HYDROLOGY REPORT

For

Pointe Common
1600 West Commonwealth Avenue,
Fullerton, CA 92833

December 2022

Prepared for:

Meta Housing Corp.

11150 W. Olympic Blvd., Suite 620

Los Angeles, CA 90064

Prepared by:

DK ENGINEER, CORP

6420 Wilshire Blvd., Suite 1000

Los Angeles, CA 90048

Tel: (909) 559-7361

Contact: Matt Plourde

TABLE OF CONTENTS

A. INTRODUCTION

Purpose

The scope of this report is to present the existing and proposed drainage characteristics of the subject property. The proposed drainage facilities are evaluated for the 2-year and 100-year, 24-hour storm.

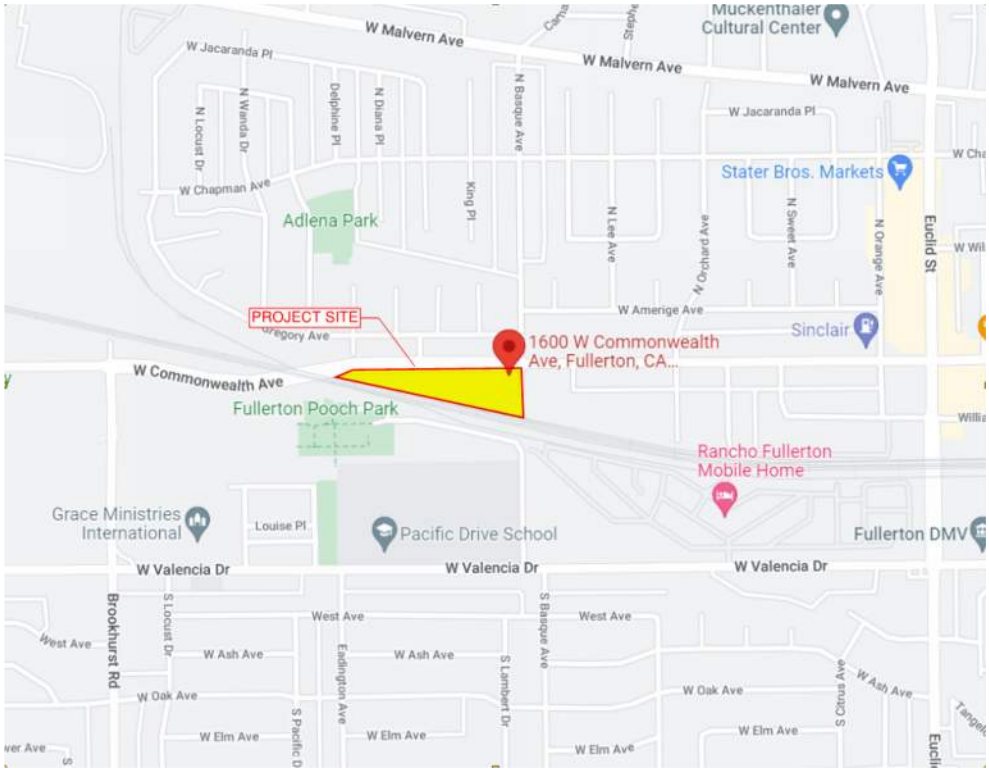
The purpose of this report is to show what the effect of the proposed project will be on the overall hydrologic condition of the subject property.

Project Description

The project is located at 1600 W Commonwealth Ave, Fullerton, CA 92833. See vicinity map below. The property is currently undeveloped and is being used as a public works laydown yard. There are no permanent structures onsite however there are several temporary storage containers scattered throughout the property.

The proposed project will involve the construction of a 65-unit affordable housing development. The project will construct a 3-story building for the housing units as well as build an on-grade parking lot for the residents. There will also be several landscape and hardscape improvements around the site including walkways, seating areas, and lawn and garden space.

Vicinity Map



Basis of Design

This report and calculations shown within will be based on the Orange County Hydrology Manual as well as the OC Local Drainage Manual.

B. Project Site Conditions

Existing On-Site Condition

Based on the topographic survey for the property the existing site is relatively flat. There is only about 3-4 feet of grade change over the entire site. The majority of the site slopes from south to north and from east to west. There is a smaller section of the site which appears to flow from north to south.

There are no distinguishable drainage measures onsite and the site appears to drain via sheet flow. Most of the site sheet flows over the sidewalk on Commonwealth Ave and into the gutter located on the south side of the street. A smaller portion of the site appears to sheet flow onto the railroad right of way located south of the property.

Per the FEMA Flood Map the site is located in a flood zone X with a 0.2% annual chance of flood. There is no base flood elevation associated with zone x so onsite flooding is not expected to be a concern. See Appendix D.

Existing Off-Site Condition

The site is bordered by Commonwealth Ave to the north, a fueling station to the east, and the railroad tracks to the south.

Commonwealth Ave is fully developed with curb and gutter and no runoff from Commonwealth appears to flow onto the property. The fueling station to the east is sloped towards Commonwealth Ave and Basque Ave. Runoff is expected to flow towards the public streets and not onto the subject property. The railroad tracks to the south a very flat and no distinguishing flow path can be made. This area appears to generally slope from east to west towards a retaining wall along Commonwealth Ave. Runoff from the railroad tracks is not expected to enter the subject property.

Proposed On-Site Condition

After construction the site will be broken up into several sub areas. For the purposes of this report the site was divided into 5 sub areas to be analyzed. See Appendix A for pre and post development site maps with sub areas delineated accordingly.

The site will no longer drain via sheet flow but will instead runoff will be collected using gutters, catch basins, area drains, and underground pipes. Additionally, the site will no longer sheet flow over the sidewalk on Commonwealth Ave. but will instead drain directly to the gutter via parkway drains and curb drains. The site will also

no longer drain onto the railroad tracks to the north. This area will be redirected to Commonwealth Ave. via underground pipes.

In addition to the storm drain improvements the project will also install 2 infiltration trench systems as part of the WQMP for the project. These infiltration trenches will help mitigate the overall impact of the project on the site runoff.

Proposed Off-Site Condition

Offsite drainage characteristics will remain unchanged once the project is complete.

C. Hydrologic Analysis

Methodology

Due to the relatively small size of the project area (less than 640 acres), the rational method can be used to compute the peak runoff. The runoff analysis is based on the proposed land use, topographic features, and proposed grading for the site area. The average land slopes and runoff coefficients were used for computing runoff.

The runoff equation for the Rational Method is as follows:

$$Q = CIA$$

Where: Q = Peak runoff rate (CFS)
C = Runoff coefficient
I = Average rainfall intensity (in/hr)
A = Drainage area (acres)

Results

Hydrology Summary	
Design Frequency	2 Year
Total Area	2.5 Acres
Percent Impervious	1.0% Existing, 70.5% Proposed
Time of Concentration	13.5 min (Pre) 10.5 min (Post)
ISOHYET	See Hydrology Summary Tables
Soil Group	B per OC Hydrology Map (See Appendix C)
Runoff	Pre-Development – 2.44 CFS Post-Development – 4.03 CFS

Hydrology Summary	
Design Frequency	100 Year
Total Area	2.5 Acres
Percent Impervious	1.0% Existing, 70.5% Proposed
Time of Concentration	13.5 min (Pre) 10.5 min (Post)
ISOHYET	See Hydrology Summary Tables
Soil Group	B per OC Hydrology Map (See Appendix C)
Runoff	Pre-Development – 6.67 CFS Post-Development – 11.03 CFS

*See Appendix B for full Calculations

Conclusions

Based on the summary tables the proposed project will increase the overall runoff from the site. This is expected since the existing condition is undeveloped and the proposed project will increase the overall imperviousness of the site.

When the project moves into the design phase the storm drain system and the overflow drains will have to be designed the adequately convey flows from the site.

Per the WQMP report associated with this project there are no Hydrologic Conditions of Concern (HCOC) downstream of the subject property so hydromodification improvements are not anticipated to be required. The project will install infiltration BMPs which will help with reducing the overall runoff amount, especially from smaller storm events. If the project is conditioned to further mitigate runoff from the site then these infiltration systems can be used to lower the total runoff from the site.

D. Hydraulic Analysis

Scope

Since this is a preliminary study and a full storm drain system has not been developed for the onsite portion of this project yet, this section will focus on the impacts of the project on the hydraulics in public right of way. This section will cover the sizing for the parkway drain outlets along Commonwealth Ave., check the design capacity of Commonwealth Ave., and check the existing catch basin sizing.

Methodology

The Orange County Local Drainage Manual will be the basis for the hydraulic analysis. Section 3.2.1.1 will cover the design capacity of Commonwealth Ave. and Section 3.3.2.8.3.1 will cover the catch basin sizing.

Additionally, Bentley Flowmaster software will be used to help check the sizing of the parkway drains and the spread in Commonwealth Ave.

Results – Parkway Drains

Based on Section C of this report the project will have a post-development flow of 11.03 CFS. The site will be drained to the street via 2 parkway drains on Commonwealth Ave. For the purpose of this study, we have assumed that each drain will cover 50% of the site or 5.52 CFS per drain.

We are proposing each drain be sized with a width of 42". Per the Bentley Flowmaster calculation each drain will have a normal depth of 3.1". See Appendix E. Parkway drains have a total height of 4" therefore the parkway drains are adequately sized.

Results – Design Capacity for Commonwealth Ave

Commonwealth Ave is a multi-lane street with a speed limit of 40 mph. Per section 3.2.1.1 the 100-year flood must be contained within the street right of way. Using Bentley Flowmaster, the 100-year flow from section C was used to model the spread of the runoff in the street. This model was run using the lowest longitudinal slope along Commonwealth Ave in order to be conservative.

Based on the Flowmaster model the 100-year storm will have a spread of 16.4 ft. The south side of Commonwealth Ave has a width of 28.2 ft from median to curb therefore the full 100-year storm is contained. This also leaves a full lane of traffic unaffected by the 100-year storm. See results in Appendix E.

Results – Catch Basin

There are 2 existing City owned Catch Basins Commonwealth Ave. along the project frontage. Both these drains are 2' wide by 3' long. Using Chart 9B from the OC Local Drainage Manual we checked the drain capacity against the 100-year storm. In order to be conservative, we assumed the total runoff from the site is collected by just one of the catch basins.

Based on the sizing chart, and using a 50% clogging factor, the catch basin will have a depth of 0.43 ft (5.16") over the catch basin. Commonwealth has a typical curb height of 8" therefore the 100-year storm is contained. See chart in Appendix E.

.

Conclusion

Based on the results above the parkway drains are sized adequately for the 100-year storm, Commonwealth Ave has capacity to convey the 100-year storm, and the existing catch basins are adequately sized for the 100-year storm. Therefore it is assumed that the existing street and storm drain infrastructure can support the proposed project.

.

APPENDIX A
Hydrology Maps

DKE
DK ENGINEER, CORP
6420 WILSHIRE BLVD. #1000
LOS ANGELES, CA 90048
310.926.0248

Martha Pl

Alberta Pl

Commonwealth Avenue

A2

A1

NOT PART OF PROJECT

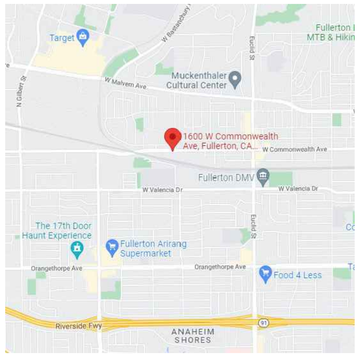
NOT PART OF PROJECT

B.N.S.F. Railroad Right-of-Way

LEGEND:

PROPERTY LINE

DIRECTION OF FLOW



VICINITY MAP
NOT TO SCALE

N

0 15' 30'
SCALE: 1"=30'

PRE-DEVELOPMENT HYDROLOGY MAP

SHEET NUMBER

C1.0

PLOT DATE:

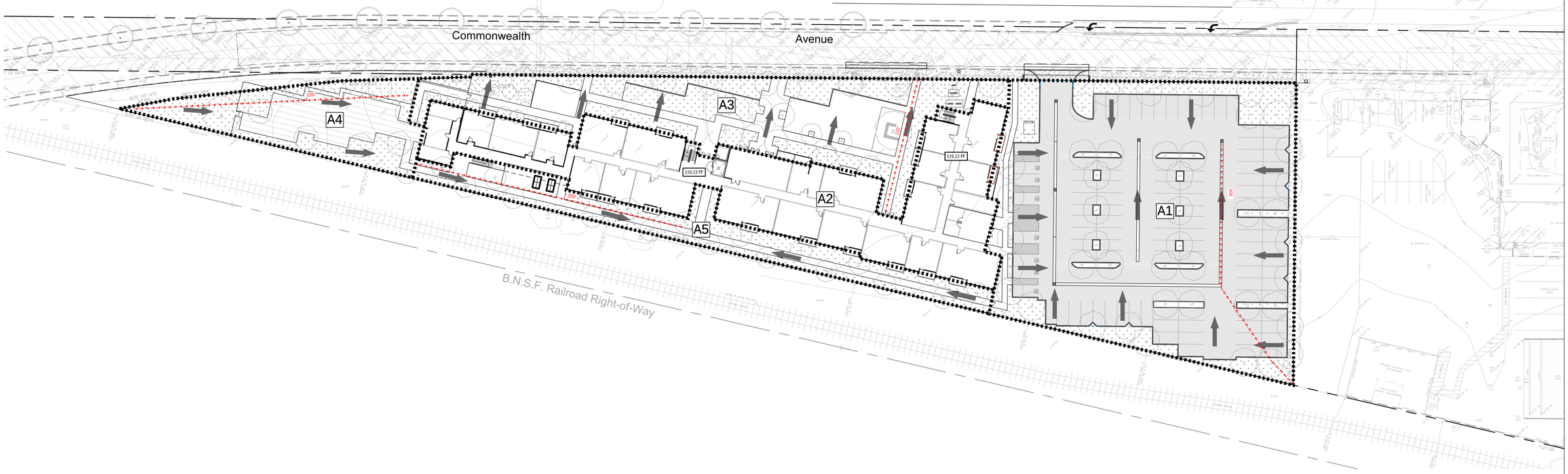
DKE
DK ENGINEER, CORP
6420 WILSHIRE BLVD. #1000
LOS ANGELES, CA 90048
310.926.0248

REGISTERED PROFESSIONAL ENGINEER
MATT PLOURDE
No. 73483
CIVIL
STATE OF CALIFORNIA

Martha Pl

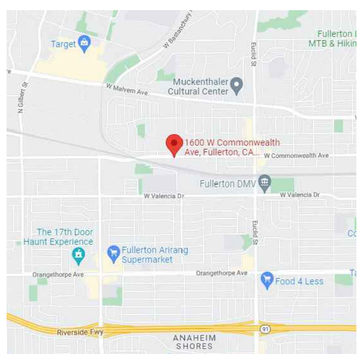
Alberta Pl

Commonwealth Avenue



LEGEND:

- PROPERTY LINE
- DIRECTION OF FLOW
- CONCRETE PAVING
- ASPHALT PAVING
- PLANTER AREA PER LANDSCAPE



VICINITY MAP
NOT TO SCALE

N

0 15' 30'
SCALE: 1"=30'

PLOT DATE:

POST-DEVELOPMENT HYDROLOGY MAP

SHEET NUMBER

C2.0

APPENDIX B

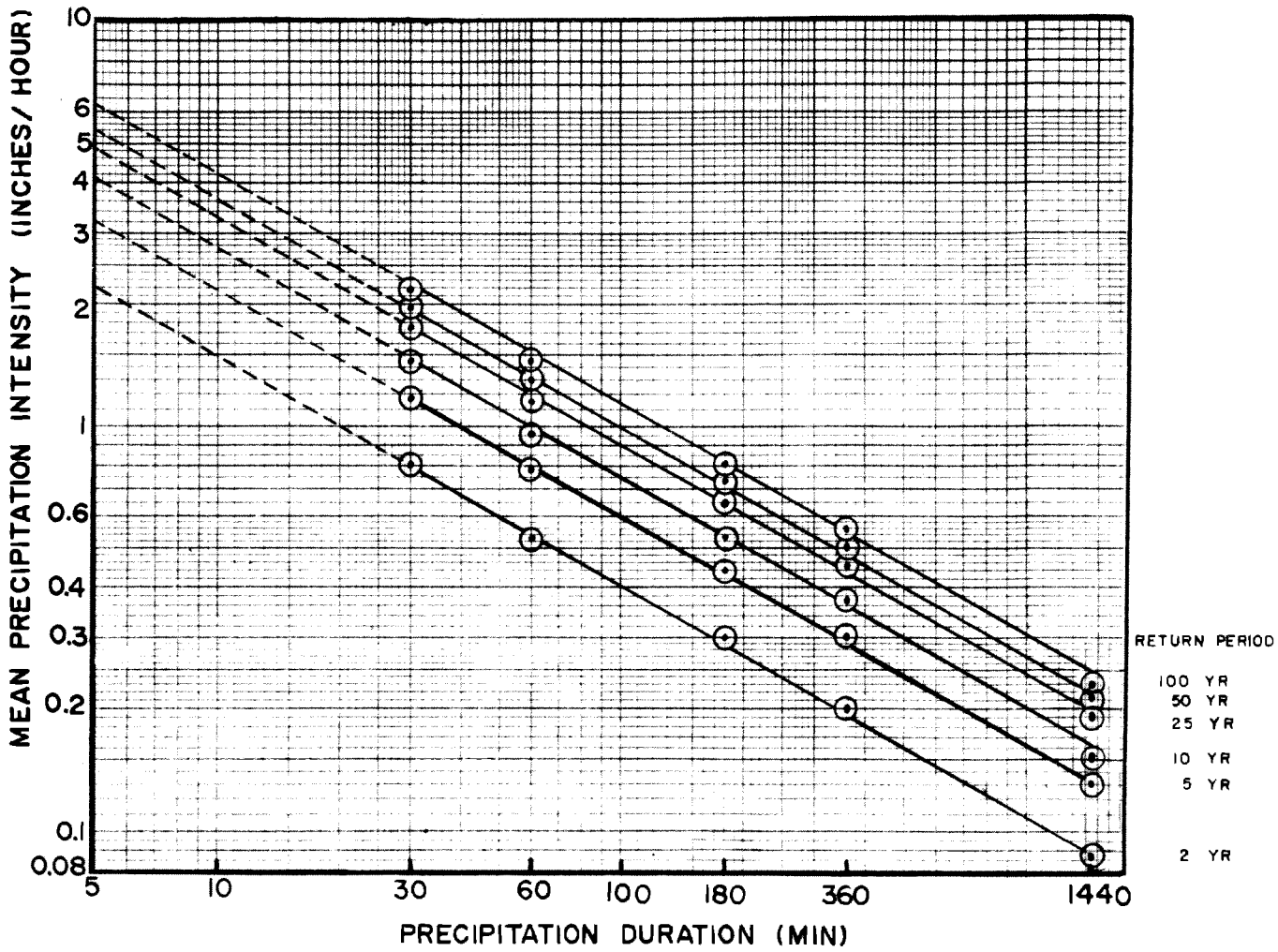
Hydrologic Calculations

(Per Orange County Hydrology Manual)

Regression Equations: $I(t) = at^b$

(I= Intensity in inches/hour, t= duration in minutes)

Return Frequency (years)	a	b
2	5.702	-0.574
5	7.870	-0.562
10	10.209	-0.573
25	11.995	-0.566
50	13.521	-0.566
100	15.560	-0.573



ORANGE COUNTY
HYDROLOGY MANUAL

MEAN PRECIPITATION INTENSITIES FOR NONMOUNTAINOUS AREAS

Figure B-3

C.6.4. Estimation of Maximum Loss Rates for Pervious Areas, F_p

Table C.2 lists the maximum loss rates (inch/hour), F_p, for pervious area as a function of soil group.

TABLE C.2.

MAXIMUM EFFECTIVE PERVIOUS AREA LOSS RATES (inch/hour), F_p

SOIL GROUP:	A	B	C	D
F_p:	0.40	0.30	0.25	0.20

Table C.2 reflects the model calibration assuming an F_p of 0.30 in/hr. for all the considered catchments and storm return frequencies. This mean value of F_p of 0.30 in/hr. was assigned to Hydrologic Soil Group B due to the actual average soil conditions in the reconstitution study areas. The F_p values for Hydrologic Soil Groups A, C, and D, were assigned to account for the different soil types that may be found in Orange County.

C.6.5. Estimation of Catchment Maximum Loss Rates, F_m

The maximum loss rate selected from Table C.2 applies to the pervious area fraction of the watershed. The loss rate assumed for an impervious surface is 0.0 inch/hour. The maximum loss rate, F_m, for a catchment is therefore given by

$$F_m = a_p F_p \qquad (C.7)$$

where a_p is the pervious area fraction and F_p is the maximum loss rate for the pervious area (Section C.6.4).

Should a catchment contain several F_m values, the composite F_m value is determined as a simple area average of the several F_m values.

SECTION D

RATIONAL METHOD

D.1. RATIONAL METHOD EQUATION

The rational method was originally developed to estimate runoff from small (less then one square mile) urban and developed areas and its use shall be limited to those conditions. Basically, the rational method equation relates rainfall intensity, a runoff coefficient, and drainage area size to the direct peak runoff from the drainage area. This relationship is expressed by the equation:

$$Q = CIA \qquad (D.1)$$

where

- Q = the runoff in cubic feet per second (cfs) from a given area
- C = a runoff coefficient representing the ratio of runoff to rainfall
- I = the time-averaged rainfall intensity in inches per hour corresponding to the time of concentration
- A = drainage area (acres)

The values of the runoff coefficient (C) and the rainfall intensity (I) are based on a study of drainage area characteristics such as type and condition of the runoff surfaces and the time of concentration. These factors and the limitations of the rational method equation are discussed in the following sections. Drainage area (A) may be determined by planimetering a suitable topographic map of the project area.

Data required for the computation of peak discharge by the rational method are: (i) rainfall intensity (I) for a storm of specified duration and selected

design frequency; (ii) drainage area characteristics of size (A), shape, slope; and (iii) a runoff coefficient (C).

D.2. LIMITATIONS OF THE RATIONAL METHOD

The validity of the relationship expressed by the rational method equation holds true only if certain assumptions are reasonably correct and limitations of the method are observed. Two basic assumptions are that (i) the frequency of a storm runoff is the same as the frequency of the rainfall producing this runoff; i.e., a 25-year recurrence interval rainfall will provide a 25-year recurrence interval storm runoff, and (ii) that the peak runoff occurs when all parts of the drainage area are contributing to the runoff. The use of the rational method equation is limited to watersheds of size less than 640 acres.

The rational method equation is only applicable where the rainfall intensity (I) can be assumed to be uniformly distributed over the drainage area at a uniform rate throughout the duration of the storm. This assumption applies fairly well to small areas of less than 640 acres. Beyond this limit, the rainfall distribution may vary considerably from the point values given in rainfall isohyetal maps and the rational method equation should not be used.

The selection of the runoff coefficient (C) is another major limitation for the rational method equation. For small urban and developed areas the runoff coefficient can be reasonably well estimated from field and aerial photo studies. For larger areas where the determination of the runoff coefficient is to be based on vegetation type, cover density, the infiltration capacity of the ground surface, and the slope of the drainage area, an estimate of the runoff coefficient may be subject to a much greater error due to the variability of the drainage area characteristics. Rainfall losses due to evaporation, transpiration, depression and channel storage are inadequately evaluated, and may appreciably affect the estimate of the watershed peak rate of runoff. The effects of depth-area-duration (or depth-area) factors are not accounted for in the simple intensity-duration curve used for rational method studies.

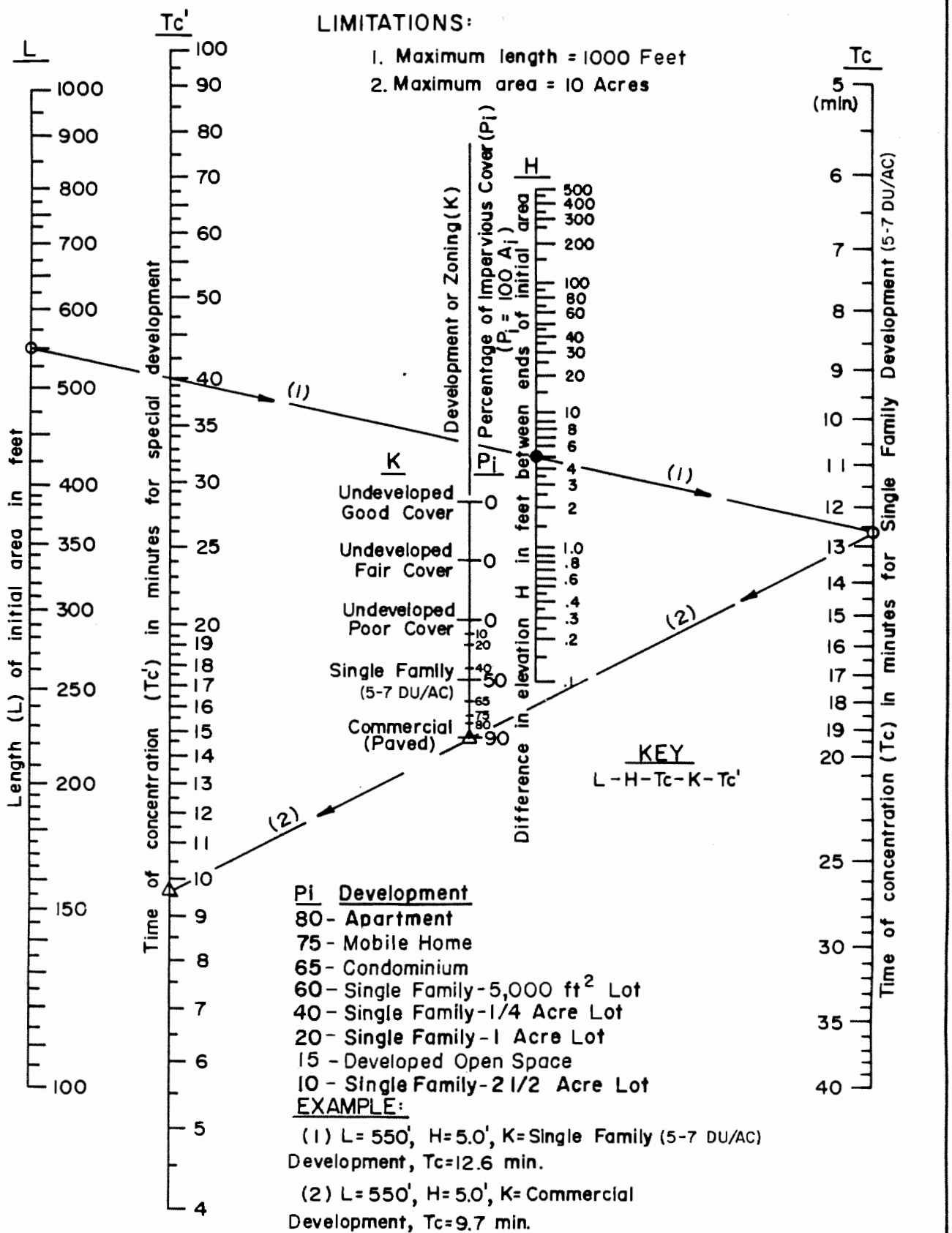
For large drainage areas, the absence of depth-area adjustments can result in significant differences in the estimate of the average depth of catchment point rainfalls.

The above limitations indicate that an estimate of the peak rate of runoff becomes less reliable as the drainage area becomes larger and the rational method equation should, therefore, not be used for drainage areas larger than 640 acres.

D.3. CRITICAL DURATION (TIME OF CONCENTRATION)

The critical duration of the storm rainfall required in the rational method equation is based on the time of concentration of the drainage area.

The time of concentration (Tc) is defined as the interval of time (in minutes) required for the flow at a given point to become a maximum under a uniform rainfall intensity. Generally, this occurs when all parts of the drainage area are contributing to the flow. Generally, the time of concentration is the interval of time from the beginning of rainfall for water from the hydraulically most remote portion of the drainage area to reach the point of concentration; e.g., the inlet of the drainage structure. The time of concentration is a function of many variables including the length of the flow path from the most remote point of an area to the concentration point, the slope and other characteristics of natural and improved channels in the area, the infiltration characteristics of the soil, and the extent and type of development. For rational method studies based on this manual, the time of concentration for an initial subarea may be estimated from the nomograph of Figure D-1. The time of concentration for the next downstream subarea is computed by adding to the initial Tc, the time required for the computed peak flow to travel to the next concentration point. Time of concentration is computed for each subsequent subarea by computing travel time between subareas and adding to the cumulative sum.



ORANGE COUNTY

HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1

When the flow is concentrated in curb and gutters, drainage channels or conduits, the flow velocity may be estimated by the well-known Manning's equation

$$V = \frac{1.49}{n} R^{2/3} S^{1/2} \qquad (D.2)$$

where

V = mean velocity (fps)

n = Manning coefficient of roughness (see Design Manual)

R = hydraulic radius (feet)

S = energy slope which equals the conduit invert slope for uniform flow

The travel time will then be the flow distance divided by the velocity of flow.

Computations of travel time through subareas which continually add to the peak flow (e.g., streetflow) should be based on the average peak flow through the subarea. This average peak flow is generally a simple average of the peak flow rates estimated at the upstream and downstream points of the subarea.

The initial subarea Tc estimation often is the most significant factor leading to the Tc computation of a watershed. Small development studies typically utilize only initial subarea estimations due to the small subarea sizes. Larger study areas generally show high sensitivity to the initial subarea Tc. Consequently, judgment is needed when developing initial subarea Tc estimates. The nomograph of Figure D-1 is based on the Kirpich formula and relates an initial subarea Tc to subarea slope and development type. It is assumed in the nomograph that overland flow effects dominate the travel time hydraulics.

It is noted that the Tc computation procedure is based upon the summation of an initial subarea time of concentration with the several travel times estimated by normal depth flow-velocities through subsequent subareas.

D.4. INTENSITY-DURATION CURVES

The precipitation intensity-duration curves presented in Section B.3 (Figures B-3 and B-4) are appropriate for the rational method.

D.5. RUNOFF COEFFICIENT

The runoff coefficient (C) is the ratio of rate of runoff to the rate of rainfall at an average intensity (I) when the total drainage area is contributing. The selection of the runoff coefficient depends on rainfall intensity, soil infiltration rate (F_p), and impervious and pervious area fractions (a_i and a_p).

Since one acre-inch/hour is equal to 1.008 cfs, the rational formula is generally assumed to estimate a peak flowrate in cfs. Runoff coefficient curves are developed using the relationship:

$$C = \begin{cases} 0.90\ (a_i + \dfrac{(I - F_p)a_p}{I}), & \text{for I greater than } F_p; \\ 0.90\ a_i, & \text{for I less than or equal to } F_p \end{cases} \qquad (D.3)$$

where the proportion factor of 0.90 is a calibration constant determined by an average fit between the rational method and design storm unit hydrograph (see Section E) peak flow rate estimates, and where

C	=	runoff coefficient
I	=	rainfall intensity (inches/hour)
F_p	=	infiltration rate for pervious areas (inches/hour) (see Section C.6.4)
a_i	=	ratio of impervious area to total area (decimal fraction)
a_p	=	ratio of pervious area to total area (decimal fraction), ($a_p = 1 - a_i$)

D.6. PEAK FLOW RATE FORMULA

Combining Equations (D.1) and (D.3), the peak flow estimate for Q is written in simpler terms by

$$Q = .90\ (I - F_m)A \qquad (D.4)$$

where $F_m = a_p F_p$ (see section C.6.5), and where in (D.4) it is understood that I is greater than F_p; otherwise $Q = .90\ a_i IA$.

In (D.4), F_m represents the loss rate for the total watershed tributary to the point of concentration. Should the tributary area contain several runoff surfaces, an area-averaged F_m is calculated. Table D.1 illustrates such an area-averaged F_m computation.

TABLE D.1. AREA-AVERAGED F_m COMPUTATION

Subarea Number (1)	a_p (2)	Soil Group (3)	F_p (inch/hour) (4)	Area (acres) (5)	Area Weighting of (4)
1	0.60	A	0.40	8	1.92
2	0.80	B	0.30	12	2.88
3	0.75	C	0.25	11	2.06
4	0.10	D	0.20	15	0.30
5	0.50	C	0.25	16	2.00
				62	9.16

From Table D.1., the area-averaged maximum loss rate, F_m, is given by F_m = (9.16)/(62) = 0.147 inch/hour, say 0.15.

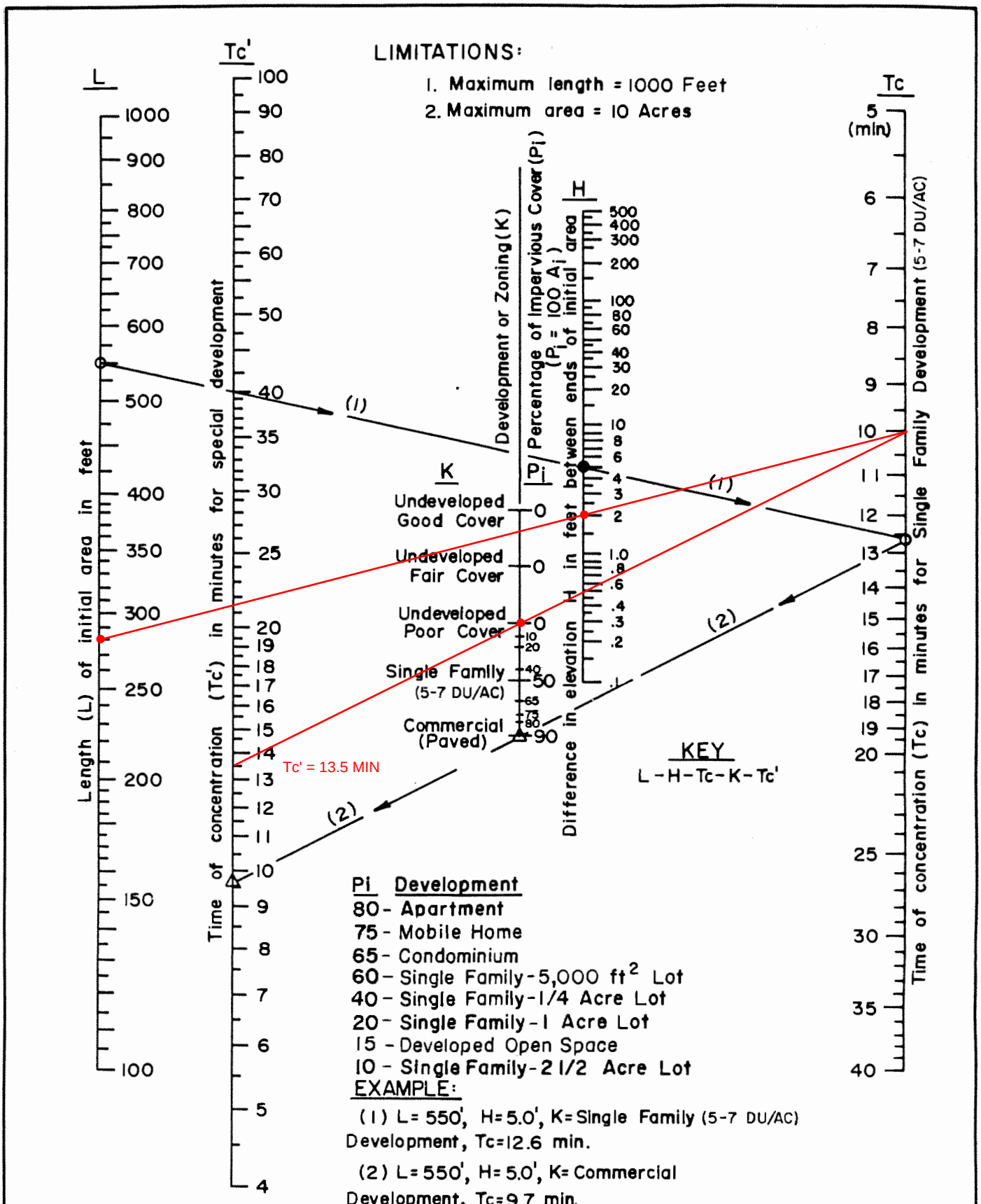
D.7. DRAINAGE AREA

The contributing drainage area may be determined from topographic contour maps, aerial photos, and field surveys. Watershed divides are then drawn on a suitable topographic map and the enclosed drainage area is determined by planimeter or other methods. In areas where lateral and transverse slopes on the watershed are very mild, the nominal watershed area (or drainage subdivision) runoff may "cascade" under severe rainfall. That is,

Pre-Development Hydrologic Summary Table										
Sub-Area	Area	Imp	Length (Feet)	H (Feet)	Tc (Min)	I (2-year) (in/hr)	I (100-year) (in/hr)	C	Q (2-year) (cfs)	Q (100-year) (cfs)
A1	2.04	0.01	280	2	13.5	1.28	3.50	0.69	1.80	4.94
A2	0.46	0.01	112	3	7.25	1.83	5.00	0.75	0.63	1.73
								Total	2.44	6.67

Post-Development Hydrologic Summary Table										
Sub-Area	Area	Imp	Length (Feet)	H (Feet)	Tc (Min)	I (2-year) (in/hr)	I (100-year) (in/hr)	C	Q (2-year) (cfs)	Q (100-year) (cfs)
A1	1.02	0.8	205	2.5	6.5	1.95	5.32	0.87	1.73	4.74
A2	0.58	1	50	1	4.75	2.33	6.37	0.90	1.22	3.33
A3	0.46	0.22	110	0.5	8.9	1.63	4.45	0.77	0.58	1.58
A4	0.22	0.41	220	1	10.5	1.48	4.04	0.79	0.26	0.70
A5	0.22	0.29	200	1	10.5	1.48	4.04	0.77	0.25	0.69
								Total	4.03	11.03

PRE-DEVELOPMENT AREA A1



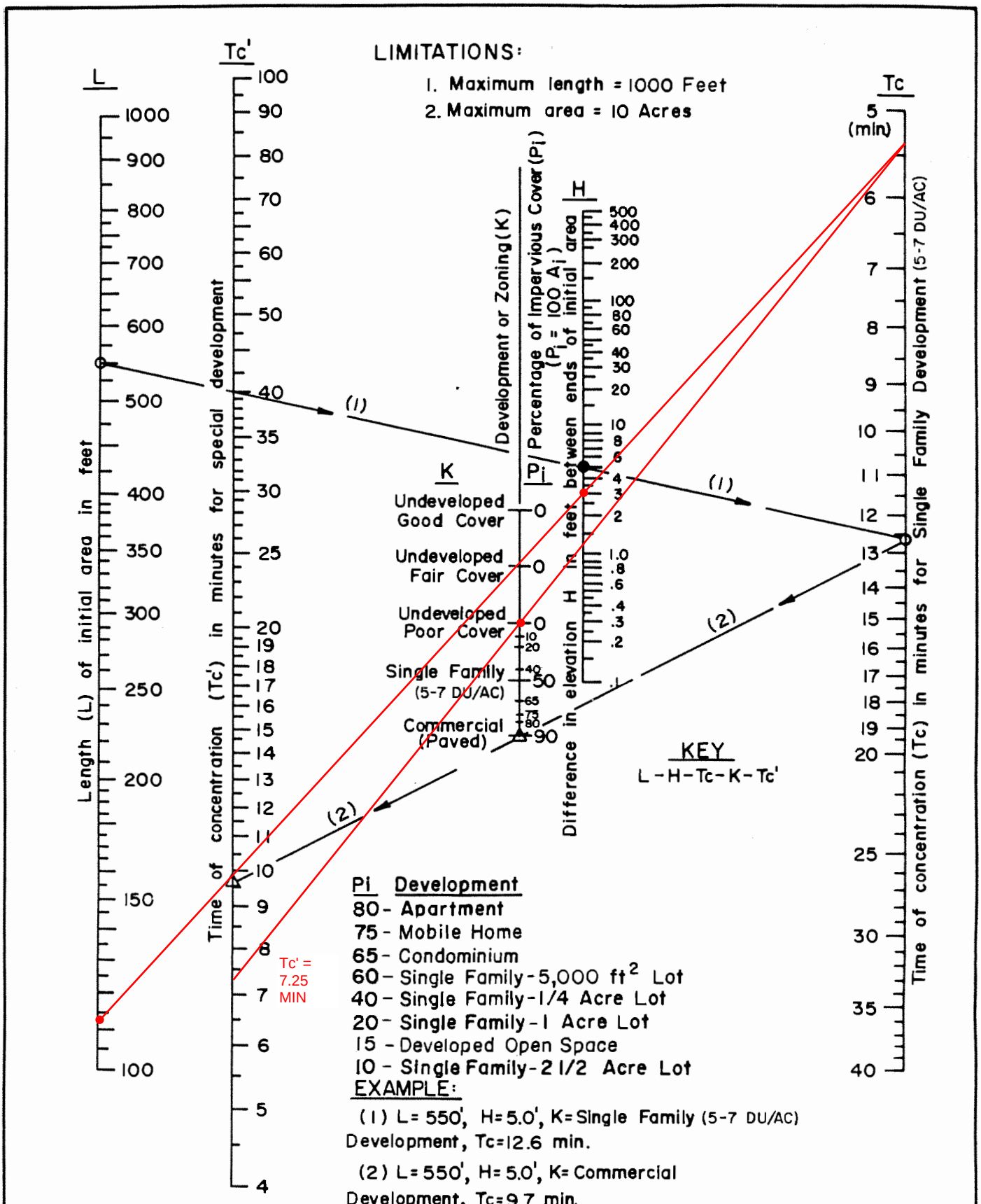
ORANGE COUNTY

HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1

PRE-DEVELOPMENT AREA A2



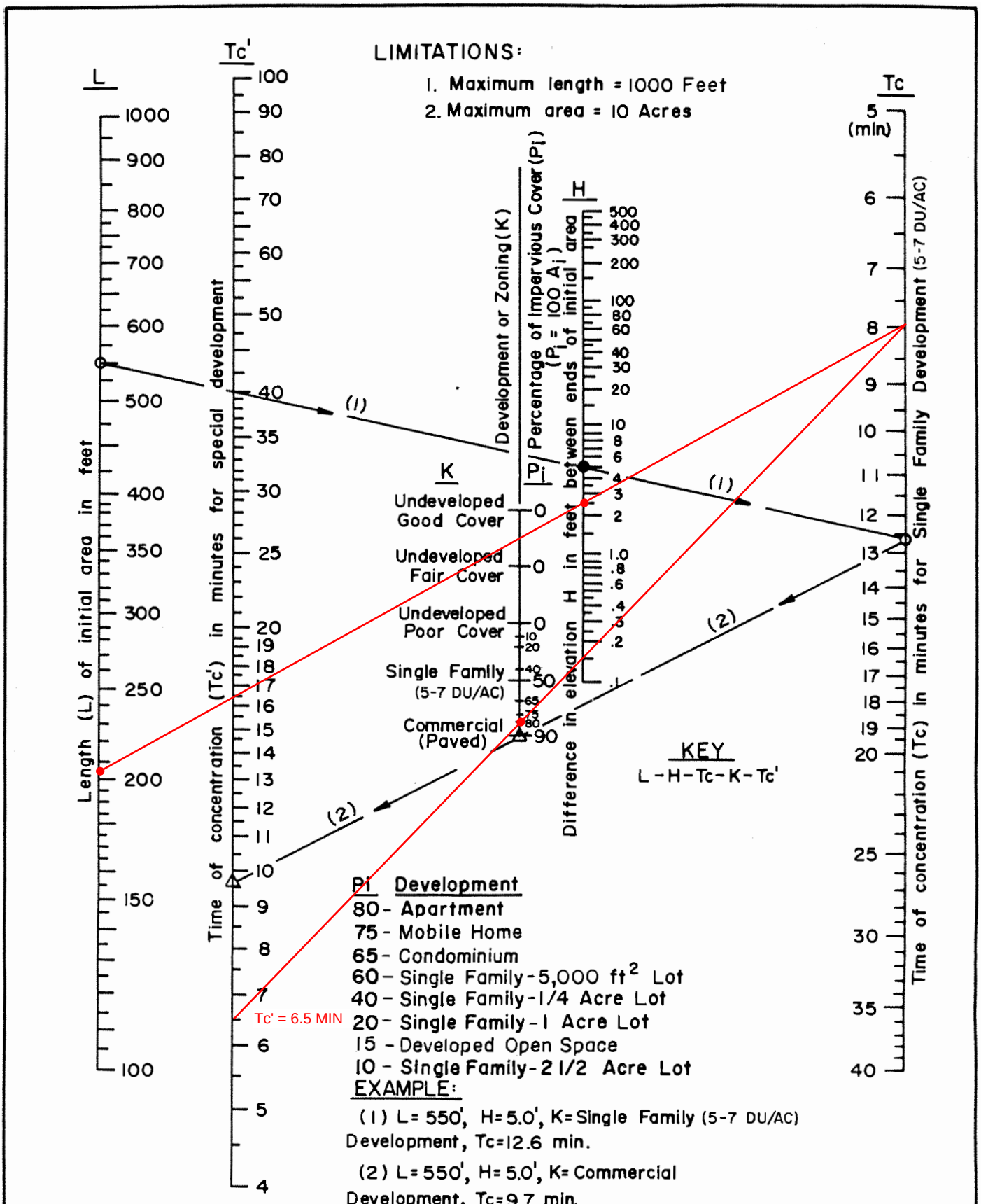
ORANGE COUNTY

HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1

POST-DEVELOPMENT AREA A1



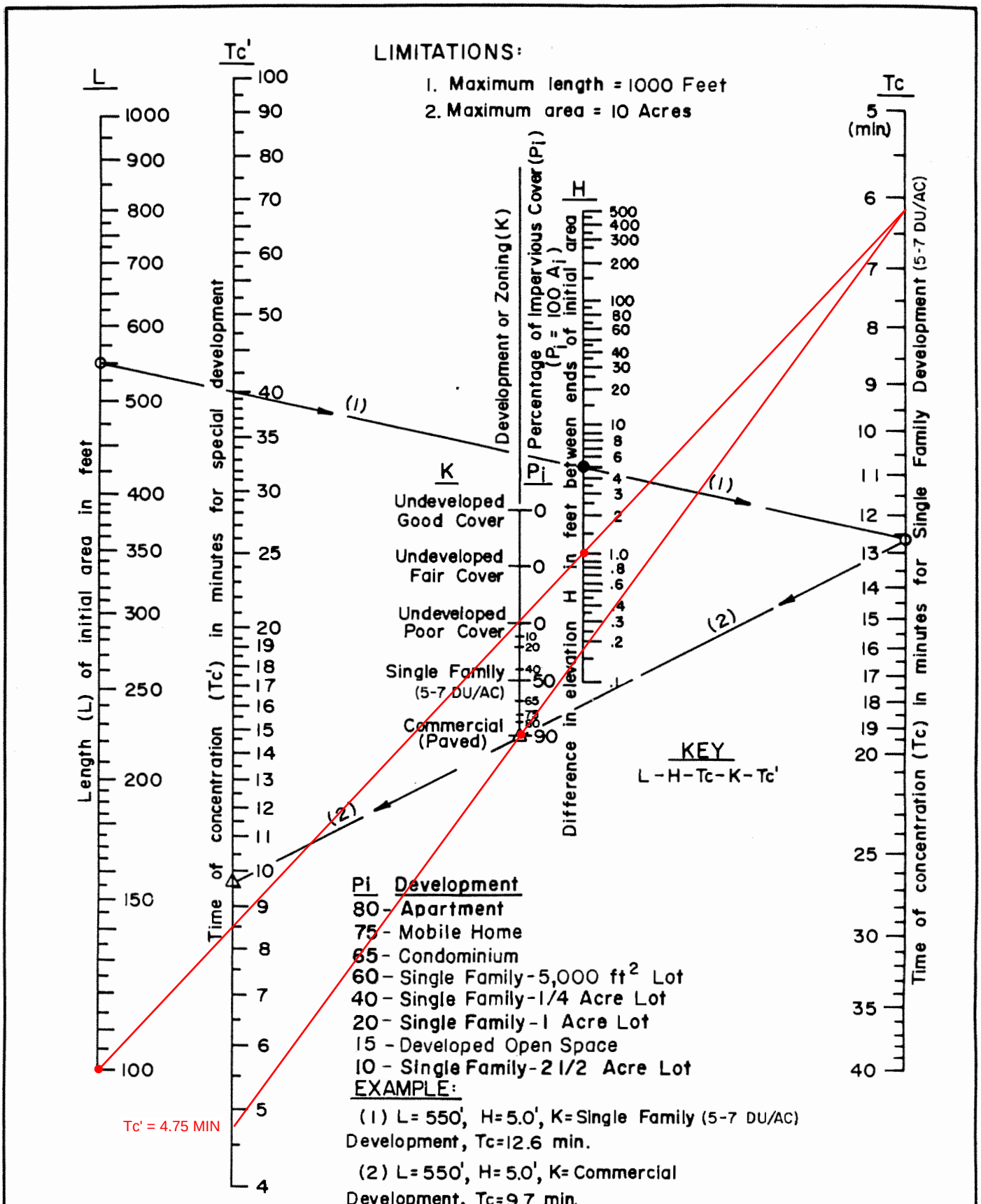
ORANGE COUNTY

HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1

POST-DEVELOPMENT AREA A2



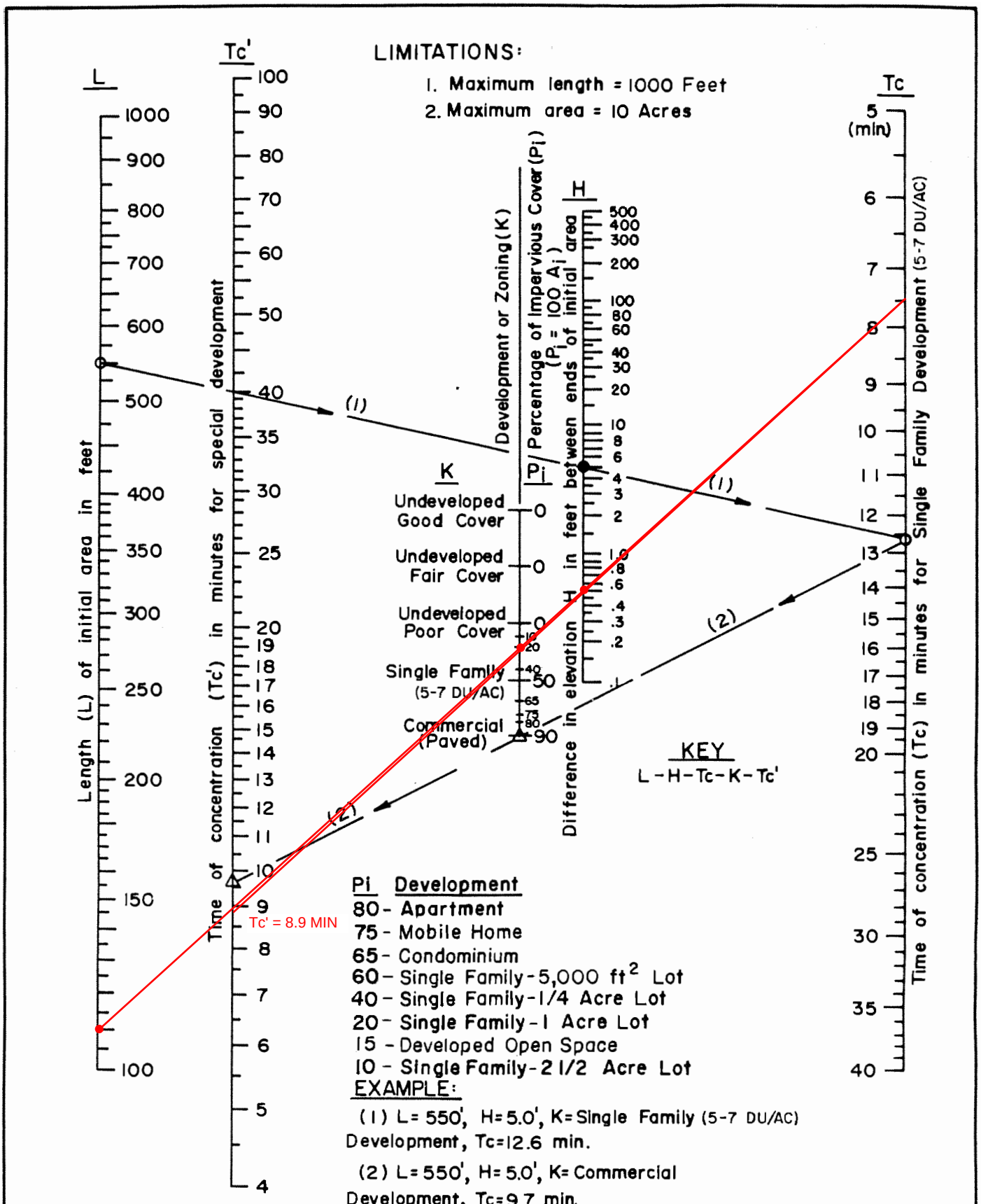
ORANGE COUNTY

HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1

POST-DEVELOPMENT AREA A3



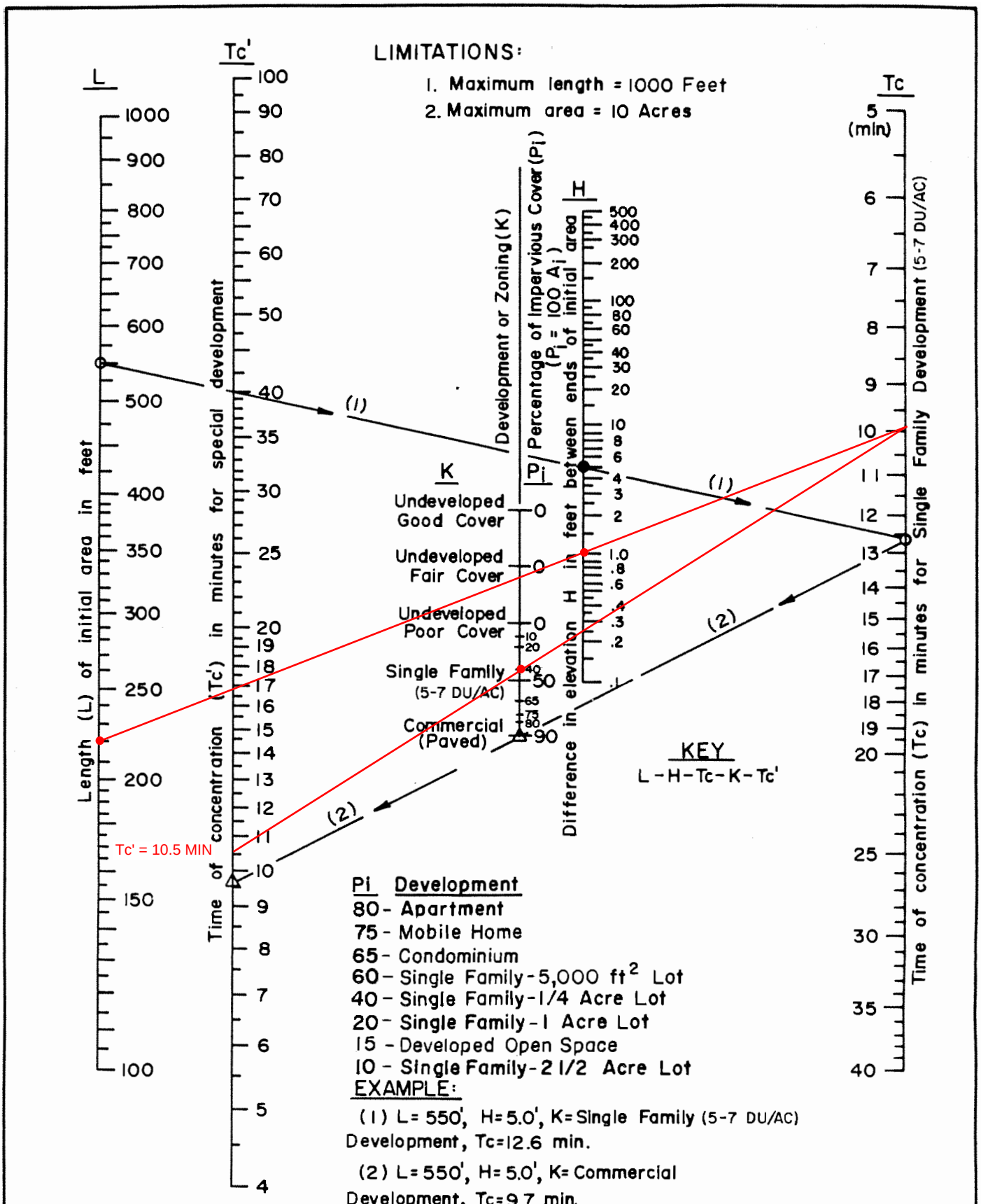
ORANGE COUNTY

HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1

POST-DEVELOPMENT AREA A4



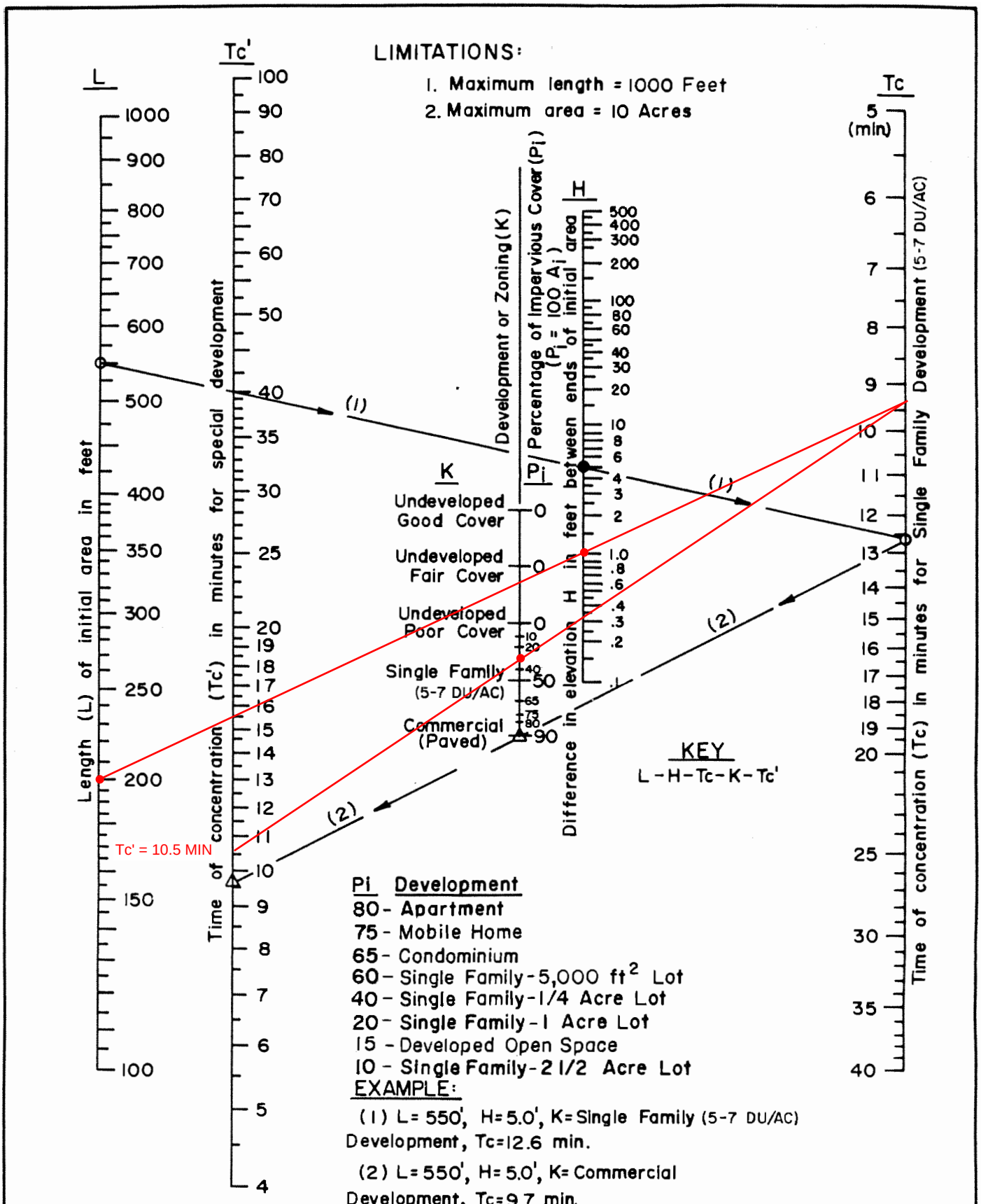
ORANGE COUNTY

HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1

POST-DEVELOPMENT AREA A5



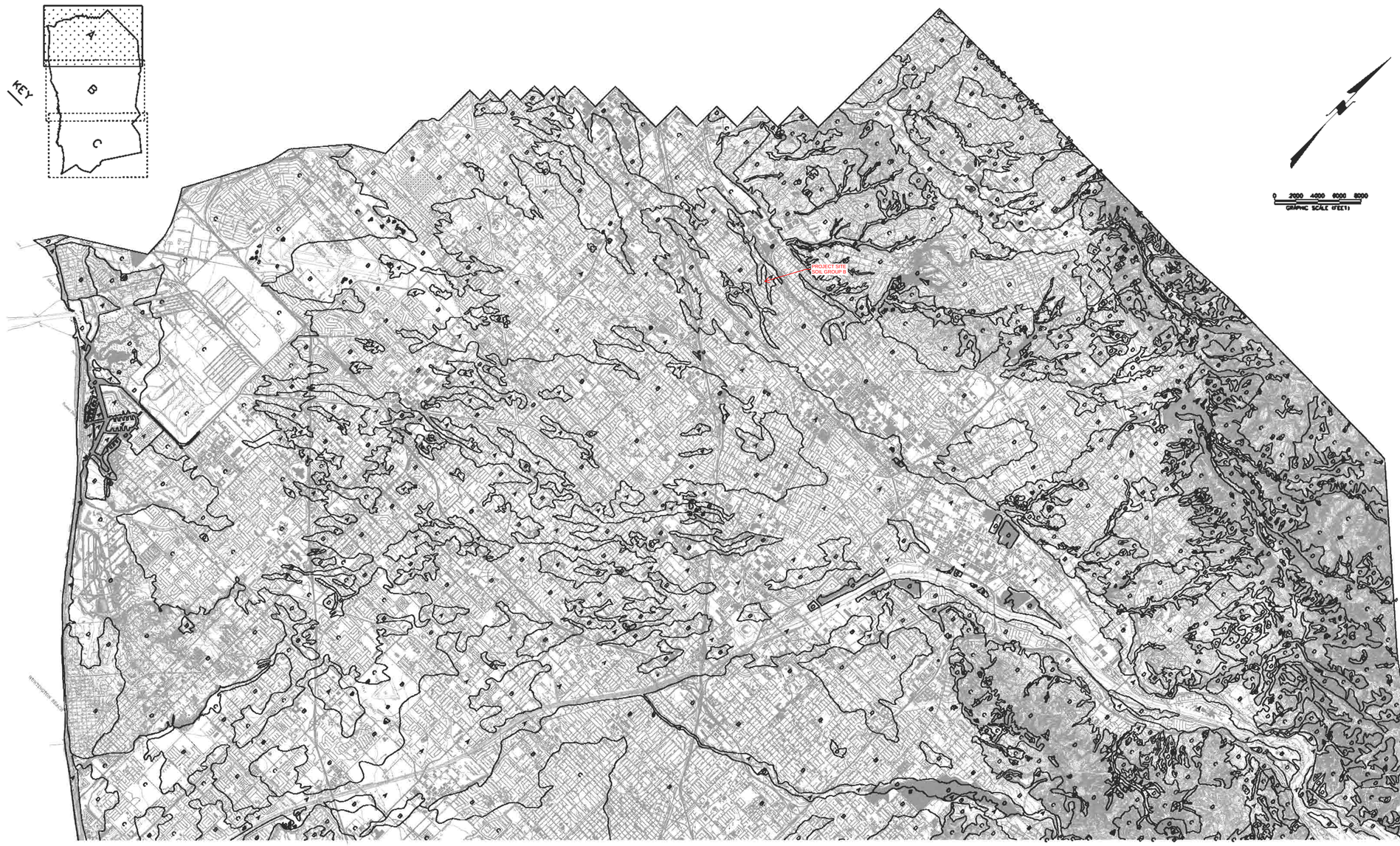
ORANGE COUNTY

HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1

APPENDIX C
Supporting Documents

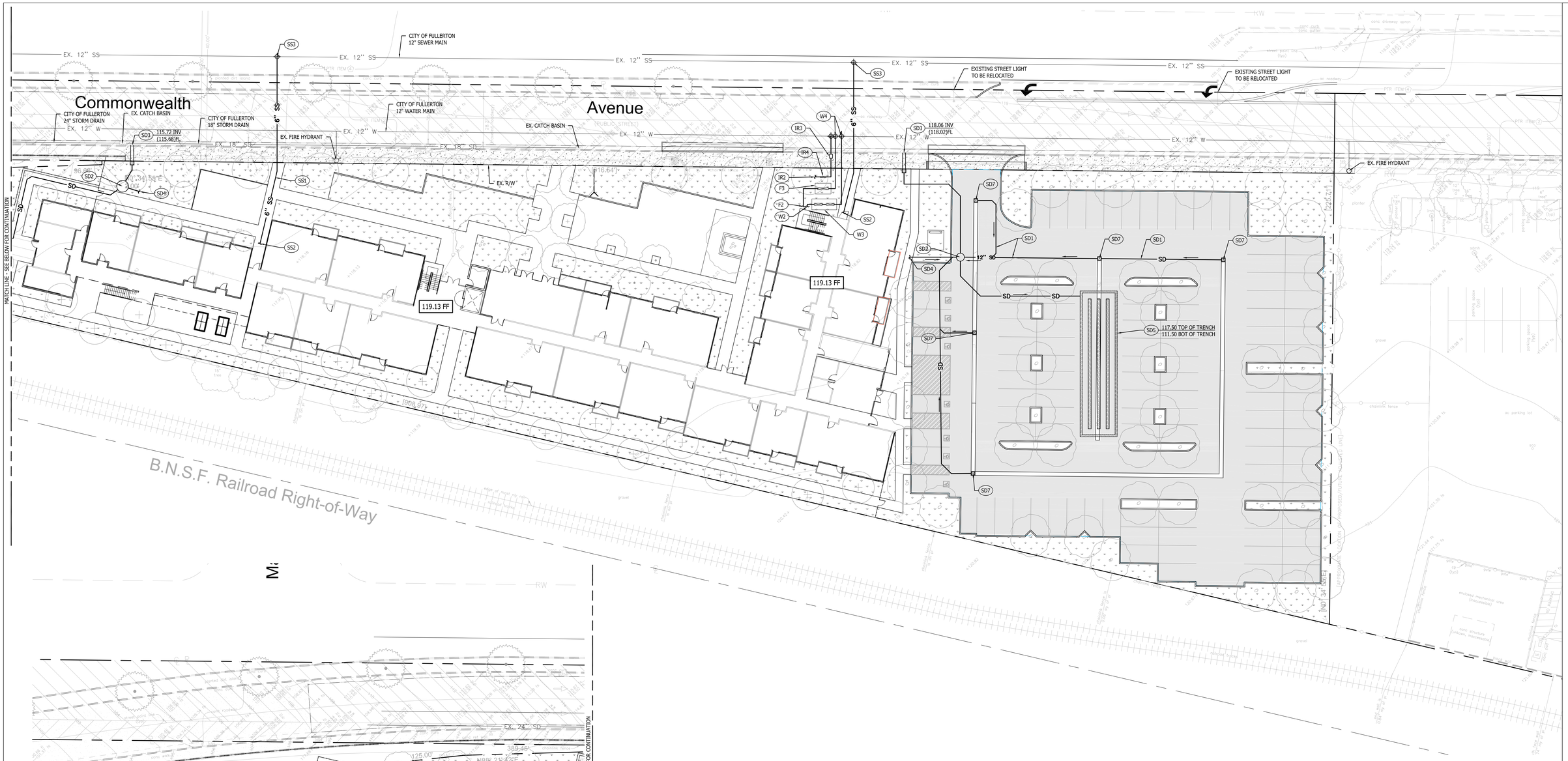


ORANGE COUNTY
HYDROLOGY MANUAL

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



UTILITY CONSTRUCTION NOTES:

STORM DRAIN

- (SD1) INSTALL SDR-35 PVC STORM DRAIN PIPE.
- (SD2) CDS PRETREATMENT FILTER UNIT BY CONTECH. SEE WQMP REPORT FOR DETAILS.
- (SD3) INSTALL PARKWAY DRAIN PER SPPWC STD 151-2. WIDTH=42".
- (SD4) DOWNSPOUT/ROOF DRAIN CONNECTION TO SITE DRAINS LINES.
- (SD5) INSTALL 73' X 18.5' X 6' INFILTRATION SYSTEM BY CONTECH. SEE WQMP REPORT FOR DETAILS.
- (SD6) INSTALL 61' X 9.5' X 6' DETENTION SYSTEM BY CONTECH. SEE WQMP REPORT FOR DETAILS.
- (SD7) INSTALL 18"X18" TRAFFIC RATED CATCH BASIN.

WATER

- (W1) INSTALL X" C-900 PVC WATER PIPE, PIPE BEDDING PER DETAIL X', SHEET C2.00.
- (W2) POINT OF CONNECTION 5' FROM BUILDING FACE. SEE PLUMBING PLANS FOR CONTINUATION.
- (W3) INSTALL WATER METER AND BACKFLOW PREVENTER PER CITY OF FULLERTON STANDARD PLAN 603.
- (W4) CONNECT TO EXISTING WATER MAIN PER CITY OF FULLERTON STANDARD PLAN 701.

FIRE WATER

- (F1) INSTALL X" C-900 PVC WATER PIPE, PIPE BEDDING PER DETAIL X', SHEET C2.00.
- (F2) POINT OF CONNECTION 5' FROM BUILDING FACE. SEE PLUMBING PLANS FOR CONTINUATION.
- (F3) INSTALL BACKFLOW PREVENTER PER CITY OF FULLERTON STANDARD PLAN 721.

IRRIGATION

- (IR1) INSTALL SCH 40 PVC WATER PIPE. BEDDING PER DETAIL X, SHEET C2.00.
- (IR2) POINT OF CONNECTION TO IRRIGATION SYSTEM. SEE LANDSCAPE PLANS FOR CONTINUATION.
- (IR3) INSTALL IRRIGATION METER PER CITY OF FULLERTON STANDARD PLAN 602.
- (IR4) INSTALL IRRIGATION BACKFLOW PREVENTER PER CITY OF FULLERTON STANDARD PLAN 604.

SEWER

- (SS1) INSTALL SDR 35 PVC SEWER PIPE. BEDDING PER DETAIL X, SHEET C2.00.
- (SS2) POINT OF CONNECTION 5' FROM BUILDING. SEE PLUMBING PLANS FOR CONTINUATION.
- (SS3) INSTALL SEWER LATERAL AND CONNECT TO EXISTING MAIN PER CITY OF FULLERTON STANDARD PLAN 209B.

N

0 10' 20'

SCALE: 1"=20'

DKE
DK ENGINEER, CORP
6420 WILSHIRE BLVD. #1000
LOS ANGELES, CA 90048
310.926.0248

REGISTERED PROFESSIONAL ENGINEER
MATT PLOURDE
No. 34893
CIVIL
STATE OF CALIFORNIA

UTILITY AND LID PLAN

SHEET NUMBER

C1.40

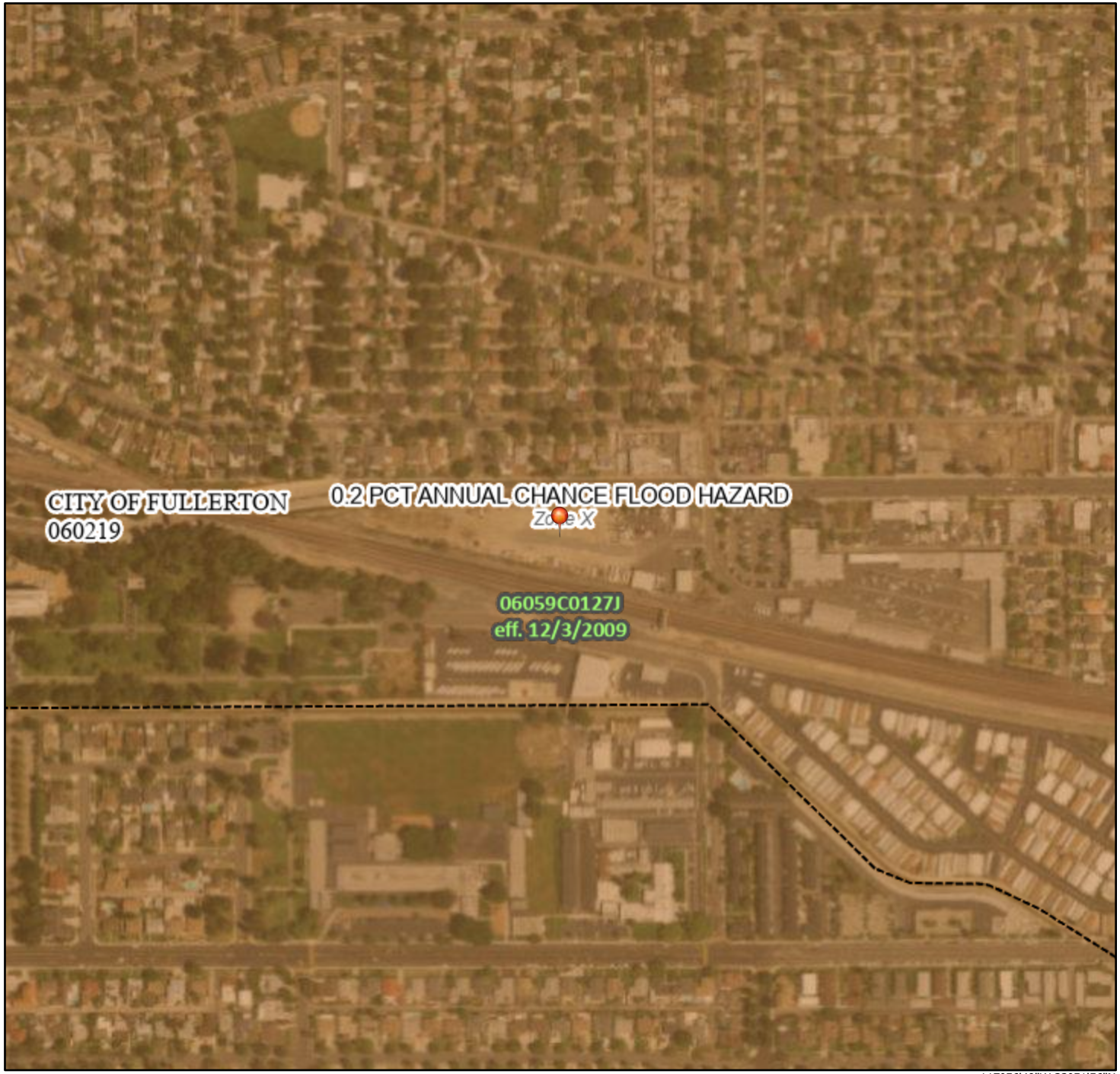
PLOT DATE:

APPENDIX D
FEMA Flood Map

National Flood Hazard Layer FIRMette

FEMA

117°57'26"W 33°52'26"N



117°56'49"W 33°51'56"N

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

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

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

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

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

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

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 12/9/2022 at 6:52 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

APPENDIX E
Hydraulic Calculations

Parkway Drain

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.013	
Channel Slope	2.0	%
Height	4.0	in
Bottom Width	42.00	in
Discharge	5.52	cfs

Results		
Normal Depth	3.1	in
Flow Area	0.9	ft²
Wetted Perimeter	48.3	in
Hydraulic Radius	2.7	in
Top Width	42.00	in
Critical Depth	4.0	in
Percent Full	78.5	%
Critical Slope	1.0	%
Velocity	6.03	ft/s
Velocity Head	0.56	ft
Specific Energy	0.83	ft
Froude Number	2.077	
Discharge Full	5.38	cfs
Slope Full	2.0	%
Flow Type	Supercritical	

GVF Input Data		
Downstream Depth	0.0	in
Length	0.0	in
Number Of Steps	0	

GVF Output Data		
Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.0	%
Normal Depth Over Rise	78.5	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	3.1	in
Critical Depth	4.0	in
Channel Slope	2.0	%
Critical Slope	1.0	%

3.2.1.1 Arterial Highway

Arterial highway design criteria are listed below. Table 3-1 shows the basis of design for different types of roadways.

- One travel lane (use 12' if not determined) shall be free from inundation in each direction in a 10-year storm.
- In a sump condition, one travel lane (use 12' if not determined) shall be free from inundation in each direction in a 25-year storm.
- Median and left-turn pockets shall not be considered as travel lanes.
- In places where super-elevation occurs on arterial highways, an inlet shall be provided (upstream of the point water starts to move across the lanes) as necessary to preclude drainage across the travel lanes. The catch basin shall intercept a minimum of a 10-year storm. Local depressions are not to be used for inlets at medians; grate opening or side opening/grate combination (for which future paving overlap will not create a drop) are recommended. Flooding width from median curbs in super elevated sections shall not exceed 2 feet.
- Flooding must be contained to top of curb for 10-year storm.
- In sump condition, flooding must be contained to top of curb for 25-year storm.
- 100-year flooded width shall not exceed street R/W, unless it can be demonstrated by the applicant that no adverse effect to adjacent low-lying structures is present.
- Cross street flow is not recommended

Type/Category/Feature	Design Storm		Design Water Spread		
	25-year	10-year	Shoulder or Parking Lane	½ Outer Lane	Local Standard
Arterial-Primary, multilane Speeds over 45 mph	X		X		
Arterial-Secondary, multilane Speeds 45 mph and under		X		X	
Low Volume, rural Speeds over 45 mph	X		X		
Urban Speeds 45 mph and under		X			X

Notes:
See OCPW Standard Plans for street types.

Table 3-1: Roadway Design Storm Criteria

Street Spread - 2yr

Project Description	
Solve For	Spread

Input Data	
Channel Slope	0.2 %
Discharge	4.03 cfs
Gutter Width	2.0 ft
Gutter Cross Slope	5.0 %
Road Cross Slope	3.2 %
Roughness Coefficient	0.013

Results	
Spread	11.2 ft
Flow Area	2.0 ft²
Depth	4.7 in
Gutter Depression	0.4 in
Velocity	1.98 ft/s

Street Spread - 100 Yr

Project Description	
Solve For	Spread

Input Data	
Channel Slope	0.2 %
Discharge	11.03 cfs
Gutter Width	2.0 ft
Gutter Cross Slope	5.0 %
Road Cross Slope	3.2 %
Roughness Coefficient	0.013

Results	
Spread	16.4 ft
Flow Area	4.4 ft²
Depth	6.7 in
Gutter Depression	0.4 in
Velocity	2.53 ft/s

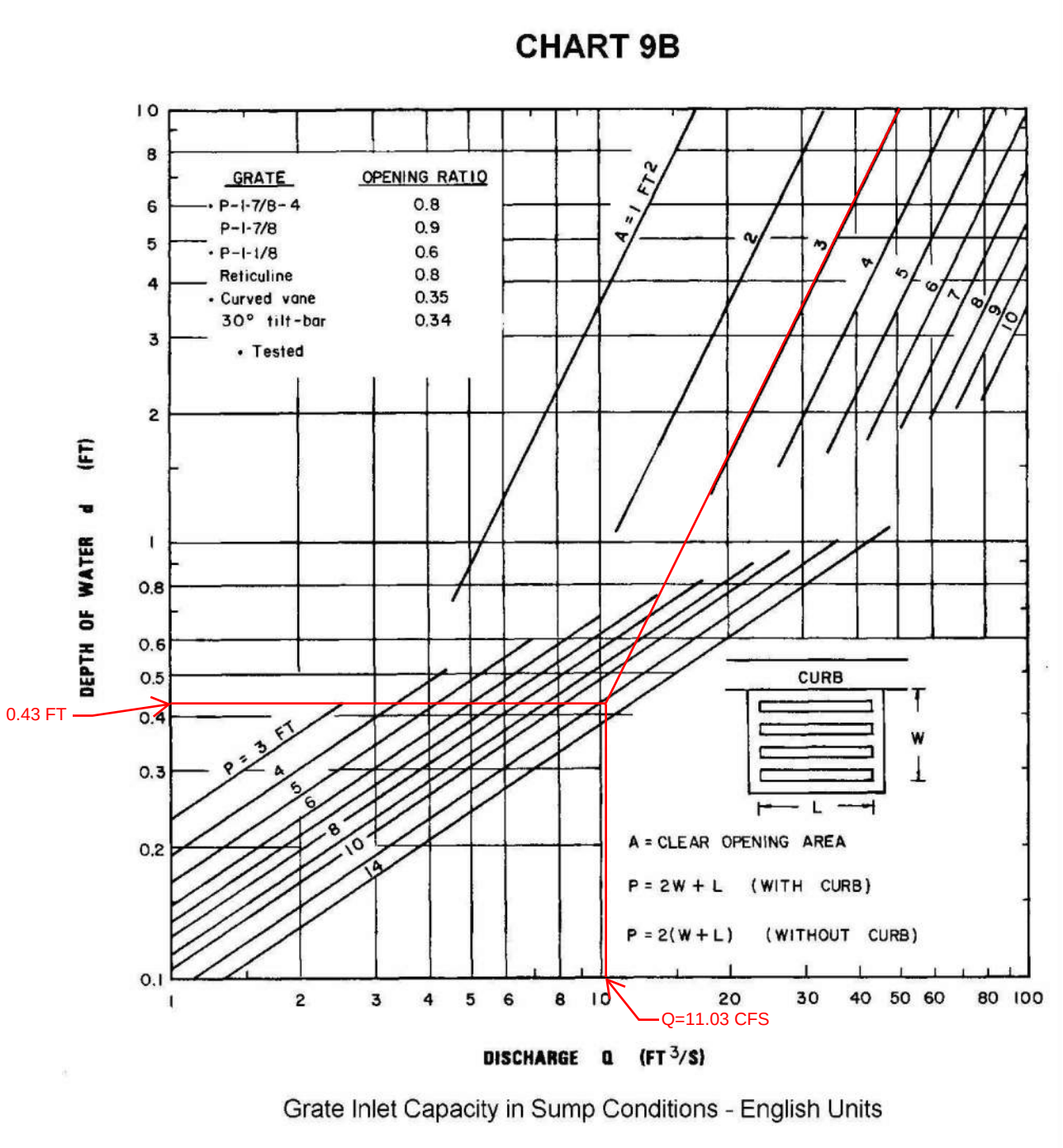


Figure 3-21: Grate Inlet Capacity in Sump Conditions Assuming No Clogging (HEC 22) (Brown, et al., 2009)

W = 2'
L = 3'
A = 6 ft^2
A = 3 ft^2 (50% clogging)

Preliminary Water Quality Management Plan (WQMP)

Project Name:

Pointe Common

1600 West Commonwealth Avenue,

Fullerton, CA 92833

Prepared for:

Meta Housing Corporation

11150 W. Olympic Blvd., Suite 620

Los Angeles, CA 90064

310-575-3543

Prepared by:

DK Engineer Corp (DKE)

Engineer ___Matt Plourde___ Registration No.___84893___

6420 Wilshire Blvd., Suite 1000

Los Angeles, CA 90048

(909) 559-7361

Prepared:

December 2022

Project Owner's Certification			
Permit/Application No.	PRJ-2022-0121	Grading Permit No.	
Tract/Parcel Map No.		Building Permit No.	
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract)			APN 030-290-22

This Water Quality Management Plan (WQMP) has been prepared for Meta Housing Corporation by DK Engineer Corp (DKE). The WQMP is intended to comply with the requirements of the local NPDES Stormwater Program requiring the preparation of the plan.

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

Owner:			
Title	Pointe Common		
Company	Meta Housing Corp, Chris Maffris, SVP		
Address	11150 W. Olympic Blvd, Suite 620 , Los Angeles, CA 90064		
Email			
Telephone #			
Signature		Date	12/12/22

Contents

Page No.

Attachments

Section I Discretionary Permit(s) and Water Quality Conditions

Provide discretionary permit and water quality information. *Refer to Section 2.1 in the Technical Guidance Document (TGD) available from the Orange County Stormwater Program (ocwatersheds.com).*

Project Infomation			
Permit/Application No.	PRJ-2022-0121	Tract/Parcel Map No./APN	030-290-22
Additional Information/ Comments:			
Water Quality Conditions			
Water Quality Conditions (list verbatim)	A Water Quality Management Plan is required for this project.		
Watershed-Based Plan Conditions			
Provide applicable conditions from watershed - based plans including WIHMPs and TMDLS.	To be determined on Final WQMP.		

Section II Project Description

II.1 Project Description

Provide a detailed project description including:

- Project areas;
- Land uses;
- Land cover;
- Design elements;
- A general description not broken down by drainage management areas (DMAs).

Include attributes relevant to determining applicable source controls. *Refer to Section 2.2 in the TGD for information that must be included in the project description.*

Description of Proposed Project				
Development Category (Verbatim from WQMP):				
Project Area (ft^2): 108,200 ft^2	Number of Dwelling Units: ___65___		SIC Code: _____	
Narrative Project Description:	The project consists of the construction of three stories of residential units. The unit count includes 62 residential units. The site is 2.5 acres and located at 1600 West Commonwealth Avenue in the City of Fullerton.			
Project Area	Pervious		Impervious	
	Area (acres or sq ft)	Percentage	Area (acres or sq ft)	Percentage
Pre-Project Conditions	107,607 sq ft	99.0%	1,087 sq ft	1.0%
Post-Project Conditions	32,053 sq ft	29.5%	76,641 sq ft	70.5%
Drainage Patterns/Connections	All roof drainage will be collected using downspouts and will flow first into one of the two on-site CDS units. After being filtered by the CDS unit, water will flow into one of two infiltration trenches. Storm water will then be infiltrated into the surrounding soil. If needed, water will overflow through the CDS units			

	into a catch basin, which will then discharge through a curb drain. No pump will be needed for overflow purposes. This existing developed site slopes from the south to the north side of the site and the runoff sheet flows off the site towards Commonwealth Avenue.

II.2 Potential Stormwater Pollutants

Determine and list expected stormwater pollutants based on land uses and site activities. *Refer to Section 2.2.2 and Table 2.1 in the TGD for guidance.*

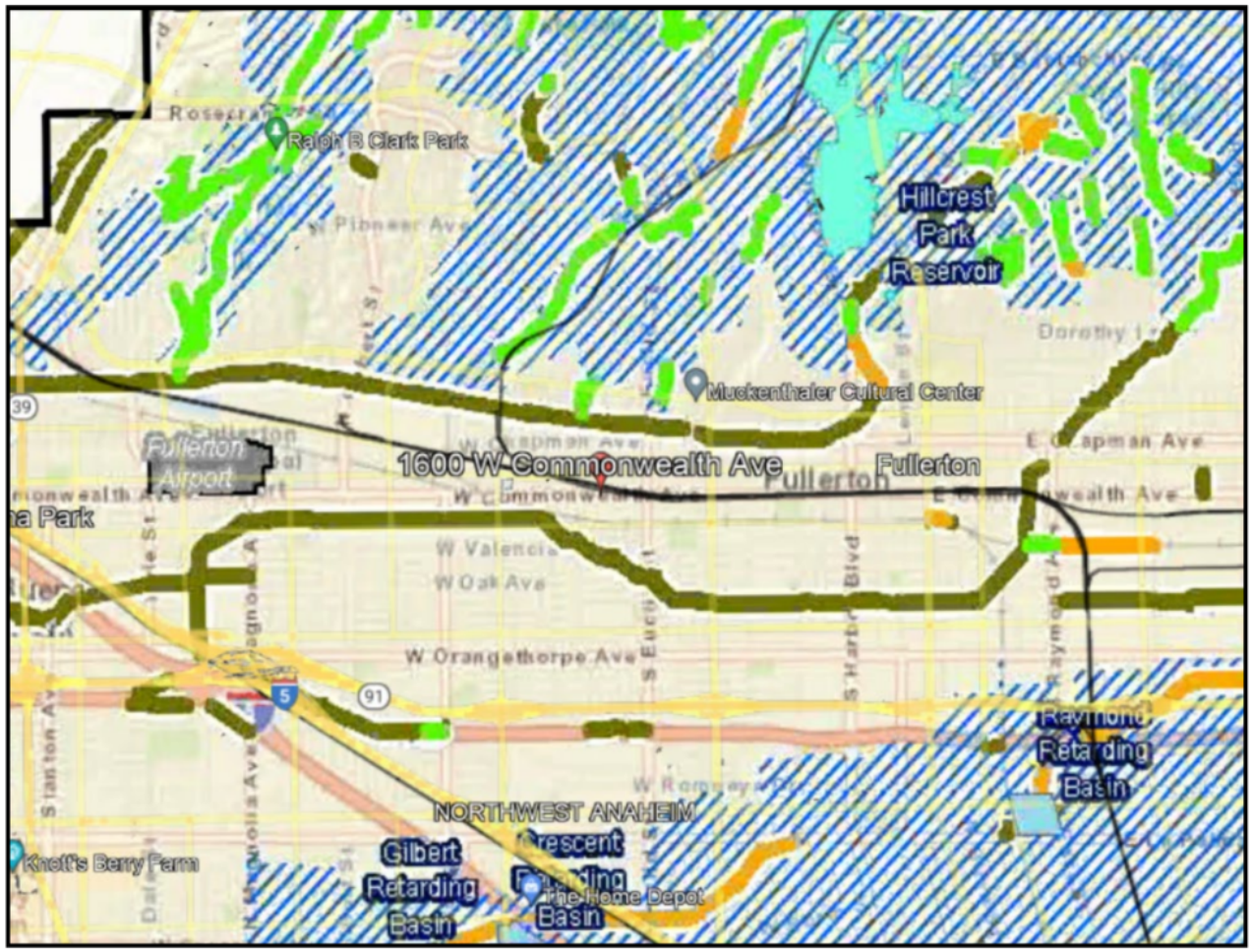
Pollutants of Concern			
Pollutant	Circle One: E=Expected to be of concern N=Not Expected to be of concern		Additional Information and Comments
Suspended-Solid/ Sediment	(E)	N	
Nutrients	(E)	N	
Heavy Metals	E	(N)	
Pathogens (Bacteria/Virus)	(E)	N	
Pesticides	(E)	N	
Oil and Grease	(E)	N	
Toxic Organic Compounds	E	(N)	
Trash and Debris	(E)	N	

II.3 Hydrologic Conditions of Concern

Determine if streams located downstream from the project area are determined to be potentially susceptible to hydromodification impacts. *Refer to Section 2.2.3.1 in the TGD for* NOC *or Section 2.2.3.2 for* <SOC>.

☒ No – Show map

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



II.4 Post Development Drainage Characteristics

Describe post development drainage characteristics. *Refer to Section 2.2.4 in the TGD.*

All roof drainage will be collected using downspouts and will flow first into one of the two on-site CDS units. After being filtered by the CDS unit, water will flow into one of two infiltration trenches. Storm water will then be infiltrated into the surrounding soil. If needed, water will overflow through the CDS units into a catch basin, which will then discharge through a curb drain. No pump will be needed for overflow purposes.

Runoff from grade level courtyards will be captured by area drains and directed by storm-drain pipe to a pump located either at the basement or outside of the proposed building and pumped to the infiltration trench.

II.5 Property Ownership/Management

Describe property ownership/management. *Refer to Section 2.2.5 in the TGD.*

To be added in the Final WQMP

Section III Site Description

III.1 Physical Setting

Fill out table with relevant information. *Refer to Section 2.3.1 in the TGD.*

Planning Area/ Community Name	Manufacturing - General
Location/Address	1600 West Commonwealth Avenue Fullerton, CA 92833
Project Area Description	The project area is a mixed-use area. To the west and south of the site are railroad tracks. To the north and east of the site are residential and commercial buildings respectively.
Land Use	The project site is currently an undeveloped lot, approximately 2.5 acres.
Zoning	M-G (Manufacturing – General)
Acreage	2.5 acres
Predominant Soil Type	B Soils

III.2 Site Characteristics

Fill out table with relevant information and include information regarding BMP sizing, suitability, and feasibility, as applicable. Refer to Section 2.3.2 in the TGD.

Precipitation Zone	0.90", Per Rainfall Zone Map XVI-1
Topography	There is some sloping on-site, with approximately 2'-3' of difference in elevation across site.
Drainage Patterns/Connections	Site slopes from the south to north of the site and sheet flows off the site towards Commonwealth Avenue.
Soil Type, Geology, and Infiltration Properties	Infiltration is viable on-site. Testing was done using the County Method and gave a measured infiltration rate of 6 in/hr on the western area of the site and 1.5 in /hr on the eastern area of the site.

Site Characteristics (continued)	
Hydrogeologic (Groundwater) Conditions	Per Geotechnical Report by GeoConcepts. Inc., dated August 23, 2022, groundwater level is approximately 42' below the surface of site.
Geotechnical Conditions (relevant to infiltration)	Soil suitable for infiltration per geotechnical report.
Off-Site Drainage	The adjacent streets drain by non-erosive methods to City storm drain inlets.
Utility and Infrastructure Information	There is an existing City storm drain line in West Commonwealth Avenue adjacent to the site.

III.3 Watershed Description

Fill out table with relevant information and include information regarding BMP sizing, suitability, and feasibility, as applicable. *Refer to Section 2.3.3 in the TGD.*

Receiving Waters	Will be determined During the final WQMP preparation.
303(d) Listed Impairments	Will be determined During the final WQMP preparation.
Applicable TMDLs	Will be determined During the final WQMP preparation.
Pollutants of Concern for the Project	Will be determined During the final WQMP preparation.
Environmentally Sensitive and Special Biological Significant Areas	Will be determined During the final WQMP preparation.

Section IV Best Management Practices (BMPs)

IV. 1 Project Performance Criteria

Describe project performance criteria. Several steps must be followed in order to determine what performance criteria will apply to a project. These steps include:

- If the project has an approved WIHMP or equivalent, then any watershed specific criteria must be used and the project can evaluate participation in the approved regional or sub-regional opportunities. The local Permittee planning or NPDES staff should be consulted regarding the existence of an approved WIHMP or equivalent.
- Determine applicable hydromodification control performance criteria. *Refer to Section 7.II-2.4.2.2 of the Model WQMP.*
- Determine applicable LID performance criteria. *Refer to Section 7.II-2.4.3 of the Model WQMP.*
- Determine applicable treatment control BMP performance criteria. *Refer to Section 7.II-3.2.2 of the Model WQMP.*
- Calculate the LID design storm capture volume for the project. *Refer to Section 7.II-2.4.3 of the Model WQMP.*

(NOC Permit Area only) Is there an approved WIHMP or equivalent for the project area that includes more stringent LID feasibility criteria or if there are opportunities identified for implementing LID on regional or sub-regional basis?	YES ☐	NO ☒
If yes, describe WIHMP feasibility criteria or regional/sub-regional LID opportunities.		

Project Performance Criteria (continued)	
If HCOC exists, list applicable hydromodification control performance criteria (Section 7.II-2.4.2.2 in MWQMP)	No HCOC
List applicable LID performance criteria (Section 7.II-2.4.3 from MWQMP)	Priority Projects must infiltrate, harvest and use, evapotranspire, or biotreat/biofilter, the 85th percentile, 24-hour storm event (Design Capture Volume). • A properly designed biotreatment system may only be considered if infiltration, harvest and use, and evapotranspiration (ET) cannot be feasibly implemented for the full design capture volume. In this case, infiltration, harvest and use, and ET practices must be implemented to the greatest extent feasible and biotreatment may be provided for the remaining design capture volume.
List applicable treatment control BMP performance criteria (Section 7.II-3.2.2 from MWQMP)	Infiltration will be utilized onsite to treat stormwater. Stormwater will be routed into two infiltration trenches.
Calculate LID design storm capture volume for Project.	<u>Total Site</u> C=%Imp * .75 + .15 Total Treatment Area = 108694 SF (2.5 Acres) C= .705 x .75 + .15 -= .68 DCV = C*d*A = 0.68*0.90in*1/12*108,694 = 5,543 ft^3

IV.2. SITE DESIGN AND DRAINAGE PLAN

Describe site design and drainage plan including

- A narrative of site design practices utilized or rationale for not using practices;
- A narrative of how site is designed to allow BMPs to be incorporated to the MEP
- A table of DMA characteristics and list of LID BMPs proposed in each DMA.
- Reference to the WQMP plot plan.
- Calculation of Design Capture Volume (DCV) for each drainage area.
- A listing of GIS coordinates for LID and Treatment Control BMPs (unless not required by local jurisdiction).

Refer to Section 2.4.2 in the TGD.

All roof drainage will be collected using downspouts and will flow first into one of the two on-site CDS units. After being filtered by the CDS unit, water will flow into one of two infiltration trenches. Storm water will then be infiltrated into the surrounding soil. If needed, water will overflow through the CDS units into a catch basin, which will then discharge through a curb drain. No pump will be needed for overflow purposes.

IV.3 LID BMP SELECTION AND PROJECT CONFORMANCE ANALYSIS

Each sub-section below documents that the proposed design features conform to the applicable project performance criteria via check boxes, tables, calculations, narratives, and/or references to worksheets. *Refer to Section 2.4.2.3 in the TGD for selecting LID BMPs and Section 2.4.3 in the TGD for conducting conformance analysis with project performance criteria.*

IV.3.1 Hydrologic Source Controls

If required HSCs are included, fill out applicable check box forms. If the retention criteria are otherwise met with other LID BMPs, include a statement indicating HSCs not required.

Name	Included?
Localized on-lot infiltration	☐
Impervious area dispersion (e.g. roof top disconnection)	☐
Street trees (canopy interception)	☐
Residential rain barrels (not actively managed)	☐
Green roofs/Brown roofs	☐
Blue roofs	☐
Impervious area reduction (e.g. permeable pavers, site design)	☐
Other: HSC not required	☒
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐

IV.3.2 Infiltration BMPs

Identify infiltration BMPs to be used in project. If design volume cannot be met state why BMPs cannot be met

Name	Included?
Bioretention without underdrains	☐
Rain gardens	☐
Porous landscaping	☐
Infiltration planters	☐
Retention swales	☐
Infiltration trenches	☒
Infiltration basins	☐
Drywells	☐
Subsurface infiltration galleries	☐
French drains	☐
Permeable asphalt	☐
Permeable concrete	☐
Permeable concrete pavers	☐
Other:	☐
Other:	☐

Show calculations below to demonstrate if the LID Design Strom Capture Volume can be met with infiltration BMPs. If not document how much can be met with infiltration and document why it is not feasible to meet the full volume with infiltration BMPs.

DCV = 5,543 CF (per section IV.1)

East Parking Lot Trench (Treats 70% of Site)

DCV= 5,543 CF * 0.7 = 3,880 CF

Trench Volume = 3,944 CF (See Contech Detail)

Trench Footprint = 73 ft x 18.5 ft = 1,350.5 SF

$K_{observed}$= 1.5 in/hr, FS= 2

K_{design}=.75 in/hr

Drawdown Time = 3,944 CF / (1,350.5 * 0.75/12) = 46.73 Hours

Western Lot Trench (Treats 30% of Site)

DCV= 5,543 CF * 0.3 = 1,663 CF

Trench Volume = 1,672 CF (See Contech Detail)

Trench Footprint = 61 ft x 9.5 ft = 579.5 SF

$K_{observed}$= 6 in/hr, FS= 2

K_{design}=3 in/hr

Drawdown Time = 1,672 CF / (579.5 * 3/12) = 11.54 Hours

See Appendix C for Infiltration Report

IV.3.3 Evapotranspiration, Rainwater Harvesting BMPs

If the full Design Storm Capture Volume cannot be met with infiltration BMPs, describe any evapotranspiration, rainwater harvesting BMPs.

Name	Included?
All HSCs; *See Section IV.3.1*	☐
Surface-based infiltration BMPs	☐
Biotreatment BMPs	☐
Above-ground cisterns and basins	☐
Underground detention	☐
Other:	☐
Other:	☐
Other:	☐

Show calculations below to demonstrate if the LID Design Strom Capture Volume can be met with evapotranspiration, rainwater harvesting BMPs in combination with infiltration BMPs. If not document how much can be met with either infiltration BMPs, evapotranspiration, rainwater harvesting BMPs, or a combination, and document why it is not feasible to meet the full volume with either of these BMPs categories.

Due to not meeting minimum TUTIA requirements or minimum Irrigation Area Thresholds, rainwater harvesting is not feasible for this site. See below for calculations.

TUTIA

Design Capture Storm Depth = .9 in

Project Type = Residential

Minimum Required TUTIA Ratio = 110

Toilet Users/Impervious Acres = 109 users/ 1.95 ac =56

Irrigation Area Thresholds

Design Capture Storm Depth = .9 in

Min. Req. Irrigation Area per Tributary Impervious Acre =1.01 Ac/Ac

Proposed Irrigation Area = .55 ac

Proposed Impervious Area = 1.95 ac

.55/1.95 = .282 < 1.01

IV.3.4 Biotreatment BMPs

If the full Design Storm Capture Volume cannot be met with infiltration BMPs, and/or evapotranspiration and rainwater harvesting BMPs, describe biotreatment BMPs. Include sections for selection, suitability, sizing, and infeasibility, as applicable.

Name	Included?
Bioretention with underdrains	☐
Stormwater planter boxes with underdrains	☐
Rain gardens with underdrains	☐
Constructed wetlands	☐
Vegetated swales	☐
Vegetated filter strips	☐

Proprietary vegetated biotreatment systems	☐
Wet extended detention basin	☐
Dry extended detention basins	☐
Other:	☐
Other:	☐

Show calculations below to demonstrate if the LID Design Strom Capture Volume can be met with infiltration, evapotranspiration, rainwater harvesting and/or biotreatment BMPs. If not document how much can be met with either infiltration BMPs, evapotranspiration, rainwater harvesting BMPs, or a combination, and document why it is not feasible to meet the full volume with either of these BMPs categories.

See section IV.3.2 for infiltation calculations

IV.3.5 Hydromodification Control BMPs

Describe hydromodification control BMPs. See Section 5 TGD. Include sections for selection, suitability, sizing, and infeasibility, as applicable. Detail compliance with Prior Conditions of Approval.

Hydromodification Control BMPs	
BMP Name	**BMP Description**

IV.3.6 Regional/Sub-Regional LID BMPs

Describe regional/sub-regional LID BMPs in which the project will participate. *Refer to Section 7.II-2.4.3.2 of the Model WQMP.*

Regional/Sub-Regional LID BMPs
None

IV.3.7 Treatment Control BMPs

Treatment control BMPs can only be considered if the project conformance analysis indicates that it is not feasible to retain the full design capture volume with LID BMPs. Describe treatment control BMPs including sections for selection, sizing, and infeasibility, as applicable.

Treatment Control BMPs	
BMP Name	**BMP Description**

IV.3.8 Non-structural Source Control BMPs

Fill out non-structural source control check box forms or provide a brief narrative explaining if non-structural source controls were not used.

Non-Structural Source Control BMPs				
Identifier	**Name**	**Check One**		**If not applicable, state brief reason**
		Included	**Not Applicable**	
N1	Education for Property Owners, Tenants and Occupants	☒	☐	
N2	Activity Restrictions	☒	☐	
N3	Common Area Landscape Management	☒	☐	
N4	BMP Maintenance	☒	☐	
N5	Title 22 CCR Compliance (How development will comply)	☒	☐	
N6	Local Industrial Permit Compliance	☐	☒	N/A
N7	Spill Contingency Plan	☐	☐	
N8	Underground Storage Tank Compliance	☐	☒	N/A
N9	Hazardous Materials Disclosure Compliance	☐	☒	N/A
N10	Uniform Fire Code Implementation	☒	☐	
N11	Common Area Litter Control	☒	☐	
N12	Employee Training	☒	☐	
N13	Housekeeping of Loading Docks	☐	☒	No loading docks on project
N14	Common Area Catch Basin Inspection	☒	☐	
N15	Street Sweeping Private Streets and Parking Lots	☐	☒	Not private street or parking lots on project.
N16	Retail Gasoline Outlets	☐	☒	N/A

IV.3.9 Structural Source Control BMPs

Fill out structural source control check box forms or provide a brief narrative explaining if Structural source controls were not used.

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

IV.4 ALTERNATIVE COMPLIANCE PLAN (IF APPLICABLE)

IV.4.1 Water Quality Credits

Determine if water quality credits are applicable for the project. *Refer to Section 3.1 of the Model WQMP for description of credits and Appendix VI of the TGD for calculation methods for applying water quality credits.*

<table>
<tr><th colspan="5">Description of Proposed Project</th></tr>
<tr><td colspan="5">Project Types that Qualify for Water Quality Credits (Select all that apply):</td></tr>
<tr><td colspan="2">☐Redevelopment projects that reduce the overall impervious footprint of the project site.</td><td colspan="2">☐Brownfield redevelopment, meaning redevelopment, expansion, or reuse of real property which may be complicated by the presence or potential presence of hazardous substances, pollutants or contaminants, and which have the potential to contribute to adverse ground or surface WQ if not redeveloped.</td><td>☐ Higher density development projects which include two distinct categories (credits can only be taken for one category): those with more than seven units per acre of development (lower credit allowance); vertical density developments, for example, those with a Floor to Area Ratio (FAR) of 2 or those having more than 18 units per acre (greater credit allowance).</td></tr>
<tr><td colspan="2">☐ Mixed use development, such as a combination of residential, commercial, industrial, office, institutional, or other land uses which incorporate design principles that can demonstrate environmental benefits that would not be realized through single use projects (e.g. reduced vehicle trip traffic with the potential to reduce sources of water or air pollution).</td><td colspan="2">☐ Transit-oriented developments, such as a mixed use residential or commercial area designed to maximize access to public transportation; similar to above criterion, but where the development center is within one half mile of a mass transit center (e.g. bus, rail, light rail or commuter train station). Such projects would not be able to take credit for both categories, but may have greater credit assigned</td><td>☐ Redevelopment projects in an established historic district, historic preservation area, or similar significant city area including core City Center areas (to be defined through mapping).</td></tr>
<tr><td>☐Developments with dedication of undeveloped portions to parks, preservation areas and other pervious uses.</td><td>☐ Developments in a city center area.</td><td>☐ Developments in historic districts or historic preservation areas.</td><td>☐ Live-work developments, a variety of developments designed to support residential and vocational needs together – similar to criteria to mixed use development; would not be able to take credit for both categories.</td><td>☐In-fill projects, the conversion of empty lots and other underused spaces into more beneficially used spaces, such as residential or commercial areas.</td></tr>
<tr><td>Calculation of Water Quality Credits
(if applicable)</td><td colspan="4">The entire DCV is being treated by LID BMPs. Water quality credits will not be used.</td></tr>
</table>

IV.4.2 Alternative Compliance Plan Information

Describe an alternative compliance plan (if applicable). Include alternative compliance obligations (i.e., gallons, pounds) and describe proposed alternative compliance measures. *Refer to Section 7.II 3.0 in the WQMP.*

N/A

Section V Inspection/Maintenance Responsibility for BMPs

Fill out information in table below. Prepare and attach an Operation and Maintenance Plan. Identify the mechanism through which BMPs will be maintained. Inspection and maintenance records must be kept for a minimum of five years for inspection by the regulatory agencies. *Refer to Section 7.II 4.0 in the Model WQMP.*

BMP Inspection/Maintenance			
BMP	**Reponsible Party(s)**	**Inspection/ Maintenance Activities Required**	**Minimum Frequency of Activities**
Infiltration Trench	To be determined	Infiltration trench inspection/maintenance will consist of the following: 1. The condition of the unit will be checked after the first several runoff events after installation. The visual inspection will ascertain that the unit is functioning properly (no blockages or obstructions to inlet and/or separation screen), measuring the amount of solid materials that have accumulated in the sump, the amount of fine sediment accumulated behind the screen, and determining the amount of floating trash and debris in the separation chamber. 2. Floatables will be removed and the sump cleaned when the sump is above 75%-85% full of solids. At least once a year, the unit will be pumped down and the screen inspected for	1. Inspect before and after storm events. 2. Inspect a minimum of two times a year. Check overflow and curb drains are free of debris and clogs. 3. If standing water is observed 48 hours after a storm event, excavate and replace the top 12" of draining soil constituting the filtration area.

		damage and to ensure that it is properly fastened. If the screen is damaged, it will be replaced or repaired. 3. Legibility of stencils and/or signs at all storm drain inlets and catch basins within the project area must be maintained at all time. 4. Maintain a log of all inspections and maintenance performed on the CDS unit.	

BMP Inspection/Maintenance			
BMP	**Reponsible Party(s)**	**Inspection/ Maintenance Activities Required**	**Minimum Frequency of Activities**

Section VI Site Plan and Drainage Plan

See attached 30"x42" Grading Plan (site plan) C1.30

See attached 30"x42" Utility Plan C1.40

VI.1 SITE PLAN AND DRAINAGE PLAN

Include a site plan and drainage plan sheet set containing the following minimum information:

- Project location
- Site boundary
- Land uses and land covers, as applicable
- Suitability/feasibility constraints
- Structural BMP locations
- Drainage delineations and flow information
- Drainage connections
- BMP details

VI.2 ELECTRONIC DATA SUBMITTAL

The minimum requirement is to provide submittal of PDF exhibits in addition to hard copies. Format must not require specialized software to open.

If the local jurisdiction requires specialized electronic document formats (CAD, GIS) to be submitted, this section will be used to describe the contents (e.g., layering, nomenclature, georeferencing, etc.) of these documents so that they may be interpreted efficiently and accurately

Section VII Educational Materials

Refer to the Orange County Stormwater Program (ocwatersheds.com) for a library of materials available. For the copy submitted to the Permittee, only attach the educational materials specifically applicable to the project. Other materials specific to the project may be included as well and must be attached.

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

ATTACHMENT A

ATTACHMENT B

SUBJECT TO FURTHER REVISION

LEGEND

- Orange County Precipitation Stations
- 24 Hour, 85th Percentile Rainfall (Inches)
- 24 Hour, 85th Percentile Rainfall (Inches) - Extrapolated
- City Boundaries

Rainfall Zones

Design Capture Storm Depth (inches)

- 0.65"
- 0.7
- 0.75
- 0.80
- 0.85
- 0.90
- 0.95
- 1.00
- 1.10"

Note: Events defined as 24-hour periods (calendar days) with greater than 0.1 inches of rainfall.
For areas outside of available data coverage, professional judgment shall be applied.

0.65 0.7 0.75 0.8 0.85 0.9 0.95 1 1.05 1.1

PROJECT SITE

LOS ANGELES COUNTY
ORANGE COUNTY
SAN BERNARDINO COUNTY
RIVERSIDE COUNTY
San Diego County

0 3 6 12 Kilometers
0 1.8 3.6 7.2 Miles

P:\9526E\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-1_RainfallZones_20110215.mxd

TITLE: RAINFALL ZONES

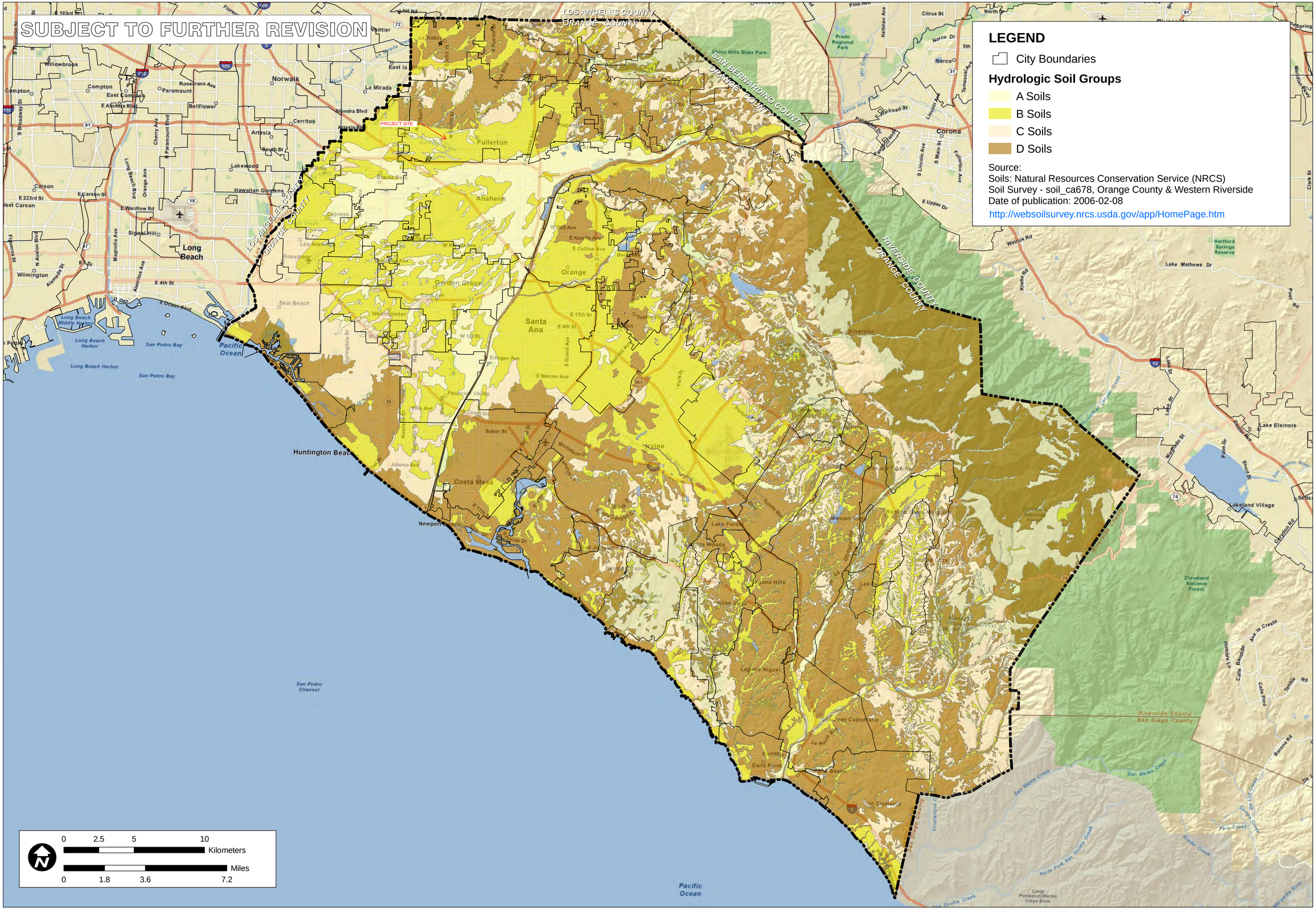
JOB: ORANGE COUNTY TECHNICAL GUIDANCE DOCUMENT — ORANGE CO. CA

SCALE	1" = 1.8 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/22/10
JOB NO.	9526-E

PACE Advanced Water Engineering

FIGURE XVI-1

SUBJECT TO FURTHER REVISION



LEGEND

- City Boundaries

Hydrologic Soil Groups

- A Soils
- B Soils
- C Soils
- D Soils

Source:
Soils: Natural Resources Conservation Service (NRCS)
Soil Survey - soil_ca678, Orange County & Western Riverside
Date of publication: 2006-02-08
http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

0 2.5 5 10 Kilometers
0 1.8 3.6 7.2 Miles

P:\95226E\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\95226E_FigureXVI-2a_HydroSoils_20110215.mxd

TITLE
NRCS HYDROLOGIC SOILS GROUPS

JOB
ORANGE COUNTY INFILTRATION STUDY
ORANGE CO. CA

SCALE	1" = 1.8 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	02/09/11
JOB NO.	95226-E

PACE
Advanced Water Engineering

FIGURE
XVI-2a

SUBJECT TO FURTHER REVISION

LEGEND

- Depth To First Groundwater Contours
- City Boundaries
- OCWD Groundwater Basin Protection Boundary

Note: Data are not available for South Orange County at this time.

Source:
Sprotte, Fuller and Greenwood, 1980.
California Division of Mines and Geology;
California Geological Survey

LOS ANGELES COUNTY
ORANGE COUNTY

SAN BERNARDINO COUNTY
ORANGE COUNTY

RIVERSIDE COUNTY
ORANGE COUNTY

PROJECT SITE

0 2 4 8 Kilometers
0 1.25 2.5 5 Miles

TITLE
NORTH ORANGE COUNTY
MAPPED DEPTH TO FIRST
GROUNDWATER

JOB
ORANGE COUNTY
INFILTRATION STUDY
ORANGE CO. CA

SCALE	1" = 1.25 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	02/09/11
JOB NO.	9526-E

PACE
Advanced Water Engineering

FIGURE
XVI-2d

P:\9526E\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-2d_DepthToGroundwaterOverview_20110215.mxd

SUBJECT TO FURTHER REVISION

PROJECT SITE

LOS ANGELES COUNTY
ORANGE COUNTY

SAN BERNARDINO COUNTY
ORANGE COUNTY

RIVERSIDE COUNTY
ORANGE COUNTY

LEGEND

- City Boundaries
- OCWD Groundwater Basin Protection Boundary

Plume Protection Boundaries

- North Basin Groundwater Protection Project
- South Basin Groundwater Protection Project
- El Toro Marine Base
- Tustin Marine Air Base
- Approximate Selenium Contamination Area

Note: Individual contamination sites are not plotted.
See State Water Resources Control Board Geotracker database (http://geotracker.waterboards.ca.gov),
Department of Toxic Substance Control Envirostor database (http://www.envirostor.dtsc.ca.gov) and other applicable sources for current listing of active contaminated sites.

Groundwater basin and plume protection boundaries for South Orange County are not shown on this exhibit at this time

0 2 4 8 Kilometers

0 1.25 2.5 5 Miles

P:\9526E\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-2f_NorthOCGroundwaterProtectionAreasStreetMap_20110215.mxd

TITLE

NORTH ORANGE COUNTY GROUNDWATER PROTECTION AREAS

ORANGE COUNTY INFILTRATION STUDY

CA

JOB

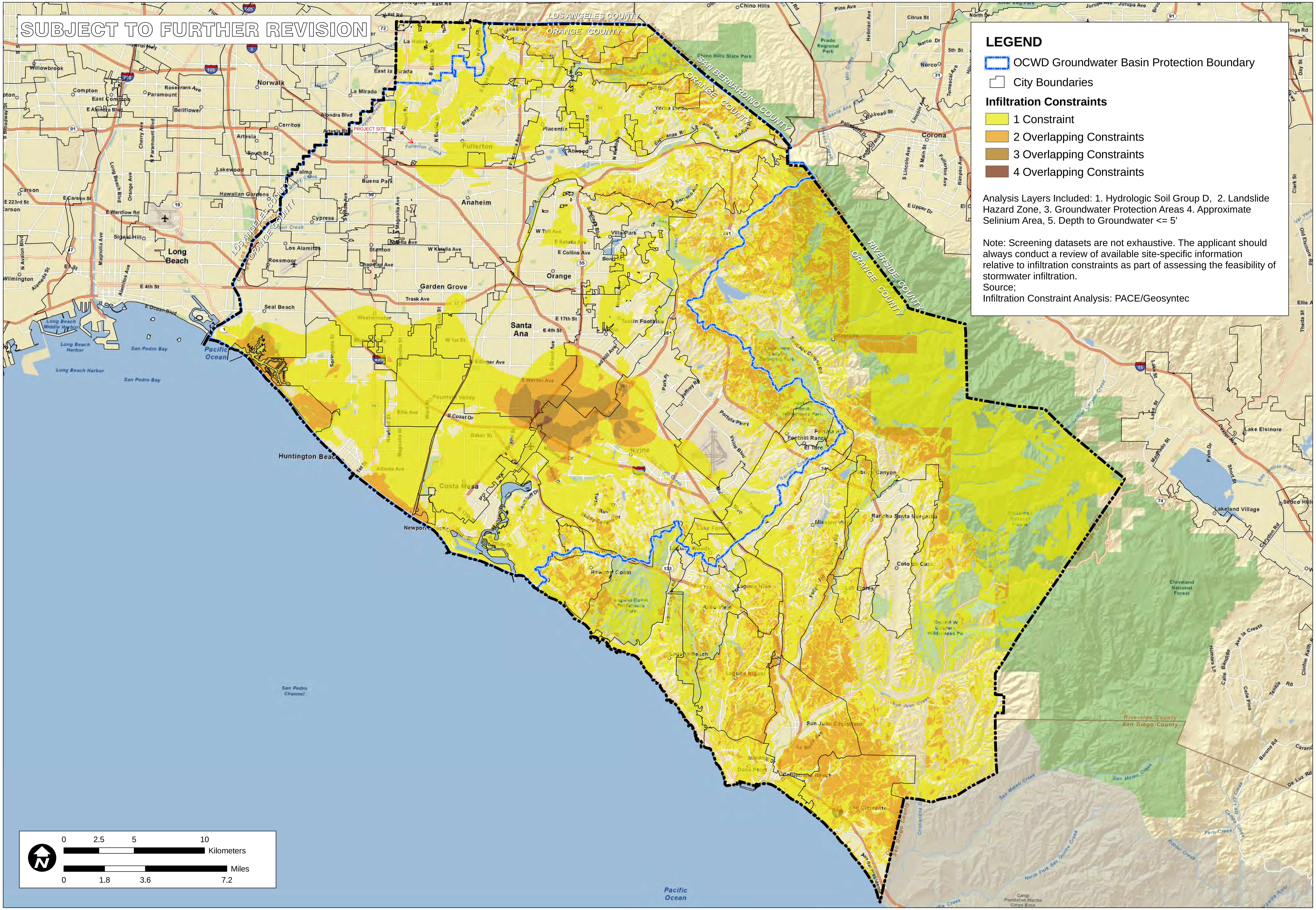
ORANGE CO.

SCALE	1" = 1.25 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/22/10
JOB NO.	9526-E

PACE
Advanced Water Engineering

FIGURE

XVI-2f



TITLE

INFILTRATION ANALYSIS OVERLAPPING CONSTRAINT LOCATIONS

JOB

ORANGE COUNTY INFILTRATION STUDY

ORANGE CO. CA

SCALE	1" = 1.8 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/22/10
JOB NO.	9526-E

PACE Advanced Water Engineering

FIGURE

XVI-2g

P:\9526E\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-2g_InfiltrationFinal_20110215.mxd

Susceptibility

Potential Areas of Erosion, Habitat, & Physical Structure Susceptibility

Channel Type

- Earth (Unstable)
- Earth (Stabilized)
- Stabilized

Tidel Influence

- <= Mean High Water Line (4.28')

Water Body

- Basin
- Lake
- Reservoir

Other Lands

- Airport/Military

Los Angeles County

PROJECT SITE

Fullerton Airport

Humble Reservoir

Orange County

Valencia Reservoir

Brea Creek Reservoir

Fullerton Reservoir

Loftus Diversion Channel Desilting Basin

Fullerton Reservoir

Fullerton Reservoir

Hillcrest Park Reservoir

Miller Retarding Basin

La Jolla Recharge Basin

Kraemer Basin

Placentia Retarding Basin

Raymond Retarding Basin

Gilbert Retarding Basin

Crescent Retarding Basin

Cypress Retarding Basin

Channel in Retarding Basin

Rossmoor Retarding Basin

Los Alamitos Retarding Basin

Los Alamitos Naval Air Station

Seal Beach Naval Weapons Station

Santa River Watershed

Anaheim Bay-Huntington Harbor Watershed

Newport Bay-Newport Coastal Streams Watershed

0 8,000 16,000 Feet

P:\9526E\6-GIS\Mxds\SuceptabilityMaps_20100505\9526E_SanGabrielCoyoteCreekSusceptibility_20100430.mxd

TITLE: SUSCEPTIBILITY ANALYIS SAN GABRIEL-COYOTE CREEK

JOB: ORANGE COUNTY WATERSHED MASTER PLANNING ORANGE CO. CA

SCALE	1" = 8000'
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/30/10
JOB NO.	9526-E

PACE Advanced Water Engineering

ATTACHMENT C

GeoConcepts INC
Geology - Geotechnical Engineering

November 7, 2022 Project 22-02182

Meta Housing Corporation
Attn: Destiny Clara
11150 W. Olympic Blvd., Suite 620
Los Angeles, CA 90064

Subject: **INFILTRATION TEST REPORT**
1600 W. Commonwealth Avenue
Fullerton, California

References:

1) Preliminary Geologic and Soils Engineering report by GeoConcepts, Inc. covering the subject site, dated August 23, 2022.

Dear Ms. Clara:

Pursuant to your request, presented herein is a summary of the findings from logging and performing infiltration tests for the proposed subsurface infiltration system. It is our understanding that the proposed infiltration system will be designed to infiltrate first storm runoff into the ground as shown on the attached Plot Map. It is our understanding that the proposed infiltration trenches will be about seven feet below the existing grade. Three test pits were excavated to a depth of six feet on October 25, 2022. The test pit locations are plotted on the attached Plot Map.

The test pits encountered fill and alluvium to the depth of the test pit logging. Encountered fill had a thickness of 0.5 feet and consists predominantly of sand with minor gravels. Encountered alluvium deposits consist predominantly of silty sand to sandy silt with minor clay binder. These soils are considered relatively homogenous in that no discernible layering, structure, fabric, texture, or changes in the soil type was encountered that would affect the rate or direction of water movement.

There is no evidence of near-surface groundwater. Highest historic groundwater onsite obtained from the State of California Seismic Hazard Zone maps is about 20 feet deep. The subject site is located within a liquefaction zone on the State of California Seismic Hazard Zones Map of the Fullerton Quadrangle.

The infiltration testing was performed in the bottom of the test pit utilizing the County Method. The results of the testing are below.

Test Pit No.	Measured Infiltration Rate (in/hour)	Test Material	Tested Depth (ft)
1	1.5	Qal	7
2	6	Qal	7
3	6	Qal	7

This testing was performed using metropolitan water from a garden hose. Therefore, the rates will vary over time. It is recommended that conventional drainage systems be incorporated into the design of the project as a backup to ensure proper drainage of the site.

The proposed infiltration trenches shall be located a minimum of ten feet from adjacent private property lines as well as any existing or proposed structures and shall contain an overflow drain that conducts the overflow drainage to the street.

The following infiltration design guidelines are considered as minimums:

1. Water infiltration into the ground must be a minimum of 10 feet above the groundwater table.

2. The distance between the infiltration facility and the adjacent private property line shall be a minimum of 10 feet. Note if any buildings, subterranean walls or deep basements exist on the adjacent property a greater distance may be required

3. Foundations shall be set back a minimum of 10 feet from the infiltration facility and the bottom of the footing shall be a minimum of 10 feet from expected zone of saturation.

4. No infiltration facility shall be placed to infiltrate into fill material.

5. The infiltration facility shall be designed to overflow to the street in the event that the drainage capacity is exceeded or in case of future failure to adequately infiltrate.

Findings

1. Based on the relatively homogeneous nature of the soils infiltration at the subject site has minimal potential for creating a perched water condition that may adversely affect structures.

2. Infiltration in the area depicted on the Plot Map will not saturate soils supported by retaining/basement walls.

3. Expansive soils are not present in the area of the proposed infiltration. Based on the distance between the proposed infiltration area and the structures the structures will not be adversely affected by the infiltration.

4. The soils encountered in the explorations are not anticipated to be subject to hydroconsolidation that may adversely affect structures.

5. The soils encountered in the explorations are not anticipated to be subject to ground settlement due to saturation from infiltration, possibly resulting in distress to structures.

Conclusions

1. The proposed site is considered suitable for stormwater infiltration at or below a depth of seven feet.

2. The infiltration of stormwater will not result in ground settlement that could adversely affect structures, either on or adjacent to the site.

3. The infiltration of stormwater will not result in soil saturation that could affect retaining/basement structures.

Should you have any questions regarding this report, please do not hesitate to contact the undersigned at your convenience.

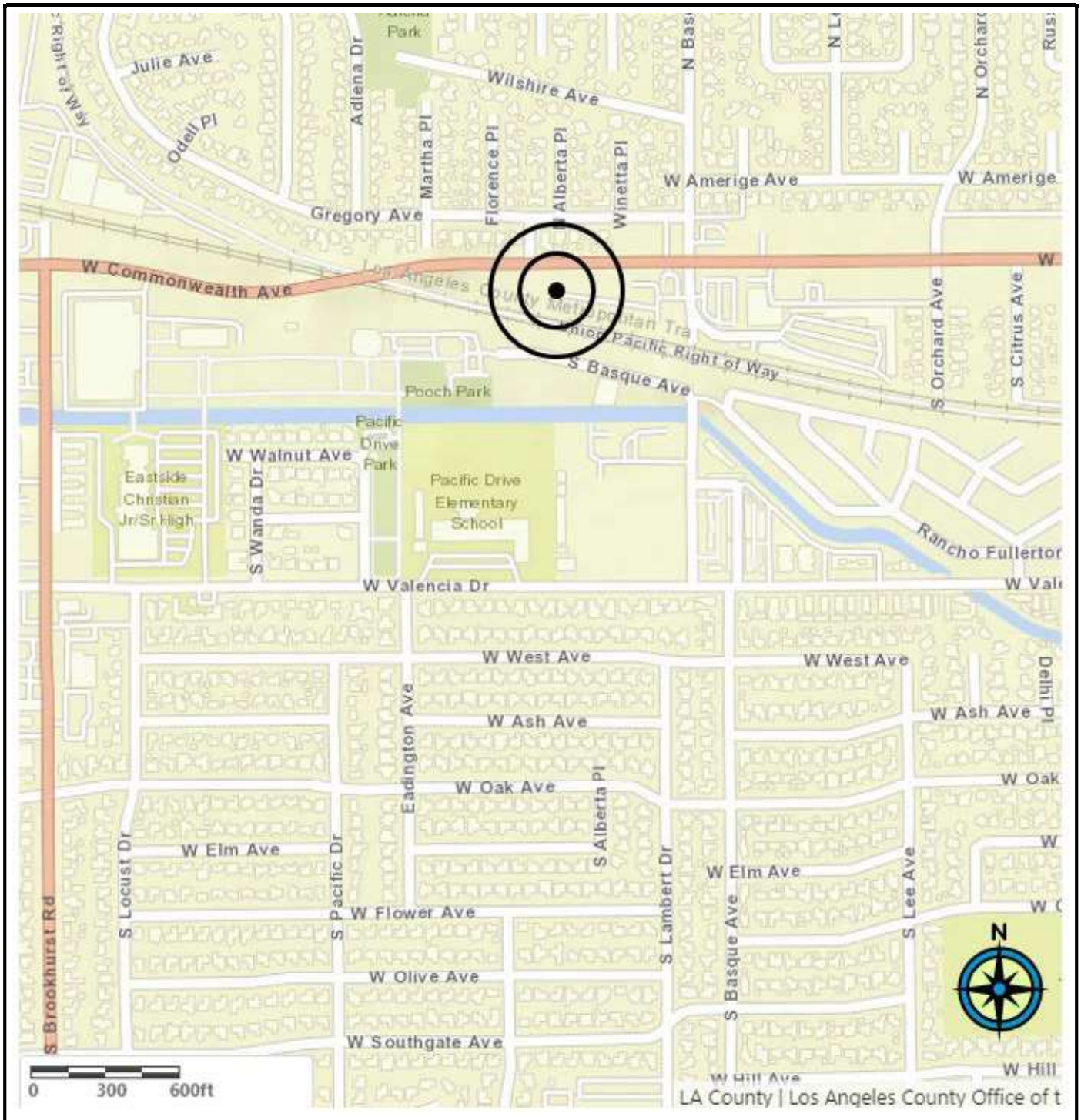
Respectfully submitted,
GEOCONCEPTS, INC.

Raffi Dermendjian
Project Engineer
PE C. 88261
RD: 22-02182-2

Enclosures: Location Maps
Test Pit Logs
Plot Map

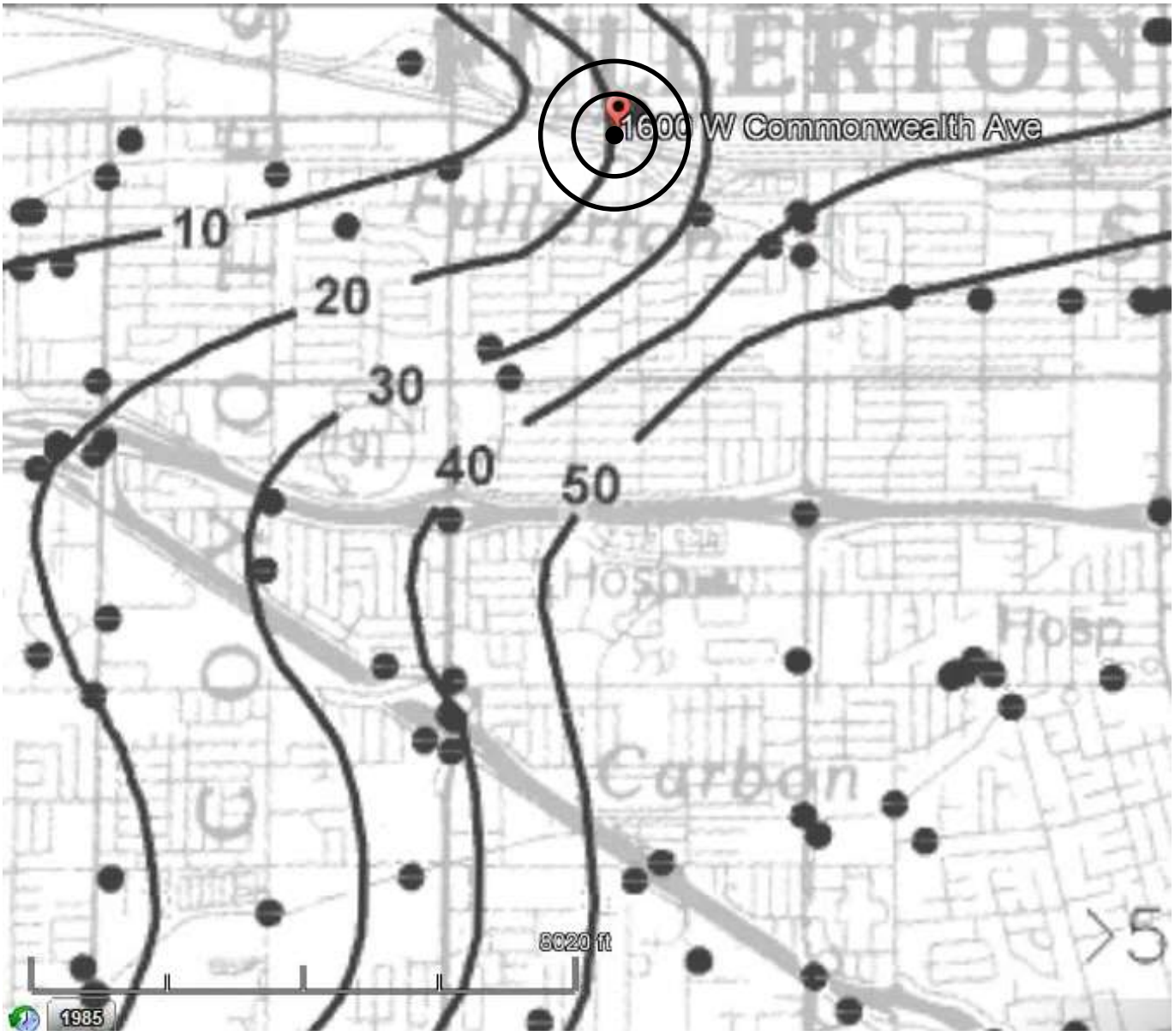
Distribution: (1) Addressee

LOCATION



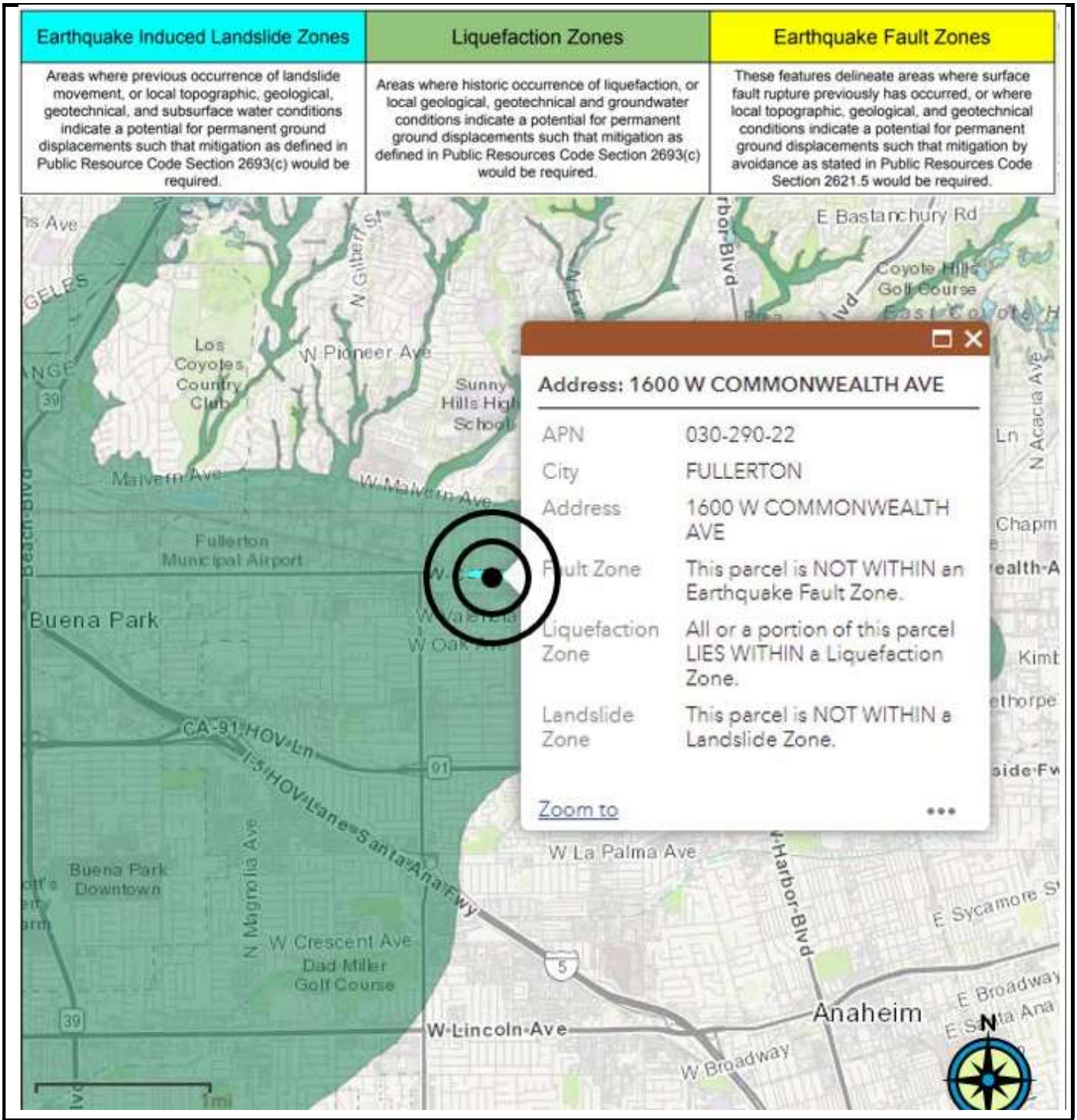
Reference:	GIS-Net
Project Address:	1600 W. Commonwealth Ave. Fullerton, CA

GROUNDWATER LEVEL MAP



Reference:	State of California Seismic Hazard Zone Reports: Quadrangle	Scale: As Shown
Project Address:	1600 W. Commonwealth Ave. Fullerton, CA	

SEISMIC HAZARD MAP



Reference:	California Geological Survey, Seismic Hazard Map https://maps.conservation.ca.gov/cgs/DataViewer/index.html	Scale: As Shown
Project Address:	1600 W. Commonwealth Ave. Fullerton, CA	

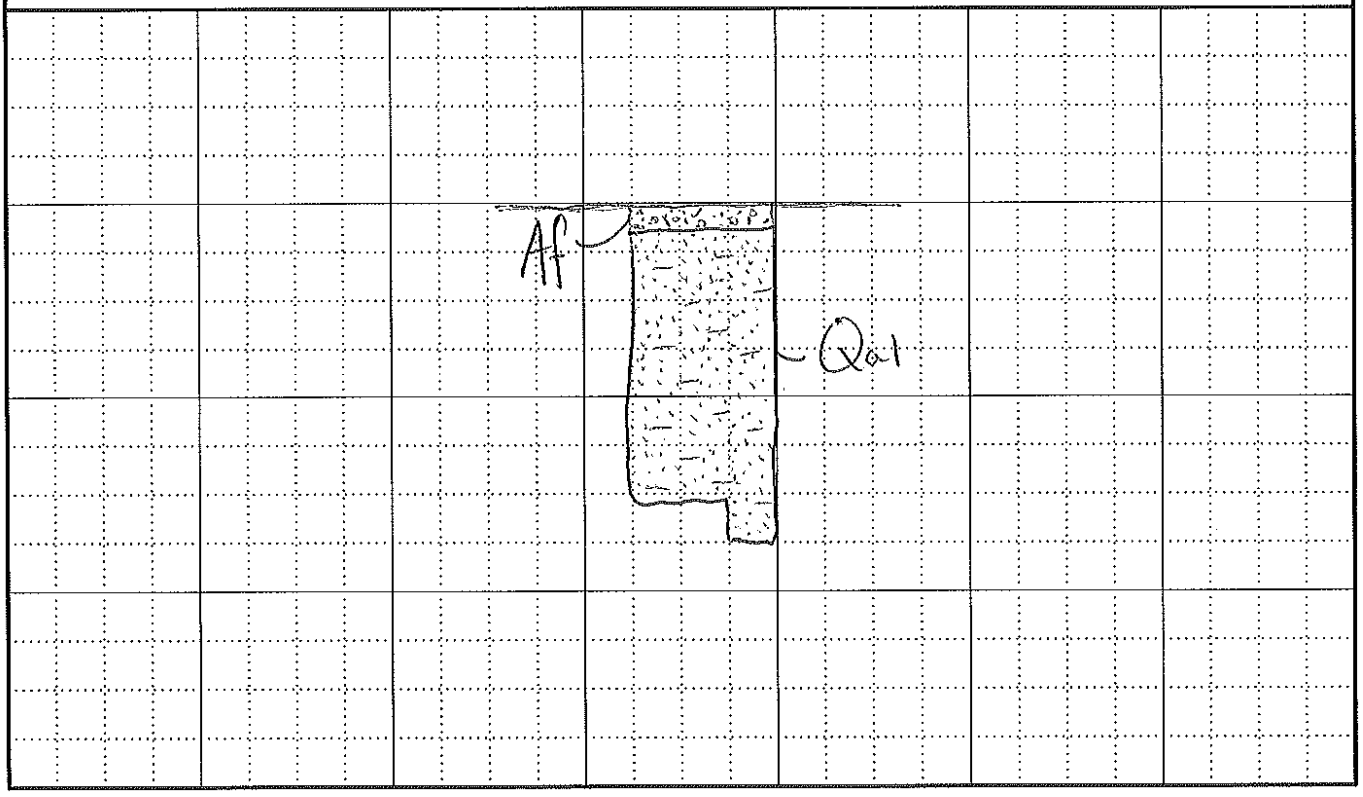
EXPLORATION: ITP-1

PROJECT: 1600 W. Commonwealth Ave | PROJECT NO.: 22-02182

DATE: October 25, 2022 | LOGGED BY: VG

ATTITUDE	DESCRIPTION
	0.0' - 6.0" **ARTIFICIAL FILL, Af,** sand with minor gravels, gray white to light brown, slightly moist to dry, hard/dense, few cement fragments
	6.0" - 7.0' **ALLUVIUM, Qal,** sandy silt to sandy sand with minor clay binder, dark brown, slightly moist, dense, fine grained
fo - foliation s - shear j - joint b - bedding	Total Depth 7.0 Feet, No Groundwater, No Caving

SCALE 1"=4' **GENERALIZED PROFILE**



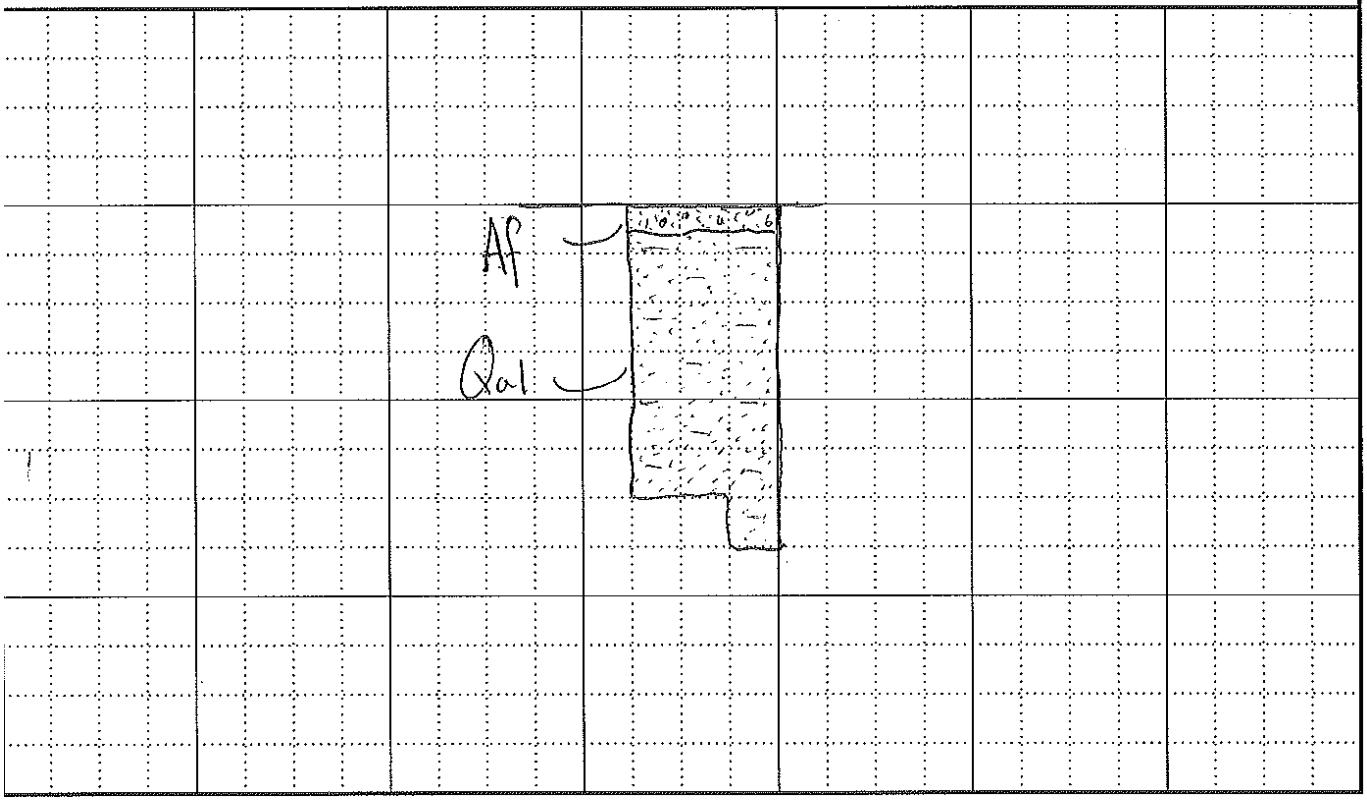
EXPLORATION: ITP-2

PROJECT: 1600 W. Commonwealth Ave | PROJECT NO.: 22-02182

DATE: October 25, 2022 | LOGGED BY: VG

ATTITUDE	DESCRIPTION
	0.0' - 6.0" **ARTIFICIAL FILL, Af,** sand with minor gravels, gray white to light brown, slightly moist to dry, hard/dense, few cement fragments 6.0" - 7.0' **ALLUVIUM, Qal,** sandy silt to sandy sand with minor clay binder, dark brown, slightly moist, dense, fine grained
fo - foliation s - shear j - joint b - bedding	Total Depth 7.0 Feet, No Groundwater, No Caving

SCALE 1"=4' **GENERALIZED PROFILE**



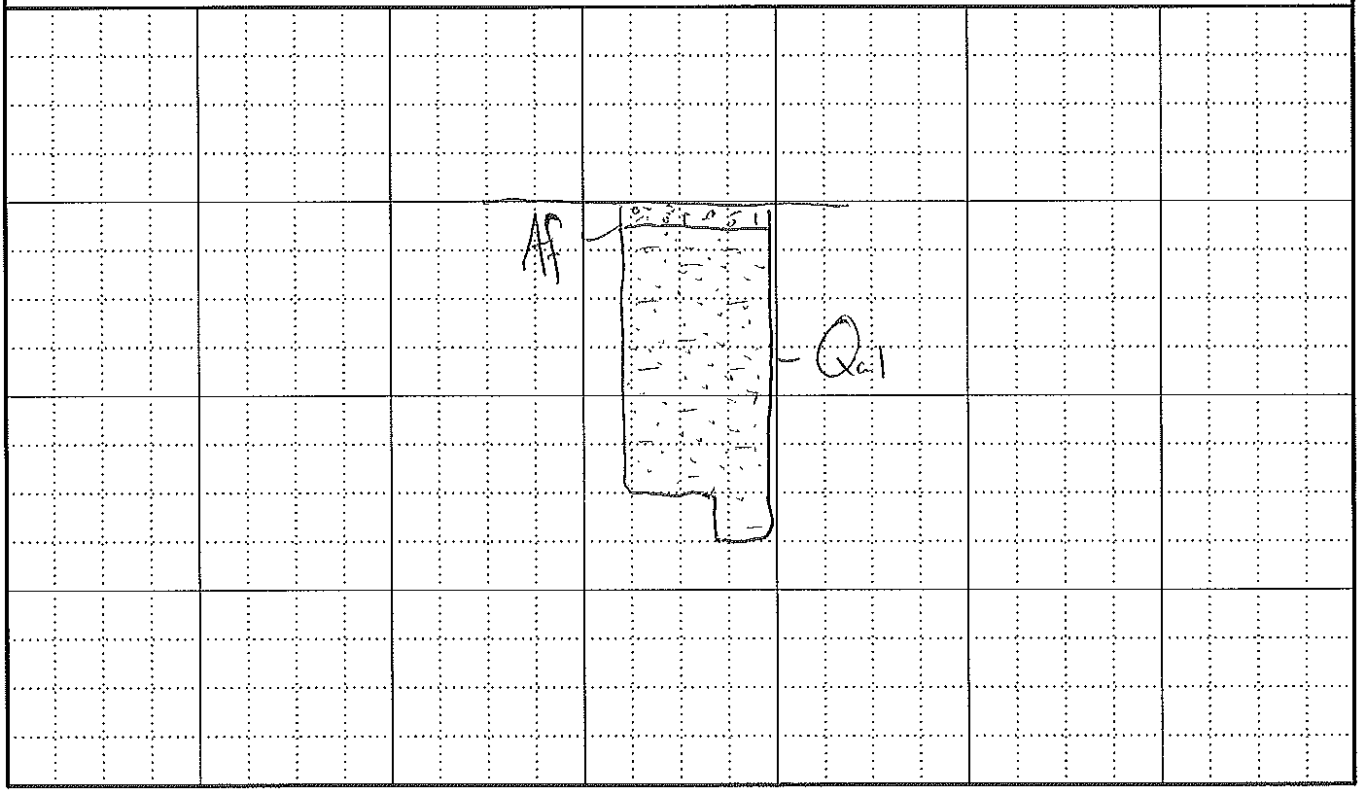
EXPLORATION: ITP-3

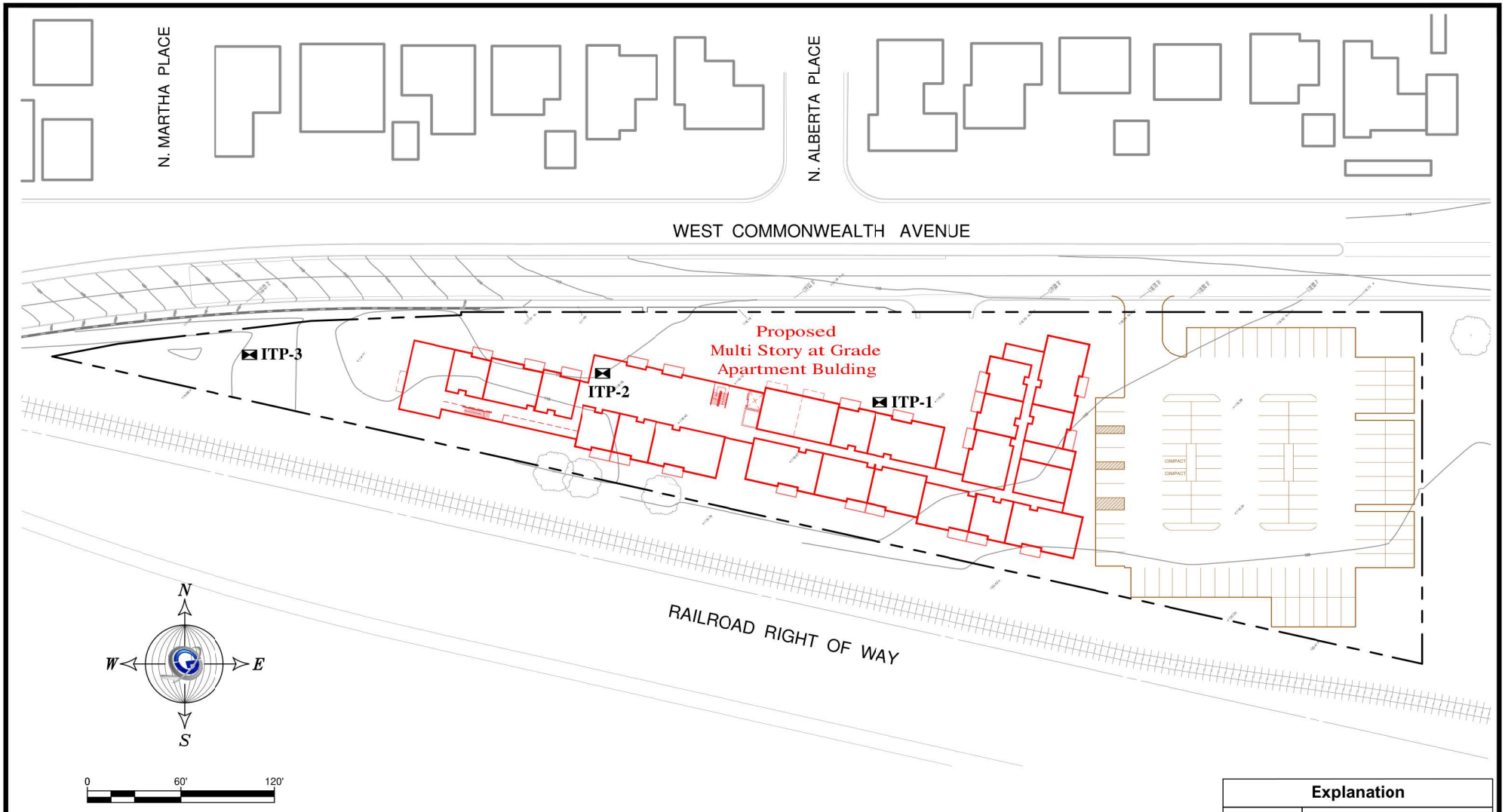
PROJECT: 1600 W. Commonwealth Ave | PROJECT NO.: 22-02182

DATE: October 25, 2022 | LOGGED BY: VG

ATTITUDE	DESCRIPTION
	0.0' - 6.0" **ARTIFICIAL FILL, Af,** sand with minor gravels, gray white to light brown, slightly moist to dry, hard/dense, few cement fragments
	6.0" - 7.0' **ALLUVIUM, Qal,** sandy silt to sandy sand with minor clay binder, dark brown, slightly moist, dense, fine grained
fo - foliation s - shear j - joint b - bedding	Total Depth 7.0 Feet, No Groundwater, No Caving

SCALE 1"=4' **GENERALIZED PROFILE**





GeoConcepts INC
Geology - Geotechnical Engineering
14428 Hamlin Street, Suite 200,Van Nuys, CA 91401
Ph (818) 994-8895 | Fax (818) 994-8599 | www.GeoConceptsInc.com

Description:
Plot Map

Base Map Provided By:
Hahn and Associates, Inc.

Project Address:
1600 West Commonwealth Avenue
Fullerton, California

Date: Nov. 2022
Scale: 1" = 60'
Job No. 22-02182-2

Worksheet B: Simple Design Capture Volume Sizing Method

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.90	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.90	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	2.5	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	.705	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	.68	
4	Calculate runoff volume, V_{design}= *(C x* $d_{remainder}$ *x A x 43560 x (1/12))*	V_{design}=	5,543	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate				
1	Enter measured infiltration rate, $K_{observed}$[1] (in/hr) (**Appendix VII**)	$K_{observed}$=	1.5	In/hr
2	Enter combined safety factor from Worksheet H, S_{total} (unitless)	S_{total}=	2	
3	Calculate design infiltration rate, $K_{design} = K_{observed} / S_{total}$	K_{design}=	.75	In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=	48	Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=	3	feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=	1,848	sq-ft

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

Worksheet H: Factor of Safety and Design Infiltration Rate and Worksheet

EAST INFILTRATION TRENCH

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25	1	.25
		Predominant soil texture	0.25	2	0.5
		Site soil variability	0.25	2	0.5
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1.50
B	Design	Tributary area size	0.25	2	0.5
		Level of pretreatment/ expected sediment loads	0.25	1	.25
		Redundancy	0.25	1	.25
		Compaction during construction	0.25	1	.25
		Design Safety Factor, $S_B = \Sigma p$			1.25
Combined Safety Factor, $S_{Total} = S_A \times S_B$					1.875
Observed Infiltration Rate, inch/hr, $K_{observed}$ (corrected for test-specific bias)					1.5
Design Infiltration Rate, in/hr, $K_{DESIGN} = K_{Observed} / S_{Total}$					2

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

Three test pits were excavated to a depth of six feet on October 25,2022. Infiltration testing was performed using the County Method in the bottom of the pits. See attached Geotechnical report for details.

Note: The minimum combined adjustment factor shall not be less than 2.0 and the maximum combined adjustment factor shall not exceed 9.0.

Worksheet H: Factor of Safety and Design Infiltration Rate and Worksheet

WEST INFILTRATION TRENCH

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25	1	.25
		Predominant soil texture	0.25	2	0.5
		Site soil variability	0.25	2	0.5
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1.50
B	Design	Tributary area size	0.25	2	0.5
		Level of pretreatment/ expected sediment loads	0.25	1	.25
		Redundancy	0.25	1	.25
		Compaction during construction	0.25	1	.25
		Design Safety Factor, $S_B = \Sigma p$			1.25

Combined Safety Factor, $S_{Total} = S_A \times S_B$	1.875
Observed Infiltration Rate, inch/hr, $K_{observed}$ (corrected for test-specific bias)	6
Design Infiltration Rate, in/hr, $K_{DESIGN} = K_{Observed} / S_{Total}$	3

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

Three test pits were excavated to a depth of six feet on October 25,2022. Infiltration testing was performed using the County Method in the bottom of the pits. See attached Geotechnical report for details.

Note: The minimum combined adjustment factor shall not be less than 2.0 and the maximum combined adjustment factor shall not exceed 9.0.

Worksheet I: Summary of Groundwater-related Feasibility Criteria

EAST INFILTRATION TRENCH

1	Is project large or small? (as defined by **Table VIII.2**) circle one	(Large)		Small
2	What is the tributary area to the BMP?	A	1.75	acres
3	What type of BMP is proposed?	Infiltration Trench		
4	What is the infiltrating surface area of the proposed BMP?	A_{BMP}	1,350.5	sq-ft
5	What land use activities are present in the tributary area (list all) RESIDENTIAL			
6	What land use-based risk category is applicable?	L	(M)	H
7	If M or H, what pretreatment and source isolation BMPs have been considered and are proposed (describe all): A hydrodynamic separator is proposed to pretreat the stormwater runoff from the site.			
8	What minimum separation to mounded seasonally high groundwater applies to the proposed BMP? See Section **VIII.2** (circle one)	5 ft	(10 ft)	
9	Provide rationale for selection of applicable minimum separation to seasonally high mounded groundwater: Infiltration Trench will be used as project BMP, therefore 10 ft Minimum shall be used. Groundwater was found at 42' BGS. Infiltration will occur 7' BGS, providing a separation of 35'.			
10	What is separation from the infiltrating surface to seasonally high groundwater?	SHGWT	35	ft
11	What is separation from the infiltrating surface to mounded seasonally high groundwater?	Mounded SHGWT	32.37	ft
12	Describe assumptions and methods used for mounding analysis: From USGS calculation sheet, groundwater mounding peaks at 39.37' BGS. Infiltration will occur at 7' BGS, providing 32.37' of separation from mounding groundwater.			
13	Is the site within a plume protection boundary (See **Figure**	Y	(N)	N/A

Worksheet I: Summary of Groundwater-related Feasibility Criteria

	VIII.2)?	
14	Is the site within a selenium source area or other natural plume area (See Figure VIII.2)?	Y (N) N/A
15	Is the site within 250 feet of a contaminated site?	Y (N) N/A
16	If site-specific study has been prepared, provide citation and briefly summarize relevant findings: N/A	
17	Is the site within 100 feet of a water supply well, spring, septic system?	Y (N) N/A
18	Is infiltration feasible on the site relative to groundwater-related criteria?	(Y) N
Provide rationale for feasibility determination: Sufficient distance from infiltration depth to groundwater.		

Note: if a single criterion or group of criteria would render infiltration infeasible, it is not necessary to evaluate every question in this worksheet.

Worksheet I: Summary of Groundwater-related Feasibility Criteria

WEST INFILTRATION TRENCH

1	Is project large or small? (as defined by **Table VIII.2**) circle one	(Large)		Small
2	What is the tributary area to the BMP?	A	0.75	acres
3	What type of BMP is proposed?	Infiltration Trench		
4	What is the infiltrating surface area of the proposed BMP?	A_{BMP}	579.5	sq-ft
5	What land use activities are present in the tributary area (list all) RESIDENTIAL			
6	What land use-based risk category is applicable?	L	(M)	H
7	If M or H, what pretreatment and source isolation BMPs have been considered and are proposed (describe all): A hydrodynamic separator is proposed to pretreat the stormwater runoff from the site.			
8	What minimum separation to mounded seasonally high groundwater applies to the proposed BMP? See Section **VIII.2** (circle one)	5 ft	(10 ft)	
9	Provide rationale for selection of applicable minimum separation to seasonally high mounded groundwater: Infiltration Trench will be used as project BMP, therefore 10 ft Minimum shall be used. Groundwater was found at 42' BGS. Infiltration will occur 7' BGS, providing a separation of 35'.			
10	What is separation from the infiltrating surface to seasonally high groundwater?	SHGWT	35	ft
11	What is separation from the infiltrating surface to mounded seasonally high groundwater?	Mounded SHGWT	25.07	ft
12	Describe assumptions and methods used for mounding analysis: From USGS calculation sheet, groundwater mounding peaks at 32.07' BGS. Infiltration will occur at 7' BGS, providing 25.07' of separation from mounding groundwater.			
13	Is the site within a plume protection boundary (See **Figure**	Y	(N)	N/A

Worksheet I: Summary of Groundwater-related Feasibility Criteria

	VIII.2)?	
14	Is the site within a selenium source area or other natural plume area (See Figure VIII.2)?	Y (N) N/A
15	Is the site within 250 feet of a contaminated site?	Y (N) N/A
16	If site-specific study has been prepared, provide citation and briefly summarize relevant findings: N/A	
17	Is the site within 100 feet of a water supply well, spring, septic system?	Y (N) N/A
18	Is infiltration feasible on the site relative to groundwater-related criteria?	(Y) N
Provide rationale for feasibility determination: Sufficient distance from infiltration depth to groundwater.		

Note: if a single criterion or group of criteria would render infiltration infeasible, it is not necessary to evaluate every question in this worksheet.

Table X.8: Minimum Irrigated Area for Potential Partial Capture Feasibility

General Landscape Type	Conservation Design: K_L = 0.35			Active Turf Areas: K_L = 0.7		
Closest ET Station	*Irvine*	*Santa Ana*	*Laguna*	*Irvine*	*Santa Ana*	*Laguna*
Design Capture Storm Depth, inches	**Minimum Required Irrigated Area per Tributary Impervious Acre for Potential Partial Capture, ac/ac**					
0.60	0.66	0.68	0.72	0.33	0.34	0.36
0.65	0.72	0.73	0.78	0.36	0.37	0.39
0.70	0.77	0.79	0.84	0.39	0.39	0.42
0.75	0.83	0.84	0.90	0.41	0.42	0.45
0.80	0.88	0.90	0.96	0.44	0.45	0.48
0.85	0.93	0.95	1.02	0.47	0.48	0.51
0.90	0.99	1.01	1.08	0.49	0.51	0.54
0.95	1.04	1.07	1.14	0.52	0.53	0.57
1.00	1.10	1.12	1.20	0.55	0.56	0.60

Worksheet J: Summary of Harvested Water Demand and Feasibility

1	What demands for harvested water exist in the tributary area (check all that apply):			
2	Toilet and urinal flushing		□	
3	Landscape irrigation		□	
4	Other:_____		□	
5	What is the design capture storm depth? (**Figure III.1**)	d	.90	inches
6	What is the project size?	A	2.48	ac
7	What is the acreage of impervious area?	IA	1.95	ac
	For projects with multiple types of demand (toilet flushing, indoor demand, and/or other demand)			
8	What is the minimum use required for partial capture? (**Table X.6**)		730	gpd
9	What is the project estimated wet season total daily use?			gpd
10	Is partial capture potentially feasible? (Line 9 > Line 8?)			
	For projects with only toilet flushing demand			
11	What is the minimum TUTIA for partial capture? (**Table X.7**)		110	
12	What is the project estimated TUTIA?		56	

Worksheet J: Summary of Harvested Water Demand and Feasibility

13	Is partial capture potentially feasible? (Line 12 > Line 11?)	No	
	For projects with only irrigation demand		
14	What is the minimum irrigation area required based on conservation landscape design? (**Table X.8**)	1.01	ac
15	What is the proposed project irrigated area? (multiply conservation landscaping by 1; multiply active turf by 2)	.282	ac
16	Is partial capture potentially feasible? (Line 15 > Line 14?)	No	

Provide supporting assumptions and citations for controlling demand calculation:

No partial capture and use being used on site.

ATTACHMENT D

DKE
DK ENGINEER, CORP
6420 WILSHIRE BLVD. #1000
LOS ANGELES, CA 90048
310.926.0248

REGISTERED PROFESSIONAL ENGINEER
MATT PLOURDE
No. 34893
CIVIL
STATE OF CALIFORNIA

Commonwealth Avenue

B.N.S.F. Railroad Right-of-Way

MATCH LINE - SEE BELOW FOR CONTINUATION

MATCH LINE - SEE ABOVE FOR CONTINUATION

119.13 FF

PROPOSED PL

EX. PL

EX. R/W

AREA OF PROPOSED/FUTURE ADJUSTED LOT AT 1001 COMMONWEALTH AVE: 108,710 SQUARE FEET, 2.49 ACRES

ESTIMATED EARTHWORK QUANTITIES

CUT:	300 CUBIC YARDS
FILL:	100 CUBIC YARDS
REMOVAL AND RECOMPACTION:	7,500 CUBIC YARDS
NET (EXPORT):	200 CUBIC YARDS

NOTES:
1. QUANTITIES SHOWN ON HERE ARE FOR PLAN CHECK PURPOSES ONLY. CONTRACTOR TO GENERATE OWN QUANTITIES FOR BIDDING PURPOSES.

OFFSITE CONSTRUCTION NOTES:

1. INSTALL DRIVEWAY PER CITY OF FULLERTON STANDARD PLAN 121-2. W=24', X=3'
2. INSTALL TYPE A CURB AND GUTTER PER CITY OF FULLERTON STANDARD PLAN 120.
3. INSTALL SIDEWALK PER CITY OF FULLERTON STANDARD PLAN 122.

LEGEND:

- PROPERTY LINE
- LIMIT OF WORK
- CONCRETE PAVING ON GRADE PER DETAIL 3, C2.01.
- PLANTER AREA PER LANDSCAPE
- ASPHALT CONCRETE PAVING
- TREE. REFER TO LANDSCAPE FOR DETAILS

N

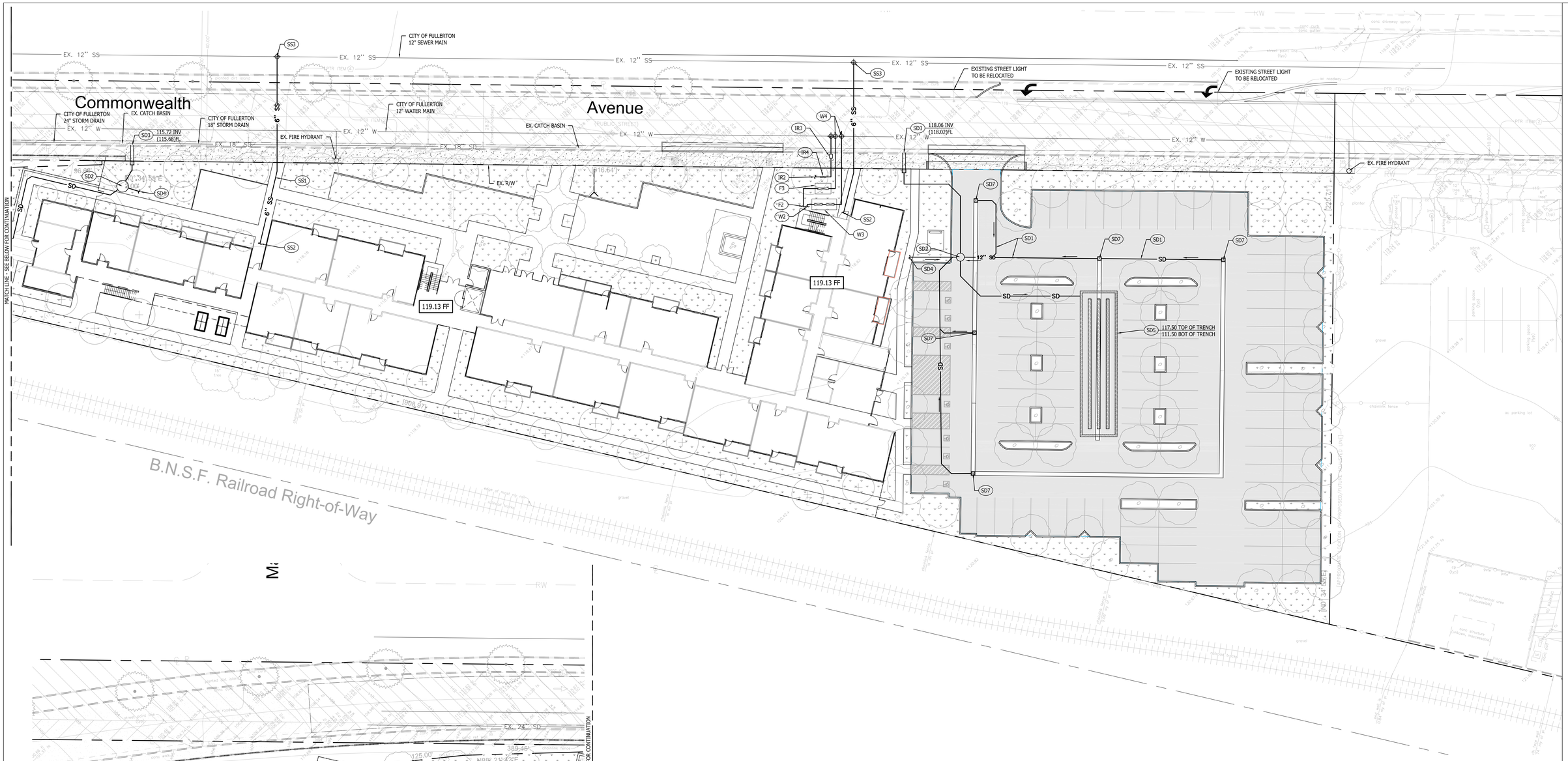
0 10' 20'
SCALE: 1"=20'

GRADING PLAN

SHEET NUMBER

C1.30

PLOT DATE: Dec 08, 2022 - 4:06pm



UTILITY CONSTRUCTION NOTES:

STORM DRAIN

- SD1 INSTALL SDR-35 PVC STORM DRAIN PIPE.
- SD2 CDS PRETREATMENT FILTER UNIT BY CONTECH. SEE WQMP REPORT FOR DETAILS.
- SD3 INSTALL PARKWAY DRAIN PER SPPWC STD 151-2. WIDTH=42".
- SD4 DOWNSPOUT/ROOF DRAIN CONNECTION TO SITE DRAINS LINES.
- SD5 INSTALL 73' X 18.5' X 6' INFILTRATION SYSTEM BY CONTECH. SEE WQMP REPORT FOR DETAILS.
- SD6 INSTALL 61' X 9.5' X 6' DETENTION SYSTEM BY CONTECH. SEE WQMP REPORT FOR DETAILS.
- SD7 INSTALL 18"X18" TRAFFIC RATED CATCH BASIN.

WATER

- W1 INSTALL X" C-900 PVC WATER PIPE, PIPE BEDDING PER DETAIL X', SHEET C2.00.
- W2 POINT OF CONNECTION 5' FROM BUILDING FACE. SEE PLUMBING PLANS FOR CONTINUATION.
- W3 INSTALL WATER METER AND BACKFLOW PREVENTER PER CITY OF FULLERTON STANDARD PLAN 603.
- W4 CONNECT TO EXISTING WATER MAIN PER CITY OF FULLERTON STANDARD PLAN 701.

FIRE WATER

- F1 INSTALL X" C-900 PVC WATER PIPE, PIPE BEDDING PER DETAIL X', SHEET C2.00.
- F2 POINT OF CONNECTION 5' FROM BUILDING FACE. SEE PLUMBING PLANS FOR CONTINUATION.
- F3 INSTALL BACKFLOW PREVENTER PER CITY OF FULLERTON STANDARD PLAN 721.

IRRIGATION

- IR1 INSTALL SCH 40 PVC WATER PIPE. BEDDING PER DETAIL X, SHEET C2.00.
- IR2 POINT OF CONNECTION TO IRRIGATION SYSTEM. SEE LANDSCAPE PLANS FOR CONTINUATION.
- IR3 INSTALL IRRIGATION METER PER CITY OF FULLERTON STANDARD PLAN 602.
- IR4 INSTALL IRRIGATION BACKFLOW PREVENTER PER CITY OF FULLERTON STANDARD PLAN 604.

SEWER

- SS1 INSTALL SDR 35 PVC SEWER PIPE. BEDDING PER DETAIL X, SHEET C2.00.
- SS2 POINT OF CONNECTION 5' FROM BUILDING. SEE PLUMBING PLANS FOR CONTINUATION.
- SS3 INSTALL SEWER LATERAL AND CONNECT TO EXISTING MAIN PER CITY OF FULLERTON STANDARD PLAN 209B.

N

0 10' 20'

SCALE: 1"=20'

DKE
DK ENGINEER, CORP
6420 WILSHIRE BLVD. #1000
LOS ANGELES, CA 90048
310.926.0248

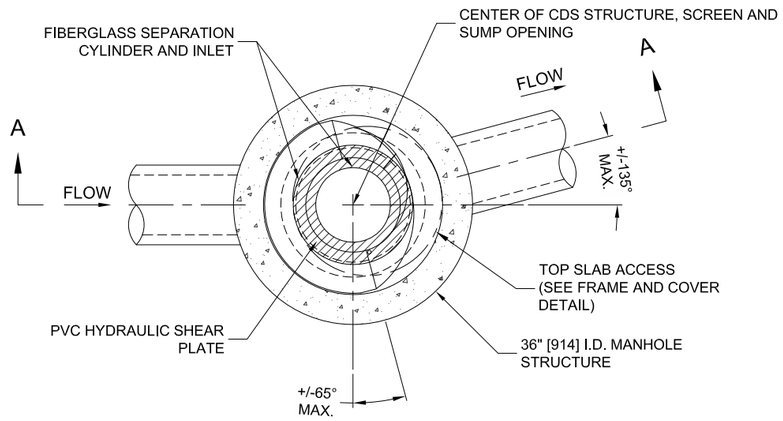
REGISTERED PROFESSIONAL ENGINEER
MATT PLOURDE
No. 34893
CIVIL
STATE OF CALIFORNIA

UTILITY AND LID PLAN

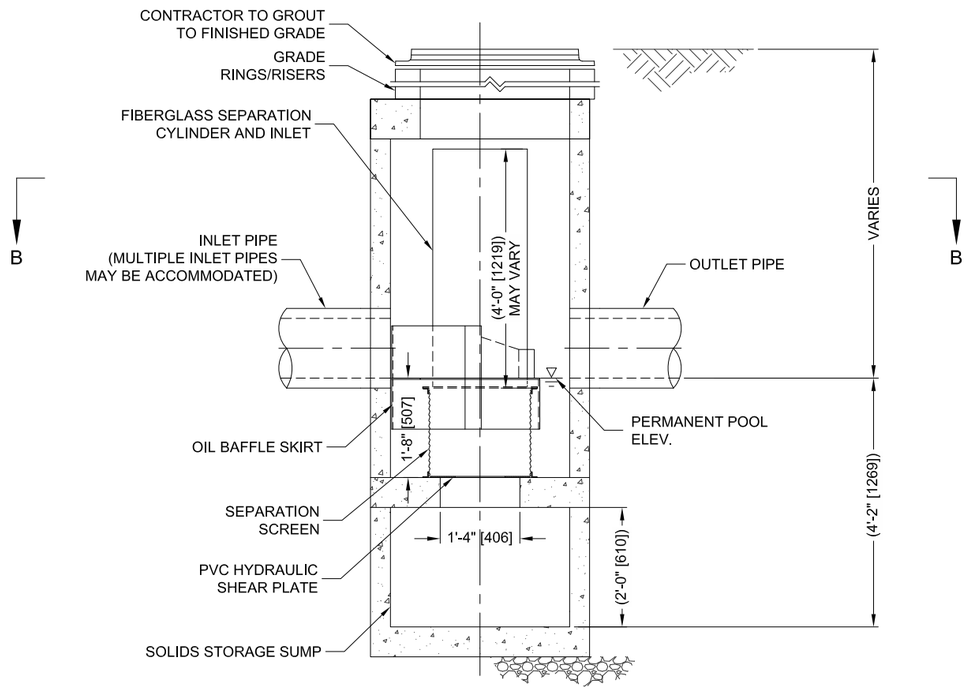
SHEET NUMBER

C1.40

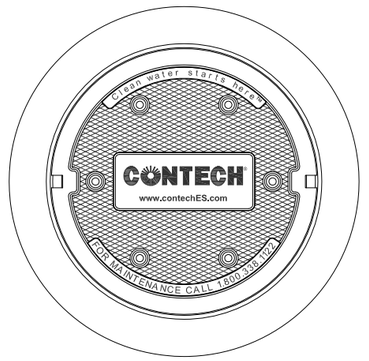
PLOT DATE:



PLAN VIEW B-B
N.T.S.



ELEVATION A-A
N.T.S.



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

CDS1515-3-C DESIGN NOTES

CDS1515-3-C RATED TREATMENT CAPACITY IS 0.50 [14.16 L/s] CFS, OR PER LOCAL REGULATIONS. MAXIMUM HYDRAULIC INTERNAL BYPASS CAPACITY IS 6.0 [170 L/s] CFS. IF THE SITE CONDITIONS EXCEED 6.0 [170 L/s] CFS, AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

THE STANDARD CDS1515-3-C CONFIGURATION IS SHOWN.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (CFS OR L/s)			*
PEAK FLOW RATE (CFS OR L/s)			*
RETURN PERIOD OF PEAK FLOW (YRS)			*
SCREEN APERTURE (2400 OR 4700)			*
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*
RIM ELEVATION			*
ANTI-FLOTATION BALLAST		WIDTH	HEIGHT
		*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
3. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2', AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO..
5. IF REQUIRED, PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.
6. CDS STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-478 AND AASHTO LOAD FACTOR DESIGN METHOD.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CDS1515-3-C ONLINE CDS STANDARD DETAIL

EAST INFILTRATION TRENCH

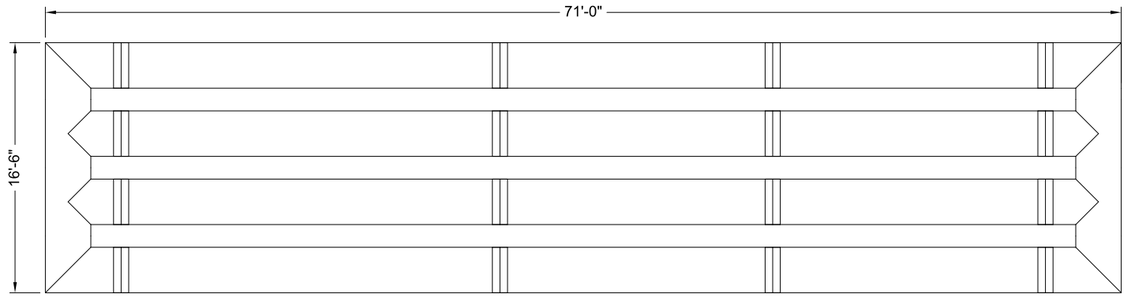
PROJECT SUMMARY

CALCULATION DETAILS
- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 293 LF

STORAGE SUMMARY
- STORAGE VOLUME REQUIRED = 3,900 CF
- PIPE STORAGE VOLUME = 2,071 CF
- BACKFILL STORAGE VOLUME = 1,873 CF
- TOTAL STORAGE PROVIDED = 3,944 CF

PIPE DETAILS
- DIAMETER = 36"
- CORRUGATION = 2 2/3x1/2
- GAGE = 16
- COATING = ALT2
- WALL TYPE = SOLID
- BARREL SPACING = 18"

BACKFILL DETAILS
- WIDTH AT ENDS = 12"
- ABOVE PIPE = 12"
- WIDTH AT SIDES = 12"
- BELOW PIPE = 12"



NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE 2⅔" x ½" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

ASSEMBLY
SCALE: 1" = 10'

C:\EXPORTS\TEMPLATES\CMP_V8.DWG 10/18/2019 10:02 AM

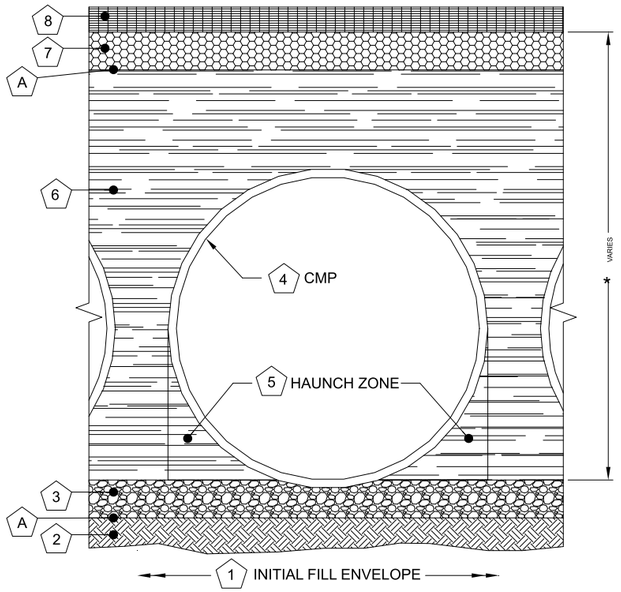
DATE	REVISION DESCRIPTION	BY

CONTECH® ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH® CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO24556 Meta Commonwealth
East Parking Lot
Fullerton, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
16235	24556	12/7/2022
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		



	DETENTION SYSTEMS - CMP DETENTION / CMP DRAINAGE			
	Material Location	Description	Material Designation	Designation
8	Rigid or Flexible Pavement (if applicable)			
7	Road Base (if applicable)			
A	Geotextile Layer	Non-Woven Geotextile	CONTECH C-40 or C-45	Engineer Decision for consideration to prevent soil migration into varying soil types
6	Backfill	Well graded granular material which may contain small amounts of silt or clay.	AASHTO M 145- A-1, A-2, A-3	Placed in 8" +/- loose lifts and compacted to 90% Standard Proctor Per AASHTO T 99
3	Bedding Stone	Well graded granular bedding material w/maximum particle size of 3"	AASHTO M43 - 3,357,4,467, 5, 56, 57	Engineer to determine if bedding is required. Pipe may be placed on the trench bottom of a relatively loose, native suitable well graded & granular material. For Arch pipes it is recommended to be shaped to a relatively flat bottom or fine-grade the foundation to a slight v-shape. Unsuitable material should be over-excavated and re-placed with a 4"-6" layer of well graded & granular stone per the material designation. See AASHTO 26.3.8.1 / 26.5.3 Bedding info.
A	Geotextile Layer	Non-Woven Geotextile	CONTECH C-40 or C-45	Engineer Decision for consideration to prevent soil migration into varying soil types
*	*Note: Backfill using controlled low-strength material (CLSM, "flash fill" or "flowable fill") when the spacing between the pipes will not allow for placement and adequate compaction of the backfill.*			

1 MINIMUM WIDTH DEPENDS ON SITE CONDITIONS AND ENGINEERING JUDGEMENT

FOUNDATION/BEDDING PREPARATION

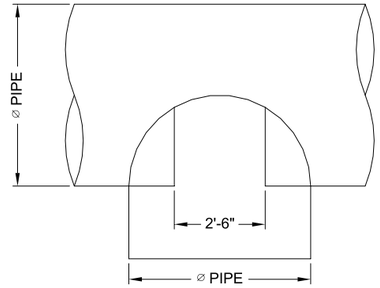
2 PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND BROUGHT BACK TO THE GRADE WITH A FILL MATERIAL AS APPROVED BY THE ENGINEER.

5 HAUNCH ZONE MATERIAL SHALL BE PLACED AND UNIFORMALLY COMPACTED WITHOUT SOFT SPOTS.

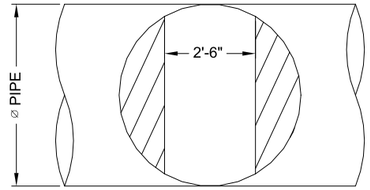
BACKFILL

WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A TWO LIFT (16") DIFFERENTIAL BETWEEN ANY OF THE PIPES AT ANY TIME DURING THE BACKFILL PROCESS. THE BACKFILL SHALL BE ADVANCED ALONG THE LENGTH OF THE DETENTION SYSTEM AT THE SAME RATE TO AVOID DIFFERENTIAL LOADING ON THE PIPE.

OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.



PLAN

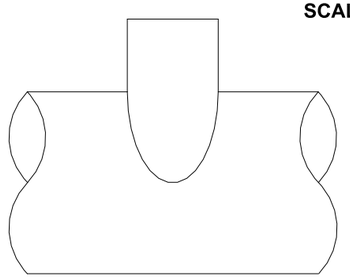


FRONT

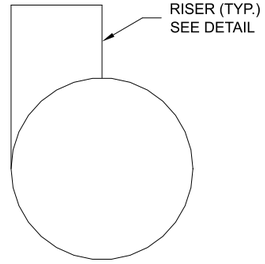
NOTE:
MANWAY DETAIL APPLICABLE FOR CMP SYSTEMS WITH DIAMETERS 48" AND LARGER. MANWAYS MAY BE REQUIRED ON SMALLER SYSTEMS DEPENDING ON ACTUAL SITE SPECIFIC CONDITIONS.

TYPICAL MANWAY DETAIL

SCALE: N.T.S.



ELEVATION

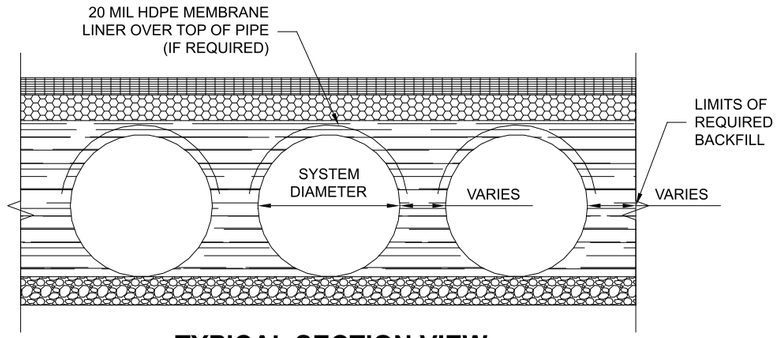


END

NOTE:
LADDERS ARE OPTIONAL AND ARE NOT REQUIRED FOR ALL SYSTEMS.

TYPICAL RISER DETAIL

SCALE: N.T.S.



TYPICAL SECTION VIEW

LINER OVER ROWS
SCALE: N.T.S.

NOTE: IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, AN HDPE MEMBRANE LINER IS RECOMMENDED WITH THE SYSTEM. THE IMPERMEABLE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.

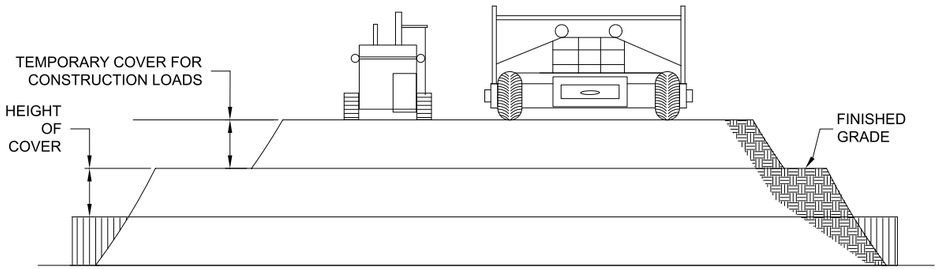
DATE	REVISION DESCRIPTION	BY

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO24556 Meta Commonwealth
East Parking Lot
Fullerton, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
16235	24556	12/7/2022
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		



CONSTRUCTION LOADS

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

CONSTRUCTION LOADING DIAGRAM

SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

SCOPE
THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM DETAILED IN THE PROJECT PLANS.

MATERIAL
THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE OF AASHTO M-197 OR ASTM B-744.

CONSTRUCTION LOADS
CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSPA GUIDELINES.

PIPE
THE PIPE SHALL BE MANUFACTURED IN ACCORDANCE TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2: AASHTO M-36 OR ASTM A-760

GALVANIZED: AASHTO M-36 OR ASTM A-760

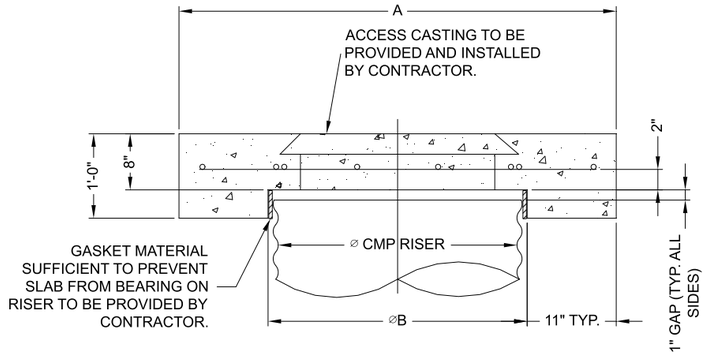
APPLICABLE POLYMER COATED: AASHTO M-245 OR ASTM A-762

ALUMINUM: AASHTO M-196 OR ASTM B-745

APPLICABLE
HANDLING AND ASSEMBLY
SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL PIPE ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.
REQUIREMENTS
INSTALLATION
SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.

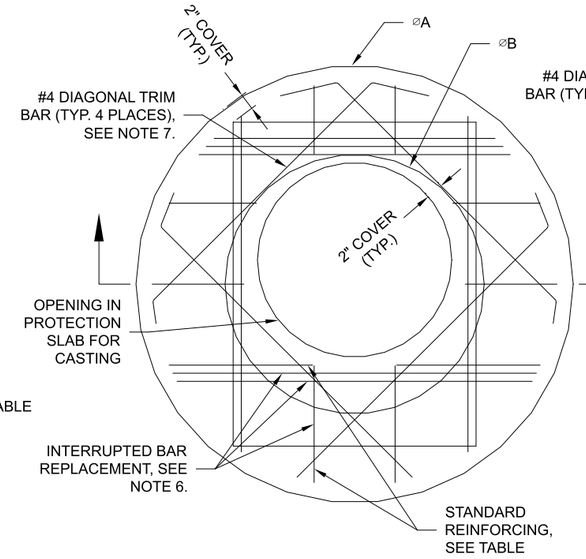
NOTE:
THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.



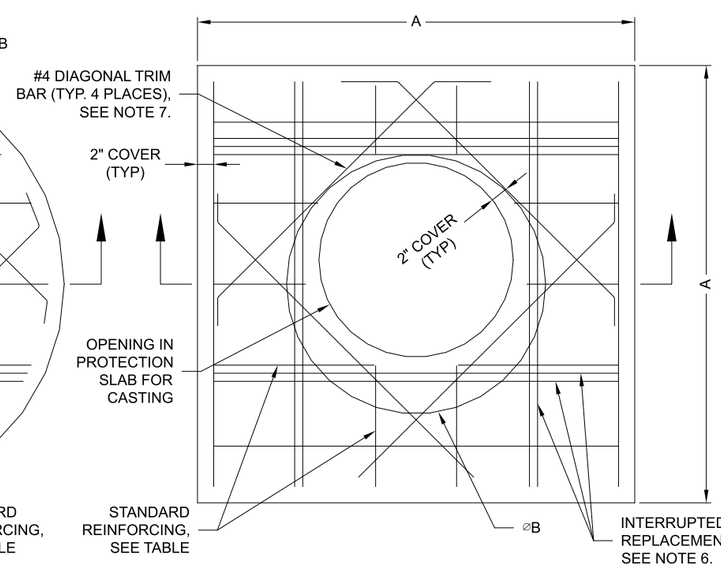
SECTION VIEW

REINFORCING TABLE				
⌀ CMP RISER	A	⌀ B	REINFORCING	**BEARING PRESSURE (PSF)
24"	⌀ 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	⌀ 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	⌀ 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	⌀ 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	⌀ 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

** ASSUMED SOIL BEARING CAPACITY



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

1. DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
2. DESIGN LOAD HS25.
3. EARTH COVER = 1' MAX.
4. CONCRETE STRENGTH = 3,500 psi
5. REINFORCING STEEL = ASTM A615, GRADE 60.
6. PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
7. TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
8. PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
9. DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

MANHOLE CAP DETAIL

SCALE: N.T.S.

DATE	REVISION DESCRIPTION	BY

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO24556 Meta Commonwealth
East Parking Lot
Fullerton, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
16235	24556	12/7/2022
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

C:\EXPORTS\TEMPLATES\CMP_V8.DWG 10/18/2019 10:02 AM

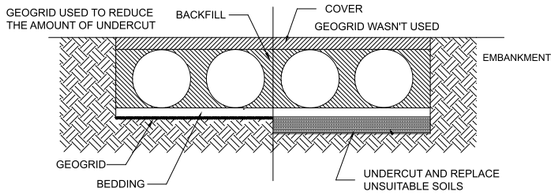
CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.

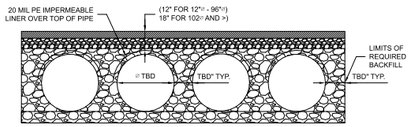


GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

GEOMEMBRANE BARRIER

A SITE'S RESISTIVITY MAY CHANGE OVER TIME WHEN VARIOUS TYPES OF SALTING AGENTS ARE USED, SUCH AS ROAD SALTS FOR DEICING AGENTS. IF SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE, A GEOMEMBRANE BARRIER IS RECOMMENDED WITH THE SYSTEM. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM THE USE OF SUCH AGENTS INCLUDING PREMATURE CORROSION AND REDUCED ACTUAL SERVICE LIFE.

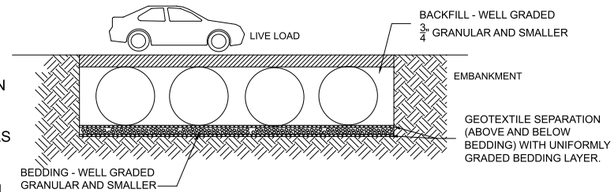
THE PROJECT'S ENGINEER OF RECORD IS TO EVALUATE WHETHER SALTING AGENTS WILL BE USED ON OR NEAR THE PROJECT SITE, AND USE HIS/HER BEST JUDGEMENT TO DETERMINE IF ANY ADDITIONAL PROTECTIVE MEASURES ARE REQUIRED. BELOW IS A TYPICAL DETAIL SHOWING THE PLACEMENT OF A GEOMEMBRANE BARRIER FOR PROJECTS WHERE SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE.



IN-SITU TRENCH WALL

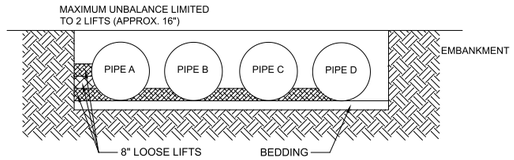
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



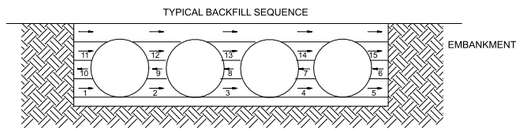
BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

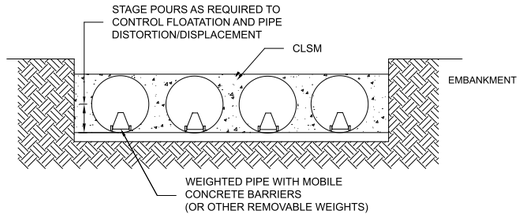


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10-FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

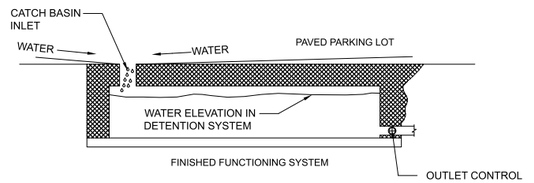


CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/ CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM

MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

ACCUMULATED SEDIMENT AND TRASH CAN TYPICALLY BE EVACUATED THROUGH THE MANHOLE OVER THE OUTLET ORIFICE. IF MAINTENANCE IS NOT PERFORMED AS RECOMMENDED, SEDIMENT AND TRASH MAY ACCUMULATE IN FRONT OF THE OUTLET ORIFICE. MANHOLE COVERS SHOULD BE SECURELY SEATED FOLLOWING CLEANING ACTIVITIES. CONTECH SUGGESTS THAT ALL SYSTEMS BE DESIGNED WITH AN ACCESS/INSPECTION MANHOLE SITUATED AT OR NEAR THE INLET AND THE OUTLET ORIFICE. SHOULD IT BE NECESSARY TO GET INSIDE THE SYSTEM TO PERFORM MAINTENANCE ACTIVITIES, ALL APPROPRIATE PRECAUTIONS REGARDING CONFINED SPACE ENTRY AND OSHA REGULATIONS SHOULD BE FOLLOWED.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DE-ICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION SYSTEM IS EASIEST WHEN THERE IS NO FLOW ENTERING THE SYSTEM. FOR THIS REASON, IT IS A GOOD IDEA TO SCHEDULE THE CLEANOUT DURING DRY WEATHER.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

C:\EXPORTS\TEMPLATES\CMP_V8.DWG 10/18/2019 10:02 AM

DATE	REVISION DESCRIPTION	BY

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH CMP DETENTION SYSTEMS

CONTECH **DYODS** DRAWING

DYO24556 Meta Commonwealth
East Parking Lot
Fullerton, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
16235	24556	12/7/2022
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

WEST INFILTRATION TRENCH

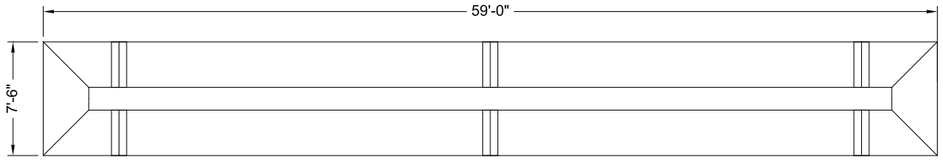
PROJECT SUMMARY

CALCULATION DETAILS
- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 121 LF

STORAGE SUMMARY
- STORAGE VOLUME REQUIRED = 1,663 CF
- PIPE STORAGE VOLUME = 855 CF
- BACKFILL STORAGE VOLUME = 817 CF
- TOTAL STORAGE PROVIDED = 1,672 CF

PIPE DETAILS
- DIAMETER = 36"
- CORRUGATION = 2 2/3x1/2
- GAGE = 16
- COATING = ALT2
- WALL TYPE = SOLID
- BARREL SPACING = 18"

BACKFILL DETAILS
- WIDTH AT ENDS = 12"
- ABOVE PIPE = 12"
- WIDTH AT SIDES = 12"
- BELOW PIPE = 12"



NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE $2\frac{2}{3}$" x $\frac{1}{2}$" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

ASSEMBLY
SCALE: 1" = 10'

DATE	REVISION DESCRIPTION	BY

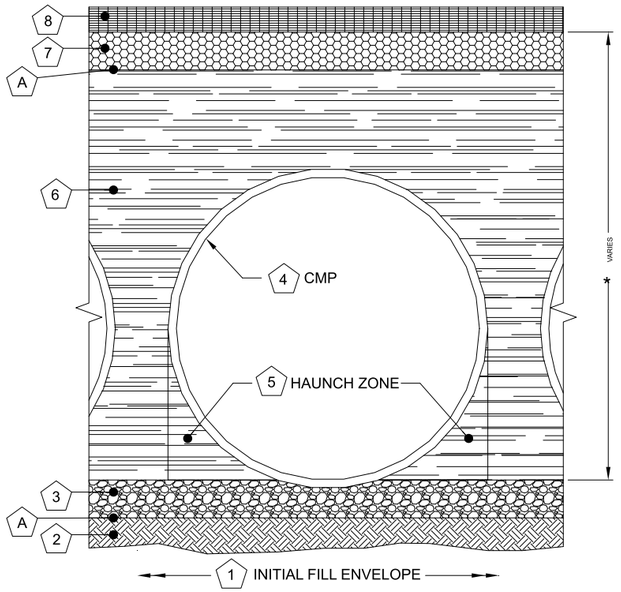
CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH CMP DETENTION SYSTEMS
CONTECH **DYODS** DRAWING

DYO24573 Meta Commonwealth
West Site
Fullerton, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
16235	24573	12/7/2022
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

C:\EXPORTS\TEMPLATES\CMP_V8.DWG 10/18/2019 10:02 AM



	DETENTION SYSTEMS - CMP DETENTION / CMP DRAINAGE			
	Material Location	Description	Material Designation	Designation
8	Rigid or Flexible Pavement (if applicable)			
7	Road Base (if applicable)			
A	Geotextile Layer	Non-Woven Geotextile	CONTECH C-40 or C-45	Engineer Decision for consideration to prevent soil migration into varying soil types
6	Backfill	Well graded granular material which may contain small amounts of silt or clay.	AASHTO M 145- A-1, A-2, A-3	Placed in 8" +/- loose lifts and compacted to 90% Standard Proctor Per AASHTO T 99
3	Bedding Stone	Well graded granular bedding material w/maximum particle size of 3"	AASHTO M43 - 3,357,4,467, 5, 56, 57	Engineer to determine if bedding is required. Pipe may be placed on the trench bottom of a relatively loose, native suitable well graded & granular material. For Arch pipes it is recommended to be shaped to a relatively flat bottom or fine-grade the foundation to a slight v-shape. Unsuitable material should be over-excavated and re-placed with a 4"-6" layer of well graded & granular stone per the material designation. See AASHTO 26.3.8.1 / 26.5.3 Bedding info.
A	Geotextile Layer	Non-Woven Geotextile	CONTECH C-40 or C-45	Engineer Decision for consideration to prevent soil migration into varying soil types
*	*Note: Backfill using controlled low-strength material (CLSM, "flash fill" or "flowable fill") when the spacing between the pipes will not allow for placement and adequate compaction of the backfill.*			

1 MINIMUM WIDTH DEPENDS ON SITE CONDITIONS AND ENGINEERING JUDGEMENT

FOUNDATION/BEDDING PREPARATION

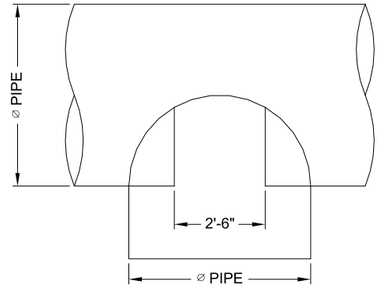
2 PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND BROUGHT BACK TO THE GRADE WITH A FILL MATERIAL AS APPROVED BY THE ENGINEER.

5 HAUNCH ZONE MATERIAL SHALL BE PLACED AND UNIFORMALLY COMPACTED WITHOUT SOFT SPOTS.

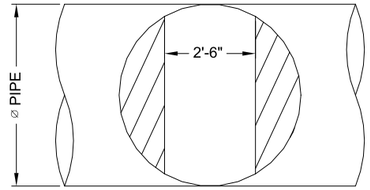
BACKFILL

WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A TWO LIFT (16") DIFFERENTIAL BETWEEN ANY OF THE PIPES AT ANY TIME DURING THE BACKFILL PROCESS. THE BACKFILL SHALL BE ADVANCED ALONG THE LENGTH OF THE DETENTION SYSTEM AT THE SAME RATE TO AVOID DIFFERENTIAL LOADING ON THE PIPE.

OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.



PLAN

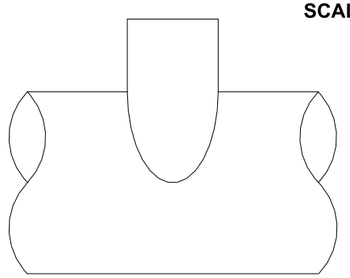


FRONT

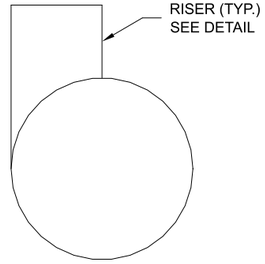
NOTE:
MANWAY DETAIL APPLICABLE FOR CMP SYSTEMS WITH DIAMETERS 48" AND LARGER. MANWAYS MAY BE REQUIRED ON SMALLER SYSTEMS DEPENDING ON ACTUAL SITE SPECIFIC CONDITIONS.

TYPICAL MANWAY DETAIL

SCALE: N.T.S.



ELEVATION

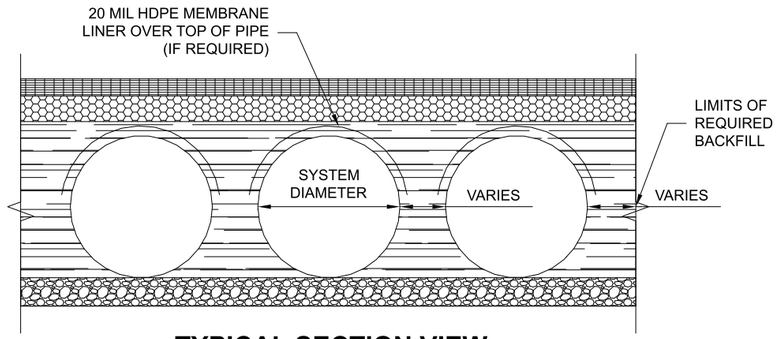


END

NOTE:
LADDERS ARE OPTIONAL AND ARE NOT REQUIRED FOR ALL SYSTEMS.

TYPICAL RISER DETAIL

SCALE: N.T.S.



TYPICAL SECTION VIEW

LINER OVER ROWS
SCALE: N.T.S.

NOTE: IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, AN HDPE MEMBRANE LINER IS RECOMMENDED WITH THE SYSTEM. THE IMPERMEABLE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.

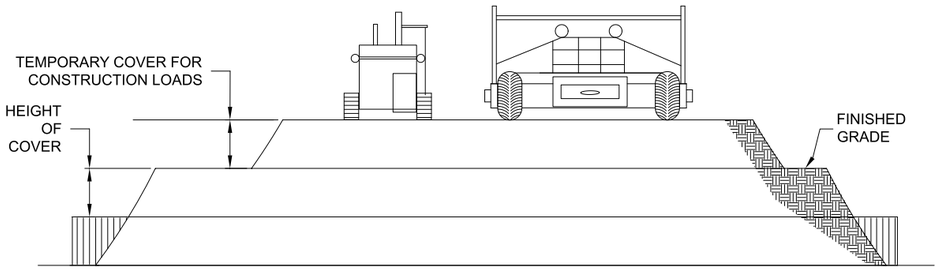
DATE	REVISION DESCRIPTION	BY

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO24573 Meta Commonwealth
West Site
Fullerton, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
16235	24573	12/7/2022
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		



CONSTRUCTION LOADS

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

CONSTRUCTION LOADING DIAGRAM

SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

SCOPE
THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM DETAILED IN THE PROJECT PLANS.

MATERIAL
THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE OF AASHTO M-197 OR ASTM B-744.

CONSTRUCTION LOADS
CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSPA GUIDELINES.

PIPE
THE PIPE SHALL BE MANUFACTURED IN ACCORDANCE TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2: AASHTO M-36 OR ASTM A-760

GALVANIZED: AASHTO M-36 OR ASTM A-760

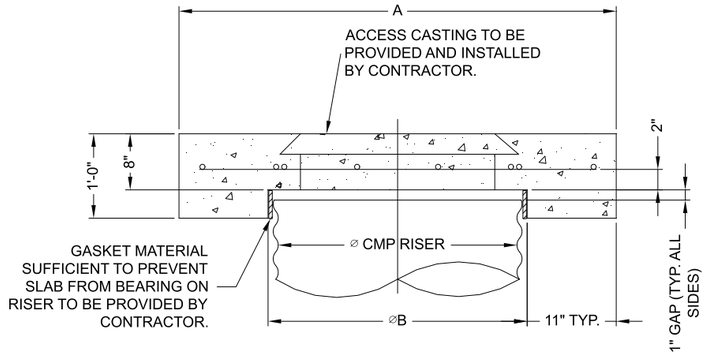
APPLICABLE POLYMER COATED: AASHTO M-245 OR ASTM A-762

ALUMINUM: AASHTO M-196 OR ASTM B-745

APPLICABLE
HANDLING AND ASSEMBLY
SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL PIPE ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.
REQUIREMENTS
INSTALLATION
SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.

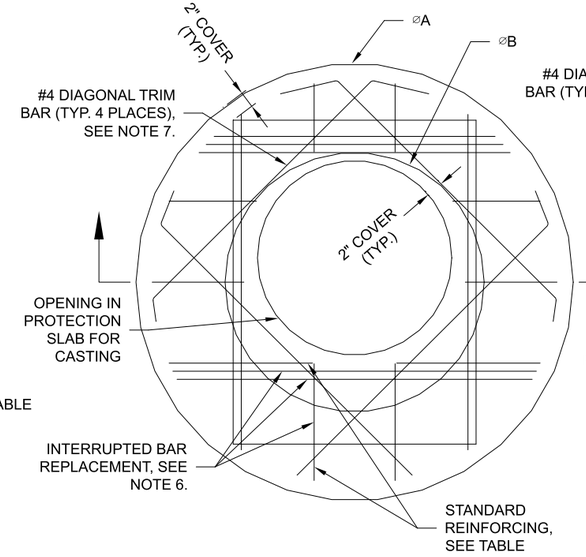
NOTE:
THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.



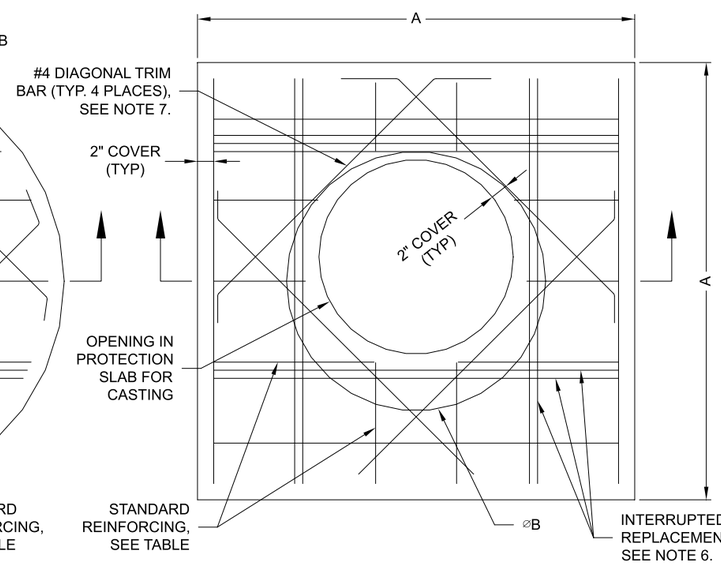
SECTION VIEW

REINFORCING TABLE				
⌀ CMP RISER	A	⌀ B	REINFORCING	**BEARING PRESSURE (PSF)
24"	⌀ 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	⌀ 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	⌀ 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	⌀ 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	⌀ 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

** ASSUMED SOIL BEARING CAPACITY



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

1. DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
2. DESIGN LOAD HS25.
3. EARTH COVER = 1' MAX.
4. CONCRETE STRENGTH = 3,500 psi
5. REINFORCING STEEL = ASTM A615, GRADE 60.
6. PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
7. TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
8. PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
9. DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

MANHOLE CAP DETAIL

SCALE: N.T.S.

DATE	REVISION DESCRIPTION	BY

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO24573 Meta Commonwealth
West Site
Fullerton, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
16235	24573	12/7/2022
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

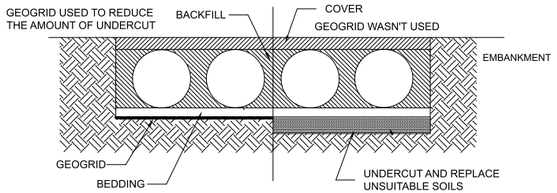
CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.

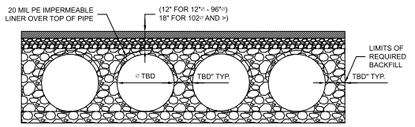


GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

GEOMEMBRANE BARRIER

A SITE'S RESISTIVITY MAY CHANGE OVER TIME WHEN VARIOUS TYPES OF SALTING AGENTS ARE USED, SUCH AS ROAD SALTS FOR DEICING AGENTS. IF SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE, A GEOMEMBRANE BARRIER IS RECOMMENDED WITH THE SYSTEM. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM THE USE OF SUCH AGENTS INCLUDING PREMATURE CORROSION AND REDUCED ACTUAL SERVICE LIFE.

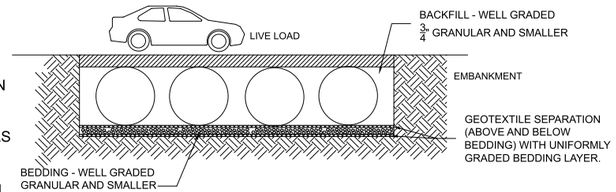
THE PROJECT'S ENGINEER OF RECORD IS TO EVALUATE WHETHER SALTING AGENTS WILL BE USED ON OR NEAR THE PROJECT SITE, AND USE HIS/HER BEST JUDGEMENT TO DETERMINE IF ANY ADDITIONAL PROTECTIVE MEASURES ARE REQUIRED. BELOW IS A TYPICAL DETAIL SHOWING THE PLACEMENT OF A GEOMEMBRANE BARRIER FOR PROJECTS WHERE SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE.



IN-SITU TRENCH WALL

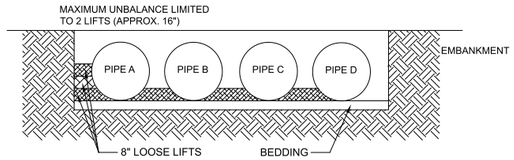
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



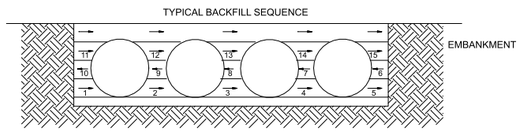
BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

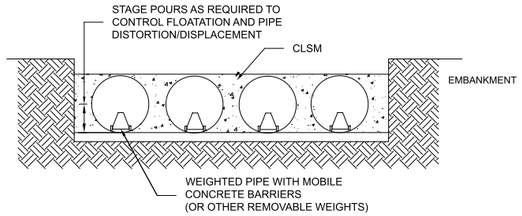


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10-FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

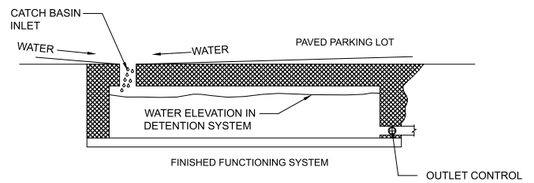


CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/ CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM

MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

ACCUMULATED SEDIMENT AND TRASH CAN TYPICALLY BE EVACUATED THROUGH THE MANHOLE OVER THE OUTLET ORIFICE. IF MAINTENANCE IS NOT PERFORMED AS RECOMMENDED, SEDIMENT AND TRASH MAY ACCUMULATE IN FRONT OF THE OUTLET ORIFICE. MANHOLE COVERS SHOULD BE SECURELY SEATED FOLLOWING CLEANING ACTIVITIES. CONTECH SUGGESTS THAT ALL SYSTEMS BE DESIGNED WITH AN ACCESS/INSPECTION MANHOLE SITUATED AT OR NEAR THE INLET AND THE OUTLET ORIFICE. SHOULD IT BE NECESSARY TO GET INSIDE THE SYSTEM TO PERFORM MAINTENANCE ACTIVITIES, ALL APPROPRIATE PRECAUTIONS REGARDING CONFINED SPACE ENTRY AND OSHA REGULATIONS SHOULD BE FOLLOWED.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DE-ICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION SYSTEM IS EASIEST WHEN THERE IS NO FLOW ENTERING THE SYSTEM. FOR THIS REASON, IT IS A GOOD IDEA TO SCHEDULE THE CLEANOUT DURING DRY WEATHER.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

C:\EXPORTS\TEMPLATES\CMP_V8.DWG 10/18/2019 10:02 AM

DATE	REVISION DESCRIPTION	BY

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH CMP DETENTION SYSTEMS

CONTECH **DYODS** DRAWING

DYO24573 Meta Commonwealth
West Site
Fullerton, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
16235	24573	12/7/2022
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		