APPENDIX J

PRELIMINARY DRAINAGE REPORT

This page intentionally left blank

HNTB Corporation
The HNTB Companies
Infrastructure Solutions

200 E. Sandpointe Avenue
Suite 200
Santa Ana, CA 92707

Telephone (714) 460-1600

www.hntb.com

Technical Memorandum

Date: **December 10, 2019**

Author: **James Enriquez, P.E.**

Subject: **Yorba Linda Boulevard Widening Project**
Preliminary Drainage Report

Project

The proposed project is located on the east side of the City of Yorba Linda on the border with Anaheim Hills. The project consists of roadway widening improvements at select locations along Yorba Linda Boulevard between La Palma Avenue and Santa Ana Canyon Road in order to provide additional carrying capacity and alleviate traffic congestion. This section of Yorba Linda Boulevard is a heavily used corridor, includes an interchange with State Route 91 (SR-91) and provides the primary ingress/egress for the Savi Ranch retail center.

The purpose of this technical memorandum is to evaluate the effects of the roadway widening on existing drainage systems and provide preliminary recommendations for drainage improvements to mitigate any adverse effects. This memorandum also provides preliminary recommendations for storm water quality improvements that will be finalized in a project-specific Water Quality Management Plan (WQMP) prepared during the final design of the project.

Description

The project area is tributary to two existing storm drain systems; one owned and operated by the City of Anaheim and the other by Caltrans as shown in the Hydrology Map in Attachment 2 and described below:

- **Drainage Areas A and B:** The majority of the project area, Drainage Areas A and B, are tributary to a 60-inch RCP storm drain located in Pullman Avenue that is owned and operated by the City of Anaheim. The as-built plans for this storm drain system, including laterals, are included in Attachment 4 and include City of Anaheim Plan Nos. 14761 through 14773. Areas A and B drain to two existing catch basins located on Savi Ranch Parkway east of Pullman Avenue connected to Lines D-5 and D-6 of the system (Plan Nos. 14767 and 14769).
- **Drainage Area C:** Drainage Area C is tributary to existing catch basins located on the west side of Weir Canyon Rd immediately south of the SR-91 eastbound offramp. These catch basins are part of the drainage system constructed for the SR-91/Yorba Linda Boulevard interchange.

Calculation and Methodology

Hydrology

The hydrology analysis was performed in accordance with the Orange County Hydrology Manual (Published in 1986) and the Addendum No. 1 (Published in 1995). A 25-year Design Storm frequency was used because the existing storm drain system servicing the project area was designed for a 25-year Design Storm.

Hydrologic calculations were completed using the computer software HydroWIN (RATSCx 2016) Version 23.0 (Release date 07/01/2016). The software is distributed by Advanced Engineering Software (AES) at www.advancedengineeringsoftware.com. The use of this software is in accordance with the Orange County Hydrology Manual. The software defines subareas and routing paths by means of node numbers with designated data relating to elevation, path of travel distances, soil group, land use type, and conveyance type. The hydrology map and accompanying data used in the computer modeling are included in Attachment 2.

Hydraulics

Hydraulics calculations for the existing mainline storm drain on Pullman Street were completed using the computer software Water Surface and Pressure Gradient Hydraulic Analysis System Program (WSPGW) Version 14.08 distributed by CIVILDESIGN Corporation at www.civildesign.com. Hydraulic performance of catch basin connector pipes was checked using a Microsoft Excel spreadsheet developed by the Los Angeles County Department of Public Works for catch basins connected in series.

The size of catch basin opening was calculated using FlowMaster V8i (SELECTseries 1) distributed by Bentley Systems, Inc. at www.bentley.com. This software uses FHWA HEC 22 methodology.

Hydraulic calculations are included in Attachment 3.

Hydrologic and Hydraulic Results & Recommendations

Drainage Areas A and B

The proposed project results in a net increase in the runoff to the existing 60-inch RCP storm drain in Pullman Avenue. Most of the increased runoff is a result of the widening of Yorba Linda Boulevard between La Palma Avenue and Savi Ranch Parkway. This area adds 0.73 acres of impervious drainage area that currently falls directly into the Santa Ana River. The 25-year runoff to the two catch basins located on Savi Ranch Parkway east of Pullman Avenue increases from 19.1 cfs[1] to 26.0 cfs (See Table 1). The WSPGW hydraulic calculations in Attachment 3 show that the existing storm drain pipes have adequate capacity to convey the added flow and no improvements to the conduits are recommended. The water surface in the 60-inch mainline increases by a maximum of 0.064 ft. The water surface in the connector pipes for these two catch basins, Lines D-5 and D-6 (Plan Nos. 14767 and 14769), also increases by an insignificant amount and the “V” Depth calculation sheets show that the catch basins and connector pipes have over 1 ft of reserve hydraulic head at peak flow despite an increase of 0.89 ft of required head resulting from the increased flow rate. Such a minimal impact to hydraulic performance keeps the design of the storm drain well within City and County design standards.

Table 2 shows the summary of the catch basin sizing calculations included in Attachment 3. The catch basin on the north side of Savi Ranch Parkway serves Drainage Area A. Runoff from Drainage Area A increases from 6.4 cfs to 13.36 cfs and requires replacement of the existing 6-ft wide catch basin with a 17-ft wide catch basin to maintain the existing depth and spread on the street. The catch basin on the south side of the street serves Drainage Area B. The flow from Drainage Area B decreases slightly and the 6-ft wide catch basin will remain in place.

Drainage Area C

The proposed project results in an insignificant increase (0.02 cfs) in the runoff to the existing catch basins on Weir Canyon Road resulting from a slight increase in impervious area (0.09 acres). No drainage improvements are recommended at this location.

[1] 25-year Design Storm flow rate shown on City of Anaheim Plan No. 14769. Existing condition hydrology was not modeled because the plan shows the existing design capacity.

TABLE 1: HYDROLOGY RESULTS (25-Year Design Storm)

Drainage Area	Existing		Proposed		Notes
	Total Area (Acre)	25-year Runoff (CFS)	Total Area (Acres)	25-year Runoff (CFS)	
Area A	--	6.4	5.87	13.36	Existing condition not modeled since as-built plans show design flow rate.
Area B	--	12.7	5.23	12.64	Existing condition not modeled since as-built plans show design flow rate.
Area C	1.5	5.41	1.5	5.43	Increased flow due to negligible increase in impervious area.

TABLE 2: CATCH BASIN SIZING RESULTS (25-Year Design Storm)

Drainage Area	Existing		Proposed		Notes
	25-year Runoff (CFS)	Catch Basin Width (FT)	25-year Runoff (CFS)	Catch Basin Width (FT)	
Area A	6.4	6.0	13.36	17.0	
Area B	12.7	6.0	12.64	6.0	
Area C					Two existing grating catch basins to remain due to insignificant flow increase of 0.02 cfs.

Water Quality Management Plan Recommendations

The project is located within the Santa Ana Region in the North Orange County Permit Area. The project is classified as a Priority Project per Table 7.II-2 of Section 7.II-1.2 of the Model WQMP because it consists of the construction of more than 5,000 SF of roadway surface. The project also adds 52,811 SF of impervious area (2,371 SF for S/E corner of Yorba Linda Blvd & Savi Ranch Pkwy; 3,920 SF for N/W corner of Yorba Linda Blvd & Santa Ana Cyn Rd; and 46,520 for the east side of Yorba Linda Blvd).

For public agency projects classified as Priority Projects, Section 7.II-1.5 of the Model WQMP requires implementation of United States Environmental Protection Agency (USEPA) guidance, "Managing Wet Weather with Green Infrastructure: Green Streets" Manual (Green Streets) in a manner consistent with the maximum extent practicable (MEP) standard. Table 3 lists the types of infrastructure recommended by the Green Streets Manual and the applicability to this project.

As indicated in Table 3, the width of the proposed street widening has been limited to the minimum width required to achieve the desired traffic volume capacity enhancements and pedestrian and bike improvements. Permeable pavement is not appropriate for the volume and weight of vehicular traffic traveling on these roadways. The recommended storm water treatment is a combination of landscaped planters and biofiltration vaults.

Filterra Vaults were considered but did not provide the required treatment volume due to the configuration of the drainage areas. Since the existing underground drainage systems in the area do not extend into the project area, surface drainage for the entire project area (Drainage Areas A and B) is conveyed in the street gutter to an existing system on Savi Ranch Parkway just east of Pullman Avenue. Drainage Area C is also conveyed in the gutter to existing catch basins on Weir Canyon Road just south of the eastbound SR-91

offramp. By the time runoff is caught by the underground storm drain system, the amount of accumulated runoff exceeds the treatment volume capacity of Filterra Vaults.

Therefore, Modular Wetlands System Linear vaults (manufactured by BioClean) are recommended for this project. These are larger biofiltration vaults designed for flow-based treatment with the capacity to treat larger areas. The recommended locations and approximate sizes of the vaults are shown in the Hydrology Map in Attachment 2. The product information for these vaults is included in Attachment 5.

The vaults recommended for Drainage Areas A and B are located on Savi Ranch Parkway between Pullman Avenue and Yorba Linda Boulevard. Right-of-way acquisition will be required for these vaults since the existing sidewalk is 8 feet wide and the proposed vaults are 9 feet wide. Right-of-way acquisition will also need to include additional width to provide the desired sidewalk width around the back of the planted vault. It shall also be noted that these four vaults are located within the City of Anaheim. The right-of-way to be acquired for the widening of Weir Canyon Road north of Santa Ana Canyon Road will also need to include right-of-way for the proposed vault.

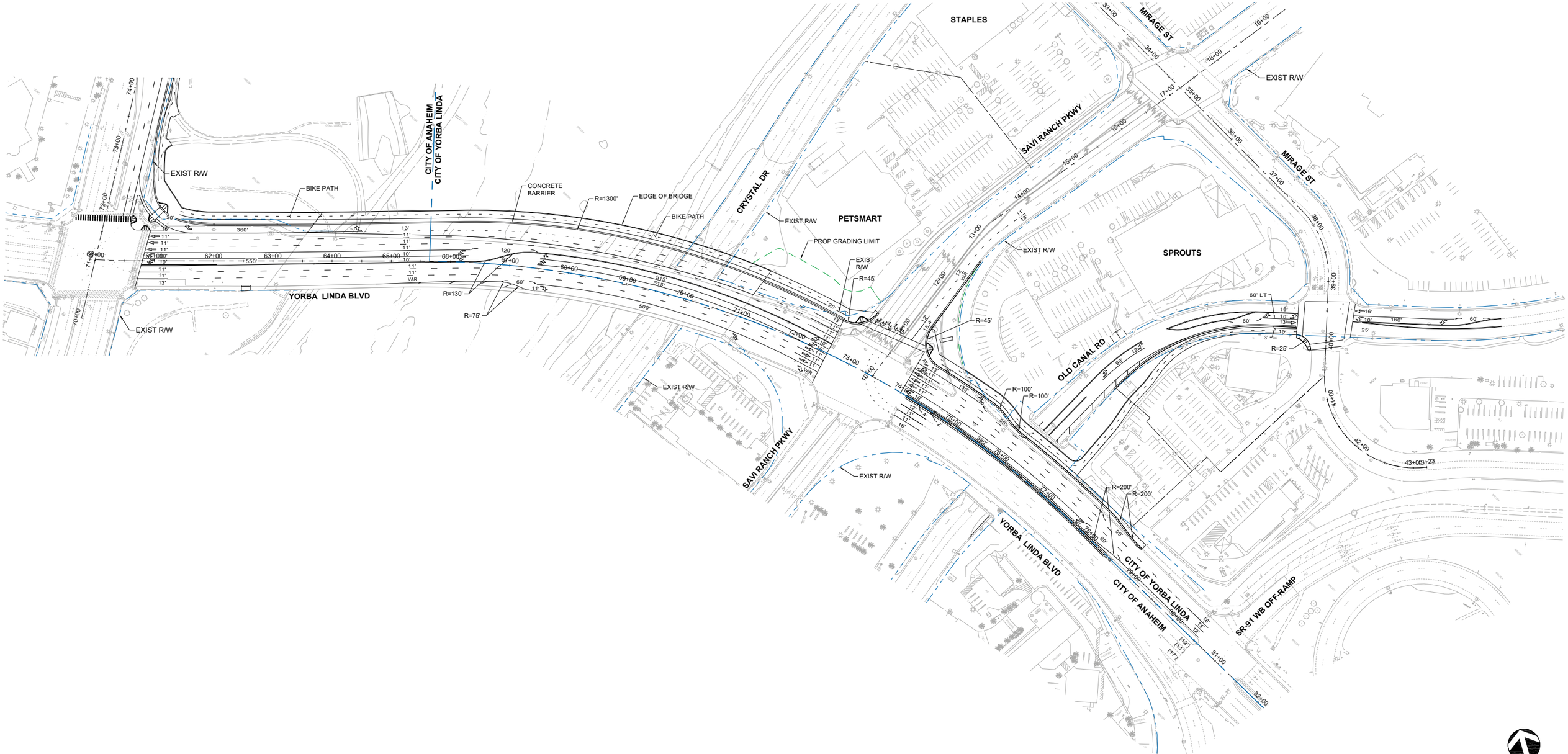
The final design for the project will include the preparation of a final Water Quality Management Plan and refinement of the design of the biofiltration vaults.

TABLE 3: GREEN STREETS INFRASTRUCTURE MATRIX

Infrastructure Recommended in Green Streets Manual	Implementation Notes
Alternative Street Design (Street Widths)	The purpose of the project is to widen existing roadways. The amount of widening recommended is limited to the minimum width that will achieve the required volume capacity enhancements and pedestrian/bike improvements.
Bioretention Curb Extensions and Sidewalk Planters	The existing and proposed street configuration do not accommodate curb extensions. Modular Wetlands System Linear vaults are recommended within the sidewalk areas at select locations and include landscaping (See Hydrology Map in Attachment 2 for proposed locations).
Permeable Pavement	Permeable pavement is not appropriate for the volume and weight of vehicular traffic on these roadways.
Sidewalk Trees and Tree Boxes	Modular Wetlands System Linear vaults are recommended within the sidewalk areas at select locations and include landscaping (See Hydrology Map in Attachment 2 for proposed locations).

ATTACHMENT 1

PROPOSED IMPROVEMENTS EXHIBITS

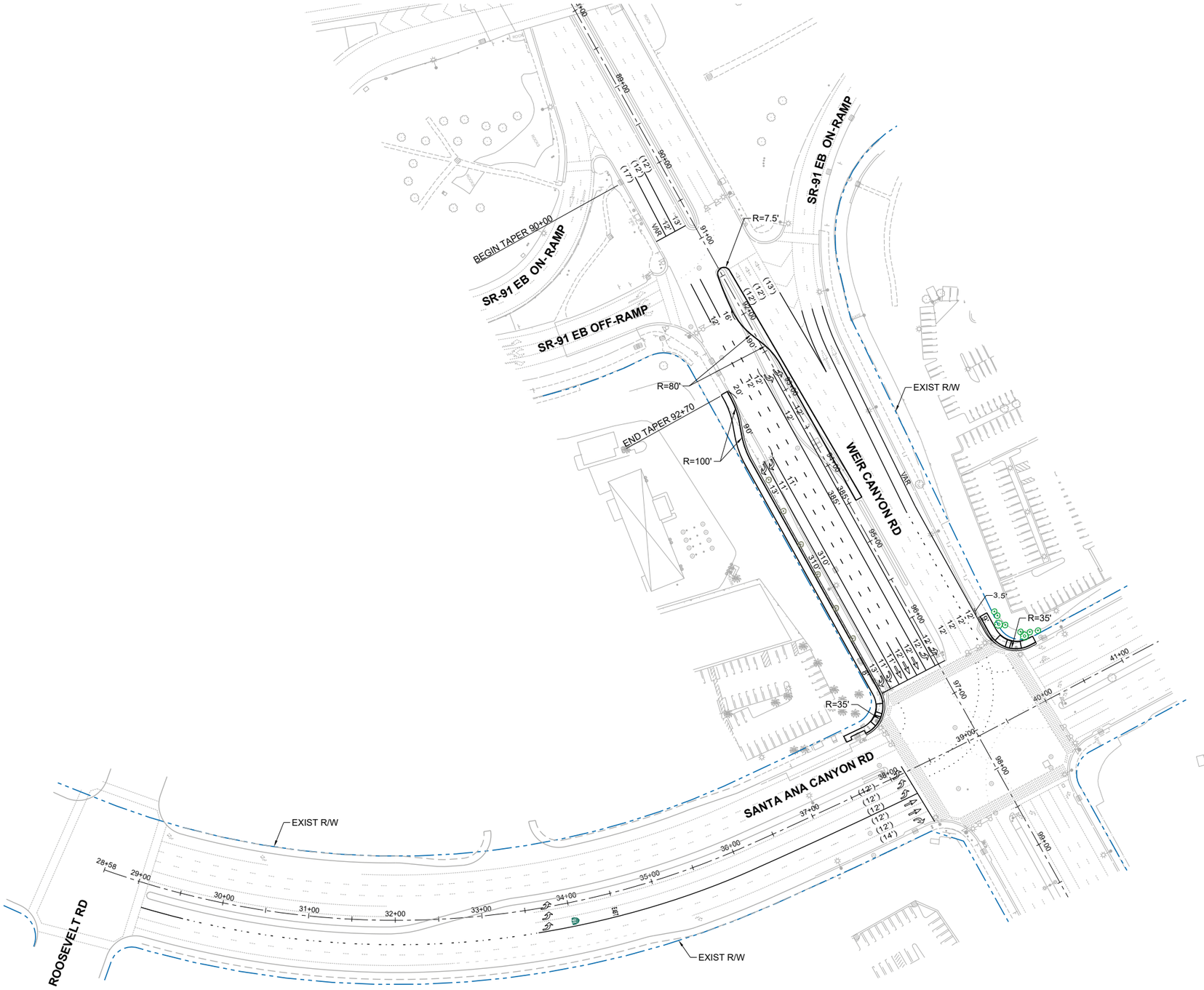


YORBA LINDA BOULEVARD WIDENING

LA PALMA AVENUE TO SR-91 RAMPS

Scale: 1"=60'

HNTB

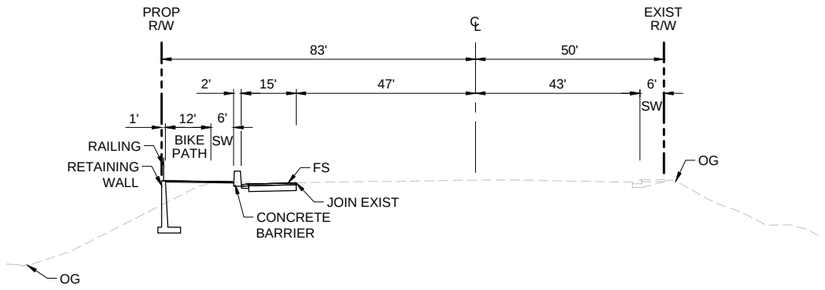


WEIR CANYON ROAD WIDENING

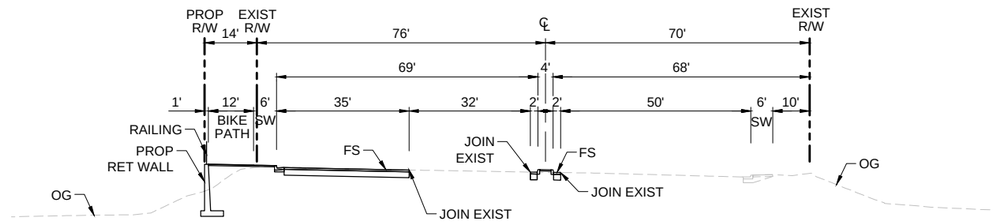
SANTA ANA CANYON ROAD TO SR-91 RAMPS

Scale: 1"=60'

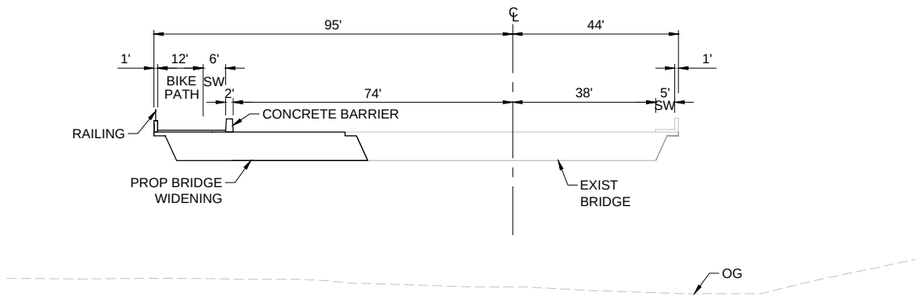
HNTB



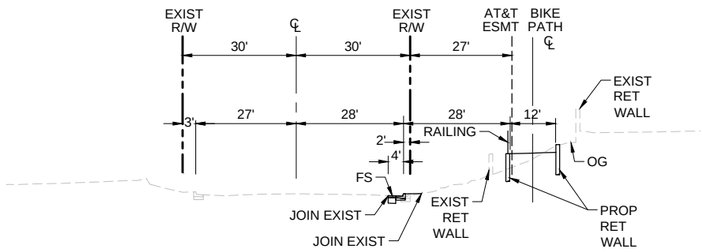
YORBA LINDA BLVD
SECTION A-A



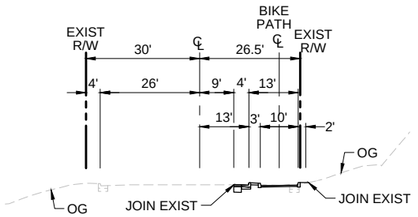
YORBA LINDA BLVD
SECTION D-D



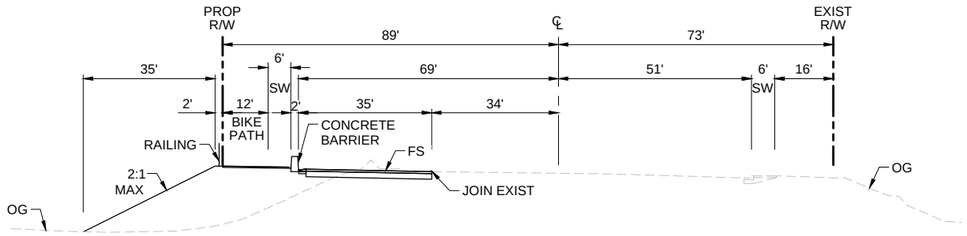
YORBA LINDA BLVD
SECTION B-B



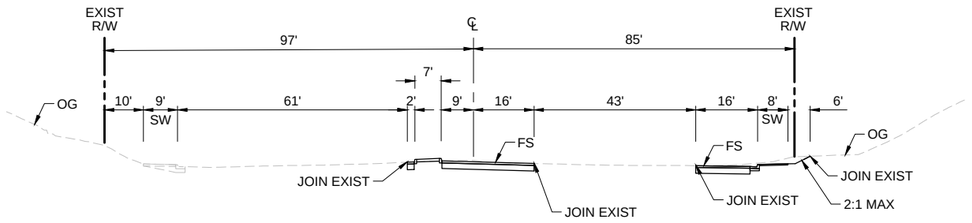
OLD CANAL RD
SECTION E-E



OLD CANAL RD
SECTION F-F



YORBA LINDA BLVD
SECTION C-C



WEIR CANYON RD
SECTION G-G

PRELIMINARY ENGINEERING
NOT FOR CONSTRUCTION

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

CADD PROJECT FILE NAME: EXH_SECTIONS.DWG
DATE: 2019-10-23
TIME: 5:54:26 PM

Underground Service Alert of Southern California
Call: TOLL FREE 1-800-227-2600
TWO WORKING DAYS BEFORE YOU DIG

PLANS PREPARED BY:
HNTB
200 E. SANDPOINTE AVE, SUITE 200
SANTA ANA, CA 92707
(714) 460-1600

DESIGNED BY: DATE:
DRAWN BY: DATE:
CHECKED BY: DATE:
UNDER THE SUPERVISION OF:
DAVID M. EAMES RCE # 55501 DATE

REVISIONS

No.	DATE	BY	DESCRIPTION	APP'D BY	DATE

BENCH MARK:

APPROVALS

DIVISION	BY	DATE
DESIGN		
TRAFFIC		
RIGHT OF WAY		
UTILITIES		
PROJECT MANAGER		

APPROVED
CHIEF ENGINEER RCE # DATE

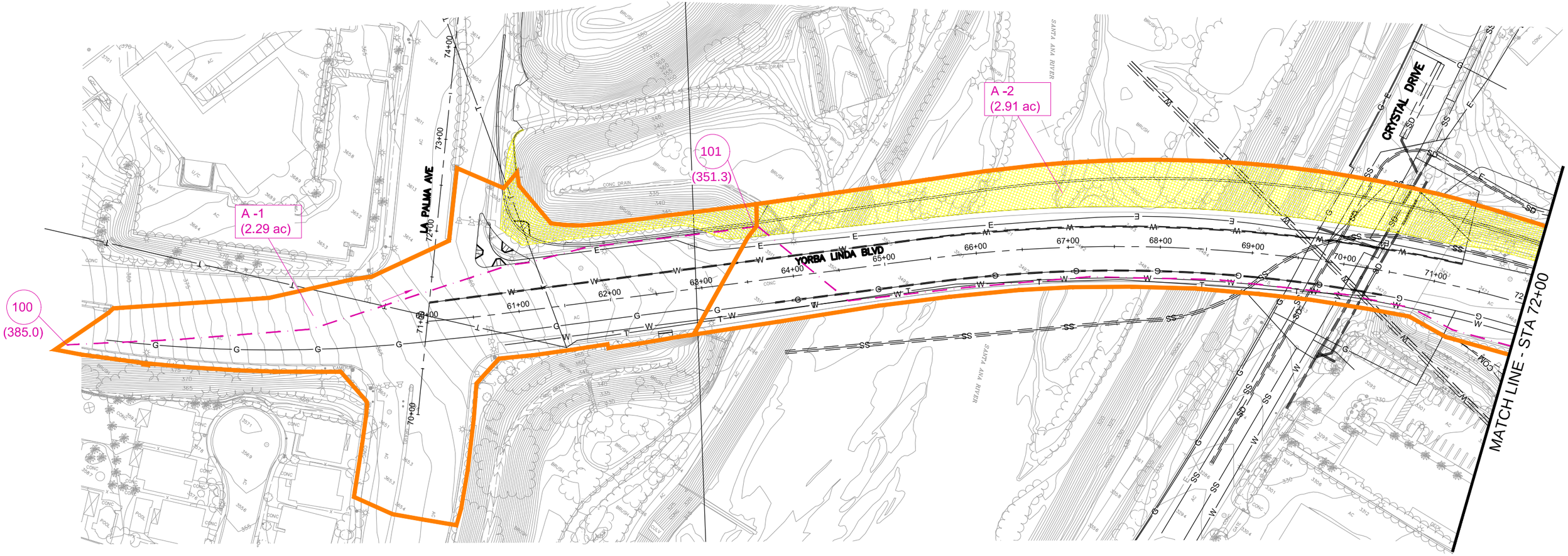
CITY OF YORBA LINDA AND CITY OF ANAHEIM
YORBA LINDA BLVD/WEIR CANYON RD WIDENING
CROSS SECTIONS

DWG
SHEET 11 OF XX

J:\73660 SAVI-Ranch\00_CADD\003_EXHIBITS\11x17\EXH_SECTIONS.dwg

ATTACHMENT 2

HYDROLOGIC MAPS AND CALCULATIONS



LEGEND

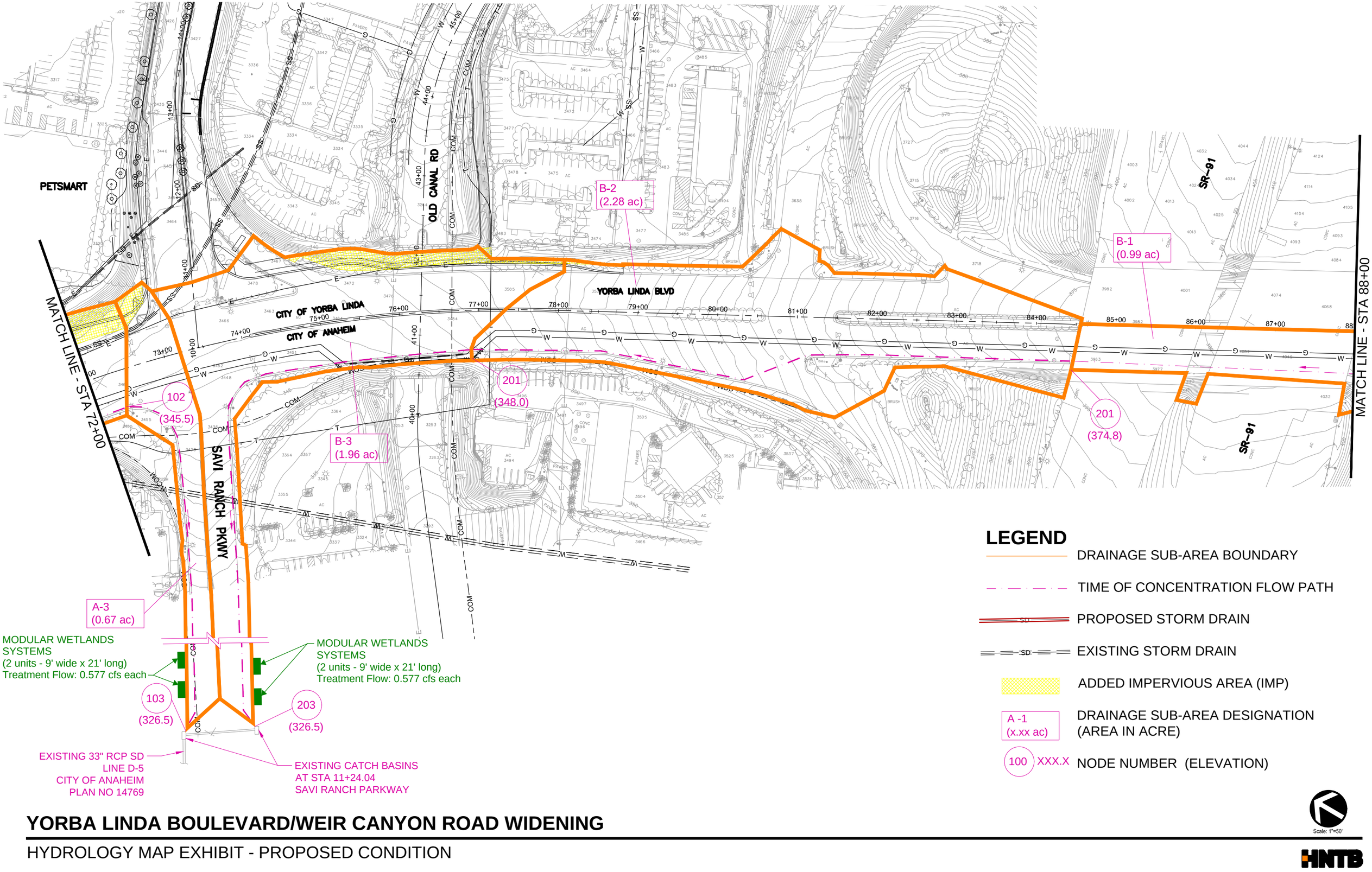
- DRAINAGE SUB-AREA BOUNDARY
- TIME OF CONCENTRATION FLOW PATH
- PROPOSED STORM DRAIN
- EXISTING STORM DRAIN
- ADDED IMPERVIOUS AREA (IMP)
- A -1 (x.xx ac) — DRAINAGE SUB-AREA DESIGNATION (AREA IN ACRE)
- 100 XXX.X — NODE NUMBER (ELEVATION)

YORBA LINDA BOULEVARD/WEIR CANYON ROAD WIDENING

HYDROLOGY MAP EXHIBIT - PROPOSED CONDITION

Scale: 1"=50'

HNTB



LEGEND

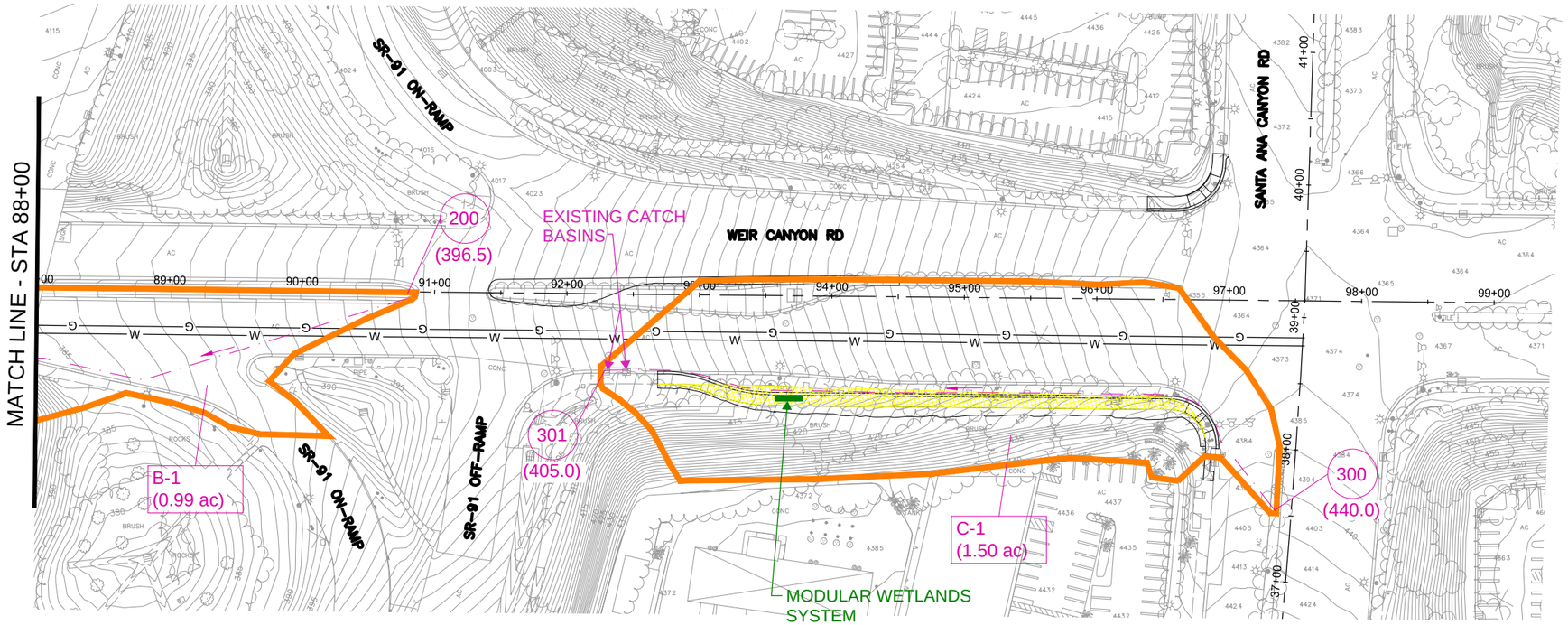
- DRAINAGE SUB-AREA BOUNDARY
- TIME OF CONCENTRATION FLOW PATH
- PROPOSED STORM DRAIN
- EXISTING STORM DRAIN
- ADDED IMPERVIOUS AREA (IMP)
- A -1 (x.xx ac) — DRAINAGE SUB-AREA DESIGNATION (AREA IN ACRE)
- 100 XXX.X — NODE NUMBER (ELEVATION)

Scale: 1"=50'

YORBA LINDA BOULEVARD/WEIR CANYON ROAD WIDENING

HYDROLOGY MAP EXHIBIT - PROPOSED CONDITION

HNTB



LEGEND

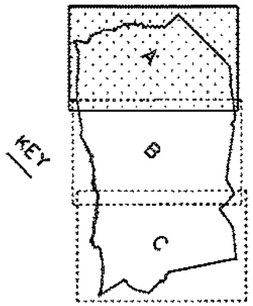
- DRAINAGE SUB-AREA BOUNDARY
- TIME OF CONCENTRATION FLOW PATH
- PROPOSED STORM DRAIN
- EXISTING STORM DRAIN
- ADDED IMPERVIOUS AREA (IMP)
- A -1 (x.xx ac) — DRAINAGE SUB-AREA DESIGNATION (AREA IN ACRE)
- 100 XXX.X — NODE NUMBER (ELEVATION)

YORBA LINDA BOULEVARD/WEIR CANYON ROAD WIDENING

HYDROLOGY MAP EXHIBIT - PROPOSED CONDITION

Scale: 1"=50'

HNTB



Project Site

ORANGE COUNTY
HYDROLOGY MANUAL

LEGEND
A B C D 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, 1978.

HYDROLOGIC CLASSIFICATION OF SOILS
ORANGE COUNTY, CALIFORNIA
PLATE A

Hydrology Data										
Yorba Linda Boulevard Widening Project										
(Soil Type B)										
Sub Area		Process Code	Starting Node		Ending Node		Distance between nodes (ft)	Area by Land Use Type (Ac)		Comments
No.	Area (Ac)		No.	Elev (ft)	No.	Elev (ft)		a_p	a_i	
A-1	2.29		100.0	385.0	101.0	351.3	761.0	0.00	2.29	Initial Subarea
A-2	2.91		101.0	351.3	102.0	345.5	890.0	0.00	2.91	Street Flow Analysis Thru Subarea
A-3	0.67		102.0	345.5	103.0	326.5	545.0	0.00	0.67	Street Flow Analysis Thru Subarea
B-1	0.99		200.0	396.5	201.0	374.8	643.0	0.00	0.99	Initial Subarea
B-2	2.28		201.0	374.8	202.0	348.0	758.0	0.00	2.28	Street Flow Analysis Thru Subarea
B-3	1.96		202.0	348.0	203.0	326.5	825.0	0.00	1.96	Street Flow Analysis Thru Subarea
C-1	1.50		300.0	440.0	301.0	405.0	552.0	0.58	0.92	Initial Subarea (Existing)
C-1	1.50		300.0	440.0	301.0	405.0	552.0	0.49	1.01	Initial Subarea (Proposed)
TOTAL:	**14.10**							**1.07**	**13.03**	

```
**************************************************************************
            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 1436

                          Analysis prepared by:
```

```
 ************************* DESCRIPTION OF STUDY *************************
* HNTB Corporation                                                      *
* Yorba Linda Blvd Widening Project                                     *
* Drainage Area C (Existing)                                            *
 ************************************************************************

  FILE NAME: YORBAEX3.DAT
  TIME/DATE OF STUDY: 11:30 12/12/2019
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 1.00
  *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    300.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   552.00
  ELEVATION DATA: UPSTREAM(FEET) =    440.00  DOWNSTREAM(FEET) =    405.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.595
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.124
  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.)
  PUBLIC PARK                B        0.58      0.30     0.850    56   10.48
  COMMERCIAL                 B        0.92      0.30     0.100    56    6.60
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.390
  SUBAREA RUNOFF(CFS) =      5.41
  TOTAL AREA(ACRES) =      1.50   PEAK FLOW RATE(CFS) =      5.41
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.5  TC(MIN.) =      6.60
  EFFECTIVE AREA(ACRES) =      1.50  AREA-AVERAGED Fm(INCH/HR)=  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.390
  PEAK FLOW RATE(CFS)   =       5.41
============================================================================
============================================================================
  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 1436

                          Analysis prepared by:
```

```
 ************************* DESCRIPTION OF STUDY *************************
* HNTB Corporation                                                      *
* Yorba Linda Lbd Widening Project                                      *
* Drainage Area A (Proposed)                                            *
 ************************************************************************

  FILE NAME: YORBAPR1.DAT
  TIME/DATE OF STUDY: 11:31 12/12/2019
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 1.00
  *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    100.00 TO NODE    101.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   761.00
  ELEVATION DATA: UPSTREAM(FEET) =    385.00  DOWNSTREAM(FEET) =    351.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.057
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.682
  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                 B        2.29      0.30     0.100    56    8.06
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      7.53
  TOTAL AREA(ACRES) =      2.29   PEAK FLOW RATE(CFS) =      7.53

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  351.30  DOWNSTREAM ELEVATION(FEET) =  345.50
  STREET LENGTH(FEET) =   890.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      11.09
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.54
    HALFSTREET FLOOD WIDTH(FEET) =   21.05
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.67
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.44
  STREET FLOW TRAVEL TIME(MIN.) =   5.55   Tc(MIN.) =   13.61
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.737
```

```
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 B        2.91      0.30     0.100    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    2.91      SUBAREA RUNOFF(CFS) =    7.09
  EFFECTIVE AREA(ACRES) =      5.20    AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        5.2         PEAK FLOW RATE(CFS) =      12.67

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.56   HALFSTREET FLOOD WIDTH(FEET) =  22.23
  FLOW VELOCITY(FEET/SEC.) =  2.75   DEPTH*VELOCITY(FT*FT/SEC.) =   1.54
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =    1651.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  345.50  DOWNSTREAM ELEVATION(FEET) =  326.50
  STREET LENGTH(FEET) =   545.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      13.43
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.45
    HALFSTREET FLOOD WIDTH(FEET) =   16.21
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.29
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    2.39
  STREET FLOW TRAVEL TIME(MIN.) =   1.72   Tc(MIN.) =   15.33
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.558
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 B        0.67      0.30     0.100    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
```

```
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.67      SUBAREA RUNOFF(CFS) =    1.52
  EFFECTIVE AREA(ACRES) =      5.87    AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        5.9        PEAK FLOW RATE(CFS) =      13.36

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.45   HALFSTREET FLOOD WIDTH(FEET) =  16.21
  FLOW VELOCITY(FEET/SEC.) =  5.26   DEPTH*VELOCITY(FT*FT/SEC.) =   2.38
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =    2196.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        5.9  TC(MIN.) =     15.33
  EFFECTIVE AREA(ACRES) =      5.87  AREA-AVERAGED Fm(INCH/HR)=  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =      13.36
============================================================================
============================================================================
  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 1436

                          Analysis prepared by:
```

```
 ************************* DESCRIPTION OF STUDY *************************
* HNTB Corporation                                                      *
* Yorba Linda Blvd Widening Project                                     *
* Drainage Area B (Proposed)                                            *
 ************************************************************************

  FILE NAME: YORBAPR2.DAT
  TIME/DATE OF STUDY: 11:32 12/12/2019
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 1.00
  *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    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   643.00
  ELEVATION DATA: UPSTREAM(FEET) =    396.50  DOWNSTREAM(FEET) =    374.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.953
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.709
  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                 B        0.99      0.30     0.100    56    7.95
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      3.28
  TOTAL AREA(ACRES) =      0.99   PEAK FLOW RATE(CFS) =      3.28

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  374.80  DOWNSTREAM ELEVATION(FEET) =  348.00
  STREET LENGTH(FEET) =   758.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.46
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.37
    HALFSTREET FLOOD WIDTH(FEET) =   11.84
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.47
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.67
  STREET FLOW TRAVEL TIME(MIN.) =   2.82   Tc(MIN.) =   10.78
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.123
```

```
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 B        2.28      0.30     0.100    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    2.28      SUBAREA RUNOFF(CFS) =    6.35
  EFFECTIVE AREA(ACRES) =      3.27    AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        3.3        PEAK FLOW RATE(CFS) =       9.10

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.41   HALFSTREET FLOOD WIDTH(FEET) =  13.71
  FLOW VELOCITY(FEET/SEC.) =  4.86   DEPTH*VELOCITY(FT*FT/SEC.) =   1.98
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =    1401.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  348.00  DOWNSTREAM ELEVATION(FEET) =  326.50
  STREET LENGTH(FEET) =   825.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      11.47
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.45
    HALFSTREET FLOOD WIDTH(FEET) =   16.13
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.56
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    2.05
  STREET FLOW TRAVEL TIME(MIN.) =   3.02   Tc(MIN.) =   13.80
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.716
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 B        1.96      0.30     0.100    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
```

```
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.96      SUBAREA RUNOFF(CFS) =    4.74
  EFFECTIVE AREA(ACRES) =      5.23    AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        5.2        PEAK FLOW RATE(CFS) =      12.64

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.46   HALFSTREET FLOOD WIDTH(FEET) =  16.84
  FLOW VELOCITY(FEET/SEC.) =  4.64   DEPTH*VELOCITY(FT*FT/SEC.) =   2.15
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    203.00 =    2226.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        5.2  TC(MIN.) =     13.80
  EFFECTIVE AREA(ACRES) =      5.23  AREA-AVERAGED Fm(INCH/HR)=  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =      12.64
============================================================================
============================================================================
  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 1436

                          Analysis prepared by:
```

```
 ************************* DESCRIPTION OF STUDY *************************
* HNTB Corporation                                                      *
* Yorba Linda Blvd Widening Project                                     *
* Drainage Area C (Proposed)                                            *
 ************************************************************************

  FILE NAME: YORBAPR3.DAT
  TIME/DATE OF STUDY: 11:33 12/12/2019
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 1.00
  *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    300.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   552.00
  ELEVATION DATA: UPSTREAM(FEET) =    440.00  DOWNSTREAM(FEET) =    405.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.595
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.124
  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.)
  PUBLIC PARK                B        0.49      0.30     0.850    56   10.48
  COMMERCIAL                 B        1.01      0.30     0.100    56    6.60
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.345
  SUBAREA RUNOFF(CFS) =      5.43
  TOTAL AREA(ACRES) =      1.50   PEAK FLOW RATE(CFS) =      5.43
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.5  TC(MIN.) =      6.60
  EFFECTIVE AREA(ACRES) =      1.50  AREA-AVERAGED Fm(INCH/HR)=  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.345
  PEAK FLOW RATE(CFS)   =       5.43
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

ATTACHMENT 3

HYDRAULIC CALCULATIONS

```
T1 YORBA LINDA PULLMAN ST DRAIN (Q=25YR) - ASBUILT PLANS
T2 J. ENRIQUEZ
T3
SO   2910.00  312.00   1                          321.80
R    2910.00  312.00   1      .013
JX   2985.75  312.09   1  2   .013   16.90          312.25       45.00
R    2995.00  312.10   1      .013                                          1
R    3022.69  312.13   1      .013                                 64.44
JX   3022.69  312.13   1  2   .013   14.30          312.25       45.00
R    3027.35  312.14   1      .013                                          1
R    3037.96  312.15   1      .013
JX   3095.08  312.22   1  2   .013    9.00          314.02       90.00
JX   3257.96  312.42   1  3   .013   10.90          313.00       45.00
R    3267.11  312.44   1      .013                                          1
R    3595.10  313.41   1      .013
R    3625.00  313.47   1      .013                                 38.32
JX   3625.00  313.47   1  4   .013   20.40          314.99       45.00
R    3670.35  313.54   1      .013                                 57.49
R    3750.00  313.72   1      .013
R    3769.90  313.76   1      .013
R    3781.04  313.78   1      .013                                          1
SH   3781.04  313.78   1      .013
CD   1  4               5.00
CD   2  4               3.00
CD   3  4               2.75
CD   4  4               2.00
Q            24.800  1.0
```

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	1	4	0		5.000														
CD	2	4	0		3.000														
CD	3	4	0		2.750														
CD	4	4	0		2.000														

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

YORBA LINDA PULLMAN ST DRAIN (Q=25YR) - ASBUILT PLANS

HEADING LINE NO 2 IS -

J. ENRIQUEZ

HEADING LINE NO 3 IS -

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET

U/S DATA	STATION	INVERT	SECT	W S ELEV
	2910.000	312.000	1	321.800

ELEMENT NO 2 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2910.000	312.000	1	.013	.000	.000	.000	0

ELEMENT NO 3 IS A JUNCTION

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	2985.750	312.090	1	2	0	.013	16.900	.000	312.250	.045	.000	.000

RADIUS	ANGLE
.000	.000

ELEMENT NO 4 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2995.000	312.100	1	.013	.000	.000	.000	1

ELEMENT NO 5 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3022.690	312.130	1	.013	24.620	64.440	.000	0

ELEMENT NO 6 IS A JUNCTION

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	3022.690	312.130	1	2	0	.013	14.300	.000	312.250	.045	.000	.000

RADIUS	ANGLE
.000	.000

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 7 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3027.350	312.140	1	.013	.000	.000	.000	1

ELEMENT NO 8 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3037.960	312.150	1	.013	.000	.000	.000	0

ELEMENT NO 9 IS A JUNCTION

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	3095.080	312.220	1	2	0	.013	9.000	.000	314.020	.090	.000	.000

RADIUS	ANGLE
.000	.000

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 10 IS A JUNCTION

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	3257.960	312.420	1	3	0	.013	10.900	.000	313.000	.045	.000	.000

RADIUS	ANGLE
.000	.000

ELEMENT NO 11 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3267.110	312.440	1	.013	.000	.000	.000	1

ELEMENT NO 12 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3595.100	313.410	1	.013	.000	.000	.000	0

ELEMENT NO 13 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3625.000	313.470	1	.013	44.706	38.320	.000	0

ELEMENT NO 14 IS A JUNCTION

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	3625.000	313.470	1	4	0	.013	20.400	.000	314.990	.045	.000	.000

RADIUS	ANGLE
.000	.000

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 15 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3670.350	313.540	1	.013	45.197	57.490	.000	0

ELEMENT NO 16 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3750.000	313.720	1	.013	.000	.000	.000	0

ELEMENT NO 17 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3769.900	313.760	1	.013	.000	.000	.000	0

ELEMENT NO 18 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3781.040	313.780	1	.013	.000	.000	.000	1

ELEMENT NO 19 IS A SYSTEM HEADWORKS

U/S DATA	STATION	INVERT	SECT	W S ELEV
	3781.040	313.780	1	.000

Program Package Serial Number: 7244

WATER SURFACE PROFILE LISTING Date:12-11-2019 Time:12:58: 8

YORBA LINDA PULLMAN ST DRAIN (Q=25YR) - ASBUILT PLANS

J. ENRIQUEZ

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS) / SF Ave	Vel Head / HF	Energy Grd.El. / SE Dpth	Super Elev / Froude N	Critical Depth / Norm Dp	Flow Top Width	Height/Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
2910.000	312.000	9.800	321.800	96.30	4.90	.37	322.17	.00	2.79	.00	5.000	.000	.00	0 .0
JUNCT STR	.0012				.0011	.09	9.80	.00			.013	.00	.00	PIPE
2985.750	312.090	9.972	322.062	79.40	4.04	.25	322.32	.00	2.52	.00	5.000	.000	.00	0 .0
9.250	.0011				.0009	.01	9.97	.00	3.80	.013		.00	.00	PIPE
2995.000	312.100	9.984	322.084	79.40	4.04	.25	322.34	.00	2.52	.00	5.000	.000	.00	0 .0
27.690	.0011				.0009	.03	.00	.00	3.80	.013		.00	.00	PIPE
3022.690	312.130	10.022	322.152	79.40	4.04	.25	322.41	.00	2.52	.00	5.000	.000	.00	0 .0
JUNCT STR	.0000				.0008	.00	10.02	.00			.013	.00	.00	PIPE
3022.690	312.130	10.143	322.273	65.10	3.32	.17	322.44	.00	2.27	.00	5.000	.000	.00	0 .0
4.660	.0021				.0006	.00	10.14	.00	2.62	.013		.00	.00	PIPE
3027.350	312.140	10.144	322.284	65.10	3.32	.17	322.46	.00	2.27	.00	5.000	.000	.00	0 .0
10.610	.0009				.0006	.01	10.14	.00	3.43	.013		.00	.00	PIPE
3037.960	312.150	10.141	322.291	65.10	3.32	.17	322.46	.00	2.27	.00	5.000	.000	.00	0 .0
JUNCT STR	.0012				.0005	.03	10.14	.00			.013	.00	.00	PIPE
3095.080	312.220	10.172	322.392	56.10	2.86	.13	322.52	.00	2.10	.00	5.000	.000	.00	0 .0
JUNCT STR	.0012				.0004	.06	10.17	.00			.013	.00	.00	PIPE
3257.960	312.420	10.091	322.511	45.20	2.30	.08	322.59	.00	1.88	.00	5.000	.000	.00	0 .0
9.150	.0022				.0003	.00	10.09	.00	2.11	.013		.00	.00	PIPE

YORBA LINDA PULLMAN ST DRAIN (Q=25YR) - ASBUILT PLANS
J. ENRIQUEZ

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
3267.110	312.440	10.078	322.518	45.20	2.30	.08	322.60	.00	1.88	.00	5.000	.000	.00	0 .0
327.990	.0030					.0003	.10	10.08	.00	1.94	.013	.00	.00	PIPE
3595.100	313.410	9.207	322.617	45.20	2.30	.08	322.70	.00	1.88	.00	5.000	.000	.00	0 .0
29.900	.0020					.0003	.01	.00	.00	2.16	.013	.00	.00	PIPE
3625.000	313.470	9.167	322.637	45.20	2.30	.08	322.72	.00	1.88	.00	5.000	.000	.00	0 .0
JUNCT STR	.0000					.0002	.00	.00	.00		.013	.00	.00	PIPE
3625.000	313.470	9.224	322.694	24.80	1.26	.02	322.72	.00	1.38	.00	5.000	.000	.00	0 .0
45.350	.0015					.0001	.00	.00	.00	1.68	.013	.00	.00	PIPE
3670.350	313.540	9.162	322.702	24.80	1.26	.02	322.73	.00	1.38	.00	5.000	.000	.00	0 .0
79.650	.0023					.0001	.01	9.16	.00	1.52	.013	.00	.00	PIPE
3750.000	313.720	8.990	322.710	24.80	1.26	.02	322.73	.00	1.38	.00	5.000	.000	.00	0 .0
19.900	.0020					.0001	.00	8.99	.00	1.56	.013	.00	.00	PIPE
3769.900	313.760	8.951	322.711	24.80	1.26	.02	322.74	.00	1.38	.00	5.000	.000	.00	0 .0
11.140	.0018					.0001	.00	8.95	.00	1.61	.013	.00	.00	PIPE
3781.040	313.780	8.934	322.714	24.80	1.26	.02	322.74	.00	1.38	.00	5.000	.000	.00	0 .0

```
T1 YORBA LINDA PULLMAN ST DRAIN (Q=25YR) - PROPOSED
T2 J. ENRIQUEZ
T3
SO   2910.00  312.00   1                            321.80
R    2910.00  312.00   1      .013
JX   2985.75  312.09   1  2   .013   16.90           312.25       45.00
R    2995.00  312.10   1      .013                                              1
R    3022.69  312.13   1      .013                                 64.44
JX   3022.69  312.13   1  2   .013   14.30           312.25       45.00
R    3027.35  312.14   1      .013                                              1
R    3037.96  312.15   1      .013
JX   3095.08  312.22   1  2   .013    9.00           314.02       90.00
JX   3257.96  312.42   1  3   .013   14.82           313.00       45.00
R    3267.11  312.44   1      .013                                              1
R    3595.10  313.41   1      .013
R    3625.00  313.47   1      .013                                 38.32
JX   3625.00  313.47   1  4   .013   20.40           314.99       45.00
R    3670.35  313.54   1      .013                                 57.49
R    3750.00  313.72   1      .013
R    3769.90  313.76   1      .013
R    3781.04  313.78   1      .013                                              1
SH   3781.04  313.78   1      .013
CD   1  4               5.00
CD   2  4               3.00
CD   3  4               2.75
CD   4  4               2.00
Q            24.800  1.0
```

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	1	4	0		5.000														
CD	2	4	0		3.000														
CD	3	4	0		2.750														
CD	4	4	0		2.000														

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

YORBA LINDA PULLMAN ST DRAIN (Q=25YR) - PROPOSED

HEADING LINE NO 2 IS -

J. ENRIQUEZ

HEADING LINE NO 3 IS -

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	2910.000	312.000	1	321.800

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2910.000	312.000	1	.013	.000	.000	.000	0

ELEMENT NO 3 IS A JUNCTION * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	2985.750	312.090	1	2	0	.013	16.900	.000	312.250	.045	.000	.000

RADIUS	ANGLE
.000	.000

ELEMENT NO 4 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2995.000	312.100	1	.013	.000	.000	.000	1

ELEMENT NO 5 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3022.690	312.130	1	.013	24.620	64.440	.000	0

ELEMENT NO 6 IS A JUNCTION * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	3022.690	312.130	1	2	0	.013	14.300	.000	312.250	.045	.000	.000

RADIUS	ANGLE
.000	.000

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 7 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3027.350	312.140	1	.013	.000	.000	.000	1

ELEMENT NO 8 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3037.960	312.150	1	.013	.000	.000	.000	0

ELEMENT NO 9 IS A JUNCTION * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	3095.080	312.220	1	2	0	.013	9.000	.000	314.020	.090	.000	.000

RADIUS	ANGLE
.000	.000

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 10 IS A JUNCTION

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	3257.960	312.420	1	3	0	.013	14.820	.000	313.000	.045	.000	.000

RADIUS	ANGLE
.000	.000

ELEMENT NO 11 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3267.110	312.440	1	.013	.000	.000	.000	1

ELEMENT NO 12 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3595.100	313.410	1	.013	.000	.000	.000	0

ELEMENT NO 13 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3625.000	313.470	1	.013	44.706	38.320	.000	0

ELEMENT NO 14 IS A JUNCTION

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	3625.000	313.470	1	4	0	.013	20.400	.000	314.990	.045	.000	.000

RADIUS	ANGLE
.000	.000

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 15 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3670.350	313.540	1	.013	45.197	57.490	.000	0

ELEMENT NO 16 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3750.000	313.720	1	.013	.000	.000	.000	0

ELEMENT NO 17 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3769.900	313.760	1	.013	.000	.000	.000	0

ELEMENT NO 18 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3781.040	313.780	1	.013	.000	.000	.000	1

ELEMENT NO 19 IS A SYSTEM HEADWORKS

U/S DATA	STATION	INVERT	SECT	W S ELEV
	3781.040	313.780	1	.000

Program Package Serial Number: 7244

WATER SURFACE PROFILE LISTING Date:12-11-2019 Time: 1: 5:46

YORBA LINDA PULLMAN ST DRAIN (Q=25YR) - PROPOSED

J. ENRIQUEZ

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS) / SF Ave	Vel Head / HF	Energy Grd.El. / SE Dpth	Super Elev / Froude N	Critical Depth / Norm Dp	Flow Top Width / "N"	Height/Dia.-FT / X-Fall	Base Wt or I.D. / ZR	ZL / Type	No Wth Prs/Pip / Ch
2910.000	312.000	9.800	321.800	100.22	5.10	.40	322.20	.00	2.85	.00	5.000	.000	.00	0 .0
JUNCT STR	.0012				.0013	.09	9.80	.00		.013	.00	.00	PIPE	
2985.750	312.090	9.991	322.081	83.32	4.24	.28	322.36	.00	2.59	.00	5.000	.000	.00	0 .0
9.250	.0011				.0010	.01	9.99	.00	3.98	.013	.00	.00	PIPE	
2995.000	312.100	10.004	322.104	83.32	4.24	.28	322.38	.00	2.59	.00	5.000	.000	.00	0 .0
27.690	.0011				.0010	.03	.00	.00	3.98	.013	.00	.00	PIPE	
3022.690	312.130	10.050	322.180	83.32	4.24	.28	322.46	.00	2.59	.00	5.000	.000	.00	0 .0
JUNCT STR	.0000				.0009	.00	10.05	.00		.013	.00	.00	PIPE	
3022.690	312.130	10.180	322.310	69.02	3.52	.19	322.50	.00	2.34	.00	5.000	.000	.00	0 .0
4.660	.0021				.0007	.00	10.18	.00	2.71	.013	.00	.00	PIPE	
3027.350	312.140	10.182	322.322	69.02	3.52	.19	322.51	.00	2.34	.00	5.000	.000	.00	0 .0
10.610	.0009				.0007	.01	10.18	.00	3.59	.013	.00	.00	PIPE	
3037.960	312.150	10.180	322.330	69.02	3.52	.19	322.52	.00	2.34	.00	5.000	.000	.00	0 .0
JUNCT STR	.0012				.0006	.04	10.18	.00		.013	.00	.00	PIPE	
3095.080	312.220	10.221	322.441	60.02	3.06	.15	322.59	.00	2.18	.00	5.000	.000	.00	0 .0
JUNCT STR	.0012				.0004	.07	10.22	.00		.013	.00	.00	PIPE	
3257.960	312.420	10.155	322.576	45.20	2.30	.08	322.66	.00	1.88	.00	5.000	.000	.00	0 .0
9.150	.0022				.0003	.00	10.16	.00	2.11	.013	.00	.00	PIPE	

Program Package Serial Number: 7244

WATER SURFACE PROFILE LISTING Date:12-11-2019 Time: 1: 5:46

YORBA LINDA PULLMAN ST DRAIN (Q=25YR) - PROPOSED

J. ENRIQUEZ

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
3267.110	312.440	10.142	322.582	45.20	2.30	.08	322.66	.00	1.88	.00	5.000	.000	.00	0 .0
327.990	.0030					.0003	.10	10.14	.00	1.94	.013	.00	.00	PIPE
3595.100	313.410	9.271	322.681	45.20	2.30	.08	322.76	.00	1.88	.00	5.000	.000	.00	0 .0
29.900	.0020					.0003	.01	.00	.00	2.16	.013	.00	.00	PIPE
3625.000	313.470	9.231	322.701	45.20	2.30	.08	322.78	.00	1.88	.00	5.000	.000	.00	0 .0
JUNCT STR	.0000					.0002	.00	.00	.00		.013	.00	.00	PIPE
3625.000	313.470	9.288	322.758	24.80	1.26	.02	322.78	.00	1.38	.00	5.000	.000	.00	0 .0
45.350	.0015					.0001	.00	.00	.00	1.68	.013	.00	.00	PIPE
3670.350	313.540	9.226	322.766	24.80	1.26	.02	322.79	.00	1.38	.00	5.000	.000	.00	0 .0
79.650	.0023					.0001	.01	9.23	.00	1.52	.013	.00	.00	PIPE
3750.000	313.720	9.054	322.774	24.80	1.26	.02	322.80	.00	1.38	.00	5.000	.000	.00	0 .0
19.900	.0020					.0001	.00	9.05	.00	1.56	.013	.00	.00	PIPE
3769.900	313.760	9.016	322.776	24.80	1.26	.02	322.80	.00	1.38	.00	5.000	.000	.00	0 .0
11.140	.0018					.0001	.00	9.02	.00	1.61	.013	.00	.00	PIPE
3781.040	313.780	8.998	322.778	24.80	1.26	.02	322.80	.00	1.38	.00	5.000	.000	.00	0 .0

LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS
(For use on Los Angeles County Department of Public Works projects only)

CATCH BASIN "V" DEPTH CALCS. IN SERIES

PROJECT: Yorba Linda Blvd Widening SH. OF

JOB NO. BY: J. Enriquez

COMMENTS: Existing Condition

INPUT			OUTPUT		
C.B. at Sta. 11+24.04 Savi Ranch Parkway					
HGL elev. =	322.51	ft.	Pipe Area 1 =	5.94	sq.ft.
Curb face =	8.00	in.	K1 =	529	
Freeboard =	6.00	in.	V1 =	3.22	ft/sec
L.D. drop =	2.00	in.	Hv1 =	0.16	ft.
			1.2 x Hv1 =	0.19	ft.
U/S C.B. DATA			Sf x L1 =	0.19	ft.
T.C elev. =	327.45	ft.			
Connector pipe L1 =	144.82	ft.	Pipe Area 2 =	4.91	sq.ft.
Connector pipe D1 =	33.00	in.	K2 =	410	
C.B. design Q1 =	19.10	cfs	V2 =	6.48	ft/sec
			Hv2 =	0.65	ft.
			1.2 x Hv2 =	0.78	ft.
D/S C.B. DATA			Sf x L2 =	0.39	ft.
T.C elev. =	327.32	ft.			
Connector pipe L2 =	64.63	ft.	Available H2 =	3.48	ft.
Connector pipe D2 =	30.00	in.	Req'd H2 =	1.17	ft.
C.B. design Q2 =	12.70	cfs	Avail H2>=Req'd H2 ?	**OK**	
			Available H =	3.61	ft.
			Req'd H =	1.55	ft.
			Avail H>=Req'd H ?	**OK**	
			Min. V1 =	4.28	ft.
			Use V1 =	7.00	ft.
			V2in > V1 - G + (L1*0.01) =	8.32	ft.
			Use V2in =	8.32	ft.
			Min. V2out =	4.87	ft.
			Use V2out =	13.36	ft.

LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS
(For use on Los Angeles County Department of Public Works projects only)

CATCH BASIN "V" DEPTH CALCS. IN SERIES

PROJECT: Yorba Linda Blvd Widening SH. OF

JOB NO. BY: J. Enriquez

COMMENTS: Proposed Condition

INPUT			OUTPUT		
C.B. at Sta. 11+24.04 Savi Ranch Parkway					
HGL elev. =	322.58	ft.	Pipe Area 1 =	5.94	sq.ft.
Curb face =	8.00	in.	K1 =	529	
Freeboard =	6.00	in.	V1 =	4.38	ft/sec
L.D. drop =	2.00	in.	Hv1 =	0.30	ft.
			1.2 x Hv1 =	0.36	ft.
U/S C.B. DATA			Sf x L1 =	0.35	ft.
T.C elev. =	327.45	ft.			
Connector pipe L1 =	144.82	ft.	Pipe Area 2 =	4.91	sq.ft.
Connector pipe D1 =	33.00	in.	K2 =	410	
C.B. design Q1 =	26.00	cfs	V2 =	7.87	ft/sec
			Hv2 =	0.96	ft.
			1.2 x Hv2 =	1.15	ft.
D/S C.B. DATA			Sf x L2 =	0.57	ft.
T.C elev. =	327.32	ft.			
Connector pipe L2 =	64.63	ft.	Available H2 =	3.41	ft.
Connector pipe D2 =	30.00	in.	Req'd H2 =	1.73	ft.
C.B. design Q2 =	12.64	cfs	Avail H2>=Req'd H2 ?	**OK**	
			Available H =	3.54	ft.
			Req'd H =	2.44	ft.
			Avail H>=Req'd H ?	**OK**	
			Min. V1 =	4.44	ft.
			Use V1 =	7.00	ft.
			V2in > V1 - G + (L1*0.01) =	8.32	ft.
			Use V2in =	8.32	ft.
			Min. V2out =	5.57	ft.
			Use V2out =	13.36	ft.

Drainage Area A (EXISTING)

Project Description

Solve For	Spread

Input Data

Discharge		6.40	ft^3/s
Gutter Width		2.00	ft
Gutter Cross Slope		0.08	ft/ft
Road Cross Slope		0.02	ft/ft
Curb Opening Length		6.00	ft
Opening Height		0.67	ft
Curb Throat Type	Inclined		
Local Depression		2.00	in
Local Depression Width		2.00	ft
Throat Incline Angle		90.00	degrees

Results

Spread	21.90	ft
Depth	0.56	ft
Gutter Depression	0.13	ft
Total Depression	0.29	ft

Drainage Area A (PROPOSED)

Project Description

Solve For	Spread

Input Data

Discharge		13.36	ft^3/s
Gutter Width		2.00	ft
Gutter Cross Slope		0.08	ft/ft
Road Cross Slope		0.02	ft/ft
Curb Opening Length		17.00	ft
Opening Height		0.67	ft
Curb Throat Type	Inclined		
Local Depression		2.00	in
Local Depression Width		2.00	ft
Throat Incline Angle		90.00	degrees

Results

Spread	21.50	ft
Depth	0.56	ft
Gutter Depression	0.13	ft
Total Depression	0.29	ft

Drainage Area B (EXISTING)

Project Description

Solve For	Spread

Input Data

Discharge		12.70	ft^3/s
Gutter Width		2.00	ft
Gutter Cross Slope		0.08	ft/ft
Road Cross Slope		0.02	ft/ft
Curb Opening Length		6.00	ft
Opening Height		0.67	ft
Curb Throat Type	Inclined		
Local Depression		2.00	in
Local Depression Width		2.00	ft
Throat Incline Angle		90.00	degrees

Results

Spread	34.58	ft
Depth	0.82	ft
Gutter Depression	0.13	ft
Total Depression	0.29	ft

Drainage Area B (PROPOSED)

Project Description

Solve For	Spread

Input Data

Discharge		12.64	ft^3/s
Gutter Width		2.00	ft
Gutter Cross Slope		0.08	ft/ft
Road Cross Slope		0.02	ft/ft
Curb Opening Length		7.00	ft
Opening Height		0.67	ft
Curb Throat Type	Inclined		
Local Depression		2.00	in
Local Depression Width		2.00	ft
Throat Incline Angle		90.00	degrees

Results

Spread	32.27	ft
Depth	0.77	ft
Gutter Depression	0.13	ft
Total Depression	0.29	ft

ATTACHMENT 4

AS-BUILT PLANS

CITY OF ANAHEIM

PLANS FOR THE CONSTRUCTION OF

SAVI RANCH PARKWAY
FROM 490'± NE'LY OF TO PULLMAN ST.

OLD CANAL ROAD
FROM 695'± NE'LY OF TO PULLMAN ST.

PULLMAN STREET
FROM CRYSTAL DR. TO OLD CANAL ROAD

CRYSTAL DRIVE
FROM 215'± NE'LY OF TO PULLMAN ST.

WEIR CANYON ROAD
FROM WEIR CYN. RD. BRIDGE TO 479'± SE'LY

GENERAL NOTES

1. All necessary utility construction within the street right of way shall be completed prior to paving per this plan.
2. All work, as shown on this plan, shall be in accordance with the applicable sections of standard specifications, for public works construction, City of Anaheim standard plans, contract documents and standard specification supplement and the latest revisions thereof.
3. All paving removal shall be sawcut at the City Engineer's direction. Minimum depth of cut: 1½".
4. "No expansive soil exists or will be imported for use within the public right of way."
5. Methods of handling irrigation lines within limits of improvements:
   A. Abandoned lines - Remove & plug to construction limits
   B. Lines in service - Relocate out of the street right of way
6. 4" Thick sand blanket under all sidewalks and 4" thick aggregate base section under all curb and gutter is required unless a report from a registered soils engineer is submitted and approved stating that the soil is non-expansive and that the sand blanket and/or aggregate base is not required.
7. Reports of compaction within the traveled way of all streets shall be submitted to and accepted by the City Engineer prior to placing any street paving.
8. Prior to approval of improvements by the Engineering Division and acceptance by the City, centerline monuments shall be set at all points of intersecting streets, beginning of curves, points of reverse curve, end of curves, center of cul-de-sacs and any other points so designated by the Field Engineer. Ties to monuments shall be set and a copy of said ties shall be furnished to the Field Engineer office.
9. Adjust all storm drain and sewer manholes, and water valves, to grade.
10. All regulatory signs shall be placed within 24 hours after curb returns have been constructed in locations as shown on these plans.
11. It shall be the contractors responsibility to protect all traffic signs where applicable.
12. "Following completion of construction, the survey markers which have been disturbed by the construction activities shall be reset in their original location and the ties submitted to the Survey Division for approval."
13. Before the forms have been set and 24 hours prior to the placement of any concrete for sidewalk or drive approach construction the contractor shall adjust all necessary utilities within the parkway to grade and obtain approval from the Field Eng. - 999-5126.
14. Notify Underground Service Alert on 1-800-422-4133 a minimum of 48 hrs. prior to start of construction within the Public Right-of-way.
15. "Soil cement trench backfill shall be required to within 1' of the finished grade where sewer or storm drain is to be constructed outside of the public right of way at a slope of 5:1 or more, unless waived by the Field Engineer."

PRIVATE ENGINEER'S NOTICE TO CONTRACTOR

THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITIES OR STRUCTURES SHOWN ON THESE PLANS ARE OBTAINED BY A SEARCH OF AVAILABLE RECORDS. TO THE BEST OF OUR KNOWLEDGE THERE ARE NO EXISTING UTILITIES EXCEPT THOSE SHOWN ON THIS PLAN. THE CONTRACTOR IS REQUIRED TO TAKE ALL PRECAUTIONARY MEASURES TO PROTECT THE UTILITIES SHOWN, AND ANY OTHER LINES OR STRUCTURES NOT SHOWN ON THESE PLANS, AND IS RESPONSIBLE FOR THE PROTECTION OF, AND ANY DAMAGE TO THESE LINES OR STRUCTURES.

CONSTRUCTION NOTES

1 *CONST. " AC OVER " AB
2 CONST. TYPE "A" CURB & GUTTER, 8" C.F., PER CITY STD. DETAIL NO. 1D4-F
3 CONST. TYPE "B" CURB & GUTTER, 6" C.F. PER CITY STD. DETAIL NO. 1D4-F
4 CONST. MEDIAN CURB & GUTTER PER DETAIL ON PLAN NO. 14762
5 CONST. ISLAND CURB & GUTTER PER DETAIL ON PLAN NO. 14762
6 CONST. 4" THICK PCC SIDEWALK PER CITY STD. DETAIL NO. 11D-C
7 CONST. STD. METAL BEAM GUARD RAILING PER CITY STD. DETAIL NO. 120
8 CONST. CURB DEPRESSION FOR SIDEWALK ACCESS RAMPS PER CITY STD. DETAIL NO. 124-C
9 CONST. CURB DEPRESSION FOR ISLAND ACCESS RAMPS
10 CONST. REINFORCED CONCRETE PROTECTION PER DETAIL ON PLAN NO. 14763
11 CONST. PATTERN STAMPED CONCRETE (BOMANITE) HACIENDA BROWN BASKET WEAVE
12 INSTALL STREET NAME SIGNS PER CITY STD. DETAIL NO. 127
13 CONST. PCC INTERCEPTOR DRAIN PER DETAIL ON PLAN NO. 14766
14 CONST. PCC DOWN DRAIN PER DETAIL ON PLAN NO. 14765
15 CONST. CONC. BLOCK SPLASH WALL PER DETAIL IN ADDENDUM NO. 1 EXHIBIT 2
16 OVEREXCAVATE TO 2' BELOW EXISTING GROUND OR SUBGRADE (WHICHEVER IS LOWER). BACKFILL WITH UNCLASSIFIED FILL TO 90% RELATIVE COMPACTION.
17 CONST. DBL 36" BRICK & MORTAR BULKHEAD

*STRUCTURAL SECTION TO BE DETERMINED AND APPROVED PRIOR TO PLACING PAVEMENT.

THIS PLAN HAS BEEN EXAMINED AND IS APPROVED ONLY AS TO COMPATIBILITY WITH ADJOINING EXISTING OR FUTURE IMPROVEMENTS AND CONFORMANCE WITH CITY OF ANAHEIM STANDARD DETAILS AND THE REQUIREMENTS FOR THE FOLLOWING APPLICABLE FACTORS: RIGHT OF WAY, ROADWAY MATERIALS, ALIGNMENTS AND GRADES, HYDROLOGY AND HYDRAULICS DESIGN OF STORM DRAIN OR SANITARY SEWER SYSTEMS AND UNDERGROUND CONDUIT OR OPEN-CHANNEL ALIGNMENTS, GRADES, SIZES AND MATERIALS.

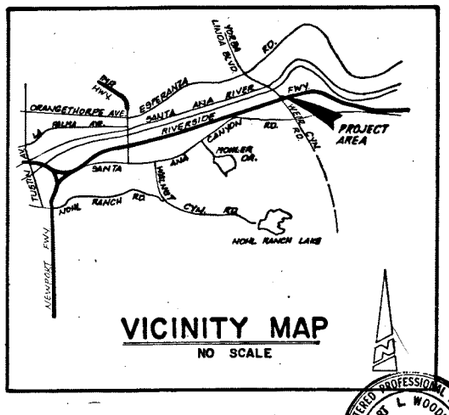
SHEET INDEX

Sht. No.	Plan No.	Description
1	14761	TITLE SHEET
2	14762	TYPICAL ROADWAY SECTIONS, CURB & ISLAND DETAILS
3	14763	CRYSTAL DRIVE - FROM WEIR CANYON RD. TO PULLMAN ST.
STREET IMPROVEMENTS		
4	14764	SAVI RANCH PKWY - FROM 490'± NE'LY OF TO PULLMAN ST
5	14766	OLD CANAL RD - FROM 695'± NE'LY OF TO PULLMAN ST
6	14766	PULLMAN ST - FROM CRYSTAL DR TO OLD CANAL RD
STORM DRAIN IMPROVEMENTS		
7	14767	PULLMAN ST - FROM SANTA ANA RIVER TO OLD CANAL RD
8	14768	OLD CANAL RD - FROM 450'± NE'LY OF TO PULLMAN ST
9	14769	PROFILES AND DETAILS
10	14770	150' WEST OF WEIR CANYON RD. - FROM CRYSTAL DR. TO OLD CANAL RD.
11	14771	CRYSTAL DR. - FROM WEIR CANYON RD. TO PULLMAN ST
TRAFFIC		
12	14772	SIGNING AND STRIPING
REFERENCE		
13	14773	WEIR CANYON RD - FROM 1050'± NORTH OF RIVERSIDE FWY TO 1550'± NORTH OF RIVERSIDE FWY
GRADING		
14		BORROW SITE SOUTH OF OLD CANAL RD. AT PULLMAN ST.

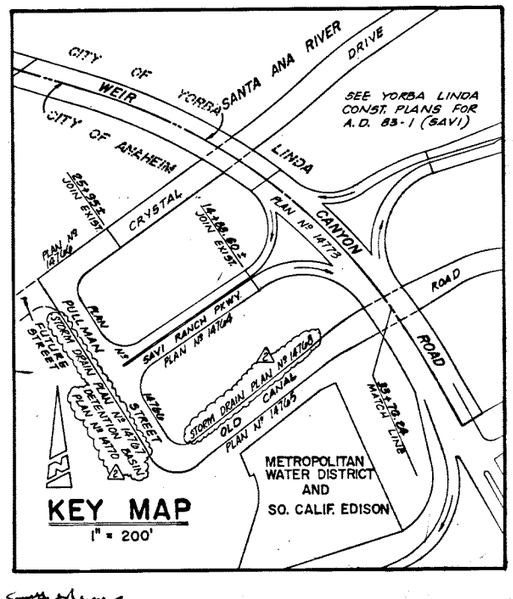
CITY OF ANAHEIM
PLANS 14761 THRU 14773

NO.	ITEM	QUANTITY
1.	CLEARING & GRUBBING	LS
2.	UNCLASSIFIED EXCAVATION	90,000 CY
3.	UNCLASSIFIED FILL	100 CY
4.	ASPHALT CONCRETE PAVEMENT	2,750 TN
5.	AGGREGATE BASE	7,410 TN
6.	TYPE "A" CURB & GUTTER (8")	3,400 LF
7.	TYPE "B" CURB & GUTTER (6")	180 LF
8.	ISLAND CURB (6")	370 LF
9.	MEDIAN CURB (8")	1,230 LF
10.	4" PCC SIDEWALK	960 SF
11.	PATTERN STAMPED PCC (BOMANITE)	4,720 SF
12.	METAL BEAM GUARD RAIL	100 LF
13.	MWD PROTECTION	DELETED
14.	60" RCP 1350D	796 LF
15.	42" RCP 1350D THICKWALLED	102 LF
16.	36" RCP 1350D	140 LF
17.	33" RCP 1350D	432 LF
18.	30" RCP 1500D	64 LF
19.	27" RCP 1350D	95 LF
20.	24" RCP 2400D	16 LF
21.	24" RCP 1500D	54 LF
22.	24" RCP 1350D	12 LF
23.	18" RCP 1500D	125 LF
24.	60" CSP 12 GA.	111 LF
25.	60" CSP TEE 12 GA.	1 EA
26.	60" CONCRETE COLLAR	3 EA
27.	42" CONCRETE COLLAR	1 EA
28.	24" CONCRETE COLLAR	1 EA
29.	MANHOLE NO. 4	2 EA
30.	MANHOLE NO. 2	2 EA
31.	MANHOLE NO. 1	1 EA
32.	JUNCTION STRUCTURE NO. 4	1 EA
33.	JUNCTION STRUCTURE NO. 2	1 EA
34.	CATCH BASIN NO. 1 W=10' W/LD	1 EA
35.	CATCH BASIN NO. 1 W=6' W/LD	6 EA
36.	24" CSP INLET PER OETAIL	5 EA
37.	MWD INLET	LS
38.	24" CSP PERFORATED RISER INLET	DELETED
39.	96" CSP OUTLET	DELETED
40.	RIP RAP	DELETED
41.	OBL. BRICK & MORTAR BULKHEAD (36")	DELETED
42.	72" I.D. R.C. M.H., PUMP. STA.	DELETED
43.	DETENTION BASIN PUMPS AND CONTROLS	DELETED
44.	8" PVC SCH. 40 DISCHARGE LINE	DELETED
45.	CONCRETE SLOPE ANCHORS	2 EA
46.	60" CSP ANTI-SEEP RING	3 EA
47.	GROUTED RIPRAP	13 CY
48.	R.C. VEE DITCH	1,455 LF
49.	NON-REINFORCED CONCRETE DITCH	700 LF
50.	6' HIGH C.L. FENCE W/GATE	DELETED

NOTE: FOR U.G. ELECTRICAL FACILITIES SEE CITY OF ANAHEIM ELECTRICAL UTILITIES DWG. ESK. 052088



VICINITY MAP
NO SCALE



KEY MAP
1" = 200'

NO.	DATE	INITIAL	DESCRIPTION	DATE	APPR.
1	1-19-83	H.C.C.	PER CITY OF ANAHEIM PLAN CHECK	3/11/83	
2	10-31-84	N.C.W.	PER "AS BUILT"	10/5/84	
3	5-16-84	L.A.S.	ADDED 8" V.C.P. SEWER LINE	"	
4	5-8-84	L.D.E.	REVISED MEDIANS	"	
5	5-2-84	L.A.S.	REVISED LOCATION OF WATER LINE	"	
6	12-21-83	L.D.E.	MISC. REVISIONS TO STREET, TO STORM DRAIN, SEWER & WATER	"	
7	11-21-83	M.S.M.	DELETED FIRE HYDRANTS AT STA's 39+30 & 40+87, ADDED GATE VALVE @ STA. 40+82	"	
8	10-20-83	M.S.M.	REVISED PER Y.L.C.W.D.	"	
9	10-11-83	M.S.M.	ADDED STEEL	"	
10	9-29-83	MH	CHANGE PER CITY OF ANAHEIM	"	
11	9-29-83	LDE	DELETED E.P., ADDED E.W. CURB & GUTTER @ SAVI RANCH PKWY	"	
12	9-8-83	MSM	REVISED M.W.D. INLET AT OLD CANAL RD. STA. 27+70	"	
13	8-25-83	MSM	ADDED SEWER AT OLD CANAL & MIRAGE	"	
14	8-12-83	LDE	REVISED SLOPE & S.D. INLETS S/E OLD CANAL RD. STA 39+87 TO 38+90	"	
15	8-5-83	MSM	WATER LINE AND INTERTIE RELOCATION AND REVISION	"	

REVISIONS

NO.	DATE	INITIAL	DESCRIPTION	DATE	APPR.
1	5-19-83	MH	REVISED TRAFFIC SIGNS & PAVEMENT LEGENDS	7/5/83	
2	6-27-83	MSM	CHANGE PER CITY OF ANAHEIM	"	
3	5-20-83	MSM	ADDED TELEPHONE CONSTRUCTION DATA ON WEIR CANYON ROAD	"	
4	7-5-83	AJF	ADDED FIRE HYDRANTS, CHANGED FH LOCATION YORBA LINDA SIDE ONLY	"	
5	7-18-83	AJF	SEWER LATERAL RELOCATION YORBA LINDA SIDE ONLY	7/19/83	
6	7-20-83	AJF	WATER LINE AND INTERTIE RELOCATION AND REVISION	7/26/83	

REFERENCES

BENCH MARK. EL = 345.697
0.15 MI. N.W. ON WEIR CYN. RD., FROM THE RIVERSIDE FWY. TO A CONC. HOWL. ON THE WEST SIDE, 95' W. OF THE CENTERLINE OF WEIR CYN. RD., 114'± S. OF THE B.A.V.I. CANAL, SET IN THE TOP OF THE CONC. HOWL.
O.C.S. 1976 ADJ. 3KK-20-71

PLANS FOR THESE IMPROVEMENTS CITY OF ANAHEIM STD. DTLS.
STREET - 14761 - 14766, 14772, 14773
SEWER - 14774 - 14777
STORM DRAIN - 14761 - 14767 - 14771

APPR. _____ ELECTRICAL ENGINEERING MANAGER DATE 3-16-88
APPR. _____ WATER ENGINEERING MANAGER DATE

CITY OF YORBA LINDA A.D. 83-01 APPROVED
_____ CITY ENGINEER
16 MAY 88 DATE

REGISTERED PROFESSIONAL ENGINEER ROBERT L WOODWINGS No. C33706 CIVIL STATE OF CALIFORNIA

SCALE: AS SHOWN
PREPARED UNDER THE SUPERVISION OF _____ R.C.E. NO. _____ DATE 10-15-87
RECOMMEND APPROVAL _____ DEPUTY CITY ENGINEER DATE 5-22-88
APPROVED _____ CITY ENGINEER DATE 5-23-88

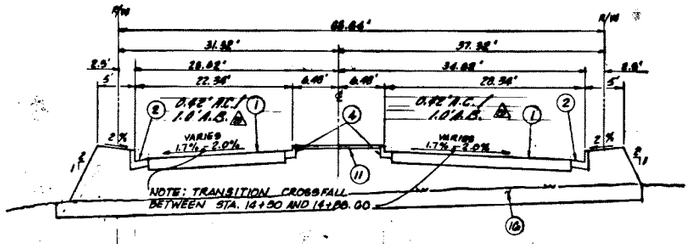
PLANS PREPARED FOR
CITY OF YORBA LINDA
4845 MAIN STREET
P.O. BOX 487 - PH.(714) 777-5000
YORBA LINDA, CA. 92686
ASSESSMENT DISTRICT 83-1

PLANS PREPARED BY
BSI BERRYMAN & STEPHENSON INC.
CONSULTANTS TO GOVERNMENT AGENCIES
1615 EAST SEVENTEENTH STREET
SANTA ANA, CALIFORNIA 92701
(714) 558-1552

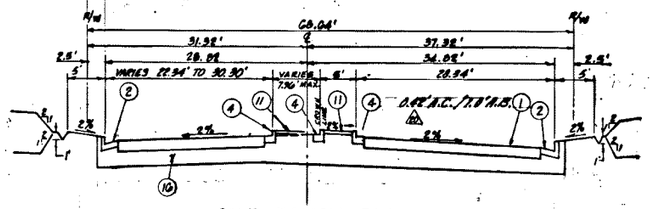
SP 1556

STREET & STORM DRAIN IMPROVEMENT PLANS FOR
SAVI RANCH PARKWAY, OLD CANAL ROAD, PULLMAN STREET, CRYSTAL DRIVE & WEIR CANYON ROAD
TITLE SHEET
CITY OF ANAHEIM

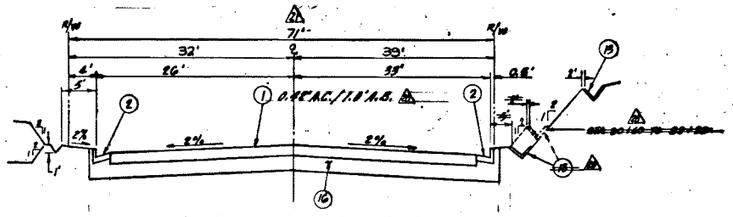
SHEET 1 OF 14
14761
PLAN NUMBER



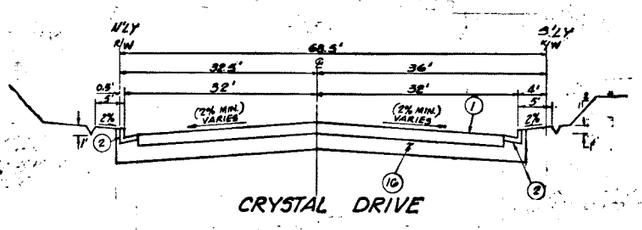
SAVI RANCH PARKWAY
STA. 14+00 TO 14+88.62



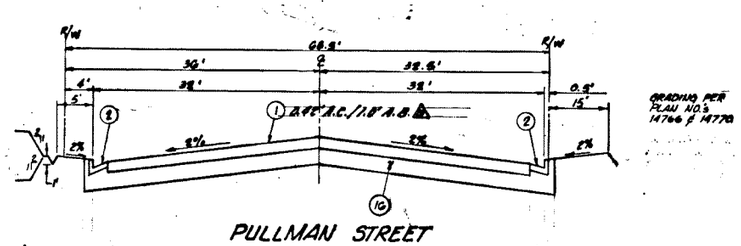
SAVI RANCH PARKWAY
STA. 11+15 TO 14+00



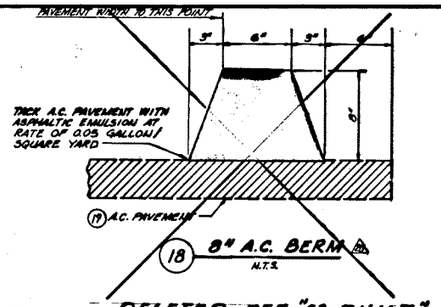
OLD CANAL ROAD



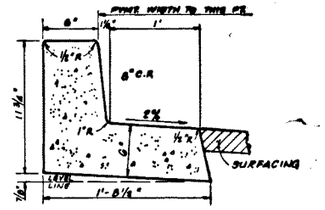
CRYSTAL DRIVE



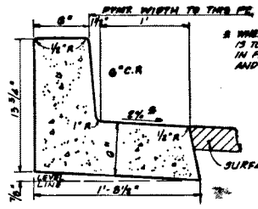
PULLMAN STREET



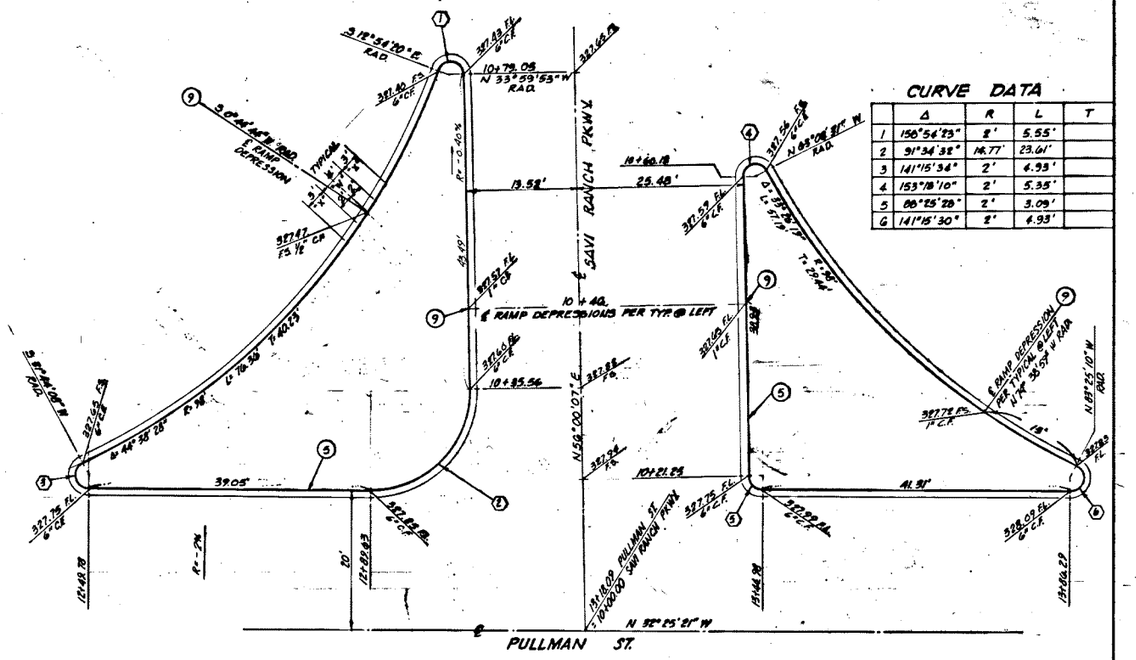
DELETED PER "AS BUILT"



(4) MEDIAN CURB DETAIL
N.T.S.



(5) ISLAND CURB DETAIL
N.T.S.



CURVE DATA

	Δ	R	L	T
1	156°54'23"	2'	5.55'	
2	91°34'38"	14.77'	23.61'	
3	141°15'34"	2'	6.93'	
4	153°18'10"	2'	5.35'	
5	86°25'28"	2'	3.09'	
6	141°15'30"	2'	6.93'	

ISLAND DETAIL
N.T.S.

CONSTRUCTION NOTES

1. CONSTRUCT A.C. OVER A.B. ⚠
2. CONSTRUCT TYPE "A" CURB & GUTTER, 6" C.R. PER CITY STD. DETAIL NO. 104-P
4. CONSTRUCT MEDIAN CURB & GUTTER PER DETAIL HEREON
5. CONSTRUCT ISLAND CURB & GUTTER PER DETAIL HEREON
9. CONSTRUCT CURB DEPRESSION FOR ISLAND ACCESS RAMPS
11. CONSTRUCT PATTERN STAMPED CONCRETE (BOMANITE) HACIENDA BROWN BASKET WEAVE
13. CONSTRUCT R.C.C. INTERCEPTOR DRAIN PER DETAIL ON PLAN NO. 14769
14. OVEREXCAVATE TO 2' BELOW EXISTING GROUND OR SUBGRADE (WHICHEVER IS LOWER) BACKFILL WITH UNCLASSIFIED FILL TO 90% RELATIVE COMPACTION
18. CONSTRUCT 8" A.C. BERM PER DETAIL HEREON.
19. CONSTRUCT 3" TEMPORARY A.C. PVMT. ON NATIVE SOIL.
⚠ STRUCTURAL SECTION TO BE DETERMINED AND APPROVED PRIOR TO PLACING PAVEMENT

REGISTERED PROFESSIONAL ENGINEER
GEORGE ALBERT GALLAHER IV
No. 24704
Exp. 12-31-89
CIVIL
STATE OF CALIFORNIA

AS-BUILT OCT 30 1984

SP 1556

THIS PLAN HAS BEEN EXAMINED AND IS APPROVED ONLY AS TO COMPATIBILITY WITH ADJOINING EXISTING OR FUTURE IMPROVEMENTS AND CONFORMANCE WITH CITY OF ANAHEIM STANDARD DETAILS AND THE REQUIREMENTS FOR THE FOLLOWING APPLICABLE FACTORS: RIGHT OF WAY, ROADWAY MATERIALS, ALIGNMENTS AND GRADES, HYDROLOGY AND HYDRAULICS DESIGN OF STORM DRAIN OR SANITARY SEWER SYSTEMS AND UNDERGROUND CONDUIT OR OPEN-CHANNEL ALIGNMENTS, GRADES, SIZES AND MATERIALS.

FOR GENERAL NOTES, QUANTITY ESTIMATE & KEY MAP SEE PLAN 14761

REVISIONS

NO.	DATE	INITIAL	DESCRIPTION	DATE	APPR.
⚠	4-30-84	R.C.W.	PER "AS BUILT"		
⚠	8-10-87	V.R.S.	PER CITY OF ANAHEIM PLAN CHECK		

REFERENCES

BENCH MARK: EL. = 345.697
0.15 MI. N.W. ON WEIR CYN. RD., FROM THE RIVERSIDE F.W.Y. TO A CONC. HDWL. ON THE WEST SIDE, 95' W. OF THE CENTERLINE OF WEIR CYN. RD., 116' S. OF THE S.A.V.I. CANAL, SET IN THE TOP OF THE CONC. HDWL.
O.C.S. 1970 ADJ. 3KK 30-71

PLANS FOR THESE IMPROVEMENTS CITY OF ANAHEIM STD. DTLS.
STREET 1410-1470½, 1471C, 14773
SEWER 14776 - 14777
STORM DRAIN 1470I, 1470J-1477I

APPR. ELECTRICAL ENGINEERING MANAGER DATE
APPR. WATER ENGINEERING MANAGER DATE

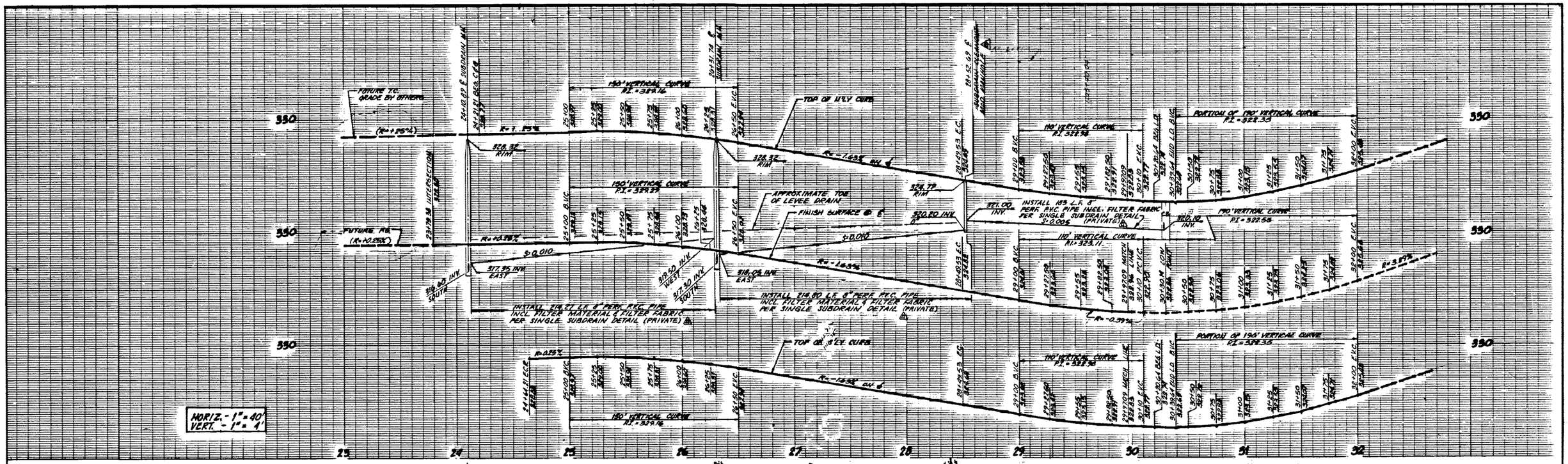
SCALE:	
PREPARED UNDER THE SUPERVISION OF George A. Gallaher R.C.E. NO. 24704	DATE 5-3-88
RECOMMEND APPROVAL DEPUTY CITY ENGINEER	5-23-88
APPROVED CITY ENGINEER	5-27-88

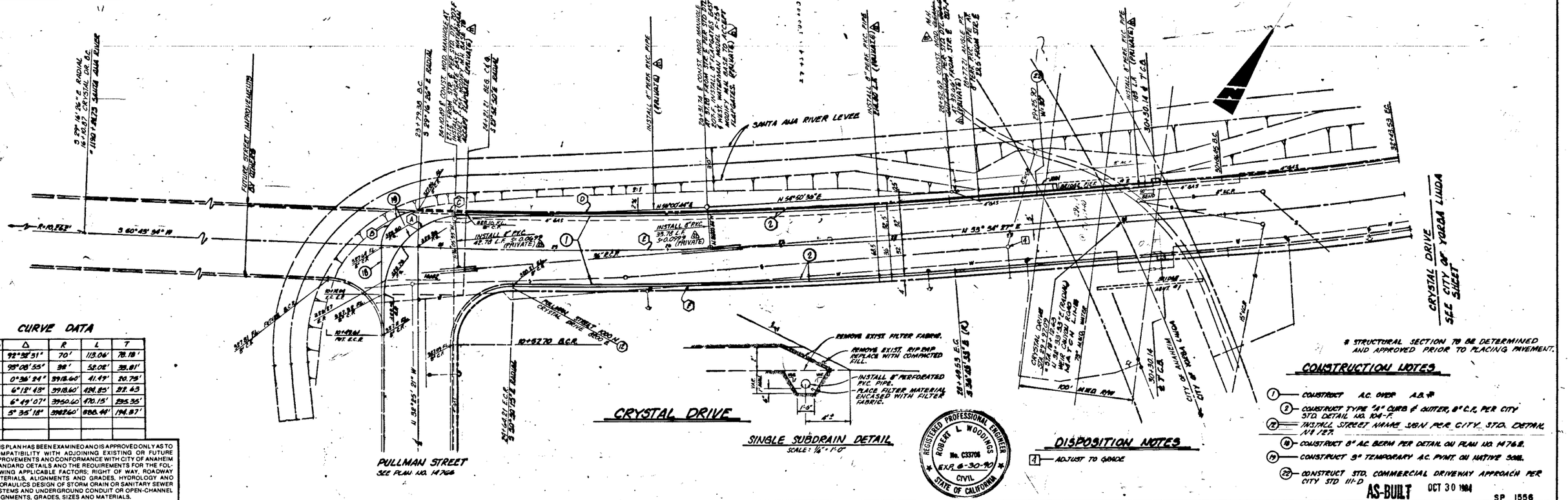
STREET IMPROVEMENTS
SAVI RANCH PARKWAY, OLD CANAL ROAD PULLMAN STREET, CRYSTAL DRIVE
TYPICAL ROADWAY SECTIONS, CURB & ISLAND DETAILS

CITY OF ANAHEIM

SHEET 2 OF 11

14762
PLAN NUMBER





CURVE DATA

	Δ	R	L	T
A	92°38'31"	70'	113.06'	78.18'
B	99°08'55"	98'	52.08'	39.81'
C	0°36'24"	3918.60'	41.49'	20.75'
D	6°18'43"	3918.60'	431.85'	312.43
E	6°49'07"	3950.60'	470.15'	295.35'
F	5°35'18"	3982.60'	388.44'	194.37'

THIS PLAN HAS BEEN EXAMINED AND IS APPROVED ONLY AS TO COMPATIBILITY WITH ADJOINING EXISTING OR FUTURE IMPROVEMENTS AND CONFORMANCE WITH CITY OF ANAHEIM STANDARD DETAILS AND THE REQUIREMENTS FOR THE FOLLOWING APPLICABLE FACTORS: RIGHT OF WAY, ROADWAY MATERIALS, ALIGNMENTS AND GRADES, HYDROLOGY AND HYDRAULICS DESIGN OF STORM DRAIN OR SANITARY SEWER SYSTEMS AND UNDERGROUND CONDUIT OR OPEN-CHANNEL ALIGNMENTS, GRADES, SIZES AND MATERIALS.

* STRUCTURAL SECTION TO BE DETERMINED AND APPROVED PRIOR TO PLACING PAVEMENT.

CONSTRUCTION NOTES

1. CONSTRUCT A.C. OVER A.B.*
2. CONSTRUCT TYPE "A" CURB & GUTTER, 6" C.I.P. PER CITY STD. DETAIL NO. 104-F.
3. INSTALL STREET NAME SIGN PER CITY STD. DETAIL NO. 127.
10. CONSTRUCT 8" A.C. BERM PER DETAIL ON PLAN NO. 14762.
19. CONSTRUCT 8" TEMPORARY A.C. PVMT. ON NATIVE SOIL.
22. CONSTRUCT STD. COMMERCIAL DRIVEWAY APPROACH PER CITY STD. 111-D

DISPOSITION NOTES

4. ADJUST TO GRADE

REGISTERED PROFESSIONAL ENGINEER — ROBERT L WOODINGS — No. C33708 — EXP. 6-30-90 — CIVIL — STATE OF CALIFORNIA

AS-BUILT OCT 30 1984

SP 1556

REVISIONS

NO.	DATE	INITIAL	DESCRIPTION	DATE	APPR.
2	6-30-86	M.C.W.	PER "AS BUILT"		
1	1-19-87	M.C.C.	PER CITY OF ANAHEIM PLAN CHECK		

REFERENCES

BENCH MARK:

PLANS FOR THESE IMPROVEMENTS CITY OF ANAHEIM STD. DTLS.
STREET
SEWER
STORM DRAIN

APPR. ELECTRICAL ENGINEERING MANAGER — DATE
APPR. WATER ENGINEERING MANAGER — DATE

SCALE:

PREPARED UNDER THE SUPERVISION OF — R.C.E. NO. 33706 — DATE 10-15-84

RECOMMEND APPROVAL — DEPUTY CITY ENGINEER — DATE 5-22-85

APPROVED — CITY ENGINEER — DATE 5-23-85

STREET IMPROVEMENTS

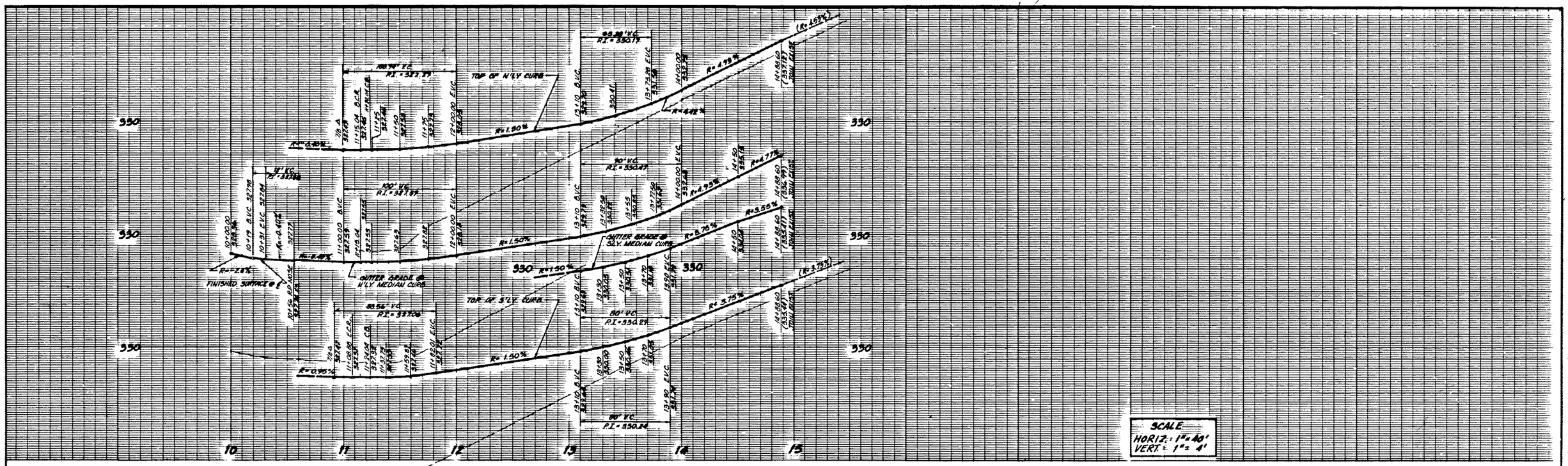
CRYSTAL DRIVE

FROM WEIR CANYON ROAD TO PULLMAN STREET

CITY OF ANAHEIM

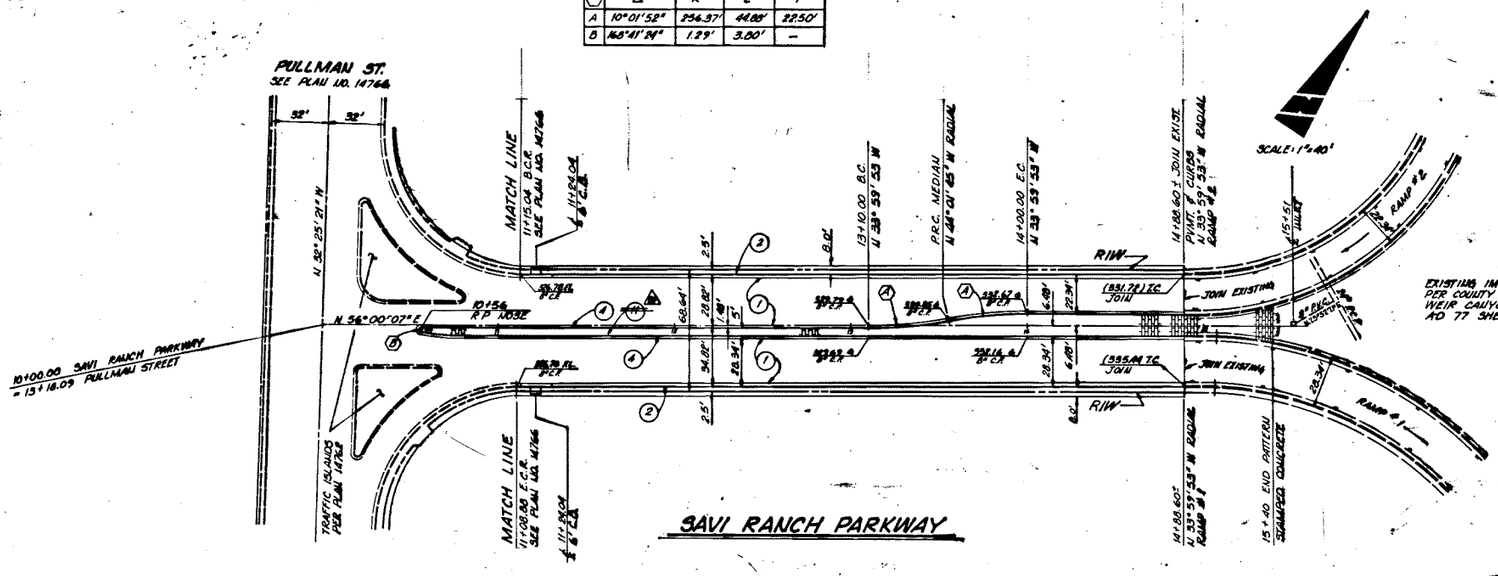
SHEET 3 OF 14

14763 PLAN NUMBER



CURVE DATA

	Δ	R	L	T
A	10°01'52"	254.37'	44.08'	22.50'
B	168°41'34"	1.29'	3.80'	—



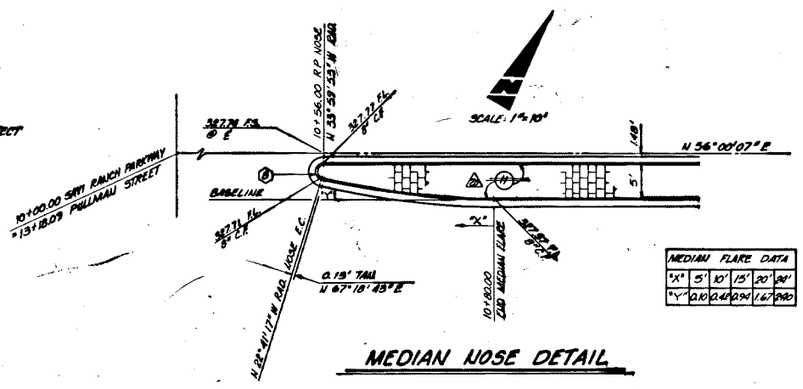
SAVI RANCH PARKWAY

EXISTING IMPROVEMENTS PER COUNTY OF ORANGE WEIR CANYON ROAD PROJECT AD 77 SHEET X-2

CONSTRUCTION NOTES

1. CONSTRUCT A#/AC OVER 4.0" AB. #
2. CONSTRUCT TYPE "A" CURB & GUTTER, 6" C.F. PER CITY STD. DETAIL NO. 104-P.
4. CONSTRUCT MEDIAN CURB & GUTTER PER DETAIL ON PLAN NO. 14762.
M. ~~CONSTRUCT PATTERN STAMPED CONCRETE (SQUARE) (HEXAGON) SAW CUT JOINTS~~

STRUCTURAL SECTION TO BE DETERMINED AND APPROVED PRIOR TO PLACING PAVEMENT.



MEDIAN FLARE DATA					
"X"	5'	10'	15'	20'	25'
"Y"	0.10	0.40	0.94	1.67	2.60

MEDIAN NOSE DETAIL

THIS PLAN HAS BEEN EXAMINED AND IS APPROVED ONLY AS TO COMPATIBILITY WITH ADJOINING EXISTING OR FUTURE IMPROVEMENTS AND CONFORMANCE WITH CITY OF ANAHEIM STANDARD DETAILS AND THE REQUIREMENTS FOR THE FOLLOWING APPLICABLE FACTORS; RIGHT OF WAY, ROADWAY MATERIALS, ALIGNMENTS AND GRADES, HYDROLOGY AND HYDRAULICS DESIGN OF STORM DRAIN OR SANITARY SEWER SYSTEMS AND UNDERGROUND CONDUIT OR OPEN-CHANNEL ALIGNMENTS, GRADES, SIZES AND MATERIALS.

REGISTERED PROFESSIONAL ENGINEER — ROBERT L WOODINGS — No. C33706 — EXP 6-30-90 — CIVIL — STATE OF CALIFORNIA

AS-BUILT:
OCT 30 1984
SP 1556

FOR GENERAL NOTES, QUANTITY ESTIMATE & KEY MAP SEE PLAN NO. 14761

REVISIONS

NO.	DATE	INITIAL	DESCRIPTION	DATE	APPR.
1	9-29-84	R.C.W.	PER "AS BUILT"		

REFERENCES

BENCH MARK: - ELEVATION 345.697
0.15' W.I. U/W ON WEIR CANYON RD., FROM THE RIVERSIDE FWY. TO A CONC. HDWL. ON THE WEST SIDE, 95' W. OF THE CENTERLINE OF WEIR CANYON RD., 114' S. OF THE S.A.V.I. CANAL, SET IN THE TOP OF THE CONC. HDWL. - O.C.S. 1976 ADJ. 3.K.K.-80-71.

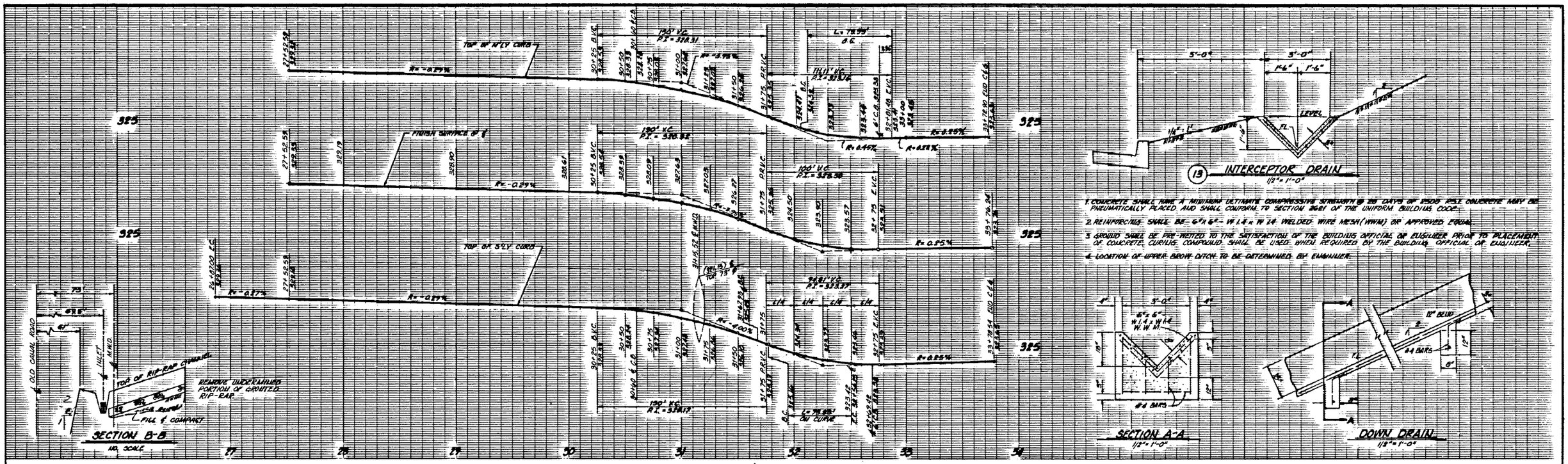
PLANS FOR THESE IMPROVEMENTS CITY OF ANAHEIM STD. DTLS.
STREET 14761-14764, 14772, 14779
SEWER 14774-14777
STORM DRAIN 14761, 14767-14771

APPR. ELECTRICAL ENGINEERING MANAGER — DATE
APPR. ~~WATER~~ ENGINEERING MANAGER — DATE

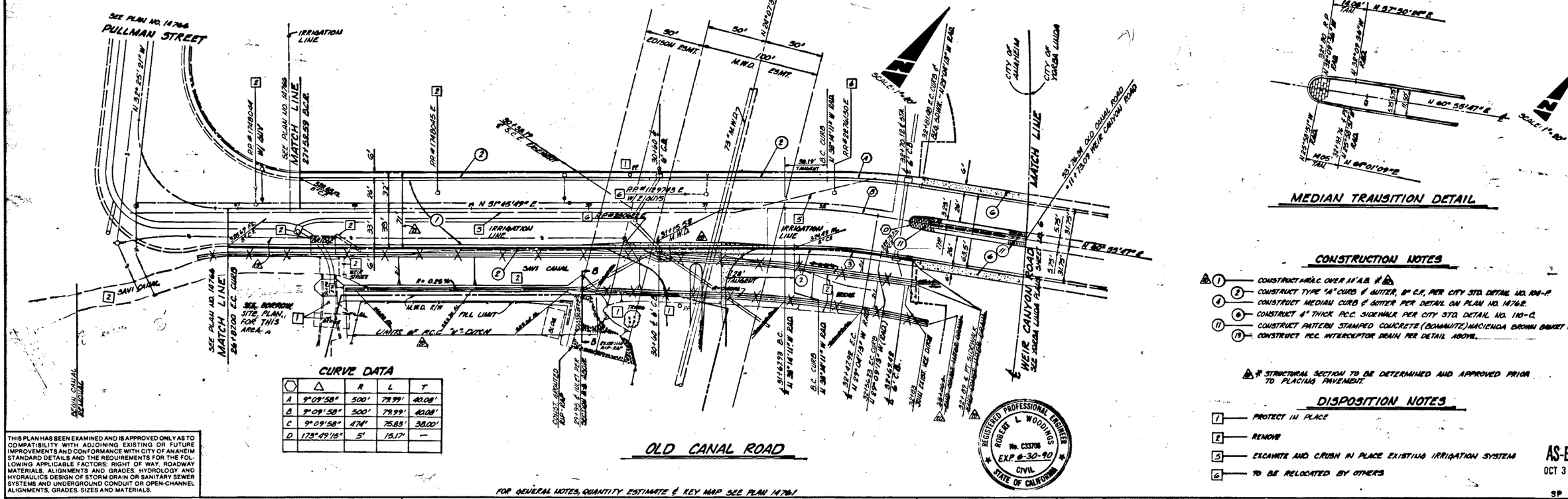
SCALE:
PREPARED UNDER THE SUPERVISION OF — R.C.E. NO. — DATE 10-15-84
RECOMMEND APPROVAL — DEPUTY CITY ENGINEER — DATE 5-22-85
APPROVED — CITY ENGINEER — DATE 5-13-85

STREET IMPROVEMENTS
SAVI RANCH PARKWAY
FROM 490'± NE'LY OF TO PULLMAN STREET
CITY OF ANAHEIM

SHEET 4 OF 14
14764
PLAN NUMBER



1. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH @ 28 DAYS OF 2500 PSI. CONCRETE MAY BE PNEUMATICALLY PLACED, AND SHALL CONFORM TO SECTION 2601 OF THE UNIFORM BUILDING CODE.
2. REINFORCING SHALL BE 6"X 6" - W 1.4 x W 1.4 WELDED WIRE MESH (WWM) OR APPROVED EQUAL.
3. GROUND SHALL BE PRE-WETTED TO THE SATISFACTION OF THE BUILDING OFFICIAL OR ENGINEER PRIOR TO PLACEMENT OF CONCRETE. CURING COMPOUND SHALL BE USED WHEN REQUIRED BY THE BUILDING OFFICIAL OR ENGINEER.
4. LOCATION OF UPPER BROW DITCH TO BE DETERMINED BY ENGINEER.



CURVE DATA

	Δ	R	L	T
A	9°09'58"	500'	79.99'	40.08'
B	9°09'58"	500'	79.99'	40.08'
C	9°09'58"	474'	75.83'	38.00'
D	179°49'15"	5'	15.17'	—

CONSTRUCTION NOTES

1. CONSTRUCT A.R.A.C. OVER 10' A.B. ⚠ *
2. CONSTRUCT TYPE "A" CURB & GUTTER, 18" C.F., PER CITY STD. DETAIL NO. 106-D.
4. CONSTRUCT MEDIAN CURB & GUTTER PER DETAIL ON PLAN NO. 14762.
6. CONSTRUCT 4" THICK P.C.C. SIDEWALK PER CITY STD. DETAIL NO. 110-C.
11. CONSTRUCT PATTERN STAMPED CONCRETE (BOMANITE) HACIENDA BROWN BASKET WEAVE.
19. CONSTRUCT R.C.C. INTERCEPTOR DRAIN PER DETAIL ABOVE.

⚠ * STRUCTURAL SECTION TO BE DETERMINED AND APPROVED PRIOR TO PLACING PAVEMENT.

DISPOSITION NOTES

1. PROTECT IN PLACE
2. REMOVE
5. EXCAVATE AND CRUSH IN PLACE EXISTING IRRIGATION SYSTEM
6. TO BE RELOCATED BY OTHERS

THIS PLAN HAS BEEN EXAMINED AND IS APPROVED ONLY AS TO COMPATIBILITY WITH ADJOINING EXISTING OR FUTURE IMPROVEMENTS AND CONFORMANCE WITH CITY OF ANAHEIM STANDARD DETAILS AND THE REQUIREMENTS FOR THE FOLLOWING APPLICABLE FACTORS: RIGHT OF WAY, ROADWAY MATERIALS, ALIGNMENTS AND GRADES, HYDROLOGY AND HYDRAULICS DESIGN OF STORM DRAIN OR SANITARY SEWER SYSTEMS AND UNDERGROUND CONDUIT OR OPEN-CHANNEL ALIGNMENTS, GRADES, SIZES AND MATERIALS.

REGISTERED PROFESSIONAL ENGINEER — ROBERT L WOODINGS — No. C33706 — EXP. 6-30-90 — CIVIL — STATE OF CALIFORNIA

AS-BUILT
OCT 30 1984

FOR GENERAL NOTES, QUANTITY ESTIMATE & KEY MAP SEE PLAN 14761

REVISIONS

NO.	DATE	INITIAL	DESCRIPTION	DATE	APPR
3	5-15-84	L.A.S.	ADDED 8" R.C.P. SEWER LINE		
2	9-28-88	M.C.M.	PER "AS BUILT"		
1	8-10-87	M-S	PER CITY OF ANAHEIM PLAN CHECK		

REFERENCES

BENCH MARK: ELEVATION-345.697
0.15 MI. N.W. ON WEIR CANYON RD. FROM THE RIVERSIDE FWY. TO A CONC. HDWL. ON THE WESTSIDE, 99' W. OF THE CENTERLINE OF WEIR CANYON RD., 1.41' S. OF THE S.A.V.I. CANAL, SET IN THE TOP OF THE CONC. HDWL. C.C.S. 1976 ADJ. 3.K.K.-20-71

PLANS FOR THESE IMPROVEMENTS CITY OF ANAHEIM STD. DTLS.
STREET 14761-14766, 14778, 14779
SEWER 14749-14777
STORM DRAIN 14761, 14767-14771

APPR. ELECTRICAL ENGINEERING MANAGER — DATE
APPR. WATER ENGINEERING MANAGER — DATE

SCALE:	DATE
PREPARED UNDER THE SUPERVISION OF R.C.E. NO. 37706	10-15-84
RECOMMEND APPROVAL — DEPUTY CITY ENGINEER	5-29-85
APPROVED — CITY ENGINEER	3-22-85

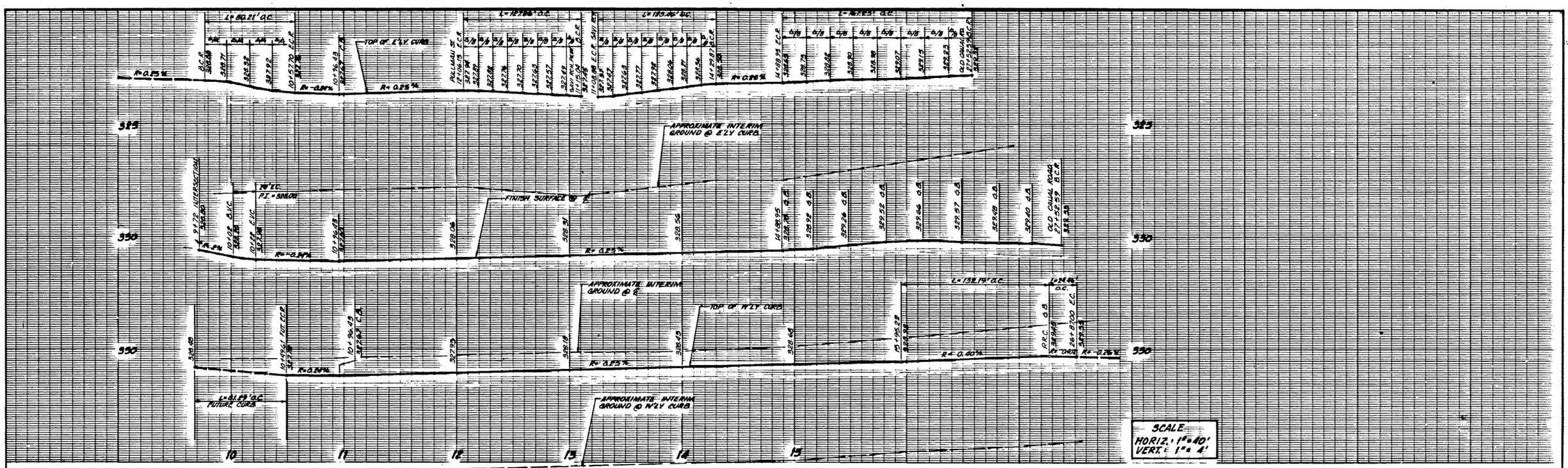
STREET IMPROVEMENTS
OLD CANAL ROAD
FROM WEIR CANYON ROAD TO PULLMAN STREET

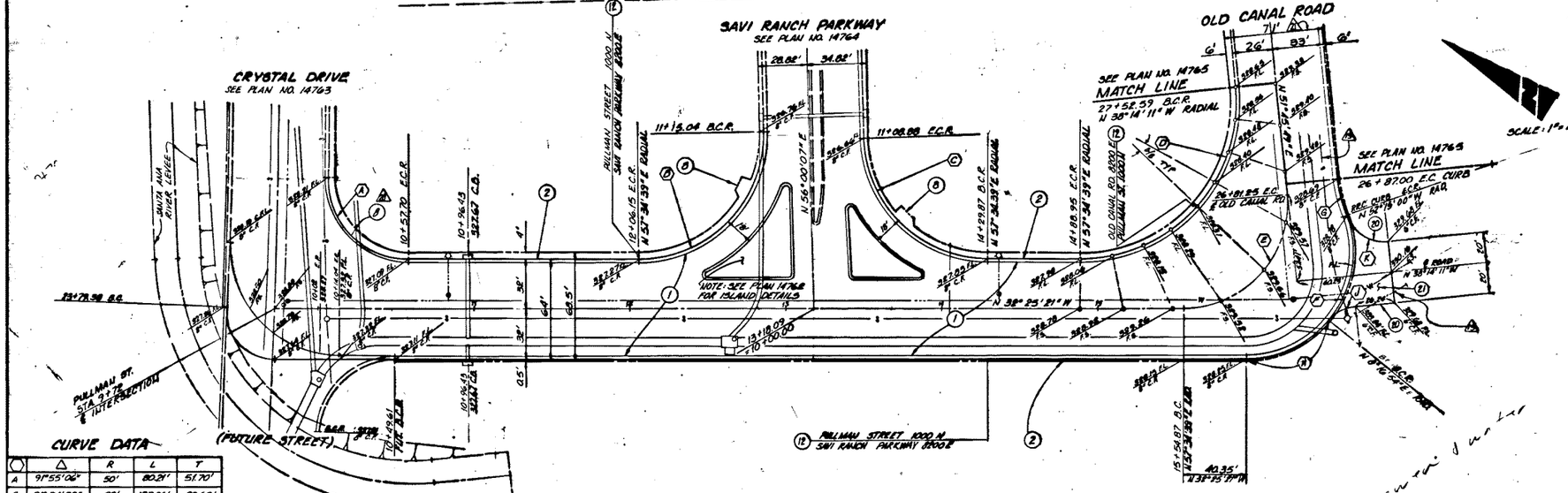
CITY OF ANAHEIM

SHEET 5 OF 14

14765
PLAN NUMBER

SP 1556





CONSTRUCTION NOTES

1. CONSTRUCT A.C.B./A.C. OVER 10" A.B. ℄
2. CONSTRUCT TYPE "A" CURB ℄ GUTTER, 8" C.F., PER CITY STD. DETAIL NO. 104-F
3. ~~CONSTRUCT STD. METAL BEAM GUARD RAILING PER CITY STD. DETAIL NO. 162~~
8. CONSTRUCT CURB DEPRESSION FOR SIDEWALK ACCESS RAMPS PER CITY STD. DETAIL NO. 124-C.
18. INSTALL STREET NAME SIGNS PER CITY STD. DETAIL NO. 127
20. CONSTRUCT TYPE "E" CURB, VARY "C.F." TO 0", PER CITY STD. DTL. NO 104-F
21. CONSTRUCT 6" THICK P.C.C.

℄ * STRUCTURAL SECTION TO BE DETERMINED AND APPROVED PRIOR TO PLACING PAVEMENT.

CURVE DATA

	Δ	R	L	T
A	91°55'06"	50'	80.21'	51.70'
B	91°34'38"	80'	187.06'	88.63'
C	88°25'28"	80'	183.46'	77.83'
D	95°48'50"	100'	167.23'	110.70'
E	95°48'50"	67'	112.04'	74.17'
F	109°49'39"	69'	132.19'	99.65'
G	14°00'49"	100'	24.46'	12.29'
H	49°17'45"	68'	58.51'	31.20'

	Δ	R	L	T
J	43°28'55"	25'	18.97'	9.97'
K	75°59'11"	25'	33.16'	19.53'

THIS PLAN HAS BEEN EXAMINED AND IS APPROVED ONLY AS TO COMPATIBILITY WITH ADJOINING EXISTING OR FUTURE IMPROVEMENTS AND CONFORMANCE WITH CITY OF ANAHEIM STANDARD DETAILS AND THE REQUIREMENTS FOR THE FOLLOWING APPLICABLE FACTORS: RIGHT OF WAY, ROADWAY MATERIALS, ALIGNMENTS AND GRADES, HYDROLOGY AND HYDRAULICS DESIGN OF STORM DRAIN OR SANITARY SEWER SYSTEMS AND UNDERGROUND CONDUIT OR OPEN-CHANNEL ALIGNMENTS, GRADES, SIZES AND MATERIALS.

REGISTERED PROFESSIONAL ENGINEER
ROBERT L WOODINGS
No. C33706
EXP. 6-30-90
CIVIL
STATE OF CALIFORNIA

AS-BUILT
OCT 30 1984

SP 1556

FOR GENERAL NOTES, QUANTITY ESTIMATE & KEY MAP SEE PLAN NO. 14761

REVISIONS

NO.	DATE	INITIAL	DESCRIPTION	DATE	APPR.
13	5-16-84	L.A.S.	ADDED 8" W.C.P. SEWER LINE		
12	11-30-83	R.C.W.	PER "AS BUILT"		
11	8-10-87	VRS	PER CITY OF ANAHEIM PLAN CHECK		

REFERENCES

BENCH MARK: ELEVATION 349.697
0.13 MI. N.W. ON WEIR CANYON RD. FROM THE RIVERSIDE FWY. TO A CONC. HDWL. ON THE WEST SIDE, 95' W. OF THE CENTERLINE OF WEIR CANYON RD., 14' S. OF THE S.A.V.I. CANAL, SET IN THE TOP OF THE CONC. HDWL. - O.C.S. 1976 A.D.J. 3RK-20-71

PLANS FOR THESE IMPROVEMENTS CITY OF ANAHEIM STD. DTLS.
STREET 14761-14766, 14772, 14778
SEWER 14774-14777
STORM DRAIN 14761, 14767-14771

APPR. ELECTRICAL ENGINEERING MANAGER — DATE
APPR. WATER ENGINEERING MANAGER — DATE

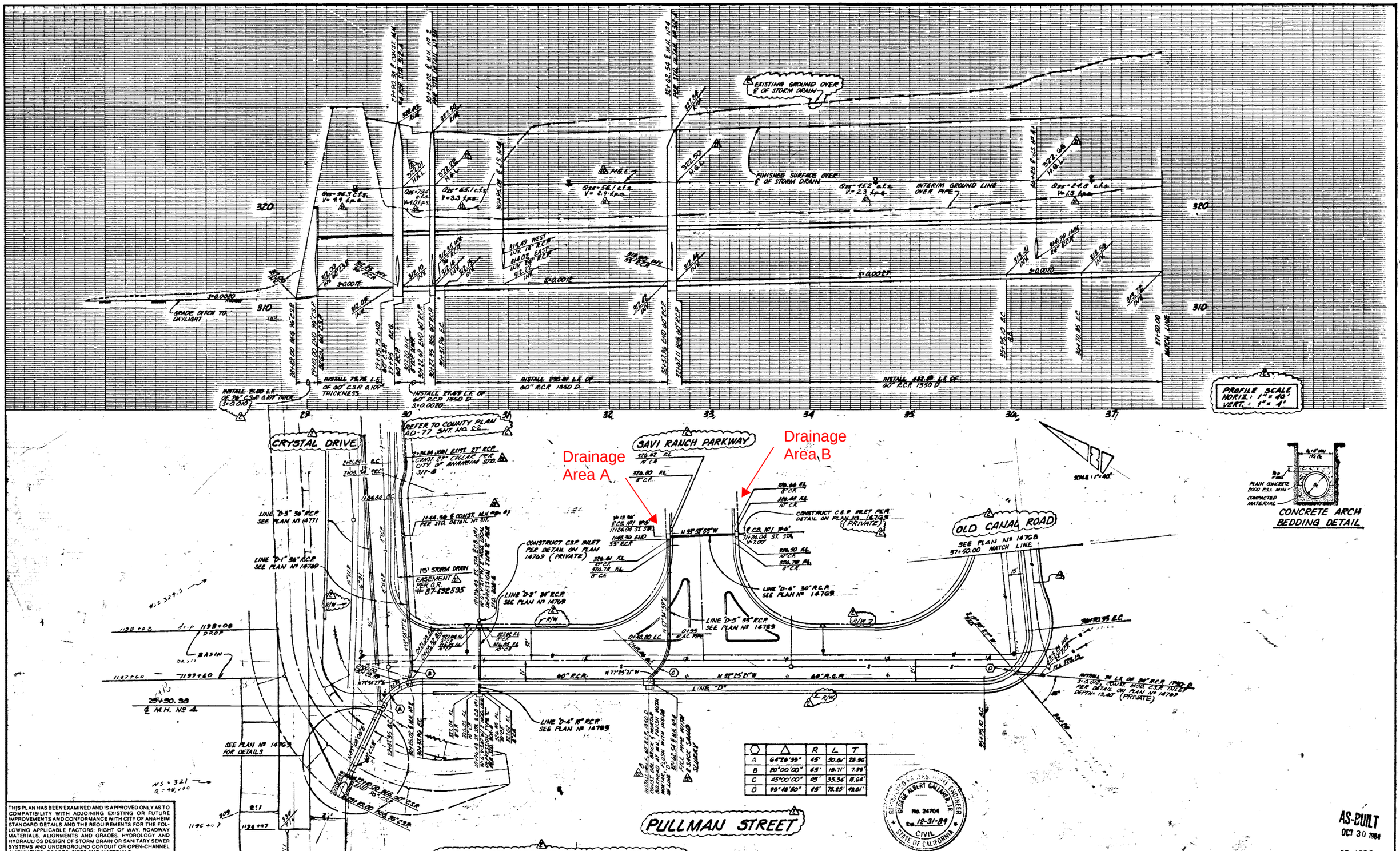
SCALE:
PREPARED UNDER THE SUPERVISION OF — DATE 10-15-84
R.C.E. NO. 33706
RECOMMEND APPROVAL — DEPUTY CITY ENGINEER — 5-22-88
APPROVED — CITY ENGINEER — 3-22-88

STREET IMPROVEMENTS
PULLMAN STREET
FROM CRYSTAL DRIVE TO OLD CANAL ROAD

CITY OF ANAHEIM

SHEET 6 OF 14

14766
PLAN NUMBER



		R	L	T
A	64°26'39"	45'	50.61'	28.36'
B	20°00'00"	45'	15.71'	7.93'
C	45°00'00"	45'	35.34'	18.64'
D	95°48'50"	45'	75.25'	49.81'

THIS PLAN HAS BEEN EXAMINED AND IS APPROVED ONLY AS TO COMPATIBILITY WITH ADJOINING EXISTING OR FUTURE IMPROVEMENTS AND CONFORMANCE WITH CITY OF ANAHEIM STANDARD DETAILS AND THE REQUIREMENTS FOR THE FOLLOWING APPLICABLE FACTORS: RIGHT OF WAY, ROADWAY MATERIALS, ALIGNMENTS AND GRADES, HYDROLOGY AND HYDRAULICS DESIGN OF STORM DRAIN OR SANITARY SEWER SYSTEMS AND UNDERGROUND CONDUIT OR OPEN-CHANNEL ALIGNMENTS, GRADES, SIZES AND MATERIALS.

GEORGE ALBERT CALLAHAN JR. No. 24704 Exp. 12-31-89 REGISTERED PROFESSIONAL ENGINEER CIVIL STATE OF CALIFORNIA

AS-BUILT OCT 30 1984

SP 1556

REVISIONS

NO.	DATE	INITIAL	DESCRIPTION
12	6-27-85	NSM	CHANGE PER CITY OF ANAHEIM
13	5-16-84	L.A.S.	ADDED 8" V.C.P. SEWER LINE
14	10-30-86	N.C.M.	PER "AS BUILT"
15	1-19-87	H.C.C.	PER CITY OF ANAHEIM PLAN CHECK

REFERENCES

BENCH MARK: EL. 345.697
0.15 MI. N.W. ON WEIR CANYON RD., FROM THE RIVERSIDE FWY. TO A CONC. HDWL. ON THE WEST SIDE, 35' W. OF THE CENTERLINE OF WEIR CANYON RD., 114' S. OF THE SAVI. CANAL, SET IN THE TOP OF THE CONC. HDWL.-O.C.S. 1976 ADJ. 3KM-30-71

PLANS FOR THESE IMPROVEMENTS CITY OF ANAHEIM STD. DTLS.

STREET	14701-14706, 14772, 14779
SEWER	14774-14777
STORM DRAIN	14701, 14767-14771

APPR. ELECTRICAL ENGINEERING MANAGER DATE

APPR. WATER ENGINEERING MANAGER DATE

FOR GENERAL NOTES, QUANTITY ESTIMATES & KEY MAP SEE PLAN 14761

SCALE:

PREPARED UNDER THE SUPERVISION OF George A. Callahan R.C.E. NO. 24704 — DATE 5/3/89

RECOMMEND APPROVAL Arthur L. Davis DEPUTY CITY ENGINEER — DATE 5-22-89

APPROVED John M. Johnson CITY ENGINEER — DATE 5-22-89

STORM DRAIN IMPROVEMENTS

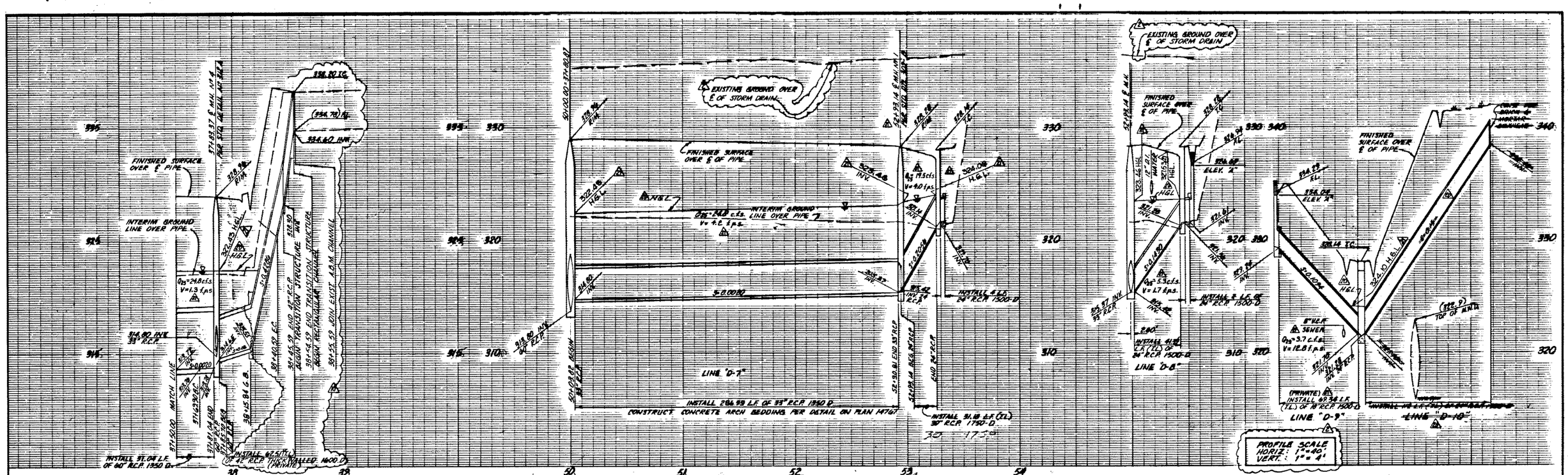
PULLMAN STREET

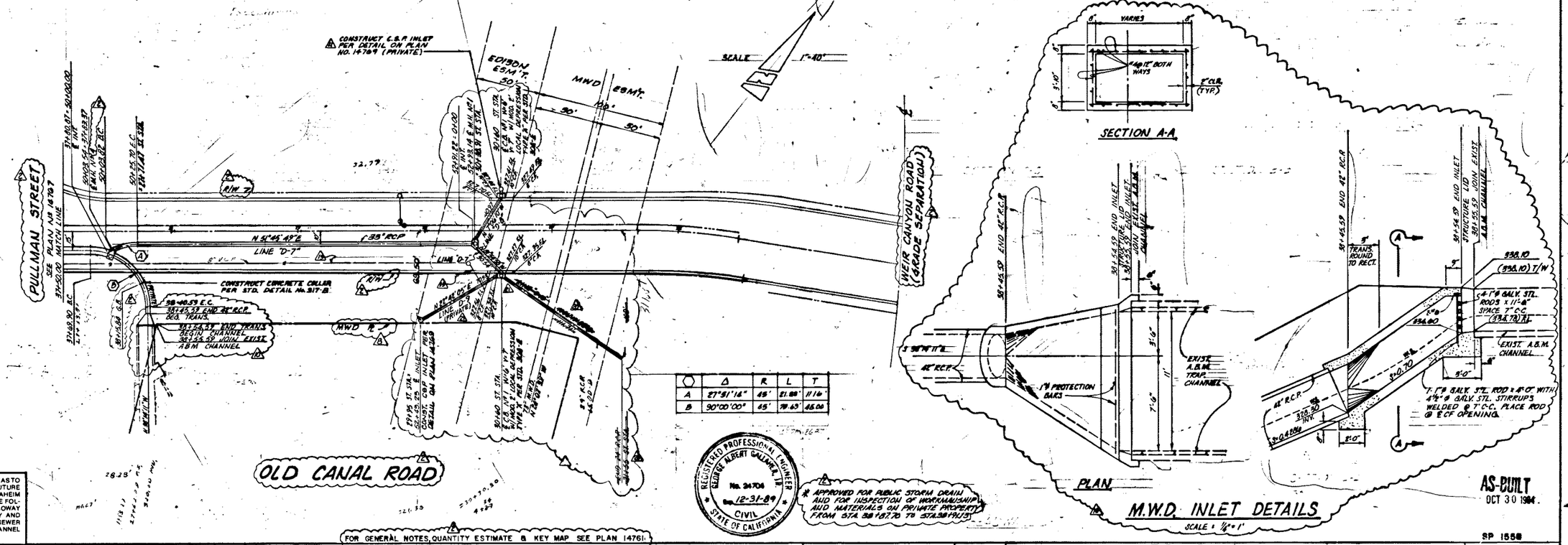
FROM SANTA ANA RIVER TO OLD CANAL RD.

CITY OF ANAHEIM

SHEET 7 OF 14

14767 PLAN NUMBER





	Δ	R	L	T
A	27°51'16"	45'	21.88'	11.16'
B	90°00'00"	45'	78.63'	45.00'

THIS PLAN HAS BEEN EXAMINED AND IS APPROVED ONLY AS TO COMPATIBILITY WITH ADJOINING EXISTING OR FUTURE IMPROVEMENTS AND CONFORMANCE WITH CITY OF ANAHEIM STANDARD DETAILS AND THE REQUIREMENTS FOR THE FOLLOWING APPLICABLE FACTORS: RIGHT OF WAY, ROADWAY MATERIALS, ALIGNMENTS AND GRADES, HYDROLOGY AND HYDRAULICS DESIGN OF STORM DRAIN OR SANITARY SEWER SYSTEMS AND UNDERGROUND CONDUIT OR OPEN-CHANNEL ALIGNMENTS, GRADES, SIZES AND MATERIALS.

REGISTERED PROFESSIONAL ENGINEER GEORGE ALBERT GALLAHER, III No. 24704 Exp. 12-31-89 CIVIL STATE OF CALIFORNIA

* APPROVED FOR PUBLIC STORM DRAIN AND FOR INSPECTION OF WORKMANSHIP AND MATERIALS ON PRIVATE PROPERTY FROM STA 38+97.70 TO STA 38+97.03

AS-BUILT OCT 30 1984.

FOR GENERAL NOTES, QUANTITY ESTIMATE & KEY MAP SEE PLAN 14761

REVISIONS

NO.	DATE	INITIAL	DESCRIPTION	DATE APPD.
A	6-27-85	M.S.M.	CHANGE PER CITY OF ANAHEIM	7-16-85
B	6-12-86	L.D.E.	REVISED SLOPE & G.D. INLETS 3/9 OLD CANAL RD. STA 20+87 TO 32+50	
C	9-9-86	M.S.M.	REVISED M.W.D. INLET AT OLD CANAL RD. STA. 27+70	
D	5-14-86	L.A.S.	ADDED 8"V.C.P. SEWER LINE	
E	11-5-87	N.C.M.	PER "AS BUILT"	
F	1-19-87	K.L.C.	PER CITY OF ANAHEIM PLAN CHECK	

REFERENCES

BENCH MARK: EL. 345.697
0.15 NE'LY OF N.W. ON WEIR CANYON RD., FROM THE RIVERSIDE FWY. TO A CONC. NOMI. ON THE WEST SIDE, 25'W OF THE CENTERLINE OF WEIR CANYON RD., 1/4'S. OF THE S.A.V.I. CANAL, SET IN THE TOP OF THE CURB. NGVD - OCS. 1976 ADJ. 3 KK 20-79

PLANS FOR THESE IMPROVEMENTS CITY OF ANAHEIM STD. DTLS.
STREET (14761 - 14766, 14772, 14779
SEWER (14774 - 14777
STDRM DRAIN (14701, 14767-14771

APPR. ELECTRICAL ENGINEERING MANAGER — APPR. WATER ENGINEERING MANAGER
DATE — DATE

SCALE:	DATE
PREPARED UNDER THE SUPERVISION OF George A. Gallaher R.C.E. NO. 24704	5/3/85
RECOMMEND APPROVAL Arthur L. Dam DEPUTY CITY ENGINEER	5-22-85
APPROVED CITY ENGINEER	5-22-85

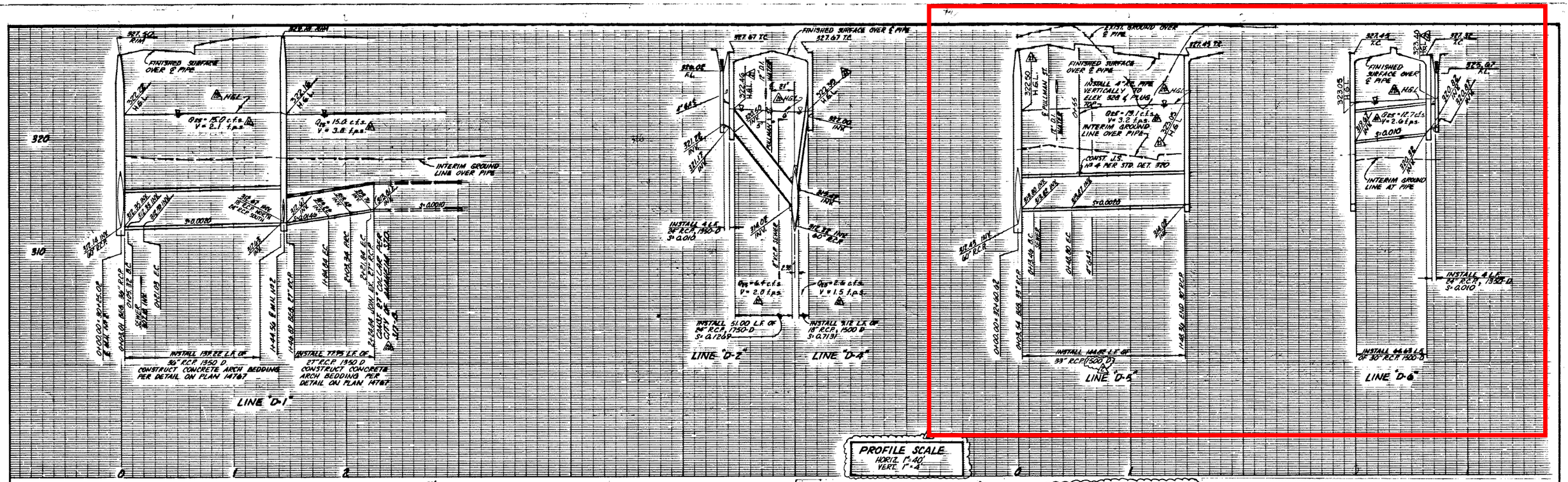
STORM DRAIN IMPROVEMENTS
OLD CANAL ROAD
FROM 450'± NE'LY OF TO PULLMAN ST.

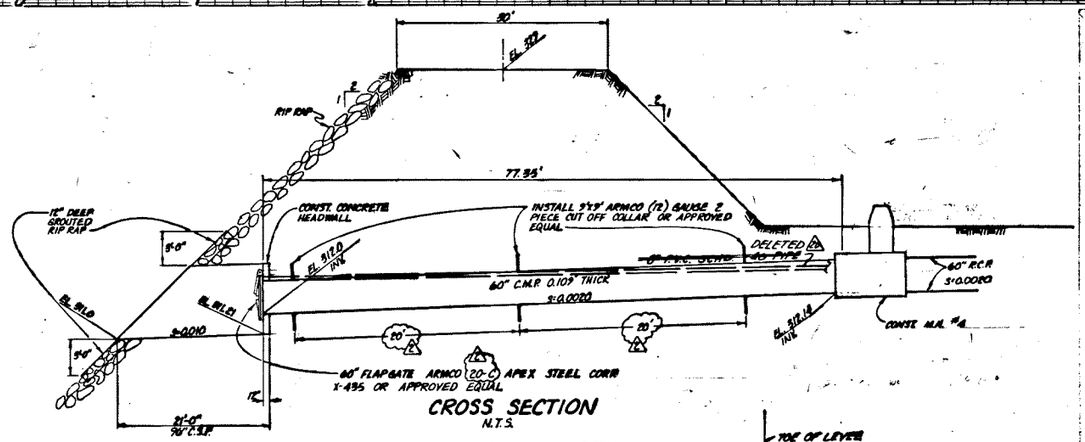
CITY OF ANAHEIM

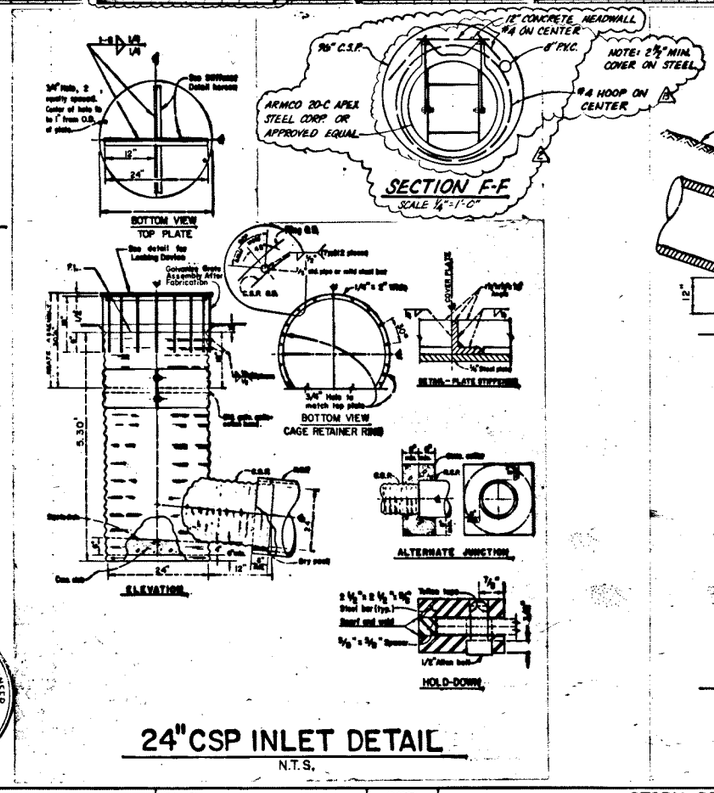
SHEET 8 OF 14

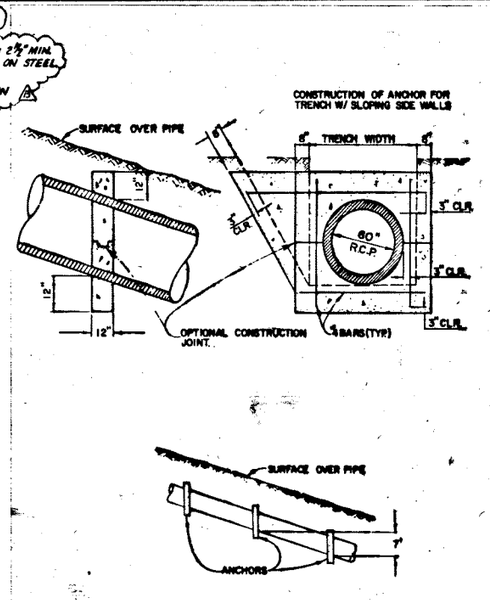
SP 155B

14768 PLAN NUMBER









THIS PLAN HAS BEEN EXAMINED AND IS APPROVED ONLY AS TO COMPATIBILITY WITH ADJOINING EXISTING OR FUTURE IMPROVEMENTS AND CONFORMANCE WITH CITY OF ANAHEIM STANDARD DETAILS AND THE REQUIREMENTS FOR THE FOLLOWING APPLICABLE FACTORS: RIGHT OF WAY, ROADWAY MATERIALS, ALIGNMENTS AND GRADES, HYDROLOGY AND HYDRAULICS DESIGN OF STORM DRAIN OR SANITARY SEWER SYSTEMS AND UNDERGROUND CONDUIT OR OPEN-CHANNEL ALIGNMENTS, GRADES, SIZES AND MATERIALS.

REGISTERED PROFESSIONAL ENGINEER — GEORGE ALBERT GALLAHER, III — No. 24704 — Exp. 12-31-89 — CIVIL — STATE OF CALIFORNIA

AS-BUILT
OCT 30 1984
SP 1556

FOR GENERAL NOTES, QUANTITY ESTIMATE & KEY MAP SEE PLAN 14761

REVISIONS

NO.	DATE	INITIAL	DESCRIPTION	DATE	APPR.
A	6-21-85	M.S.M.	CHANGE PER CITY OF ANAHEIM	7/5/82	
B	10-11-85	M.S.M.	ADDED STEEL		
C	10-30-86	N.C.W.	PER "AS BUILT"		
D	1-19-87	N.C.C.	PER CITY OF ANAHEIM PLAN CHECK		

BENCH MARK:

REFERENCES

PLANS FOR THESE IMPROVEMENTS CITY OF ANAHEIM STD. DTLS.

STREET (14710-14760, 14772, 14779)

SEWER (14774-14777)

STORM DRAIN (14761, 14767-14771)

APPR. ELECTRICAL ENGINEERING MANAGER — DATE

APPR. WATER ENGINEERING MANAGER — DATE

SCALE:	DATE
PREPARED UNDER THE SUPERVISION OF George A. Gallaher, Jr. R.C.E. No. 24704	5/2/83
RECOMMEND APPROVAL Arthur T. Gross DEPUTY CITY ENGINEER	8-22-88
APPROVED CITY ENGINEER	3-15-88

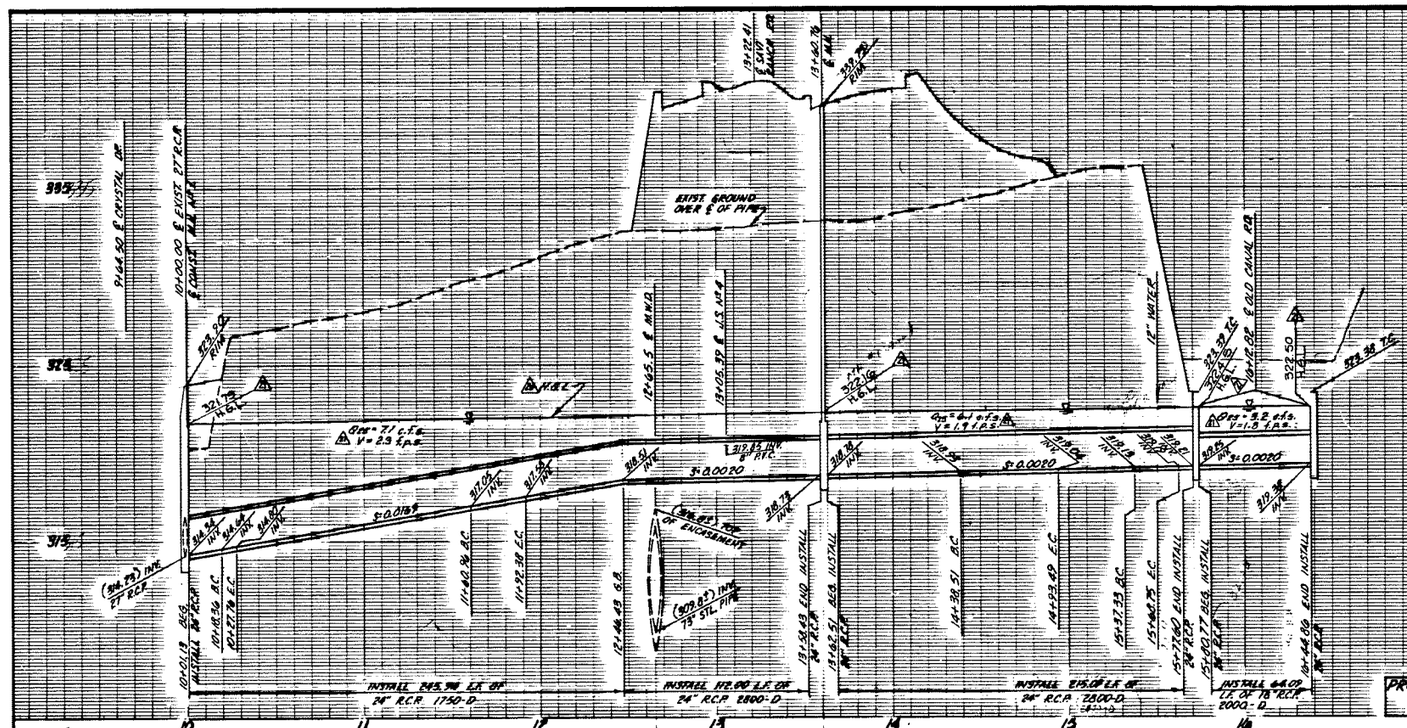
STORM DRAIN IMPROVEMENTS

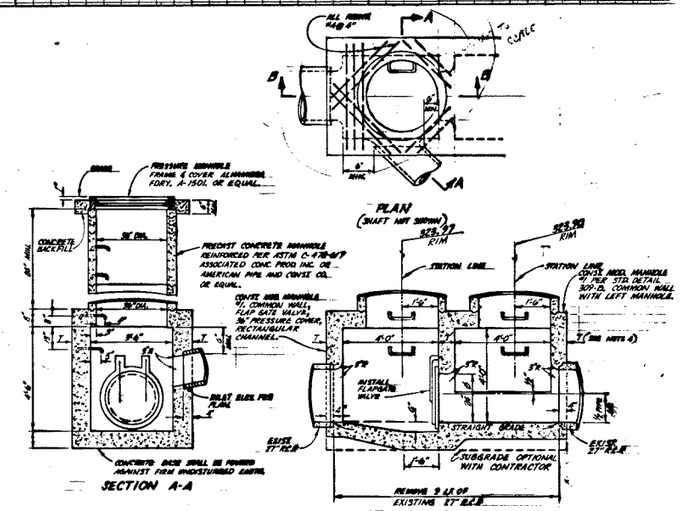
PROFILES AND DETAILS

CITY OF ANAHEIM

SHEET 9 OF 14

14769
PLAN NUMBER





NOTES:
1. CONCRETE SHALL BE CLASS 560-C-3250 WITH A MAXIMUM SLUMP OF 5"
2. FLOOR OF MANHOLE SHALL BE STEEL TROWELED.
3. PRECAST MANHOLE SECTIONS SHALL BE SEATED IN MORTAR WITH INSIDE JOINTS NEATLY STRUCK AND POINTED AND NOT EXCEEDING 3/8" IN THICKNESS.
4. THICKNESS T SHALL BE 8" FOR H UP TO AND INCLUDING 8 FT. AND SHALL BE 10" FOR VALUES OF H OVER 8 FT.
5. STEPS SHALL BE 5/8 ϕ GALV. STEEL AS ALHAMBRA FDRY. A-9320, OR EQUAL.
6. FLAPGATE VALVE SHALL BE 24" FLANGE BACK WATERMAN MODEL F-25F OR EQUAL.

MODIFIED MANHOLES No 1 SECTIONS
NO SCALE

		R	L	T
A	11°57'54"	45'	9.40'	4.72'
B	40°00'00"	45'	18.98'	9.48'
C	35°00'00"	90'	54.98'	28.58'
D	20°00'00"	90'	31.42'	15.87'

THIS PLAN HAS BEEN EXAMINED AND IS APPROVED ONLY AS TO COMPATIBILITY WITH ADJOINING EXISTING OR FUTURE IMPROVEMENTS AND CONFORMANCE WITH CITY OF ANAHEIM STANDARD DETAILS AND THE REQUIREMENTS FOR THE FOLLOWING APPLICABLE FACTORS: RIGHT OF WAY, ROADWAY MATERIALS, ALIGNMENTS AND GRADES, HYDROLOGY AND HYDRAULICS DESIGN OF STORM DRAIN OR SANITARY SEWER SYSTEMS AND UNDERGROUND CONDUIT OR OPEN-CHANNEL ALIGNMENTS, GRADES, SIZES AND MATERIALS.

REGISTERED PROFESSIONAL ENGINEER GEORGE ALBERT GALLOWAY No. 24706 Exp. 12-31-89 CIVIL STATE OF CALIFORNIA

PROJECT ENGINEER

AS-BUILT
OCT 30 1984
SP 1550

FOR GENERAL NOTES, QUANTITY ESTIMATE & KEY MAP SEE PLAN 14774

REVISIONS

NO.	DATE	INITIAL	DESCRIPTION	DATE	APPR.
A	8-31-84	K.C.W.	PER "AS BUILT"		
B	1-17-87	K.C.C.	PER CITY OF ANAHEIM PLAN CHECK		

REFERENCES

BENCH MARK: BL 845.697
0.15 MI. N.W. ON WEIR CANYON RD., FROM THE RIVERSIDE FWY. TO A CONC. HDWL. ON THE WEST SIDE, 95' W. OF THE CENTERLINE OF WEIR CANYON RD., 114' S. OF THE S.A.V.I. CANAL, SET IN THE TOP OF THE CONC. HDWL. - QC 2 1976 ADJ. 3KR-80-74

PLANS FOR THESE IMPROVEMENTS CITY OF ANAHEIM STD. DTLS.
STREET 14761 14766, 14772, 14773
SEWER 14774- 16777
STORM DRAIN 14761, 14767-14771

APPR. ELECTRICAL ENGINEERING MANAGER DATE
APPR. WATER ENGINEERING MANAGER DATE

SCALE:

	DATE
PREPARED UNDER THE SUPERVISION OF J. Michael Mahoney R.C.E. NO. 23946	11-8-84
RECOMMEND APPROVAL Arthur L. Palmer DEPUTY CITY ENGINEER	8-22-89
APPROVED Jan L. Johnson CITY ENGINEER	3-22-89

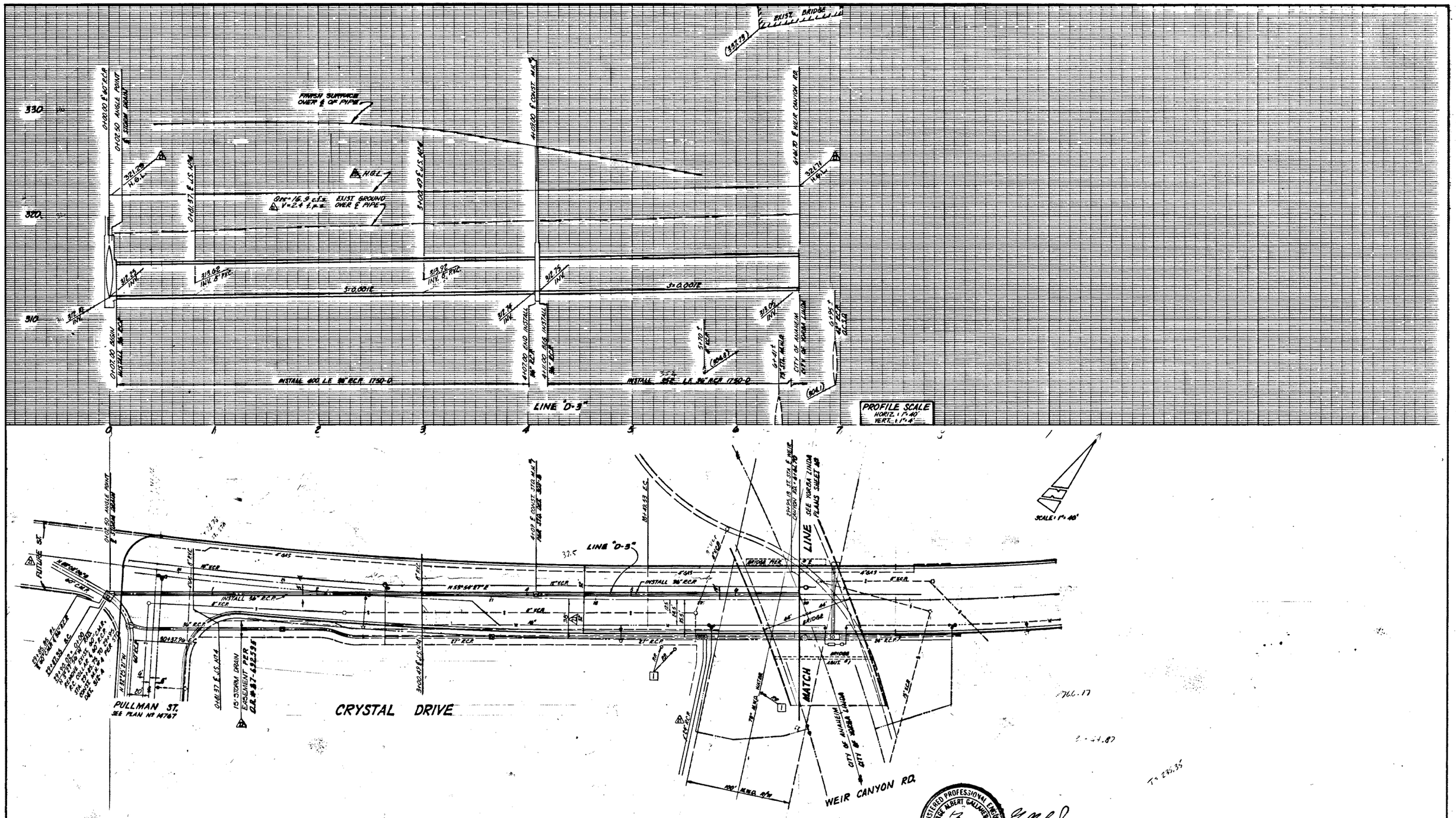
STORM DRAIN IMPROVEMENTS
150'±WEST OF WEIR CANYON RD.
FROM CRYSTAL DR. TO OLD CANAL RD.

CITY OF ANAHEIM

SHEET 10 OF 14

14770
14770
PLAN NUMBER

1550



THIS PLAN HAS BEEN EXAMINED AND IS APPROVED ONLY AS TO COMPATIBILITY WITH ADJOINING EXISTING OR FUTURE IMPROVEMENTS AND CONFORMANCE WITH CITY OF ANAHEIM STANDARD DETAILS AND THE REQUIREMENTS FOR THE FOLLOWING APPLICABLE FACTORS: RIGHT OF WAY, ROADWAY MATERIALS, ALIGNMENTS AND GRADES, HYDROLOGY AND HYDRAULICS DESIGN OF STORM DRAIN OR SANITARY SEWER SYSTEMS AND UNDERGROUND CONDUIT OR OPEN-CHANNEL ALIGNMENTS, GRADES, SIZES AND MATERIALS.

REGISTERED PROFESSIONAL ENGINEER — GEORGE ALBERT GALLAHER JR. — No. 36706 — 12-31-89 — CIVIL — STATE OF CALIFORNIA

PROJECT ENGINEER

AS-BUILT
OCT 30 1984

FOR GENERAL NOTES, QUANTITY ESTIMATE & KEY MAP SEE PLAN 14774

REVISIONS

NO.	DATE	INITIAL	DESCRIPTION	DATE	APPR
1	1-19-87	H.C.C.	PER CITY OF ANAHEIM PLAN CHECK		

REFERENCES

BENCH MARK: EL. 345.697
0.15 MI. N.W. ON WEIR CANYON RD., FROM THE RIVERSIDE FWY. TO A CONC. HOWL ON THE WEST SIDE, 95' W. OF THE CENTERLINE OF WEIR CANYON RD., 114' S. OF THE S.A.V.I. CANAL, SET IN THE TOP OF THE CONC. HOWL. - O.C.S. 1976 ADJ. 3ER-20-71

APPR. _____ ELECTRICAL ENGINEERING MANAGER — DATE _____
APPR. _____ WATER ENGINEERING MANAGER — DATE _____

PLANS FOR THESE IMPROVEMENTS CITY OF ANAHEIM STD. OTLS.

STREET	14761- 14766, 14772, 14779
SEWER	14774- 14777
STORM DRAIN	14761, 14767- 14771

SCALE:

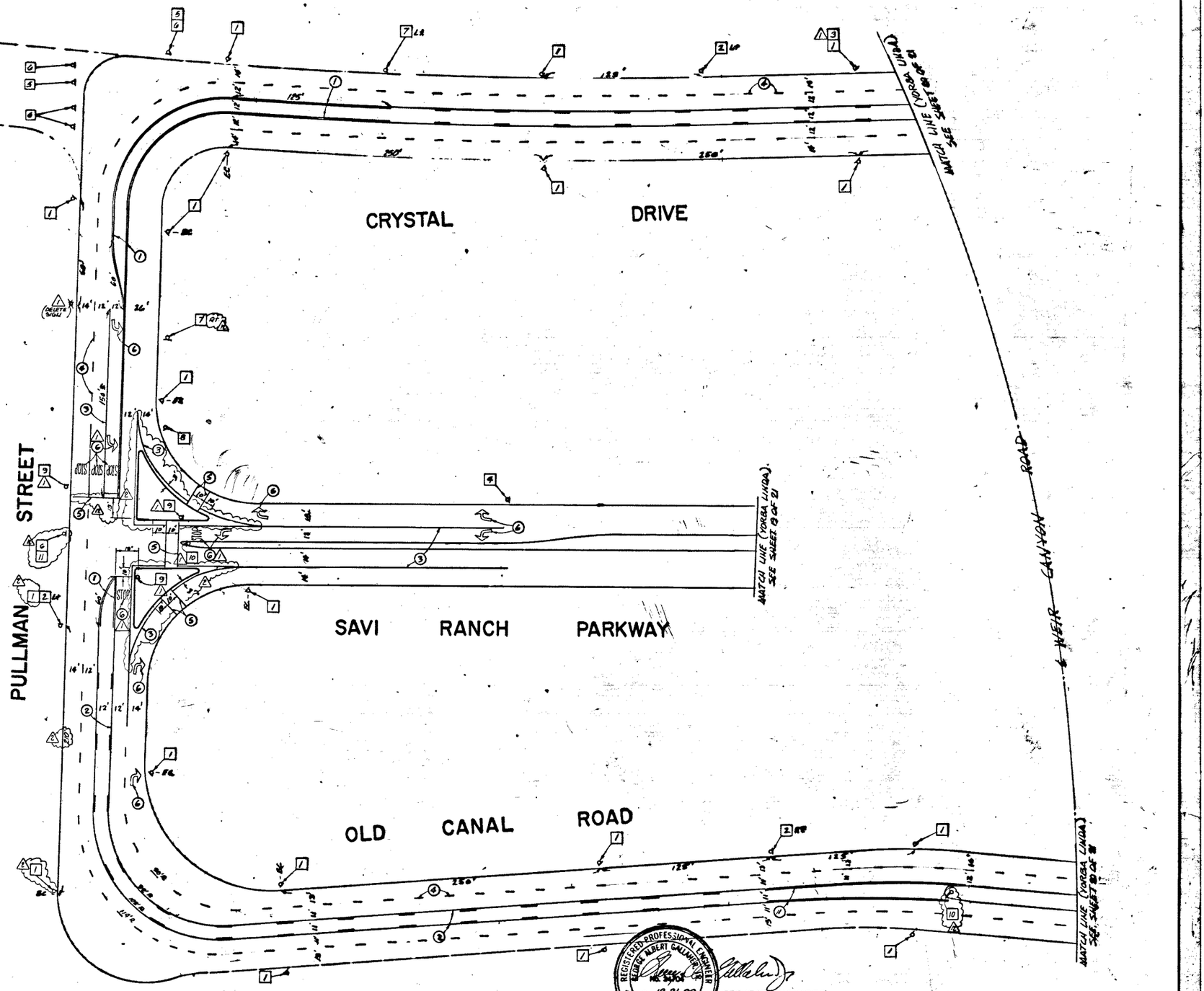
		DATE
PREPARED UNDER THE SUPERVISION OF	J. Michael Mahoney R.E. NO. 23946	11-8-84
RECOMMEND APPROVAL	Arthur L. Dam DEPUTY CITY ENGINEER	8-29-88
APPROVED	James E. Johnson CITY ENGINEER	3-22-89

STORM DRAIN IMPROVEMENTS
CRYSTAL DRIVE
FROM WEIR CANYON RD. TO PULLMAN ST.

CITY OF ANAHEIM

SP 1556
SHEET 11 OF 16
13771 / 14771
PLAN NUMBER

SCALE: 1" = 40'



SIGNING NOTES

1. INSTALL ~~R22A(S)~~ R26(S) W/RT & LT ARROW "NO STOPPING ANY TIME" SIGN AND POST.
2. INSTALL W3 STANDARD "TURN" SIGN AND W6 STANDARD (20 MPH) "ADVISORY SPEED" SIGN AND POST.
3. INSTALL W11 STANDARD "LANE DROP" SIGN AND POST.
4. INSTALL R18-2.1 "RIGHT LANE MUST TURN RIGHT" SIGN AND POST.
5. INSTALL W87-1 (WARNING ARROW SIGN) & POST.
6. INSTALL TYPE XJ WARNING SIGN & POST.
7. INSTALL W6-4.1 ARROW WITH "18" SIGN & POST.
8. INSTALL R25 "YIELD SIGN" & POST
9. INSTALL R1 "STOP" SIGN (36" x 36") SIGN & POST
10. INSTALL R7 "KEEP RIGHT (SYMBOL)" SIGN & POST
11. INSTALL W56 WARNING ARROW SIGN

STRIPING NOTES

1. PAINT DOUBLE YELLOW LINE ~~AND INSTALL PAVEMENT MARKERS PER FIGURE 8-4, DETAIL 22.~~
2. PAINT TWO-WAY LEFT TURN LANE ~~AND INSTALL PAVEMENT MARKERS PER FIGURE 8-7, DETAIL 33.~~
3. PAINT CHANNELIZATION LINE ~~AND INSTALL PAVEMENT MARKERS PER FIGURE 8-8, DETAIL 38.~~ PAVEMENT MARKERS ~~NOT REQUIRED ON CHEVRON STRIPS.~~
4. PAINT SKIP LINE ~~AND INSTALL PAVEMENT MARKERS PER FIGURE 8-8, DETAIL 8.~~
5. PAINT 12" WHITE LIMIT OR CROSSWALK LINE.
6. PAINT INDICATED PAVEMENT MARKING.
7. PAINT 4" WHITE EDGELINE STRIPE

GENERAL NOTES

1. Traffic signs, stripes, legends and pavement markers per Caltrans Traffic Sign Specifications, Traffic Manual, Maintenance Manual, and Standard Specifications. Conform pavement legends to existing city pavement markings. Reflectorize all signs, stripes, and legends. New sign posts shall be per Caltrans Specifications.
2. Painting procedures for striping per Standard Specifications for Public Works Construction (APWA/AGC).

THIS PLAN HAS BEEN EXAMINED AND IS APPROVED ONLY AS TO COMPATIBILITY WITH ADJOINING EXISTING OR FUTURE IMPROVEMENTS AND CONFORMANCE WITH CITY OF ANAHEIM STANDARD DETAILS AND THE REQUIREMENTS FOR THE FOLLOWING APPLICABLE FACTORS: RIGHT OF WAY, ROADWAY MATERIALS, ALIGNMENTS AND GRADES, HYDROLOGY AND HYDRAULICS DESIGN OF STORM DRAIN OR SANITARY SEWER SYSTEMS AND UNDERGROUND CONDUIT OR OPEN-CHANNEL ALIGNMENTS, GRADES, SIZES AND MATERIALS

FOR GENERAL NOTES, QUANTITY ESTIMATE & KEY MAP SEE PLAN 14781

REVISIONS

NO.	DATE	INITIAL	DESCRIPTION	DATE	APPR
1	5-15-85	MH	CHANGED PVMT LEGEND; ADDED SIGNING NOTES, REVISED TRAFFIC SIGNAL	5/15/85	
2	6-27-85	MSM	CHANGE PER CITY OF ANAHEIM	7/5/85	
3	9-29-85	MTH	CHANGE PER CITY OF ANAHEIM	11/19/85	
4	8-28-86	MTH	DELETED RAISED PVMT MARKERS	11/19/86	

REFERENCES

BENCH MARK:

PLANS FOR THESE IMPROVEMENTS, CITY OF ANAHEIM STD DTLS.

STREET (14761- 14764, 14772, 14773)

SEWER (14776- 14777)

STORM DRAIN (14761, 14767- 14771)

APPR ELECTRICAL ENGINEERING MANAGER DATE

APPR WATER ENGINEERING MANAGER DATE

PREPARED BY: BSI BERRYMAN & STEPHENSON INC. CONSULTANTS TO GOVERNMENT AGENCIES 1410 EAST SEVENTEENTH STREET SANTA ANA, CALIFORNIA 92701 (714) 835-1900

SCALE:

PREPARED UNDER THE SUPERVISION OF

R.C.E. NO 30640 — DATE 9-14-88

RECOMMEND APPROVAL (TRAFFIC ENGINEER) — DATE 3-30-88

APPROVED (CITY ENGINEER) — DATE 5-30-88

REGISTERED PROFESSIONAL ENGINEER GEORGE ALBERT GALLIMORE JR. No. 30640 12-31-89 CIVIL STATE OF CALIFORNIA

PROJECT ENGINEER

AS-BUILT OCT 30 1990

SP 1556

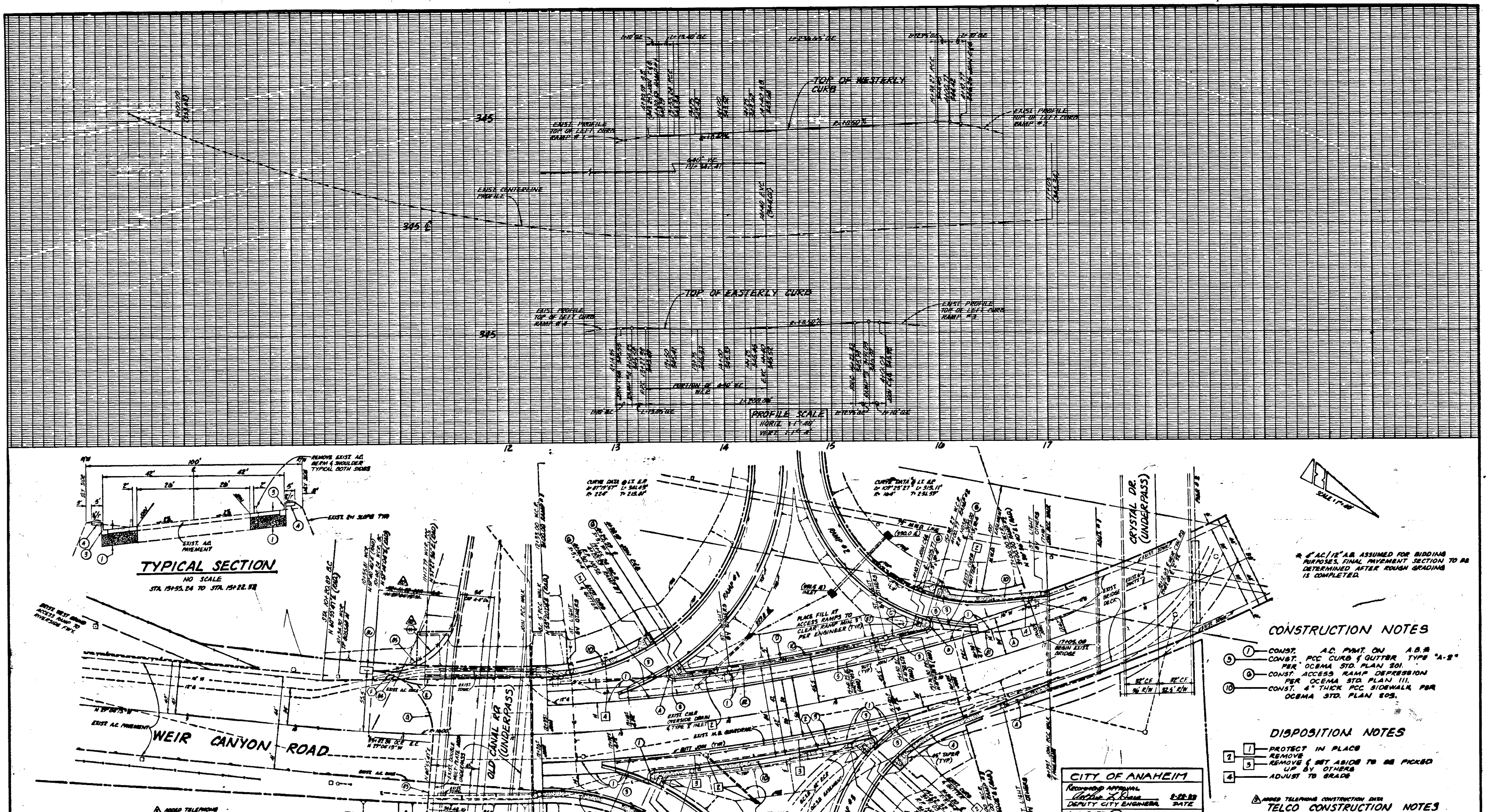
SIGNING & STRIPING PLAN

SAVI RANCH

CITY OF ANAHEIM

SHEET 12 OF 14

14772 PLAN NUMBER



* 4" AC/12" A.B. ASSUMED FOR BIDDING PURPOSES, FINAL PAVEMENT SECTION TO BE DETERMINED AFTER ROUGH GRADING IS COMPLETED.

CONSTRUCTION NOTES

- (1) CONST. A.C. PVMT. ON A.B.*
- (5) CONST. PCC CURB & GUTTER TYPE "A-8" PER OCEMA STD. PLAN 201.
- (6) CONST. ACCESS RAMP DEPRESSION PER OCEMA STD. PLAN 111.
- (10) CONST. 4" THICK PCC SIDEWALK PER OCEMA STD. PLAN 203.

DISPOSITION NOTES

- [1] PROTECT IN PLACE
- [2] REMOVE
- [3] REMOVE & SET ASIDE TO BE PICKED UP BY OTHERS
- [4] ADJUST TO GRADE

△3 ADDED TELEPHONE CONSTRUCTION DATA

TELCO CONSTRUCTION NOTES

- (81) PLACE 155' 6-4" DUCTS
- (82) PLACE 435' 6-4" DUCTS
- (83) PLACE 215' 4-4" DUCTS
- (84) PLACE 20' 10-4" DUCTS
- (85) PLACE 116' 4-4" DUCTS
- (86) PLACE 12'L x 6'W x 7'H MANHOLE
- (87) PLACE 8½'L x 4½'W x 6½'H MANHOLE

3P 1556.

AS-BUILT
OCT 30 1984

NOTE: THIS SHEET DELETED WITH EXCEPTION OF TELEPHONE INFO. S/O OLD CANAL RD.

CITY OF ANAHEIM
Recommend APPROVAL
DEPUTY CITY ENGINEER — DATE 8-22-83
APPROVED
CITY ENGINEER — DATE 8-23-83

△3 ADDED TELEPHONE CONSTRUCTION DATA

CURVE DATA

NO.	Δ	R	L	T
1	149°33'03"	5.00'	13.05'	18.37'
2	6°58'51"	1642'	200.06'	100.15'
3	145°03'28"	5.00'	12.66'	15.89'
4	153°31'52"	5.00'	13.40'	21.26'
5	8°42'10"	1558'	236.65'	118.55'
6	148°26'16"	5.00'	12.95'	17.69'

TELCO CURVE DATA

NO.	Δ	R	L	T
A	27°17'21"	150'	71.44'	36.41'
B	22°39'38"	150'	59.33'	30.06'
C	0°53'17"	1554.5'	24.09'	12.05'
D	15°09'51"	1554.5'	411.42'	206.92'
E	24°27'34"	60'	25.76'	13.01'
F	22°41'06"	60'	25.61'	12.04'
G	69°00'38"	60'	72.27'	41.25'
H	~~88°16'16"~~	~~75'~~	~~115.59'~~	~~72.81'~~
I	~~[illegible]~~	~~110'~~	~~40.86'~~	~~[illegible]~~

REVISIONS

NUMBER	DATE	INITIALS		APP'VD
△3	5-20-83	MSM	ADDED TELEPHONE CONSTRUCTION DATA	
△2	6-27-83	M.S.M.	CHANGE PER CITY OF ANAHEIM	
△	11-2-85	N.C.W.	PER "AS BUILT"	

REFERENCES

BENCH MARK: EL. 345.697
0.15 MI. N.W. ON WEIR CANYON RD., FROM THE RIVERSIDE FWY. TO A CONC. HDWL. ON THE WEST SIDE, 95' W. OF THE CENTERLINE OF WEIR CANYON RD., 114' S. OF THE S.A.V.I. CANAL, SET IN THE TOP OF THE CONC. HDWL. - O.C.S. 1976 ADJ. 3KK-20-71

BASIS OF BEARING:
THE ℄ OF WEIR CANYON RD. BEING N29°04'13"W PER STATE DIVISION OF HIGHWAYS MAP № F-1841.2 FOR THE RIGHT OF WAY OF THE RIVERSIDE FREEWAY.

PREPARED UNDER THE SUPERVISION OF [signature] R.C.E. NO. 24704 — DATE 5/3/83
DRAWN BY
CHECKED
RECOMMENDED
APPROVED See Above
DEPARTMENT OF PUBLIC WORKS — DATE:

REGISTERED PROFESSIONAL ENGINEER GEORGE ALBERT GALLAGHER JR. No. 24704 Exp. 12-31-89 CIVIL STATE OF CALIFORNIA

ASSESSMENT DISTRICT NO. 83-1 (SAVI)

WEIR CANYON ROAD

FROM 1050'± NORTH OF RIVERSIDE FWY. TO 1550'± NORTH OF RIVERSIDE FWY.
STREET IMPROVEMENTS

CITY OF YORBA LINDA

CITY OF ANAHEIM
PLAN NO. 14773
SHEET NO. 13 OF 14

ATTACHMENT 5

WATER QUALITY EXHIBITS

Bio Clean

A Forterra Company

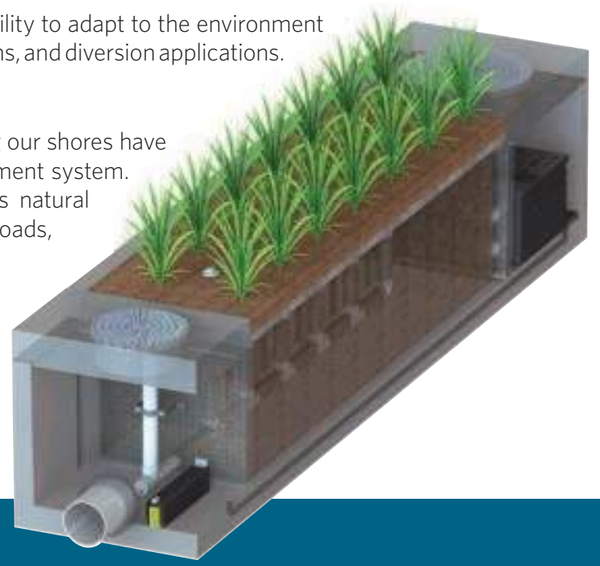
Modular Wetlands® System Linear

A Stormwater Biofiltration Solution

OVERVIEW

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

Horizontal flow also gives the system the unique ability to adapt to the environment through a variety of configurations, bypass orientations, and diversion applications.



The Urban Impact

For hundreds of years, natural wetlands surrounding our shores have played an integral role as nature's stormwater treatment system. But as cities grow and develop, our environment's natural filtration systems are blanketed with impervious roads, rooftops, and parking lots.

Bio Clean understands this loss and has spent years re-establishing nature's presence in urban areas, and rejuvenating waterways with the Modular Wetlands® System Linear.

PERFORMANCE

The Modular Wetlands® continues to outperform other treatment methods with superior pollutant removal for TSS, heavy metals, nutrients, hydrocarbons, and bacteria. Since 2007 the Modular Wetlands® has been field tested on numerous sites across the country and is proven to effectively remove pollutants through a combination of physical, chemical, and biological filtration processes. In fact, the Modular Wetlands® harnesses some of the same biological processes found in natural wetlands in order to collect, transform, and remove even the most harmful pollutants.

66% REMOVAL OF DISSOLVED ZINC	**69%** REMOVAL OF TOTAL ZINC	**38%** REMOVAL OF DISSOLVED COPPER	**64%** REMOVAL OF TOTAL PHOSPHORUS	
45% REMOVAL OF NITROGEN	**50%** REMOVAL OF TOTAL COPPER	**95%** REMOVAL OF MOTOR OIL	**67%** REMOVAL OF ORTHO PHOSPHORUS	**85%** REMOVAL OF TSS

APPROVALS

The Modular Wetlands® System Linear has successfully met years of challenging technical reviews and testing from some of the most prestigious and demanding agencies in the nation and perhaps the world. Here is a list of some of the most high-profile approvals, certifications, and verifications from around the country.

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

California Water Resources Control Board, Full Capture Certification
The Modular Wetlands® System is the first biofiltration system to receive certification as a full capture trash treatment control device.

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

Maryland Department of the Environment, Approved ESD
Granted Environmental Site Design (ESD) status for new construction, redevelopment, and retrofitting when designed in accordance with the design manual.

MASTEP Evaluation
The University of Massachusetts at Amherst – Water Resources Research Center issued a technical evaluation report noting removal rates up to 84% TSS, 70% total phosphorus, 68.5% total zinc, and more.

Rhode Island Department of Environmental Management, Approved BMP
Approved as an authorized BMP and noted to achieve the following minimum removal efficiencies: 85% TSS, 60% pathogens, 30% total phosphorus, and 30% total nitrogen.

ADVANTAGES

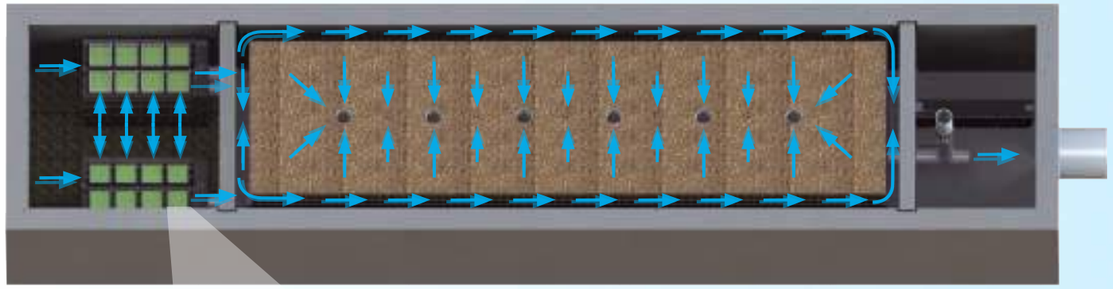
- HORIZONTAL FLOW BIOFILTRATION
- GREATER FILTER SURFACE AREA
- PRETREATMENT CHAMBER
- PATENTED PERIMETER VOID AREA
- FLOW CONTROL
- NO DEPRESSED PLANTER AREA
- AUTO DRAINDOWN MEANS NO MOSQUITO VECTOR

OPERATION

The Modular Wetlands® System Linear is the most efficient and versatile biofiltration system on the market, and it is the only system with horizontal flow which:

- Improves performance
- Reduces footprint
- Minimizes maintenance

Figure 1 & Figure 2 illustrate the invaluable benefits of horizontal flow and the multiple treatment stages.



2x to 3x more surface area than traditional downward flow bioretention systems.

Figure 2, Top View

1 PRETREATMENT

SEPARATION

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

PRE-FILTER CARTRIDGES

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

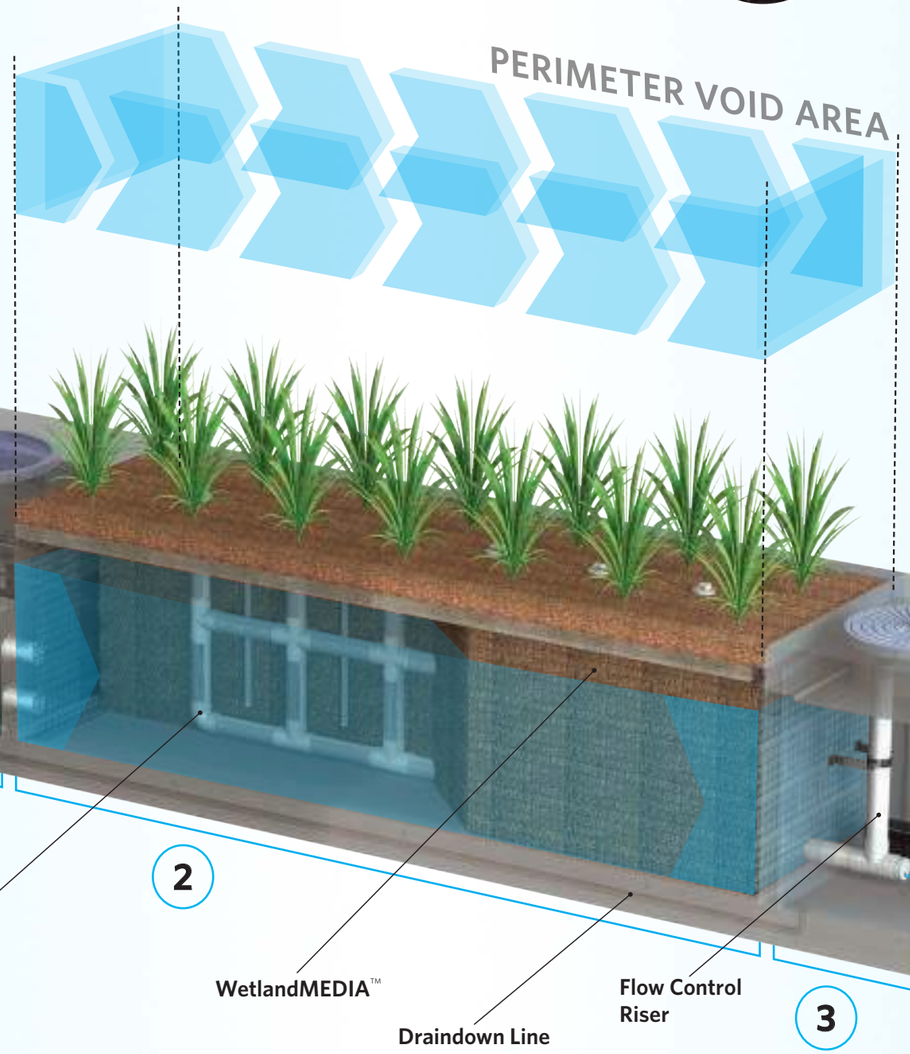


Figure 1

2 BIOFILTRATION

HORIZONTAL FLOW

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

PATENTED PERIMETER VOID AREA

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

WETLANDMEDIA

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

3 DISCHARGE

FLOW CONTROL

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

DRAINDOWN FILTER

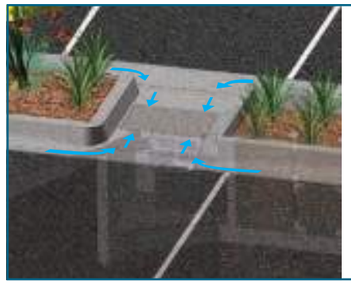
- The draindown is an optional feature that completely drains the pretreatment chamber
- Water that drains from the pretreatment chamber between storm events will be treated

CONFIGURATIONS

The Modular Wetlands® System Linear is the preferred biofiltration system of civil engineers across the country due to its versatile design. This highly versatile system has available "pipe-in" options on most models, along with built-in curb or grated inlets for simple integration into your storm drain design.

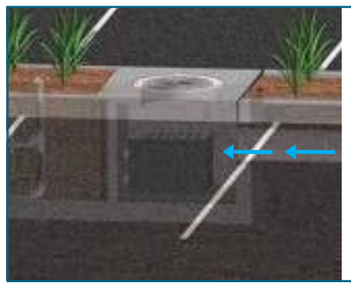
CURB TYPE

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



GRATE TYPE

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



VAULT TYPE

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

DOWNSPOUT TYPE

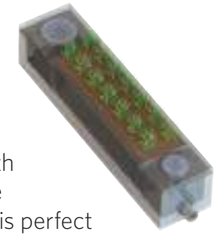
The Downspout Type is a variation of the Vault Type and is designed to accept a vertical downspout pipe from rooftop and podium areas. Some models have the option of utilizing an internal bypass, simplifying the overall design. The system can be installed as a raised planter, and the exterior can be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

ORIENTATIONS

SIDE-BY-SIDE

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

END-TO-END



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

BYPASS

INTERNAL BYPASS WEIR (SIDE-BY-SIDE ONLY)

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

EXTERNAL DIVERSION WEIR STRUCTURE

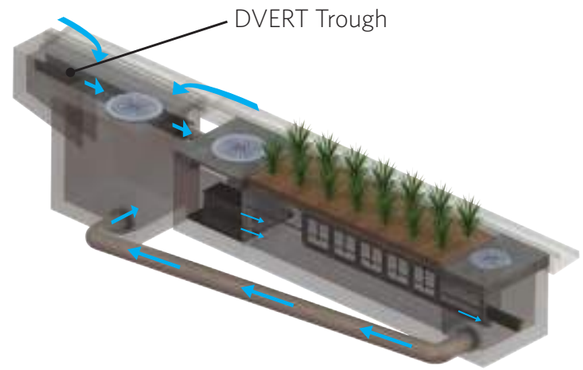
This traditional offline diversion method can be used with the Modular Wetlands® in scenarios where runoff is being piped to the system. These simple and effective structures are generally configured with two outflow pipes. The first is a smaller pipe on the upstream side of the diversion weir - to divert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

FLOW-BY-DESIGN

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

DVERT LOW FLOW DIVERSION

This simple yet innovative diversion trough can be installed in existing or new curb and grate inlets to divert the first flush to the Modular Wetlands® via pipe. It works similar to a rain gutter and is installed just below the opening into the inlet. It captures the low flows and channels them over



to a connecting pipe exiting out the wall of the inlet and leading to the MWS Linear. The DVERT is perfect for retrofit and green street applications that allow the Modular Wetlands® to be installed anywhere space is available.

SPECIFICATIONS

FLOW-BASED DESIGNS

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

MODEL #	DIMENSIONS	WETLANDMEDIA SURFACE AREA (sq. ft.)	TREATMENT FLOW RATE (cfs)
MWS-L-4-4	4′ x 4′	23	0.052
MWS-L-4-6	4′ x 6′	32	0.073
MWS-L-4-8	4′ x 8′	50	0.115
MWS-L-4-13	4′ x 13′	63	0.144
MWS-L-4-15	4′ x 15′	76	0.175
MWS-L-4-17	4′ x 17′	90	0.206
MWS-L-4-19	4′ x 19′	103	0.237
MWS-L-4-21	4′ x 21′	117	0.268
MWS-L-6-8	7′ x 9′	64	0.147
MWS-L-8-8	8′ x 8′	100	0.230
MWS-L-8-12	8′ x 12′	151	0.346
MWS-L-8-16	8′ x 16′	201	0.462
MWS-L-8-20	9′ x 21′	252	0.577
MWS-L-8-24	9′ x 25′	302	0.693
MWS-L-10-20	10' x 20'	302	0.693

VOLUME-BASED DESIGNS

HORIZONTAL FLOW BIOFILTRATION ADVANTAGE

Modular Wetlands® with
Box Culvert Prestorage

The Modular Wetlands® System Linear offers a unique advantage in the world of biofiltration due to its exclusive horizontal flow design: Volume-Based Design. No other biofilter has the ability to be placed downstream of detention ponds, extended dry detention basins, underground storage systems and permeable paver reservoirs. The systems horizontal flow configuration and built-in orifice control allows it to be installed with just 6" of fall between inlet and outlet pipe for a simple connection to projects with shallow downstream tie-in points. In the example above, the Modular Wetlands® is installed downstream of underground box culvert storage. Designed for the water quality volume, the Modular Wetlands® will treat and discharge the required volume within local draindown time requirements.

Modular Wetlands® with
Arch Plastic Chambers

DESIGN SUPPORT

Bio Clean engineers are trained to provide you with superior support for all volume sizing configurations throughout the country. Our vast knowledge of state and local regulations allow us to quickly and efficiently size a system to maximize feasibility. Volume control and hydromodification regulations are expanding the need to decrease the cost and size of your biofiltration system. Bio Clean will help you realize these cost savings with the Modular Wetlands®, the only biofilter than can be used downstream of storage BMPs.

ADVANTAGES

- LOWER COST THAN FLOW-BASED DESIGN
- MEETS LID REQUIREMENTS
- BUILT-IN ORIFICE CONTROL STRUCTURE
- WORKS WITH DEEP INSTALLATIONS

APPLICATIONS

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

INDUSTRIAL

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

RESIDENTIAL

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

STREETS

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

PARKING LOTS

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

COMMERCIAL

Compared to bioretention systems, the Modular Wetlands® can treat far more area in less space, meeting treatment and volume control requirements.

MIXED USE

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

More applications include:

• Agriculture • Reuse • Low Impact Development • Waste Water

PLANT SELECTION

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

A wide range of plants are suitable for use in the Modular Wetlands®, but selections vary by location and climate. View suitable plants by visiting biocleanenvironmental.com/plants.

INSTALLATION

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

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

MAINTENANCE

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

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

Bio Clean
A Forterra Company

5796 Armada Drive Suite 250
Carlsbad, CA 92008
855.566.3938
stormwater@forterrabp.com
biocleanenvironmental.com

010419R1A