ALAN R. SHORT, P.E.

HYDROLOGY REPORT

FOR

CITY OF GARDEN GROVE

TENTATIVE TRACT NO. 19298
12828 NEWHOPE STREET

PREPARED FOR:

THE OLSON COMPANY
3010 OLD RANCH PARKWAY, SUITE 100
SEAL BEACH, CA. 92740

PREPARED BY:

Alan R Short

_____

ALAN R. SHORT, P.E.
RCE 30873, EXPIRES 3/31/24

Latest Revision: September 15, 2023

7263 W. GALEN DR.
HERRIMAN, UT 84096
(949) 586-5200
ALANSHORTPE@GMAIL.COM

TABLE OF CONTENTS

INTRODUCTION & SUMMARY

This is a preliminary drainage study for a proposed multi-family development (i.e. Tentative Tract No. 19298) in the City of Garden Grove, County of Orange, as shown on the Vicinity Map. The site is bounded on the west by Newhope Street, on the east by existing single family homes fronting on Lemonwood Lane, on the north and south by private streets, Zeta Street and Dunklee Lane which serve the existing condominium project surrounding the property on three sides.

The project site is currently a one single-family home. Currently, the site drains to the west and is surrounded by walls on the north, south and east sides. There is an existing 36" RCP storm drain in Newhope street (flowing South) with existing catch basins approximately 500' south of the property. It appears that all runoff from this property currently flows to these existing catch basins.

In the post-development condition, the proposed drainage pattern is generally the same. The initial drainage is collected in a proposed area drain system to deliver the required 2,095 ft^3 "Design Capture Volume" to a proposed infiltration drywell with some detention storage, as recommended in the Geotechnical Report. Storm flows will then be conveyed through a proposed 10" pipe into the existing 36" RCP storm drain within Newhope Street. Currently, there is no water quality devices at the site.

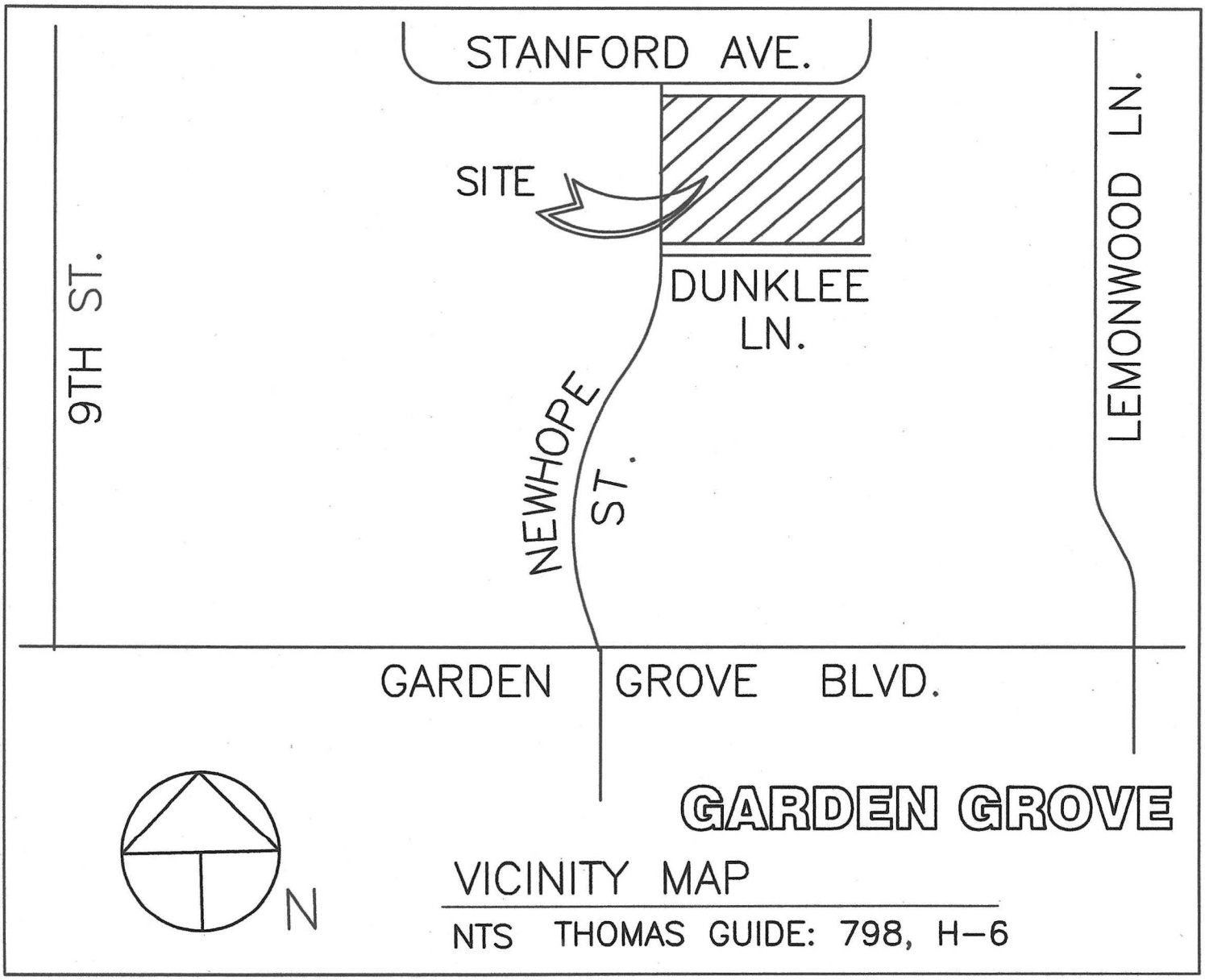
The immediate downstream storm drain facilities consist of reinforced concrete pipes (i.e. 36" RCP) and a reinforced concrete channel (C05S10), and ultimately draining into the East Garden Grove Wintersburg Channel (OCFCD Facility No. C05). The "*Susceptibility Analysis Anaheim Bay – Huntington Harbor" map*, dated April 22, 2010 (attached), indicates that this property is not subject to hydromodification.

Rational Method hydrology, in accordance with the Orange County Hydrology Manual dated 1986 and its latest addendum, was used to calculate the peak flow discharges. Advance Engineering Software (AES), Version 19.0 was utilized for the hydrology calculations. "Orange County Local Drainage Manual" was used as reference for hydraulic parameters. The results are as follows:

	Pre-Development	Post-Development
10-Year	1.72	2.42
25-Year	2.10	2.90
100-Year	2.73	3.72

Since the proposed site is in a flow-by condition, the storm drain system (i.e. PVC pipes, area drains and parkway culvert) will be designed to carry the 10-Year Storm Event flows.

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) No. 06059C0143J, dated December 3, 2009, the site is located within Zone "X" (i.e. *"0.2% Annual Chance Flood Hazard, Areas of*



VICINITY MAP

NTS THOMAS GUIDE: 798, H-6

2. Rational Method Hydrology

Pre-Development

10-Year Storm Event
25-Year Storm Event
100-Year Storm Event

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
        (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
      (c) Copyright 1983-2016 Advanced Engineering Software (aes)
          Ver. 23.0  Release Date: 07/01/2016  License ID 1355

                        Analysis prepared by:



 ************************* DESCRIPTION OF STUDY *************************
* Tract 84168, City of Garden Grove                                      *
* 10-Year Storm Event                                                    *
*                                                                        *
 ************************************************************************

  FILE NAME: GG.DAT
  TIME/DATE OF STUDY: 20:45 08/23/2023
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *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 0.0312 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     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) =    90.00
  ELEVATION DATA: UPSTREAM(FEET) =     95.30  DOWNSTREAM(FEET) =     94.10

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.986
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.351
  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.)
  RESIDENTIAL
  ".4 DWELLING/ACRE"          B        0.03      0.30     0.900    56    6.99
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.900
  SUBAREA RUNOFF(CFS) =      0.08
  TOTAL AREA(ACRES) =      0.03   PEAK FLOW RATE(CFS) =      0.08

************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   315.00
  ELEVATION DATA: UPSTREAM(FEET) =     95.30  DOWNSTREAM(FEET) =     93.10

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   12.638
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.386
  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.)
  RESIDENTIAL
  "1 DWELLING/ACRE"           B        0.85      0.30     0.800    56   12.64
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  SUBAREA RUNOFF(CFS) =      1.64
  TOTAL AREA(ACRES) =      0.85   PEAK FLOW RATE(CFS) =      1.64
========================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.9  TC(MIN.) =     12.64
  EFFECTIVE AREA(ACRES) =      0.85  AREA-AVERAGED Fm(INCH/HR)=  0.24
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.800
  PEAK FLOW RATE(CFS)   =       1.64
========================================================================
========================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
        (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
      (c) Copyright 1983-2016 Advanced Engineering Software (aes)
          Ver. 23.0  Release Date: 07/01/2016  License ID 1355

                        Analysis prepared by:



 ************************* DESCRIPTION OF STUDY *************************
* Tract 84168, City of Garden Grove                                      *
* 25-Year Storm Event                                                    *
*                                                                        *
 ************************************************************************

  FILE NAME: GG.DAT
  TIME/DATE OF STUDY: 20:46 08/23/2023
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *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 0.0312 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     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) =    90.00
  ELEVATION DATA: UPSTREAM(FEET) =     95.30  DOWNSTREAM(FEET) =     94.10

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.986
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.992
  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.)
  RESIDENTIAL
  ".4 DWELLING/ACRE"          B        0.03      0.30     0.900    56    6.99
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.900
  SUBAREA RUNOFF(CFS) =      0.10
  TOTAL AREA(ACRES) =      0.03   PEAK FLOW RATE(CFS) =      0.10

************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   315.00
  ELEVATION DATA: UPSTREAM(FEET) =     95.30  DOWNSTREAM(FEET) =     93.10

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   12.638
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.854
  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.)
  RESIDENTIAL
  "1 DWELLING/ACRE"           B        0.85      0.30     0.800    56   12.64
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  SUBAREA RUNOFF(CFS) =      2.00
  TOTAL AREA(ACRES) =      0.85   PEAK FLOW RATE(CFS) =      2.00
========================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.9  TC(MIN.) =     12.64
  EFFECTIVE AREA(ACRES) =      0.85  AREA-AVERAGED Fm(INCH/HR)=  0.24
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.800
  PEAK FLOW RATE(CFS)   =       2.00
========================================================================
========================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
        (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
      (c) Copyright 1983-2016 Advanced Engineering Software (aes)
          Ver. 23.0  Release Date: 07/01/2016  License ID 1355

                        Analysis prepared by:
```

```
 ************************** DESCRIPTION OF STUDY **************************
* Tract 84168, City of Garden Grove                                       *
* 100-Year Storm Event                                                    *
*                                                                         *
 *************************************************************************

  FILE NAME: GG.DAT
  TIME/DATE OF STUDY: 20:47 08/23/2023
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *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 0.0312 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      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) =    90.00
 ELEVATION DATA: UPSTREAM(FEET) =     95.30  DOWNSTREAM(FEET) =     94.10

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.986
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.108
 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.)
 RESIDENTIAL
 ".4 DWELLING/ACRE"          B        0.03      0.30     0.900    76    6.99
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.900
 SUBAREA RUNOFF(CFS) =      0.13
 TOTAL AREA(ACRES) =      0.03   PEAK FLOW RATE(CFS) =      0.13

********************************************************************************
 FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
========================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   315.00
 ELEVATION DATA: UPSTREAM(FEET) =     95.30  DOWNSTREAM(FEET) =     93.10

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   12.638
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.637
 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.)
 RESIDENTIAL
 "1 DWELLING/ACRE"           B        0.85      0.30     0.800    76   12.64
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
 SUBAREA RUNOFF(CFS) =      2.60
 TOTAL AREA(ACRES) =      0.85   PEAK FLOW RATE(CFS) =      2.60
========================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =        0.9  TC(MIN.) =     12.64
 EFFECTIVE AREA(ACRES) =      0.85  AREA-AVERAGED Fm(INCH/HR)=  0.24
 AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.800
 PEAK FLOW RATE(CFS)   =       2.60
========================================================================
========================================================================
 END OF RATIONAL METHOD ANALYSIS
```

NEWHOPE STREET

N

1"=20'

	TOTAL AREA	0.88 AC
	PERVIOUS AREA	0.57 AC
	% PERVIOUS	64.8 %
	% IMPERVIOUS	35.2 %

PERVIOUS AREA
EXISTING CONDITION
TENTATIVE TRACT NO. 84168

LATEST REVISION: 8/8/23

GARDEN GROVE

2. Rational Method Hydrology

Post-Development

10-Year Storm Event
25-Year Storm Event
100-Year Storm Event

```
**********************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
        (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
      (c) Copyright 1983-2016 Advanced Engineering Software (aes)
          Ver. 23.0  Release Date: 07/01/2016  License ID 1355

                        Analysis prepared by:
```

```
 ************************* DESCRIPTION OF STUDY *************************
* Tentative Tract No. 19298, City of Garden Grove                      *
* 10-Year Storm Event                                                  *
*                                                                      *
 **********************************************************************

  FILE NAME: GGP.DAT
  TIME/DATE OF STUDY: 08:33 09/10/2023
======================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
======================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *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 0.0312 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     30.00 TO NODE     31.00 IS CODE =  21
```

```
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   327.00
  ELEVATION DATA: UPSTREAM(FEET) =     96.50  DOWNSTREAM(FEET) =     92.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.922
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.118
  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.)
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"        B        0.88      0.30      0.200    56    7.92
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      2.42
  TOTAL AREA(ACRES) =      0.88   PEAK FLOW RATE(CFS) =      2.42

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    91.00  DOWNSTREAM(FEET) =    86.00
  FLOW LENGTH(FEET) =    27.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   4.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.41
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.42
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    7.95
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =     354.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.9  TC(MIN.) =      7.95
  EFFECTIVE AREA(ACRES) =      0.88  AREA-AVERAGED Fm(INCH/HR)=  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.200
  PEAK FLOW RATE(CFS)   =       2.42
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

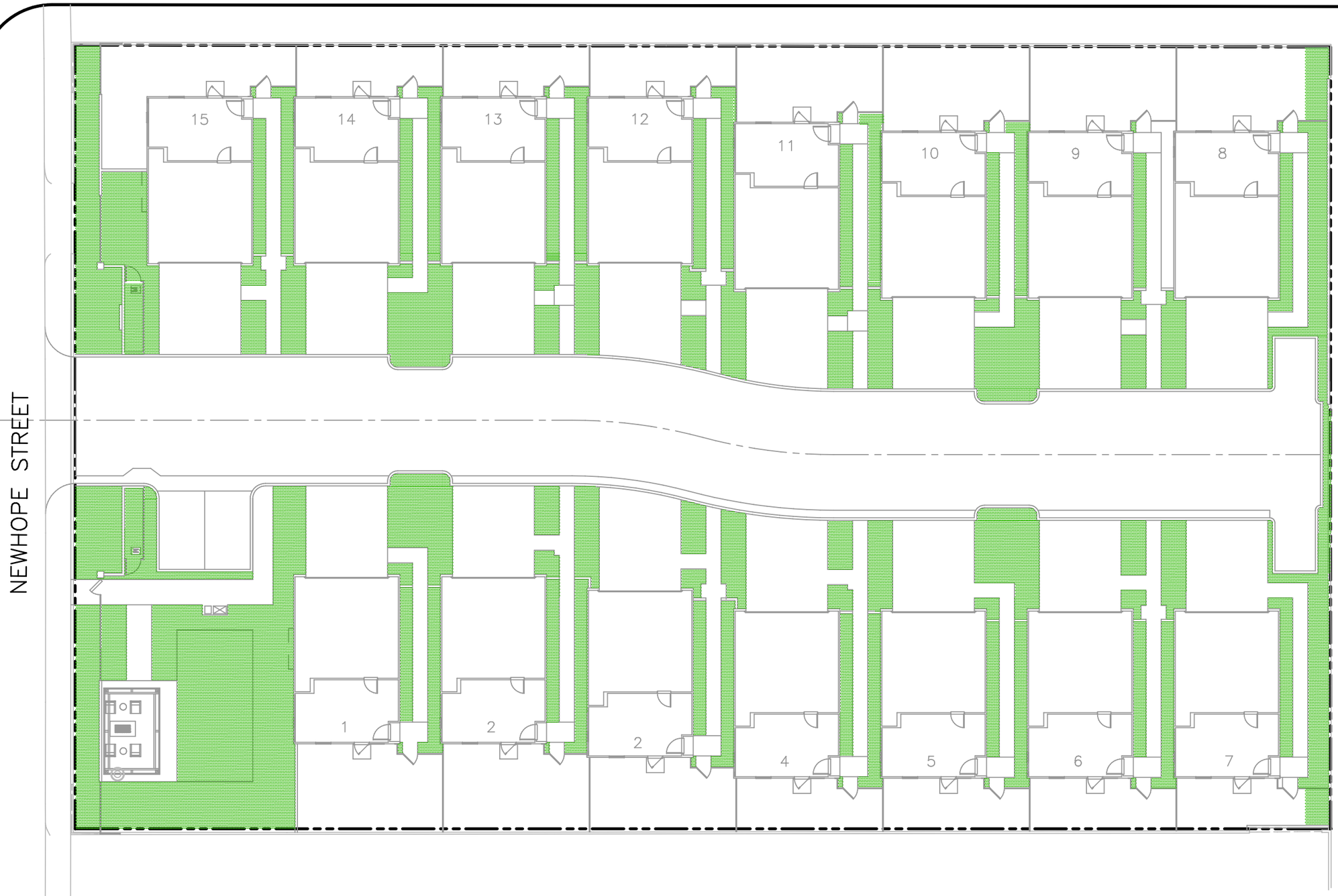
```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
        (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
      (c) Copyright 1983-2016 Advanced Engineering Software (aes)
          Ver. 23.0  Release Date: 07/01/2016  License ID 1355

                        Analysis prepared by:



 ************************* DESCRIPTION OF STUDY *************************
* Tentative Tract No. 19298, City of Garden Grove                        *
* 25-Year Storm Event                                                    *
*                                                                        *
 ************************************************************************

  FILE NAME: GGP.DAT
  TIME/DATE OF STUDY: 08:32 09/10/2023
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *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 0.0312 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     30.00 TO NODE     31.00 IS CODE =  21
```

```
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   327.00
  ELEVATION DATA: UPSTREAM(FEET) =     96.50  DOWNSTREAM(FEET) =     92.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.922
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.717
  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.)
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"        B        0.88      0.30      0.200    56    7.92
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      2.90
  TOTAL AREA(ACRES) =      0.88   PEAK FLOW RATE(CFS) =      2.90

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    91.00  DOWNSTREAM(FEET) =    86.00
  FLOW LENGTH(FEET) =    27.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   3.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.62
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.90
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    7.95
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =     354.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.9  TC(MIN.) =      7.95
  EFFECTIVE AREA(ACRES) =      0.88  AREA-AVERAGED Fm(INCH/HR)=  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.200
  PEAK FLOW RATE(CFS)   =       2.90
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
        (c) Copyright 1983-2016 Advanced Engineering Software (aes)
            Ver. 23.0  Release Date: 07/01/2016  License ID 1355

                          Analysis prepared by:
```

```
 ************************** DESCRIPTION OF STUDY **************************
* Tentative Tract No. 19298, City of Garden Grove                         *
* 100-Year Storm Event                                                    *
*                                                                         *
 *************************************************************************

  FILE NAME: GGP.DAT
  TIME/DATE OF STUDY: 08:31 09/10/2023
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *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 0.0312 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     30.00 TO NODE     31.00 IS CODE =  21
```

```
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   327.00
  ELEVATION DATA: UPSTREAM(FEET) =     96.50  DOWNSTREAM(FEET) =     92.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.922
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.753
  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.)
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       B        0.88      0.30     0.200    76    7.92
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      3.72
  TOTAL AREA(ACRES) =      0.88   PEAK FLOW RATE(CFS) =      3.72

******************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  31
------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    91.00  DOWNSTREAM(FEET) =    86.00
  FLOW LENGTH(FEET) =    27.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.63
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.72
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    7.95
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =     354.00 FEET.
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.9  TC(MIN.) =      7.95
  EFFECTIVE AREA(ACRES) =      0.88  AREA-AVERAGED Fm(INCH/HR)=  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.200
  PEAK FLOW RATE(CFS)   =       3.72
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```



TOTAL AREA	0.88	AC
PERVIOUS AREA	0.19	AC
% PERVIOUS	21.6	%
% IMPERVIOUS	78.4	%

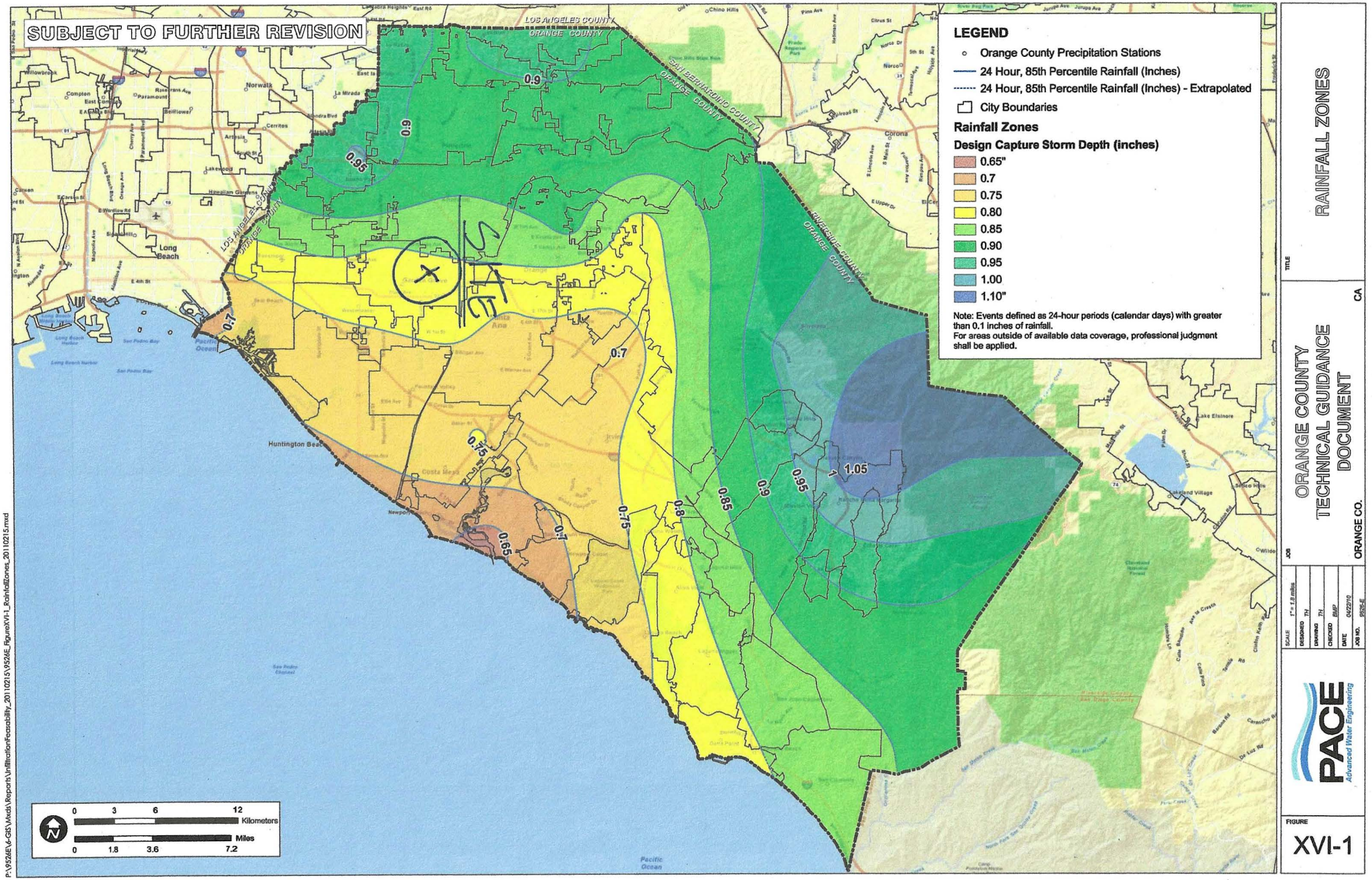
PERVIOUS AREA
PROPOSED CONDITION
TENTATIVE TRACT NO. 19298
GARDEN GROVE

3. Stormwater Quality Design Flow Calculations

Worksheet B: Simple Design Capture Volume Sizing Method

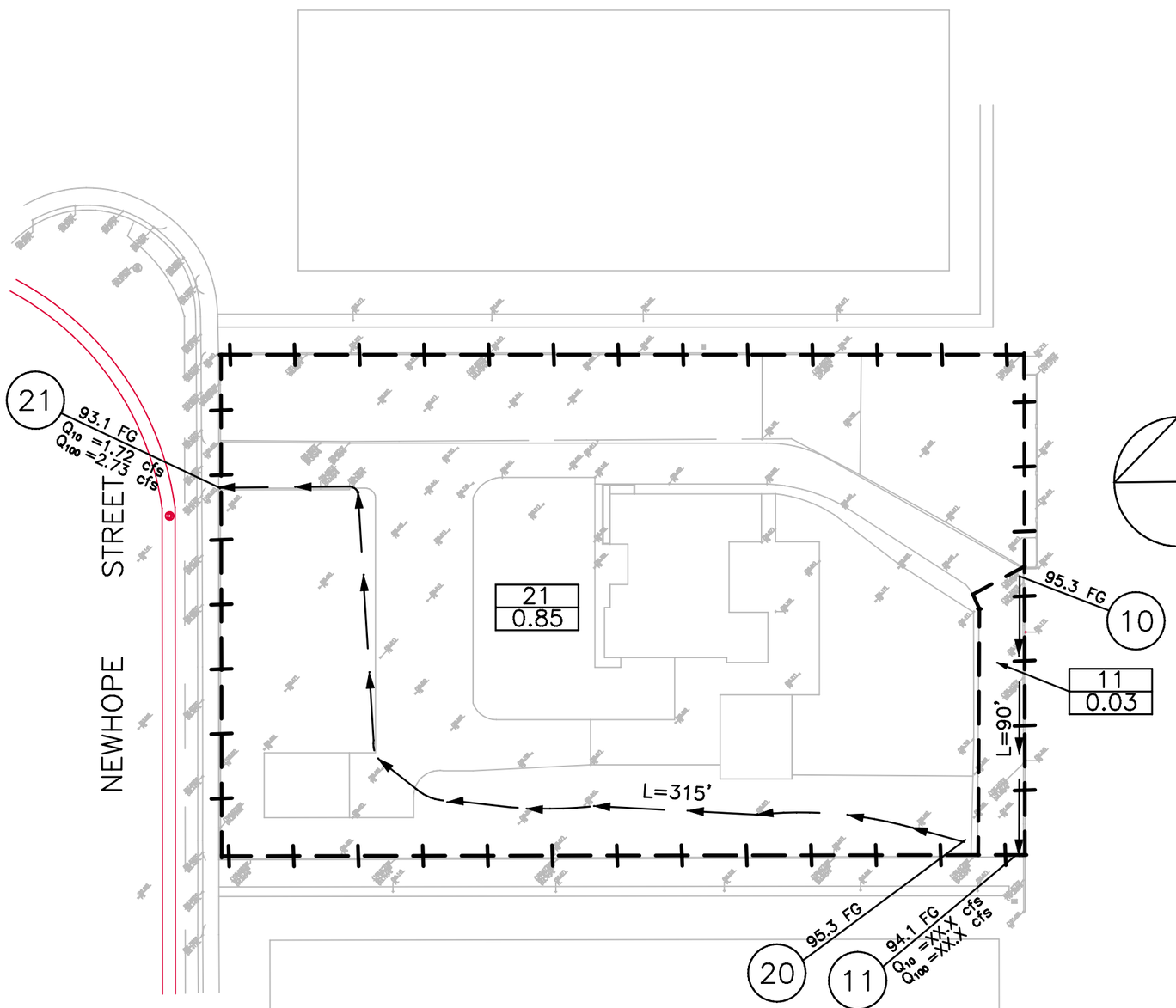
Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.78	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=		inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=		inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.88	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.78	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.74	
4	Calculate runoff volume, V_{design}= *(C x* $d_{remainder}$ *x A x 43560 x (1/12))*	V_{design}=	2,095	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate				
1	Enter measured infiltration rate, $K_{observed}$[1] (in/hr) (Appendix VII)	$K_{observed}$=		In/hr
2	Enter combined safety factor from Worksheet H, S_{total} (unitless)	S_{total}=		
3	Calculate design infiltration rate, $K_{design} = K_{observed} / S_{total}$	K_{design}=		In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=		Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=		feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=		sq-ft

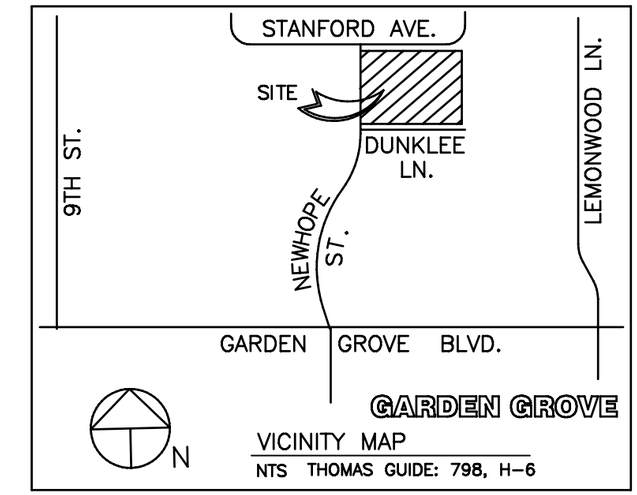
[1] $K_{observed}$ is the vertical infiltration measured in the field, before applying a factor of safety. If field testing measures a rate that is different than the vertical infiltration rate (for example, three-dimensional borehole percolation rate), then this rate must be adjusted by an acceptable method (for example, Porchet method) to yield the field estimate of vertical infiltration rate, $K_{observed}$. See Appendix VII.

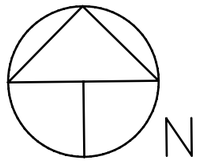

SUBJECT TO FURTHER REVISION
LEGEND
Orange County Precipitation Stations
24 Hour, 85th Percentile Rainfall (Inches)
24 Hour, 85th Percentile Rainfall (Inches) - Extrapolated
City Boundaries
Rainfall Zones
Design Capture Storm Depth (inches)
0.65"
0.7
0.75
0.80
0.85
0.90
0.95
1.00
1.10"
Note: Events defined as 24-hour periods (calendar days) with greater than 0.1 inches of rainfall.
For areas outside of available data coverage, professional judgment shall be applied.
LOS ANGELES COUNTY
ORANGE COUNTY
SAN BERNARDINO COUNTY
RIVERSIDE COUNTY
Huntington Beach
Long Beach
Norwalk
Corona
Lake Elsinore
Pacific Ocean
0 3 6 12 Kilometers
0 1.8 3.6 7.2 Miles
TITLE
RAINFALL ZONES
JOB
ORANGE COUNTY TECHNICAL GUIDANCE DOCUMENT
CA
ORANGE CO.
SCALE 1" = 1.8 miles
DESIGNED TH
DRAWING TH
CHECKED BMP
DATE 04/23/10
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 A

Pre- and Post-Development Hydrology Maps







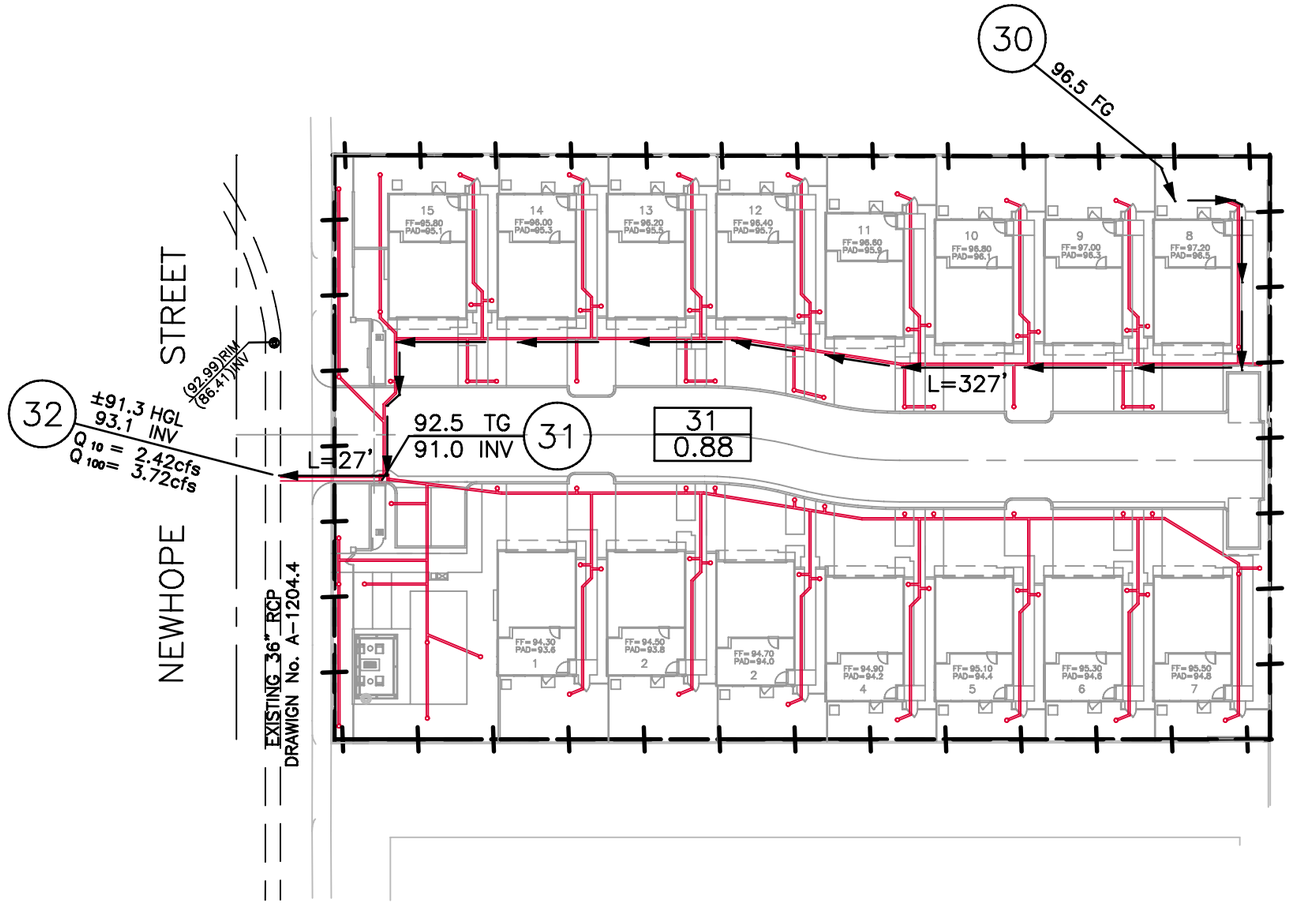
Scale 1" = 40'

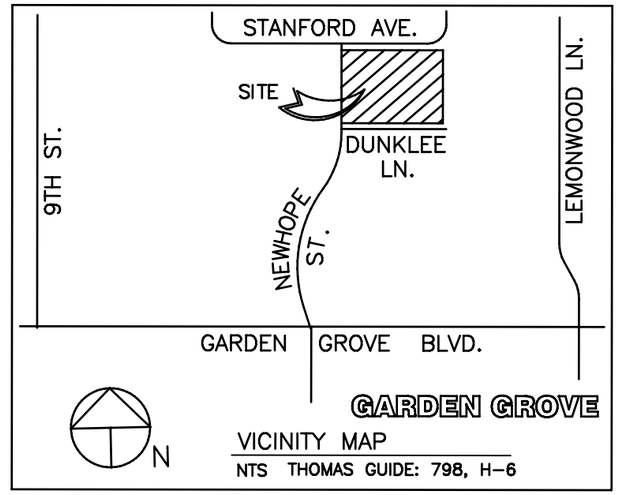
LEGEND

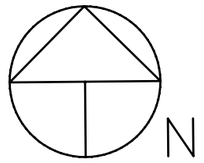
- DRAINAGE BOUNDARY
- SUB–AREA BOUNDARY
- (10) NODAL POINT
- (21 / 0.13) TRIBUTARY NODAL POINT / AREA (AC)

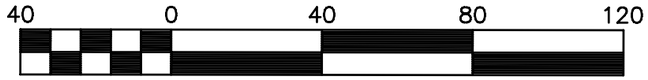
9/15/23

EXISTING HYDROLOGY MAP
TENTATIVE TRACT No. 19298
CITY OF GARDEN GROVE









LEGEND

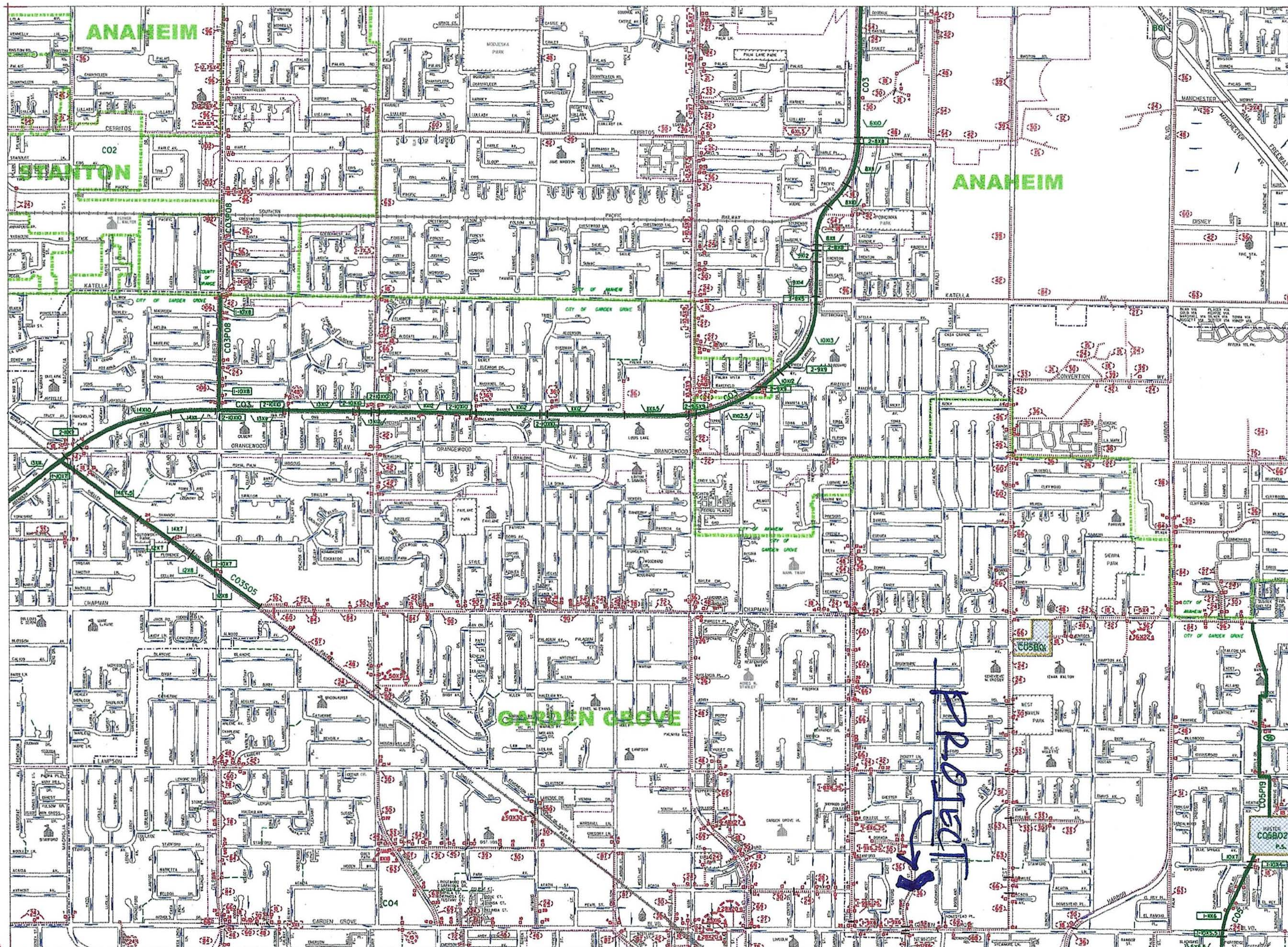
- DRAINAGE BOUNDARY
- SUB-AREA BOUNDARY
- (10) NODAL POINT
- 31 / 0.88 TRIBUTARY NODAL POINT AREA (AC)

9/15/23

PROPOSED HYDROLOGY MAP
TENTATIVE TRACT No. 19298
CITY OF GARDEN GROVE

Appendix B

Susceptibility Analysis Map



20

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 (OCPW) Flood Control Division of additions or corrections, please contact Sal Gutierrez at (714) 834-5396 or by email at sal.gutierrez@rdmd.ocgov.com

ORANGE COUNTY FLOOD CONTROL DISTRICT

BASE MAP OF DRAINAGE FACILITIES IN ORANGE COUNTY

REVISION	DATE	SHEET NO.	DWG. NO.
S. GUTIERREZ	JAN.12/2000	20	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

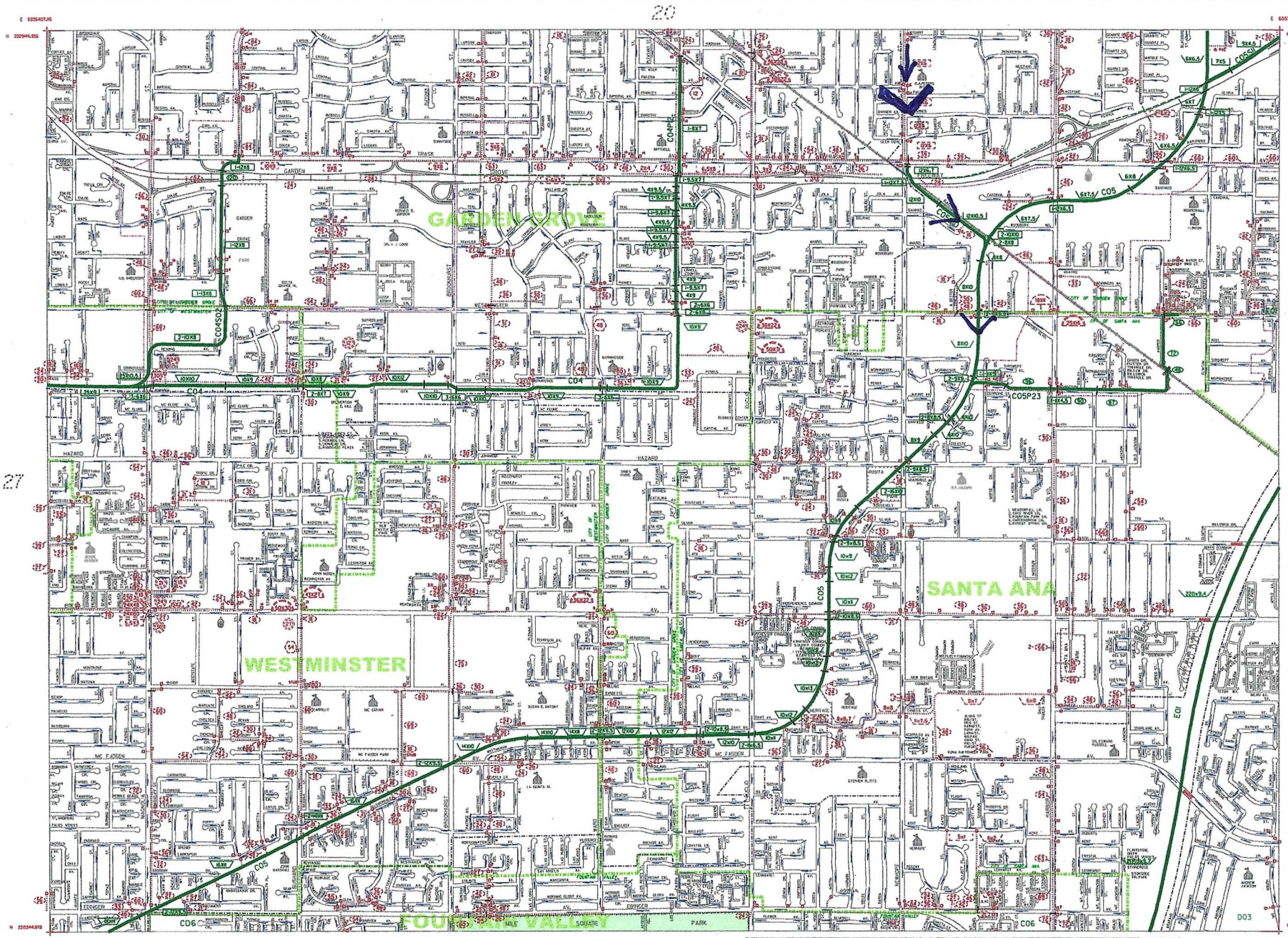
Ownership (if other than City or County): Private=P State=S Federal=F

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)

20



NOTICE

The drainage information has been prepared for information purposes only. The location, ownership, facility information and facts 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 the Resources & Development Management Department (RDMD) of additions or corrections, please contact Sal Gutierrez at (714) 834-5396 or by email at sal.gutierrez@rdmd.ocgov.com

N

0 200 400 600 800 FEET

ORANGE COUNTY FLOOD CONTROL DISTRICT

BASE MAP OF DRAINAGE FACILITIES IN ORANGE COUNTY

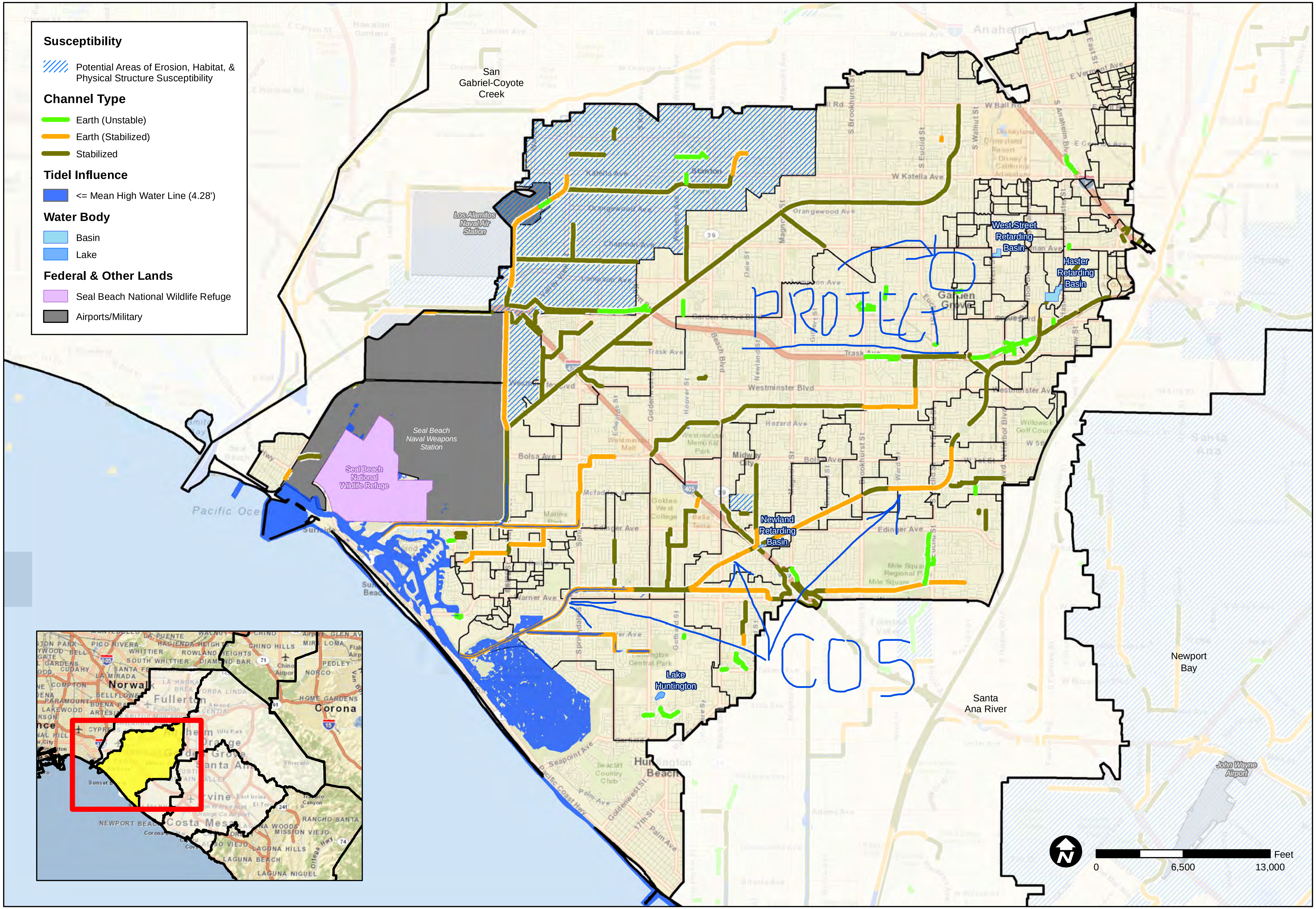
REVISION	DATE	SHEET NO.	DWG NO.
R. GUTIERREZ	JULY 22, 2008	28	MAPS-113-3

- 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)


Susceptibility
Potential Areas of Erosion, Habitat, & Physical Structure Susceptibility
Channel Type
Earth (Unstable)
Earth (Stabilized)
Stabilized
Tidel Influence
<= Mean High Water Line (4.28')
Water Body
Basin
Lake
Federal & Other Lands
Seal Beach National Wildlife Refuge
Airports/Military
San Gabriel-Coyote Creek
Los Alamitos Naval Air Station
Seal Beach Naval Weapons Station
Seal Beach National Wildlife Refuge
Pacific Ocean
West Street Retarding Basin
Haster Retarding Basin
Newland Retarding Basin
Lake Huntington
Santa Ana River
Newport Bay
John Wayne Airport
PROJECT
C05
Feet
0
6,500
13,000

TITLE
SUSCEPTIBILITY ANALYSIS ANAHEIM BAY-HUNTINGTON HARBOR

JOB
ORANGE COUNTY WATERSHED MASTER PLANNING
ORANGE CO. CA

SCALE	DESIGNED	DRAWING	CHECKED	DATE	JOB NO.
1" = 6500'	TH	TH	BMP	04/22/10	9526-E

PACE
Advanced Water Engineering

FIGURE
2

P:\9526E\6-GIS\Mxds\Workspace\SusceptibleAnalysis_20100422\9526E_AnaheimBay_20100331.mxd

Appendix C

National Flood Hazard Layer FIRMette

National Flood Hazard Layer FIRMette

FEMA

117°56'4"W 33°46'42"N

117°55'26"W 33°46'12"N

Feet 1:6,000

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

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
- Levee, Dike, or Floodwall

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

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

N

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 8/26/2023 at 2:10 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.