FUSCOE ENGINEERING

FINAL HYDROLOGY REPORT

COSTCO WHOLESALE WAREHOUSE NO. 122
2655 EL CAMINO REAL
TUSTIN, CA

FUSCOE ENGINEERING, INC.
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PROJECT MANAGER: Mark Nero

DATE PREPARED: May 2019

PROJECT NUMBER: 756-059-01

full circle thinking®

PREPARED BY:

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Project Number:

756-059

COSTCO WHOLESALE WAREHOUSE NO. 122
2655 EL CAMINO REAL
Tustin, California

Supervising Engineer:

Mark Nero, P.E.

Date Prepared:

May 2019

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION

The site 11.9-acre which consists of an existing Costco Warehouse with associated parking and a tire store has a site improvement study area of only 6.6 acres. The existing Costco Warehouse is to remain whilst the tire store will be demolished, and the area converted to parking stalls.

The existing site flows can be divided into two separate areas, Area A and Area B. Area A consists of the existing warehouse building and truck docks along with parking areas to the south. This drainage area drains south towards the low point for Area A which is located in the southwest corner of the parking area. The run-off is collected in a catch basin located in a quasi-sump and conveyed by an existing 18" pipe to the south. Area B is an existing tire shop and parking that drains east into an adjacent parking area. The southeast corner of this parking area is the low point with a catch basin in a quasi-sump. The catch basin connects to the pipe system serving Area A via an 18" pipe. The combined pipe system which increases to a 54" pipe conveys the flows south which then connects to the existing OCFCD F07 channel. See existing hydrology map in Appendix 4.

The project is located in flood zone 'X' per FEMA Flood Insurance Rate Map (FIRM) No. 06059C0281J, revised December 3, 2009. Flood zone 'X' corresponds to areas outside the 500-year flood. See FEMA FIRMETTE in Appendix 3. The site has a type D hydrological soil, see the Orange County Soil Map in Appendix 3.

1.2 PURPOSE OF THIS REPORT

The purpose of this report is to accomplish the following objectives:

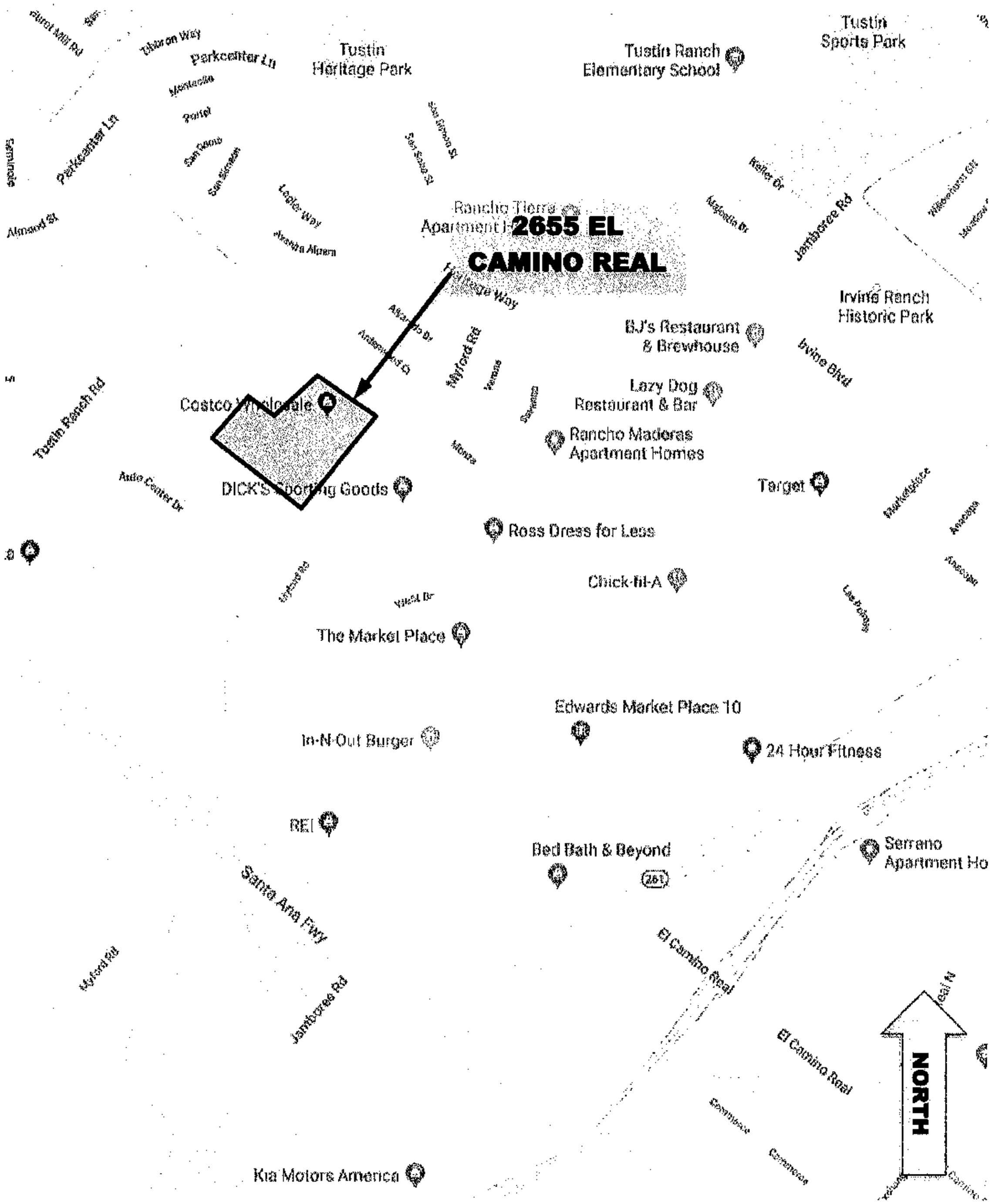
To determine the developed storm water discharges generated within the project area for determination of design feasibility, detention requirements, constructability and impact on existing facilities.

To establish that there are no significant impacts to the surrounding facilities and properties because of this development.

1.3 REFERENCES

- Orange County Hydrology Manual
- Orange County Local Drainage Manual Design Manual
- Federal Emergency Management Agency; FEMA Map Service Center (Web based)
- City of Tustin Standard plans
- County of Orange GIS database (Soil type and downstream facilities)

1.4 PROJECT SITE LOCATION MAP



2.0 PROPOSED ON-SITE DRAINAGE FACILITIES

The purpose of this report to determine the feasibility of the proposed drainage facilities. Detailed design that can be used for construction will provided in the final report.

This project will provide water quality treatment to the low flows within the limits of the project. A portion of the Costco Warehouse's parking area is proposed to be converted to a gas fueling area. Storm runoff is not allowed to be directed towards or across the proposed fueling pad area. Any runoff from the fueling pad area will be collected and treated prior to entering any other area or drainage system. See this project's water quality management plan currently under review titled: Preliminary Water Quality Management Plan (WQMP); Costco Tustin Gas Station & Parking; 2655 El Camino Real, Tustin Orange County.

The proposed improvements include three proposed inlets to collect the runoff for water quality treatment. The site is graded to provide secondary flow paths for runoff from events exceeding the major storm event.

2.1 PROPOSED SITE CONDITIONS

Proposed Area A will contain a proposed fueling area. To prevent upstream runoff entering the fueling area a proposed landscape buffer with a 6" curb and gutter diverts the runoff around the fueling pad area. The run off once directed east or west then continues towards collection inlets located either to the southeast or southwest of the fueling pad area. The low flow runoff is then diverted to a Modular Wetland Systems (MWS) unit equipped with full trash capture devices for water quality treatment. Refer to the proposed Hydrology map provided in Appendix 4.

Subarea A1 includes the roof for the fueling area, which is directed to the westerly of these MWS units via underground pipes. The fueling pad area surface flows, when they occur are directed towards a ribbon gutter along the west edge, collected in an inlet and conveyed via a pipe to a sand oil interceptor and oil stop valve, before connecting to the existing storm pipe system. It is anticipated that flows from the fueling pad area are minimal and therefore do not impact Subarea A1.

Subarea A1 is graded such that the runoff in the parking area is directed to the proposed southwest corner inlet with a connection to the historic existing 18" pipe. This pipe system continues south and enlarges to a 54" storm pipe system which connects to the OCFCD F07 concrete lined channel. Flows that exceed the capacity of the proposed southwest corner inlet will top the curb and continue south to the El Camino Real street curb and gutter system. The Hydrology Map in appendix 4 illustrates these flow paths and facilities.

The east MWS unit for Subarea A2 has a curb opening that collects the 10-year runoff for this Subarea and connects via 24" pipe to an existing 36" storm drain pipe. The flow in the existing 36" pipe is then directed straight into the existing OCFCD F07 channel. Refer to Appendix 2 for the analysis of the pipes. Flows that exceed the internal by-pass of the MWS unit (greater than the 10-year event) will top the curb and flow to the channel. The Hydrology Map in appendix 4 illustrates these flow paths and facilities.

Proposed Area B is graded to directs the runoff from Area B to flow by the proposed MWS unit that is sized to treat the first flush runoff. A new 12" pipe will connect this unit to the existing 18" private storm pipes. Any flows that exceed the unit will by-pass and continue to be collected in the existing inlet located in the parking lot shown in the Hydrology Map in Appendix 4.

The proposed development makes minor changes to the historic drainage patterns. These changes consist of minor adjustments to the capture of runoff in subareas A1 with a new inlet and using the existing storm pipe. The other change is with subarea A2 being collected in a new location and discharged into the same channel, OCFCD channel F07, 860' upstream from the historic discharge point. Historically both subareas A1 and A2 were collected at the same location and conveyed together to OCFCD channel F07.

2.2 DETENTION REQUIREMENT

Proposed flows are less than the existing flows due to the added landscape areas in the proposed parking area and reduced travel times. No detention will be needed for the site. Refer to the Flow Comparison table on page 8 of this report.

2.3 HYDRAULIC CALCULATIONS

Hydraulic calculations for the proposed inlets were performed using the nomograph for grated inlets in the Orange County Hydraulics Manual. Should complete clogging of the inlets occur, ponding of the storm flows will occur until the depth exceeds the adjacent curb and the runoff will flow as mentioned in section 2.1. The closest structure is the office for the fueling area attendant and building finish floor is approximately 1 foot above the top of curb that is used as the overflow path for the closest inlet in the southwest corner of Subarea A2. See Appendix 2 for calculations.

3.0 HYDROLOGY STUDY

3.1 STORM FREQUENCY

The existing Area A directs the entire proposed improvement area runoff to the 54" pipe system in Auto Center Drive, which eventually discharges into the OCFCD F07 channel. Existing Area B is part of a larger drainage area that also discharges into the 54" pipe in Auto Center Drive. The proposed Subarea A1 improvement runoff is directed to this existing 54" pipe system, while Subarea A2's runoff flows are directed to the OCFCD F07 channel via an existing 36" pipe. The proposed improvements reduce the burden placed on the 54" pipe system in the historic condition by 1.6 cfs for the 10-year event.

The proposed drain system(s) will be designed to be consistent with the following goals and guidelines as presented in the Orange County Hydrology Manual.

Onsite design storm is based on a 10-year event and 25-year event for overflow since the Subareas are only in a quasi-sump condition. All inlets and appurtenant piping will be designed in conformance with the Orange County Hydraulics manual.

3.2 METHODOLOGY

This study was prepared in conformance with the Orange County Hydrology Manual. The calculations from the Manual were made in AES a computer program to compile the hydrologic data and to determine the peak discharges.

Hydraulic calculations were done using Manning's equation and equations from the Manual were run in an Excel spreadsheet to determine pipe capacities.

The catch basin capacity/size was determined based on Orange County Local Drainage Manuals methods for sump and one grade inlets.

Copies of the computer print-outs and calculations are included in the appendixes of this report.

4.0 DESIGN CRITERIA

The proposed inlets and storm drain system(s) will be designed to be consistent with the following goals and guidelines as presented in the Orange County Hydrology and the Orange County Local Drainage Manuals.

All habitable buildings shall be protected from flooding during a 100-year frequency storm. This site is in flood zone 'X' per FEMA maps and flooding is not considered an issue on this site. (See section 1.2)

Onsite design storm is based on a 25-year frequency for overflow conditions which are in a quasi-sump condition.

Recommended design water surface elevations inside area drains shall be 0.5' below inlet grate elevation when possible.

Pipe size may not be decreased downstream without the City's approval.

Branching of flow is not allowed.

Area drains and appurtenant piping shall be designed in conformance with the Orange County Hydraulics manual.

4.1 SUMMARY OF FLOWS, 10-YEAR EVENT

	Area ID (Node)	Area (Acres)	Flow (cfs)	Notes
EXISTING	A	6.11	19.4	
	B	0.63	2.3	Total Existing flow = 21.7 cfs
PROPOSED	A1	2.63	8.0	0.29AC fueling area roof flow = 0.9 cfs
	A2	3.37	10.0	
	B	0.63	2.1	Total Proposed flow = 20.1 cfs

4.2 SUMMARY OF FLOWS, 25-YEAR EVENT

	Area ID (Node)	Area (Acres)	Flow (cfs)	Notes
EXISTING	A	6.11	23.1	
	B	0.63	2.7	Total Existing flow = 25.8 cfs
PROPOSED	A1	2.63	9.5	
	A2	3.37	11.9	
	B	0.63	2.5	Total Proposed flow = 23.9 cfs

5.0 CONCLUSIONS

The proposed condition runoff from Area A (made up of Subareas A1 & A2 in the proposed condition) has less flows than in comparison to the existing condition for each storm event analyzed. Also, a portion of the Area's flows are directed towards the adjacent OCFCD channel F07 which reduces the load on the existing public system in El Camino Real and beyond. Area B has almost matching runoff for the existing and proposed conditions. These results indicate that the proposed project may be constructed in a manner that minimizes the impact of the proposed storm flow to the existing surrounding areas and neighborhood while providing safe and adequate drainage operation for the proposed project.

APPENDIX 1 - Existing and Proposed Hydrology Studies

```
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
          (c) Copyright 1983-2014 Advanced Engineering Software (aes)
              Ver. 21.0  Release Date: 06/01/2014  License ID 1355

                          Analysis prepared by:

                            Fuscoe Engineering
                           16795 Von Karman Ave
                                 Ste 100
                             Irvine, CA 92606

 ************************** DESCRIPTION OF STUDY **************************
 * COSTCO WHOLESALE WAREHOUSE NO. 122                                     *
 * EXISTING 10 YEAR                                                       *
 * PN 756-59                                                              *
 **************************************************************************

  FILE NAME: E10.DAT
  TIME/DATE OF STUDY: 16:00 04/29/2019
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                   --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  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
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  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
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  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
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  ELEVATION DATA: UPSTREAM(FEET) =     94.00  DOWNSTREAM(FEET) =     87.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.311
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.552
  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        6.11      0.20      0.100    75    6.31
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     19.42
  TOTAL AREA(ACRES) =      6.11   PEAK FLOW RATE(CFS) =     19.42

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     22.00 IS CODE =  21
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  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
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  INITIAL SUBAREA FLOW-LENGTH(FEET) =      0.63
  ELEVATION DATA: UPSTREAM(FEET) =     94.00  DOWNSTREAM(FEET) =     90.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  4.060
  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        0.63      0.20      0.100    75    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      2.29
  TOTAL AREA(ACRES) =      0.63   PEAK FLOW RATE(CFS) =      2.29
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =        0.6  TC(MIN.) =      5.00
  EFFECTIVE AREA(ACRES) =      0.63  AREA-AVERAGED Fm(INCH/HR)=  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)    =       2.29
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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****************************************************************************
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                          Analysis prepared by:

                            Fuscoe Engineering
                           16795 Von Karman Ave
                                 Ste 100
                             Irvine, CA 92606

 ************************** DESCRIPTION OF STUDY **************************
 * COSTCO WHOLESALE WAREHOUSE NO. 122                                       *
 * EXISTING 25 YEAR                                                         *
 * PN 756-59                                                                *
 **************************************************************************

  FILE NAME: E25.DAT
  TIME/DATE OF STUDY: 16:35 04/29/2019
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                   --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  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 0.0313 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     10.00 TO NODE     11.00 IS CODE =  21
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  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
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INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
ELEVATION DATA: UPSTREAM(FEET) =     94.00  DOWNSTREAM(FEET) =     87.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.311
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.228
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         6.11     0.20     0.100    75    6.31
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
SUBAREA RUNOFF(CFS) =     23.14
TOTAL AREA(ACRES) =      6.11   PEAK FLOW RATE(CFS) =     23.14

****************************************************************************
 FLOW PROCESS FROM NODE      20.00 TO NODE      22.00 IS CODE =  21
----------------------------------------------------------------------------
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
INITIAL SUBAREA FLOW-LENGTH(FEET) =     0.63
ELEVATION DATA: UPSTREAM(FEET) =     94.00  DOWNSTREAM(FEET) =     90.50

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.824
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         0.63     0.20     0.100    75    5.00
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
SUBAREA RUNOFF(CFS) =      2.72
TOTAL AREA(ACRES) =      0.63   PEAK FLOW RATE(CFS) =      2.72
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END OF STUDY SUMMARY:
TOTAL AREA(ACRES)     =        0.6  TC(MIN.) =      5.00
EFFECTIVE AREA(ACRES) =      0.63  AREA-AVERAGED Fm(INCH/HR)=  0.02
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.100
PEAK FLOW RATE(CFS)   =       2.72
============================================================================
============================================================================
END OF RATIONAL METHOD ANALYSIS
```

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                         Analysis prepared by:

                           Fuscoe Engineering
                          16795 Von Karman Ave
                                Ste 100
                           Irvine, CA 92606

 ************************** DESCRIPTION OF STUDY **************************
 * COSTCO WHOLESALE WAREHOUSE NO. 122                                       *
 * PROPOSED 10 YEAR                                                         *
 * PN 756-59                                                                *
 **************************************************************************

  FILE NAME: P10.DAT
  TIME/DATE OF STUDY: 16:11 04/29/2019
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                  --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  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

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  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) =   300.00
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 ELEVATION DATA: UPSTREAM(FEET) =     94.00  DOWNSTREAM(FEET) =     89.30

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 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.835
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.394
 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        2.63      0.20      0.100    75    6.83
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      7.99
 TOTAL AREA(ACRES) =      2.63   PEAK FLOW RATE(CFS) =      7.99

****************************************************************************
 FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  21
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 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
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 ELEVATION DATA: UPSTREAM(FEET) =     94.20  DOWNSTREAM(FEET) =     88.30

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.164
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.304
 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        3.37      0.20      0.100    75    7.16
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      9.96
 TOTAL AREA(ACRES) =      3.37   PEAK FLOW RATE(CFS) =      9.96

****************************************************************************
 FLOW PROCESS FROM NODE     20.00 TO NODE     22.00 IS CODE =  21
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 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   225.00
 ELEVATION DATA: UPSTREAM(FEET) =     94.30  DOWNSTREAM(FEET) =     90.50

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.001
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.656
 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        0.63      0.20      0.100    75    6.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      2.06
 TOTAL AREA(ACRES) =      0.63   PEAK FLOW RATE(CFS) =      2.06
```

```
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =        0.6  TC(MIN.) =      6.00
  EFFECTIVE AREA(ACRES) =      0.63  AREA-AVERAGED Fm(INCH/HR)=  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)    =       2.06
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

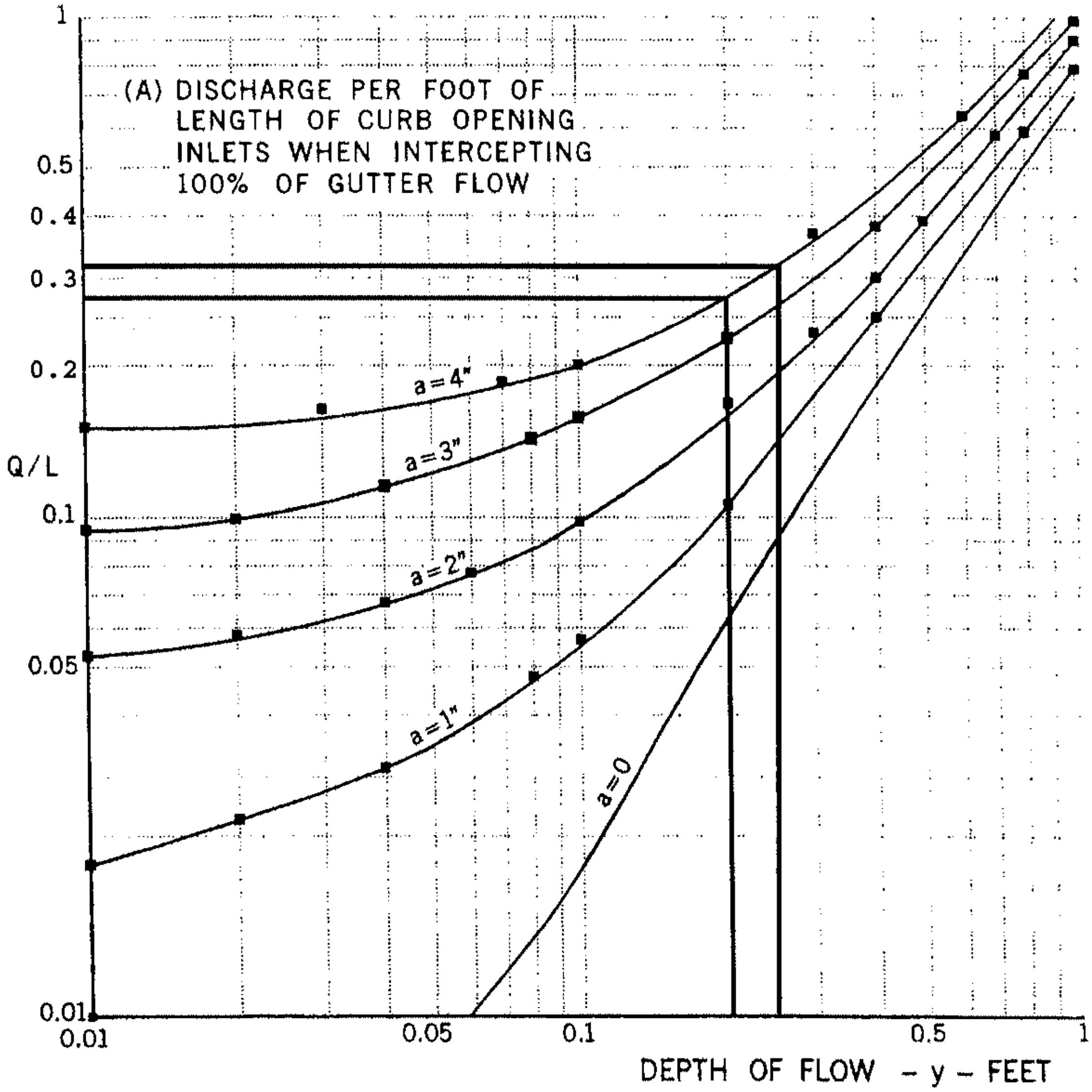
```
****************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
        (c) Copyright 1983-2014 Advanced Engineering Software (aes)
           Ver. 21.0  Release Date: 06/01/2014  License ID 1355

                         Analysis prepared by:

                          Fuscoe Engineering
                         16795 Von Karman Ave
                               Ste 100
                           Irvine, CA 92606

 ************************** DESCRIPTION OF STUDY **************************
* COSTCO WHOLESALE WAREHOUSE NO. 122                                       *
* PROPOSED 25 YEAR                                                         *
* PN 756-59                                                                *
 **************************************************************************

  FILE NAME: P25.DAT
  TIME/DATE OF STUDY: 16:37 04/29/2019
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  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 0.0313 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     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) =   300.00
ELEVATION DATA: UPSTREAM(FEET) =     94.00  DOWNSTREAM(FEET) =     89.30

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.835
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.042
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        2.63      0.20      0.100    75    6.83
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
SUBAREA RUNOFF(CFS) =      9.52
TOTAL AREA(ACRES) =      2.63   PEAK FLOW RATE(CFS) =      9.52

****************************************************************************
  FLOW PROCESS FROM NODE      12.00 TO NODE     13.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
INITIAL SUBAREA FLOW-LENGTH(FEET) =   350.00
ELEVATION DATA: UPSTREAM(FEET) =     94.20  DOWNSTREAM(FEET) =     88.30

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.164
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.935
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        3.37      0.20      0.100    75    7.16
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
SUBAREA RUNOFF(CFS) =     11.88
TOTAL AREA(ACRES) =      3.37   PEAK FLOW RATE(CFS) =     11.88

****************************************************************************
  FLOW PROCESS FROM NODE      20.00 TO NODE     22.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
INITIAL SUBAREA FLOW-LENGTH(FEET) =   225.00
ELEVATION DATA: UPSTREAM(FEET) =     94.30  DOWNSTREAM(FEET) =     90.50

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.001
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.350
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        0.63      0.20      0.100    75    6.00
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
SUBAREA RUNOFF(CFS) =      2.46
```

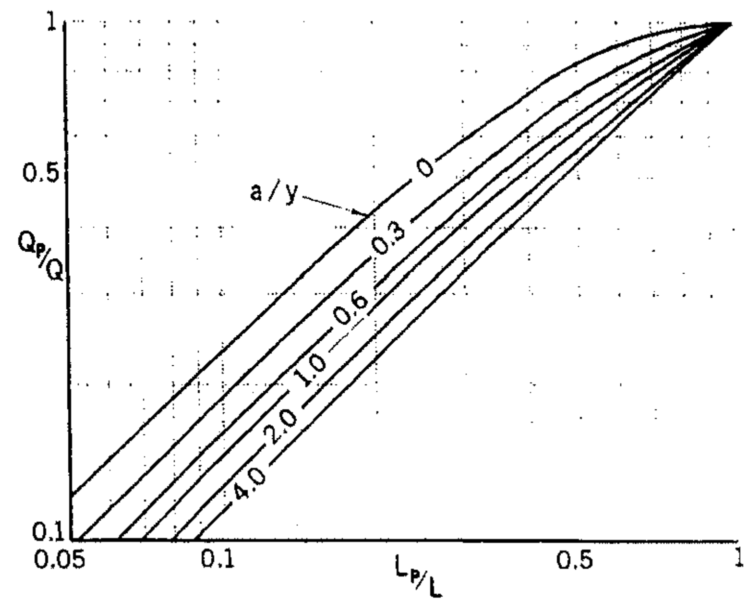
```
 TOTAL AREA(ACRES) =      0.63   PEAK FLOW RATE(CFS) =      2.46
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =        0.6  TC(MIN.) =      6.00
 EFFECTIVE AREA(ACRES) =      0.63  AREA-AVERAGED Fm(INCH/HR)=  0.02
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.100
 PEAK FLOW RATE(CFS)   =       2.46
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

APPENDIX 2 - Hydraulic Calculations

PROPOSED CURB INLET CAPCITY



(B) PARTIAL INTERCEPTION RATIO FOR INLETS OF LENGTH LESS THAN L



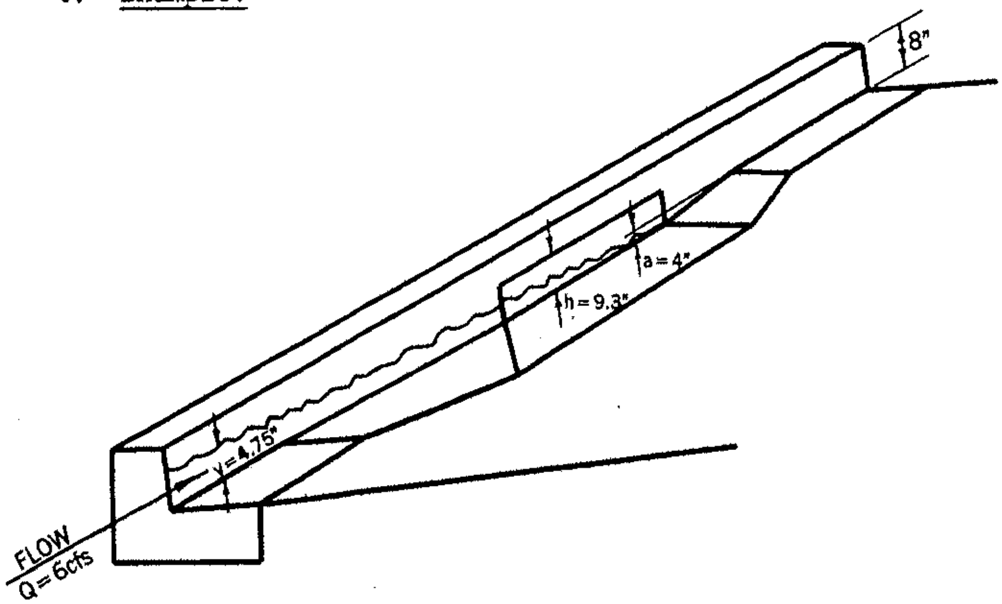
—— BASIN A2

—— BASIN B

CAPACITY OF INLETS

FIGURE 5–10

6. Example:



Inlet Definition Figure
Figure 5-11

a. Given:

Q in street	= 6 cfs
Curb height	= 8"
Depth of water at curb, y	= 4.75"
Height of local depression, a	= 4"

Use Standard curved face inlet (see Figure 5-7)

b. Calculations:

height of curb opening, h = 9.3" (from Table 5-4)

check that h > a + y
9.3" > 4.75" + 4" (OK)

from figure 5-10 (A) (for a = 4", y = 4.75" = .4')
Q/L = 0.44 cfs/ft.

therefore length of catch basin
L = Q/(Q/L) = 6/0.44 = 13.6 ft.

Use 14 ft. catch basin.

c. Standard Calculation Format

A standard form calculation format has been included as Figure 5-12.

Project: Tustin Costco

Designer: ______

Location/Street: SubArea A2

Date: May 2019

Inlet # ______

CURB OPENING (Interception)

Plan Sketch

GIVEN:

(a) Discharge Q wq = 0.8 CFS

(b) Street slope S = .005 '/'

(c) Curb type "A2-6 " "D" other ______

(d) Half street width = 18 ft.

SOLUTION: Street capacity table reference 5-2

$Q/S^{1/2}$ = 0.8 / (0.005)$^{1/2}$ = 11.3 . Therefore y = 0.26 .

Q/L = 3.1 [from Figure 5-10(A)]

L = Q/(Q/L) = 0.8 / 3.1 = 0.3 (L for total interception)

TRY:

Lp = 4 ft.

Lp/L = ______/______ = ______

a/y = .33/______ = ______

Q_p/Q = ______ [from Figure 5-10(B)]

$Q_p = (Q_p/Q) \times Q$ = ______ X ______ = ______ CFS (Intercepted)

$Q_c = Q - Q_p$ = ______ - ______ = ______ CFS (Carryover)

Project: Tustin Costco

Designer: ______

Location/Street: Area B

Date: May 2019

Inlet # ______

CURB OPENING (Interception)

Plan Sketch

GIVEN:

(a) Discharge Q wq = 0.2 CFS

(b) Street slope S = .005 '/'

(c) Curb type "A2-6" "D" other ______

(d) Half street width = 18 ft.

SOLUTION: Street capacity table reference 5-2

$Q/S^{1/2}$ = 0.2 / (0.005)$^{1/2}$ = 2.8. Therefore y = 0.2.

Q/L = 2.7 [from Figure 5-10(A)]

L = Q/(Q/L) = 0.2 / 2.7 = 0.1 (L for total interception)

TRY:

Lp = 4 ft.

Lp/L = ______/______ = ______

a/y = .33/______ = ______

Q_p/Q = ______ [from Figure 5-10(B)]

$Q_p = (Q_p/Q) \times Q$ = ______ X ______ = ______ CFS (Intercepted)

$Q_c = Q - Q_p$ = ______ - ______ = ______ CFS (Carryover)

7. Capacity of Curb Opening Inlets in a Low Point or Sump

The capacity of a curb opening inlet in a sump or low point varies with the length of the inlet (L) and the depth of water at the entrance ($H = a + y$). The inlet will operate as a weir until the water submerges the entrance. When the depth of water is about twice the height of the entrance or more, it will operate as an orifice. Between these two depths the inlet will operate somewhere between a weir and orifice.

8. Nomograph Figure 5-13 Parameters

a. Physical basis of Nomograph

° The curb opening inlet may be located on a continuous grade or at a low point in the grade. Low point is created by depressed gutter on continuous grade street.

° All flow coming to the inlet must eventually enter the inlet and will pond until sufficient head is built up so the flow through the inlet will equal the peak inflow from the gutters.

b. The hydraulic basis of the nomograph is as follows:

° For heads (depth of water) less then the height of the opening (i.e., H/h less then 1.0), the inlet acts as a weir with the flow passing through critical depth at the entrance per the formula:

$$Q = 3.087\ LH^{3/2}$$

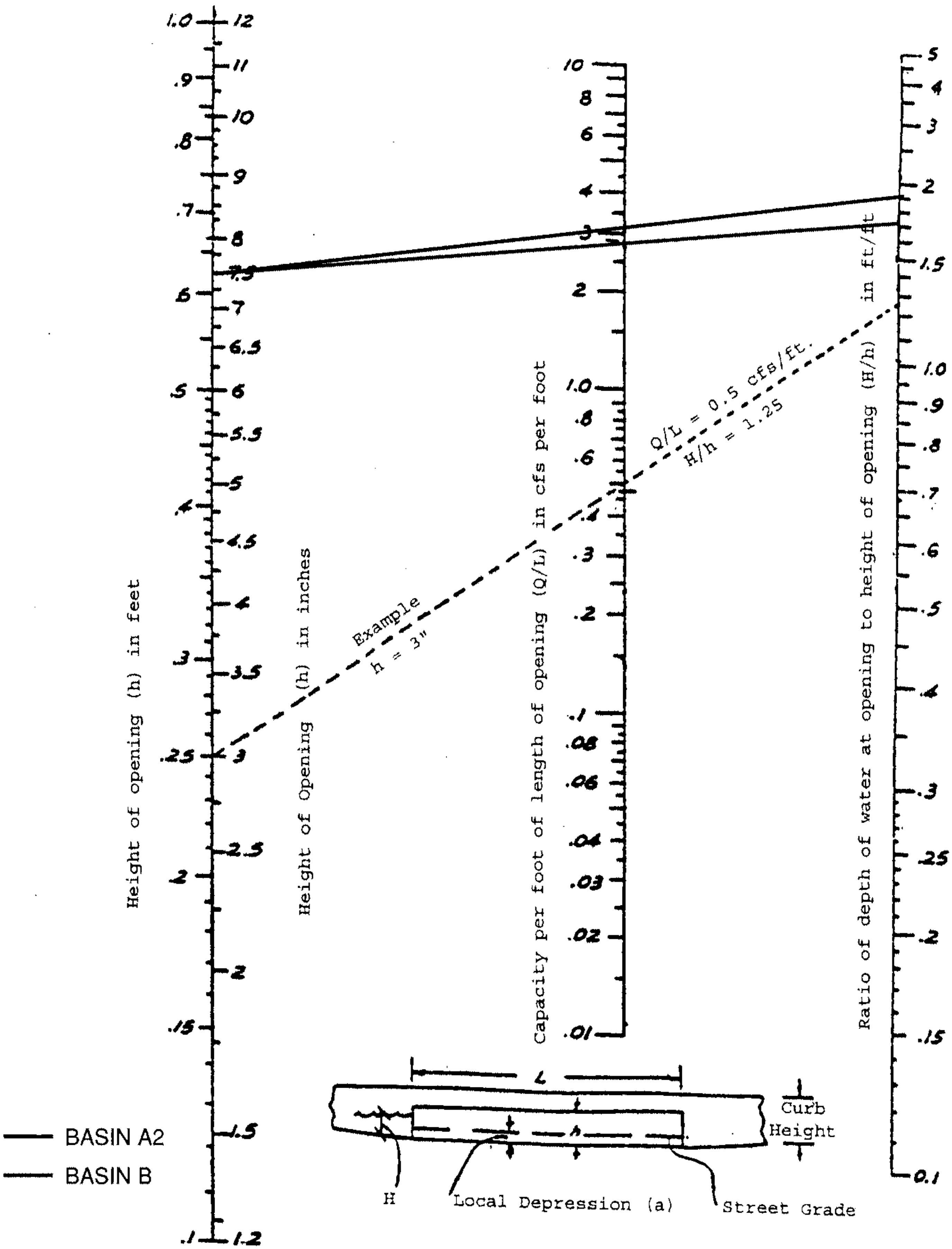
NOTE: This condition assumes no pressure flow in storm drain to cause a head to restrict a critical depth flow at entrance.

° For heads with H/h between 1 and 2, a transition was used as the operation of the inlet is not defined.

° For head equal to or greater than twice the height of opening (i.e., H/h greater than 2), the inlet acts as an orifice per the formula.

$$Q = 5.62\ h^{3/2}\ (H'/h)^{1/2}\ L$$

with H′ equal to the head on the middle of the inlet opening ($H' = H - h/2$).



Bureau of Public Roads
Division Two, Wash., D.C.

Nomograph for capacity at curb opening inlets at low points

Figure 5-13

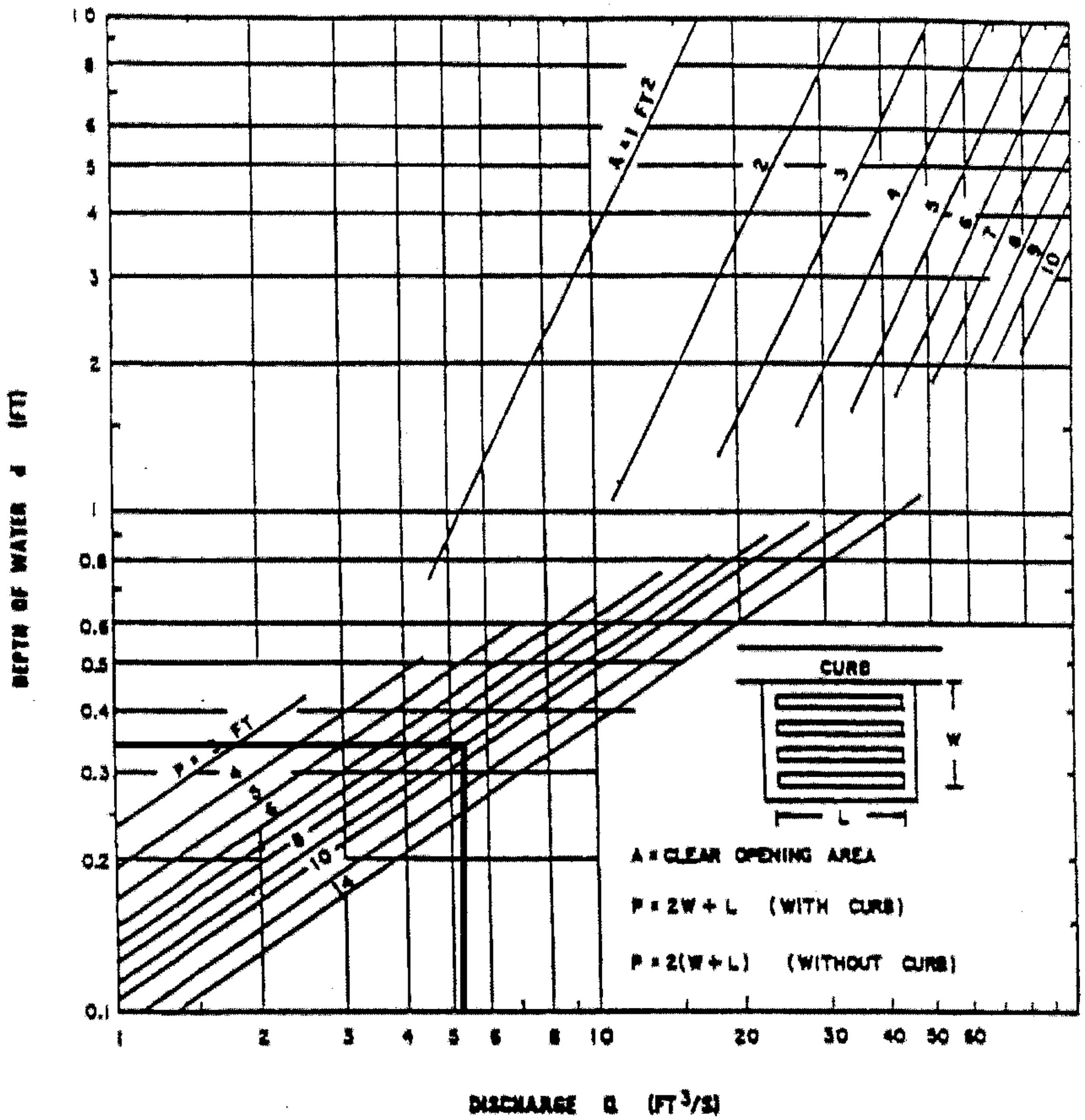
OCEMA
STREET FLOW TABLES

Street Half Width = 18'
Curb Type = A2-6"

Flow Depth ft	Flow Area sqft	Flooded Widths Street ft	Flooded Widths Parkway ft	Maximum S for Y*V=6	Conveyance Q/S**.5
0.20	0.3	4.1	0.0	3.933	3.8
0.21	0.3	4.7	0.0	3.440	4.6
0.22	0.3	5.3	0.0	2.980	5.5
0.23	0.4	5.8	0.0	2.571	6.5
0.24	0.5	6.4	0.0	2.215	7.8
0.25	0.5	7.0	0.0	1.912	9.2
0.26	0.6	7.6	0.0	1.654	10.8
0.27	0.7	8.2	0.0	1.436	12.7
0.28	0.8	8.8	0.0	1.251	14.7
0.29	0.9	9.4	0.0	1.094	17.0
0.30	1.0	10.0	0.0	0.961	19.5
0.31	1.1	10.6	0.0	0.847	22.3
0.32	1.2	11.2	0.0	0.750	25.3
0.33	1.3	11.8	0.0	0.666	28.6
0.34	1.4	12.3	0.0	0.594	32.1
0.35	1.5	12.9	0.0	0.532	36.0
0.36	1.7	13.5	0.0	0.477	40.1
0.37	1.8	14.1	0.0	0.430	44.5
0.38	1.9	14.7	0.0	0.388	49.3
0.39	2.1	15.3	0.0	0.351	54.3
0.40	2.2	15.9	0.0	0.319	59.7
0.41	2.4	16.5	0.0	0.291	65.5
0.42	2.6	17.1	0.0	0.265	71.5
0.43	2.8	17.7	0.0	0.243	78.0
EXCEEDS CROWN					
0.44	5.9	36.0	0.0	0.218	171.1
0.45	6.2	36.0	0.0	0.193	188.9
0.46	6.6	36.0	0.0	0.172	207.3
0.47	6.9	36.0	0.0	0.153	226.5
0.48	7.3	36.0	0.0	0.137	246.3
0.49	7.7	36.0	0.0	0.124	266.7
0.50	8.0	36.0	0.0	0.112	287.8
EXCEEDS TOP OF CURB					
0.51	8.4	36.0	0.5	0.105	304.7
0.52	8.8	36.0	1.0	0.098	322.3
0.53	9.1	36.0	1.4	0.092	340.6
0.54	9.5	36.0	1.9	0.087	359.6
0.55	9.9	36.0	2.4	0.082	379.3
0.56	10.4	36.0	2.9	0.077	399.8
0.57	10.8	36.0	3.4	0.073	421.0
0.58	11.2	36.0	3.8	0.069	443.0
0.59	11.7	36.0	4.3	0.065	465.8
0.60	12.1	36.0	4.8	0.061	489.4
0.61	12.6	36.0	5.3	0.058	513.8
0.62	13.0	36.0	5.8	0.055	539.0
0.63	13.5	36.0	6.2	0.052	565.0
0.64	14.0	36.0	6.7	0.049	591.9
0.65	14.5	36.0	7.2	0.047	619.6
0.66	15.0	36.0	7.7	0.044	648.2

EXCEEDS RIGHT-OF-WAY

PROPOSED SOUTHWEST INLET IN QUASI-SUMP



GRATE INLET CAPACITY IN SUMP CONDITIONS

(Table assumes no clogging.)

Figure 5-18

Worksheet for 24in Area A2 pipe

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.02000	ft/ft
Diameter	2.00	ft
Discharge	10.00	ft³/s

Results

Normal Depth	0.77	ft
Flow Area	1.11	ft²
Wetted Perimeter	2.67	ft
Hydraulic Radius	0.42	ft
Top Width	1.95	ft
Critical Depth	1.13	ft
Percent Full	38.4	%
Critical Slope	0.00520	ft/ft
Velocity	9.00	ft/s
Velocity Head	1.26	ft
Specific Energy	2.03	ft
Froude Number	2.10	
Maximum Discharge	34.41	ft³/s
Discharge Full	31.99	ft³/s
Slope Full	0.00195	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	38.40	%
Downstream Velocity	Infinity	ft/s

Worksheet for 24in Area A2 pipe

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.77	ft
Critical Depth	1.13	ft
Channel Slope	0.02000	ft/ft
Critical Slope	0.00520	ft/ft

APPENDIX 3 - Support Figures and Maps

National Flood Hazard Layer FIRMette

FEMA

33°43'58.44"N

33°43'28.52"N

Feet 1:6,000

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

Legend

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

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *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

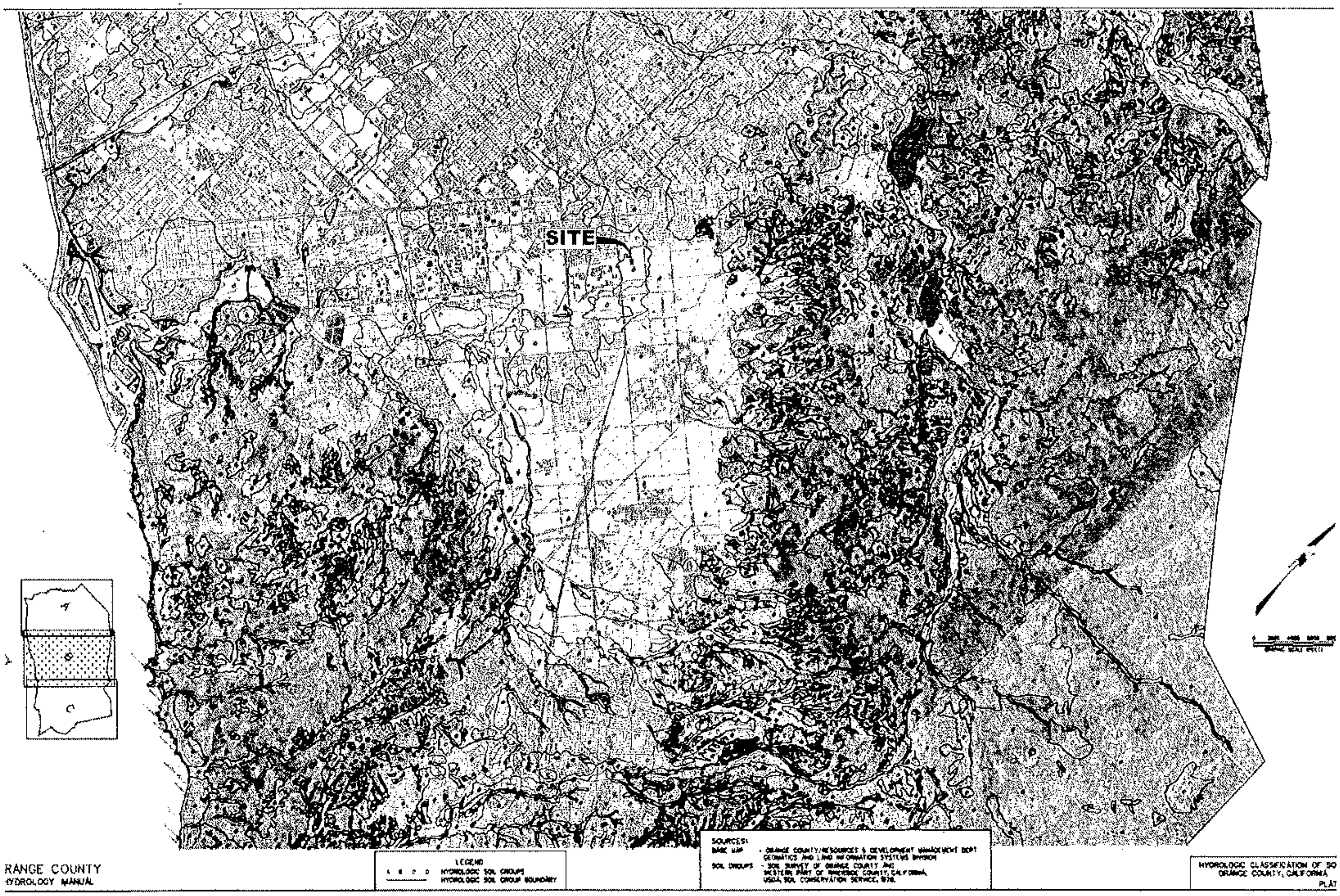
N

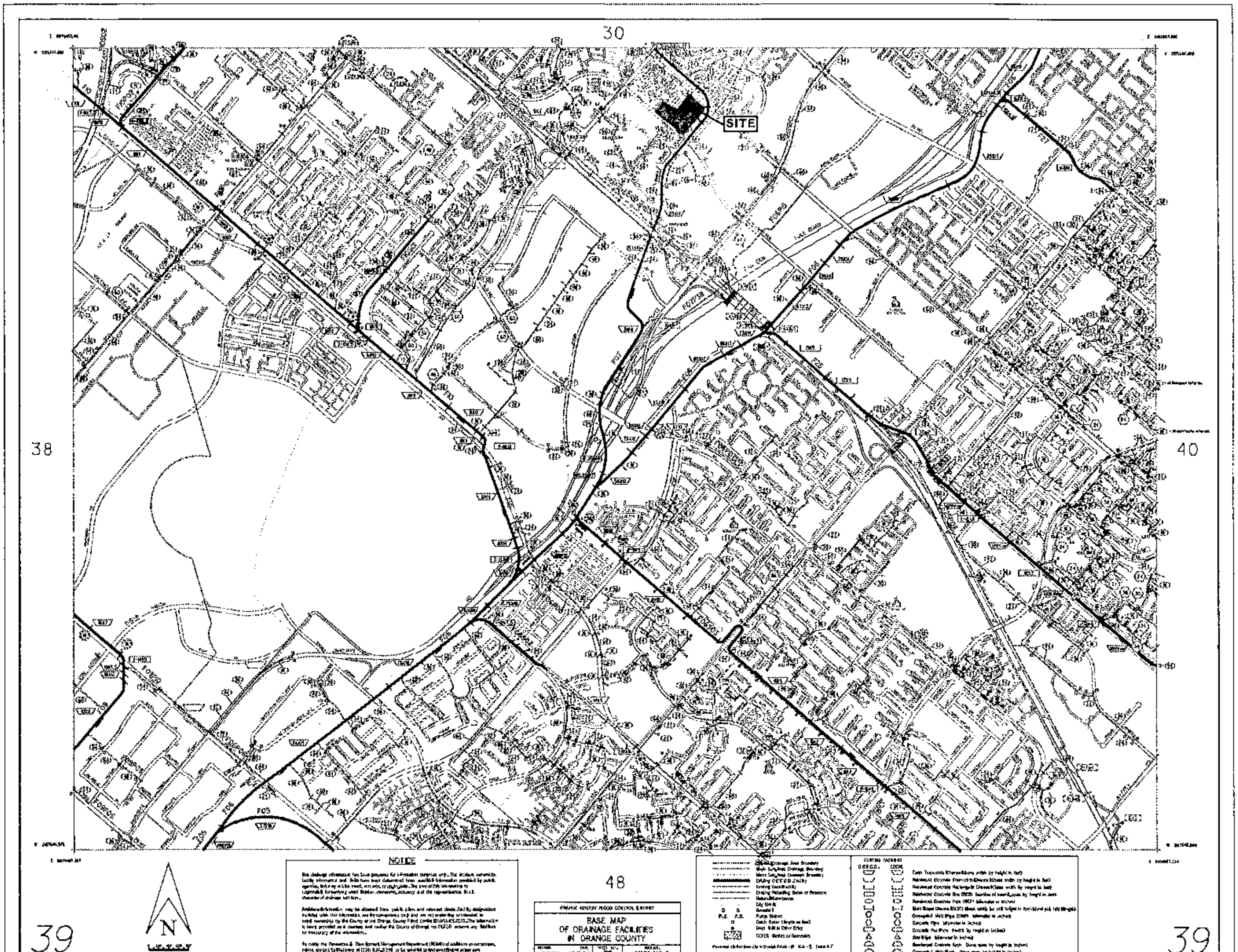
The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

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

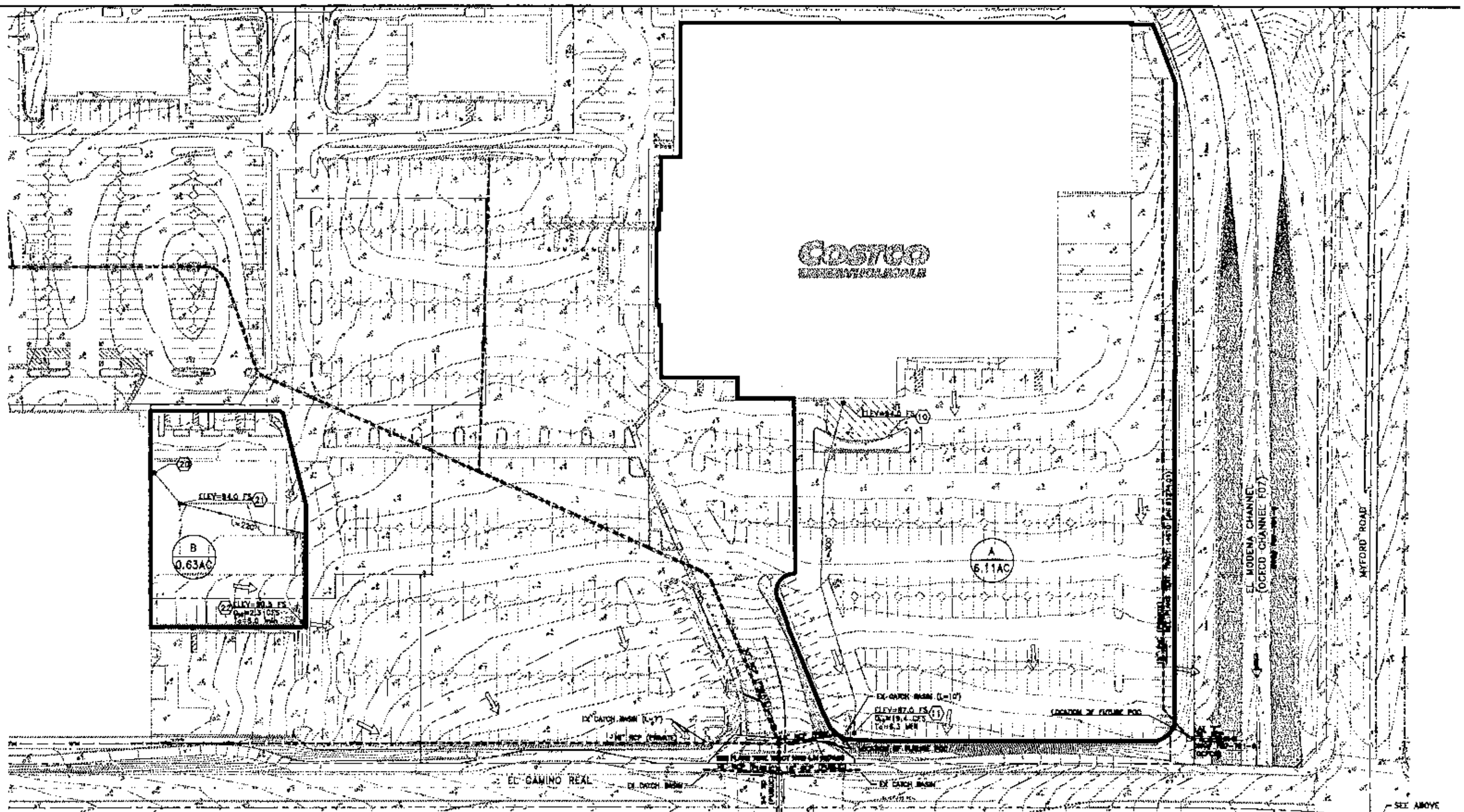
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 10/29/2018 at 1:59:53 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded 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.


SITE
RANGE COUNTY
HYDROLOGY MANUAL
LEGEND
HYDROLOGIC SOIL GROUPS
HYDROLOGIC SOIL GROUP BOUNDARY
SOURCES:
BASE MAP - ORANGE COUNTY/RESOURCES & DEVELOPMENT MANAGEMENT DEPT
GEOMATICS AND LAND INFORMATION SYSTEMS DIVISION
SOIL GROUPS - SOIL SURVEY OF ORANGE COUNTY AND
WESTERN PART OF RIVERSIDE COUNTY, CALIFORNIA,
USDA SOIL CONSERVATION SERVICE
HYDROLOGIC CLASSIFICATION OF SO
ORANGE COUNTY, CALIFORNIA
PLAT


30
SITE
38
40
48
39
N
NOTICE
BASE MAP
OF DRAINAGE FACILITIES
IN ORANGE COUNTY
39
39

APPENDIX 4 - Hydrology Maps



HYDROLOGIC CONDITIONS

SOIL TYPE: D
Ai: 0.9
Ap: 0.1
Fm: 0.02 IN/HR
TOTAL AREA: 6.7 AC

LEGEND:

RIGHT-OF-WAY LINE
CENTERLINE
DMA BOUNDARY
FLOW LINE
STORM DRAIN LINE
B/B2 — BASIN/SUBAREA DESIGNATION
11.3AC — AREA (ACRES)
10 — HYDROLOGY NODE
Q_{10} — CALCULATED RUNOFF (CFS) FOR 10 YEAR FREQUENCY
FLOW DIRECTION

ABBREVIATIONS:

AC — ACRES
CFS — CUBIC FEET PER SECOND
ELEV — ELEVATION
FS — FINISH SURFACE
L — LENGTH
MIN — MINUTES
OCFCD — ORANGE COUNTY FLOOD CONTROL DISTRICT, FACILITY OWNER
PRIV — PRIVATE STORM FACILITIES, OWNED BY OWNERS ASSOCIATION
PUBLIC — PUBLIC STORM FACILITIES, OWNED BY THE CITY OF TUSTIN
T_c — TIME OF CONCENTRATION

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

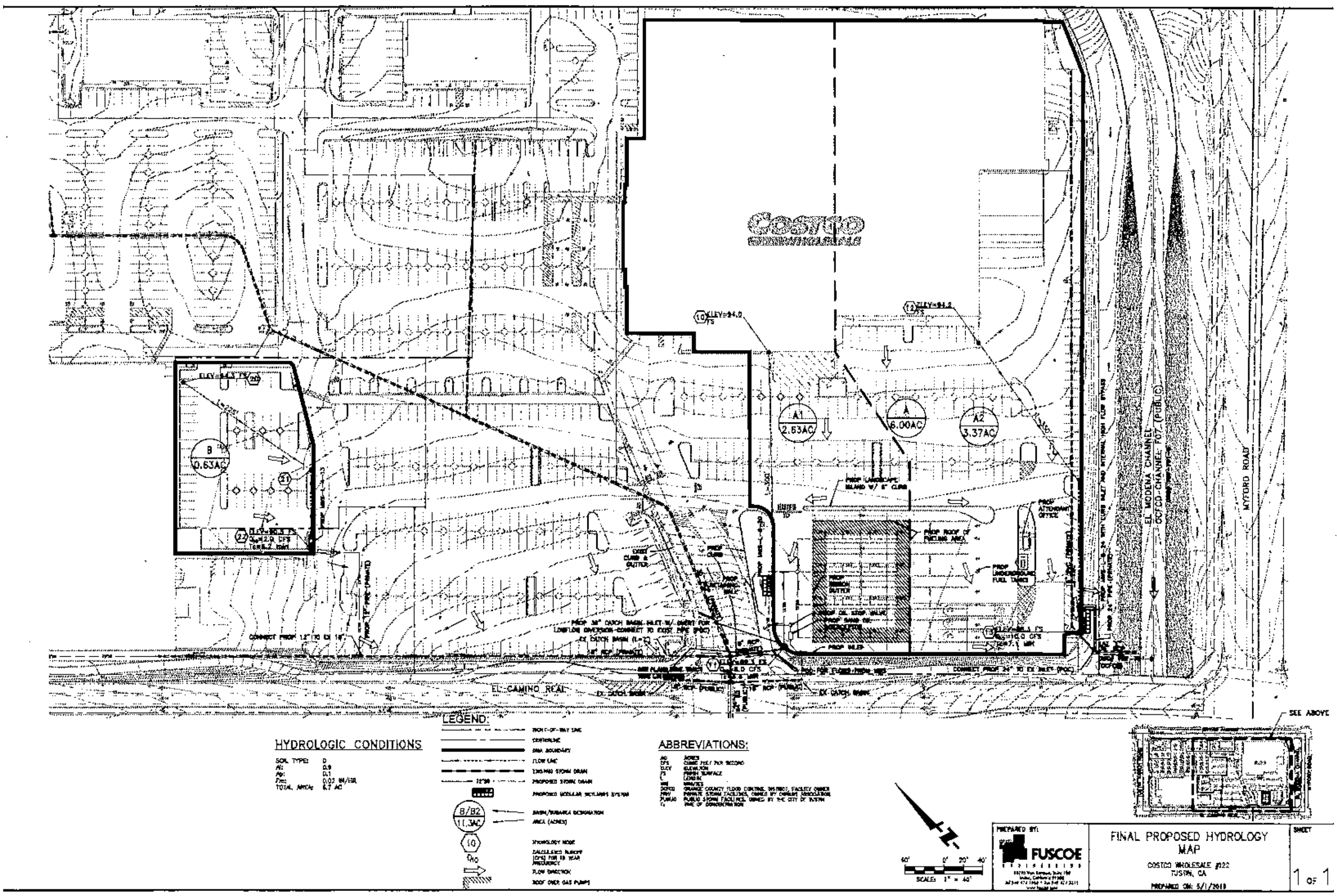
PREPARED BY:
FUSCOE ENGINEERING

FINAL EXISTING HYDROLOGY MAP

COSTCO WHOLESALE #122
TUSTIN, CA

PREPARED ON: 11/28/2018

SHEET
1 OF 1


COSTCO
A1
2.53AC
A
6.00AC
A2
3.37AC
B
0.63AC
EL CAMINO REAL
EL MODENA CHANNEL
OCFCD CHANNEL F07 (PUBLIC)
MYFORD ROAD
CONNECT PROP 12" TO EX 18"
PROP ATTENDANT OFFICE
PROP UNDERGROUND FUEL TANKS
SEE ABOVE
LEGEND:
HYDROLOGIC CONDITIONS
SOIL TYPE: D
Ai: 0.9
Ap: 0.1
Fm: 0.02 IN/HR
TOTAL AREA: 6.7 AC
ABBREVIATIONS:
B/B2
11.3AC
10
FLOW DIRECTION
ROOF OVER GAS PUMPS
SCALE: 1" = 40'
PREPARED BY:
FUSCOE
FINAL PROPOSED HYDROLOGY MAP
COSTCO WHOLESALE #122
TUSTIN, CA
SHEET
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