guide for Sustainable Water Use	X	Proper Maintenance Practices for Your Business	
Household Tips	X	**Other Material**	**Check If Attached**
Proper Disposal of Household Hazardous Waste	X		
Recycle at Your Local Used Oil Collection Center (North County)			
Recycle at Your Local Used Oil Collection Center (Central County)	X		
Recycle at Your Local Used Oil Collection Center (South County)			
Tips for Maintaining a Septic Tank System			
Responsible Pest Control	X		
Sewer Spill	X		
Tips for the Home Improvement Projects	X		
Tips for Horse Care			
Tips for Landscaping and Gardening	X		
Tips for Pet Care	X		
Tips for Pool Maintenance			
Tips for Residential Pool, Landscape and Hardscape Drains			
Tips for Projects Using Paint	X		

APPENDICES

APPENDIX A

EDUCATIONAL MATERIALS

- ....The Ocean Begins at Your Front Door
- ....Tips for the Home Mechanic
- ....Homeowners Guide for Sustainable Water Use
- ....Household Tips
- ....Proper Disposal of Household Hazardous Waste
- ....Recycle at Your Local Used Oil Collection Center (Central County)
- ....Responsible Pest Control
- ....Sewage Spill
- ....Tips for Home Improvement Projects
- ....Tips for Landscape and Gardening
- ....Tips for Pet Care
- ....Tips for Projects Using Paint

The Ocean Begins at Your Front Door

PROJECT
Pollution
PREVENTION

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

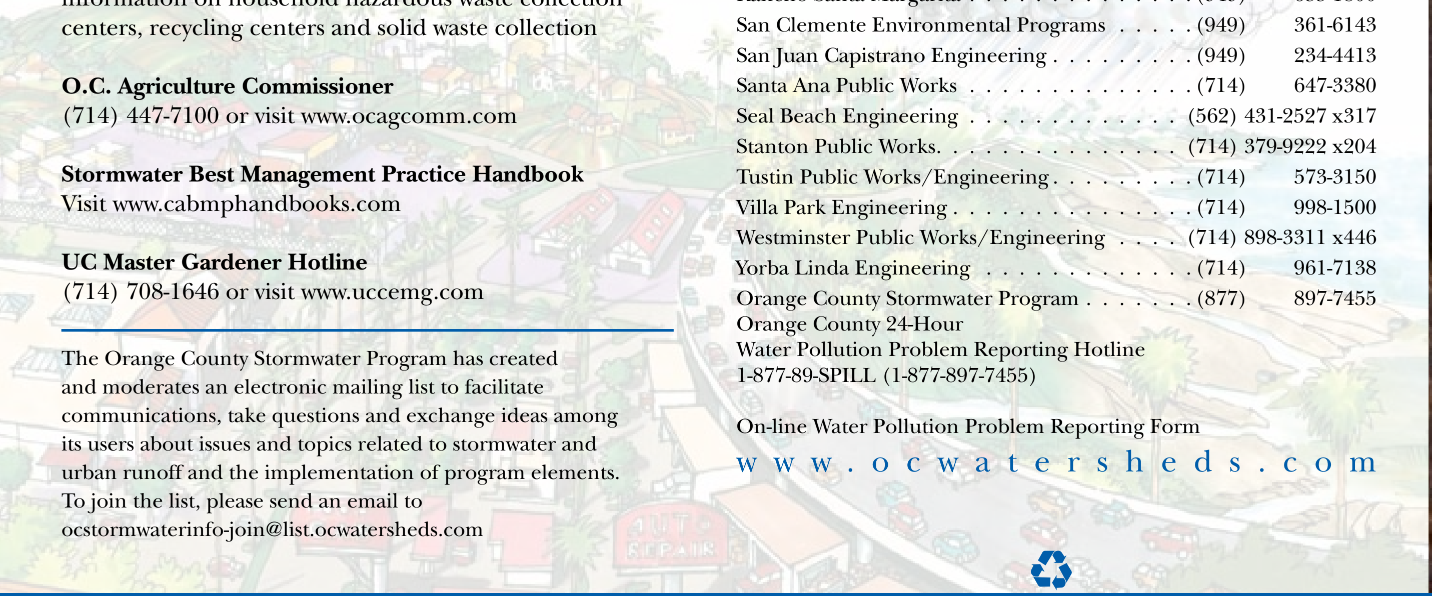
UC Master Gardener Hotline
(714) 708-1646 or visit www.uccemg.com

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

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, not properly disposing of used oil is illegal and can lead to fines. If you pour or drain oil onto driveways, sidewalks or streets, it can be washed into the storm drain.

Help prevent water pollution by taking your used oil and oil filters to a used oil collection center. Most major automotive maintenance centers will accept up to five gallons of used motor oil at no cost. For a list of locations, please visit www.cleanup.org.

For more information,
please call the
Orange County Stormwater Program
at **1-877-89-SPILL**
(1-877-897-7455)
or visit
www.ocwatersheds.com.

For information about the proper disposal of household hazardous waste, call the **Household Waste Hotline** at **1-877-89-SPILL (1-877-897-7455)** or visit **www.oclandfills.com.**

For additional information about the nearest oil recycling center, call the **Used Oil Program** at **1-800-CLEANUP** or visit **www.cleanup.org.**

RECYCLE
USED OIL

emc/rev9/08

Help Prevent Ocean Pollution:

Tips for the Home Mechanic

PROJECT
Pollution
PREVENTION

The Ocean Begins at Your Front Door

Tips for the Home Mechanic

WORK SITE

- Locate the storm drains on or near your property. Do not allow used oil or any materials to flow into these drains.
- Examine your home for sources of pollution.
- Perform automotive projects under cover and in a controlled area to prevent stormwater runoff.
- Sweep or vacuum your automotive workspace regularly
- Use a damp mop to clean work areas. Never hose down surfaces into the street, gutter or storm drain.

- Pour mop water into a sink or toilet. Never dispose of water in a parking lot, street, gutter or storm drain.

PREVENT LEAKS AND SPILLS

- Keep absorbent materials such as rags and/or cat litter in the work area
- Empty drip pans into a labeled, seal container before they are full
- Wipe up any spills or repair leaks as they happen. Don't let them sit.
- Place large pans under any wrecked cars until all fluids are drained.
- Promptly dispose of collected fluids into a hazardous waste drum or deliver them to an oil recycling center. Used oil recycling locations can be found at http://www.ochealthinfo.com/regulatory/usedoil.htm

CLEANING SPILLS

- Clean up spills immediately by using absorbent material such as rags, cat litter or sand. If the material spilled is hazardous, dispose of the rag, litter or sand in the same manner as hazardous waste. If the material spill is non-hazardous, dispose of it in the trash.

- Immediately report spills that have entered the street, gutter or storm drain to the County's 24-Hour Water Pollution Problem Reporting Hotline at 1-877-89-SPILL (1-877-897-7455) or visit www.ocwatersheds.com to fill out an incident report.
- Report emergencies to 911.

VEHICLE FLUID MANAGEMENT

- Vehicle fluids are hazardous waste and must be stored and disposed of in accordance with all local, state and federal laws.
- Designate an area to drain vehicle fluids away from storm drains and sanitary drains.
- When possible, drain vehicle fluids indoors or within covered areas, and only over floors that are constructed of a non-porous material such as concrete. Asphalt and dirt floors absorb spilled or leaked fluids, making the cleanup extremely difficult.

PROJECT Pollution PREVENTION

The Pollution Solution

Several residential activities can result in water pollution. Among these activities are car washing and hosing off driveways and sidewalks. Both activities can waste water and result in excess runoff. Water conservation methods described in this pamphlet can prevent considerable amounts of runoff and conserve water. By taking your car to a commercial car wash and by sweeping driveways and sidewalks, you can further prevent the transport of pollutants to Orange County waterways. Here are some of the common pollutants for which you can be part of the solution:

1 Pesticides and Fertilizer

- **Pollution:** The same pesticides that are designed to be toxic to pests can have an equally lethal impact on our marine life. The same fertilizer that promotes plant growth in lawns and gardens can also create nuisance algae blooms, which remove oxygen from the water and clog waterways when it decomposes.
- **Solution:** Never use pesticides or fertilizer within 48 hours of an anticipated rainstorm. Use only as much as is directed on the label and keep it off driveways and sidewalks.

2 Dirt and Sediment

- **Pollution:** Dirt or sediment can impede the flow of the stormwater and negatively impact stream habitat as it travels through waterways and deposits downstream. Pollutants can attach to sediment, which can then be transported through our waterways.
- **Solution:** Protect dirt stockpiles by covering them with tarps or secure plastic sheets to prevent wind or rain from allowing dirt or sediment to enter the storm drain system.

3 Metals

- **Pollution:** Metals and other toxins present in car wash water can harm important plankton, which forms the base of the aquatic food chain.
- **Solution:** Take your car to a commercial car wash where the wash water is captured and treated at a local wastewater treatment plant.

DID YOU KNOW?

Did you know that most of the pollution found in our waterways is not from a single source, but from a "non-point" source meaning the accumulation of pollution from residents and businesses throughout the community

4 Pet Waste

- **Pollution:** Pet waste carries bacteria through our watersheds and eventually will be washed out to the ocean. This can pose a health risk to swimmers and surfers.
- **Solution:** Pick up after your pets!

5 Trash and Debris

- **Pollution:** Trash and debris can enter waterways by wind, littering and careless maintenance of trash receptacles. Street sweeping collects some of this trash; however, much of what isn't captured ends up in our storm drain system where it flows untreated out to the ocean.
- **Solution:** Don't litter and make sure trash containers are properly covered. It is far more expensive to clean up the litter and trash that ends up in our waterways than it is to prevent it in the first place. Come out to one of Orange County's many locations for Coastal and Inner-Coastal Cleanup Day, which is held in September.

6 Motor Oil / Vehicle Fluids

- **Pollution:** Oil and petroleum products from our vehicles are toxic to people, wildlife and plants.

- **Solution:** Fix any leaks from your vehicle and keep the maintenance up on your car. Use absorbent material such as cat litter on oil spills, then sweep it up and dispose of it in the trash. Recycle used motor oil at a local Household Hazardous Waste Collection Center.

A TEAM EFFORT

The Orange County Stormwater Program has teamed with the Municipal Water District of Orange County (MWDOC) and the University of California Cooperative Extension Program (UCCE) to develop this pamphlet.

Low Impact Development (LID) and sustainable water use prevents water pollution and conserves water for drinking and reuse. Reducing your water use and the amount of water flowing from your home protects the environment and saves you money.

Thank you for making water protection a priority!

For more information, please visit www.ocwatersheds.com/publiced/

www.mwdoc.com

www.uccemg.com

ORANGE COUNTY PublicWorks
Our Community. Our Commitment.
Jess A. Carbajal, Executive Director
Search
Contact The County
OCGOV | Services | Government | Residents | Business | Visitor | Health | Law | Emergency | Info OC | Departments & Agencies
The Ocean Begins at Your Front Door
www.ocwatersheds.com | Report a spill 1.877.89.SPILL
Stormwater 101 | Residents | Kid's Corner | Business | Schools | News/Events | Resources | STORMWATER IQ QUIZ | USED OIL LOCATIONS | CONTACTS

The Public Education section of the Orange County Stormwater Program website is filled with information, interactive games, video and radio public service announcements and issue-specific brochures for you to learn more about water pollution prevention.

Click here to find out about Earth Day events in your community.

It's easy to protect our waterways from pollution. Click here to learn how!

OC WATERSHEDS CLICK HERE FOR MORE INFORMATION | KID'S CORNER Click. Play. Learn. | ESPAÑOL/NGUOI VIET Multi-Cultural Resources Click Here | STAY INFORMED Fill out our form to get news and events | Jump To Our Contact Form

Acceptable Use | Accessibility | Disclaimer | Privacy Policy | Sitemap | FAQs | © 2009 Orange County Public Works

To report a spill, call the Orange County 24-Hour Water Pollution Prevention Reporting Hotline
at 1-877-89-SPILL \ (1-877-897-7455)

Special Thanks to
The City of Los Angeles Stormwater Program for the use of its artwork

The Metropolitan Water District of Southern California for the use of the California-Friendly Plant and Native Habitat photos

PROJECT Pollution PREVENTION | UC CE University of California | MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

Homeowners Guide for Sustainable Water Use

Low Impact Development, Water Conservation & Pollution Prevention

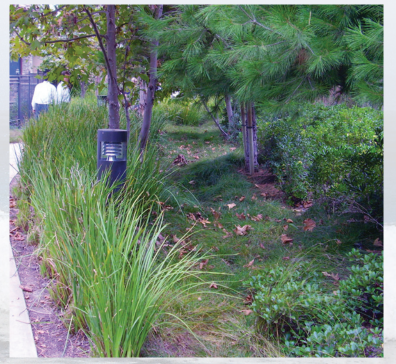
The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION | UC CE University of California | MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

RUNOFF, RAINWATER AND REUSE

Where Does Water Runoff Go?

Stormwater, or water from rainfall events, and runoff from outdoor water use such as sprinklers and hoses flows from homes directly into catch basins and the storm drain system. After entering the storm drain, the water flows untreated into streams, rivers, bays and ultimately the Pacific Ocean. Runoff can come from lawns, gardens, driveways, sidewalks and roofs. As it flows over hard, impervious surfaces, it picks up pollutants. Some pollutants carried by the water runoff include trash, pet waste, pesticides, fertilizer, motor oil and more.



Water Conservation

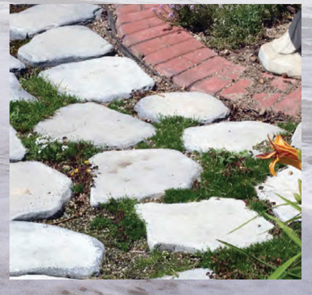
Pollution not only impairs the water quality for habitat and recreation, it can also reduce the water available for reuse. Runoff allowed to soak into the ground is cleaned as it percolates through the soil, replenishing depleted groundwater supplies. Groundwater provides at least 50% of the total water for drinking and other indoor household activities in north and central Orange County. When land is covered with roads, parking lots, homes, etc., there is less land to take in the water and more hard surfaces over which the water can flow.

In Orange County, 60-70% of water used by residents and businesses goes to irrigation and other outdoor uses. Reusing rainwater to irrigate our lawn not only reduces the impact of water pollution from runoff, but it also is a great way to conserve our precious water resources and replenish our groundwater basin.

What is Low Impact Development (LID)?

Low Impact Development (LID) is a method of development that seeks to maintain the natural hydrologic character of an area. LID provides a more sustainable and pollution-preventative approach to water management.

New water quality regulations require implementation of LID in larger new developments and encourage implementation of LID and other sustainable practices in existing residential areas. Implementing modifications to your lawn or garden can reduce pollution in our environment, conserve water and reduce your water bill.



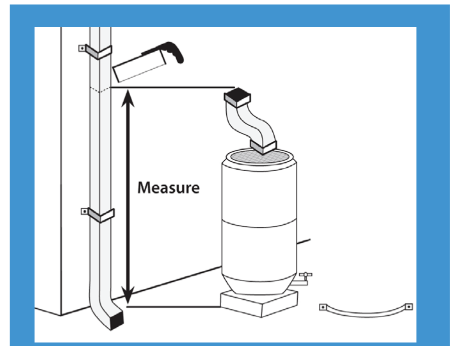
Permeable pavement allows water runoff to infiltrate through the soil and prevents most pollutants from reaching the storm drain system.

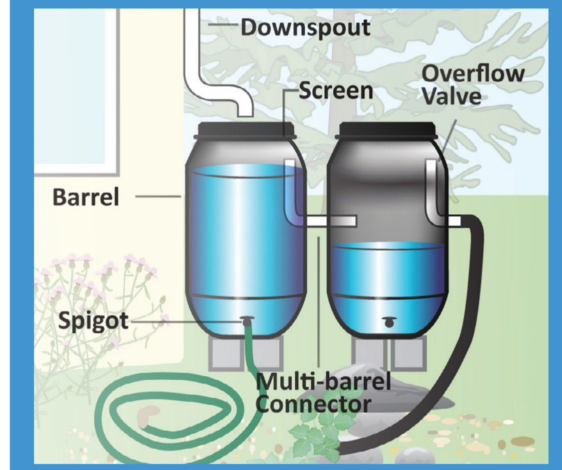
OPTIONS FOR RAINWATER HARVESTING AND REUSE

Rainwater harvesting is a great way to save money, prevent pollution and reduce potable water use. To harvest your rainwater, simply redirect the runoff from roofs and downspouts to rain barrels. Rain gardens are another option; these reduce runoff as well as encourage infiltration.

Downspout Disconnection/Redirection

Disconnecting downspouts from pipes running to the gutter prevents runoff from transporting pollutants to the storm drain. Once disconnected, downspouts can be redirected to rain gardens or other vegetated areas, or be connected to a rain barrel.





Rain Barrels

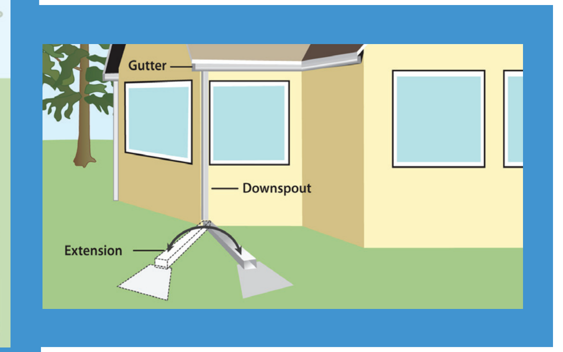
Rain barrels capture rainwater flow from roofs for reuse in landscape irrigation. Capacity of rain barrels needed for your home will depend on the amount of roof area and rainfall received. When purchasing your rain barrel, make sure it includes a screen, a spigot to siphon water for use, an overflow tube to allow for excess water to run out and a connector if you wish to connect multiple barrels to add capacity of water storage.

Mosquito growth prevention is very important when installing a rain barrel. The best way to prevent mosquito breeding is to eliminate entry points by ensuring all openings are sealed tightly. If these methods are unsuccessful, products are available to kill mosquito larvae, but that are harmless to animals and humans. Regular application of these products is essential. Please visit the Orange County Vector Control website for more information at www.ocvcd.org/mosquitoes3.php.

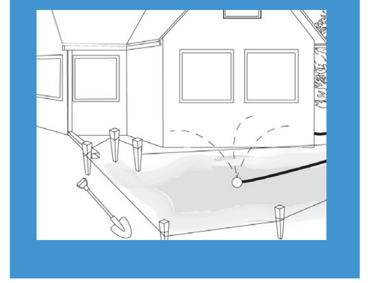
Rain Gardens

Rain gardens allow runoff to be directed from your roof downspout into a landscaped area. Vegetation and rocks in the garden will slow the flow of water to allow for infiltration into the soil. Plants and soil particles will absorb pollutants from the roof runoff. By utilizing a native plant palate, rain gardens can be maintained all year with minimal additional irrigation. These plants are adapted to the semi-arid climate of Southern California, require less water and can reduce your water bill.

Before modifying your yard to install a rain garden, please consult your local building and/or planning departments to ensure your garden plan follows pertinent building codes and ordinances. Besides codes and ordinances, some home owner associations also have guidelines for yard modifications. If your property is in hill areas or includes engineered slopes, please seek professional advice before proceeding with changes.



For information on how to disconnect a downspout or to install and maintain a rain barrel or rain garden at your home, please see the Los Angeles Rainwater Harvesting Program, A Homeowner's "How-To" Guide, November 2009 at www.larainwaterharvesting.org/



OTHER WATER CONSERVATION AND POLLUTION PREVENTION TECHNIQUES

Native Vegetation and Maintenance

"California Friendly" plants or native vegetation can significantly reduce water use. These plants often require far less fertilizers and pesticides, which are two significant pollutants found in Orange County waterways. Replacing water "thirsty" plants and grass types with water efficient natives is a great way to save water and reduce the need for potentially harmful pesticides and fertilizer.

Please see the California Friendly Garden Guide produced by the Metropolitan Water District of Southern California and associated Southern California Water Agencies for a catalog of California friendly plants and other garden resources at www.bewaterwise.com/Gardensoft.

Weed Free Yards

Weeds are water thieves. They often reproduce quickly and rob your yard of both water and nutrients. Weed your yard by hand if possible. If you use herbicides to control the weeds, use only the amount recommended on the label and never use it if rain is forecast within the next 48 hours.

Soil Amendments

Soil amendments such as green waste (e.g. grass clippings, compost, etc.) can be a significant source of nutrients and can help keep the soil near the roots of plants moist. However, they can cause algal booms if they get into our waterways, which reduces the amount of oxygen in the water and impacts most aquatic organisms. It is important to apply soil amendments more than 48 hours prior to predicted rainfall.

IRRIGATE EFFICIENTLY

Water runoff from sprinklers left on too long will carry pollutants into our waterways.

Smart Irrigation Controllers

Smart Irrigation Controllers have internal clocks as well as sensors that will turn off the sprinklers in response to environmental changes. If it is raining, too windy or too cold, the smart irrigation control sprinklers will automatically shut off.

Check with your local water agency for available rebates on irrigation controllers and smart timers.

- Aim your sprinklers at your lawn, not the sidewalk – By simply adjusting the direction of your sprinklers you can save water, prevent water pollution from runoff, keep your lawn healthy and save money.
- **Set a timer for your sprinklers** – lawns absorb the water they need to stay healthy within a few minutes of turning on the sprinklers. Time your sprinklers; when water begins running off your lawn, you can turn them off. Your timer can be set to water your lawn for this duration every time.
- **Water at Sunrise** – Watering early in the morning will reduce water loss due to evaporation. Additionally, winds tend to die down in the early morning so the water will get to the lawn as intended.
- **Water by hand** – Instead of using sprinklers, consider watering your yard by hand. Hand-watering ensures that all plants get the proper amount of water and you will prevent any water runoff, which wastes water and carries pollutants into our waterways.
- **Fix leaks** - Nationwide, households waste one trillion gallons of water a year to leaks – that is enough water to serve the entire state of Texas for a year. If your garden hose is leaking, replace the nylon or rubber hose washer and ensure a tight connection. Fix broken sprinklers immediately.

Do your part to prevent water pollution in our creeks, rivers, bays and ocean.

Remember the Water in Your Storm Drain is Not Treated BEFORE It Enters Our Waterways

Clean beaches and healthy creeks, rivers, bays, and ocean are important to Orange County. However, many common household activities can lead to water pollution if you're not careful.

Litter, oil, chemicals and other substances that are left on your yard or driveway can be blown or washed into storm drains that flow to the ocean. Over-watering your lawn and washing your car can also flush materials into the storm drains. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated.

You would never pour soap, fertilizers or oil into the ocean, so don't let them enter streets, gutters or storm drains. Follow the easy tips in this brochure to help prevent water pollution.

For more information,
please call the
Orange County Stormwater Program
at **1-877-89-SPILL** (1-877-897-7455)
or visit
www.ocwatersheds.com

To report a spill,
call the
Orange County 24-Hour Water Pollution Problem Reporting Hotline
1-877-89-SPILL (1-877-897-7455).

For emergencies, dial 911.

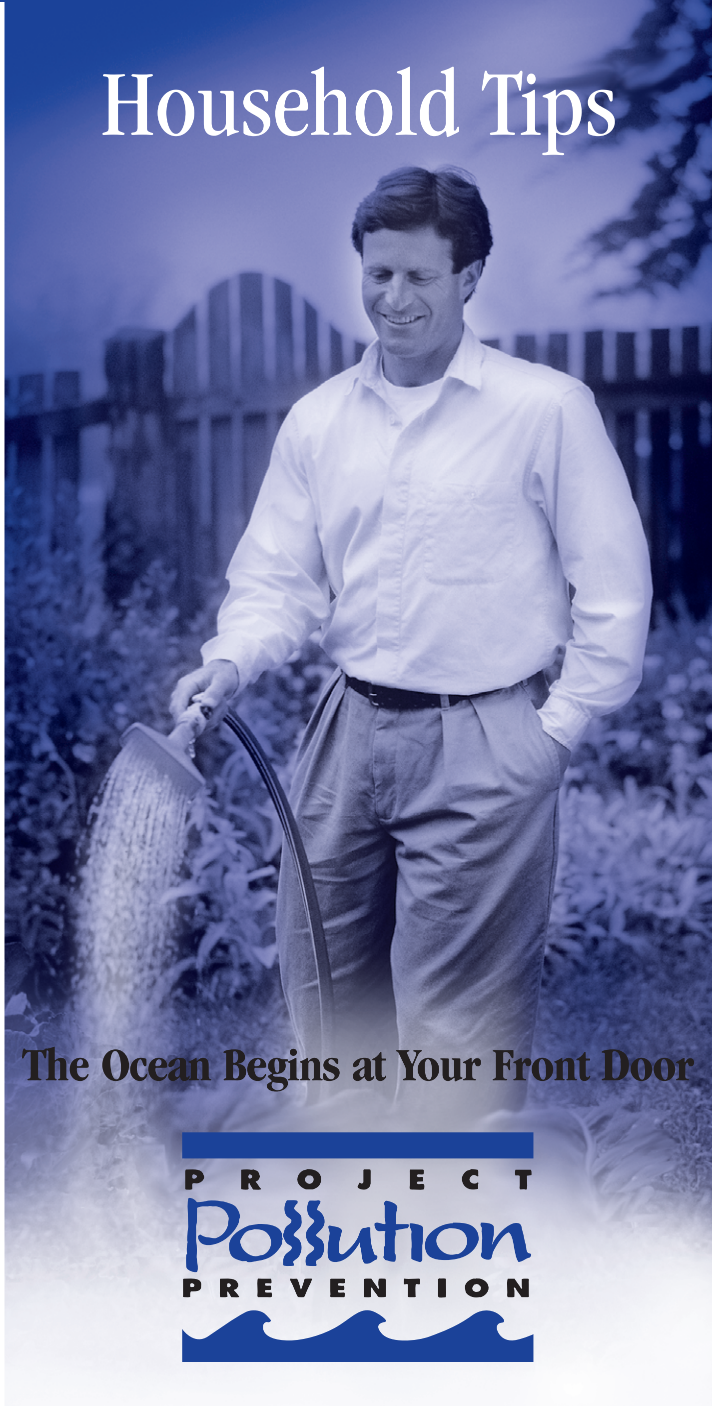
The tips contained in this brochure provide useful information to help prevent water pollution while performing everyday household activities. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

GENUINE
RECYCLED
PAPER
50% PRE-CONSUMER
AND
15% POST-CONSUMER

RECYCLE
USED OIL

Help Prevent Ocean Pollution:

Household Tips



The Ocean Begins at Your Front Door

PROJECT
Pollution
PREVENTION

Pollution Prevention

Household Activities

- **Do not rinse spills with water!** Sweep outdoor spills and dispose of in the trash. For wet spills like oil, apply cat litter or another absorbent material, then sweep and bring to a household hazardous waste collection center (HHWCC).
- Securely cover trash cans.
- Take household hazardous waste to a household hazardous waste collection center.
- Store household hazardous waste in closed, labeled containers inside or under a cover.
- Do not hose down your driveway, sidewalk or patio. Sweep up debris and dispose of in trash.
- Always pick up after your pet. Flush waste down the toilet or dispose of in the trash.
- Bathe pets indoors or have them professionally groomed.

Household Hazardous Wastes include:

- **Batteries**
- **Paint thinners, paint strippers and removers**
- **Adhesives**
- **Drain openers**
- **Oven cleaners**
- **Wood and metal cleaners and polishes**
- **Herbicides and pesticides**
- **Fungicides/wood preservatives**
- **Automotive fluids and products**
- **Grease and rust solvents**
- **Thermometers and other products containing mercury**
- **Fluorescent lamps**
- **Cathode ray tubes, e.g. TVs, computer monitors**
- **Pool and spa chemicals**

Gardening Activities

- Follow directions on pesticides and fertilizers, (measure, do not estimate amounts) and do not use if rain is predicted within 48 hours.
- Water your lawn and garden by hand to control the amount of water you use. Set irrigation systems to reflect seasonal water needs. If water flows off your yard and onto your driveway or sidewalk, your system is over-watering.
- Mulch clippings or leave them on the lawn. If necessary, dispose in a green waste container.
- Cultivate your garden often to control weeds.

Washing and Maintaining Your Car

- Take your car to a commercial car wash whenever possible.
- Choose soaps, cleaners, or detergents labeled “non-toxic,” “phosphate free” or “biodegradable.” Vegetable and citrus-based products are typically safest for the environment, **but even these should not be allowed into the storm drain.**
- Shake floor mats into a trash can or vacuum to clean.
- Do not use acid-based wheel cleaners and “hose off” engine degreasers at home. They can be used at a commercial facility, which can properly process the washwater.
- **Do not dump washwater onto your driveway, sidewalk, street, gutter or storm drain.** Excess washwater should be disposed of in the sanitary sewers (through a sink, or toilet) or onto an absorbent surface like your lawn.
- Use a nozzle to turn off water when not actively washing down automobile.
- Monitor vehicles for leaks and place pans under leaks. Keep your car well maintained to stop and prevent leaks.
- Use cat litter or other absorbents and sweep to remove any materials deposited by vehicles. Contain sweepings and dispose of at a HHWCC.
- Perform automobile repair and maintenance under a covered area and use drip pans or plastic sheeting to keep spills and waste material from reaching storm drains.
- **Never pour oil or antifreeze in the street, gutter or storm drains.** Recycle these substances at a service station, HHWCC, or used oil recycling center. For the nearest Used Oil Collection Center call 1-800-CLEANUP or visit www.ciwmb.ca.gov/UsedOil.

For locations and hours of Household Hazardous Waste Collection Centers in Anaheim, Huntington Beach, Irvine and San Juan Capistrano, call (714)834-6752 or visit www.oclandfills.com.

Do your part to prevent water pollution in our creeks, rivers, bays and ocean.

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, not properly disposing of household hazardous waste can lead to water pollution. Batteries, electronics, paint, oil, gardening chemicals, cleaners and other hazardous materials cannot be thrown in the trash. They also must never be poured or thrown into yards, sidewalks, driveways, gutters or streets. Rain or other water could wash the materials into the storm drain and eventually into our waterways and the ocean. In addition, hazardous waste must not be poured in the sanitary sewers (sinks and toilets).

NEVER DISPOSE OF HOUSEHOLD HAZARDOUS WASTE IN THE TRASH, STREET, GUTTER, STORM DRAIN OR SEWER.

For more information,
please call the
Orange County Stormwater Program
at **1-877-89-SPILL** (1-877-897-7455)
or visit
www.ocwatersheds.com

To Report Illegal Dumping of Household Hazardous Waste call 1-800-69-TOXIC

To report a spill,
call the
Orange County 24-Hour Water Pollution Problem Reporting Hotline
1-877-89-SPILL (1-877-897-7455).

For emergencies, dial 911.

RECYCLE USED OIL

Printed on Recycled Paper

Help Prevent Ocean Pollution:

Proper Disposal of Household Hazardous Waste

The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

ORANGE COUNTY

Pollution Prevention

WHEN POSSIBLE, USE NON-HAZARDOUS OR LESS-HAZARDOUS PRODUCTS.

Leftover household products that contain corrosive, toxic, ignitable, or reactive ingredients are considered to be "household hazardous waste" or "HHW." HHW can be found throughout your home, including the bathroom, kitchen, laundry room and garage.

Disposal of HHW down the drain, on the ground, into storm drains, or in the trash is illegal and unsafe.

Proper disposal of HHW is actually easy. Simply drop them off at a Household Hazardous Waste Collection Center (HHWCC) for free disposal and recycling. Many materials including anti-freeze, latex-based paint, motor oil and batteries can be recycled. Some centers have a "Stop & Swap" program that lets you take partially used home, garden, and automobile products free of charge. There are four HHWCCs in Orange County:

Anaheim:..................1071 N. Blue Gum St
Huntington Beach:.........17121 Nichols St
Irvine:........................... 6411 Oak Canyon
San Juan Capistrano:... 32250 La Pata Ave

Centers are open Tuesday-Saturday, 9 a.m.-3 p.m. Centers are closed on rainy days and major holidays. For more information, call **(714) 834-6752** or visit **www.oclandfills.com.**

Common household hazardous wastes

- Batteries
- Paint and paint products
- Adhesives
- Drain openers
- Household cleaning products
- Wood and metal cleaners and polishes
- Pesticides
- Fungicides/wood preservatives
- Automotive products (antifreeze, motor oil, fluids)
- Grease and rust solvents
- Fluorescent lamps
- Mercury (thermometers & thermostats)
- All forms of electronic waste including computers and microwaves
- Pool & spa chemicals
- Cleaners
- Medications
- Propane (camping & BBQ)
- Mercury-containing lamps
- Television & monitors (CRTs, flatscreens)

Tips for household hazardous waste

- Never dispose of HHW in the trash, street, gutter, storm drain or sewer.
- Keep these materials in closed, labeled containers and store materials indoors or under a cover.
- When possible, use non-hazardous products.
- Reuse products whenever possible or share with family and friends.
- Purchase only as much of a product as you'll need. Empty containers may be disposed of in the trash.
- HHW can be harmful to humans, pets and the environment. Report emergencies to 911.

Did you know that just one quart of oil can pollute 250,000 gallons of water?

A clean ocean and healthy creeks, rivers, bays and beaches are important to Orange County. However, not properly disposing of used oil can lead to water pollution. If you pour or drain oil onto driveways, sidewalks or streets, it can be washed into the storm drain. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering the ocean. Help prevent water pollution by taking your used oil to a used oil collection center.

Included in this brochure is a list of locations that will accept up to five gallons of used motor oil at no cost. Many also accept used oil filters. Please contact the facility before delivering your used oil. This listing of companies is for your reference and does not constitute a recommendation or endorsement of the company.

Please note that used oil filters may not be disposed of with regular household trash. They must be taken to a household hazardous waste collection or recycling center in Anaheim, Huntington Beach, Irvine or San Juan Capistrano. For information about these centers, visit www.oclandfills.com.

Please do not mix your oil with other substances!

For more information, please call the Orange County Stormwater Program at 1-877-89-SPILL (1-877-897-7455) or visit www.watersheds.com.

For information about the proper disposal of household hazardous waste, call the Household Waste Hotline at (714) 834-6752 or visit www.oclandfills.com.

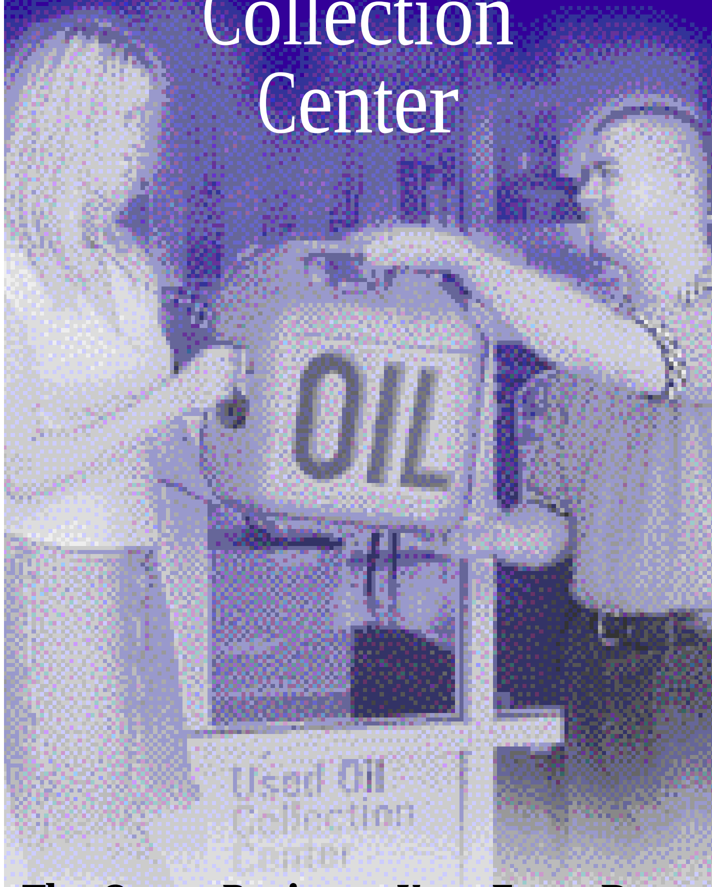
RECYCLE USED OIL

For additional information about the nearest oil recycling center, call the Used Oil Program at 1-800-CLEANUP or visit www.cleanup.org.

DTP113 Rev 8/03
printed on recycled paper

Help Prevent Ocean Pollution:

Recycle at Your Local Used Oil Collection Center



The Ocean Begins at Your Front Door

PROJECT
Pollution
PREVENTION

CENTRAL COUNTY

Used Oil Collection Centers

Balboa
Hill’s Boat Service
814 E Bay Ave., Balboa, CA 92661
(949)675-0740( )
CIWMB#: 30-C-03538

Balboa Island
Island Marine Fuel
406 S Bay Front, Balboa Island, CA 92662
(949)673-1103( )
CIWMB#: 30-C-03728

Corona Del Mar
Corona Del Mar 76
2201 E. Pacific Coast Hwy., Corona Del Mar, CA 92625
(949)673-3320( )
CIWMB#: 30-C-06620

Corona Del Mar Chevron
2546 E. Coast Hwy., Corona Del Mar, CA 92625
(949)495-0774(14)
CIWMB#: 30-C-06424

Mobil (Harbor View)
2500 San Joaquin Hills Rd., Corona Del Mar, CA 92625
(949)640-4759( )
CIWMB#: 30-C-03363

Costa Mesa
AutoZone #5520
744 W. 19th St., Costa Mesa, CA 92627
(901)495-7159( )
CIWMB#: 30-C-05992

Big O Tires #5571
3181 Harbor Blvd., Costa Mesa, CA 92626
(949)443-4155( )
CIWMB#: 30-C-04676

Big O Tires #694
322 E. 17th St., Costa Mesa, CA 92627
(949)642-4131( )
CIWMB#: 30-C-05811

Coast General Performance
2855 Harbor Blvd., Costa Mesa, CA 92626
(714)540-5710( )
CIWMB#: 30-C-05916

Connell Chevrolet
2828 Harbor Blvd., Costa Mesa, CA 92626
(714)546-1200( )
CIWMB#: 30-C-06286

EZ Lube Inc #15
3599 Harbor Blvd., Costa Mesa, CA 92626
(714)966-1647( )
CIWMB#: 30-C-03137

EZ Lube Inc #46
400 E 17th St., Costa Mesa, CA 92627
(714)556-1312( )
CIWMB#: 30-C-05779

EZ Lube Inc. #44
2248 Harbor Blvd., Costa Mesa, CA 92627
(714)556-1312( )
CIWMB#: 30-C-05737

Firestone Store #71T7
475 E 17th St., Costa Mesa, CA 92627
(949)646-2444( )
CIWMB#: 30-C-02120

Jiffy Lube #1969
300 E 17th St., Costa Mesa, CA 92627
(949)548-2505( )
CIWMB#: 30-C-05553

Jiffy Lube #1970
2175 Newport Blvd., Costa Mesa, CA 92627
(949)548-4150( )
CIWMB#: 30-C-05554

Jiffy Lube #607
2255 Fairview Rd., Costa Mesa, CA 92627
(949)650-5823( )
CIWMB#: 30-C-05551

Jiffy Lube #861
375 Bristol St., Costa Mesa, CA 92626
(714)557-5823( )
CIWMB#: 30-C-05552

Kragen Auto Parts #0725
1739 Superior Ave., Costa Mesa, CA 92627
(949)642-3384( )
CIWMB#: 30-C-02624

Kragen Auto Parts #0796
1175 Baker Blvd., Unit E, Costa Mesa, CA 92626
(714)662-2005( )
CIWMB#: 30-C-02664

Nabers Cadillac
2600 Harbor Blvd., Costa Mesa, CA 92626
(714)444-5200( )
CIWMB#: 30-C-05051

Oil Stop Inc.
Oil Stop Inc. Costa Mesa, CA 92626
(714)434-8350( )
CIWMB#: 30-C-06293

Pep Boys #660
2946 Bristol St., Costa Mesa, CA 92626
(714)549-1533( )
CIWMB#: 30-C-03416

Plaza Chevron Service Center
3048 Bristol Costa Mesa, CA 92626
(714)545-4257( )
CIWMB#: 30-C-01123

Scher Tire Inc #15 dba Goodyear Tire
1596 Newport Blvd., Costa Mesa, CA 92627
(949)548-9384( )
CIWMB#: 30-C-03034

Fountain Valley
Firestone Store #7147
17975 Magnolia Ave., Fountain Valley, CA 92708
(714)842-3341( )
CIWMB#: 30-C-01219

Golden Shell
8520 Warner Ave., Fountain Valley, CA 92708
(714)842-7150( )
CIWMB#: 30-P-05002

Kragen Auto Parts #0734
9880 Warner Ave., Fountain Valley, CA 92708
(714)964-6427( )
CIWMB#: 30-C-02609

Kragen Auto Parts #1505
16147 Harbor Blvd., Fountain Valley, CA 92708
(714)531-8525( )
CIWMB#: 30-C-04125

Oil Can Henry's
9525 Warner Ave., Fountain Valley, CA 92708
(714)473-7705( )
CIWMB#: 30-C-05843

Purrfect Auto Service #10
16780 Harbor Blvd., Fountain Valley, CA 92708
(714)839-3899( )
CIWMB#: 30-C-01380

Huntington Beach
AutoZone #5528
6800 Warner Ave., Huntington Beach, CA 92647
(714)891-8211( )
CIWMB#: 30-C-04777

Bella Terra Car Wash
16061 Beach Blvd., Huntington Beach, CA 92647
(714)847-4924( )
CIWMB#: 30-C-06195

Big O Tires #553
19411 Beach Blvd., Huntington Beach, CA 92648
(714)536-7571( )
CIWMB#: 30-C-00970

Econo Lube N' Tune #26
19961 Beach Blvd., Huntington Beach, CA 92648
(714)536-6519( )
CIWMB#: 30-C-06117

Expertec Automotive
7680 Talbert Ave Suite A & B, Huntington Beach, CA 92648
(714)848-9222( )
CIWMB#: 30-C-05914

EZ Lube Inc #16
7361 Edinger Ave., Huntington Beach, CA 92647
(714)899-3600( )
CIWMB#: 30-C-03289

EZ Lube Inc. #79
9862 Adams St., Huntington Beach, CA 92647
(714)556-1312( )
CIWMB#: 30-C-06547

Firestone Store #71T5
16171 Beach Blvd., Huntington Beach, CA 92647
(714)847-6081( )
CIWMB#: 30-C-02118

Huntington Beach Car Wash
18971 Beach Blvd., Huntington Beach, CA 92648
(714)847-4924( )
CIWMB#: 30-C-05303

Jiffy Lube #1857
8971 Warner Ave., Huntington Beach, CA 92647
(714)596-7213( )
CIWMB#: 30-C-05053

Kragen Auto Parts #1468
10072 Adams Ave., Huntington Beach, CA 92646
(714)593-6156( )
CIWMB#: 30-C-04284

Kragen Auto Parts #1511
7171 Warner Ave., Huntington Beach, CA 92647
(714)842-4531( )
CIWMB#: 30-C-04129

Kragen Auto Parts #1633
18888 Beach Blvd., Huntington Beach, CA 92648
(714)965-2353( )
CIWMB#: 30-C-02645

Oilmax 10 Minute Lube/Wash
9862 Adams Ave., Huntington Beach, CA 92646
(714)964-7110( )
CIWMB#: 30-C-03219

Pep Boys #799
19122 Brookhurst St., Huntington Beach, CA 92646
(714)964-0777( )
CIWMB#: 30-C-03439

Quik Change Lube & Oil
5841 Warner Ave., Huntington Beach, CA 92649
(714)840-2331( )
CIWMB#: 30-C-03208

R Kids Tire and Service #6
5062 Warner Ave., Huntington Beach, CA 92647
(714)846-1189( )
CIWMB#: 30-C-05691

Saturn of Huntington Beach
18801 Beach Blvd., Huntington Beach, CA 92648
(714)841-5428( )
CIWMB#: 30-C-05221

USA Express Tire & Service Inc
7232 Edinger Ave., Huntington Beach, CA 92647
(714)842-0717( )
CIWMB#: 30-C-04429

Zito's Auto Care
19002 Magnolia St., Huntington Beach, CA 92646
(714)968-8788( )
CIWMB#: 30-C-03251

Irvine
Firestone Store #71W4
51 Auto Center Dr., Irvine, CA 92618
(949)829-8710( )
CIWMB#: 30-C-03689

Irvine City Auto Parts
14427 Culver Dr., Irvine, CA 92604
(949)551-5588( )
CIWMB#: 30-C-02186

Jiffy Lube #1856 Irvine Spectrum
8777 Irvine Center Dr., Irvine, CA 92618
(949)753-0485( )
CIWMB#: 30-C-06094

Jiffy Lube #1988
3080 Main St., Irvine, CA 92614
(714)961-5491(27)
CIWMB#: 30-C-04450

Kragen Auto Parts #4174
15315 Culver Dr., Ste.#170, Irvine, CA 92604
(602)631-7115( )
CIWMB#: 30-C-06417

Newport Beach
Jiffy Lube #2811
1520 W Coast Hwy., Newport Beach, CA 92663
(949)764-9255( )
CIWMB#: 30-C-05629

Newport Landing Fuel Dock
503 E Edgewater Newport Beach, CA 92661
(949)673-7878( )
CIWMB#: 30-C-03628

Orange
AutoZone #5942
1330 N. Glassell Orange, CA 92867
(714)538-4551( )
CIWMB#: 30-C-04553

Big O Tires #570
1825 E Katella Ave., Orange, CA 92867
(714)538-0016( )
CIWMB#: 30-C-00974

David Wilsons Ford of Orange
1350 W Katella Ave., Orange, CA 92867
(714)633-6731( )
CIWMB#: 30-C-02341

EZ Lube #74
3232 Chapman Ave. #E, Orange, CA 92869
(714)556-1312(106)
CIWMB#: 30-C-06627

Firestone Store #7185
1690 N Tustin Ave., Orange, CA 92867
(714)282-8144( )
CIWMB#: 30-C-0122

Jiffy Lube #1457
433 W. Katella Ave., Orange, CA 92867
(714)720-5757( )
CIWMB#: 30-C-06280

Kragen Auto Parts #1764
910 Tustin St., Orange, CA 92867
(714)771-3000( )
CIWMB#: 30-C-02625

Managed Mobile, Inc.
1030 N Batavia St., #B, Orange, CA 92867
(714)400-0250( )
CIWMB#: 30-C-05776

Pep Boys #806
215 E Katella Ave., Orange, CA 92867
(714)997-1540( )
CIWMB#: 30-C-01759

Santiago Hills Car Care
8544 East Chapman Ave., Orange, CA 92869
(714)919-1060( )
CIWMB#: 30-C-05622

Scher Tire #33
1821 E. Katella Ave., Orange, CA 92867
(909)343-3100( )
CIWMB#: 30-C-06324

Tabassi Shell Service Station
830 E Katella Ave., Orange, CA 92867
(714)771-6990( )
CIWMB#: 30-C-00552

The Tune-up Center
193 S Main St., Orange, CA 92868
(714)633-1876( )
CIWMB#: 30-C-02091

Tony's Fuel and Towing
1650 W La Veta Ave., Orange, CA 92868
(714)953-7676( )
CIWMB#: 30-C-00868

Truck Lubrication Company
143 S. Pixley Orange, CA 92868
(714)997-7730( )
CIWMB#: 30-C-06001

Santa Ana
All Phase Environmental
910 E. Fourth St., Santa Ana, CA 92701
(714)731-5995( )
CIWMB#: 30-C-06116

Archie's Tire & Towing
4518 Westminster Ave., Santa Ana, CA 92703
(714)636-4518( )
CIWMB#: 30-C-02058

AutoZone #3320
2007 S. Main St., Santa Ana, CA 92707
(901)495-7217( )
CIWMB#: 30-C-06508

AutoZone #5232
430 W 17th Santa Ana, CA 92706
(714)547-7003( )
CIWMB#: 30-C-04609

AutoZone #5538
1101 S Bristol Santa Ana, CA 92704
(714)241-0335( )
CIWMB#: 30-C-00829

Big O Tires
1211 W. Warner Ave., Santa Ana, CA 92707
(714)540-8646( )
CIWMB#: 30-C-04679

Big O Tires #712
1302 E. 17th St., Santa Ana, CA 92705
(714)541-6811( )
CIWMB#: 30-C-05813

Firestone Store #7175
3733 S Bristol Santa Ana, CA 92704
(714)549-4015( )
CIWMB#: 30-C-01223

Firestone Store #71TA
101 S Main St., Santa Ana, CA 92701
(714)542-8857( )
CIWMB#: 30-C-02123

Firestone Store #71W6
2005 N Tustin Ave., Ste A, Santa Ana, CA 92705
(714)541-7977( )
CIWMB#: 30-C-03688

Guaranty Chevrolet Motors Inc.
711 E 17th St., Santa Ana, CA 92701
(714)973-1711(277)
CIWMB#: 30-C-06506

Jiffy Lube #1303
2025 N. Tustin Santa Ana, CA 92701
(714)720-5757( )
CIWMB#: 30-C-06283

John's Mobil
1465 S Main St., Santa Ana, CA 92707
(714)835-3266( )
CIWMB#: 30-C-00578

Kragen Auto Parts #0736
1302 E 17th St., Santa Ana, CA 92705
(714)953-6061( )
CIWMB#: 30-C-02610

Kragen Auto Parts #1253
1400 W Edinger Ave., Santa Ana, CA 92704
(714)754-1432( )
CIWMB#: 30-C-02627

Kragen Auto Parts #1376
521 W 17th St., Santa Ana, CA 92706
(714)543-4492( )
CIWMB#: 30-C-03901

Kragen Auto Parts #1516
2337 S Bristol Ave., Santa Ana, CA 92704
(714)557-0787( )
CIWMB#: 30-C-04106

Kragen Auto Parts #1648
1015 S Main St., Santa Ana, CA 92701
(714)568-1570( )
CIWMB#: 30-C-05664

Pep Boys #609
120 E 1st St., Santa Ana, CA 92701
(714)547-7477( )
CIWMB#: 30-C-01738

Pep Boys #802
1107 S Harbor Blvd., Santa Ana, CA 92704
(714)775-0828( )
CIWMB#: 30-C-01739

Purrfect Auto Service
2519 S Main St., Santa Ana, CA 92707
(714)549-7900( )
CIWMB#: 30-C-02085

Saturn of Santa Ana
1350 Auto Mall Dr., Santa Ana, CA 92705
(714)648-2444( )
CIWMB#: 30-C-05222

Scher Tire #28
1805 N Grand Ave., Santa Ana, CA 92705
(714)558-8644( )
CIWMB#: 30-C-03225

Tustin
Big O Tires #555
131 E 1st St., Tustin, CA 92780
(714)544-9431( )
CIWMB#: 30-C-00972

EZ Lube #42
12972 Newport Ave., Tustin, CA 92780
(714)556-1312( )
CIWMB#: 30-C-06408

Jiffy Lube #1406
3087 Edinger Ave., Tustin, CA 92780
(949)651-8814( )
CIWMB#: 30-C-03778

Kragen Auto Parts #1533
502 B E 1st St., Tustin, CA 92780
(714)544-9249( )
CIWMB#: 30-C-04128

Scher Tire Inc #17 dba Goodyear Tire
14511 Redhill Ave., Tustin, CA 92780
(714)832-6011( )
CIWMB#: 30-C-03035

Villa Park
Phil’s Villa Park 76
17771 Santiago Blvd., Villa Park, CA 92861
(714)637-0854( )
CIWMB#: 30-C-06579

This information was provided by the County of Orange Integrated Waste Management Department and the California Integrated Waste Management Board (CIWMB).

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many common activities such as pest control can lead to water pollution if you're not careful. Pesticide treatments must be planned and applied properly to ensure that pesticides do not enter the street, gutter or storm drain. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never dump pesticides into the ocean, so don't let it enter the storm drains. Pesticides can cause significant damage to our environment if used improperly. If you are thinking of using a pesticide to control a pest, there are some important things to consider.

For more information,
please call
University of California Cooperative
Extension Master Gardeners at
(714) 708-1646
or visit these Web sites:
www.uccemg.org
www.ipm.ucdavis.edu

For instructions on collecting a specimen sample visit the Orange County Agriculture Commissioner's website at:
http://www.ocagcomm.com/ser_lab.asp

To report a spill, call the **Orange County 24-Hour Water Pollution Problem Reporting Hotline at 1-877-89-SPILL (1-877-897-7455).**

For emergencies, dial 911.

Information From:
Cheryl Wilen, Area IPM Advisor; Darren Haver, Watershed Management Advisor; Mary Louise Flint, IPM Education and Publication Director; Pamela M. Geisel, Environmental Horticulture Advisor; Carolyn L. Unruh, University of California Cooperative Extension staff writer. Photos courtesy of the UC Statewide IPM Program and Darren Haver.

Funding for this brochure has been provided in full or in part through an agreement with the State Water Resources Control Board (SWRCB) pursuant to the Costa-Machado Water Act of 2000 (Prop. 13).

Printed on Recycled Paper

Help Prevent Ocean Pollution:

Responsible Pest Control

The Ocean Begins at Your Front Door

PROJECT
Pollution
PREVENTION

Tips for Pest Control

Key Steps to Follow:

Step 1: Correctly identify the pest (insect, weed, rodent, or disease) and verify that it is actually causing the problem.

Three life stages of the common lady beetle, a beneficial insect.

This is important because beneficial insects are often mistaken for pests and sprayed with pesticides needlessly.

Consult with a Certified Nursery Professional at a local nursery or garden center or send a sample of the pest to the Orange County Agricultural Commissioner's Office.

Determine if the pest is still present – even though you see damage, the pest may have left.

Step 2: Determine how many pests are present and causing damage.

Small pest populations may be controlled more safely using non-pesticide techniques. These include removing food sources, washing off leaves with a strong stream of water, blocking entry into the home using caulking and replacing problem plants with ones less susceptible to pests.

Integrated Pest Management (IPM) usually combines several least toxic pest control methods for long-term prevention and management of pest problems without harming you, your family, or the environment.

University of California Cooperative Extension

Step 3: If a pesticide must be used, choose the least toxic chemical.

Obtain information on the least toxic pesticides that are effective at controlling the target pest from the UC Statewide Integrated Pest Management (IPM) Program's Web site at www.ipm.ucdavis.edu.

Seek out the assistance of a Certified Nursery Professional at a local nursery or garden center when selecting a pesticide. Purchase the smallest amount of pesticide available.

Apply the pesticide to the pest during its most vulnerable life stage. This information can be found on the pesticide label.

Step 4: Wear appropriate protective clothing.

Follow pesticide labels regarding specific types of protective equipment you should wear. Protective clothing should always be washed separately from other clothing.

Step 5: Continuously monitor external conditions when applying pesticides such as weather, irrigation, and the presence of children and animals.

Never apply pesticides when rain is predicted within the next 48 hours. Also, do not water after applying pesticides unless the directions say it is necessary.

Apply pesticides when the air is still; breezy conditions may cause the spray or dust to drift away from your targeted area.

In case of an emergency call 911 and/or the regional poison control number at (714) 634-5988 or (800) 544-4404 (CA only).

For general questions you may also visit www.calpoison.org.

Step 6: In the event of accidental spills, sweep up or use an absorbent agent to remove any excess pesticides. Avoid the use of water.

Be prepared. Have a broom, dust pan, or dry absorbent material, such as cat litter, newspapers or paper towels, ready to assist in cleaning up spills.

Contain and clean up the spill right away. Place contaminated materials in a doubled plastic bag. All materials used to clean up the spill should be properly disposed of according to your local Household Hazardous Waste Disposal site.

Step 7: Properly store and dispose of unused pesticides.

Purchase Ready-To-Use (RTU) products to avoid storing large concentrated quantities of pesticides.

Store unused chemicals in a locked cabinet.

Unused pesticide chemicals may be disposed of at a Household Hazardous Waste Collection Center.

Empty pesticide containers should be triple rinsed prior to disposing of them in the trash.

Household Hazardous Waste
Collection Center
(714) 834-6752
www.oclandfills.com

PROJECT Pollution PREVENTION

Sewage Spill Regulatory Requirements

Allowing sewage to discharge to a gutter or storm drain may subject you to penalties and/or out-of-pocket costs to reimburse cities or public agencies for clean-up efforts.

Here are the pertinent codes, fines, and agency contact information that apply.

Orange County Stormwater Program

24 Hour Water Pollution Reporting Hotline

1-877-89-SPILL (1-877-897-7455)

- County and city water quality ordinances prohibit discharges containing pollutants.

Orange County Health Care Agency Environmental Health

(714) 433-6419

California Health and Safety Code, Sections 5410-5416

- No person shall discharge raw or treated sewage or other waste in a manner that results in contamination, pollution or a nuisance.
- Any person who causes or permits a sewage discharge to any state waters:
  - must immediately notify the local health agency of the discharge.
  - shall reimburse the local health agency for services that protect the public's health and safety (water-contact receiving waters).
  - who fails to provide the required notice to the local health agency is guilty of a misdemeanor and shall be punished by a fine (between $500–$1,000) and/or imprisonment for less than one year.

Regional Water Quality Control Board

Santa Ana Region	San Diego Region
(951) 782-4130	(858) 467-2952

- Requires the prevention, mitigation, response to and reporting of sewage spills.

California Office of Emergency Services

(800) 852-7550

California Water Code, Article 4, Chapter 4, Sections 13268-13271
California Code of Regulations, Title 23, Division 3, Chapter 9.2, Article 2, Sections 2250-2260

- Any person who causes or permits sewage in excess of 1,000 gallons to be discharged to state waters **shall immediately notify the Office of Emergency Services.**
- Any person who fails to provide the notice required by this section is **guilty of a misdemeanor** and shall be punished by a fine (less than $20,000) and/or imprisonment for not more than one year.

DTP113 Rev 4/06
printed on recycled paper

Sewage Spill

Reference Guide

Your Responsibilities as a Private Property Owner

Residences
Businesses
Homeowner/Condominium Associations
Federal and State Complexes
Military Facilities

Orange County
Sanitation District

Health Care Agency
Environmental Health

PROJECT Pollution PREVENTION

www.ocwatersheds.com

This brochure was designed courtesy of the Orange County Sanitation District (OCSD). For additional information, call (714) 962-2411, or visit their website at www.ocsd.com

---

What is a Sewage Spill?

Sewage spills occur when the wastewater being transported via underground pipes overflows through a manhole, cleanout or broken pipe. Sewage spills can cause health hazards, damage to homes and businesses, and threaten the environment, local waterways and beaches.

Common Causes of Sewage Spills

Grease builds up inside and eventually blocks sewer pipes. Grease gets into the sewer from food establishments, household drains, as well as from poorly maintained commercial grease traps and interceptors.

Structure problems caused by tree roots in the lines, broken/cracked pipes, missing or broken cleanout caps or undersized sewers can cause blockages.

Infiltration and inflow (I/I) impacts pipe capacity and is caused when groundwater or rainwater enters the sewer system through pipe defects and illegal connections.

You Are Responsible for a Sewage Spill Caused by a Blockage or Break in Your Sewer Lines!

Time is of the essence in dealing with sewage spills. You are required to **immediately**:

Control and minimize the spill. Keep spills contained on private property and out of gutters, storm drains and public waterways by shutting off or not using the water.

Use sandbags, dirt and/or plastic sheeting to prevent sewage from entering the storm drain system.

Clear the sewer blockage. Always wear gloves and wash your hands. It is recommended that a plumbing professional be called for clearing blockages and making necessary repairs.

Always notify your city sewer/public works department or public sewer district of sewage spills. If the spill enters the storm drains also notify the Health Care Agency. In addition, if it exceeds 1,000 gallons notify the Office of Emergency Services. Refer to the numbers listed in this brochure.

Overflowing cleanout pipe located on private property

You Could Be Liable

Allowing sewage from your home, business or property to discharge to a gutter or storm drain may subject you to penalties and/or out-of-pocket costs to reimburse cities or public agencies for clean-up and enforcement efforts. See Regulatory Codes & Fines section for pertinent codes and fines that apply.

What to Look For

Sewage spills can be a very noticeable gushing of water from a manhole or a slow water leak that may take time to be noticed. Don't dismiss unaccounted-for wet areas.

Look for:

- Drain backups inside the building.
- Wet ground and water leaking around manhole lids onto your street.
- Leaking water from cleanouts or outside drains.
- Unusual odorous wet areas: sidewalks, external walls or ground/landscape around a building.

Caution

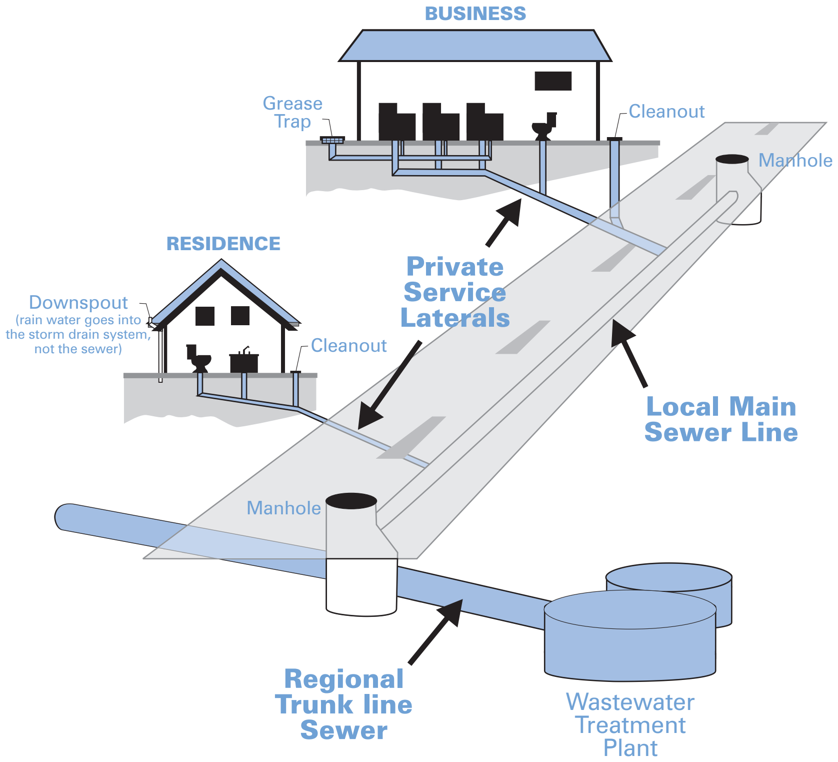
Keep people and pets away from the affected area. Untreated sewage has high levels of disease-causing viruses and bacteria. Call your local health care agency listed on the back for more information.

If You See a Sewage Spill Occurring, Notify Your City Sewer/Public Works Department or Public Sewer District IMMEDIATELY!

How a Sewer System Works

A property owner's sewer pipes are called service laterals and are connected to larger local main and regional trunk lines. Service laterals run from the connection at the home to the connection with the public sewer (including the area under the street). These laterals are the responsibility of the property owner and must be maintained by the property owner. Many city agencies have adopted ordinances requiring maintenance of service laterals. Check with your city sewer/local public works department for more information.

Operation and maintenance of **local and regional sewer lines** are the responsibility of the city sewer/public works departments and public sewer districts.



How You Can Prevent Sewage Spills

1. **Never put grease down garbage disposals, drains or toilets.**
2. **Perform periodic cleaning to eliminate grease, debris and roots in your service laterals.**
3. **Repair any structural problems in your sewer system and eliminate any rainwater infiltration/inflow leaks into your service laterals.**


Sewage spills can cause damage to the environment. Help prevent them!

Preventing Grease Blockages

The drain is not a dump! Recycle or dispose of grease properly and never pour grease down the drain.

Homeowners should mix fats, oils and grease with absorbent waste materials such as paper, coffee grounds, or kitty litter and place it in the trash. Wipe food scraps from plates and pans and dump them in the trash.

Restaurants and commercial food service establishments should always use "Kitchen Best Management Practices." These include:

- Collecting all cooking grease and liquid oil from pots, pans and fryers in covered grease containers for recycling.
- Scraping or dry-wiping excess food and grease from dishes, pots, pans and fryers into the trash.
- Installing drain screens on all kitchen drains.
- Having spill kits readily available for cleaning up spills.
- Properly maintaining grease traps or interceptors by having them serviced regularly. Check your local city codes.

Orange County Agency Responsibilites

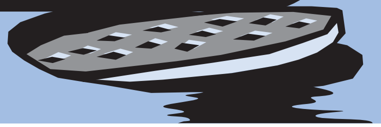
- **City Sewer/Public Works Departments—** Responsible for protecting city property and streets, the local storm drain system, sewage collection system and other public areas.
- **Public Sewer/Sanitation District—** Responsible for collecting, treating and disposing of wastewater.
- **County of Orange Health Care Agency—** Responsible for protecting public health by closing ocean/bay waters and may close food-service businesses if a spill poses a threat to public health.
- **Regional Water Quality Control Boards—** Responsible for protecting State waters.
- **Orange County Stormwater Program—** Responsible for preventing harmful pollutants from being discharged or washed by stormwater runoff into the municipal storm drain system, creeks, bays and the ocean.

You Could Be Liable for Not Protecting the Environment

Local and state agencies have legal jurisdiction and enforcement authority to ensure that sewage spills are remedied.

They may respond and assist with containment, relieving pipe blockages, and/or clean-up of the sewage spill, especially if the spill is flowing into storm drains or onto public property.

A property owner may be charged for costs incurred by these agencies responding to spills from private properties.



Report Sewage Spills!

City Sewer/Public Works Departments

Aliso Viejo	(949) 425-2500
Anaheim	(714) 765-6860
Brea	(714) 990-7691
Buena Park	(714) 562-3655
Costa Mesa	(949) 645-8400
Cypress	(714) 229-6760
Dana Point	(949) 248-3562
Fountain Valley	(714) 593-4600
Fullerton	(714) 738-6897
Garden Grove	(714) 741-5375
Huntington Beach	(714) 536-5921
Irvine	(949) 453-5300
Laguna Beach	(949) 497-0765
Laguna Hills	(949) 707-2650
Laguna Niguel	(949) 362-4337
Laguna Woods	(949) 639-0500
La Habra	(562) 905-9792
Lake Forest	(949) 461-3480
La Palma	(714) 690-3310
Los Alamitos	(562) 431-3538
Mission Viejo	(949) 831-2500
Newport Beach	(949) 644-3011
Orange	(714) 532-6480
Orange County	(714) 567-6363
Placentia	(714) 993-8245
Rancho Santa Margarita	(949) 635-1800
San Clemente	(949) 366-1553
San Juan Capistrano	(949) 443-6363
Santa Ana	(714) 647-3380
Seal Beach	(562) 431-2527
Stanton	(714) 379-9222
Tustin	(714) 962-2411
Villa Park	(714) 998-1500
Westminster	(714) 893-3553
Yorba Linda	(714) 961-7170

Public Sewer/Water Districts

Costa Mesa Sanitary District	(714) 393-4433/ (949) 645-8400
El Toro Water District	(949) 837-0660
Emerald Bay Service District	(949) 494-8571
Garden Grove Sanitary District	(714) 741-5375
Irvine Ranch Water District	(949) 453-5300
Los Alamitos/Rossmoor Sewer District	(562) 431-2223
Midway City Sanitary District (Westminster)	(714) 893-3553
Moulton Niguel Water District	(949) 831-2500
Orange County Sanitation District	(714) 962-2411
Santa Margarita Water District	(949) 459-6420
South Coast Water District	(949) 499-4555
South Orange County Wastewater Authority	(949) 234-5400
Sunset Beach Sanitary District	(562) 493-9932
Trabuco Canyon Sanitary District	(949) 858-0277
Yorba Linda Water District	(714) 777-3018

Other Agencies

Orange County Health Care Agency	(714) 433-6419
Office of Emergency Services	(800) 852-7550

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many common activities can lead to water pollution if you're not careful. Home improvement projects and work sites must be maintained to ensure that building materials do not enter the street, gutter or storm drain. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never dump building materials into the ocean, so don't let them enter the storm drains. Follow these tips to help prevent water pollution.

For more information,
please call the
Orange County Stormwater Program
at **1-877-89-SPILL** (1-877-897-7455)
or visit
www.ocwatersheds.com

To report a spill,
call the
Orange County 24-Hour Water Pollution Problem Reporting Hotline
at **1-877-89-SPILL** (1-877-897-7455).

For emergencies, dial 911.

The tips contained in this brochure provide useful information to help prevent water pollution while performing home improvement projects. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

♻

Printed on Recycled Paper

Help Prevent Ocean Pollution:

Tips for Home Improvement Projects

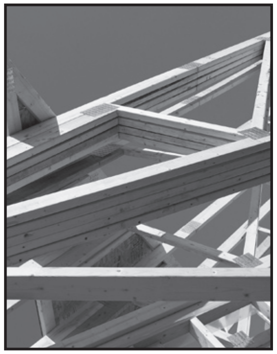
The Ocean Begins at Your Front Door

PROJECT
Pollution
PREVENTION

Tips for Home Improvement Projects

Home improvement projects can cause significant damage to the environment. Whether you hire a contractor or work on the house yourself, it is important to follow these simple tips while renovating, remodeling or improving your home:

General Construction



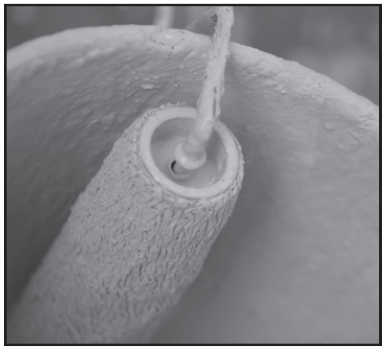
- Schedule projects for dry weather.
- Keep all construction debris away from the street, gutter and storm drain.
- Store materials under cover with temporary roofs or plastic sheets to eliminate or reduce the possibility that rainfall, runoff or wind will carry materials from the project site to the street, storm drain or adjacent properties.

Building Materials

- Never hose materials into a street, gutter or storm drain.
- Exposed piles of construction material should not be stored on the street or sidewalk.
- Minimize waste by ordering only the amount of materials needed to complete the job.
- Do not mix more fresh concrete than is needed for each project.
- Wash concrete mixers and equipment in a designated washout area where the water can flow into a containment area or onto dirt.
- Dispose of small amounts of dry excess materials in the trash. Powdery waste, such as dry concrete, must be properly contained within a box or bag prior to disposal. Call your local trash hauler for weight and size limits.

Paint

- Measure the room or object to be painted, then buy only the amount needed.
- Place the lid on firmly and store the paint can upside-down in a dry location away from the elements.
- Tools such as brushes, buckets and rags should never be washed where excess water can drain into the street, gutter or storm drain. All tools should be rinsed in a sink connected to the sanitary sewer.
- When disposing of paint, never put wet paint in the trash.



- Dispose of water-based paint by removing the lid and letting it dry in the can. Large amounts must be taken to a Household Hazardous Waste Collection Center (HHWCC).
- Oil-based paint is a household hazardous waste. All leftover paint should be taken to a HHWCC.
- For HHWCC locations and hours, call **(714) 834-6752** or visit **www.oclandfills.com**.

Erosion Control

- Schedule grading and excavation projects for dry weather.
- When temporarily removing soil, pile it in a contained, covered area where it cannot spill into the street, or obtain the required temporary encroachment or street closure permit and follow the conditions instructed by the permit.
- When permanently removing large quantities of soil, a disposal location must be found prior to excavation. Numerous businesses are available to handle disposal needs. For disposal options, visit **www.ciwmb.ca.gov/SWIS**.
- Prevent erosion by planting fast-growing annual and perennial grasses. They will shield and bind the soil.

Recycle

- Use a construction and demolition recycling company to recycle lumber, paper, cardboard, metals, masonry (bricks, concrete, etc.), carpet, plastic, pipes (plastic, metal and clay), drywall, rocks, dirt and green waste.
- For a listing of construction and demolition recycling locations in your area, visit **www.ciwmb.ca.gov/recycle.**

Spills

- Clean up spills immediately by using an absorbent material such as cat litter, then sweep it up and dispose of it in the trash.
- Immediately report spills that have entered the street, gutter or storm drain to the County's 24-Hour Water Pollution Problem Reporting Hotline at **(714) 567-6363** or visit **www.ocwatersheds.com** to fill out an incident reporting form.

PROJECT Pollution PREVENTION

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many common activities can lead to water pollution if you're not careful. Fertilizers, pesticides and other chemicals that are left on yards or driveways can be blown or washed into storm drains that flow to the ocean. Overwatering lawns can also send materials into storm drains. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never pour gardening products into the ocean, so don't let them enter the storm drains. Follow these easy tips to help prevent water pollution.

For more information,
please call the
Orange County Stormwater Program
at **1-877-89-SPILL** (1-877-897-7455)
or visit
www.ocwatersheds.com

UCCE Master Gardener Hotline:
(714) 708-1646

To report a spill,
call the
Orange County 24-Hour
Water Pollution Problem
Reporting Hotline
1-877-89-SPILL (1-877-897-7455).

For emergencies, dial 911.

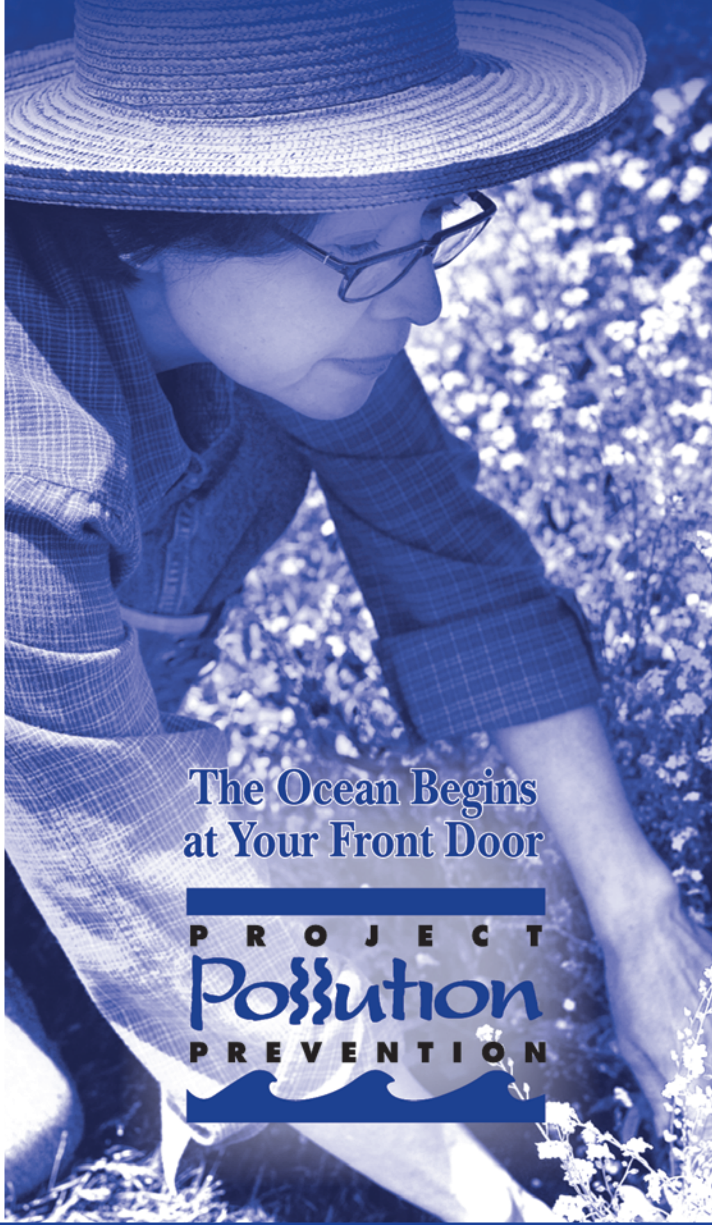
The tips contained in this brochure provide useful information to help prevent water pollution while landscaping or gardening. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

♲

Printed on Recycled Paper

Help Prevent Ocean Pollution:

Tips for Landscape & Gardening



The Ocean Begins at Your Front Door

PROJECT
Pollution
PREVENTION

Tips for Landscape & Gardening

Never allow gardening products or polluted water to enter the street, gutter or storm drain.

General Landscaping Tips

- Protect stockpiles and materials from wind and rain by storing them under tarps or secured plastic sheeting.
- Prevent erosion of slopes by planting fast-growing, dense ground covering plants. These will shield and bind the soil.
- Plant native vegetation to reduce the amount of water, fertilizers, and pesticide applied to the landscape.

- Never apply pesticides or fertilizers when rain is predicted within the next 48 hours.

Garden & Lawn Maintenance

- Do not overwater. Use irrigation practices such as drip irrigation, soaker hoses or micro spray systems. 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 green waste by composting, hauling it to a permitted landfill, or recycling it through your city's program.
- Use slow-release fertilizers to minimize leaching, and use organic fertilizers.
- Read labels and use only as directed. Do not over-apply pesticides or fertilizers. Apply to spots as needed, rather than blanketing an entire area.
- Store pesticides, fertilizers and other chemicals in a dry covered area to prevent exposure that may result in the deterioration of containers and packaging.

- Rinse empty pesticide containers and re-use rinse water as you would use the product. Do not dump rinse water down storm drains. Dispose of empty containers in the trash.
- When available, use non-toxic alternatives to traditional pesticides, and use pesticides specifically designed to control the pest you are targeting. For more information, visit **www.ipm.ucdavis.edu**.
- If fertilizer is spilled, sweep up the spill before irrigating. If the spill is liquid, apply an absorbent material such as cat litter, and then sweep it up and dispose of it in the trash.
- Take unwanted pesticides to a Household Hazardous Waste Collection Center to be recycled. Locations are provided below.

Household Hazardous Waste Collection Centers

Anaheim:	1071 N. Blue Gum St.
Huntington Beach:	17121 Nichols St.
Irvine:	6411 Oak Canyon
San Juan Capistrano:	32250 La Pata Ave.

For more information, call (714) 834-6752 or visit www.oclandfills.com

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many common activities can lead to water pollution if you're not careful. Pet waste and pet care products can be washed into the storm drains that flow to the ocean. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never put pet waste or pet care products into the ocean, so don't let them enter the storm drains. Follow these easy tips to help prevent water pollution.

For more information,
please call the
Orange County Stormwater Program
at **1-877-89-SPILL** (1-877-897-7455)
or visit
www.ocwatersheds.com

To report a spill,
call the
Orange County 24-Hour
Water Pollution Problem
Reporting Hotline
1-877-89-SPILL (1-877-897-7455).

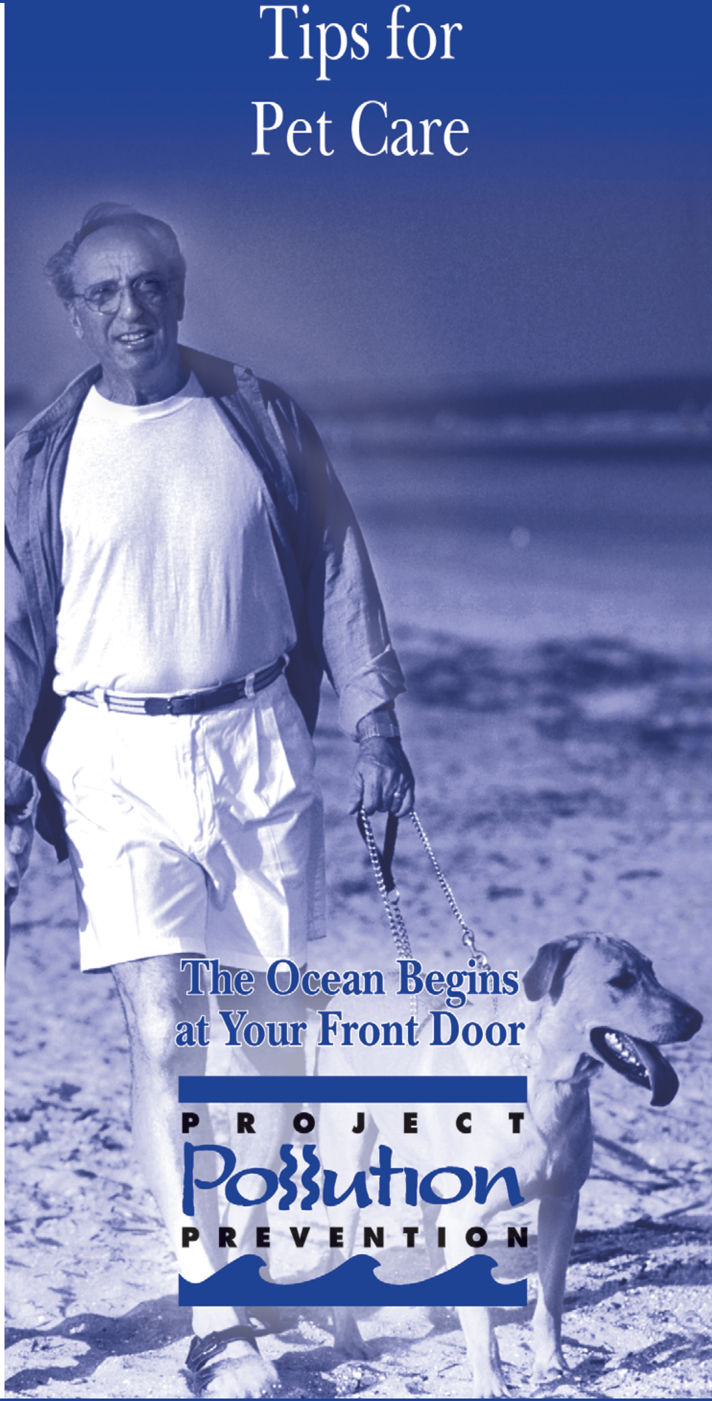
For emergencies, dial 911.

The tips contained in this brochure provide useful information to help prevent water pollution while caring for your pet. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

Printed on Recycled Paper

Help Prevent Ocean Pollution:

Tips for Pet Care



The Ocean Begins at Your Front Door

PROJECT
Pollution
PREVENTION

Tips for Pet Care

Never let any pet care products or washwater run off your yard and into the street, gutter or storm drain.

Washing Your Pets

Even biodegradable soaps and shampoos can be harmful to marine life and the environment.

- If possible, bathe your pets indoors using less-toxic shampoos or have your pet professionally groomed. Follow instructions on the products and clean up spills.
- If you bathe your pet outside, wash it on your lawn or another absorbent/ permeable surface to keep the washwater from running into the street, gutter or storm drain.

Flea Control

- Consider using oral or topical flea control products.
- If you use flea control products such as shampoos, sprays or collars, make sure to dispose of any unused products at a Household Hazardous Waste Collection Center. For location information, call **(714) 834-6752**.

Why You Should Pick Up After Your Pet

It's the law! Every city has an ordinance requiring you to pick up after your pet. Besides being a nuisance, pet waste can lead to water pollution, even if you live inland. During rainfall, pet waste left outdoors can wash into storm drains. This waste flows directly into our waterways and the ocean where it can harm human health, marine life and the environment.

As it decomposes, pet waste demands a high level of oxygen from water. This decomposition can contribute to killing marine life by reducing the amount of dissolved oxygen available to them.

Have fun with your pets, but please be a responsible pet owner by taking care of them and the environment.

- Take a bag with you on walks to pick up after your pet.
- Dispose of the waste in the trash or in a toilet.

PROJECT
Pollution
PREVENTION

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many common activities such as painting can lead to water pollution if you're not careful. Paint must be used, stored and disposed of properly to ensure that it does not enter the street, gutter or storm drain. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never dump paint into the ocean, so don't let it enter the storm drains. Follow these easy tips to help prevent water pollution.

For more information,
please call the
Orange County Stormwater Program
at **1-877-89-SPILL** (1-877-897-7455)
or visit
www.ocwatersheds.com

To report a spill,
call the
Orange County 24-Hour
Water Pollution Problem
Reporting Hotline
at **1-877-89-SPILL** (1-877-897-7455).

For emergencies, dial 911.

The tips contained in this brochure provide useful information to help prevent water pollution while using, storing and disposing of paint. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

Printed on Recycled Paper

Help Prevent Ocean Pollution:

Tips for Projects Using Paint

The Ocean Begins at Your Front Door

PROJECT
Pollution
PREVENTION

Tips for Projects Using Paint

Paint can cause significant damage to our environment. Whether you hire a contractor or do it yourself, it is important to follow these simple tips when purchasing, using, cleaning, storing and disposing of paint.

Purchasing Paint

- Measure the room or object to be painted, then buy only the amount needed.
- Whenever possible, use water-based paint since it usually does not require hazardous solvents such as paint thinner for cleanup.

Painting

- Use only one brush or roller per color of paint to reduce the amount of water needed for cleaning.
- Place open paint containers or trays on a stable surface and in a position that is unlikely to spill.
- Always use a tarp under the area or object being painted to collect paint drips and contain spills.

Cleaning

- Never clean brushes or rinse paint containers in the street, gutter or storm drain.
- For oil-based products, use as much of the paint on the brushes as possible. Clean brushes with thinner. To reuse thinner, pour it through a fine filter (e.g. nylon, metal gauze or filter paper) to remove solids such as leftover traces of paint.
- For water-based products, use as much of the paint on the brushes as possible, then rinse in the sink.
- Collect all paint chips and dust. Chips and dust from marine paints or paints containing lead, mercury or tributyl tin are hazardous waste. Sweep up and dispose of at a Household Hazardous Waste Collection Center (HHWCC).

Storing Paint

- Store paint in a dry location away from the elements.
- Store leftover water-based paint, oil-based paint and solvents separately in original or clearly marked containers.
- Avoid storing paint cans directly on cement floors. The bottom of the can will rust much faster on cement.
- Place the lid on firmly and store the paint can upside-down to prevent air from entering. This will keep the paint usable longer. Oil-based paint is usable for up to 15 years. Water-based paint remains usable for up to 10 years.

Alternatives to Disposal

- Use excess paint to apply another coat, for touch-ups, or to paint a closet, garage, basement or attic.
- Give extra paint to friends or family. Extra paint can also be donated to a local theatre group, low-income housing program or school.
- Take extra paint to an exchange program such as the **"Stop & Swap"** that allows you to drop off or pick up partially used home care products free of charge. **"Stop & Swap"** programs are available at most HHWCCs.
- For HHWCC locations and hours, call **(714) 834-6752** or visit **www.oclandfills.com**.

Disposing of Paint

- Never put wet paint in the trash.

For water-based paint:

- If possible, brush the leftover paint on cardboard or newspaper. Otherwise, allow the paint to dry in the can with the lid off in a well-ventilated area protected from the elements, children and pets. Stirring the paint every few days will speed up the drying.
- Large quantities of extra paint should be taken to a HHWCC.
- Once dried, paint and painted surfaces may be disposed of in the trash. When setting a dried paint can out for trash collection, leave the lid off so the collector will see that the paint has dried.

For oil-based paint:

- Oil-based paint is a household hazardous waste. All leftover paint should be taken to a HHWCC.

Aerosol paint:

- Dispose of aerosol paint cans at a HHWCC.

Spills

- Never hose down pavement or other impermeable surfaces where paint has spilled.
- Clean up spills immediately by using an absorbent material such as cat litter. Cat litter used to clean water-based paint spills can be disposed of in the trash. When cleaning oil-based paint spills with cat litter, it must be taken to a HHWCC.
- Immediately report spills that have entered the street, gutter or storm drain to the County's 24-Hour Water Pollution Problem Reporting Hotline at **(714) 567-6363** or visit **www.ocwatersheds.com** to fill out an incident reporting form.

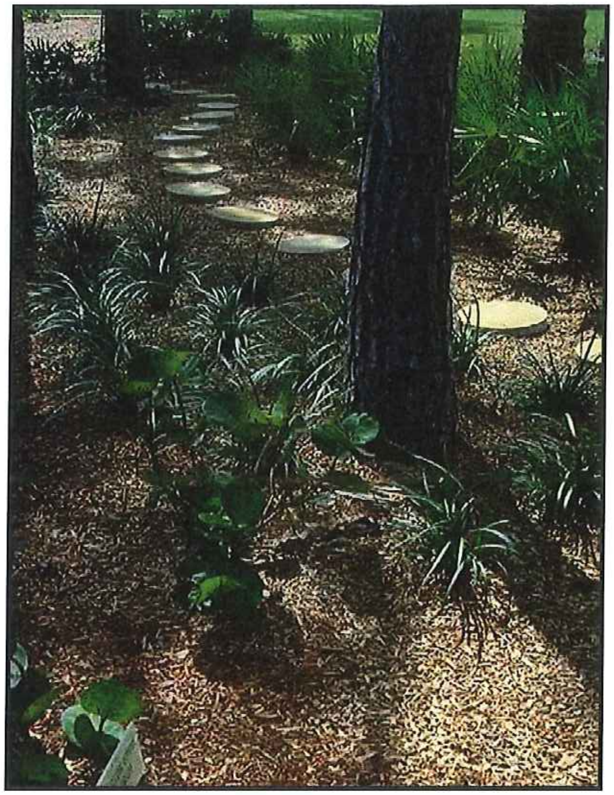
PROJECT
Pollution
PREVENTION

APPENDIX B

POST CONSTRUCTION BMP FACT SHEETS

- ....SD-10 Site Design & Landscape Planning
- ....SD-12 Efficient Irrigation
- ....SD-13 Storm Drain Signage
- ....R-1 Automobile Repair and Maintenance
- ....R-2 Automobile Washing
- ....R-3 Automobile Parking
- ....R-4 Home and Garden Care Activities
- ....R-5 Disposal of Pet Wastes
- ....R-6 Disposal of Green Wastes
- ....R-7 Household Hazardous Waste
- ....R-8 Water Conservation
- ....FP-3 Roads, Streets, and Highways Operation and Maintenance
- ....FP-5 Solid Waste Handling
- ....FP-6 Water and Sewer Utility Operation and Maintenance
- ....DF-1 Drainage Facility Operation and Maintenance

Site Design & Landscape Planning SD-10



Design Objectives

- ✓ Maximize Infiltration
- ✓ Provide Retention
- ✓ Slow Runoff
- ✓ Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Each project site possesses unique topographic, hydrologic, and vegetative features, some of which are more suitable for development than others. Integrating and incorporating appropriate landscape planning methodologies into the project design is the most effective action that can be done to minimize surface and groundwater contamination from stormwater.

Approach

Landscape planning should couple consideration of land suitability for urban uses with consideration of community goals and projected growth. Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Design requirements for site design and landscapes planning should conform to applicable standards and specifications of agencies with jurisdiction and be consistent with applicable General Plan and Local Area Plan policies.

CASQA
California Stormwater Quality Association

Designing New Installations

Begin the development of a plan for the landscape unit with attention to the following general principles:

- Formulate the plan on the basis of clearly articulated community goals. Carefully identify conflicts and choices between retaining and protecting desired resources and community growth.

- Map and assess land suitability for urban uses. Include the following landscape features in the assessment: wooded land, open unwooded land, steep slopes, erosion-prone soils, foundation suitability, soil suitability for waste disposal, aquifers, aquifer recharge areas, wetlands, floodplains, surface waters, agricultural lands, and various categories of urban land use. When appropriate, the assessment can highlight outstanding local or regional resources that the community determines should be protected (e.g., a scenic area, recreational area, threatened species habitat, farmland, fish run). Mapping and assessment should recognize not only these resources but also additional areas needed for their sustenance.

Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Conserve Natural Areas during Landscape Planning

If applicable, the following items are required and must be implemented in the site layout during the subdivision design and approval process, consistent with applicable General Plan and Local Area Plan policies:

- Cluster development on least-sensitive portions of a site while leaving the remaining land in a natural undisturbed condition.

- Limit clearing and grading of native vegetation at a site to the minimum amount needed to build lots, allow access, and provide fire protection.

- Maximize trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of native and/or drought tolerant plants.

- Promote natural vegetation by using parking lot islands and other landscaped areas.

- Preserve riparian areas and wetlands.

Maximize Natural Water Storage and Infiltration Opportunities Within the Landscape Unit

- Promote the conservation of forest cover. Building on land that is already deforested affects basin hydrology to a lesser extent than converting forested land. Loss of forest cover reduces interception storage, detention in the organic forest floor layer, and water losses by evapotranspiration, resulting in large peak runoff increases and either their negative effects or the expense of countering them with structural solutions.

- Maintain natural storage reservoirs and drainage corridors, including depressions, areas of permeable soils, swales, and intermittent streams. Develop and implement policies and regulations to discourage the clearing, filling, and channelization of these features. Utilize them in drainage networks in preference to pipes, culverts, and engineered ditches.

- Evaluating infiltration opportunities by referring to the stormwater management manual for the jurisdiction and pay particular attention to the selection criteria for avoiding groundwater contamination, poor soils, and hydrogeological conditions that cause these facilities to fail. If necessary, locate developments with large amounts of impervious surfaces or a potential to produce relatively contaminated runoff away from groundwater recharge areas.

Protection of Slopes and Channels during Landscape Design

- Convey runoff safely from the tops of slopes.
- Avoid disturbing steep or unstable slopes.
- Avoid disturbing natural channels.
- Stabilize disturbed slopes as quickly as possible.
- Vegetate slopes with native or drought tolerant vegetation.
- Control and treat flows in landscaping and/or other controls prior to reaching existing natural drainage systems.
- Stabilize temporary and permanent channel crossings as quickly as possible, and ensure that increases in run-off velocity and frequency caused by the project do not erode the channel.
- Install energy dissipaters, such as riprap, at the outlets of new storm drains, culverts, conduits, or channels that enter unlined channels in accordance with applicable specifications to minimize erosion. Energy dissipaters shall be installed in such a way as to minimize impacts to receiving waters.
- Line on-site conveyance channels where appropriate, to reduce erosion caused by increased flow velocity due to increases in tributary impervious area. The first choice for linings should be grass or some other vegetative surface, since these materials not only reduce runoff velocities, but also provide water quality benefits from filtration and infiltration. If velocities in the channel are high enough to erode grass or other vegetative linings, riprap, concrete, soil cement, or geo-grid stabilization are other alternatives.
- Consider other design principles that are comparable and equally effective.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

SD-10 Site Design & Landscape Planning

Redevelopment may present significant opportunity to add features which had not previously been implemented. Examples include incorporation of depressions, areas of permeable soils, and swales in newly redeveloped areas. While some site constraints may exist due to the status of already existing infrastructure, opportunities should not be missed to maximize infiltration, slow runoff, reduce impervious areas, disconnect directly connected impervious areas.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Stormwater Management Manual for Western Washington, Washington State Department of Ecology, August 2001.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Efficient Irrigation

SD-12

Design Objectives

- ✓ Maximize Infiltration
- ✓ Provide Retention
- ✓ Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Irrigation water provided to landscaped areas may result in excess irrigation water being conveyed into stormwater drainage systems.

Approach

Project plan designs for development and redevelopment should include application methods of irrigation water that minimize runoff of excess irrigation water into the stormwater conveyance system.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Designing New Installations

The following methods to reduce excessive irrigation runoff should be considered, and incorporated and implemented where determined applicable and feasible by the Permittee:

- Employ rain-triggered shutoff devices to prevent irrigation after precipitation.
- Design irrigation systems to each landscape area's specific water requirements.
- Include design featuring flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.
- Implement landscape plans consistent with County or City water conservation resolutions, which may include provision of water sensors, programmable irrigation times (for short cycles), etc.

CASQA
California Stormwater Quality Association

- Design timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the storm water drainage system.
- Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements (for example, native or drought tolerant species). Consider design features such as:
  - Using mulches (such as wood chips or bar) in planter areas without ground cover to minimize sediment in runoff
  - Installing appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant materials where possible and/or as recommended by the landscape architect
  - Leaving a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible
  - Choosing plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth
- Employ other comparable, equally effective methods to reduce irrigation water runoff.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define “redevelopment” in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of “ redevelopment” must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under “designing new installations” above should be followed.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Storm Drain Signage SD-13

Design Objectives

Maximize Infiltration

Provide Retention

Slow Runoff

Minimize Impervious Land Coverage

☑ Prohibit Dumping of Improper Materials

Contain Pollutants

Collect and Convey

Description

Waste materials dumped into storm drain inlets can have severe impacts on receiving and ground waters. Posting notices regarding discharge prohibitions at storm drain inlets can prevent waste dumping. Storm drain signs and stencils are highly visible source controls that are typically placed directly adjacent to storm drain inlets.

Approach

The stencil or affixed sign contains a brief statement that prohibits dumping of improper materials into the urban runoff conveyance system. Storm drain messages have become a popular method of alerting the public about the effects of and the prohibitions against waste disposal.

Suitable Applications

Stencils and signs alert the public to the destination of pollutants discharged to the storm drain. Signs are appropriate in residential, commercial, and industrial areas, as well as any other area where contributions or dumping to storm drains is likely.

Design Considerations

Storm drain message markers or placards are recommended at all storm drain inlets within the boundary of a development project. The marker should be placed in clear sight facing toward anyone approaching the inlet from either side. All storm drain inlet locations should be identified on the development site map.

Designing New Installations

The following methods should be considered for inclusion in the project design and show on project plans:

- Provide stenciling or labeling of all storm drain inlets and catch basins, constructed or modified, within the project area with prohibitive language. Examples include "NO DUMPING

CASQA
CALIFORNIA STORMWATER
QUALITY ASSOCIATION

– DRAINS TO OCEAN" and/or other graphical icons to discourage illegal dumping.

- Post signs with prohibitive language and/or graphical icons, which prohibit illegal dumping at public access points along channels and creeks within the project area.

Note - Some local agencies have approved specific signage and/or storm drain message placards for use. Consult local agency stormwater staff to determine specific requirements for placard types and methods of application.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. If the project meets the definition of "redevelopment", then the requirements stated under " designing new installations" above should be included in all project design plans.

Additional Information

Maintenance Considerations

- Legibility of markers and signs should be maintained. If required by the agency with jurisdiction over the project, the owner/operator or homeowner's association should enter into a maintenance agreement with the agency or record a deed restriction upon the property title to maintain the legibility of placards or signs.

Placement

- Signage on top of curbs tends to weather and fade.

- Signage on face of curbs tends to be worn by contact with vehicle tires and sweeper brooms.

Supplemental Information

Examples

- Most MS4 programs have storm drain signage programs. Some MS4 programs will provide stencils, or arrange for volunteers to stencil storm drains as part of their outreach program.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

R-1

AUTOMOBILE REPAIR AND MAINTENANCE

Automobile repair and maintenance activities have the potential to contribute directly to storm drain systems primarily through spills or the dumping of waste fluids being conveyed to the storm drain. Automotive fluids, such as oils, greases, and solvents, are hydrocarbon based, and may contain metals, chlorinated hydrocarbons, and other toxic compounds. Removal of caked dirt and grime from an automobile increases the sediment load to the storm drain system. The pollution prevention activities outlined in this fact sheets are used to prevent the discharge of pollutants to the storm drain system.

Think before conducting automobile repair and maintenance activities. Remember - The ocean starts at your front door.

The activities outlined in this fact sheet target the following pollutants:	
Sediment	x
Nutrients	
Bacteria	
Foaming Agents	
Metals	x
Hydrocarbons	x
Hazardous Materials	x
Pesticides and Herbicides	
Other	

Required Activities

RECYCLE USED OIL

- Recycle used oil and antifreeze by taking them to service stations and other recycling centers. Never pour oil in storm drains or other areas.

- Do not perform repair and maintenance activities during rain events.

- Immediately clean up and contain any spills. Dispose of all waste and adsorbent materials properly.

- Store hazardous materials and wastes (including, but not limited to, fluids, solvents, parts containing fluids, batteries) indoors, under cover, or in watertight containers.

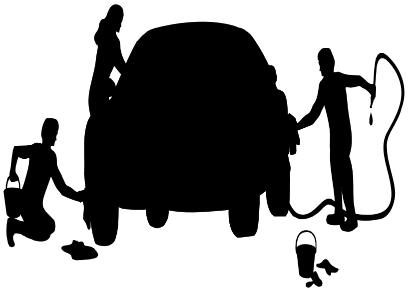
- Perform automobile maintenance and repairs over impervious surfaces such as concrete, so spills and waste material should be readily cleaned up. Use drip pans, plastic sheeting, etc. to contain spills and waste material.

- Dispose of cleaning solvents at the designated hazardous waste center.

Recommended Activities

- Conduct auto repair activities at a commercial repair facility
- Perform automobile repair and maintenance activities under a covered area.
- Do not buy fluids containing target pollutants (e.g. degreasers containing PERC).
- Monitor parked or stored vehicles and equipment for leaks and place pans under leaks to collect fluids for proper disposal or recycling.

For additional information contact:
County of Orange, OC Watershed
Main: (714) 955-0600 Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: www.ocwatersheds.com



R-2
AUTOMOBILE WASHING

The activities outlined in this fact sheet target the following pollutants:	
Sediment	x
Nutrients	X
Bacteria	
Foaming Agents	X
Metals	X
Hydrocarbons	X
Hazardous Materials	x
Pesticides and Herbicides	
Other	

Automobile washing activities have the potential to contribute pollutants because road dust washed from vehicles may contain metals and hydrocarbons. Any leaking fluids washed from the automobile may be carried to the storm drain by the wash water. Detergents used for automobile washing may also contain phosphorus and foaming agents, which contribute to the eutrophication of receiving waterbodies. The pollution prevention activities outlined in this fact sheets are used to prevent the discharge of pollutants to the storm drain system.

Think before conducting automobile washing activities. Remember - The ocean starts at your front door.

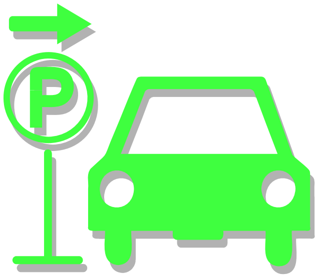
Required Activities

- Shake floor mats into trashcan or vacuum to clean. Do not shake over ground.
- If using cleaners (such as acid based wheel cleaners) use a rag to wipe them on and off, do not rinse them off with water.
- If possible, divert runoff from automobile washing to a grassy surface large enough to contain and allow complete infiltration
- Dispose of excess wash water into the sanitary sewer (i.e. via sink, or toilet) or onto a landscaped area that will allow for complete infiltration.
- Conduct engine degreasing at a commercial facility that is set up to handle that type of waste.

Recommended Activities

- When possible, use commercial wash facilities
- Wash vehicles over pervious surfaces such as lawns and gravel areas
- Choose soaps, cleaners, or detergents labeled “non-toxic”, “phosphate free”, or “biodegradable”. Vegetable and citrus-based products are typically safest for the environment.
- Turn off water when not actively washing down automobile.
- If available, use established neighborhood wash areas, where runoff is properly controlled and managed.

For additional information contact:
County of Orange, OC Watershed
Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: www.ocwatersheds.com



R-3
AUTOMOBILE PARKING

The activities outlined in this fact sheet target the following pollutants:	
Sediment	x
Nutrients	
Bacteria	
Foaming Agents	
Metals	X
Hydrocarbons	X
Hazardous Materials	x
Pesticides and Herbicides	
Other	

Parked automobiles may contribute pollutants to the storm drain because poorly maintained vehicles may leak fluids containing hydrocarbons, metals, and other pollutants. In addition, heavily soiled automobiles may drop clods of dirt onto the parking surface, contributing to the sediment load when runoff is present. During rain events, or wash-down activities, the pollutants may be carried into the storm drain system. The pollution prevention activities outlined in this fact sheets are used to prevent the discharge of pollutants to the storm drain system.

Think before parking your car. Remember - The ocean starts at your front door.

Required Activities

- If required, vehicles have to be removed from the street during designated street sweeping/cleaning times.
- If the automobile is leaking, place a pan or similar collection device under the automobile, until such time as the leak may be repaired.
- Use dry cleaning methods to remove any materials deposited by vehicles (e.g. adsorbents for fluid leaks, sweeping for soil clod deposits).

Recommended Activities

- Park automobiles over permeable surfaces (e.g. gravel, or porous cement).
- Limit vehicle parking to covered areas.
- Perform routine maintenance to minimize fluid leaks, and maximize fuel efficiency.

For additional information contact:
County of Orange, OC Watershed
Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: www.ocwatersheds.com

R-4

HOME AND GARDEN CARE ACTIVITIES

The activities outlined in this fact sheet target the following pollutants:	
Sediment	x
Nutrients	
Bacteria	x
Foaming Agents	x
Metals	x
Hydrocarbons	x
Hazardous Materials	x
Pesticides and Herbicides	
Other	x

HOME CARE

Many hazardous materials may be used in and around residences during routine maintenance activities (such as: oils, paints, cleaners, bleaches, pesticides, glues, solvents, and other products). Improper or excessive use of these products can increase the potential for pollutants to be transported to the storm drain by runoff. The pollution prevention activities outlined in this fact sheets are used to prevent the discharge of pollutants to the storm drain system.

Think before conducting home care activities. Remember - The ocean starts at your front door.

Required Activities

- Clean out painting equipment in an area where the waste can be contained and properly disposed of (latex – sewer, oil based – household hazardous waste center).

- Rinse off cement mixers and cement laden tools in a contained washout area. Dispose of dried concrete waste in household trash.

- If safe, contain, clean up, and properly dispose all household hazardous waste spills. If an unsafe condition exists, call 911 to activate the proper response team.

- Household hazardous materials must be stored indoors or under cover, and in closed and labeled containers. Dispose of them at a household hazardous waste center.

- Household wash waters (e.g. washer machine effluent, mop water, etc.) must be disposed of in the sanitary sewer.

- Pool and spa water may be discharged to the storm drain if residual chlorine is less than 0.1 mg/L, the pH is between 6.5 and 8.5, and the water is free from any unusual coloration. (Call 714-834-6107 to obtain information on a pool drain permit). Pool filter media must be contained and disposed of properly.

Recommended Activities

- Only purchase the types and amounts of materials needed.
- Share unused portions of products with neighbors or community programs (latex paint)

GARDEN CARE

The activities outlined in this fact sheet target the following pollutants:	
Sediment	x
Nutrients	x
Bacteria	x
Foaming Agents	
Metals	
Hydrocarbons	
Hazardous Materials	
Pesticides and Herbicides	x
Other	x

Garden activities may contribute pollutants via soil erosion, green waste, fertilizer and pesticide use. Plant and garden care activities such as landscape maintenance, fertilization, and pesticide application have the potential to discharge significant quantities of pollutants to the storm drain system. Nonvegetated surfaces may allow for significant erosion leading to high sediment loads. Other pollutants such as pesticides may adsorb onto the soil particles and be transported off site. Excess fertilizer and pesticide pollutants from over application may be carried to the storm drain by dissolving in irrigation runoff or rainwater. Green wastes may also contain organic matter and may have adsorbed fertilizers and pesticides.

Excessive irrigation is often the most significant factor in home and garden care activities. Pollutants may dissolve in irrigation water and then be transported to the storm drain, or particles and materials coated with fertilizers and pesticides may be suspended in the irrigation flow and carried to the storm drain. The pollution prevention activities outlined in this fact sheets are used to prevent the discharge of pollutants to the storm drain system.

Think before conducting garden care activities. Remember - The ocean starts at your front door.

Required Activities

- Irrigation systems must be properly adjusted to reflect seasonal water needs.
- Minimize the use of pesticides and fertilizers. Read the labels and follow directions to avoid improper use. Do not apply chemicals if it is windy or about to rain.
- Properly clean up and dispose of spills of gardening chemicals, fertilizes, or soils. If possible, return the spilled material to the container for future use.
- Lawn and garden care products must be stored in closed labeled containers, in covered areas, or off-ground and under protective tarps.
- Household hazardous waste must be properly disposed at a household hazardous waste center.
- Cover nonvegetated surfaces to prevent erosion.

Recommended Activities

- Utilize xeroscaping and use of drought and insect resistant landscaping.
- Cultivate garden often to control weeds
- Use integrated pest management (IPM). Planting pest repelling plants (e.g. Marigolds) or using pest eating insects (e.g. ladybugs) may reduce the need for pesticides.
- Do not leave food (human or pet) outside overnight
- Remove fruit and garden waste

R-5
DISPOSAL OF PET WASTES

The activities outlined in this fact sheet target the following pollutants:	
Sediment	x
Nutrients	x
Bacteria	x
Foaming Agents	
Metals	
Hydrocarbons	
Hazardous Materials	
Pesticides and Herbicides	
Other	

Pet wastes left in the environment may introduce solids, bacteria, and nutrients to the storm drain. The type and quantity of waste will dictate the proper disposal method. Small quantities of waste are best disposed with regular trash or flushed down a toilet. Large quantities of wastes from herbivore animals may be composted for subsequent use or disposal to landfill.

Pick up after your pet! It's as easy as 1-2-3. 1) Bring a bag. 2) Clean it up. 3) Dispose of it properly (toilet or trash). The pollution prevention activities outlined in this fact sheets are used to prevent the discharge of pollutants to the storm drain system.

Think before you dispose of any pet wastes. Remember - The ocean starts at your front door.

Required Activities

- All pet wastes must be picked up and properly disposed of. Pet waste should be disposed of in the regular trash, flushed down a toilet, or composted as type and quantities dictate.

- Properly dispose of unused flea control products (shampoo, sprays, or collars).

- Manure produced by livestock in uncovered areas should be removed at least daily for composting, or storage in water-tight container prior to disposal. Never hose down to stream or storm drain. Composting or storage areas should be configured and maintained so as not to allow contact with runoff. Compost may be donated to greenhouses, nurseries, and botanical parks. Topsoil companies and composting centers may also accept composted manure.

- Line waste pits or trenches with an impermeable layer, such as thick plastic sheeting.

- When possible, allow wash water to infiltrate into the ground, or collect in an area that is routed to the sanitary sewer.

- Confine livestock in fenced in areas except during exercise and grazing times. Restrict animal access to creeks and streams, preferably by fencing.

- Install gutters that will divert roof runoff away from livestock areas.

Recommended Activities

- In order to properly dispose of pet waste, carry bags, pooper-scooper, or equivalent to safely pick up pet wastes while walking with pets.
- Bathe pets indoors and use less toxic shampoos. When possible, have pets professionally groomed.
- Properly inoculate your pet in order to maintain their health and reduce the possibility of pathogens in pet wastes.
- Maintain healthy and vigorous pastures with at least three inches of leafy material.
- Consider indoor feeding of livestock during heavy rainfall, to minimize manure exposed to potential runoff.
- Locate barns, corrals, and other high use areas on portions of property that either drain away from or are located distant form nearby creeks or storm drains.

R-6
DISPOSAL OF GREEN WASTES

The activities outlined in this fact sheet target the following pollutants:	
Sediment	x
Nutrients	x
Bacteria	x
Foaming Agents	
Metals	
Hydrocarbons	
Hazardous Materials	x
Pesticides and Herbicides	x
Other	

Green wastes entering the storm drain may clog the system creating flooding problems. Green wastes washed into receiving waters create an oxygen demand as they are decomposed, reducing the available oxygen for aquatic life. Pesticide and nutrient residues may be carried to the receiving water with the green wastes. The pollution prevention activities outlined in this fact sheets are used to prevent the discharge of pollutants to the storm drain system.

Think before disposing of any green wastes – Remember - The ocean starts at your front door.

Required Activities

- Green wastes can not be disposed of in the street, gutter, public right-of-way, storm drain, or receiving water. Dispose of green wastes as a part of the household trash. If the quantities are too large, arrange a pick up with the local waste hauler.

- After conducting yard or garden activities sweep the area and properly dispose of the clippings and waste. Do not sweep or blow out into the street or gutter.

Recommended Activities

- Utilize a commercial landscape company to conduct the landscape activities and waste disposal.

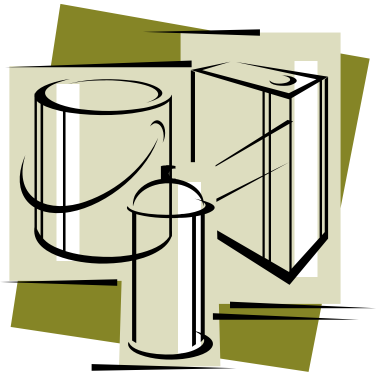
- Utilize native plants and drought tolerant species to reduce the water use and green waste produced.

- Use a lawn mower that has a mulcher so that the grass clippings remain on the lawn and do not have to be collected and disposed of.

- Compost materials in a designated area within the yard.

- Recycle lawn clippings and greenery waste through local programs if available.

For additional information contact:
County of Orange, OC Watershed
Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: www.ocwatersheds.com



R-7
HOUSEHOLD HAZARDOUS WASTE

Household hazardous wastes (HHW) are defined as waste materials which are typically found in homes or similar sources, which exhibit characteristics such as: corrosivity, ignitability, reactivity, and/or toxicity, or are listed as hazardous materials by EPA.

The activities outlined in this fact sheet target the following pollutants:	
Sediment	
Nutrients	
Bacteria	
Foaming Agents	x
Metals	x
Hydrocarbons	x
Hazardous Materials	x
Pesticides and Herbicides	x
Other	x

List of most common HHW products:

Drain openers
Oven cleaners
Wood and metal cleaners and polishes
Automotive oil and fuel additives
Grease and rust solvents
Carburetor and fuel injection cleaners
Starter fluids
Batteries
Paint Thinners
Paint strippers and removers
Adhesives
Herbicides
Pesticides
Fungicides/wood preservatives

Many types of waste can be recycled, however options for each waste type are limited. Recycling is always preferable to disposal of unwanted materials. All gasoline, antifreeze, waste oil, and lead-acid batteries can be recycled. Latex and oil-based paint can be reused, as well as recycled. Materials that cannot be reused or recycled should be disposed of at a properly permitted landfill.

Think before disposing of any household hazardous waste. Remember - The ocean starts at your front door.

RECYCLE
USED OIL

Required Activities

- Dispose of HHW at a local collection facility. Call (714) 834-6752 for the household hazardous waste center closest to your area.

- Household hazardous materials must be stored indoors or under cover, and in closed and labeled containers.

- If safe, contain, clean up, and properly dispose all household hazardous waste spills. If an unsafe condition exists, call 911 to activate the proper response team.

Recommended Activities

- Use non-hazardous or less-hazardous products.
- Participate in HHW reuse and recycling. Call (714) 834-6752 for the participating household hazardous waste centers.

The California Integrated Waste Management Board has a Recycling Hotline (800) 553-2962, that provides information and recycling locations for used oil.

For additional information contact:
County of Orange, OC Watershed
Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: www.ocwatersheds.com

R-8
WATER CONSERVATION

The activities outlined in this fact sheet target the following pollutants:	
Sediment	x
Nutrients	x
Bacteria	x
Foaming Agents	x
Metals	x
Hydrocarbons	x
Hazardous Materials	x
Pesticides and Herbicides	x
Other	x

Excessive irrigation and/or the overuse of water is often the most significant factor in transporting pollutants to the storm drain system. Pollutants from a wide variety of sources including automobile repair and maintenance, automobile washing, automobile parking, home and garden care activities and pet care may dissolve in the water and be transported to the storm drain. In addition, particles and materials coated with fertilizers and pesticides may be suspended in the flow and be transported to the storm drain.

Hosing off outside areas to wash them down not only consumes large quantities of water, but also transports any pollutants, sediments, and waste to the storm drain system. The pollution prevention activities outlined in this fact sheets are used to prevent the discharge of pollutants to the storm drain system.

Think before using water. Remember - The ocean starts at your front door.

Required Activities

- Irrigation systems must be properly adjusted to reflect seasonal water needs.
- Do not hose off outside surfaces to clean, sweep with a broom instead.

Recommended Activities

- Fix any leaking faucets and eliminate unnecessary water sources.
- Use xeroscaping and drought tolerant landscaping to reduce the watering needs.
- Do not over watering lawns or gardens. Over watering wastes water and promotes diseases.
- Use a bucket to re-soak sponges/rags while washing automobiles and other items outdoors. Use hose only for rinsing.
- Wash automobiles at a commercial car wash employing water recycling.

FP-3

ROADS, STREETS, AND HIGHWAYS OPERATION AND MAINTENANCE

Streets, roads, and highways are significant sources of pollutants in storm water discharges, and operation and maintenance (O&M) practices, if not conducted properly, can contribute to the problem. O&M practices may involve one or more of the following activities:

1. **Sweeping & Cleaning**
2. **Street Repair & Maintenance**
3. **Bridge and Structure Maintenance**

Streets, roads, and highways are significant sources of pollutants in storm water discharges, and operation and maintenance (O&M) practices, if not conducted properly, can contribute to the problem. O&M practices may involve one or more of the following activities:

Pollution prevention measures that should be consider and the minimum required and optional model procedures for each performance standard are provided below.

POLLUTION PREVENTION:

Pollution prevention measures have been considered and incorporated in the model procedures. Implementation of these measures may be more effective and reduce or eliminate the need to implement other more complicated or costly procedures. Possible pollution prevention measure for roads, streets, and highways operation and maintenance include:

- Use the least toxic materials available (e.g. water based paints, gels or sprays for graffiti removal)
- Recycle paint and other materials whenever possible.
- Once per year, educate municipal staff on pollution prevention measures.

MODEL PROCEDURES:

1. Sweeping & Cleaning

Sweeping Frequency and Timing

✓ Maintain a consistent sweeping schedule. Provide minimum monthly sweeping of streets.

✓ Perform street cleaning during dry weather if possible.

✓ Avoid wet cleaning or flushing of streets, and utilize dry methods where possible.

✓ If flushing of a street is absolutely necessary, sweep and remove debris before flushing. Do not let wash water enter storm drain inlets. Collect wash water and direct to a dirt or vegetated area, pump into a vacuum truck and dispose of properly.

OPTIONAL:

- Consider increasing sweeping frequency based on factors such as traffic volume, land use, field observations of sediment and trash accumulation, proximity to water courses, etc.

Equipment Operation and Selection

✓ Maintain cleaning equipment in good working condition and purchase replacement equipment as needed. Old sweepers should be replaced as needed with new technologically advanced sweepers (preferably regenerative air sweepers) that maximize pollutant removal.

✓ Operate sweepers at manufacturer requested optimal speed levels to increase effectiveness.

✓ Clean sweepers at a wash rack that drains to the sanitary sewer. The wash rack area should be covered and bermed and wash water should drain to a clarifier prior to entering the sanitary sewer.

✓ Regularly inspect vehicles and equipment for leaks, and repair immediately.

OPTIONAL:

- If available use vacuum or regenerative air sweepers in the high sediment and trash areas (typically industrial/commercial).

> ➔ *Note: Permission must be obtained for any discharge of wash water to the sanitary sewer from the local sewering agency.*

Management of Material Removed by Sweeping

✓ Dispose of street sweeping debris and dirt at a landfill.

✓ Do not store swept material along the side of the street or near a storm drain inlet.

✓ If dewatering of saturated materials is necessary it should be conducted in a designated area away from storm drain inlets and the water contained for proper disposal.

✓ If authorized by the local sanitation agency, water may be discharged to the sanitary sewer only after passing through a clarifier. As an alternative, dewatering can be conducted in a containment area in which saturated materials are placed on a tarp and allowed to dry. Dry debris is then disposed of properly.

➔ *Note: Permission must be obtained for any discharge of wash water to the sanitary sewer from the local sewering agency.*

✓ Keep debris storage to a minimum during the wet season or make sure debris piles are contained (e.g. by berming the area) or covered (e.g. with tarps or permanent covers).

Maximize Access for Sweepers

✓ Keep accurate operation logs to track program.

✓ Properly maintain and operate equipment; which will increase efficiency.

✓ Sweeping should be conducted as close to the curb line as possible.

OPTIONAL:

- Institute a parking policy to restrict parking in problematic areas during periods of street sweeping.
- Post permanent street sweeping signs in problematic areas; use temporary signs if installation of permanent signs is not possible.
- Develop and distribute flyers notifying residents of street sweeping schedules.

2. Repair and Maintenance

Pavement Marking

✓ Develop paint handling procedures for proper use, storage, and disposal of paints.

✓ Transfer and load paint and hot thermoplastic away from storm drain inlets.

✓ Street or hand sweep thermoplastic grindings. Yellow thermoplastic grindings may require special handling as they may contain lead.

✓ Replace paints containing lead and tributyltin with less toxic alternatives.

✓ Use water based paints. Clean application equipment in a sink that is connected to the sanitary sewer.

✓ Properly store leftover paints if they are to be kept for the next job, or dispose of properly.

✓ See *Spill Control procedure sheet* for guidance on the proper cleanup of paint spills.

Concrete Installation and Repair

✓ Avoid mixing excess amounts of fresh concrete or cement mortar on-site. Only mix what is needed for the job.

✓ Wash concrete trucks off site or in designated areas on site, such that there is no discharge of concrete wash water into storm drain inlets, open ditches, streets, or other stormwater conveyance structures.

✓ Store concrete materials under cover, away from drainage areas.

✓ 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.

✓ When washing poured concrete areas to remove fine particles and expose the aggregate, contain the wash water for proper disposal; do not discharge water to the storm drain system.

✓ Do not allow excess concrete to be dumped on-site, except in designated areas.

✓ Apply concrete, asphalt, and seal coat during dry weather to allow the material to adequately dry prior to a rain event.

✓ When making saw cuts in pavement, use as little water as possible and perform during dry weather. Cover each nearby or appropriate storm drain inlet completely with filter fabric or plastic 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. Alternatively, a small on-site vacuum may be used to pick up the slurry as this will prohibit slurry from reaching storm drain inlets.

Patching, Resurfacing, and Surface Sealing

✓ Pre-heat, transfer or load hot bituminous material away from storm drain inlets.

✓ Apply concrete, asphalt, and seal coat during dry weather to allow the material to adequately dry prior to a rain event.

✓ Where applicable, cover and seal each nearby or appropriate storm drain inlet (with waterproof material, plastic or mesh) and maintenance holes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and until all water from emulsified oil sealants has drained or evaporated. Clean any debris from covered man holes and storm drain inlets when the job is complete.

✓ Use only as much water as necessary for dust control, to avoid runoff.

✓ Catch drips from paving equipment that is not in use with pans or absorbent material placed under the machines. Dispose of collected material and absorbents properly.

✓ Prior to a rain event or at the completion of a project, sweep the project area by hand or with a street sweeper.

Equipment Cleaning, Maintenance, and Storage

Also see Equipment Repair & Maintenance procedure sheet.

✓ Clean equipment including sprayers, sprayer paint supply lines, patch and paving equipment, and mudjacking equipment at the end of each day. If equipment can be cleaned and materials reapplied at the job site, do so in compliance with the laws and regulations. Clean in a sink or other area (e.g. vehicle wash area) that is connected to the sanitary sewer.

> ➔ *Note: Permission must be obtained for any discharge of wash water to the sanitary sewer from the local sewering agency.*

✓ If refueling or repairing vehicles and equipment must be done on-site, conduct the activity away from storm drain inlets and watercourses.

✓ Place drip pans or absorbent materials under heavy equipment when not in use.

✓ Clean paint brushes and tools covered with water-based paints in sinks connected to sanitary sewers. Brushes and tools covered with non-water-based paints, finishes, or other materials must be cleaned in a manner that enables collection of used solvents (e.g., paint thinner, turpentine, etc.) for recycling or proper disposal.

OPTIONAL:

- Conduct cleaning at a corporation or maintenance yard if possible.
- When practical, perform major equipment repairs at the corporation yard.

> ➔ *In addition to the procedures above, review and apply general procedures outlined for Minor Construction activities when conducting street, road, and highway repair and maintenance activities.*

3. Bridge and Structure Maintenance

Painting and Paint Removal

✓ Transport paint and materials to and from job sites in containers with secure lids and tied down to the transport vehicle.

✓ Do not transfer or load paint near storm drain inlets or watercourses.

✓ Test and inspect spray equipment prior to starting to paint. Tighten all hoses and connections and do not overfill paint container.

✓ If sand blasting is used to remove paint, cover nearby storm drain inlets prior to starting work.

✓ If the bridge crosses a watercourse, perform work on a maintenance traveler or platform, or use suspended netting or tarps to capture paint, rust, paint removing agents, or other materials, to prevent discharge of materials to surface waters. If sanding, use a sander with a vacuum filter bag.

✓ Recycle paint when possible (e.g. paint may be used for graffiti removal activities). Dispose of paint at an appropriate household hazardous waste facility.

✓ See Spill Control procedure sheet for guidance on the proper cleanup of paint spills.

Graffiti Removal

✓ Avoid graffiti abatement activities during rain events.

✓ Protect nearby storm drain inlets prior to removing graffiti from walls, signs, sidewalks, or other structures needing graffiti abatement. Clean up afterwards by sweeping or vacuuming thoroughly, and/or by using absorbent and properly disposing of the absorbent.

- ✓ Note that care should be taken when disposing of waste since it may need to be disposed of as hazardous waste.
- ✓ When graffiti is removed by painting over, implement the procedures under Painting and Paint Removal above.
- ✓ Direct runoff from sand blasting and high pressure washing (with no cleaning agents) into a landscaped or dirt area.
- ✓ If a graffiti abatement method generates wash water containing a cleaning compound (such as high pressure washing with a cleaning compound), plug nearby storm drains and collect wash water and dispose of properly.

OPTIONAL:

- Consider using a waterless and non-toxic chemical cleaning method for graffiti removal (e.g. gels or spray compounds).

Guardrail and Fence Repair

- ✓ When cleaning guardrails or fences follow the appropriate surface cleaning methods (depending on the type of surface) outlined in the *Sidewalk, Plaza, and Fountain Maintenance and Cleaning* procedure sheet.
- ✓ If painting is conducted, follow the *Painting and Paint Removal* procedures above.
- ✓ If graffiti removal is conducted, follow the *Graffiti Removal* procedures above.
- ✓ If construction takes place, see the procedure sheet for *Minor Construction*.
- ✓ Recycle materials whenever possible.

LIMITATIONS:

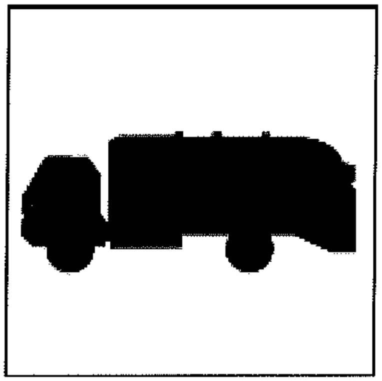
Limitations related to street sweeping may include high equipment costs, the potential inability to restrict parking in urban areas, the need for sweeper operator training, the inability of current sweeper technology to remove oil and grease, and the lack of scientific evidence regarding the expected levels of pollutant removal.

REFERENCES:

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.

Santa Clara Valley Urban Runoff Pollution Prevention Program. 1997 Urban Runoff Management Plan. September 1997, updated October 2000.



FP-5

SOLID WASTE HANDLING

It is important to control litter to eliminate trash and other materials in storm water runoff. Waste reduction is a major component of waste management and should be encouraged through training and public outreach. Management of waste once it is collected may involve reuse, recycling, or proper disposal. Specific solid waste handling activities may include one or more of the following:

1. **Solid Waste Collection**
2. **Waste Reduction and Recycling**
3. **Hazardous Waste Collection**
4. **Litter Control**

Reduce by purchasing only the amount needed.
Reuse products when possible.
Recycle leftover products that are recyclable, and dispose of other wastes safely.

POLLUTION PREVENTION:

Pollution prevention measures have been considered and incorporated in the model procedures. Implementation of these measures may be more effective and reduce or eliminate the need to implement other more complicated or costly procedures. Possible pollution prevention measures for solid waste handling include:

- Reuse products when possible.
- Recycle leftover products that are recyclable.
- Once per year, educate municipal staff on pollution prevention measures.

MODEL PROCEDURES:

1. Solid Waste Collection

✓ Implement procedures, where applicable, to collect, transport, and dispose of solid waste at appropriate disposal facilities in accordance with applicable federal, state, and local laws and regulations. Optional disposal options include the reuse and recycling of appropriate materials (see following sections).

✓ Include properly designed trash storage areas.

✓ Regularly inspect solid waste containers for structural damage. Repair or replace damaged containers as necessary.

✓ Secure solid waste containers; containers must be closed tightly when not in use.

✓ Do not fill waste containers with washout water or any other liquid.

✓ Remove all debris from containers prior to cleaning with water. Only clean out containers in a designated area that drains to a washrack that is connected to a sanitary sewer.

Also see Emergency Spill Response procedure sheet.

✓ Minimize spillage/leaking from solid waste containers. For larger solid waste containers (especially compactors) that utilize a hydraulic fluid pump system, regularly inspect and replace faulty pumps or hoses to minimize the potential of releases and spills.

✓ Ensure that only appropriate solid wastes are disposed of. Certain wastes such as hazardous wastes, appliances, fluorescent bulbs, pesticides, etc. may not be disposed of in solid waste containers.

2. Waste Reduction and Recycling

Although many types of waste can be recycled, recycling options for each waste type may be limited. All gasoline, antifreeze, waste oil, and lead-acid batteries can be recycled. Latex and oil-based paint can be reused, as well as recycled. Materials that cannot be reused or recycled should be disposed of properly.

✓ Provide containers for the collection and storage of recyclable materials.

✓ Do not mix liquid wastes, this can cause chemical reactions or make recycling impossible and complicate disposal.

✓ Recycle used motor oil. Municipalities are required to have a used oil recycling element within their integrated waste management plan.

CalRecycle has a Recycling Hotline, (800) RECYCLE, that provides information and recycling locations for used oil.

3. Hazardous Waste Collection

Household hazardous wastes (HHW) are defined as waste materials which are typically found in homes or similar sources, which exhibit characteristics such as: corrosivity, ignitability, reactivity, and/or toxicity, or are listed as hazardous materials by EPA.

List of most common HHW products:
Drain opener
Oven cleaners
Wood and metal cleaners and polishes
Paint Thinners
Automotive oil and fuel additives
Adhesives
Grease and rust solvents Batteries
Herbicides
Paint strippers and removers Pesticides
Fungicides/wood preservatives
Starter fluids
Carburetor and fuel injection cleaners

- ✓ Follow proper storage and disposal measures for hazardous waste materials as identified on packaging or Material Safety Data Sheets.
- ✓ Emergencies related to hazardous waste should be reported to 911

OPTIONAL:

- Identify and promote use of non-hazardous alternatives.
- Promote household hazardous waste (HHW) reuse and recycling.

4. Litter Control

- ✓ Enforce anti-litter laws.
- ✓ Provide litter receptacles in busy, high pedestrian traffic areas of the community, at recreational facilities, and at community events.
- ✓ Clean out and cover litter receptacles frequently to prevent overflow.
- ✓ Increase litter control for events generating substantial quantities of litter.

OPTIONAL:

- Post "No Littering" signs
- Place trash receptacles at transit stops and maintain as necessary.
- Participate in and/or organize additional clean-up programs (e.g., "Coastal Clean Up Day", "Pride Days", "Volunteer Connection Days").

REFERENCES:

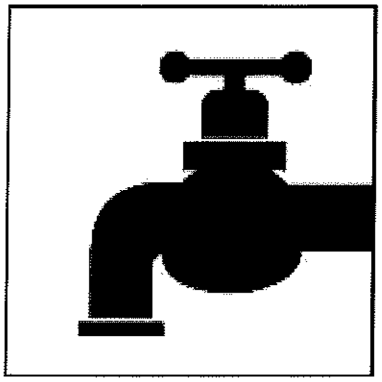
Bay Area Stormwater Management Agencies Association. 1996. *Pollution From Surface Cleaning.*

California Storm Water Best Management Practice Handbooks. Municipal Best Management Practice Handbook. Prepared by Camp Dresser & McKee, Larry Walker Associates, Uribe and Associates, Resources Planning Associates for Stormwater Quality Task Force. March 1993.

Environmental Protection Agency (EPA). *Pollution Prevention and Good Housekeeping for Municipal Operations Storm Water. Pet Waste Collection.* Office of Wastewater Management. Online:

http://www.epa.gov/npdes/menuofbmps/poll_3.htm

Harvard University. 2002. Solid Waste Container Best Management Practices – Fact Sheet On-Line Resources – Environmental Health and Safety.



FP-6

WATER AND SEWER UTILITY OPERATION AND MAINTENANCE

Although the operation and maintenance of public utilities are not considered themselves a chronic source 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. Activities associated with the operation and maintenance of water and sewer utilities to prevent and handle such incidents include the following:

1. **Water Line Maintenance**
2. **Sanitary Sewer Maintenance**
3. **Spill/Leak/Overflow Control, Response, and Containment**

Cities that do not provide maintenance of water and sewer utilities should coordinate with the contracting agency responsible for these activities and ensure that these model procedures are followed.

POLLUTION PREVENTION:

Pollution prevention measures have been considered and incorporated in the model procedures. Implementation of these measures may be more effective and reduce or eliminate the need to implement other more complicated or costly procedures. Possible pollution prevention measures for water and sewer utility operation and maintenance include:

- Inspect potential non-storm water discharge flow paths and clear/cleanup any debris or pollutants found (i.e. remove trash, leaves, sediment, and wipe up liquids, including oil spills).
- Once per year, educate municipal staff on pollution prevention measures.

MODEL PROCEDURES:

1. Water Line Maintenance

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 breaks, sheared fire hydrants, equipment malfunction, and operator error.

Planned Discharges

✓ For planned discharges use one of the following options:

- Reuse water for dust suppression, irrigation, or construction compaction
- Discharge to the sanitary sewer system with approval
- Discharge to the storm drain system or to a creek using applicable pollution control measures listed below (this option is ONLY applicable to uncontaminated pumped ground water, water line flushing, fire hydrant testing and flushing, discharges from potable water sources other than water main breaks) and may require a permit from the Regional Water Quality Control Board.

✓ If water is discharged to a storm drain inlet (catch basin), control measures must be put in place to control potential pollutants (i.e. sediment, chlorine, etc.). Examples of some storm drain inlet 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).

✓ Select appropriate pollution control measure(s) considering the receiving system (i.e. curb inlet, drop inlet, culvert, creek, etc.) and ensure that the control device(s) fit properly.

✓ 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 as needed.

OPTIONAL:

- Sediment removal may be enhanced by placing filter fabric, gravel bags, etc. at storm drain inlets.

Unplanned Discharges

✓ Stop the discharge as quickly as possible by turning off water source.

✓ Inspect flow path of the discharged water:

  - Control erosion along the flow path.
  - Identify areas that may produce significant sediment or gullies, use sandbags to redirect the flow.
  - Identify erodible areas which may need to be repaired or protected during subsequent repairs or corrective actions

✓ 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 and ensure that no additional discharged water enters storm drain inlets.

2. 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 the Permittee. The owner of the sanitary sewer facilities is the entity responsible for carrying out this prevention and response program.

Sewer System Cleaning

✓ Sewer lines should be cleaned 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.

Preventative and Corrective Maintenance

✓ 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

✓ Document suggestions and requests for repair and report the information to the appropriate manager or supervisor.

✓ 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.

3. Spill/Leak/Overflow Control, Response, and Containment

Control

Also see Drainage System procedures sheet

✓ Refer to countywide *Illicit Discharge Detection and Elimination Program.* Components of this program include:

- Investigation/inspection and follow-up
- Elimination of illicit discharges and connections
- Enforcement of ordinances
- Respond to sewage spills

- Facilitate public reporting of illicit discharges and connections. A citizen's hotline for reporting observed overflow conditions should be established to supplement the field screening efforts being conducted by the Principal Permittee.

Response and Containment

- ✓ Establish lead department/agency responsible for spill response and containment. Provide coordination within departments.
- ✓ When a spill, leak, and/or overflow occurs, keep sewage from entering the storm drain system to the maximum extent practicable by covering or blocking storm drain inlets or by containing and diverting the sewage away from open channels and other storm drain facilities (using sandbags, inflatable dams, etc.).
- ✓ If a spill reaches the storm drain notify County of Orange Health Care Agency through Control One at (714) 628-7208.
- ✓ Remove the sewage using vacuum equipment or use other measures to divert it back to the sanitary sewer system.
- ✓ Record required information at the spill site.
- ✓ Perform field tests as necessary to determine the source of the spill.
- ✓ Develop additional notification procedures regarding spill reporting as needed.

LIMITATIONS:

Private property access rights needed to perform testing along storm drain right-of-ways. Requirements of municipal ordinance authority for suspected source verification testing necessary for guaranteed rights of entry.

REFERENCES:

California Storm Water Best Management Practice Handbooks. Municipal Best Management Practice Handbook. Prepared by Camp Dresser & McKee, Larry Walker Associates, Uribe and Associates, Resources Planning Associates for Stormwater Quality Task Force. March 1993.

Los Angeles County Stormwater Quality. Public Agency Activities Model Program. On-line: http://ladpw.org/wmd/npdes/public_TC.cfm

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. Water Utility Pollution Prevention Plan.

DF-1
DRAINAGE FACILITY OPERATION AND MAINTENANCE

As a consequence of its function, the stormwater conveyance system collects and transports urban runoff and storm water that may contain certain pollutants. Consequently these pollutants may accumulate in the system and must be removed periodically. In addition, the systems must also be maintained to function properly hydraulically to avoid flooding. Maintaining the system may involve the following activities:

1. Inspection and Cleaning of Stormwater Conveyance Structures
2. Controlling Illicit Connections and Discharges
3. Controlling Illegal Dumping

This list of Model Maintenance Procedures can be utilized as an inspection checklist to determine where better compliance with Designated Minimum Best Management Practices (notated with checkmarks and capital letters) is needed, and to recommend Additional Best Management Practices (notated with bullet points and lower case letters) that may be applicable under certain circumstances, especially where there are certain Pollutant Constituents of Concern. BMPs applicable to certain constituents are notated as:

Bacteria (BACT) *Sediment (SED)* *Nutrients (NUT)* *Oil and Grease (O&G)* *Pesticides (PEST)*

OtherToxic Compounds (TOX) *Trash (TRASH)* *Hydrological Impacts (HYD)* *Any/All or General (ANY)*

Program/Facility Being Inspected: ______________________________

Date: ____________________ Inspector Name: ______________________________

When completed, the checklist should be attached to the General Inspection Form Cover Sheet and copies should be provided to the Supervisor of the Facility/Program being inspected.

MAINTENANCE PROCEDURES:

1. Inspection and Cleaning of Drainage Facilities

Unsatisfactory **OK**

☐ ____________________ ☐
____
☐ ____________________ ☐
____
☐ ____________________ ☐
____
☐ ____________________ ☐
____
____
____
☐ ____________________ ☐
____
____
☐ ____________________ ☐
____
____
☐ ____________________ ☐
____
____
____

General Guidelines

T 1A. Annually inspect and clean drainage structures as needed.

T 1B. Maintain appropriate records of cleaning and inspections.

T 1C. Properly dispose of removed materials at a landfill or recycling facility.

T 1D. Conduct intermittent supplemental visual inspections during the wet season to determine if there are problem inlets where sediment/trash or other pollutants accumulate, and provide for additional cleanouts as appropriate.

T 1E. Prevent or clean up any discharges that may occur during the course of maintenance and cleaning procedures.

T 1F. Verify that appropriate employees or subcontractors are trained in proper conductance of maintenance activities, including record keeping and disposal.

T 1G. Annually inspect and clean v-ditches as needed, prior to the wet season. On shrub-covered slopes, vegetative debris may be placed on the downhill side of the ditch. Trash should be bagged and disposed at a landfill.

Unsatisfactory **OK**

☐ ☐

☐ ☐

☐ ☐

☐ ☐

☐ ☐

☐ ☐

☐ ☐

☐ ☐

☐ ☐

☐ ☐

☐ ☐

☐ ☐

General Guidelines (cont.)

- 1a. Remove trash or debris as needed from open channels. It should be noted that major vegetative debris removal may require other regulatory permits prior to completing the work. (TRASH)
- 1b. Consider retrofitting energy dissipaters (e.g. riprap) below culvert outfalls to minimize potential for erosion. (SED)
- 1c. Repair any v-ditches that have cracked or displaced in a manner that accelerates erosion. (SED)
- 1d. If suspicious conditions appear to exist, test selected samples of the removed wastes for compliance with hazardous waste regulations prior to disposal. (TOX)
- 1e. Consider more frequent regular cleaning of selected drainage structures to help address ongoing specific impairments. (SED, BACT, NUT, TRASH)
- 1f. Consider structural retrofits to the MS4 to help address ongoing specific impairments (SED, BACT, NUT, TRASH, O&G)
- 1g. Consider cleaning out pipes at gradient breaks or other in-pipe debris accumulation points as identified/needed. (ANY, BACT, NUT, TRASH)

Storm Drain Flushing

- 1h. Flushing of storm drains or storm drain inlets should only be done when critically necessary and no other solution is practical. (SED, BACT, TRASH).
- 1i. If flushed, to the extent practical the material should be collected (vacuumed), treated with an appropriate filtering device to remove sand and debris and disposed of properly. (SED)

Waste Management

T 1H. Store wastes collected from cleaning activities of the drainage facilities in appropriate containers or temporary storage sites in a manner that prevents discharge to the storm drain.

- 1j. Dewater the wastes if necessary with outflow into the sanitary sewer if permitted. Water should be treated with an appropriate filtering device to remove the sand and debris prior to discharge to the sanitary sewer. If discharge to the sanitary sewer is not permitted, water should be pumped or vacuumed to a tank and properly disposed of. Do not dewater near a storm drain or stream. (SED, TRASH)
- 1k. Provide for laboratory analysis of at least one randomly collected sediment (less the debris) sample per year from the storm drain inlet leaning program to ensure that it does not meet the EPA criteria for hazardous waste. If the sample is determined to be hazardous, the sediment must be disposed of as hazardous waste and the source should be investigated. (TOX).

2. Controlling Illicit Connections and Discharges

Unsatisfactory	OK	General Guidelines
☐	☐	T 2A. Report prohibited discharges such as dumping, paint spills, abandoned oil containers, etc. observed during the course of normal daily activities so they can be investigated, contained, and cleaned up.
☐	☐	T 2B. Where field observations and/or monitoring data indicate significant problems, conduct field investigations to detect and eliminate existing illicit connections and improper disposal of pollutants into the storm drain (i.e. identify problem areas where discharges or illegal connections may occur and follow up stream to determine the source(s)). (Refer to Appendices A-10 and A-11.)
☐	☐	T 2C. Report all observed illicit connections and discharges to the 24-hour water pollution problem reporting hotline (714) 567-6363.
☐	☐	T 2D. Encourage public reporting of improper waste disposal by distributing public education materials and advertising the 24-hour water pollution problem reporting hotline.
		Storm Drain Stenciling ("No Dumping—Drains to Ocean")
☐	☐	T 2E. Implement and maintain a storm drain stenciling program.
☐	☐	• 2a. Consider adding the hotline number to the storm drain stencils (BACT, TOX, TRASH).

3. Controlling Illegal Dumping

		Field Investigation
☐	☐	T 3A. Report prohibited discharges such as dumpings observed during the course of normal daily activities so they can be investigated, contained and cleaned up.
☐	☐	T 3B. Conduct field investigations to detect and eliminate improper disposal of pollutants into the storm drain (i.e. identify problem areas where discharges or illegal connections may occur and follow up stream to determine the source(s)).
☐	☐	T 3C. Report all observed illegal dumping to the 24-hour water pollution problem reporting hotline (714) 567-6363.
☐	☐	T 3D. Encourage public reporting of improper waste disposal by distributing public education materials and advertising the 24-hour water pollution problem reporting hotline.
☐	☐	T 3E. If perpetrator can be identified, take appropriate enforcement action.
☐	☐	• 3a. Consider posting "No Dumping" signs in problem areas with a phone number for reporting dumping and disposal. Signs could also indicate fines and penalties for illegal dumping. (ANY)

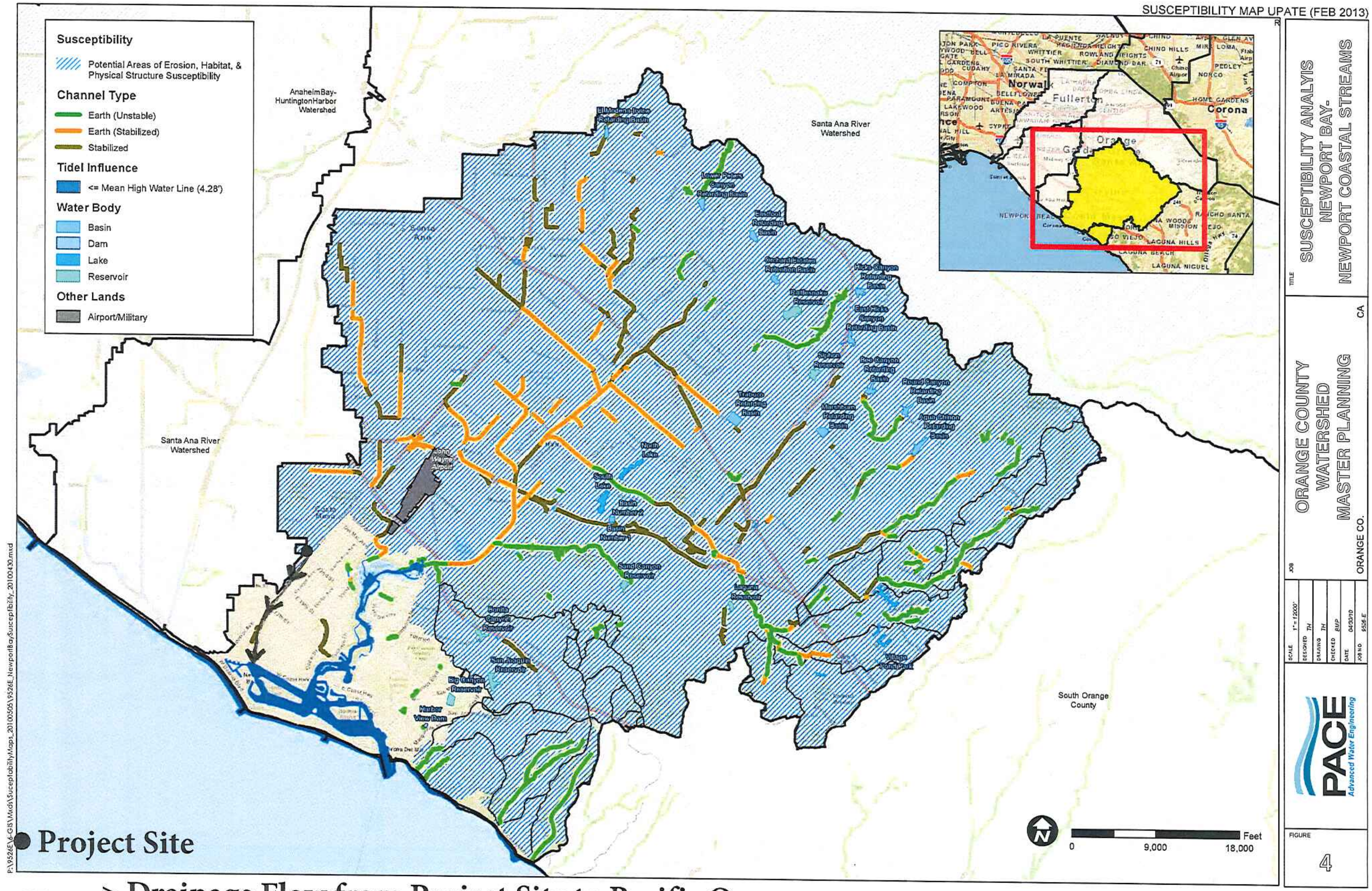
Unsatisfactory **OK** ☐ ☐ ☐ ☐ ☐ ☐	**Training/Education/Outreach** T 3F. Verify that appropriate employees and subcontractors are trained to recognize and report illegal dumping. T 3G. Encourage public reporting of illegal dumping by advertising the 24-hour water pollution problem reporting hotline (714) 567-6363. • 3b. Take extra steps to educate the public in neighborhoods where illegal dumping has occurred to inform them why illegal dumping is a problem, and that illegal dumping carries a significant financial penalty. (ANY)

LIMITATIONS:

Clean-up activities may create a slight disturbance for local aquatic species. Access to items and material on private property may be limited. Trade-offs may exist between channel hydraulics and water quality/riparian habitat. If storm channels or basins are recognized as wetlands, many activities, including maintenance, may be subject to regulation and permitting.

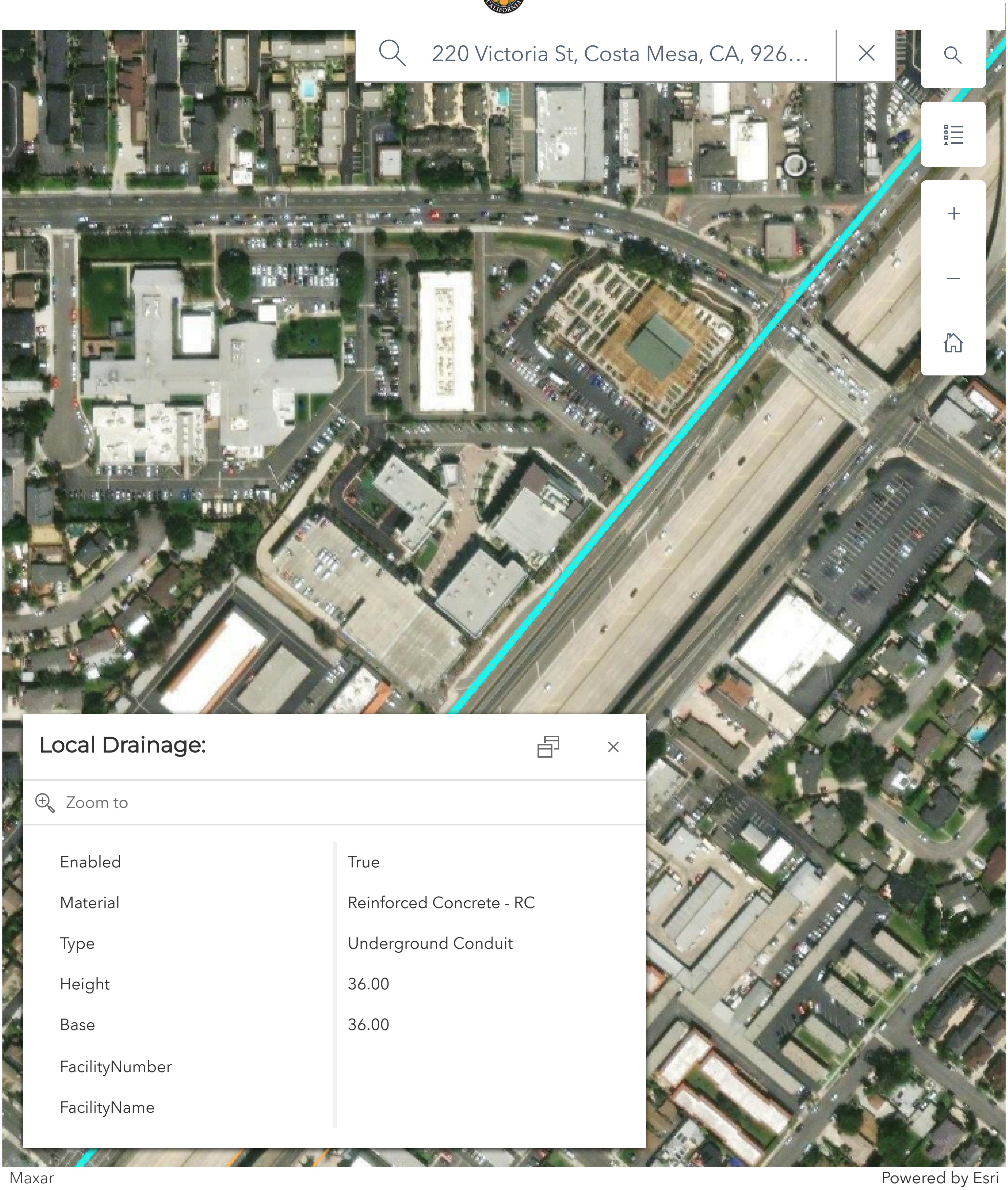
APPENDIX C

SUSCEPTIBILITY ANALYSIS MAP FOR NEWPORT BAY-NEWPORT COASTAL STREAMS WATERSHED AND COUNTY OF ORANGE STORMWATER NETWORK MAP



● Project Site

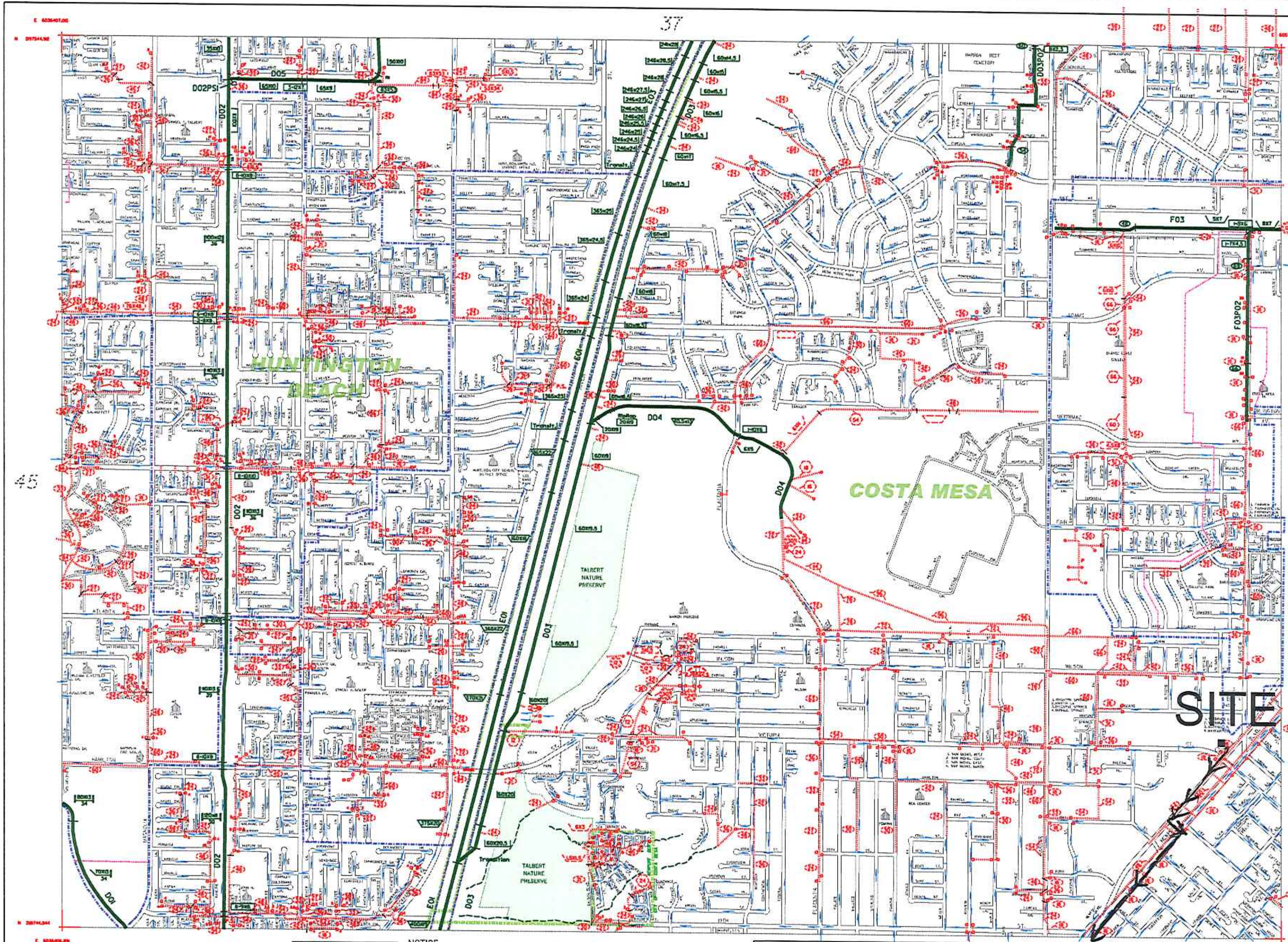
-------> Drainage Flow from Project Site to Pacific Ocean



220 Victoria St, Costa Mesa, CA, 926...

Local Drainage:

Enabled	True
Material	Reinforced Concrete - RC
Type	Underground Conduit
Height	36.00
Base	36.00
FacilityNumber	
FacilityName	



NOTICE

The drainage information has been prepared for information purposes only. The location, ownership, facility information and limits have been determined from available information provided by public agencies, but may not be exact, accurate, or up-to-date. The user of this information is responsible for verifying exact location, ownership, accuracy, and the regional versus local character of drainage facilities.

Additional information may be obtained from public plans and recorded deeds. Facility designations included with this information are for convenience only and are not controlling or intended to imply ownership by the County or the Orange County Flood Control District (OCFCD). The information is being provided as a courtesy and neither the County of Orange nor OCFCD assume any liabilities for inaccuracy of the information.

To notify OC Public Works Flood Control Section of additions or corrections, please contact Sal Gutierrez at (714) 834-5356 or by email at sal.gutierrez@ocpw.ocgov.com

46

ORANGE COUNTY FLOOD CONTROL DISTRICT

BASE MAP
OF DRAINAGE FACILITIES
IN ORANGE COUNTY

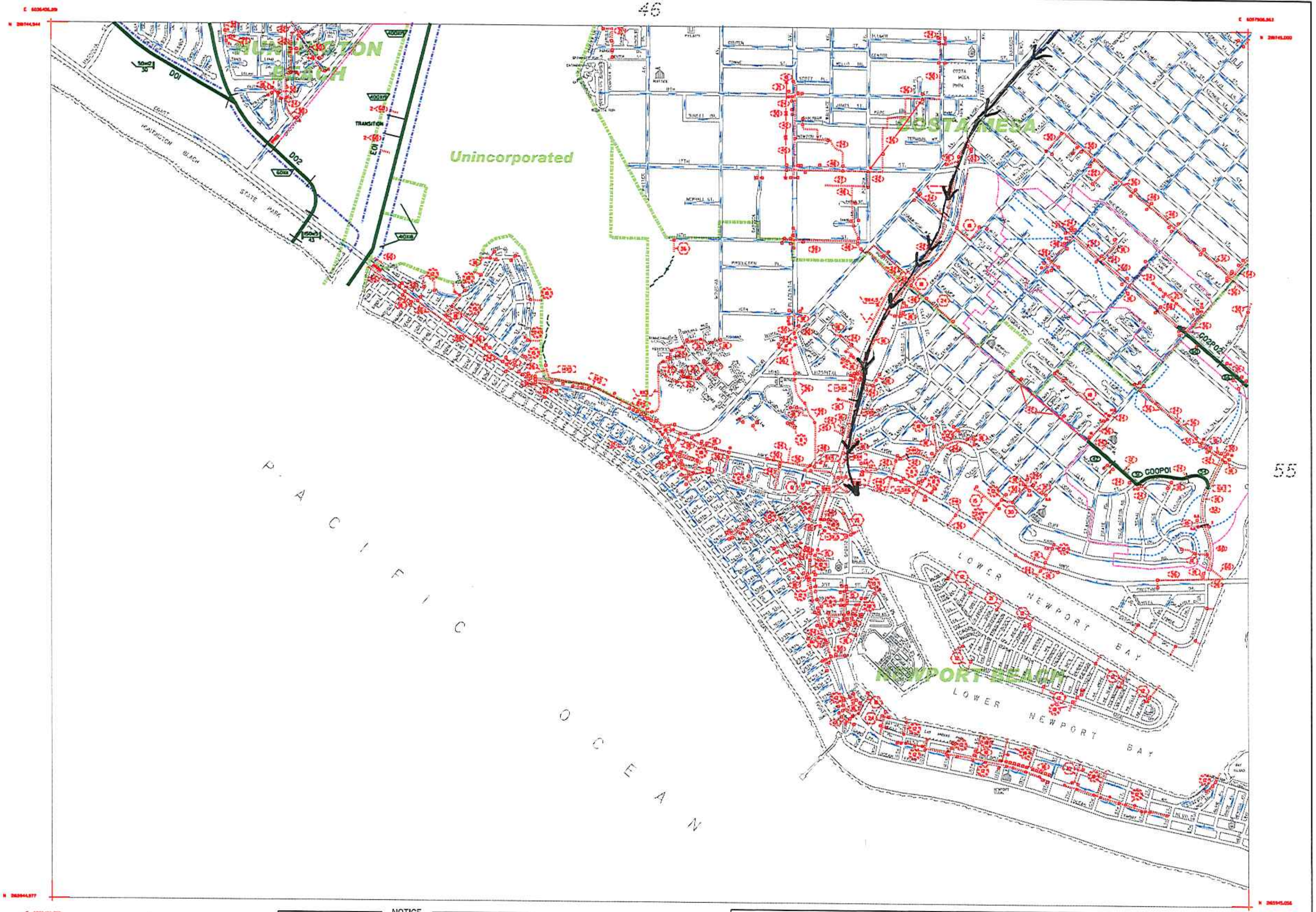
REVISION	DATE	SHEET NO.	DWG. NO.
S. GUTIERREZ	JAN.10 2007	46	MAPS-113-3

Channel Drainage Area Boundary
Major Sub-Area Drainage Boundary
Minor Sub-Area Drainage Boundary
Existing O.C.F.C.D. Facility
Existing Local Facility
Existing Retarding Basin or Reservoir
Natural Watercourse
City Limits
G G Greenbelt
P.S. P.S. Pump Station
Catch Basin (length in feet)
Drop Inlet or Other Entry
OCFCD Basins or Reservoirs
Ownership (if other than City or County): Private P State S Federal F

EXISTING FACILITIES

O.C.F.C.D.	LOCAL	
		Earth Trapezoidal Channel (base width by height in feet)
		Reinforced Concrete Trapezoidal Channel (base width by height in feet)
		Reinforced Concrete Rectangular Channel (base width by height in feet)
		Reinforced Concrete Box (RCB) (number of barrels-span by height in feet)
		Reinforced Concrete Pipe (RCP) (diameter in inches)
		Metal Sheet Channel (MSC) (Base width by pile height in feet/Sheet pile total length)
		Corrugated Metal Pipe (CMP) (diameter in inches)
		Concrete Pipe (diameter in inches)
		Concrete Oval Pipe (width by height in inches)
		Steel Pipe (diameter in inches)
		Reinforced Concrete Arch (base span by height in inches)
		Corrugated Metal Arch (base span by height in inches)

46



NOTICE

The drainage information has been prepared for information purposes only. The location, ownership, facility information and limits have been determined from available information provided by public agencies, but may not be exact, accurate, or up-to-date. The user of this information is responsible for verifying exact location, ownership, accuracy, and the regional versus local character of drainage facilities.

Additional information may be obtained from public plans and recorded deeds. Facility designations included with this information are for convenience only and are not controlling or intended to imply ownership by the County or the Orange County Flood Control District (OCFCD). The information is being provided as a courtesy and neither the County of Orange nor OCFCD assume any liabilities for inaccuracy of the information.

To notify OC Public Works Flood Control Section of additions or corrections, please contact Sal Gutierrez at (714) 834-5390 or by email at sal.gutierrez@ocpw.ocgov.com

ORANGE COUNTY FLOOD CONTROL DISTRICT

BASE MAP
OF DRAINAGE FACILITIES
IN ORANGE COUNTY

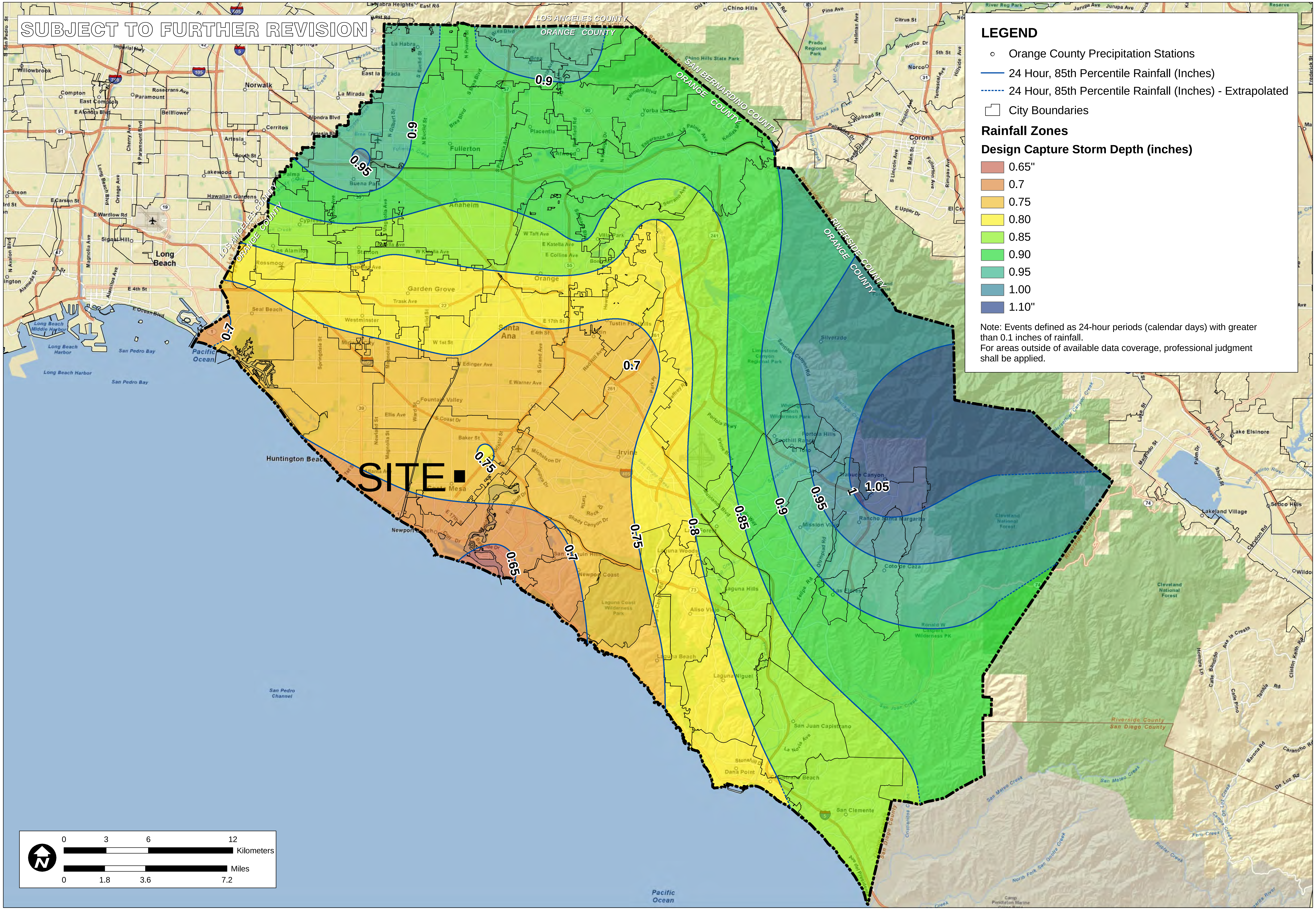
REVISION	DATE	SHEET NO.	DWG. NO.
S. GUTIERREZ	JAN/18/2000	54	MAPS-113-3

Channel Drainage Area Boundary
Major Sub-Area Drainage Boundary
Minor Sub-Area Drainage Boundary
Existing O.C.F.C.D. Facility
Existing Local Facility
Existing Retarding Basin or Reservoir
Natural Watercourse
City Limits
G G Greenbelt
P.S. P.S. Pump Station
Catch Basin (length in feet)
Drop Inlet or Other Entry
OCFCD Basins or Reservoirs
Ownership (if other than City or County): Private P State S Federal F

EXISTING FACILITIES
O.C.F.C.D. LOCAL
Earth Trapezoidal Channel (base width by height in feet)
Reinforced Concrete Trapezoidal Channel (base width by height in feet)
Reinforced Concrete Rectangular Channel (base width by height in feet)
Reinforced Concrete Box (RCB) (number of barrels-span by height in feet)
Reinforced Concrete Pipe (RCP) (diameter in inches)
Metal Sheet Channel (MSC) (Base width by pile height in feet/Sheet pile total length)
Corrugated Metal Pipe (CMP) (diameter in inches)
Concrete Pipe (diameter in inches)
Concrete Oval Pipe (width by height in inches)
Steel Pipe (diameter in inches)
Reinforced Concrete Arch (base span by height in inches)
Corrugated Metal Arch (base span by height in inches)

APPENDIX D

RAINFALL ZONE MAP FOR ORANGE COUNTY



■ Project Site Address: 220, 222, 234 & 236 Victoria Street, Costa Mesa, CA 92626

TITLE
RAINFALL ZONES

JOB
ORANGE COUNTY
TECHNICAL GUIDANCE
DOCUMENT
ORANGE CO. CA

SCALE 1" = 1.8 miles
DESIGNED TH
DRAWING TH
CHECKED BMP
DATE 04/22/10
JOB NO. 9526-E

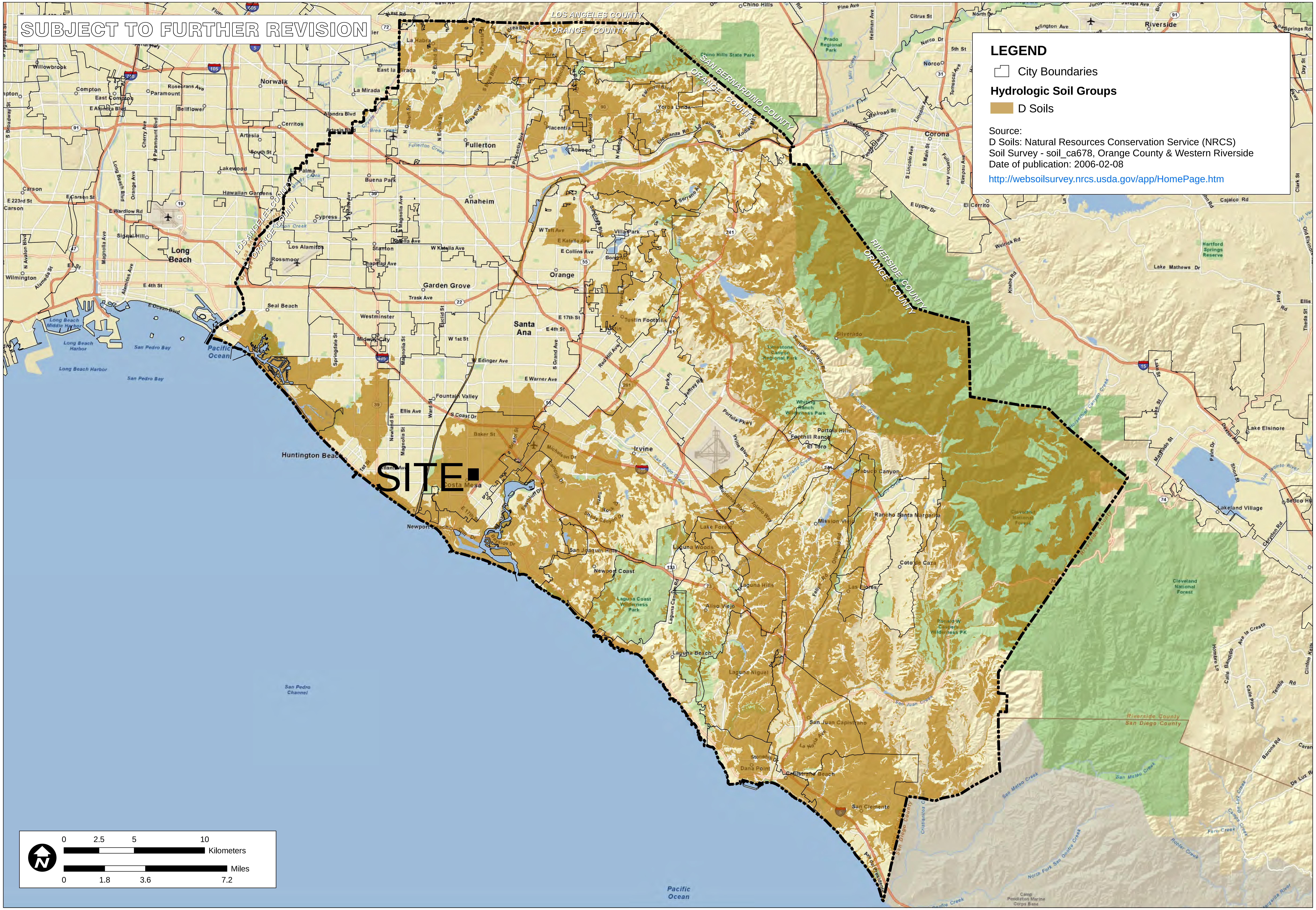
PACE
Advanced Water Engineering

FIGURE
XVI-1

P:\9526E\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-1_RainfallZones_20110215.mxd

APPENDIX E

HYDROLOGIC SOIL GROUP TYPE D NRCS SOIL SURVEY MAP FOR ORANGE COUNTY



LEGEND

⬜ City Boundaries

Hydrologic Soil Groups

▨ D Soils

Source:
D Soils: Natural Resources Conservation Service (NRCS)
Soil Survey - soil_ca678, Orange County & Western Riverside
Date of publication: 2006-02-08

http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

TITLE

HYDROLOGIC SOIL GROUP
TYPE D NRCS SOIL SURVEY

JOB

ORANGE COUNTY
INFILTRATION STUDY

ORANGE CO. CA

SCALE	1" = 1.8 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	02/09/11
JOB NO.	9526-E

PACE
Advanced Water Engineering

FIGURE
XVI-2b

P:\9526E\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-2b_D-Soils_20110215.mxd

Project Site Address: 220, 222, 234 & 236 Victoria Street, Costa Mesa, CA 92626

APPENDIX F

SOIL PACIFIC INC.'S SOIL AND FOUNDATION EVALUATION REPORT, PROPOSED MULTI-TENANT BUILDING COMPLEX, 220, 222, AND 234 VICTORIA STREET, COSTA MESA, CALIFORNIA, DATED SEPTEMBER 19, 2024; SOIL PACIFIC INC.'S INFILTRATION TESTING/CLARIFICATION LETTER, PROPOSED MULTI-TENANT BUILDING COMPLEX, 220, 222, AND 234 VICTORIA STREET, COSTA MESA, CALIFORNIA, DATED FEBRUARY 14, 2025

soil PACIFIC INC.
Geotechnical and Environmental Services

Project No. A-9899-24
September 19, 2024

WCD Corporation
WMC, LLC
234 Victoria Place,
Costa Mesa, California

SUBJECT: **Soil and Foundation Evaluation Report**
Proposed Multi-tenant Building Complex
220, 222, and 234 Victoria Place, Costa Mesa, California

Dear Sir;

Pursuant to your authorization, we are pleased to submit our report for the subject project. Our Site evaluation was conducted on October 2024. This evaluation consisted of field exploration, sub-surface soil sampling, laboratory testing, engineering evaluation, and preparation of the following report containing a summary of our conclusions and recommendations.

The opportunity to be of service is appreciated. Should any questions arise pertaining to any portion of this report, please contact this firm in writing for further clarification.

Very truly,

Soil Pacific Inc.

Yones Kabir
President

Hoss Eftekhari
RCE

REGISTERED PROFESSIONAL ENGINEER
HOSS EFTEKHARI
No. C50121
EXP. 6-30-25
CIVIL
STATE OF CALIFORNIA

675 N. Eckhoff, Suite A, Orange, CA 92868 ○ Tel (714) 879-1203 ○ Fax (714) 879-4812

Soil and Foundation Evaluation Report
Proposed Multi-tenant Building Complex
220, 222, and 234 Victoria Place, Costa Mesa, California

Prepared for:

WCD Corporation
WMC, LLC
236 Victoria Place,
Costa Mesa, California

Prepared by:

SOIL PACIFIC INC.
675 N. ECKHOFF STREET, SUITE A
ORANGE, CALIFORNIA 92868
Tel. (714) 879 1203

Project No. A-9899-24
September 19, 2024

Table of Contents

Soil and Foundation Evaluation Report
Proposed Muti-tenant Building Complex
220, 222, and 234 Victoria Place, Costa Mesa, California

LIMITATIONS

Between exploratory excavations and/or field testing locations, all subsurface deposits, consequent of their anisotropic and heterogeneous characteristics, can and will vary in many important geotechnical properties. The results presented herein are based on the information in part furnished by others and as generated by this firm, and represent our best interpretation of that data benefiting from a combination of our earthwork related construction experience, as well as our overall geotechnical knowledge. Hence, the conclusions and recommendations expressed herein are our professional opinions about pertinent project geotechnical parameters which influence the understood site use; therefore, no other warranty is offered or implied.

All the findings are subject to field modification as more subsurface exposures become available for evaluations. Before providing bids, contractors shall make thorough explorations and findings. Soil Pacific Inc., is not responsible for any financial gains or losses accrued by persons/firms or a third party from this project.

In the event the contents of this report are not clearly understood, due in part to the usage of technical terms or wording, please contact the undersigned in writing for clarification.

SECTION 1.0
PRELIMINARY EVALUATION

1.1 Site Description

The subject site is comprised of several adjacent parcel recognized as 220, 222, and 234 Victoria Place, Costa Mesa, California. The item parcels collectively named as "The Site" is located within the residential and commercial community of the City of Costa Mesa. The parcels are developed as commercial scattered one story building and storage sheds. The site is partially paved and partially covered with thick gravel bed. Neighboring properties are mixed use residential and commercial developed parcels. Current site access is through Victoria Street and injunction with Victoria Street with Newport Boulevard. The site elevation is about 80 feet above the main sea level, with a sheet water flow toward the south/southwest.

Address:	234 VICTORIA ST
APN	419-111-22
City	COSTA MESA
Address	236 VICTORIA ST
Fault Zone	This parcel is NOT WITHIN an Earthquake Fault Zone.
Liquefaction Zone	This parcel is NOT WITHIN a Liquefaction Zone.
Landslide Zone	This parcel is NOT WITHIN a Landslide Zone.

1.2 Planned Land Use

It is understood that the proposed construction will consist of new designed multi-tenant residential buildings with associated paved driveway and parking areas. Entire existing building and sheds will be removed or demolished. The entire site then will be prepared for construction of the planned structures.

1.3 Field Exploration

Subsurface conditions were explored by using 4 inches auger borings to a minimum depth of 10-12 feet below the existing grade. In total eight boring were planed and performed randomly to cover the adjacent parcels subject to redevelopment.

The relatively undisturbed soil samples, consisting of 2½ inch ring samples that were obtained with the hollow stem auger. A reasonable effort was made to restore drill hole sites to their original condition. This included backfilling and tamping of the test borings, and general surface cleanup. It should be noted that as with any backfill, residual consolidation could occur at the test boring locations. The client is cautioned to periodically examine the test boring locations and if necessary, backfill any resulting depressions.

All of the borings were backfilled with the excavated cuttings following logging, and obtaining bulk and relatively undisturbed samples for laboratory testing. The boring locations are shown on Plate A-1-1 and the logs are included in Appendix A.

Based on this evaluation, the site is underlain by a relatively thin top soils/ fill mantel to about 1-2 feet depth. It comprised of fine to medium grained silty sand, sand with some silt. Underlaying materials were mainly silty sand and clayey sand to clayey sand alluvial paralic deposits.

Earth materials encountered within the exploratory borings were classified and logged by the field engineer in accordance with the visual-manual procedures of the Unified Soil Classification System (USCS), ASTM Test Standard D2488.

1.4 Laboratory Testing

1.4.1. Classification

Soils were classified visually according to the Unified Soil Classification System. Moisture content and dry density determinations were made for the samples taken at various depths in the exploratory excavations. Results of moisture-density and dry-density determinations, together with classifications, are shown on the boring logs, Appendix A.

1.4.2 Expansion

An expansion index test was performed on a representative sample in accordance with the California Building Code Standard. A low expansion potential (EI=38) is anticipated for the encountered soils at the surficial soils (0-5 feet).

1.4.3 Direct Shear

Shear strength parameters are determined by means of strain-controlled, double plain, direct shear tests performed in general accordance with ASTM D-3080. Generally, three or more specimens are tested, each under a different normal load, to determine the effects upon shear resistance and displacement, and strength properties such as Mohr strength envelopes. The direct shear test is suited to the relatively rapid determination of consolidated drained strength properties because the drainage paths through the test specimen are short, thereby allowing excess pore pressure to be dissipated more rapidly than with other drained stress tests. The rate of deformation is determined from the time required for the specimen to achieve fifty percent consolidation at given normal stress. The test can be made on all soil materials and undisturbed, remolded or compacted materials. There is, however, a limitation on maximum particle size. Sample displacement during testing may range from 10 to 20 percent of the specimen's original diameter or length.

The shear test results are plotted on the attached shear test diagrams and unless otherwise noted on the shear test diagram, all tests are performed on undisturbed, saturated samples.

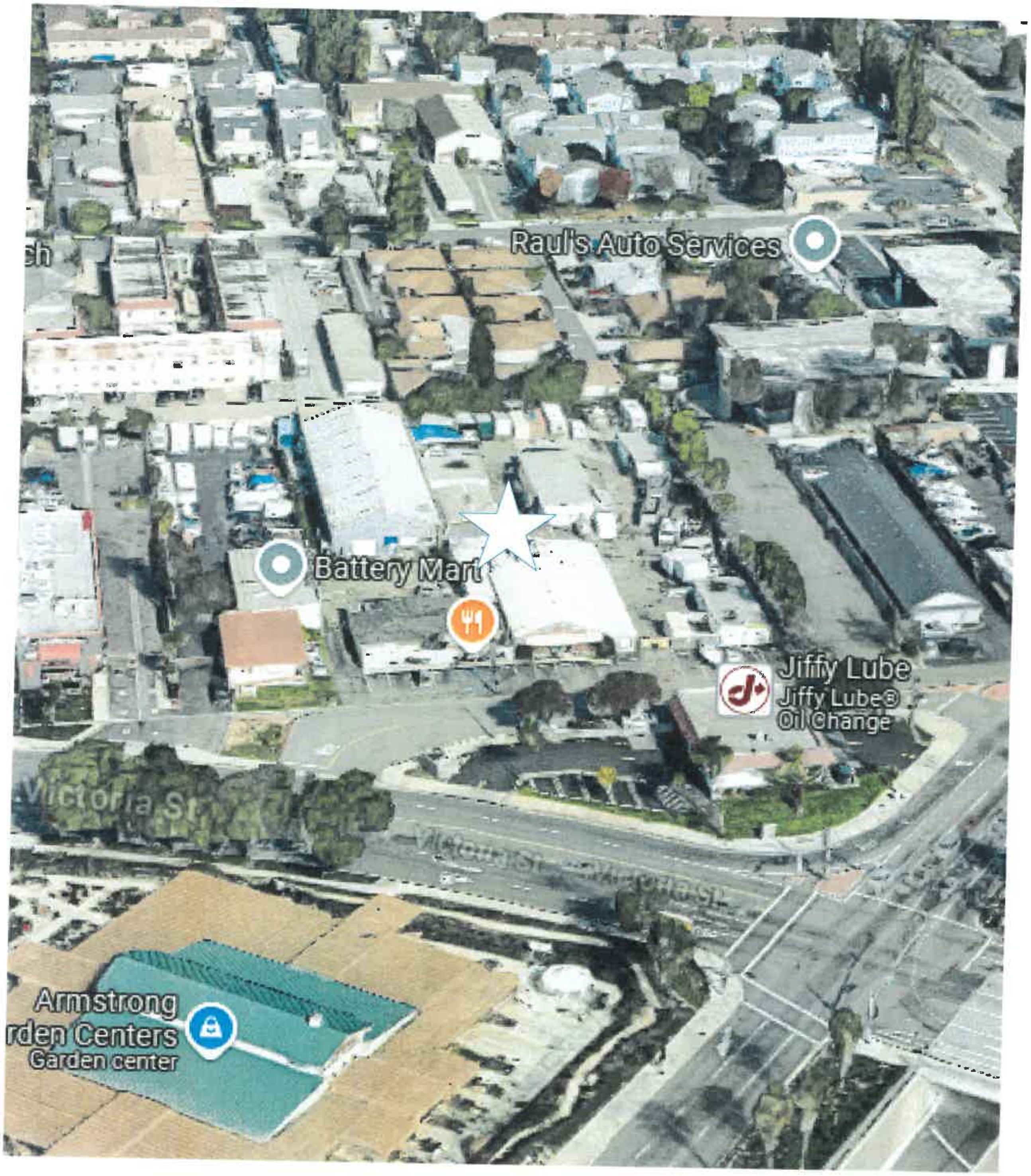


Figure 1: Site Aerial Photo.

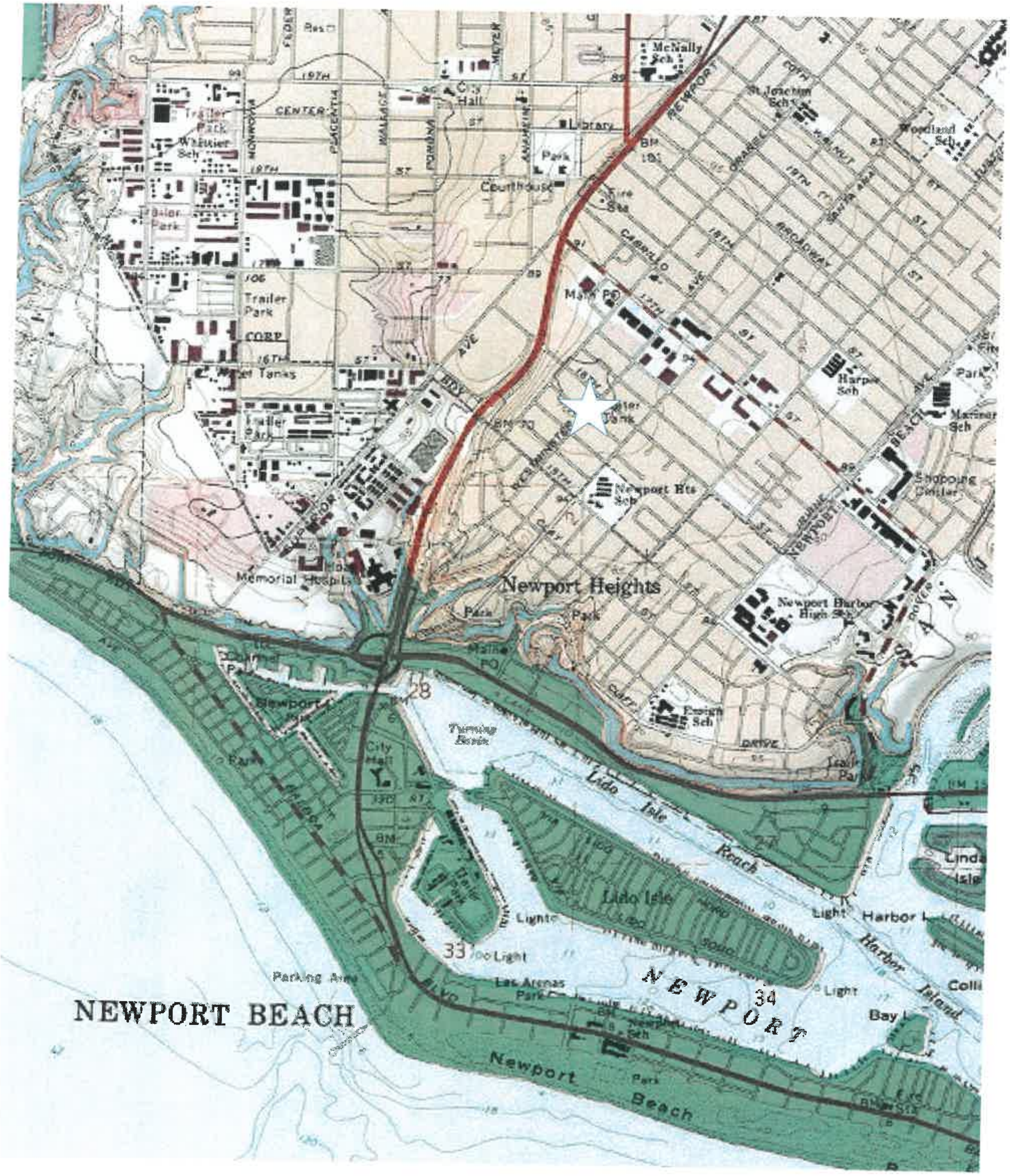


Figure 2: Site Geologic/topographic map by USGS/AAGS.

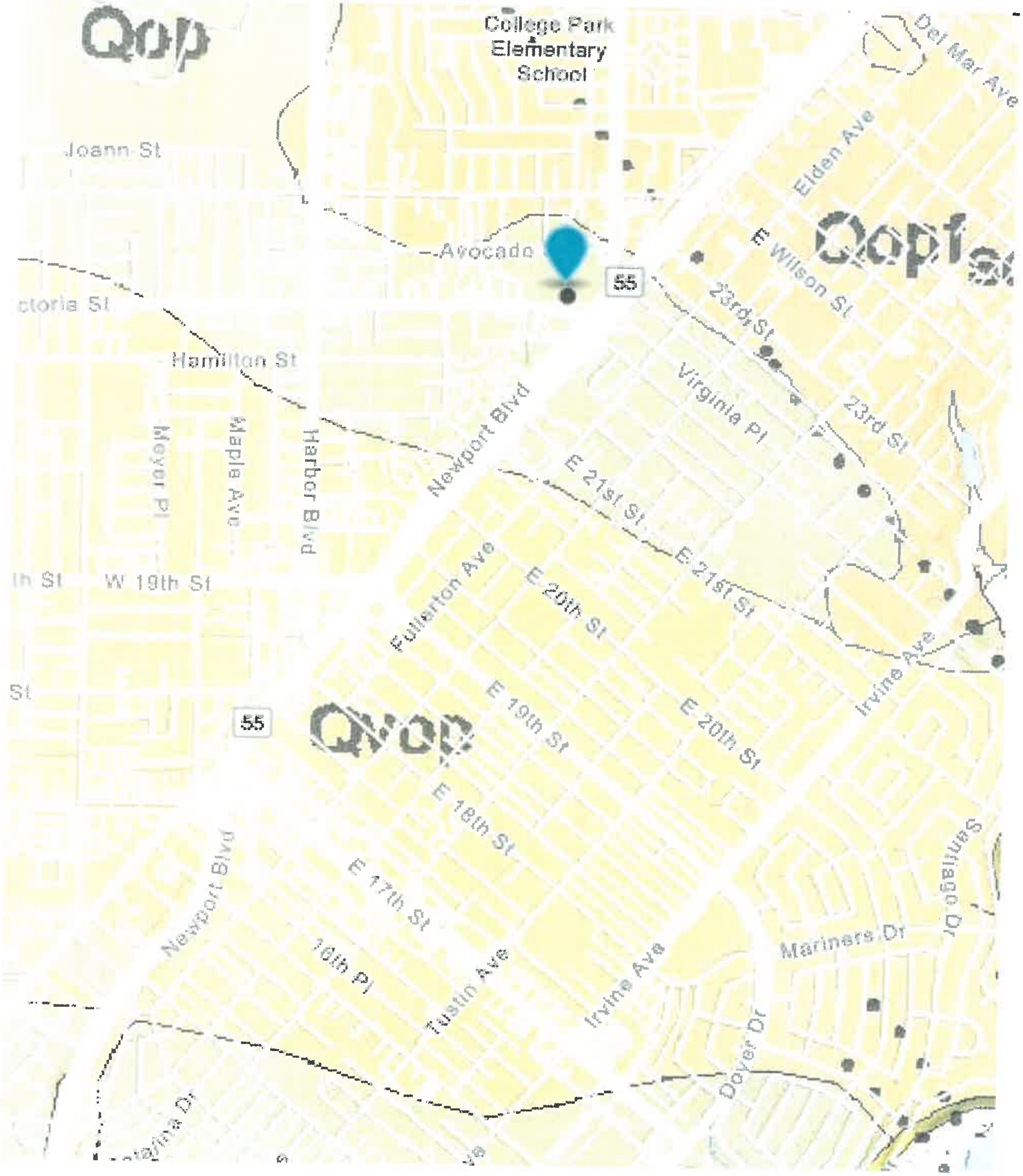


Figure 3: Site Geologic Map. (USGS).

Section 2.0
Conclusions

The proposed construction is considered feasible from a soils engineering standpoint. All earthwork should be performed in accordance with applicable engineering recommendations presented herein or applicable Agency Codes, whichever are the most stringent.

2. 1 Earth Materials

The site is located on an within a south old paralic deposits along the southern flank of the western of Santa Ana Costal Plain. The Coastal Plain lies within the southwest portion of the Los Angeles Basin and consists of semi-consolidated marine and non-marine deposits ranging in age from Miocene to recent. The western boundary of the Coastal Plain, in which the site is located, is referred to as the Tustin Plain. It is bound by the Santa Ana Mountains to the northeast and the San Joaquin Hills to the southeast.

Based on available geologic maps the site is underlain by a thin mantle of estuarine or engineered fill. The shallow soil layer is underlain by Quaternary-age old paralic deposits (Qop) which are described as medium dense to very dense, oxidized, fine to medium grained, moderately to well-cemented sand and silty sand. The old paralic deposits are underlain by massive bedrock of the Monterey Formation (Tm). (reference: Santa Ana 30x60' Geology Quadrangle. Morton).

Fill/ Topsoils

Fill Mantel is relatively thin (0-2 feet). Fill soils consists of light brown, to dark gray fine to medium grained sand /silty sand, moist top soil, underlain by clayey sand/sandy silt and clayey layers. At between 9-12 feet a layer of white to yellowish sandy clay with sea shell fragment was encountered.

Alluvium (Qop)

These deposits are composed of sandy clay and silt, clayey deposits with some sand and silt. The Paralic deposits are moderately dense. The density increases by depth increase.

2.2 Foundations

Proposed detached addition footings will be placed and embedded into prepared certified engineered fill.

2.3 Bearing Materials

Encountered surficial soils are relatively loose to a maximum depth of 2 feet and can not be used as a bearing materials.

2.4 Groundwater

The site is located within the Coastal Plain of Orange County Groundwater Basin (California Department of Water Resources, [CDWR], 2019). Groundwater depth varies within the area and flow direction beneath the subject site is toward the south, southwest. Groundwater during our subsurface exploration program was not encountered.

2.5 CBC Seismic Design Parameters

Earthquake loads on earthen structures and buildings are a function of ground acceleration, which may be determined from the site-specific acceleration response spectrum. To provide the design team with the parameters necessary to construct the site-specific acceleration response spectrum for this project, we used computer application that is available on the United States Geological Survey (USGS) website, https://earthquake.usgs.gov/ws/designmaps/ or https://asce7hazardtool.online.

Based on our review of pertinent CGS maps, no active or potentially active faults are known to traverse the area of the proposed development at the subject site. However, Southern California is seismically active with numerous faults capable of causing ground shaking at the site. The general location of active and potentially active faults within the southern California region can generate ground shaking at the site.

2.6 Chemical Contents

Chemical testing for detection of hydrocarbon or other potential contamination is beyond the scope of this report.

2.7 Liquefaction Study/ Secondary Seismic Hazard Zonation

Based on our review of the published maps (Newport Beach State Hazard 7.5 Min. Quadrangle Map), the subject site is not located within the area having a potential for Liquefaction susceptibility.

Liquefaction occurs when seismically-induced dynamic loading of a saturated sand or silt causes pore water pressures to increase to levels where grain-to-grain contact pressure is significantly decreased and the soil material temporarily behaves as a viscous fluid. Liquefaction can cause settlement of the ground surface, settlement and tilting of engineered structures, flotation of buoyant buried structures and fissuring of the ground surface. A common manifestation of liquefaction is the formation of sand boils (short-lived fountains of soil and water emerges from fissures or vents and leave freshly deposited conical mounds of sand or silt on the ground surface).

Seismicity

Alquist-Priolo Zone: According to the map entitled "State of California Special Studies Zones, Newport Beach Quadrangle," dated July 1, 1986, the site is not situated within an Alquist Priolo Special Studies Zone.

Liquefaction

According to the maps entitled "State of California Seismic Hazard Zones, Newport Beach Quadrangle" the site is not located within a mapped zone for seismic hazard due to liquefaction.

Summary of Findings

Based on our subsurface exploration and laboratory testing, engineering analysis, and our experience with similar sites and developments, the proposed development is feasible from a geotechnical engineering standpoint provided the recommendations contained in this report are implemented into its design and construction.

As mentioned earlier, soils at the site consist of fill soils to a depth of approximately 1 to 2 feet below grade. The fill soils are underlain by stiff to very stiff silts and clays underlain by medium and very dense sand and silty sands. Groundwater was not encountered within our borings to the depth explored.

The onsite fill soils are not considered suitable for the support of the proposed foundations, slabs on grade, and pavement section and should be overexcavated to the firm native soils. The excvated soils shall be recompacted properly to a minimum 90% relative compaction as an acceptable engineered fill.

Section 3.0
Recommendations

Based on our exploration and experience with similar projects, the proposed construction is considered feasible from a soils engineering standpoint providing the following recommendations are made a part of the plans and are implemented during construction.

3.1 Clearing and Site Preparation

Based on the proposed project concept a newly designed building structures are planned. In referencing to the encountered on-site materials, soil removal and recompaction (R&R) should be planned. The following recommendation can be used in preparation of R &R plan by project civil engineer.

1. Upon demolishing the exiting structures, the areas to receive compacted fill should be stripped of all vegetation, construction debris and trashes, non engineered fill, left in place incompetent material up to approved soils (3-3.5 feet). If soft spots are encountered, project soil engineer will evaluate the site conditions and will provide necessary recommendations.

2. The excavated area should be scarified to a minimum of 8 inches, adjusted to optimum moisture content, and reworked to achieve a minimum of 90 percent relative compaction.

3. Compacted fill should extend at least 5 feet beyond all perimeter footings or to a distance equal to the depth of the certified compacted fill, whichever is the greatest and feasible.

4. Compacted fill, consisting of on-site soil shall be placed in lifts not exceeding 6 inches in uncompacted thickness. The excavated onsite materials are considered satisfactory for reuse in the fill if the moisture content is near optimum. All organic material and construction debris should be removed and shall be segregated. Any imported fill should be observed, tested, and approved by the soils engineer prior to use as fill. Rocks larger than 6 inches in diameter should not be used in the fill.

5. The fill should be compacted to at least 90 percent of the maximum dry density for the material. The maximum density should be determined by ASTM Test Designation D 1557-00.

6. Field observation, and compaction testing should be performed by a representative of Soil Pacific Inc. during the grading to assist the contractor in obtaining the required degree of compaction and the proper moisture content. Where compaction is less than required, additional compaction effort should be made with adjustment of the moisture content, as necessary, until a minimum of 90 percent relative compaction is obtained.

7. Subject site is a part of very old development area and may contain old septic tanks and or water wells. These type of old structure amenities must be properly abandoned. In general the liquid part of septic should be removed and the septic well must be backfilled with 2 sack slurry mix or 3/4 inches of single size gravel to-4 feet below grade. The upper portion of any abandoned wells/pits must be filled with the same engineered fill mantel.

3.2 Site Preparation and Excavations

If any unanticipated subsurface improvements (pipe lines, irrigation lines, etc.) are encountered during earthwork construction, this office should be informed and appropriate remedial recommendations would subsequently be provided.

3.3 Stability of Temporary Cuts

The stability of temporary cuts required during removal process depends on many factors, including the slope angle, closeness of the adjacent building foundation or public property traffic, the shearing strength of the underlying materials, and the height of the cut and the length of time the excavation remains open and exposed to equipment vibrations and rainfall. The geotechnical consultant should be present to observe all temporary excavations at the site. The possibility of temporary excavations failing may be minimized by:

1) keeping the time between cutting and filling operations to a minimum;
2) limiting excavation length exposed at any one time; and,
3) shoring prior to cut.

3.4 Foundations

Considering the site specific condition, the following recommendations may be used in preparation of the design and construction of the foundation system.

3.4.1 Bearing Value

Allowable bearing value is 2000 psf. The bearing value may be increased by 1/3 when considering short duration seismic or wind loads.

An allowable frictional resistance of 0.30 may be used for design of concrete foundations poured on approved materials. When frictional and passive resistance are combined to compute the total lateral resistance, no reduction is needed to any of these two components.

3.4.2 Foundation Settlement

Based upon anticipated structural loads, the maximum total settlement for the proposed foundation is not expected to exceed 1 inch at design load. Differential settlement between adjacent footings and lateral displacement of lateral resisting elements should not exceed 1/2 inch.

3.4.3 Concrete Type

Based on our experience with similar project at the vicinity of the site, Type II concrete can be used in planning and construction.

3.4.4 Slabs-on-grade

If slabs-on-grade is desired to design then it should be a minimum of 5 inches in nominal thickness. Slab areas that are to be carpeted or tiled, or where the intrusion of moisture is objectionable, should be underlain by a moisture barrier consisting of 15-mil Visqueen, properly protected from the puncture by four inches of gravel per Calgreen requirements. The slab should be reinforced by rebars no. 3 at 16 inches on center and shall be tied to the foundation.

3.5 Utility Trench Backfill

Utility trenches backfill should be placed in accordance with Appendix D. It is the owners' and contractors' responsibility to inform subcontractors of these requirements and to notify Soil Pacific when backfill placement is to begin.

3.6 Seismic Design and Construction

Construction should be in conformance with seismic design parameters of the latest edition of California Building Code (C.B.C.) Please refer to the following table for related seismic design parameters.

SS (0.2 sec)	S1 (1.0 sec)	Soil Class	SDS (0.2 sec)	SD1 (1.0 sec)	PGAm	Seismic Design Cat
1.344	.48	D	0.898	-	.64	II

3.7 Retaining Wall Design Recommendations

A retaining wall is not planned or proposed. If a conventional retaining wall is planned to envelop and cover the proposed decking cavity around the planned decking, then the following design criteria may be used.

1) The free standing retaining walls should be designed using at active pressure condition. The minimum equivalent fluid pressure, for lateral soil loads, of 642 pounds per cubic foot may be used for design for onsite non expansive granular soils conditions and level backfill (10:1 to 4:1 or less).

2) An allowable soil bearing pressure of 2000 lbs. per square foot may be used in design for footings embedded to the street level (estimated to be in the order of a minimum of 4 feet deep).

3) A friction coefficient of .30 between concrete and natural or compacted soil and a passive bearing value of 345 lbs. per square foot per foot of depth, up to a maximum of 1000 pounds per square foot at the bottom excavation level may be employed to resist lateral loads. Any wall exceeding 6 feet height should be designed against static and seismic loads.

3.8 Concrete Driveway

1. The subgrade soils for all flatwork should be checked to have a minimum moisture content of 2 percentage points above the optimum moisture content to a depth of at least 18 inches.
2. Local irrigation and drainage should be diverted from all flatwork areas. Area drains and swales should be utilized to reduce the amount of subsurface water intrusion beneath the foundation and flatwork areas.
3. The concrete flatwork should have enough cold joints to prevent cracking. Adequate reinforcement considering the expansion potential is required. A minimum of rebar no. 4 placed at 18 inches on center must be used.
4. Surface and shrinkage cracking of the finished slab may be significantly reduced if a low slump and water-cement ratio are maintained during concrete placement. Excessive water added to concrete prior to placement is likely to cause shrinkage cracking.
5. Construction joints and saw cuts should be designed and implemented by the concrete contractor or design engineer based on the medium expansive soil conditions. Maximum joint spacing should not exceed 8 feet in any direction.
6. Patio or driveway subgrade soil should be compacted to a minimum of 90 percent to a depth of 18 inches. All run-off should be gathered in gutters and conducted off-site in a non-erosive manner. Planters located adjacent to footings should be sealed, and leach water intercepted.

3.9 Patio Slabs and Hardscape

It may be desirable to support new patio slabs and hardscape (patios, steps, walkways, etc.) on the existing surficial soils. These structures are not normally subject to building code requirements for structural support. In order to reduce the potential for distress due to potential settlement, it may be desirable to provide additional subgrade preparation and additional steel and concrete thickness for the proposed patio slabs and hardscape at the site. We recommend that patio slabs and hardscape be reinforced with a minimum of No.4 rebar spaced a maximum distance of 16 inches on center, each way. The upper 12 inches of existing surficial soils (depending on field conditions) to be used for slab support should be removed and recompacted to 90% of the maximum dry density as determined by ASTM:D-1557. It should be noted that patio slabs/hardscape constructed to the preceding specification may be subject to distress over time. Periodic maintenance or replacement may be necessary.

3.10 Pavement Section Design

To provide support for paving, the subgrade soils should be prepared as recommended in the Earthwork Section of this report. Our pavement recommendations are based on our findings and observations during our field investigation.

The required pavement thicknesses are based on expected wheel loads and the volume of traffic (TI or Traffic Index). Anticipated traffic indices of 4 through 7 have been used to develop pavement recommendations as presented in the tables below.

Asphalt Concrete Pavement

Traffic Usage	**Traffic Index**	**Asphaltic Concrete** inch	**Base Course** inch
Automobile Parking Areas	4	3	8
Automobile Traffic	5	3	10
Truck Traffic	6	4	13
Heaving Truck Traffic	7	4	16

Cement Concrete Pavement

Traffic Usage	**Traffic Index**	**Asphaltic Concrete** inch	**Base Course** inch
Automobile Parking Areas	4	5	8
Automobile Traffic	5	5	10
Truck Traffic	6	7	13
Heaving Truck Traffic	7	7	16

The above design recommendation is subject to perform sub-base grade soils to be compacted to a minimum of 95 percent relative compaction.

3.11 Excavation

Calosha requires that any excavation exceeding 4 feet in vertical cut require shoring or 1:1 trim above the 4 feet vertical cut.

All temporary excavations shall conform to the requirements of CAL-OSHA (Title 8, Division 1, Subchapter 4, Article 6 "Excavations" Sections 1539 to 1547) as well as all specific worker safety requirements as enforced by the local Building Authority. Proposed excavation will require adequate shoring, and maintain drained in an appropriate manner to prevent the continual accumulation of water. All vertical cuts shall be inspected by this office, to verify geologic continuity.

3.12 On-site Infiltration Testing

It is our understanding that in order to control the stormwater flow of the proposed site improvements, stormwater infiltration devices such as dry wells or other similar concepts, are proposed for the subject site. Percolation testing was performed at the site to provide subsurface soil percolation potential and to assist in the design of the infiltration devices.

Percolation testing was performed in several boring shafts having a 10 feet depth throughout the site. Percolation at the site is not feasible. The rate of the percolation is less than the minimum acceptable rate.

3.13 Shrinkage and Subsidence

Volumetric changes in earth quantities will occur when excavated onsite soil materials are replaced as properly compacted fill. We estimate the existing surficial soils may shrink approximately 5 to 10% when removed and replaced as compacted fill. Subsidence due to the processing of excavations exposing competent deposits is anticipated to be negligible. The estimates of shrinkage and subsidence are intended as an aid for project engineers in determining earthwork quantities. However, these estimates should be used with some caution since they are not absolute values.

This value may be included for balancing earthwork quantities based on actual shrinkage and subsidence that occurs during the grading process. The project Civil Engineer should consider that the upper two feet shrinkage may be much higher than 5-10%, while the rate of shrinkage by depth will be lesser.

3.14 Site Drainage

Ponding and saturation of the soils in the vicinity of the proposed foundations should be avoided. To reduce this potential, we recommend that positive drainage be provided for the site, in both improvement and landscaping areas, to carry surface water away from the building foundations and slabs on grade and towards appropriate drop inlets or other surface drainage devices. Site grading adjacent to structures and foundations should be slopped away a minimum of 5 percent for a minimum distance of 10 feet away from the face of wall. Impervious surfaces within 10 feet of structures should be sloped a minimum of 2 percent away from the building. These grades should be maintained for the life of the structure. We also recommend that roof runoff be connected to a suitable collection and discharge system to avoid surface discharge and potential saturating the soils near foundations. Poor perimeter and surface drainage may result in water migration beneath building foundations, and may result in potential distress to the proposed improvements.

Planter areas adjacent to the building and foundations should be lined to reduce the infiltration of irrigation water beneath the building. Care should also be taken to maintain a leak-free irrigation system.

3.15 Observation and Testing

All grading and earthwork including trench backfill should be performed under the observation and testing of the consulting engineer for proper sub-grade preparation, selection of satisfactory materials, placement and compaction of all structural fill. Sufficient notification prior to stripping and earthwork construction is essential in order that the work will be adequately observed and tested.

Prior to initiation of grading, a meeting should be arranged by the developer and should be attended by representatives of the governmental agencies, contractors, consultants and the developer. Construction should be inspected at the following stages by the Geotechnical Consultant.

It is recommended that representative of **Soil Pacific, Inc.** be present to observe and test during the following stages of construction:

☐ Site grading to confirm proper removal of unsuitable materials and to observe and test the placement of fill.

☐ Inspection of all foundation excavations prior to placement of steel or concrete.

☐ During the placement of retaining wall subdrain and backfill materials.

☐ Inspection of all slab-on-grade areas prior to placement of sand, Visqueen.

☐ After trenches have been properly backfilled and compacted.

☐ When any unusual conditions are encountered.

APPENDIX A

Field Exploration

Log of Sub-surface Exploration

B-1

Equipment Type: SH 2800		Boring # B-1
Diameter: 4"	Logged by: D. B.	Date:9/16/24
Depth: 10 feet	G.water: - feet	Backfilled:Y

Std. Pen	Bulk/Bag	Ring	Elev. (feet)	Drive Wt: Drop: C/S N	Laboratory Moisture	Laboratory Dry Reading	Graphic	USCS Letter	Description of Earth Materials
								SM	Fill- Gray to dark brown gravelly grained silty snad with some clay.
					14.3	110.9			
					13.8	114.0			
			5					SC	Qof- Dark brown clayey sand, stiff and relatively dense, interbedded with sandy clayey layers.Old Paralic deposit. Moist to wet.
								SM/ SC	At 8 feet, interbedded with silty sand with some gravel.
			10		11.3	117.2			
			15						
			20						End of subsurface exploration 10 feet. No perchedwater was encountered.
			25						
			30						
			35						
			40						

Log depicts conditions at the time and location drilled.

Soil Pacific Inc.

Geotechnical and Environmental Services

Project Name: 220,222,234 Victoria Blvd., Costa Mesa

Project Number: A-9899-24

Report Date:

Figure:

Log of Sub-surface Exploration

B-2

Equipment Type: SH 2800
Boring # B-2
Diameter: 4"
Logged by: Y.K.
Date:9/16/24
Depth: 12 feet
G.water: - feet
Backfilled:Y

Std. Pen
Bulk/Bag
Ring
Drive Wt: Drop:
C/S N

Elev. (feet)	Laboratory Moisture	Laboratory Dry Reading	Graphic	USCS Letter	Description of Earth Materials
	13.4	109.5	▥	SM	Fill- Gray to dark brown gravelly grained silty snad with some clay.
	13.2	112.8	▨		
5			▨	SC	Qof- Dark brown clayey sand, stiff and relatively dense, interbedded with sandy clayey layers.Old Paralic deposit. Moist to wet.
10			▥	SM/ SC	At 9 feet, interbedded with silty sand with some gravel.
	11.0	118.0	▥		At 11 feet, white to yellowish gray clayey sand with frequent see shell fragments, damp to moist in general.
15					
20					End of subsurface exploration 12 feet. No perchedwater was encountered.
25					
30					
35					
40					

Log depicts conditions at the time and location drilled.

Soil Pacific Inc.

Geotechnical and Environmental Services

Project Name: 220,222,234 Victoria Blvd., Costa Mesa

Project Number: A-9899-24

Report Date:

Figure:

Log of Sub-surface Exploration

B-3

Equipment Type: SH 2800		Boring # B-3
Diameter: 4"	Logged by: Y.K.	Date:9/16/24
Depth: 10 feet	G.water: - feet	Backfilled:Y

Std. Pen	Bulk/Bag	Ring	Elev. (feet)	Drive Wt: Drop: C/S N	Laboratory Moisture	Laboratory Dry Reading	Graphic	USCS Letter	**Description of Earth Materials**
							▥	SM	Fill- Gray to dark brown gravelly grained silty snad with some clay.
					13.0	113.7	▨	SC	Qof- Dark brown clayey sand, stiff and relatively dense, interbedded with sandy clayey layers.Old Paralic deposit. Moist to wet.
			5				▨		
							▦▥	SM/ SC	At 8.5 feet, interbedded with silty sand with some clay. Damp to moist.
			10		12.5	116.1			
			15						
			20						End of subsurface exploration 10 feet. No perchedwater was encountered.
			25						
			30						
			35						
			40						

Log depicts conditions at the time and location drilled.

Soil Pacific Inc.

Geotechnical and Environmental Services

Project Name: 220,222,234 Victoria Blvd., Costa Mesa

Project Number: A-9899-24

Report Date:

Figure:

Log of Sub-surface Exploration

B-4

Equipment Type: SH 2800		Boring # B-4
Diameter: 4"	Logged by: Y.K.	Date:9/16/24
Depth: 10 feet	G.water: - feet	Backfilled:Y

Std. Pen Bulk/Bag Ring Elev. (feet)	Drive Wt: Drop: C/S N	Laboratory Moisture	Laboratory Dry Reading	Graphic / USCS Letter	Description of Earth Materials
				SM	Fill- Gray to dark brown gravelly grained silty snad with some clay.
		13.0	113.7	SC	Qof- Dark brown clayey sand, stiff and relatively dense, interbedded with sandy clayey layers.Old Paralic deposit. Moist to wet.
5					
				SM/SC	At 8.5 feet, interbedded with silty sand with some clay. Damp to moist.
10		12.5	116.1		
15					
20					End of subsurface exploration 10 feet. No perchedwater was encountered.
25					
30					
35					
40					

Log depicts conditions at the time and location drilled.

Soil Pacific Inc.

Geotechnical and Environmental Services

Project Name: 220,222,234 Victoria Blvd., Costa Mesa

Project Number: A-9899-24

Report Date:

Figure:

Log of Sub-surface Exploration

B-5

Equipment Type: SH 2800		Boring # B-5
Diameter: 4"	Logged by: Y.K.	Date:9/16/24
Depth: 12 feet	G.water: - feet	Backfilled:Y

Std. Pen	Bulk/Bag	Ring	Elev. (feet)	Drive Wt: Drop:	C/S N	Laboratory Moisture	Laboratory Dry Reading	Graphic	USCS Letter	Description of Earth Materials
									SM	Fill- Gray to dark brown gravelly grained silty snad with some clay.
			5						SC	Qof- Dark brown clayey sand, stiff and relatively dense, interbedded with sandy clayey layers.Old Paralic deposit. Moist to wet.
									SM/	Brown fine to medium garined clayey sand. Damp.
			10						SC	At 10 feet, interbedded with silty sand with some clay. Damp to moist.
			15							
			20							End of subsurface exploration 12 feet. No perchedwater was encountered.
			25							
			30							
			35							
			40							

Log depicts conditions at the time and location drilled.

Soil Pacific Inc.

Geotechnical and Environmental Services

Project Name: 220,222,234 Victoria Blvd., Costa Mesa

Project Number: A-9899-24

Report Date:

Figure:

Log of Sub-surface Exploration

B-6

Equipment Type: SH 2800		Boring # B-6
Diameter: 4"	Logged by: Y.K.	Date:9/16/24
Depth: 10 feet	G.water: - feet	Backfilled:Y

Std. Pen Bulk/Bag Ring Elev. (feet)	Drive Wt: Drop: C/S N	Laboratory Moisture	Laboratory Dry Reading	USCS Letter Graphic	Description of Earth Materials
				SM	Fill- Gray to dark brown gravelly grained silty snad with some clay.
5				SC	Qof- Dark brown clayey sand, stiff and relatively dense, interbedded with sandy clayey layers.Old Paralic deposit. Moist to wet.
10				SM/ SC	Brown fine to medium garined clayey sand, underlain by silty sand with some clay. Damp to moist.
15					
20					End of subsurface exploration 10 feet. No perchedwater was encountered.
25					
30					
35					
40					

Log depicts conditions at the time and location drilled.

Soil Pacific Inc.

Geotechnical and Environmental Services

Project Name: 220,222,234 Victoria Blvd., Costa Mesa

Project Number: A-9899-24

Report Date:

Figure:

Log of Sub-surface Exploration

B-7

Equipment Type: SH 2800		Boring # B-7
Diameter: 4"	Logged by: Y.K.	Date:9/16/24
Depth: 12 feet	G.water: - feet	Backfilled:Y

Std. Pen	Bulk/Bag	Ring	Elev. (feet)	Drive Wt: Drop: C/S N	Laboratory Moisture	Laboratory Dry Reading	USCS Letter	Description of Earth Materials
							SM	Fill- Gray to dark brown gravelly grained silty snad with some clay.
			5				SC	Qof- Dark brown clayey sand, stiff and relatively dense, interbedded with sandy clayey layers.Old Paralic deposit. Moist to wet.
			10				SM/ SC	Brown fine to medium garined clayey sand, underlain by silty sand with some clay. Damp to moist.
			15					
			20					End of subsurface exploration 12 feet. No perchedwater was encountered.
			25					
			30					
			35					
			40					

Log depicts conditions at the time and location drilled.

Soil Pacific Inc.

Geotechnical and Environmental Services

Project Name: 220,222,234 Victoria Blvd., Costa Mesa

Project Number: A-9899-24

Report Date:

Figure:

Log of Sub-surface Exploration

B-8

Equipment Type: SH 2800		Boring # B-8
Diameter: 4"	Logged by: Y.K.	Date:9/16/24
Depth: 10 feet	G.water: - feet	Backfilled:Y

Elev. (feet)	Std. Pen	Bulk/Bag	Ring	Drive Wt: Drop: C/S N	Laboratory Moisture	Laboratory Dry Reading	Graphic	USCS Letter	Description of Earth Materials
							▥	SM	Fill- Gray to dark brown gravelly grained silty snad with some clay.
5							▨	SC	Qof- Dark brown clayey sand, stiff and relatively dense, interbedded with sandy clayey layers.Old Paralic deposit. Moist to wet.
10							░▥	SM/ SC	Brown fine to medium garined clayey sand, underlain by silty sand with some clay. Damp to moist.
15									
20									End of subsurface exploration 10 feet. No perchedwater was encountered.
25									
30									
35									
40									

Log depicts conditions at the time and location drilled.

Soil Pacific Inc.

Geotechnical and Environmental Services

Project Name: 220,222,234 Victoria Blvd., Costa Mesa

Project Number: A-9899-24

Report Date:

Figure:

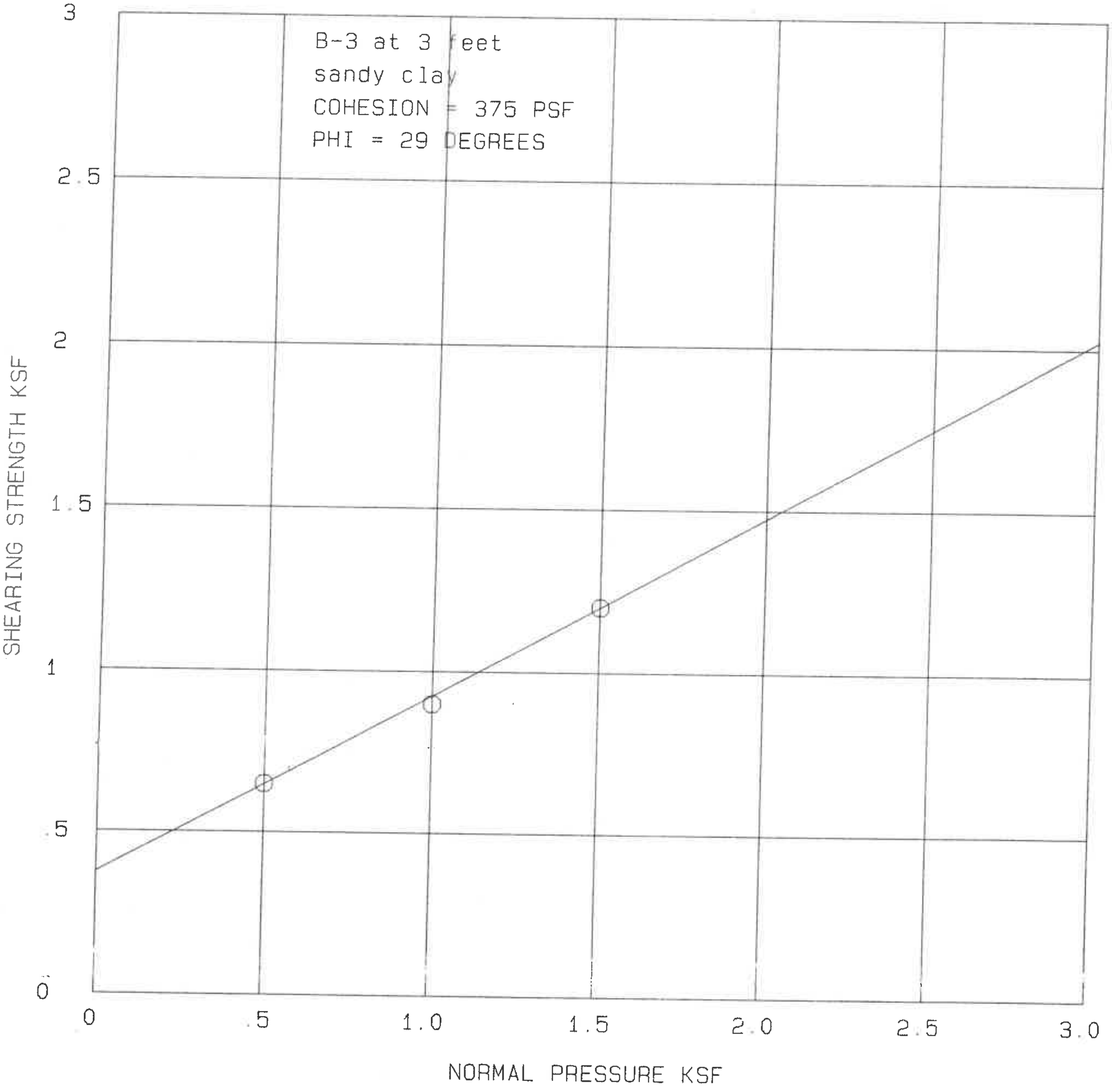
APPENDIX B

Laboratory

SHEAR TEST DIAGRAM

J.O. A-9899-24

DATE 9/18/24

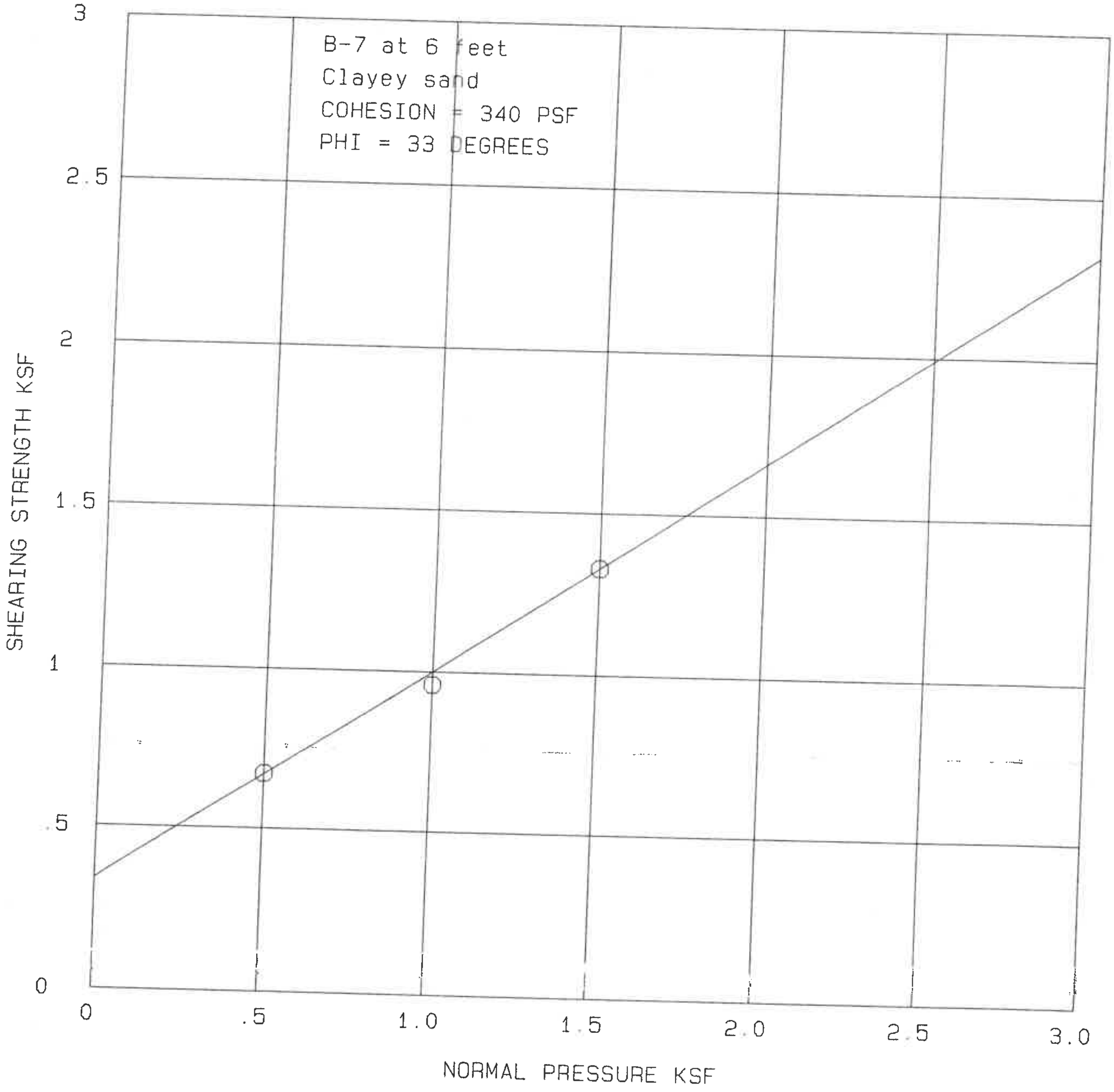


PLATE

SHEAR TEST DIAGRAM

J.O. A-9899-24

DATE 9/18/24



B-7 at 6 feet
Clayey sand
COHESION = 340 PSF
PHI = 33 DEGREES

PLATE

APPENDIX

TEMPORARY BACKCUT STABILITY

J.O. A-9899-24

DATE 9/18/24

COHESION = 375 PSF

GAMA = 120 PCF

PHI = 29 DEGREES

CUT HEIGHT = 4 FEET

SOIL TYPE = Clayey sand

BACKFILL ASSUMED TO BE LEVEL

PORE PRESSURE NOT CONSIDERED

FORMULA

$$\text{SAFETY FACTOR} = \frac{(C * L) + (GA * AREA * COS(Z) * TAN(PHI))}{GA * AREA * SIN(Z)} = 3.9$$

$$Z = 45 + (PHI/2)$$

SINCE THE SAFETY FACTOR OF 3.9 IS GREATER THAN THE REQUIRED 1.25, THE TEMPORARY EXCAVATION IS CONSIDERED TO BE STABLE. THIS IS WITH A LEVEL AREA EQUAL TO THE LENGTH OF THE VERTICAL CUT ABOVE THE CUT.

PLATE

APPENDIX

BEARING VALUE ANALYSIS

J.O. A-9899-24

DATE 9/18/24

COHESION = 375 PSF

GAMA = 120 PCF

PHI = 29 DEGREES

DEPTH OF FOOTING = 2 FEET

BREADTH OF FOOTING = 2 FEET

FOOTING TYPE = SQUARE

BEARING CAPACITY FACTORS

Nc = 27.9

Nq = 16.4

Ng = 15.6

FOOTING COEFFICIENTS

K1 = 1.2

K2 = .4

REFERENCE: TERZAGHI & PECK; 1967; 'SOIL MECHANICS IN ENGINEERING PRACTICE'; PAGES 217 TO 225.

FORMULA

ULIMATE BEARING = (K1 * Nc * C) + (K2 * GA * Ng * B) + (Nq * GA * D) = 17983.9

ALLOWABLE BEARING = $\frac{\text{ULTIMATE BEARING}}{3}$ = 5994.6

THE ALLOWABLE BEARING VALUE SHOULD NOT EXCEED 5994.6 PSF. DESIGN SHOULD CONSIDER EXPANSION INDEX.

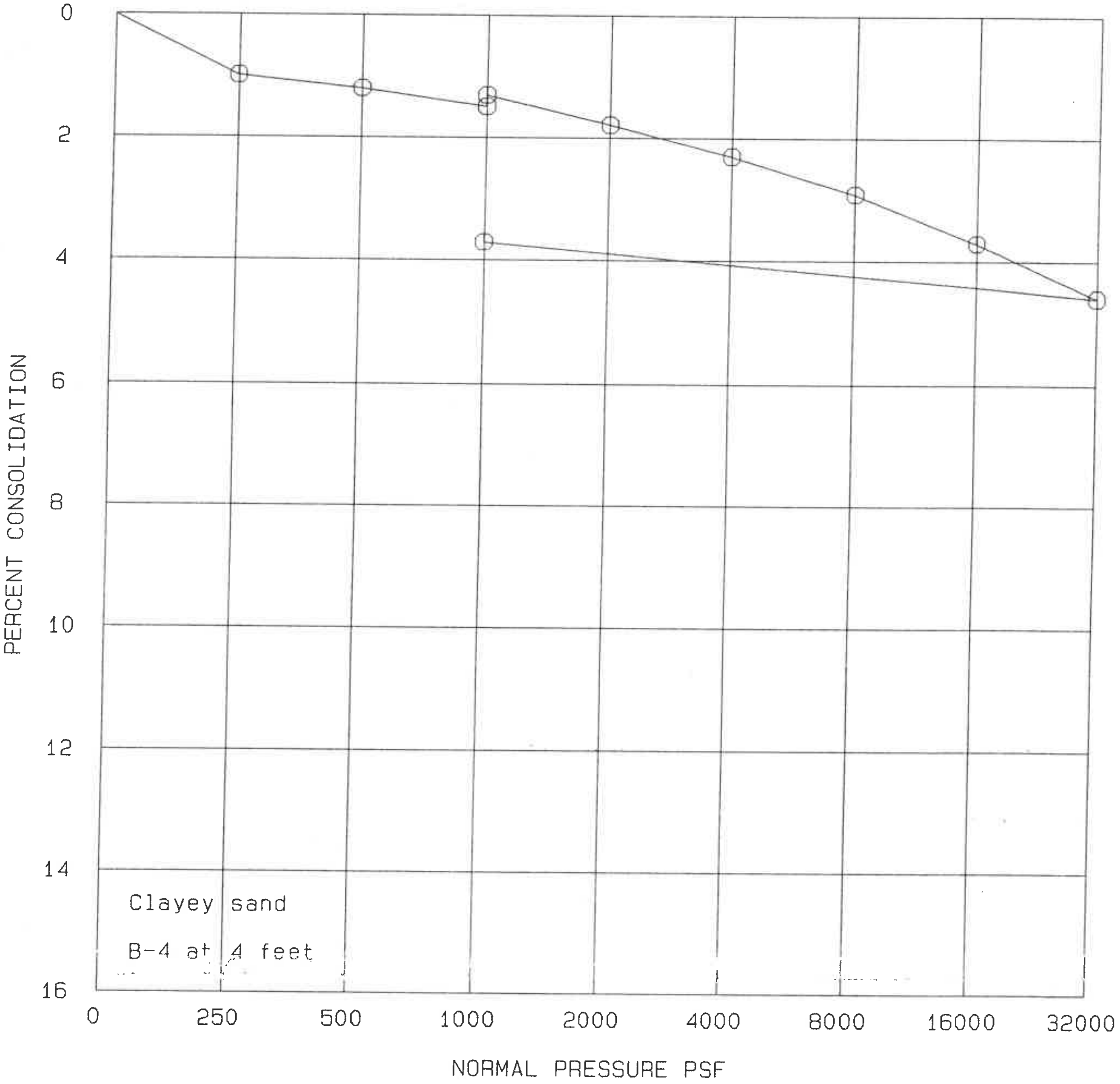
PLATE

SOFTWARE

CONSOLIDATION PRESSURE CURVE

J.O. A-9899-24

DATE 9/18/24



Clayey sand

B-4 at 4 feet

PLATE

APPENDIX

BEARING VALUE ANALYSIS

J.O. A-9899-24

DATE 9/18/24

COHESION = 375 PSF

GAMA = 120 PCF

PHI = 29 DEGREES

DEPTH OF FOOTING = 2 FEET

BREADTH OF FOOTING = 1.5 FEET

FOOTING TYPE = CONTINUOUS

BEARING CAPACITY FACTORS

Nc = 27.9

Nq = 16.4

Ng = 15.6

FOOTING COEFFICIENTS

K1 = 1

K2 = .5

REFERENCE: TERZAGHI & PECK: 1967: 'SOIL MECHANICS IN ENGINEERING PRACTICE': PAGES 217 TO 225.

FORMULA

ULIMATE BEARING = (K1 * Nc * C) + (K2 * GA * Ng * B) + (Nq * GA * D) = 15800.6

$$\text{ALLOWABLE BEARING} = \frac{\text{ULTIMATE BEARING}}{3} = 5266.9$$

THE ALLOWABLE BEARING VALUE SHOULD NOT EXCEED 5266.9 PSF. DESIGN SHOULD CONSIDER EXPANSION INDEX.

PLATE

Earth Pressure Calculations

Soil Strength Parameters:

$\phi := 29$

$\gamma := 120$

Active :

$$Ka := \tan\left[\left(45 - \frac{\phi}{2}\right) \cdot \left(\frac{\pi}{180}\right)\right]^2$$

Active earth Presure

$Ka = 0.347$

$Pa := Ka \cdot \gamma$

slope angle range, degrees

$Pa = 41.637$	LEVEL BACKFILL BEHIND WALL		$Pa = 41.637$
$Pa18 := Pa \cdot 1.08$	5:1	BACKFILL BEHIND WALL	$Pa18 = 44.968$
$Pa18 := Pa \cdot 1.22$	3:1	BACKFILL BEHIND WALL	$Pa18 = 50.797$
$Pa39 := Pa \cdot 1.48$	2:1	BACKFILL BEHIND WALL	$Pa39 = 61.623$

Passive

$$Kp := \tan\left[\left(45 + \frac{\phi}{2}\right) \cdot \left(\frac{\pi}{180}\right)\right]^2$$

$Kp = 2.882$

Pasive Earth Presure

$Pp := Kp \cdot \gamma$

$Pp = 345.847$

Atrest

$$Kat := 1 - \sin\left(\phi \cdot \frac{\pi}{180}\right)$$

$Kat = 0.515$

$Pat := Kat \cdot \gamma$

$Pat = 61.823$

Seismic lateral earth pressure

Free standing Wall

$\phi := 29 \cdot deg$ angle of internal friction of soil

$\delta := 17 \cdot deg$ angle of friction between soil and wall, (concrete or masonry)

$PGAm := .64$

$h := 10$ Height of wall

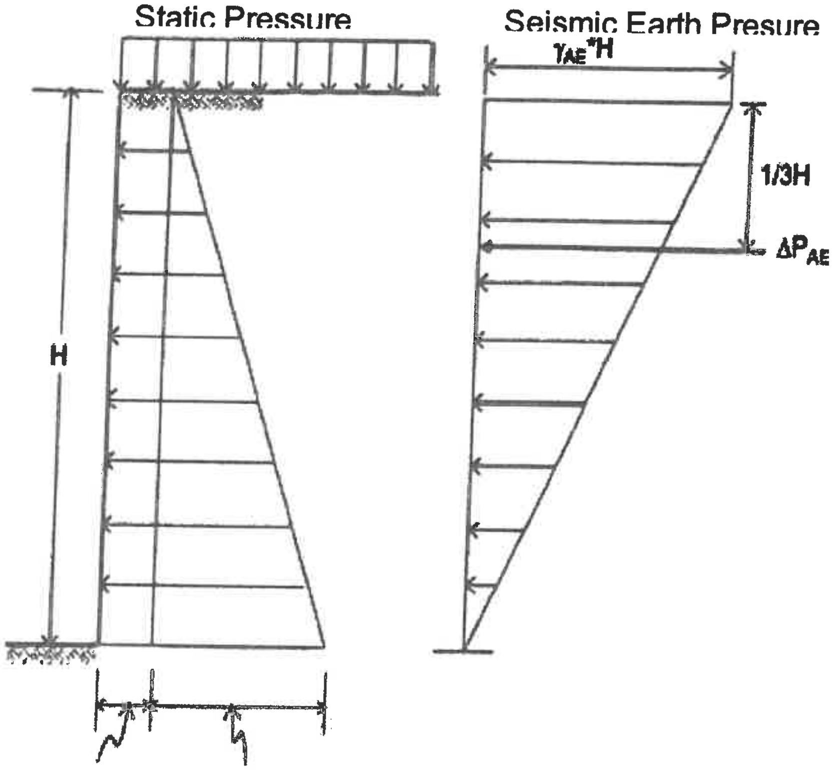
$$kh := \frac{\left[\left(\frac{2}{3}\right)PGAm\right]}{2}$$

$kh = 0.213$

$\gamma := 120$ Soil Unit Weight

$$PaE := \frac{3}{8} \cdot \gamma \cdot h^2 \cdot kh$$

$PaE = 960$ PLF



$$EFPs := 2 \cdot \frac{PaE}{h^2}$$

0.45q EFPxH(psf)

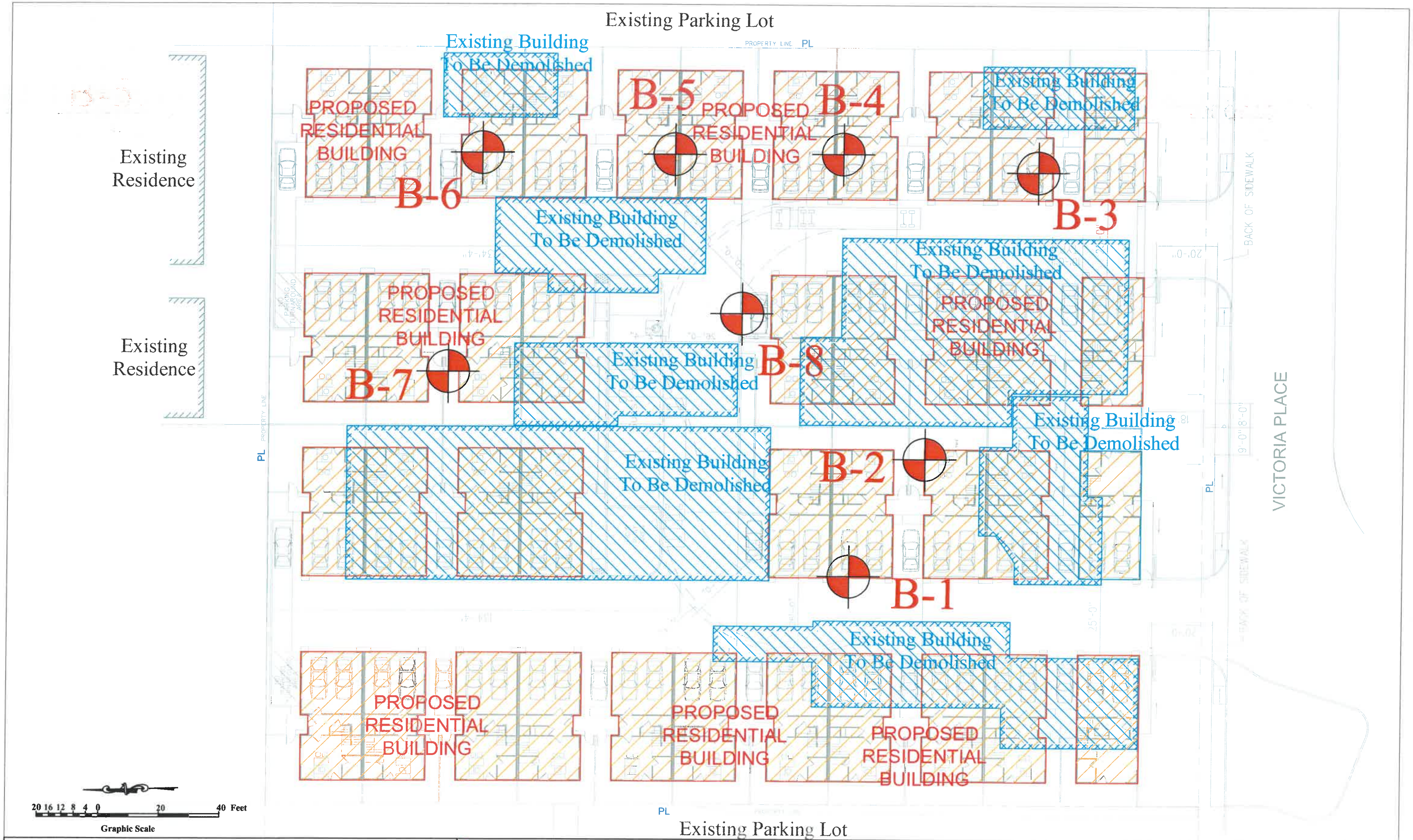
$EFPs = 19.2$ PCF seismic Lateral Force (retaining wall In excess of 6 feet)

$q := 0$ Surcharge Load should be added by structural justification

Project No.= A – 9899 – 24

APPENDIX C

References



LEGEND

⊕ Soil Boring Location

▨ Proposed Building

▨ Existing Building to Be Demolished

soil PACIFIC Inc.
Geotechnical & Environmental Services
675 N. Eckhoff, Suite # A
Orange, CA 92868

Project Location:
220, 222, 234 & 236
Victoria Place, Costa Mesa, CA

GEOTECHNICAL PLAN

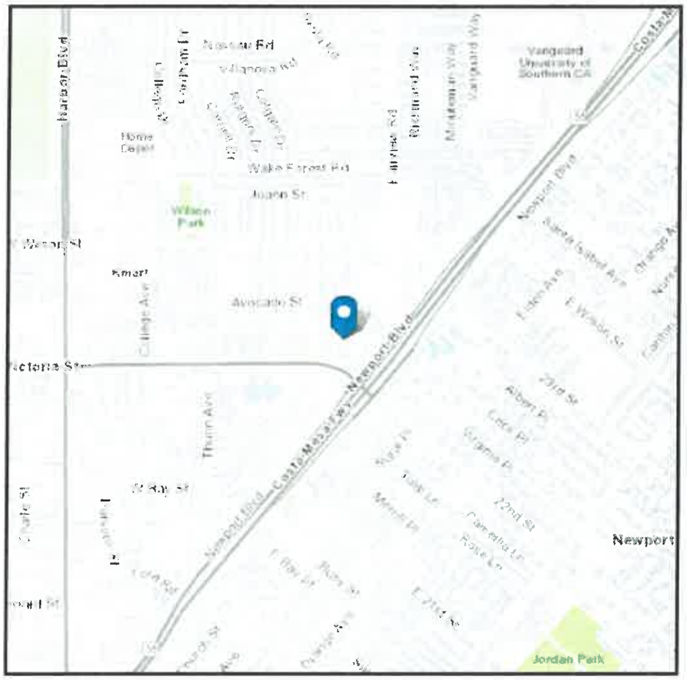
FIGURE-A-1-1	PROJECT NO.:A-9899-24
DATE : 9/19/2024	SCALE: 1"=30'

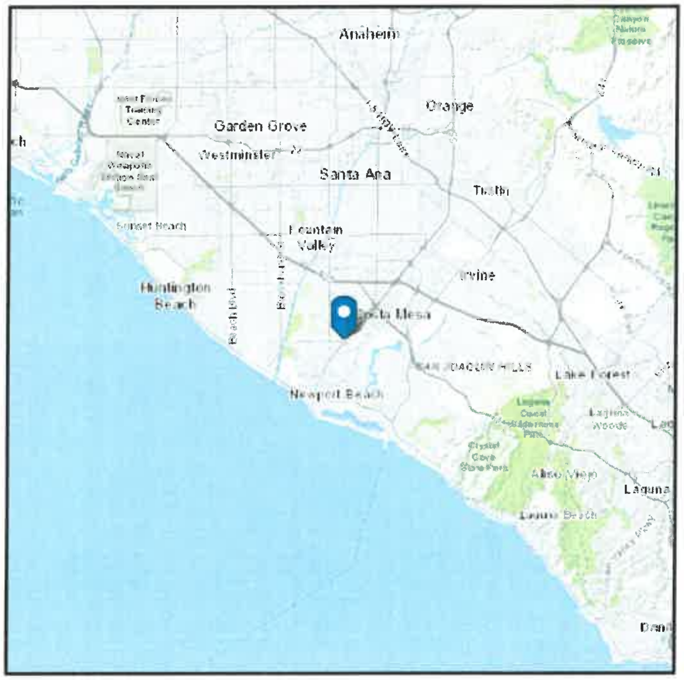
ASCE Hazards Report

Address:
234 Victoria St
Costa Mesa, California
92627

Standard: ASCE/SEI 7-16
Risk Category: II
Soil Class: D - Stiff Soil

Latitude: 33.65332
Longitude: -117.909244
Elevation: 84.76877108202316 ft (NAVD 88)





Seismic

Site Soil Class: D - Stiff Soil

Results:

S_S :	1.344	S_{D1} :	N/A
S_1 :	0.48	T_L :	8
F_a :	1	PGA :	0.582
F_v :	N/A	PGA_M :	0.64
S_{MS} :	1.344	F_{PGA} :	1.1
S_{M1} :	N/A	I_e :	1
S_{DS} :	0.896	C_v :	1.369

Ground motion hazard analysis may be required. See ASCE/SEI 7-16 Section 11.4.8.

Data Accessed: Thu Sep 19 2024

Date Source: USGS Seismic Design Maps

The ASCE Hazard Tool is provided for your convenience, for informational purposes only, and is provided "as is" and without warranties of any kind. The location data included herein has been obtained from information developed, produced, and maintained by third party providers; or has been extrapolated from maps incorporated in the ASCE standard. While ASCE has made every effort to use data obtained from reliable sources or methodologies, ASCE does not make any representations or warranties as to the accuracy, completeness, reliability, currency, or quality of any data provided herein. Any third-party links provided by this Tool should not be construed as an endorsement, affiliation, relationship, or sponsorship of such third-party content by or from ASCE.

ASCE does not intend, nor should anyone interpret, the results provided by this Tool to replace the sound judgment of a competent professional, having knowledge and experience in the appropriate field(s) of practice, nor to substitute for the standard of care required of such professionals in interpreting and applying the contents of this Tool or the ASCE standard.

In using this Tool, you expressly assume all risks associated with your use. Under no circumstances shall ASCE or its officers, directors, employees, members, affiliates, or agents be liable to you or any other person for any direct, indirect, special, incidental, or consequential damages arising from or related to your use of, or reliance on, the Tool or any information obtained therein. To the fullest extent permitted by law, you agree to release and hold harmless ASCE from any and all liability of any nature arising out of or resulting from any use of data provided by the ASCE Hazard Tool.

APPENDIX D

General Grading Specifications

GENERAL EARTHWORK AND GRADING SPECIFICATIONS

1. GENERAL INTENT

These specifications present general procedures and requirements for grading and earthwork as shown on the approved grading plans, including preparation of areas to be filled, placement of fill, installation of subdrains, and excavations. The recommendations contained in the geotechnical report are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict. Evaluations performed by the consultant during the course of grading may result in new recommendations of the geotechnical report.

2.EARTHWORK OBSERVATION AND TESTING

Prior to the commencement of grading, a qualified geotechnical consultant (soils engineer and engineering geologist, and their representatives) shall be employed for the purpose of observing earthwork and testing the fills for conformance with the recommendations of the geotechnical report and these specifications. It will be necessary that the consultant provide adequate testing and observation so that he may determine that the work was accomplished as specified. It shall be the responsibility of the contractor to assist the consultant and keep him apprised of work schedules and changes so that he may schedule his personnel accordingly.

It shall be the sole responsibility of the contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes or agency ordinances, these specifications and the approved grading plans. If in the opinion of the consultant, unsatisfactory conditions, such as questionable soil, poor moisture condition, inadequate compaction, adverse weather, etc., are resulting in a quality of work less than required in these specifications, the consultant will be empowered to reject the work and recommend that construction be topped until the conditions are rectified. Maximum dry density tests used to determine the degree of compaction will be performed in accordance with the American Society of Testing and Materials tests method ASTM D 1557-00.

3.0 PREPARATION OF AREAS TO BE FILLED

3.1 Clearing and Grubbing: All brush, vegetation and debris shall be removed or piled and otherwise disposed of.

3.2 Processing: The existing ground which is determined to be satisfactory for support of fill shall be scarified to a minimum depth of 6 inches. Existing ground which is not satisfactory shall be overexcavated as specified in the following section. Scarification shall continue until the soils are broken down and free of large clay lumps or clods and until the working surface is reasonably uniform and free of uneven features which would inhibit uniform compaction.

3.3 Overexcavation: Soft, dry, spongy, highly fractured or otherwise unsuitable ground, extending to such a depth that the surface processing cannot adequately improve the condition, shall be overexcavated down to firm ground, approved by the consultant.

3.4 Moisture Conditioning: Overexcavated and processed soils shall be watered, dried-back, blended, and/or mixed, as required to attain a uniform moisture content near optimum.

3.5 Recompaction: Overexcavated and processed soils which have been properly mixed and moisture- conditioned shall be recompacted to a minimum relative compaction of 90 percent.

3.6 Benching: Where fills are to be placed on ground with slopes steeper than 5: 1 (horizontal to vertical units), the ground shall be stepped or benched. The lowest bench shall be a minimum of 15 feet wide, shall be at least 2 feet deep, shall expose firm material, and shall be approved by the consultant. Other benches shall be excavated in firm material for a minimum width of 4 feet. Ground sloping flatter than 5 : 1 shall be benched or otherwise overexcavated when considered necessary by the consultant.

3.7 Approval: All areas to receive fill, including processed areas, removal areas and toe-of-fill benches shall be approved by the consultant prior to fill placement.

4.0 FILL MATERIAL

4.1 General: Material to be placed as fill shall be free of organic matter and other deleterious substances, and shall be approved by the consultant. Soils of poor gradation, expansion, or strength characteristics shall be placed in areas designated by consultant or shall be mixed with other soils to serve as satisfactory fill material.

4.2 Oversize: Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 12 inches, shall not be buried or placed in fills, unless the location, materials, and disposal methods are specifically approved by the consultant. Oversize disposal operations shall be such that nesting of oversize material does not occur, and such that the oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 feet vertically of finish grade or within the range of future utilities or underground construction, unless specifically approved by the consultant.

4.3 Import: If importing of fill material is required for grading, the import material shall meet the requirements of Section 4. 1.

5.0 FILL PLACEMENT AND COMPACTION

5.1 Fill Lifts: Approved fill material shall be placed in areas prepared to receive fill in near-horizontal layers not exceeding 6 inches in compacted thickness. The consultant may approve thicker lifts if testing indicates the grading procedures are such that adequate compaction is being achieved with lifts of greater thickness. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to attain uniformity of material and moisture in each layer.

5.2 Fill Moisture: Fill layers at a moisture content less than optimum shall be watered and mixed, and wet fill layers shall be aerated by scarification or shall be blended with drier material. Moisture-conditioning and mixing of fill layers shall continue until the fill material is at a uniform moisture content or near optimum.

5.3 Compaction of Fill: After each layer has been evenly spread, moisture conditioned, and mixed, it shall be uniformly compacted to not less than 90 percent of maximum dry density. Compaction equipment shall be adequately sized and shall be either specifically designed for soil compaction or of proven reliability, to efficiently achieve the specified degree of compaction.

5.4 Fill Slopes: Compaction of slopes shall be accomplished, in addition to normal compacting procedures, by backfilling of slopes with sheepsfoot rollers at frequent increments of 2 to 3 feet in fill elevation gain, or by other methods producing satisfactory results. At the completion of grading, the relative compaction of the slope out to the slope face shall be at least 90 percent.

5.5 Compaction Testing: Field tests to check the fill moisture and degree of compaction will be performed by the consultant. The location and frequency of tests shall be at the consultant's discretion. In general, the tests will be taken at an interval not exceeding 2 feet in vertical rise and/or 1,000 cubic yards of embankment.

6.0 SUBDRAIN INSTALLATION

Subdrain systems, if required, shall be installed in approved ground to conform to the approximate alignment and details shown on the plans or herein. The subdrain location or materials shall not be changed or modified without the approval of the consultant. The consultant, however, may recommend and upon approval, direct changes in subdrain line, grade or material. All subdrains should be surveyed for line and grade after installation, and sufficient time shall be allowed for the surveys, prior to commencement of filling over the subdrains.

7.0 EXCAVATION

Excavation and cut slopes will be examined during grading. If directed by the consultant, further excavation or overexcavation and refilling of cut areas shall be performed, and/or remedial grading of cut slopes shall be performed. Where fill-over-cut slopes are to be graded, unless otherwise approved, the cut portion of the slope shall made and approved by the consultant prior to placement of materials for construction of the fill portion of the slope.

8.0 TRENCH BACKFILLS

8.1 Supervision: Trench excavations for the utility pipes shall be backfilled under engineering supervision.

8.2 Pipe Zone: After the utility pipe has been laid, the space under and around the pipe shall be backfilled with clean sand or approved granular soil to a depth of at least one foot over the top of the pipe. The sand backfill shall be uniformly jetted into place before the controlled backfill is placed over the sand.

8.3 Fill Placement:'The onsite materials, or other soils approved by the engineer, shall be watered and mixed as necessary prior to placement in lifts over the sand backfill.

8.4 Compaction: The controlled backfill shall be compacted to at least 90 percent of the maximum laboratory density as determined by the ASTM compaction method described above.

8.5 Observation and 'Testing: Field density tests and inspection of the backfill procedures shall be made by the soil engineer during backfilling to see that the proper moisture content and uniform compaction is being maintained. The contractor shall provide test holes and exploratory pits as required by the soil engineer to enable sampling and testing.

soil PACIFIC INC.
Geotechnical and Environmental Services

February 14, 2025
Project No. A-9899-24

WMC, LLC
1024 Bayside Dr 109
Newport Beach, California 92660

Subject: **Infiltration Testing /Clarification Letter**
Proposed Multi-tenant Building Complex
220, 222, and 234 Victoria Place, Costa Mesa, California

Dear Sir:

Pursuant to your request, we are pleased to submit our clarification letter concerning the process of the on-site infiltration at the subject site. On-site percolation was performed during our sub-surafe exploration. Several boring shaft converted to on-site infiltration shafts. AKA Inverse Borehole Method . On-site soils were mainly cohesive and not permeable to be used for on-site infiltration.

Inlight of foregoing information it is our opinion that on-site infiltration rate at the subject parcels are in the order or less than .2 inches per hour. On-site infiltration is not feasible.

The opportunity to be of service is appreciated. Should any questions arise, please contact the undersigned in writing for clarification.

Soil Pacific Inc.,
Very Truly

Hoss Eftekhari
RCE

HOSS EFTEKHARI
No. C50121
EXP. 6-30-25
CIVIL

Porchet Method, Aka Inverse Borehole Method B'-6

$\Delta T := 30$ Time Interval 10 Minutes

$D0 := 24$ Initial Depth to Water, (inch)

$Df := 34$ Final Depth to Water, (inch)

$Dr := 120$ Total Depth of the Test Hole

$r := 2$ Test Hole Redius, Inch

$H0 := Dr - D0$ Initial height of water at the selected time interval

$H0 = 96$

$Hf := Dr - Df$ Final height of water at the selected time interval

$Hf = 86$

$\Delta H := H0 - Hf$ ΔH=ΔDChange in height over the time interval

$\Delta H = 10$

$$Havg := \frac{(H0 + Hf)}{2}$$

$Havg = 91$

The Conversion Equation is used:

$$IR := \frac{\Delta H \cdot (60 \cdot r)}{\Delta T \cdot (r + 2Havg)}$$

$IR = 0.217$ inch /Hour Infiltration rate without including factor of safety

$FS := 3$

$$Infilt := \frac{IR}{FS}$$

$Infilt = 0.072$ Per Hour

Porchet Method, Aka Inverse Borehole Method B'-7

$\Delta T := 40$ Time Interval 10 Minutes

$D0 := 24$ Initial Depth to Water, (inch)

$Df := 36$ Final Depth to Water, (inch)

$Dr := 120$ Total Depth of the Test Hole

$r := 2$ Test Hole Redius, Inch

$H0 := Dr - D0$ Initial height of water at the selected time interval

$H0 = 96$

$Hf := Dr - Df$ Final height of water at the selected time interval

$Hf = 84$

$\Delta H := H0 - Hf$ ΔH=ΔDChange in height over the time interval

$\Delta H = 12$

$$Havg := \frac{(H0 + Hf)}{2}$$

$Havg = 90$

The Conversion Equation is used:

$$IR := \frac{\Delta H \cdot (60 \cdot r)}{\Delta T \cdot (r + 2Havg)}$$

$IR = 0.198$ inch /Hour Infiltration rate without including factor of safety

$FS := 3$

$$Infilt := \frac{IR}{FS}$$

$Infilt = 0.066$ Per Hour

Porchet Method, Aka Inverse Borehole Method B'-8

$\Delta T := 50$	Time Interval 10 Minutes
$D0 := 30$	Initial Depth to Water, (inch)
$Df := 44$	Final Depth to Water, (inch)
$Dr := 120$	Total Depth of the Test Hole
$r := 2$	Test Hole Redius, Inch
$H0 := Dr - D0$	Initial height of water at the selected time interval

$H0 = 90$

$Hf := Dr - Df$ Final height of water at the selected time interval

$Hf = 76$

$\Delta H := H0 - Hf$ ΔH=ΔDChange in height over the time interval

$\Delta H = 14$

$$Havg := \frac{(H0 + Hf)}{2}$$

$Havg = 83$

The Conversion Equation is used:

$$IR := \frac{\Delta H \cdot (60 \cdot r)}{\Delta T \cdot (r + 2Havg)}$$

$IR = 0.2$ inch /Hour Infiltration rate without including factor of safety

$FS := 3$

$$Infilt := \frac{IR}{FS}$$

$Infilt = 0.067$ Per Hour

APPENDIX G

OPERATION AND MAINTENANCE (O&M) PLAN

OPERATION AND MAINTENANCE (O&M) PLAN

Water Quality Management Plan
for

VICTORIA STREET TOWNHOME PROJECT (TR 19351)

220, 222, 234 & 236 Victoria Street

Costa Mesa, CA 92626

Appendix G, Operation and Maintenance Plan
Note: OWNER = WMC, LLC

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Non-Structural Source Control BMPs			
Y	**N1. Education for Property Owners, Tenants and Occupants** Educational materials shall be reviewed and made available to purchasers of the Victoria Place Townhomes. Refer to Appendices A and B of the Project WQMP for a list of applicable educational materials and BMP Fact Sheets. For developments with POA and residential projects of more than fifty (50) dwelling units, project conditions of approval will require that the POA periodically provide environmental awareness education materials, made available by the municipalities, to all of its members. Among other things, these materials will describe the use of chemicals (including household type) that should be limited to the property, with no discharge of wastes via hosing or other direct discharge to gutters, catch basins and storm drains. Educational materials available from the County of Orange can be downloaded here: http://www.ocwatersheds.com/PublicEd/resources/default.aspx	**Frequency: Upon occupancy, and annually thereafter**	**WMC, LLC** **(Owner)** **1024 Bayside Drive, Suite 109** **Newport Beach, CA 92660** **Contact: Tony Weeda** **tweeda@sbcglobal.net**

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Y	**N2. Activity Restrictions** The owner shall include in any employee training manual, lease, and/or CCRs the on-site activity restrictions, including but not limited to: (1) No hosing down of any paved surface where the water would flow directly to the street, gutter or storm drain; (2) No car washing outside of established community car wash areas (if any); and (3) No disposal of wash water in the street, gutter or storm drain—all wash water must be disposed of in a mop sink or an area with a floor drain.	**Frequency: Continuous**	**WMC, LLC** **(Owner)** **1024 Bayside Drive, Suite 109** **Newport Beach, CA 92660** **Contact: Tony Weeda** **tweeda@sbcglobal.net**
Y	**N3. Common Area Landscape Management** Ongoing maintenance must be consistent with the City's adopted water conservation ordinance, plus fertilizer and pesticide usage consistent with the "County Management Guidelines for Use of Fertilizers and Pesticides." Landscaping irrigation systems shall be adjusted and properly maintained to prevent over spray runoffs. Green waste shall not be blown or swept into, or disposed of, in the street, gutter, public right-of-way, or storm drain catch basins or inlets. Leaf blowers, if used, shall be used to move green waste into piles so they can be swept and picked up and disposed of in green waste recycling containers.	**Frequency: Weekly**	**WMC, LLC** **(Owner)** **1024 Bayside Drive, Suite 109** **Newport Beach, CA 92660** **Contact: Tony Weeda** **tweeda@sbcglobal.net**

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Y	**N4. BMP Maintenance** Owner shall be responsible for implementation of each non-structural BMP and regularly scheduled cleaning of all BMP structural facilities. Records of inspections and BMP maintenance shall be maintained by the owner and shall be available for review upon request.	**Frequency: Continuous**	**WMC, LLC** **(Owner)** **1024 Bayside Drive, Suite 109** **Newport Beach, CA 92660** **Contact: Tony Weeda** **tweeda@sbcglobal.net**
Y	**N11. Common Area Litter Control** The Owner shall provide an adequate number of trash receptacles on site. Litter patrol, emptying of trash receptacles, violation investigation, reporting and other litter control activities shall be performed in conjunction with maintenance activities.	**Frequency: Weekly**	**WMC, LLC** **(Owner)** **1024 Bayside Drive, Suite 109** **Newport Beach, CA 92660** **Contact: Tony Weeda** **tweeda@sbcglobal.net**
Y	**N12. Employee Training** The Owner shall prepare a training manual(s) for existing and future employees. The manual should include information on non-point source pollution and how to use proper Best Management Practices (BMPs) to minimize runoff pollutants. Training shall be provided upon hire and at regular intervals thereafter.	**Frequency: Upon hire, and annually thereafter**	**WMC, LLC** **(Owner)** **1024 Bayside Drive, Suite 109** **Newport Beach, CA 92660** **Contact: Tony Weeda** **tweeda@sbcglobal.net**
N	**N13. Housekeeping of Loading Docks**		

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Y	**N14. Common Area Catch Basin Inspection** The catch basins will be inspected, cleaned and maintained on an annual basis, in the early fall prior to the start of the rainy season, and before and after all major storms.	**Frequency: Annually, and before and after all major storms**	**WMC, LLC** **(Owner)** **1024 Bayside Drive, Suite 109** **Newport Beach, CA 92660** **Contact: Tony Weeda** **tweeda@sbcglobal.net**

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Y	**N15. Street Sweeping Private Streets and Parking Lots** The Owner or his agent must sweep all drive aisles and parking areas regularly (minimum monthly), and prior to the storm season (no later than October 1st each year). Sweeping shall be done with a vacuum-type sweeper. Under no circumstances are outdoor areas/lots to be rinsed or washed with water unless said rinse/wash water is collected and disposed of properly (i.e. into the sewer).	**Frequency: Biweekly or More Often if Needed**	**WMC, LLC** **(Owner)** **1024 Bayside Drive, Suite 109** **Newport Beach, CA 92660** **Contact: Tony Weeda** **tweeda@sbcglobal.net**

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Structural Source Control BMPs			
Y	**S1. Provide Storm Drain System Stenciling and Signage** Storm drain stencils are highly visible source control messages, typically placed directly adjacent to storm drain inlets. The stencils contain a brief statement that prohibits the dumping of improper materials into the municipal storm drain system. Graphical icons, either illustrating anti-dumping symbols or images of receiving water fauna, are effective supplements to the anti-dumping message. Stencils and signs alert the public to the destination of pollutants discharged into stormwater. The following requirements should be included in the project design and shown on the project plans: 1. Provide stenciling or labeling of all storm drain inlets and catch basins, constructed or modified, within the project area with prohibitive language (such as: “NO DUMPING-DRAINS TO OCEAN”) and/or graphical icons to discourage illegal dumping. 2. Post signs and prohibitive language and/or graphical icons, which prohibit illegal dumping at public access points along channels and creeks within the project area. 3. Maintain legibility of stencils and signs. See CASQA Stormwater Handbook BMP Fact Sheet SD-13 for additional information. Storm drain stencils shall be inspected for legibility, at a minimum, once prior to the storm season, and no later than October 1st of each year. Those signs determined to be illegible will be re-stenciled as soon as possible.	**Frequency: Annually**	**WMC, LLC** **(Owner)** **1024 Bayside Drive, Suite 109** **Newport Beach, CA 92660** **Contact: Tony Weeda** **tweeda@sbcglobal.net**

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Y	**S4. Use Efficient Irrigation Systems & Landscape Design** Projects shall design the timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the municipal storm drain system. The following methods to reduce excessive irrigation runoff shall be considered, and incorporated on common areas of development and other areas where determined applicable and feasible by the Permittee: 1. Employing rain shutoff devices to prevent irrigation after precipitation. 2. Designing irrigation systems to each landscape area's specific water requirements. 3. Using flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines. 4. Implementing landscape plan consistent with County Water Conservation Resolution or city equivalent, which may include provision of water sensors, programmable irrigation times (for short cycles), etc. 5. The timing and application methods of irrigation water shall be designed to minimize the runoff of excess irrigation water into the municipal storm drain system. 6. Employing other comparable, equally effective, methods to reduce irrigation water runoff. 7. Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements (for example, native or drought tolerant species). Consider other design features, such as:	**Frequency: Monthly**	**WMC, LLC** **(Owner)** **1024 Bayside Drive, Suite 109** **Newport Beach, CA 92660** **Contact: Tony Weeda** **tweeda@sbcglobal.net**

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Y	**S4. Use Efficient Irrigation Systems & Landscape Design (cont'd)** • Use mulches (such as wood chips or shredded wood products) in planter areas without ground cover to minimize sediment in runoff. • Install appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant material where possible and/or as recommended by the landscape architect. • Leave a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible. • Choose plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth. Irrigation practices shall comply with local and statewide ordinances related to irrigation efficiency.	**Frequency: Monthly**	**WMC, LLC** **(Owner)** **1024 Bayside Drive, Suite 109** **Newport Beach, CA 92660** **Contact: Tony Weeda** **tweeda@sbcglobal.net**

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Low Impact Development BMPs			
Y	**Treatment Control BMP #1** **Proprietary Catch Basin Insert Filters** **(Oldcastle FloGard +Plus Insert Filters or Approved Equivalent)** Twice a year, prior to and after the rainy season, and after major storm events, the catch basin insert filters shall be visually inspected for damage, have all sediment and debris removed, and the filter medium pouches shall be replaced if necessary. The owner may conduct this maintenance himself, or may enter into a service contract for the maintenance of the insert filters as detailed in the Oldcastle FloGard +Plus Specs/Maintenance Requirements brochure, a copy of which is attached hereto.	**Frequency:** **Every Six Months (Approximately April 1st and October 1st) and Immediately After Major Storm Events**	**WMC, LLC** **(Owner)** **1024 Bayside Drive, Suite 109** **Newport Beach, CA 92660** **Contact: Tony Weeda** **tweeda@sbcglobal.net**

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Y	**Biotreatment BMP # 1** **Modular Wetlands System** **(BIO-7: Proprietary Biotreatment)** The Modular Wetlands System is to be maintained monthly as part of routine landscape maintenance activities, and shall be visually inspected monthly and immediately after major storm events to remove collected litter and foreign debris from the screening device. Every 12 to 24 months, the following maintenance should be performed: remove sediment from the Separation Chamber, replace the Cartridge Filter Media, and replace the Drain Down Filter Media. Additional/detailed maintenance instructions for the Modular Wetlands System are contained in the "Maintenance Guidelines for Modular Wetlands System," a copy of which is attached hereto.	**Frequency:** **Screening Device Maintenance: Monthly And Immediately After Major Storm Events** **Separation Chamber, Cartridge Filter Media, and Drain Down Filter Media Maintenance: Every 12 to 24 Months**	**WMC, LLC** **(Owner)** **1024 Bayside Drive, Suite 109** **Newport Beach, CA 92660** **Contact: Tony Weeda** **tweeda@sbcglobal.net**

Required Permits

No permits are required for the implementation, operation, and maintenance of the BMPs described in this plan.

Recordkeeping

All records must be maintained for at least five (5) years and must be made available for review upon request.

APPENDIX H

RECORD OF BMP IMPLEMENTATION, MAINTENANCE AND INSPECTION

RECORD OF BMP IMPLEMENTATION, MAINTENANCE AND INSPECTION

Today's Date: ______________________________

Name of Person Performing Activity (Printed): ______________________________

Signature: ______________________________

BMP Name (As Shown in O&M Plan)	Brief Description of Implementation, Maintenance, and Inspection Activity Performed

APPENDIX I

INSPECTION REPORT FOR MODULAR WETLANDS SYSTEM;

CLEANING AND MAINTENANCE REPORT FOR MODULAR WETLANDS SYSTEM

BIO CLEAN ENVIRONMENTAL SERVICES, INC.

Inspection Report
Modular Wetlands System

MODULAR WETLANDS

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 ____________________

For Office Use Only
(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: ____________________

Cleaning and Maintenance Report
Modular Wetlands System

For Office Use Only

(Reviewed By)

(Date)

Office personnel to complete section to the left.

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 ______________________________

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:

2972 San Luis Rey Road, Oceanside, CA 92058 P. 760.433.7640 F. 760.433.3176

APPENDIX J

ANNUAL CERTIFICATE OF COMPLIANCE

(BMP MAINTENANCE)

ANNUAL CERTIFICATE OF COMPLIANCE
(BMP INSPECTION & MAINTENANCE)

Project: Victoria Street Townhome Project (TR 19351) **Year:** ___________________
220, 222, 234 & 236 Victoria Street
Costa Mesa, CA 92626

CERTIFICATION: I certify that the above-named project has complied with the inspection and maintenance frequencies specified for the onsite Best Management Practices (BMPs) detailed in the Operation and Maintenance Plan and the Water Quality Management Plan for the project. The project includes the following routine source control BMPs (marked with an "X"):

X	N1. Education for Property Owners, Tenants and Occupants	**X**	S1. Provide storm drain system stenciling and signage
X	N2. Activity Restrictions		S2. Design and construct outdoor material storage areas to reduce pollution introduction
X	N3. Common Area Landscape Management		S3. Design and construct trash and waste storage areas to reduce pollution introduction
X	N4. BMP Maintenance	**X**	S4. Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control
	N5. Title 22 CCR Compliance (How development will comply)		S5. Protect slopes and channels and provide energy dissipation Incorporate requirements applicable to individual priority project categories (from SDRWQCB NPDES Permit)
	N6. Local Industrial Permit Compliance		
	N7. Spill Contingency Plan		S6. Dock areas
	N8. Underground Storage Tank Compliance		S7. Maintenance bays
	N9. Hazardous Materials Disclosure Compliance		S8. Vehicle wash areas
	N10. Uniform Fire Code Implementation		S9. Outdoor processing areas
X	N11. Common Area Litter Control		S10. Equipment wash areas
X	N12. Employee Training		S11. Fueling areas
	N13. Housekeeping of Loading Docks		S12. Hillside landscaping
X	N14. Common Area Catch Basin Inspection		S13. Wash water control for food preparation areas
X	N15. Street Sweeping Private Streets and Parking Lots		S14. Community car wash racks
	N16. Retail Gasoline Outlets		

Owner has also upheld the recommended inspection and maintenance schedule for the project's LID BMPs listed below:

Modular Wetlands System
Oldcastle FloGard +PLUS Catch Basin Insert Filters

This facility is in compliance with the requirements of the City of Costa Mesa, the Regional Water Quality Control Board and the National Pollution Discharge Elimination System.
Copies of site inspection and maintenance reports are on file at the main Facility offices.

Facility Owner / Director____

Printed Name:________________________________ Date:__________________________

I hereby certify that this document and any attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

Facility Owner / Director____

Printed Name:________________________________ Date:__________________________

APPENDIX K

NOTICE OF TRANSFER OF RESPONSIBILITY FOR WQMP

NOTICE OF TRANSFER OF RESPONSIBILITY

WATER QUALITY MANAGEMENT PLAN

Victoria Street Townhome Project (TR 19351)

220, 222, 234 & 236 Victoria Street
Costa Mesa, CA 92626

Submission of this Notice of Transfer of Responsibility constitutes notice to the City of Costa Mesa 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 its 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 not 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 subject to 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 Owner 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 hereby certify that ____is 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:	Date:

B. New Owner

I hereby certify that ____is 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 been informed 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 L

PRELIMINARY HYDROLOGY REPORT

FOR TTM 19351, DATED FEBRUARY 11, 2025

CA ENGINEERING, INC.

Planning • Engineering • Surveying

PRELIMINARY HYDROLOGY REPORT

FOR

T.T.M. 19351

220 – 236 Victoria St.

City of Costa Mesa, CA

Date: January 6, 2025
Revised: February 11, 2025

REGISTERED PROFESSIONAL ENGINEER
FRED CORNWELL
NO. 45591
CIVIL
STATE OF CALIFORNIA

PLANS PREPARED UNDER THE SUPERVISION OF:

2-11-25

Fred Cornwell, P.E. - R.C.E 45591 Date

Table of Contents

1.0 INTRODUCTION

The purpose of this report is to present the hydrology analysis and drainage calculations for a proposed residential development located 220 – 236 Victoria Pl., in the City of Costa Mesa, California. The site proposes to construct 40 townhomes and related improvements on approximately 1.7 acres. This report will determine the existing and proposed storm water runoff rates from the project site and determine the impact on the existing surrounding drainage facilities,

2.0 EXISTING DRAINAGE CONDITIONS

The project site is located in the City of Costa Mesa, California, and is comprised of approximately 1.7 acres. The site currently has a boat storage facility, Allied Lighting building, Suburban Plumbing building, a house & Battery Mart building.

There are no runoff flows from the neighboring sites and all flows flow to the existing street.

3.0 PROPOSED DRAINAGE CONDITIONS

The drainage for the proposed project generally follows the existing flow characteristics. The site flows from north to south and the proposed site will also flow from the north to the south. The on-site flows will be picked up in drain inlets and conveyed southerly via an on-site drainage system. The on-site drainage system will convey the flows to a proposed Modular Wetlands System (MWS) that will treat the low flows and will be designed to bypass the greater storm flows. Once the flows are treated they will be conveyed to the existing storm drain in Victoria Place.

4.0 METHODOLOGY

The hydrology calculations for the study were completed using AES software based on the Orange County Hydrology Manual methodology. The Rational Method was used to determine the peak discharges for the pre-and post-developed conditions and can be found in Appendix “A” (existing) & Appendix “B” (proposed).

These peak flow rates for the 2, 10, 25 and 100 year storm events will be compared in the results section of this report found below. The hydrologic sub areas and flow paths that produce these rates are shown on the Existing (Exhibit A) & Proposed (Exhibit B) hydrology maps.

The on-site drainage will analyzed for the surface flow only and will not model the low flow inlets for the existing or proposed condition. Since the site is flat and has low ponding areas for both the existing and proposed condition, a surface flow path slope of 0.002 will be implemented for both the existing and proposed condition. This will accurately model the pre and post development flow comparison.

5.0 HYDRAULICS

5.1 CATCH BASIN CALCULATIONS

The Tables below show the sizing of the proposed grated & curb inlet catch basins.
Flow values from the Proposed Hydrology for the catch basins.

GRATED BASINS: Q = (P) (3.0) (H)3/2
(From Bureau of Public Rds.)
INPUT: "Q" (cfs)
"P" = Effective Perimeter of Basin (ft)
(Assumes 50% clogging)

Grated Basins						
Catch Basin #	**Node #**	**Q100 (CFS)**	**Basin Size**	**Perimeter**	**50% P**	**Depth (H)**
1	2	0.9	18”	6’	3’	0.26’
2	3	1.65	24”	8’	4'	0.26’
3	5	1.60	24”	8’	4'	0.26’
4	11	0.91	18”	6’	3’	0.26’
5	12	1.65	24”	8’	4'	0.26’
6	14	1.60	24”	8’	4'	0.26’

Note – The proposed catch basins will have filter inserts that will treat the first flush flow amounts.

The inlets will allow the proposed flows into the system with a maximum ponding of approximately 3”. Once the flows enter the system they will be conveyed to the modular wetlands where the flow will be treated and then discharged into the existing storm drain system.

Pipe Flows:
There will be low flow pipes installed in both drive aisles to convey flows to the Modular Wetlands unit. The pipes have a maximum capacity of 1.33 cfs (Appendix “D”) which is greater than the flows that need to be treated but are less than the total flows tributary to the inlets. The excess flows greater than the pipe capacities will flow down the drive aisles to Victoria St. which is how the hydrology calculations were modeled.

There are a couple of high points in the drive aisles that will act as a weir if the pipe system fails. To determine the depth of flow over the high points, the weir equation from King’s Handbook of Hydraulics will be implemented.
Q=CLH^1.5 : H=(Q/CL)^0.666
C=2.68
L = 25’
Q = 2.5 cfs (As shown on the piping hydrology map – 1st confluence)

H=(2.5/2.68*25)^0.6666 = 0.11’

The average depth of 0.11’will have no adverse effect on the proposed development.

6.0 WATER QUALITY

The BMP facilities will be sized to capture and treat the Design Flow Rate (DFR) per the Technical Guidance Document as published by the County of Orange.

Since there are no hydraulic conditions of concern (HCOC's), the flow will not have to be detained.

7.0 FLOOD PLAIN DESIGNATION

The site falls within a Zone "X" designation under the FEMA Map 06059C0268J, dated December 3, 2009. Zone X (Shaded Orange Area) represents areas determined 0.2% annual chance flood hazard, area of 1% annual chance flood with average depth less than one foot or with drainage areas less than one square mile.

8.0 RESULTS

The results of the Existing and Proposed (overall hydrology map) conditions for the existing site outlet location as shown on the hydrology maps are as follows:

	Existing Condition	Tc (min)	Proposed Condition	Tc (min)	Increase (Decrease)
2 Year Storm	2.02 CFS	13.31	1.88 CFS	14.70	**(0.14) CFS**
10 Year Storm	3.72 CFS	12.94	3.45 CFS	14.47	**(0.27) CFS**
25 Year Storm	4.47 CFS	12.84	4.16 CFS	14.38	**(0.31) CFS**
100 Year Storm	5.75 CFS	12.69	5.34 CFS	14.26	**(0.41) CFS**

9.0 CONCLUSION

To meet water quality requirements, the DFR will be captured onsite with grate inlet catch basins and an conveyed to the MWS. During larger storm events, as with existing conditions, drainage for the proposed project will outlet onto Victoria Pl.

During a 100 year storm event, existing flows (5.75 CFS) will be decreased by 0.41 CFS under proposed conditions (5.34 CFS). For the 10 year storm event, existing flows (3.72 CFS) will be decreased 0.27 CFS under proposed conditions (3.45 CFS). For the 25 year storm event, existing flows (4.47 CFS) will be decreased 0.31 CFS under proposed conditions (4.16 CFS). For the 10 year storm event, existing flows (3.72 CFS) will be decreased 0.27 CFS under proposed conditions (3.45 CFS). For the 2 year storm event, existing flows (1.72 CFS) will be increased by 1.20 CFS under proposed conditions (2.92 CFS).

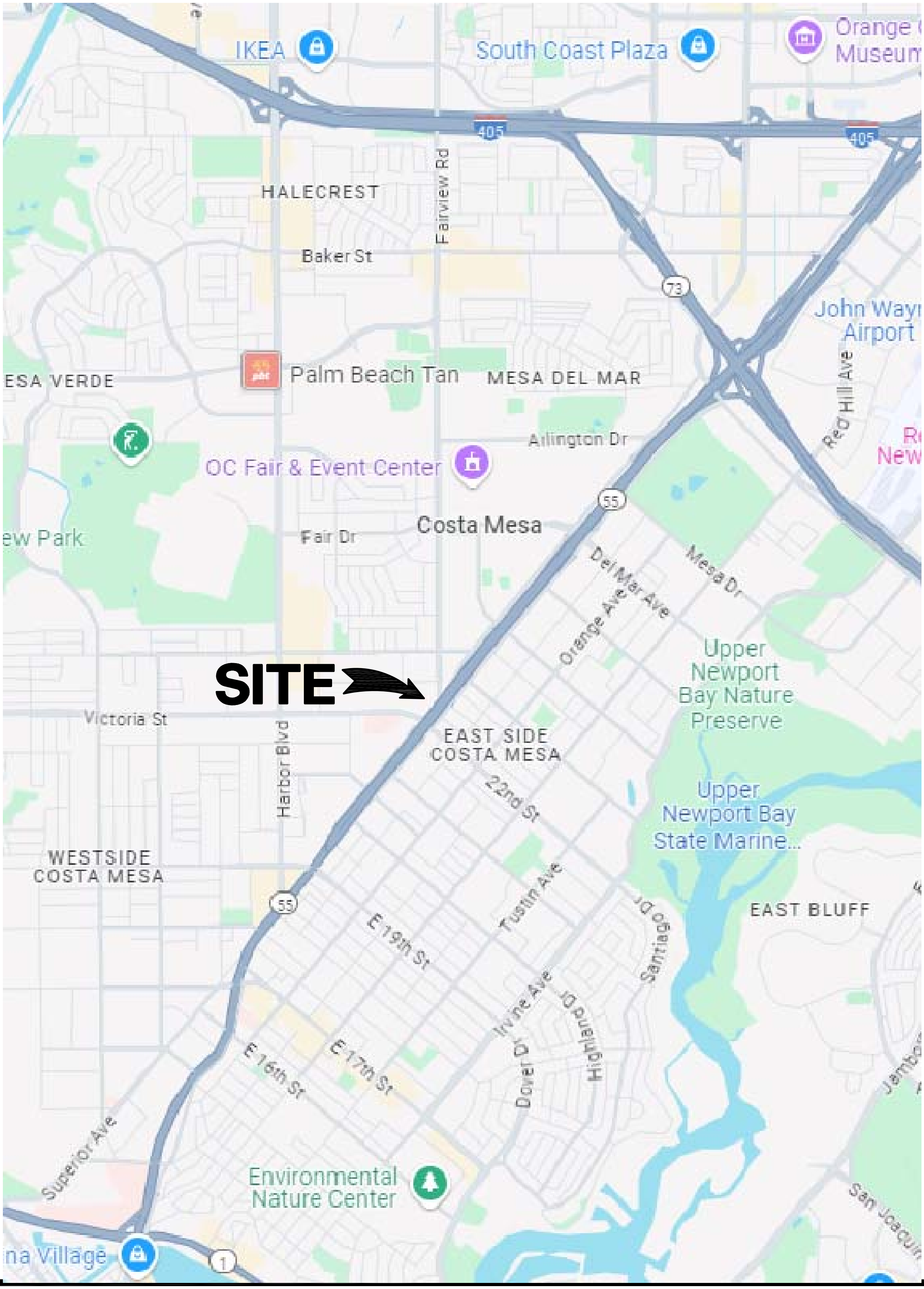
From the inlet calculations, there will be approximately 3" of ponding during the 100 year storm which will have no adverse effect on the project.

The proposed project will increase the peak flows due to implementing drainage devices that will improve the drainage for the site. The current site has very little fall and low ponding points that will be resolved via the proposed project.

10.0 VICINITY MAP

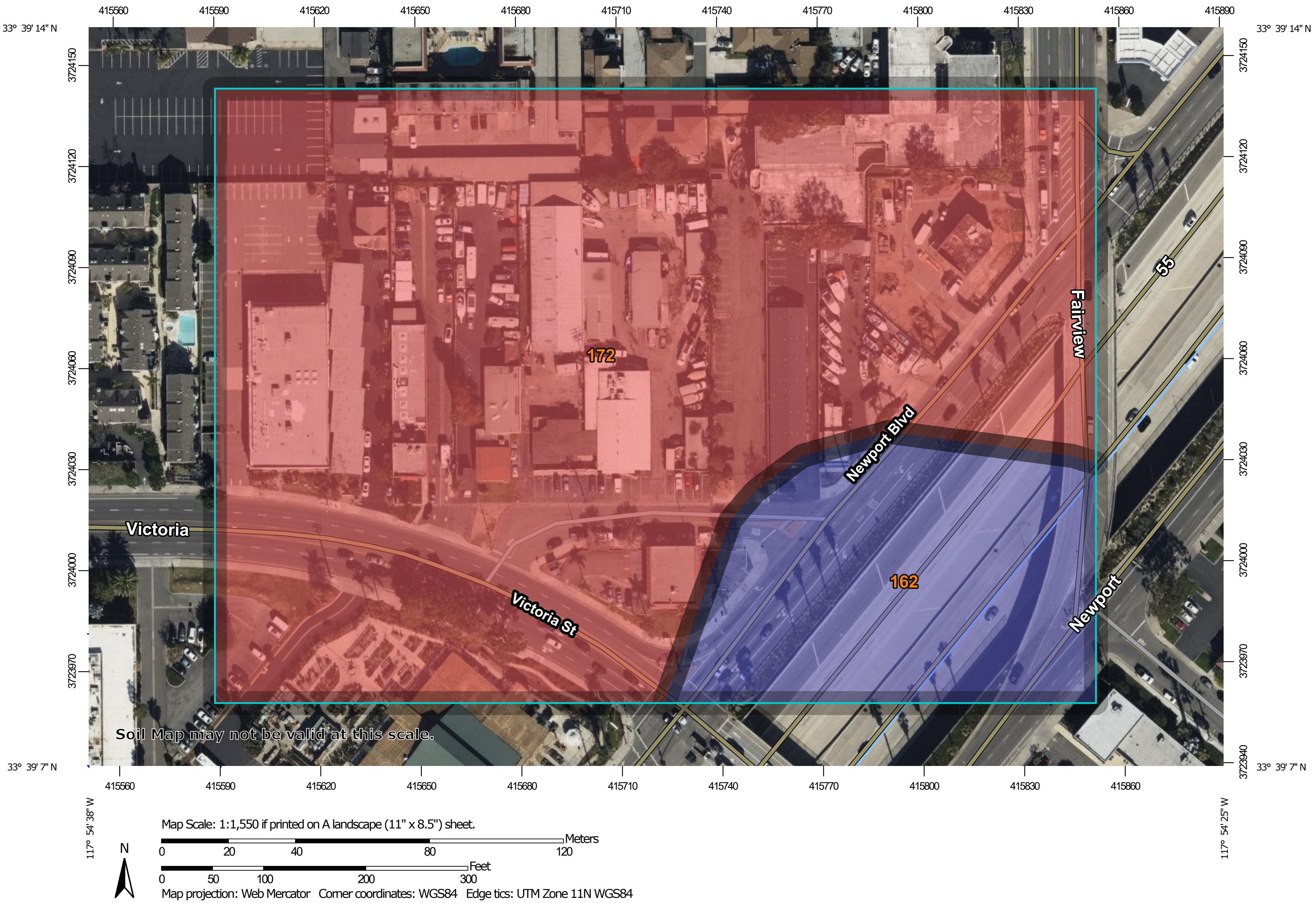
VICINITY MAP

N.T.S.



11.0 SOIL MAP

Hydrologic Soil Group—Orange County and Part of Riverside County, California



Map Scale: 1:1,550 if printed on A landscape (11" x 8.5") sheet.

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 1:24,000.

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: Orange County and Part of Riverside County, California
Survey Area Data: Version 17, Aug 30, 2023

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

Date(s) aerial images were photographed: Jan 17, 2023—Feb 8, 2023

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
162	Marina loamy sand, 2 to 9 percent slopes	B	2.1	18.0%
172	Myford sandy loam, 0 to 2 percent slopes	D	9.8	82.0%
Totals for Area of Interest			**11.9**	**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

APPENDICES

APPENDIX A: EXISTING RATIONAL METHOD, 2, 10, 25 & 100 YEAR STORM FREQUENCY OUTPUT FILES.

```
 ****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
         (c) Copyright 1983-2008 Advanced Engineering Software (aes)
             Ver. 15.0  Release Date: 04/01/2008  License ID 1420

                           Analysis prepared by:

                               CA Engineering
                         13821 Newport Ave., Ste 110
                             Tustin, Ca. 92780


  ************************** DESCRIPTION OF STUDY **************************
 * EXISTING CONDITION                                                       *
 * 2 YR STORM                                                               *
 *                                                                          *
  **************************************************************************

   FILE NAME: 727-6EX.DAT
   TIME/DATE OF STUDY: 18:27 02/05/2025
 ============================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =    2.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
   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) =   292.00
   ELEVATION DATA: UPSTREAM(FEET) =     84.63  DOWNSTREAM(FEET) =     84.05

   Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
```

```
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.219
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.502
  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        0.90      0.20     0.100    57   10.22
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      1.20
  TOTAL AREA(ACRES) =      0.90   PEAK FLOW RATE(CFS) =      1.20

*****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  91
-----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
=============================================================================
  UPSTREAM NODE ELEVATION(FEET) =     84.05
  DOWNSTREAM NODE ELEVATION(FEET) =     83.72
  CHANNEL LENGTH THRU SUBAREA(FEET) =   161.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   2.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.290
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 D        0.87      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) =      1.70
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.87
  AVERAGE FLOW DEPTH(FEET) =   0.17   FLOOD WIDTH(FEET) =   27.17
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   3.09   Tc(MIN.) =   13.31
  SUBAREA AREA(ACRES) =    0.87       SUBAREA RUNOFF(CFS) =    0.99
  EFFECTIVE AREA(ACRES) =    1.77     AREA-AVERAGED Fm(INCH/HR) =   0.02
  AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.10
  TOTAL AREA(ACRES) =        1.8         PEAK FLOW RATE(CFS) =       2.02

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.18   FLOOD WIDTH(FEET) =   29.06
  FLOW VELOCITY(FEET/SEC.) =   0.91   DEPTH*VELOCITY(FT*FT/SEC) =   0.16
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     453.00 FEET.
=============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.8  TC(MIN.) =     13.31
  EFFECTIVE AREA(ACRES) =      1.77  AREA-AVERAGED Fm(INCH/HR)=  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =       2.02
=============================================================================
=============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
         (c) Copyright 1983-2008 Advanced Engineering Software (aes)
             Ver. 15.0  Release Date: 04/01/2008  License ID 1420

                           Analysis prepared by:

                               CA Engineering
                        13821 Newport Ave., Ste 110
                             Tustin, Ca. 92780


 ************************** DESCRIPTION OF STUDY **************************
* EXISTING CONDITION                                                       *
* 10 YR STORM                                                              *
*                                                                          *
 **************************************************************************

  FILE NAME: 727-6EX.DAT
  TIME/DATE OF STUDY: 18:26 02/05/2025
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II 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) =   292.00
  ELEVATION DATA: UPSTREAM(FEET) =     84.63  DOWNSTREAM(FEET) =     84.05

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.219
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.695
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                D        0.90      0.20     0.100    75   10.22
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      2.17
 TOTAL AREA(ACRES) =      0.90   PEAK FLOW RATE(CFS) =      2.17

****************************************************************************
 FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  91
----------------------------------------------------------------------------
 >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
 UPSTREAM NODE ELEVATION(FEET) =     84.05
 DOWNSTREAM NODE ELEVATION(FEET) =     83.72
 CHANNEL LENGTH THRU SUBAREA(FEET) =   161.00
 "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
 PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0150
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
 MAXIMUM DEPTH(FEET) =   2.00
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.354
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                D        0.87      0.20     0.100    75
 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) =      3.08
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.98
 AVERAGE FLOW DEPTH(FEET) =   0.21   FLOOD WIDTH(FEET) =   34.74
 "V" GUTTER FLOW TRAVEL TIME(MIN.) =   2.73   Tc(MIN.) =   12.94
 SUBAREA AREA(ACRES) =    0.87       SUBAREA RUNOFF(CFS) =    1.83
 EFFECTIVE AREA(ACRES) =    1.77     AREA-AVERAGED Fm(INCH/HR) =   0.02
 AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.10
 TOTAL AREA(ACRES) =        1.8         PEAK FLOW RATE(CFS) =       3.72

 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) =  0.22   FLOOD WIDTH(FEET) =   37.40
 FLOW VELOCITY(FEET/SEC.) =   1.03   DEPTH*VELOCITY(FT*FT/SEC) =   0.23
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     453.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =        1.8  TC(MIN.) =     12.94
 EFFECTIVE AREA(ACRES) =      1.77  AREA-AVERAGED Fm(INCH/HR)=  0.02
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.100
 PEAK FLOW RATE(CFS)   =       3.72
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
         (c) Copyright 1983-2008 Advanced Engineering Software (aes)
             Ver. 15.0  Release Date: 04/01/2008  License ID 1420

                           Analysis prepared by:

                               CA Engineering
                        13821 Newport Ave., Ste 110
                             Tustin, Ca. 92780


 ************************** DESCRIPTION OF STUDY **************************
* EXISTING CONDITION                                                       *
* 25 YR STORM                                                              *
*                                                                          *
 **************************************************************************

  FILE NAME: 727-6EX.DAT
  TIME/DATE OF STUDY: 18:25 02/05/2025
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II 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) =   292.00
  ELEVATION DATA: UPSTREAM(FEET) =     84.63  DOWNSTREAM(FEET) =     84.05

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.219
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.219
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  COMMERCIAL                 D        0.90      0.20     0.100    75   10.22
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      2.59
  TOTAL AREA(ACRES) =      0.90   PEAK FLOW RATE(CFS) =      2.59

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =     84.05
  DOWNSTREAM NODE ELEVATION(FEET) =     83.72
  CHANNEL LENGTH THRU SUBAREA(FEET) =   161.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   2.00
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.828
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 D        0.87      0.20     0.100    75
  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) =      3.69
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.02
  AVERAGE FLOW DEPTH(FEET) =   0.22   FLOOD WIDTH(FEET) =   37.40
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   2.62   Tc(MIN.) =   12.84
  SUBAREA AREA(ACRES) =    0.87       SUBAREA RUNOFF(CFS) =    2.20
  EFFECTIVE AREA(ACRES) =    1.77     AREA-AVERAGED Fm(INCH/HR) =   0.02
  AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.10
  TOTAL AREA(ACRES) =       1.8        PEAK FLOW RATE(CFS) =       4.47

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.24   FLOOD WIDTH(FEET) =   40.43
  FLOW VELOCITY(FEET/SEC.) =   1.07   DEPTH*VELOCITY(FT*FT/SEC) =   0.25
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     453.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.8  TC(MIN.) =     12.84
  EFFECTIVE AREA(ACRES) =      1.77  AREA-AVERAGED Fm(INCH/HR)=  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =       4.47
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
         (c) Copyright 1983-2008 Advanced Engineering Software (aes)
             Ver. 15.0  Release Date: 04/01/2008  License ID 1420

                           Analysis prepared by:

                               CA Engineering
                        13821 Newport Ave., Ste 110
                             Tustin, Ca. 92780


 ************************** DESCRIPTION OF STUDY ***************************
* EXISTING CONDITION                                                        *
* 100 YR STORM                                                              *
*                                                                           *
 ***************************************************************************

  FILE NAME: 727-6EX.DAT
  TIME/DATE OF STUDY: 18:25 02/05/2025
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) III 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) =   292.00
  ELEVATION DATA: UPSTREAM(FEET) =     84.63  DOWNSTREAM(FEET) =     84.05

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.219
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.108
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  COMMERCIAL                 D        0.90      0.20     0.100    91   10.22
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      3.31
  TOTAL AREA(ACRES) =      0.90   PEAK FLOW RATE(CFS) =      3.31

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =     84.05
  DOWNSTREAM NODE ELEVATION(FEET) =     83.72
  CHANNEL LENGTH THRU SUBAREA(FEET) =   161.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   2.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.628
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 D        0.87      0.20     0.100    91
  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) =      4.73
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.09
  AVERAGE FLOW DEPTH(FEET) =   0.24   FLOOD WIDTH(FEET) =   41.19
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   2.47   Tc(MIN.) =   12.69
  SUBAREA AREA(ACRES) =    0.87       SUBAREA RUNOFF(CFS) =    2.83
  EFFECTIVE AREA(ACRES) =    1.77     AREA-AVERAGED Fm(INCH/HR) =   0.02
  AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.10
  TOTAL AREA(ACRES) =        1.8         PEAK FLOW RATE(CFS) =       5.75

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.26   FLOOD WIDTH(FEET) =   44.60
  FLOW VELOCITY(FEET/SEC.) =   1.13   DEPTH*VELOCITY(FT*FT/SEC) =   0.29
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     453.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.8  TC(MIN.) =     12.69
  EFFECTIVE AREA(ACRES) =      1.77  AREA-AVERAGED Fm(INCH/HR)=  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =       5.75
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

APPENDIX B: PROPOSED RATIONAL METHOD, 2, 10, 25 & 100 YEAR STORM FREQUENCY OUTPUT FILES. (OVERALL CONDITION)

```
____________________________________________________________________________
 ****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
         (c) Copyright 1983-2008 Advanced Engineering Software (aes)
             Ver. 15.0  Release Date: 04/01/2008  License ID 1420

                           Analysis prepared by:

                               CA Engineering
                        13821 Newport Ave., Ste 110
                             Tustin, Ca. 92780


  ************************** DESCRIPTION OF STUDY **************************
 * PROPOSED CONDITION                                                       *
 * 2 YR STORM                                                               *
 *                                                                          *
  **************************************************************************

   FILE NAME: 727-6PR.DAT
   TIME/DATE OF STUDY: 18:24 02/05/2025
 ============================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ============================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =    2.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
   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) =   291.00
   ELEVATION DATA: UPSTREAM(FEET) =     85.50  DOWNSTREAM(FEET) =     84.90

   Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
```

```
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.796
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.455
  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        0.61      0.20     0.200    57   10.80
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.78
  TOTAL AREA(ACRES) =      0.61   PEAK FLOW RATE(CFS) =      0.78

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =     84.90
  DOWNSTREAM NODE ELEVATION(FEET) =     84.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   276.00
  "V" GUTTER WIDTH(FEET) =   3.00   GUTTER HIKE(FEET) =  0.120
  PAVEMENT LIP(FEET) =  0.050   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   0.50
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.219
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 D        1.16      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) =      1.39
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.18
  AVERAGE FLOW DEPTH(FEET) =   0.27   FLOOD WIDTH(FEET) =   13.38
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   3.90   Tc(MIN.) =   14.70
  SUBAREA AREA(ACRES) =    1.16       SUBAREA RUNOFF(CFS) =    1.23
  EFFECTIVE AREA(ACRES) =    1.77     AREA-AVERAGED Fm(INCH/HR) =   0.04
  AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.20
  TOTAL AREA(ACRES) =        1.8         PEAK FLOW RATE(CFS) =       1.88

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.30   FLOOD WIDTH(FEET) =   15.96
  FLOW VELOCITY(FEET/SEC.) =   1.21   DEPTH*VELOCITY(FT*FT/SEC) =   0.36
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     567.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.8  TC(MIN.) =     14.70
  EFFECTIVE AREA(ACRES) =      1.77  AREA-AVERAGED Fm(INCH/HR)=  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.200
  PEAK FLOW RATE(CFS)   =       1.88
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
         (c) Copyright 1983-2008 Advanced Engineering Software (aes)
             Ver. 15.0  Release Date: 04/01/2008  License ID 1420

                           Analysis prepared by:

                               CA Engineering
                        13821 Newport Ave., Ste 110
                             Tustin, Ca. 92780


 ************************** DESCRIPTION OF STUDY **************************
* PROPOSED CONDITION                                                       *
* 10 YR STORM                                                              *
*                                                                          *
 **************************************************************************

  FILE NAME: 727-6PR.DAT
  TIME/DATE OF STUDY: 18:23 02/05/2025
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II 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) =   291.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.50  DOWNSTREAM(FEET) =     84.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.796
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.612
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  APARTMENTS                 D        0.61      0.20     0.200    75   10.80
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.41
  TOTAL AREA(ACRES) =      0.61   PEAK FLOW RATE(CFS) =      1.41

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =     84.90
  DOWNSTREAM NODE ELEVATION(FEET) =     84.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   276.00
  "V" GUTTER WIDTH(FEET) =   3.00   GUTTER HIKE(FEET) =  0.120
  PAVEMENT LIP(FEET) =  0.050   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   0.50
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.209
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 D        1.16      0.20     0.200    75
  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) =      2.54
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.25
  AVERAGE FLOW DEPTH(FEET) =   0.33   FLOOD WIDTH(FEET) =   18.66
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   3.67   Tc(MIN.) =   14.47
  SUBAREA AREA(ACRES) =    1.16       SUBAREA RUNOFF(CFS) =    2.26
  EFFECTIVE AREA(ACRES) =    1.77     AREA-AVERAGED Fm(INCH/HR) =   0.04
  AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.20
  TOTAL AREA(ACRES) =        1.8        PEAK FLOW RATE(CFS) =       3.45

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.36   FLOOD WIDTH(FEET) =   21.76
  FLOW VELOCITY(FEET/SEC.) =   1.30   DEPTH*VELOCITY(FT*FT/SEC) =   0.47
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     567.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.8  TC(MIN.) =     14.47
  EFFECTIVE AREA(ACRES) =      1.77  AREA-AVERAGED Fm(INCH/HR)=  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.200
  PEAK FLOW RATE(CFS)   =       3.45
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
         (c) Copyright 1983-2008 Advanced Engineering Software (aes)
             Ver. 15.0  Release Date: 04/01/2008  License ID 1420

                           Analysis prepared by:

                               CA Engineering
                        13821 Newport Ave., Ste 110
                             Tustin, Ca. 92780


 ************************** DESCRIPTION OF STUDY **************************
* PROPOSED CONDITION                                                         *
* 25 YR STORM                                                                *
*                                                                            *
 **************************************************************************

  FILE NAME: 727-6PR.DAT
  TIME/DATE OF STUDY: 18:22 02/05/2025
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II 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) =   291.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.50  DOWNSTREAM(FEET) =     84.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.796
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.120
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  APARTMENTS                 D        0.61      0.20     0.200    75   10.80
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.69
  TOTAL AREA(ACRES) =      0.61   PEAK FLOW RATE(CFS) =      1.69

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =     84.90
  DOWNSTREAM NODE ELEVATION(FEET) =     84.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   276.00
  "V" GUTTER WIDTH(FEET) =   3.00   GUTTER HIKE(FEET) =  0.120
  PAVEMENT LIP(FEET) =  0.050   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   0.50
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.652
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 D        1.16      0.20     0.200    75
  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) =      3.05
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.28
  AVERAGE FLOW DEPTH(FEET) =   0.34   FLOOD WIDTH(FEET) =   20.47
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   3.59   Tc(MIN.) =   14.38
  SUBAREA AREA(ACRES) =    1.16       SUBAREA RUNOFF(CFS) =    2.73
  EFFECTIVE AREA(ACRES) =    1.77     AREA-AVERAGED Fm(INCH/HR) =   0.04
  AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.20
  TOTAL AREA(ACRES) =       1.8        PEAK FLOW RATE(CFS) =       4.16

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.38   FLOOD WIDTH(FEET) =   23.69
  FLOW VELOCITY(FEET/SEC.) =   1.35   DEPTH*VELOCITY(FT*FT/SEC) =   0.51
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     567.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.8  TC(MIN.) =     14.38
  EFFECTIVE AREA(ACRES) =      1.77  AREA-AVERAGED Fm(INCH/HR)=  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.200
  PEAK FLOW RATE(CFS)   =       4.16
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
 ****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
          (c) Copyright 1983-2008 Advanced Engineering Software (aes)
              Ver. 15.0  Release Date: 04/01/2008  License ID 1420

                            Analysis prepared by:

                                CA Engineering
                         13821 Newport Ave., Ste 110
                              Tustin, Ca. 92780


  ************************** DESCRIPTION OF STUDY **************************
 * PROPOSED CONDITION                                                       *
 * 100 YR STORM                                                             *
 *                                                                          *
  **************************************************************************

   FILE NAME: 727-6PR.DAT
   TIME/DATE OF STUDY: 18:21 02/05/2025
 ============================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ============================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =  100.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
   *DATA BANK RAINFALL USED*
   *ANTECEDENT MOISTURE CONDITION (AMC) III 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) =   291.00
   ELEVATION DATA: UPSTREAM(FEET) =     85.50  DOWNSTREAM(FEET) =     84.90

   Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
   SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.796
   * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.981
   SUBAREA Tc AND LOSS RATE DATA(AMC III):
    DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
        LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  APARTMENTS                 D        0.61      0.20     0.200    91   10.80
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      2.16
  TOTAL AREA(ACRES) =      0.61   PEAK FLOW RATE(CFS) =      2.16

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =     84.90
  DOWNSTREAM NODE ELEVATION(FEET) =     84.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   276.00
  "V" GUTTER WIDTH(FEET) =   3.00   GUTTER HIKE(FEET) =  0.120
  PAVEMENT LIP(FEET) =  0.050   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   0.50
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.394
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 D        1.16      0.20     0.200    91
  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) =      3.91
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.33
  AVERAGE FLOW DEPTH(FEET) =   0.37   FLOOD WIDTH(FEET) =   23.04
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   3.46   Tc(MIN.) =   14.26
  SUBAREA AREA(ACRES) =    1.16       SUBAREA RUNOFF(CFS) =    3.50
  EFFECTIVE AREA(ACRES) =    1.77     AREA-AVERAGED Fm(INCH/HR) =   0.04
  AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.20
  TOTAL AREA(ACRES) =        1.8        PEAK FLOW RATE(CFS) =       5.34

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.41   FLOOD WIDTH(FEET) =   26.53
  FLOW VELOCITY(FEET/SEC.) =   1.41   DEPTH*VELOCITY(FT*FT/SEC) =   0.57
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     567.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.8  TC(MIN.) =     14.26
  EFFECTIVE AREA(ACRES) =      1.77  AREA-AVERAGED Fm(INCH/HR)=  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.200
  PEAK FLOW RATE(CFS)   =       5.34
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

APPENDIX C: PROPOSED RATIONAL METHOD, 2, 10, 25 & 100 YEAR STORM FREQUENCY OUTPUT FILES. (CATCH BASINS)

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
         (c) Copyright 1983-2008 Advanced Engineering Software (aes)
             Ver. 15.0  Release Date: 04/01/2008  License ID 1420

                           Analysis prepared by:

                               CA Engineering
                        13821 Newport Ave., Ste 110
                             Tustin, Ca. 92780


 ************************** DESCRIPTION OF STUDY **************************
* PROPOSED CONDITION                                                       *
* 2 YR STORM                                                               *
* CATCH BASINS                                                             *
 **************************************************************************

  FILE NAME: 727-6PR.DAT
  TIME/DATE OF STUDY: 14:52 09/24/2024
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  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) =   128.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.50  DOWNSTREAM(FEET) =     84.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
```

```
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.595
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.931
  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        0.19      0.20     0.200    57    6.60
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.19   PEAK FLOW RATE(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    82.40  DOWNSTREAM(FEET) =    81.80
  FLOW LENGTH(FEET) =   112.80   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   2.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.22
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.32
  PIPE TRAVEL TIME(MIN.) =   0.85    Tc(MIN.) =    7.44
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     240.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 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.) =    7.44
  RAINFALL INTENSITY(INCH/HR) =   1.80
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.19
  TOTAL STREAM AREA(ACRES) =       0.19
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.32

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      3.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   117.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.40  DOWNSTREAM(FEET) =     84.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.249
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.992
  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        0.34      0.20     0.200    57    6.25
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.60
  TOTAL AREA(ACRES) =      0.34   PEAK FLOW RATE(CFS) =      0.60
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 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.) =    6.25
  RAINFALL INTENSITY(INCH/HR) =   1.99
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.34
  TOTAL STREAM AREA(ACRES) =       0.34
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.60

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        0.32    7.44    1.802  0.20( 0.04) 0.20       0.2       1.00
      2        0.60    6.25    1.992  0.20( 0.04) 0.20       0.3       4.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        0.90    6.25    1.992  0.20( 0.04) 0.20       0.5       4.00
      2        0.86    7.44    1.802  0.20( 0.04) 0.20       0.5       1.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       0.90    Tc(MIN.) =     6.25
  EFFECTIVE AREA(ACRES) =       0.50   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        0.5
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     240.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 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) =    81.80  DOWNSTREAM(FEET) =    81.00
  FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.89
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.90
  PIPE TRAVEL TIME(MIN.) =   0.92    Tc(MIN.) =    7.17
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =     400.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      5.00 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.) =    7.17
  RAINFALL INTENSITY(INCH/HR) =   1.84
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.50
  TOTAL STREAM AREA(ACRES) =       0.53
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.90

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      5.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   160.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.20  DOWNSTREAM(FEET) =     84.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.953
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.873
  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        0.35      0.20     0.200    57    6.95
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.58
  TOTAL AREA(ACRES) =      0.35   PEAK FLOW RATE(CFS) =      0.58

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      5.00 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.) =    6.95
  RAINFALL INTENSITY(INCH/HR) =   1.87
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.35
  TOTAL STREAM AREA(ACRES) =       0.35
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.58

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        0.90    7.17    1.840  0.20( 0.04) 0.20       0.5       4.00
      1        0.86    8.38    1.683  0.20( 0.04) 0.20       0.5       1.00
      2        0.58    6.95    1.873  0.20( 0.04) 0.20       0.3       6.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        1.46    6.95    1.873  0.20( 0.04) 0.20       0.8       6.00
      2        1.47    7.17    1.840  0.20( 0.04) 0.20       0.8       4.00
      3        1.38    8.38    1.683  0.20( 0.04) 0.20       0.9       1.00
```

```
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       1.47    Tc(MIN.) =     7.17
  EFFECTIVE AREA(ACRES) =       0.85   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        0.9
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =     400.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 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) =    81.00  DOWNSTREAM(FEET) =    79.70
  FLOW LENGTH(FEET) =   142.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.10
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.47
  PIPE TRAVEL TIME(MIN.) =   0.58    Tc(MIN.) =    7.75
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =     542.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   128.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.50  DOWNSTREAM(FEET) =     84.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.395
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.965
  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        0.19      0.20     0.200    57    6.40
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.33
  TOTAL AREA(ACRES) =      0.19   PEAK FLOW RATE(CFS) =      0.33

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    81.30  DOWNSTREAM(FEET) =    80.70
  FLOW LENGTH(FEET) =   113.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   2.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.21
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
```

```
  PIPE-FLOW(CFS) =       0.33
  PIPE TRAVEL TIME(MIN.) =   0.85    Tc(MIN.) =    7.25
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     241.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 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.) =    7.25
  RAINFALL INTENSITY(INCH/HR) =   1.83
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.19
  TOTAL STREAM AREA(ACRES) =       0.19
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.33

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     12.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   117.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.40  DOWNSTREAM(FEET) =     84.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.249
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.992
  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        0.34      0.20     0.200    57    6.25
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.60
  TOTAL AREA(ACRES) =      0.34   PEAK FLOW RATE(CFS) =      0.60

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 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.) =    6.25
  RAINFALL INTENSITY(INCH/HR) =   1.99
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.34
  TOTAL STREAM AREA(ACRES) =       0.34
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.60

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        0.33    7.25    1.829  0.20( 0.04) 0.20       0.2      10.00
      2        0.60    6.25    1.992  0.20( 0.04) 0.20       0.3      13.00
```

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        0.91    6.25    1.992  0.20( 0.04) 0.20       0.5      13.00
      2        0.88    7.25    1.829  0.20( 0.04) 0.20       0.5      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       0.91    Tc(MIN.) =     6.25
  EFFECTIVE AREA(ACRES) =       0.50   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        0.5
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     241.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     14.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    80.70  DOWNSTREAM(FEET) =    79.90
  FLOW LENGTH(FEET) =   159.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.89
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.91
  PIPE TRAVEL TIME(MIN.) =   0.92    Tc(MIN.) =    7.16
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     14.00 =     400.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     14.00 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.) =    7.16
  RAINFALL INTENSITY(INCH/HR) =   1.84
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.50
  TOTAL STREAM AREA(ACRES) =       0.53
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.91

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     14.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   160.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.20  DOWNSTREAM(FEET) =     84.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.953
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.873
  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       0.35      0.20     0.200    57    6.95
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.58
  TOTAL AREA(ACRES) =      0.35   PEAK FLOW RATE(CFS) =      0.58

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     14.00 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.) =    6.95
  RAINFALL INTENSITY(INCH/HR) =   1.87
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.35
  TOTAL STREAM AREA(ACRES) =       0.35
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.58

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        0.91    7.16    1.841  0.20( 0.04) 0.20       0.5      13.00
      1        0.88    8.17    1.708  0.20( 0.04) 0.20       0.5      10.00
      2        0.58    6.95    1.873  0.20( 0.04) 0.20       0.3      15.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        1.47    6.95    1.873  0.20( 0.04) 0.20       0.8      15.00
      2        1.47    7.16    1.841  0.20( 0.04) 0.20       0.9      13.00
      3        1.40    8.17    1.708  0.20( 0.04) 0.20       0.9      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       1.47    Tc(MIN.) =     7.16
  EFFECTIVE AREA(ACRES) =       0.85   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        0.9
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     14.00 =     400.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 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) =    79.90  DOWNSTREAM(FEET) =    79.70
  FLOW LENGTH(FEET) =    20.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.23
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.47
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =    7.24
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE      7.00 =     420.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        1.47    7.03    1.861  0.20( 0.04) 0.20       0.8      15.00
      2        1.47    7.24    1.830  0.20( 0.04) 0.20       0.9      13.00
      3        1.40    8.25    1.698  0.20( 0.04) 0.20       0.9      10.00
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE      7.00 =     420.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        1.46    7.53    1.790  0.20( 0.04) 0.20       0.8       6.00
      2        1.47    7.75    1.760  0.20( 0.04) 0.20       0.8       4.00
      3        1.38    8.96    1.619  0.20( 0.04) 0.20       0.9       1.00
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =     542.80 FEET.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        2.90    7.03    1.861  0.20( 0.04) 0.20       1.6      15.00
      2        2.92    7.24    1.830  0.20( 0.04) 0.20       1.7      13.00
      3        2.92    7.53    1.790  0.20( 0.04) 0.20       1.7       6.00
      4        2.90    7.75    1.760  0.20( 0.04) 0.20       1.7       4.00
      5        2.83    8.25    1.698  0.20( 0.04) 0.20       1.7      10.00
      6        2.72    8.96    1.619  0.20( 0.04) 0.20       1.8       1.00
    TOTAL AREA(ACRES) =         1.8

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =        2.92  Tc(MIN.) =    7.530
  EFFECTIVE AREA(ACRES) =      1.70  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        1.8
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =     542.80 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =         1.8  TC(MIN.) =      7.53
  EFFECTIVE AREA(ACRES) =      1.70  AREA-AVERAGED Fm(INCH/HR)=  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.200
  PEAK FLOW RATE(CFS)   =       2.92

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        2.90    7.03    1.861  0.20( 0.04) 0.20       1.6      15.00
      2        2.92    7.24    1.830  0.20( 0.04) 0.20       1.7      13.00
      3        2.92    7.53    1.790  0.20( 0.04) 0.20       1.7       6.00
      4        2.90    7.75    1.760  0.20( 0.04) 0.20       1.7       4.00
      5        2.83    8.25    1.698  0.20( 0.04) 0.20       1.7      10.00
      6        2.72    8.96    1.619  0.20( 0.04) 0.20       1.8       1.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
         (c) Copyright 1983-2008 Advanced Engineering Software (aes)
             Ver. 15.0  Release Date: 04/01/2008  License ID 1420

                           Analysis prepared by:

                               CA Engineering
                        13821 Newport Ave., Ste 110
                             Tustin, Ca. 92780


 ************************** DESCRIPTION OF STUDY **************************
* PROPOSED CONDITION                                                       *
* 10 YR STORM                                                              *
* CATCH BASINS                                                             *
 **************************************************************************

  FILE NAME: 727-6PR.DAT
  TIME/DATE OF STUDY: 16:01 09/24/2024
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II 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) =   128.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.50  DOWNSTREAM(FEET) =     84.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.595
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.464
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  APARTMENTS                 D        0.19      0.20     0.200    75    6.60
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.59
  TOTAL AREA(ACRES) =      0.19   PEAK FLOW RATE(CFS) =      0.59

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    82.40  DOWNSTREAM(FEET) =    81.80
  FLOW LENGTH(FEET) =   112.80   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   3.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.61
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.59
  PIPE TRAVEL TIME(MIN.) =   0.72    Tc(MIN.) =    7.32
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     240.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 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.) =    7.32
  RAINFALL INTENSITY(INCH/HR) =   3.26
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.19
  TOTAL STREAM AREA(ACRES) =       0.19
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.59

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      3.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   117.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.40  DOWNSTREAM(FEET) =     84.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.249
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.573
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 D        0.34      0.20     0.200    75    6.25
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.08
  TOTAL AREA(ACRES) =      0.34   PEAK FLOW RATE(CFS) =      1.08

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 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.) =    6.25
  RAINFALL INTENSITY(INCH/HR) =   3.57
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.34
  TOTAL STREAM AREA(ACRES) =       0.34
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.08

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        0.59    7.32    3.264  0.20( 0.04) 0.20       0.2       1.00
      2        1.08    6.25    3.573  0.20( 0.04) 0.20       0.3       4.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        1.63    6.25    3.573  0.20( 0.04) 0.20       0.5       4.00
      2        1.57    7.32    3.264  0.20( 0.04) 0.20       0.5       1.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       1.63    Tc(MIN.) =     6.25
  EFFECTIVE AREA(ACRES) =       0.50   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        0.5
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     240.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 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) =    81.80  DOWNSTREAM(FEET) =    81.00
  FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.35
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.63
  PIPE TRAVEL TIME(MIN.) =   0.80    Tc(MIN.) =    7.05
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =     400.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      5.00 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.) =    7.05
  RAINFALL INTENSITY(INCH/HR) =   3.34
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.50
```

```
  TOTAL STREAM AREA(ACRES) =       0.53
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.63

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      5.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   160.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.20  DOWNSTREAM(FEET) =     84.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.953
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.361
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 D        0.35      0.20     0.200    75    6.95
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.05
  TOTAL AREA(ACRES) =      0.35   PEAK FLOW RATE(CFS) =      1.05

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      5.00 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.) =    6.95
  RAINFALL INTENSITY(INCH/HR) =   3.36
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.35
  TOTAL STREAM AREA(ACRES) =       0.35
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.05

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       1.63    7.05    3.335  0.20( 0.04) 0.20       0.5       4.00
      1       1.57    8.12    3.075  0.20( 0.04) 0.20       0.5       1.00
      2       1.05    6.95    3.361  0.20( 0.04) 0.20       0.3       6.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       2.67    6.95    3.361  0.20( 0.04) 0.20       0.8       6.00
      2       2.67    7.05    3.335  0.20( 0.04) 0.20       0.9       4.00
      3       2.53    8.12    3.075  0.20( 0.04) 0.20       0.9       1.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       2.67    Tc(MIN.) =     7.05
  EFFECTIVE AREA(ACRES) =       0.85   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        0.9
```

```
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =     400.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 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) =    81.00  DOWNSTREAM(FEET) =    79.70
  FLOW LENGTH(FEET) =   142.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   8.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.70
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.67
  PIPE TRAVEL TIME(MIN.) =   0.50    Tc(MIN.) =    7.55
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =     542.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   128.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.50  DOWNSTREAM(FEET) =     84.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.395
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.526
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 D        0.19      0.20     0.200    75    6.40
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.60
  TOTAL AREA(ACRES) =      0.19   PEAK FLOW RATE(CFS) =      0.60

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    81.30  DOWNSTREAM(FEET) =    80.70
  FLOW LENGTH(FEET) =   113.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   4.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.63
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.60
  PIPE TRAVEL TIME(MIN.) =   0.72    Tc(MIN.) =    7.11
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     241.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 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.) =    7.11
  RAINFALL INTENSITY(INCH/HR) =   3.32
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.19
  TOTAL STREAM AREA(ACRES) =       0.19
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.60

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     12.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   117.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.40  DOWNSTREAM(FEET) =     84.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.249
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.573
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 D        0.34      0.20     0.200    75    6.25
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.08
  TOTAL AREA(ACRES) =      0.34   PEAK FLOW RATE(CFS) =      1.08

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 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.) =    6.25
  RAINFALL INTENSITY(INCH/HR) =   3.57
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.34
  TOTAL STREAM AREA(ACRES) =       0.34
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.08

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        0.60    7.11    3.318  0.20( 0.04) 0.20       0.2      10.00
      2        1.08    6.25    3.573  0.20( 0.04) 0.20       0.3      13.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
```

```
    1        1.65    6.25    3.573  0.20( 0.04) 0.20       0.5      13.00
    2        1.60    7.11    3.318  0.20( 0.04) 0.20       0.5      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       1.65    Tc(MIN.) =     6.25
  EFFECTIVE AREA(ACRES) =       0.51   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        0.5
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     241.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     14.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    80.70  DOWNSTREAM(FEET) =    79.90
  FLOW LENGTH(FEET) =   159.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.35
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.65
  PIPE TRAVEL TIME(MIN.) =   0.79    Tc(MIN.) =    7.04
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     14.00 =     400.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     14.00 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.) =    7.04
  RAINFALL INTENSITY(INCH/HR) =   3.34
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.51
  TOTAL STREAM AREA(ACRES) =       0.53
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.65

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     14.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   160.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.20  DOWNSTREAM(FEET) =     84.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.953
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.361
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 D        0.35      0.20     0.200    75    6.95
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.05
  TOTAL AREA(ACRES) =      0.35   PEAK FLOW RATE(CFS) =      1.05

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

```
  FLOW PROCESS FROM NODE     14.00 TO NODE     14.00 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.) =    6.95
  RAINFALL INTENSITY(INCH/HR) =   3.36
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.35
  TOTAL STREAM AREA(ACRES) =       0.35
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.05

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        1.65    7.04    3.337  0.20( 0.04) 0.20       0.5      13.00
      1        1.60    7.91    3.122  0.20( 0.04) 0.20       0.5      10.00
      2        1.05    6.95    3.361  0.20( 0.04) 0.20       0.3      15.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        2.68    6.95    3.361  0.20( 0.04) 0.20       0.9      15.00
      2        2.68    7.04    3.337  0.20( 0.04) 0.20       0.9      13.00
      3        2.57    7.91    3.122  0.20( 0.04) 0.20       0.9      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       2.68    Tc(MIN.) =     7.04
  EFFECTIVE AREA(ACRES) =       0.86   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        0.9
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     14.00 =     400.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 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) =    79.90  DOWNSTREAM(FEET) =    79.70
  FLOW LENGTH(FEET) =    20.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.88
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.68
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =    7.11
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE      7.00 =     420.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
```

```
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        2.68    7.02    3.342  0.20( 0.04) 0.20       0.9      15.00
      2        2.68    7.11    3.319  0.20( 0.04) 0.20       0.9      13.00
      3        2.57    7.98    3.107  0.20( 0.04) 0.20       0.9      10.00
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE      7.00 =     420.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        2.67    7.46    3.229  0.20( 0.04) 0.20       0.8       6.00
      2        2.67    7.55    3.206  0.20( 0.04) 0.20       0.9       4.00
      3        2.53    8.63    2.970  0.20( 0.04) 0.20       0.9       1.00
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =     542.80 FEET.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        5.28    7.02    3.342  0.20( 0.04) 0.20       1.6      15.00
      2        5.30    7.11    3.319  0.20( 0.04) 0.20       1.7      13.00
      3        5.30    7.46    3.229  0.20( 0.04) 0.20       1.7       6.00
      4        5.29    7.55    3.206  0.20( 0.04) 0.20       1.7       4.00
      5        5.18    7.98    3.107  0.20( 0.04) 0.20       1.7      10.00
      6        4.98    8.63    2.970  0.20( 0.04) 0.20       1.8       1.00
    TOTAL AREA(ACRES) =         1.8

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =        5.30  Tc(MIN.) =    7.456
  EFFECTIVE AREA(ACRES) =      1.71  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        1.8
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =     542.80 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.8  TC(MIN.) =      7.46
  EFFECTIVE AREA(ACRES) =      1.71  AREA-AVERAGED Fm(INCH/HR)=  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.200
  PEAK FLOW RATE(CFS)   =       5.30

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        5.28    7.02    3.342  0.20( 0.04) 0.20       1.6      15.00
      2        5.30    7.11    3.319  0.20( 0.04) 0.20       1.7      13.00
      3        5.30    7.46    3.229  0.20( 0.04) 0.20       1.7       6.00
      4        5.29    7.55    3.206  0.20( 0.04) 0.20       1.7       4.00
      5        5.18    7.98    3.107  0.20( 0.04) 0.20       1.7      10.00
      6        4.98    8.63    2.970  0.20( 0.04) 0.20       1.8       1.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
         (c) Copyright 1983-2008 Advanced Engineering Software (aes)
             Ver. 15.0  Release Date: 04/01/2008  License ID 1420

                           Analysis prepared by:

                               CA Engineering
                        13821 Newport Ave., Ste 110
                             Tustin, Ca. 92780


 ************************** DESCRIPTION OF STUDY **************************
* PROPOSED CONDITION                                                       *
* 100 YR STORM                                                             *
* CATCH BASINS                                                             *
  **************************************************************************

  FILE NAME: 727-6PR.DAT
  TIME/DATE OF STUDY: 16:02 09/24/2024
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) III 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) =   128.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.50  DOWNSTREAM(FEET) =     84.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.595
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.279
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  APARTMENTS                 D        0.19      0.20     0.200    91    6.60
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.90
  TOTAL AREA(ACRES) =      0.19   PEAK FLOW RATE(CFS) =      0.90

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    82.40  DOWNSTREAM(FEET) =    81.80
  FLOW LENGTH(FEET) =   112.80   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   4.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.94
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.90
  PIPE TRAVEL TIME(MIN.) =   0.64    Tc(MIN.) =    7.23
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     240.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 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.) =    7.23
  RAINFALL INTENSITY(INCH/HR) =   5.01
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.19
  TOTAL STREAM AREA(ACRES) =       0.19
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.90

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      3.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   117.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.40  DOWNSTREAM(FEET) =     84.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.249
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.445
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 D        0.34      0.20     0.200    91    6.25
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.65
  TOTAL AREA(ACRES) =      0.34   PEAK FLOW RATE(CFS) =      1.65

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 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.) =    6.25
  RAINFALL INTENSITY(INCH/HR) =   5.45
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.34
  TOTAL STREAM AREA(ACRES) =       0.34
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.65

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        0.90    7.23    5.007  0.20( 0.04) 0.20       0.2       1.00
      2        1.65    6.25    5.445  0.20( 0.04) 0.20       0.3       4.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        2.50    6.25    5.445  0.20( 0.04) 0.20       0.5       4.00
      2        2.42    7.23    5.007  0.20( 0.04) 0.20       0.5       1.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       2.50    Tc(MIN.) =     6.25
  EFFECTIVE AREA(ACRES) =       0.50   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        0.5
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     240.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 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) =    81.80  DOWNSTREAM(FEET) =    81.00
  FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.74
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.50
  PIPE TRAVEL TIME(MIN.) =   0.71    Tc(MIN.) =    6.96
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =     400.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      5.00 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.) =    6.96
  RAINFALL INTENSITY(INCH/HR) =   5.12
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.50
```

```
  TOTAL STREAM AREA(ACRES) =       0.53
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.50

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      5.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   160.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.20  DOWNSTREAM(FEET) =     84.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.953
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.122
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 D        0.35      0.20     0.200    91    6.95
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.60
  TOTAL AREA(ACRES) =      0.35   PEAK FLOW RATE(CFS) =      1.60

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      5.00 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.) =    6.95
  RAINFALL INTENSITY(INCH/HR) =   5.12
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.35
  TOTAL STREAM AREA(ACRES) =       0.35
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.60

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        2.50    6.96    5.118  0.20( 0.04) 0.20       0.5       4.00
      1        2.42    7.98    4.732  0.20( 0.04) 0.20       0.5       1.00
      2        1.60    6.95    5.122  0.20( 0.04) 0.20       0.3       6.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        4.10    6.95    5.122  0.20( 0.04) 0.20       0.9       6.00
      2        4.10    6.96    5.118  0.20( 0.04) 0.20       0.9       4.00
      3        3.89    7.98    4.732  0.20( 0.04) 0.20       0.9       1.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       4.10    Tc(MIN.) =     6.96
  EFFECTIVE AREA(ACRES) =       0.85   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        0.9
```

```
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =     400.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 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) =    81.00  DOWNSTREAM(FEET) =    79.70
  FLOW LENGTH(FEET) =   142.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   9.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.28
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.10
  PIPE TRAVEL TIME(MIN.) =   0.45    Tc(MIN.) =    7.41
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =     542.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   128.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.50  DOWNSTREAM(FEET) =     84.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.395
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.373
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 D        0.19      0.20     0.200    91    6.40
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.91
  TOTAL AREA(ACRES) =      0.19   PEAK FLOW RATE(CFS) =      0.91

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    81.30  DOWNSTREAM(FEET) =    80.70
  FLOW LENGTH(FEET) =   113.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.97
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.91
  PIPE TRAVEL TIME(MIN.) =   0.63    Tc(MIN.) =    7.03
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     241.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 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.) =    7.03
  RAINFALL INTENSITY(INCH/HR) =   5.09
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.19
  TOTAL STREAM AREA(ACRES) =       0.19
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.91

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     12.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   117.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.40  DOWNSTREAM(FEET) =     84.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.249
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.445
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 D        0.34      0.20     0.200    91    6.25
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.65
  TOTAL AREA(ACRES) =      0.34   PEAK FLOW RATE(CFS) =      1.65

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 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.) =    6.25
  RAINFALL INTENSITY(INCH/HR) =   5.45
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.34
  TOTAL STREAM AREA(ACRES) =       0.34
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.65

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        0.91    7.03    5.090  0.20( 0.04) 0.20       0.2      10.00
      2        1.65    6.25    5.445  0.20( 0.04) 0.20       0.3      13.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
```

```
    1        2.52    6.25    5.445  0.20( 0.04) 0.20       0.5      13.00
    2        2.46    7.03    5.090  0.20( 0.04) 0.20       0.5      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       2.52    Tc(MIN.) =     6.25
  EFFECTIVE AREA(ACRES) =       0.51   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        0.5
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     241.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     14.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    80.70  DOWNSTREAM(FEET) =    79.90
  FLOW LENGTH(FEET) =   159.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.75
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.52
  PIPE TRAVEL TIME(MIN.) =   0.71    Tc(MIN.) =    6.96
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     14.00 =     400.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     14.00 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.) =    6.96
  RAINFALL INTENSITY(INCH/HR) =   5.12
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.51
  TOTAL STREAM AREA(ACRES) =       0.53
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.52

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     14.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   160.00
  ELEVATION DATA: UPSTREAM(FEET) =     85.20  DOWNSTREAM(FEET) =     84.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.953
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.122
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 D        0.35      0.20     0.200    91    6.95
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.60
  TOTAL AREA(ACRES) =      0.35   PEAK FLOW RATE(CFS) =      1.60

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

```
  FLOW PROCESS FROM NODE     14.00 TO NODE     14.00 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.) =    6.95
  RAINFALL INTENSITY(INCH/HR) =   5.12
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       0.35
  TOTAL STREAM AREA(ACRES) =       0.35
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.60

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        2.52    6.96    5.121  0.20( 0.04) 0.20       0.5      13.00
      1        2.46    7.77    4.806  0.20( 0.04) 0.20       0.5      10.00
      2        1.60    6.95    5.122  0.20( 0.04) 0.20       0.3      15.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        4.12    6.95    5.122  0.20( 0.04) 0.20       0.9      15.00
      2        4.12    6.96    5.121  0.20( 0.04) 0.20       0.9      13.00
      3        3.96    7.77    4.806  0.20( 0.04) 0.20       0.9      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       4.12    Tc(MIN.) =     6.96
  EFFECTIVE AREA(ACRES) =       0.86   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        0.9
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     14.00 =     400.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 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) =    79.90  DOWNSTREAM(FEET) =    79.70
  FLOW LENGTH(FEET) =    20.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.47
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.12
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    7.02
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE      7.00 =     420.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
```

```
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        4.12    7.01    5.097  0.20( 0.04) 0.20       0.9      15.00
      2        4.12    7.02    5.096  0.20( 0.04) 0.20       0.9      13.00
      3        3.96    7.83    4.785  0.20( 0.04) 0.20       0.9      10.00
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE      7.00 =     420.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        4.10    7.40    4.942  0.20( 0.04) 0.20       0.9       6.00
      2        4.10    7.41    4.938  0.20( 0.04) 0.20       0.9       4.00
      3        3.89    8.44    4.585  0.20( 0.04) 0.20       0.9       1.00
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =     542.80 FEET.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        8.13    7.01    5.097  0.20( 0.04) 0.20       1.7      15.00
      2        8.13    7.02    5.096  0.20( 0.04) 0.20       1.7      13.00
      3        8.14    7.40    4.942  0.20( 0.04) 0.20       1.7       6.00
      4        8.14    7.41    4.938  0.20( 0.04) 0.20       1.7       4.00
      5        7.97    7.83    4.785  0.20( 0.04) 0.20       1.7      10.00
      6        7.69    8.44    4.585  0.20( 0.04) 0.20       1.8       1.00
    TOTAL AREA(ACRES) =         1.8

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =        8.14  Tc(MIN.) =    7.402
  EFFECTIVE AREA(ACRES) =      1.72  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        1.8
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =     542.80 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.8  TC(MIN.) =      7.40
  EFFECTIVE AREA(ACRES) =      1.72  AREA-AVERAGED Fm(INCH/HR)=  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.200
  PEAK FLOW RATE(CFS)   =       8.14

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        8.13    7.01    5.097  0.20( 0.04) 0.20       1.7      15.00
      2        8.13    7.02    5.096  0.20( 0.04) 0.20       1.7      13.00
      3        8.14    7.40    4.942  0.20( 0.04) 0.20       1.7       6.00
      4        8.14    7.41    4.938  0.20( 0.04) 0.20       1.7       4.00
      5        7.97    7.83    4.785  0.20( 0.04) 0.20       1.7      10.00
      6        7.69    8.44    4.585  0.20( 0.04) 0.20       1.8       1.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

APPENDIX D: PIPE CALCULATIONS

8" pipe
Worksheet for Circular Channel

Project Description	
Project File	c:\program files\haestad\fmw\8 in pip.fm2
Worksheet	8" pipe
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.009	
Channel Slope	0.005000	ft/ft
Depth	0.67	ft
Diameter	8.00	in

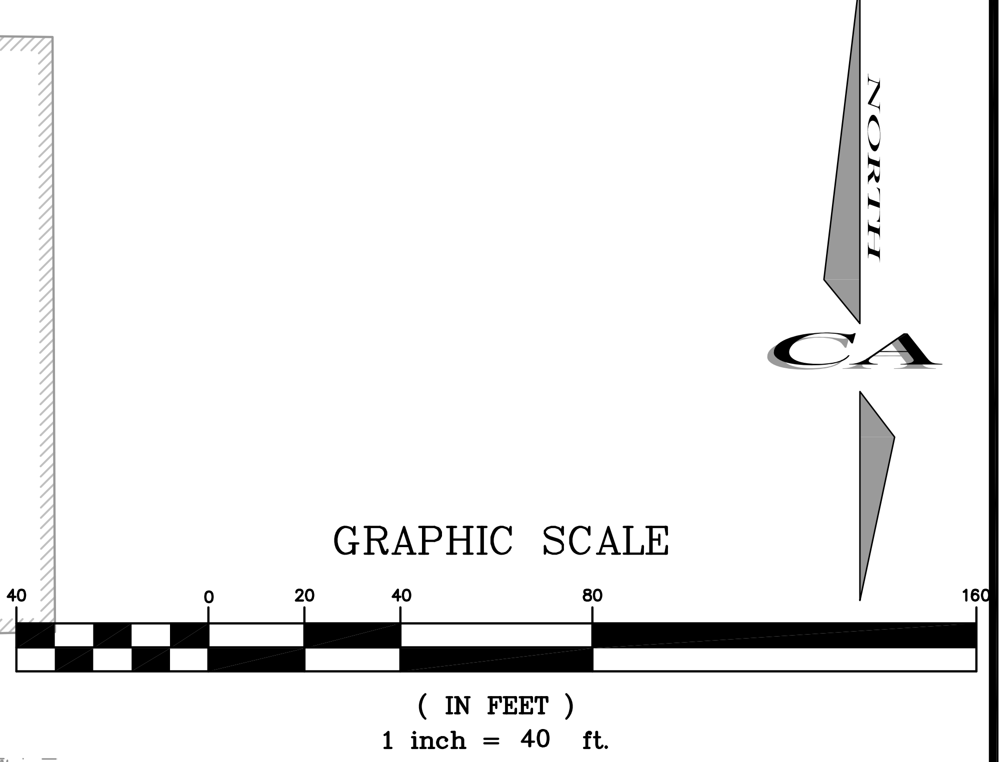
Results		
Discharge	1.24	cfs
Flow Area	0.35	ft^2
Wetted Perimeter	2.09	ft
Top Width	0.42e-2	ft
Critical Depth	0.53	ft
Percent Full	100.00	
Critical Slope	0.005391	ft/ft
Velocity	3.54	ft/s
Velocity Head	0.19	ft
Specific Energy	0.86	ft
Froude Number	0.07	
Maximum Discharge	1.33	cfs
Full Flow Capacity	1.23	cfs
Full Flow Slope	0.005013	ft/ft
Flow is subcritical.		

EXHIBITS

EXHIBIT A: EXISTING CONDITION HYDROLOGY MAP

LEGEND

A 13	SUBAREA LABEL
1.16 AC	SUBAREA ACREAGE
①	NODE
Q100 =	FLOW–C.F.S. 100 YEAR STORM
Q25 =	FLOW–C.F.S. 25 YEAR STORM
Tc=	TIME OF CONCENTRATION (100 YR)
ELEV=	ELEVATION AT NODE
▬▬▬	TRIBUTARY AREA (MAJOR)
— · · · —	FLOWLINE
	SOIL TYPE D



(IN FEET)
1 inch = 40 ft.

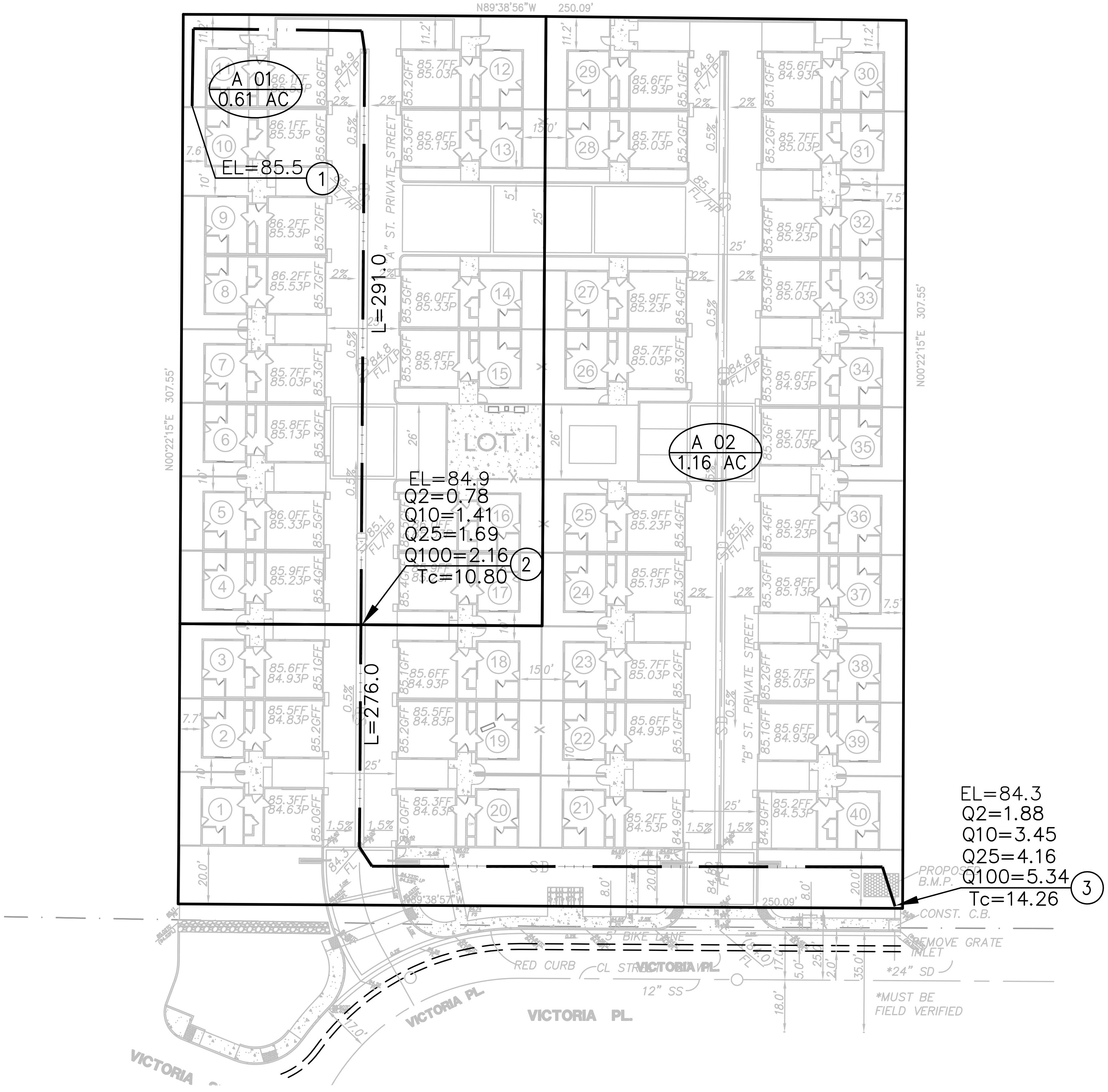
HYDROLOGY MAP

EXISTING CONDITION

JOB NO. 727-6

Sht. 1 of 1

EXHIBIT B: PROPOSED CONDITION HYDROLOGY MAP



LEGEND

A 13 / 1.16 AC	SUBAREA LABEL SUBAREA ACREAGE
①	NODE
Q100 =	FLOW-C.F.S. 100 YEAR STORM
Q25 =	FLOW-C.F.S. 25 YEAR STORM
Tc=	TIME OF CONCENTRATION (100 YR)
ELEV=	ELEVATION AT NODE
━━━	TRIBUTARY AREA (MAJOR)
	FLOWLINE
	SOIL TYPE D

NORTH

CA

GRAPHIC SCALE

40 0 20 40 80 160

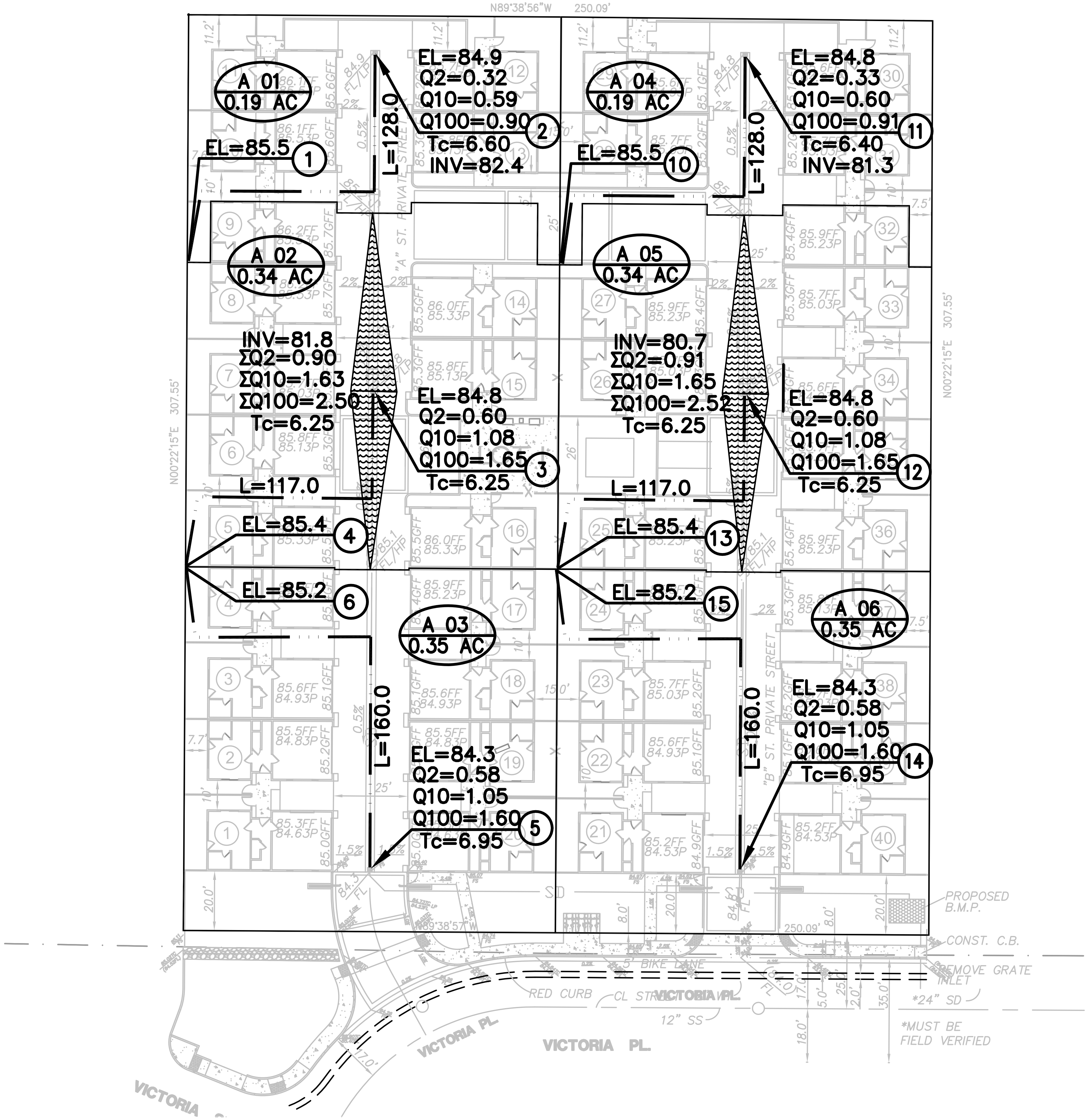
(IN FEET)

1 inch = 40 ft.

HYDROLOGY MAP PROPOSED CONDITION OVERALL FLOWS

JOB NO. 727-6

Sht. 1 of 1



LEGEND

A 13 / 1.16 AC	SUBAREA LABEL SUBAREA ACREAGE
①	NODE
Q100 =	FLOW–C.F.S. 100 YEAR STORM
Q25 =	FLOW–C.F.S. 25 YEAR STORM
Tc=	TIME OF CONCENTRATION (100 YR)
ELEV=	ELEVATION AT NODE
———	TRIBUTARY AREA (MAJOR)
—— · · · —— · · · ——	FLOWLINE
	SOIL TYPE D
▨	PONDING LIMITS

NORTH

CA

GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)
1 inch = 40 ft.

HYDROLOGY MAP
PROPOSED CONDITION CATCH BASINS

JOB NO.
727-6

Sht. 1 of 1

EXHIBIT C: FIRM MAP

National Flood Hazard Layer FIRMette

FEMA

117°54'52"W 33°39'25"N

117°54'15"W 33°38'55"N

1:6,000

Basemap Imagery Source: USGS National Map 2023

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 *Zone AE, AO, AH, VE, AR*
	▨	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	🟧	0.2% Annual Chance Flood Hazard, Areas 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 D*
GENERAL STRUCTURES	— — —	Channel, Culvert, or Storm Sewer
	IIIIIII	Levee, Dike, or Floodwall
OTHER FEATURES	B 20.2 17.5	Cross Sections with 1% Annual Chance Water Surface Elevation
	8 — — —	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

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/1/2024 at 2:15 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.

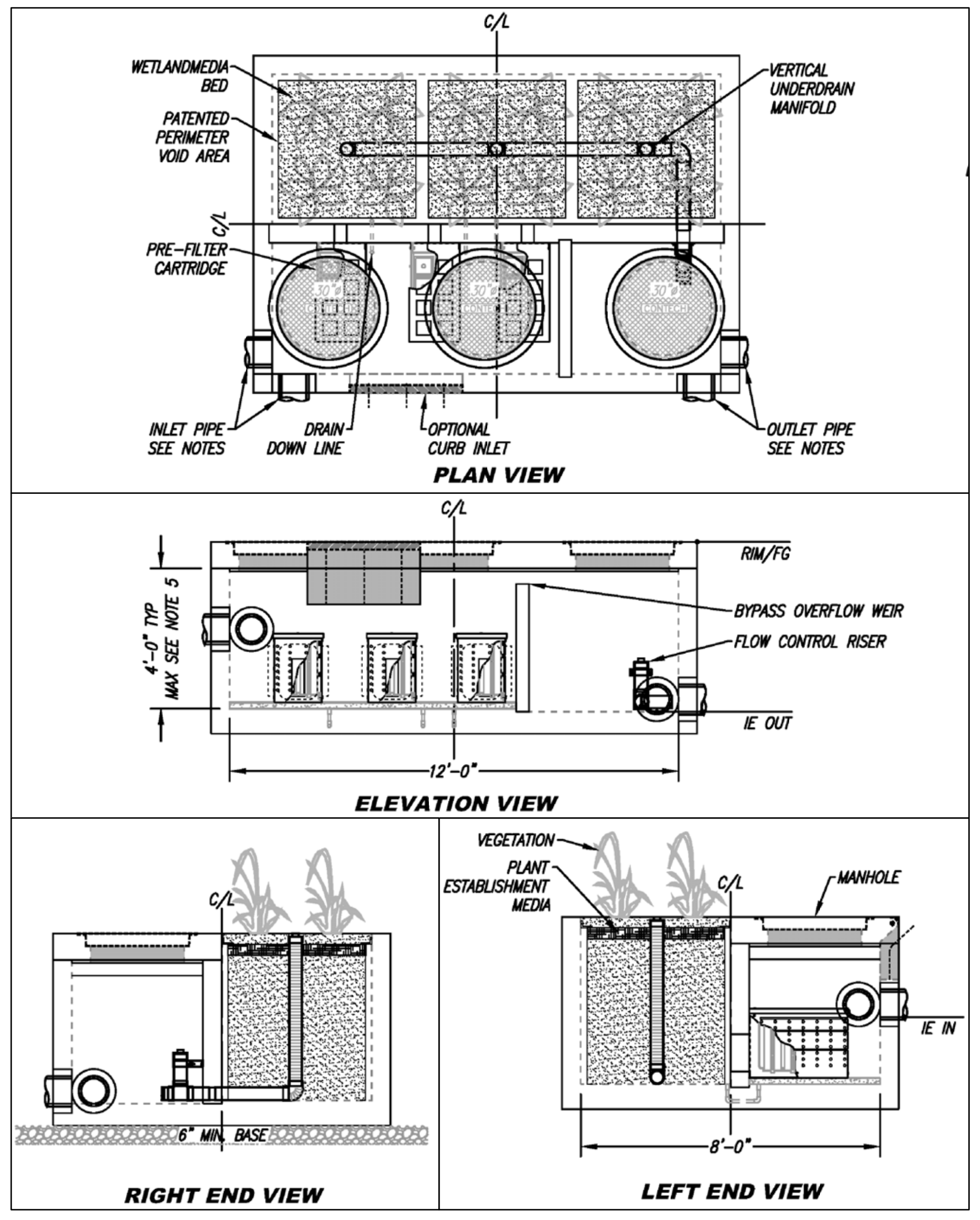
This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory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

EXHIBIT D: WQMP SITE PLAN

LEGEND: STRUCTURAL / TREATMENT BMPS

- 🟩 — LANDSCAPE AREA EFFICIENT IRRIGATION / LANDSCAPE AREA RUNOFF–MINIMIZING DESIGN
- ▨ — MODULAR WETLANDS
- ← — FLOW PATTERN
- ▬ — DRAINAGE AREAS **A1**
- ▦ — BUILDING PAD AREAS
- ▭ — CONCRETE (DRIVEWAY/GUTTERS/SIDEWALKS)
- ▭ — ASPHALT CONCRETE DRIVE AISLES
- ▨ — ENHANCED PAVING
- ■ — CATCH BASINS W/ INSERT FILTERS & STENCIL SIGNAGE
- —SS—SS— — SEWER
- —WT—WT— — WATER
- —SD—SD— — STORM DRAIN

MODULAR WETLANDS (MWS-L-8-12-V-HC) DETAIL



PROJECT DATA:

TOTAL SITE AREA OF PROPOSED DEVELOPMENT: 1.77 AC (76,916 SF)

BUILDING FOOTPRINT: 34,036 SF
DRIVE AISLES & LOADING AREA: 18,798 SF
CONCRETE HARDSCAPE/OTHER: 8,257 SF

15,825 SF LANDSCAPING
(20.6% PERVIOUS AREA)

CURRENT USE: COMMERCIAL
PROPOSED USE: RESIDENTIAL

WATERSHED:
NEWPORT BAY–NEWPORT COASTAL STREAMS WATERSHED

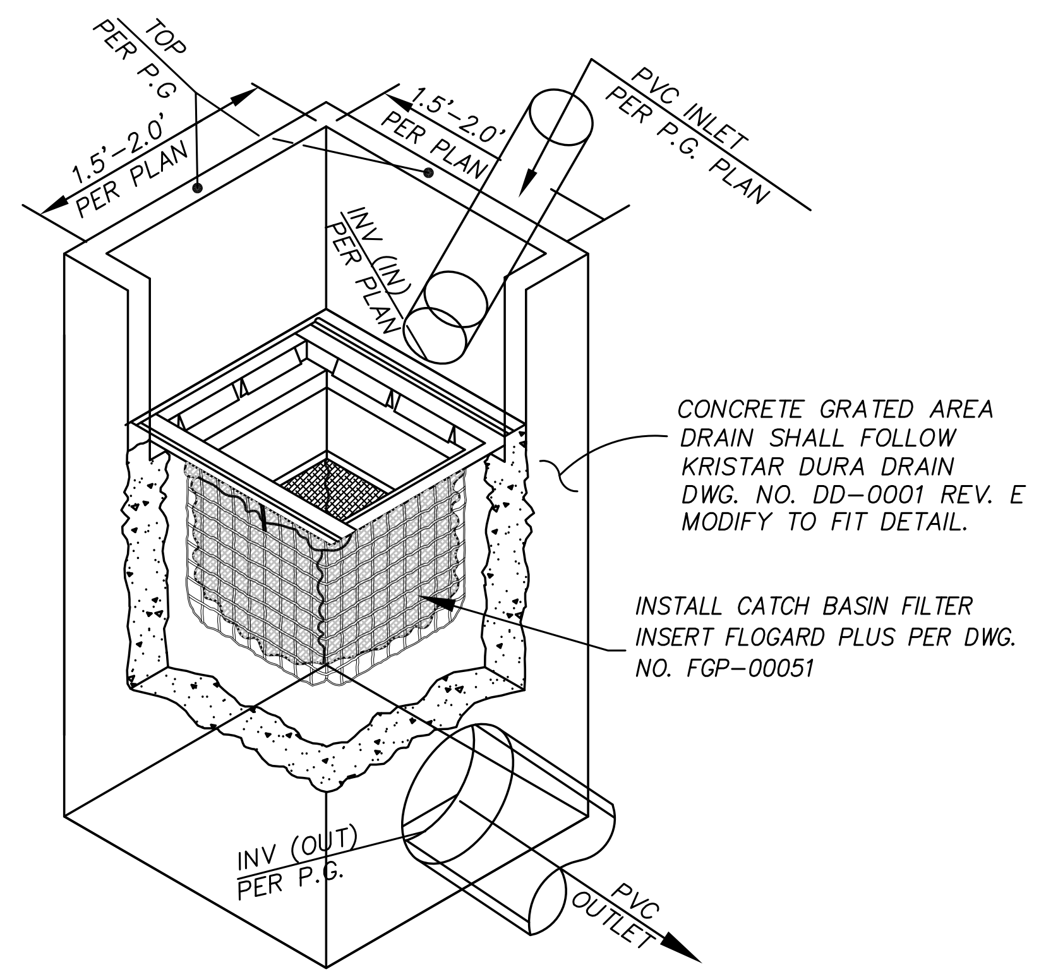
WATER QUALITY CALCULATIONS
AREA 1: MODULAR WETLANDS UNIT SIZING

AREA 1 – 76,916 SF / 1.77 AC (79.4% IMPERVIOUS)
DESIGN FLOWRATE (Qd) = C * DI * DA * 43,560 / (12in/ft x 3600sec/hr)
RUNOFF COEFFICIENT (C) = 0.75 * Imp% + 0.15 = 0.75 * 0.794 + 0.15 = 0.75
DI = DESIGN INTENSITY (in/hr) = 0.26 in/hr
DA = DRAINAGE AREA: 1.77 AC
DESIGN FLOWRATE (Qd) = 0.75 * 0.26in/hr * 1.77 AC * 43,560 / (12in/ft x 3600sec/hr)
= 0.348 cfs

MODULAR WETLANDS SELECTED SIZING : MWS–L–8–12–V–HC (8' x 12' BOX)
HIGH CAPACITY MODEL – 3.50
TREATMENT FLOW RATE (Qf) = 0.357 cfs
TREATMENT FLOW RATE (Qf) > DESIGN FLOWRATE (Qd)
0.357 cfs > 0.348 cfs

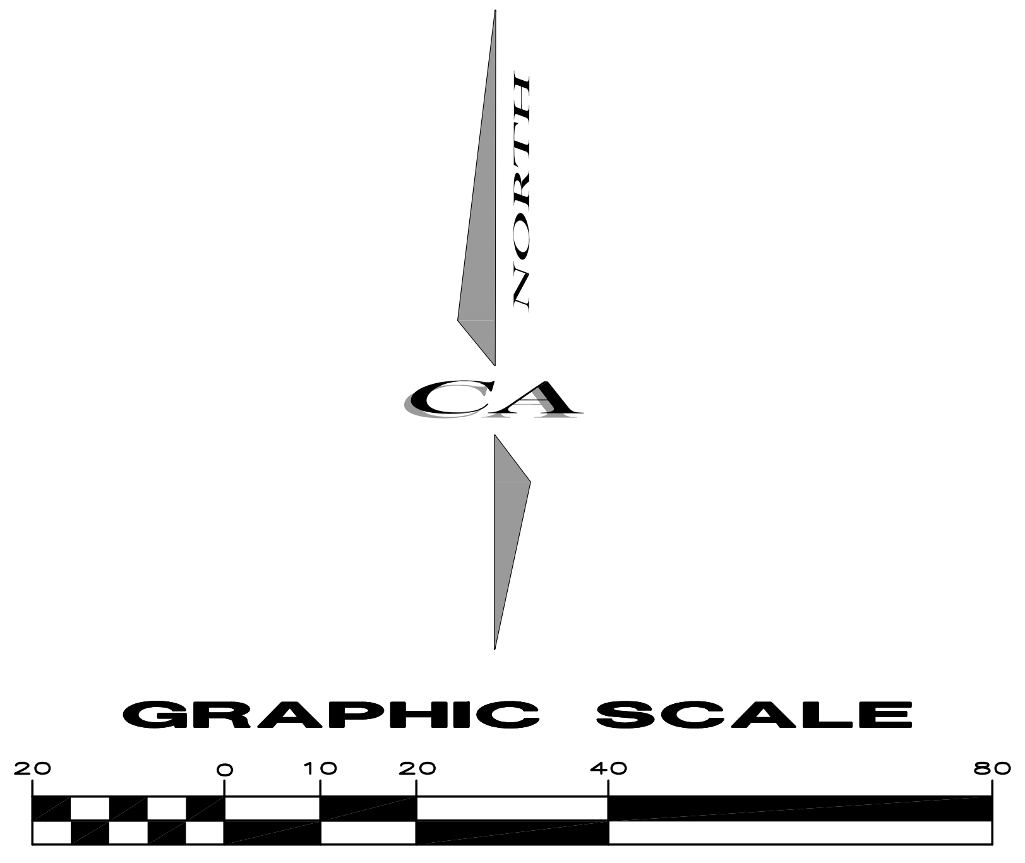
BMP LOCATIONS

BMP#1 – MWS (LAT: 33.652724° / LONG: –117.908822°)



CATCH BASIN FILTER INSERT DETAIL
GRATED INLET

FILTER PER FLOGARD PLUS, DWG. NO. FGP–00051



GRAPHIC SCALE

(IN FEET)
1 inch = 20 ft.

PREPARED BY:

CA ENGINEERING, INC.
Planning • Engineering • Surveying
4101 BIRCH ST., STE 140
NEWPORT BEACH, CA 92660
949-724-9480 949-724-9484 FAX

OWNER:

WMC, L.L.C.
1024 Bayside Dr., #109
Newport Beach, CA 90660
Contact: Tony Weeda
(714) 329-2405

Feb 11 2025

WATER QUALITY MANAGEMENT PLAN
BMP EXIBIT (SITE PLAN)
A.P.N. 419-111-19, 20, & 21
220, 222, 234 & 236 Victoria Street
Costa Mesa , CA 92626

SHEET 1 OF 1

S:\727-6 Victoria Place, Costa Mesa\WQMP\727-6 WQMP SITE PLAN.dwg Last Modified: 11 Feb 2025 – 3:39pm
Plotted on: 11 Feb 2025 – 4:56pm by cward

APPENDIX M

WATER QUALITY CONDITIONS OF APPROVAL

(TO BE INCLUDED IN FINAL WQMP)