
Fallbrook Self Storage Drainage Study

1305 East Mission Road

Fallbrook, CA 92028

APN: 105-410-18-00

Project # PDS2025-LDGRMJ-30561

Date Prepared:

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Declaration of Responsible Charge:

I hereby declare that I am the engineer of work for this project, that I have exercised responsible charge over the design of the project as defined in section 6703 of the business and professions code, and that the design is consistent with current standards. I understand that the check of the project drawings and specifications by the County of San Diego is confined to a review only and does not relieve me, as an engineer of work, of my responsibilities for project design.

Patric de Boer

RCE 83583

Registration Expires

3-31-2027

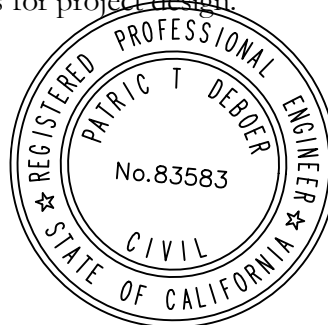


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Site & Project Description

This drainage study has been prepared for the proposed commercial development for the vacant lot at 1305 East Mission Road in Fallbrook, CA 92028. The proposed improvements include several storage buildings, a driveway, two biofiltration basins, an onsite storm drain system, drive aisles, landscape, and hardscape. The site is approximately 300 feet south of State Route 13 and 3.5 miles west of Interstate 15. See Figure No. 1 for the Vicinity Map.

The project will involve grading the existing lot to construct several storage buildings, drive aisles, and two biofiltration basins. The total area of analysis is approximately 138.80 acres. This includes the proposed disturbed areas, portions of on-site area that is not disturbed, and portions of offsite area that drain to the site. The proposed lined biofiltration basins on the northern edge of the property will be utilized for 100-year attenuation and stormwater treatment purposes. The treatment properties of the biofiltration basins are detailed in a separate Stormwater Quality Report (SWQMP).

Methodology

This drainage report has been prepared in accordance with current County of San Diego regulations and procedures. The Modified Rational Method was used to determine the peak flowrates generated by the existing and proposed site conditions.

The soil type selected for the site is Soil Type D. This was corroborated by the infiltration rates provided by the Geotechnical Investigation prepared by Geocon Incorporated on June 5, 2024. The Geotechnical Investigation concluded the site is underlain by existing alluvium and granitic rocks which provided a very low average rate of 0.009 inches per hour (with a safety factor of 2). Even though the Web Soil Survey states that the site is underlain by Type B and C soils, we believe that based on the low infiltration rates, type D soil is more representative of the onsite soils. In addition, the infiltration rate of 0.009 inches per hour is more representative of Type D soils per the County of San Diego BMP Design Manual, Table B.2-3. The web soil survey will be included on Appendix 1 along with the excerpt of the BMP Design Manual.

A SWMM model was generated to demonstrate that the proposed basins will attenuate the 100-year storm. Rick RatHydro, a hydrograph-generating program, uses the input and output data determined in the Rational Method calculations and produces a hydrograph time series with a matching peak flowrate. Rick RatHydro was used to produce two hydrographs. The hydrographs were then input manually into EPA SWMM 5.1 as a time series.

The proposed storm drain pipes and channels were sized following the County of San Diego Hydraulic Design Manual. Please refer to Appendix 15 of this report.

The Nyloplast grated inlets were sized using manufacturer provided rating curves that provide capacity vs. head values. The 50% clogging factor was included by doubling the tributary Q and obtaining a head value over the grate. The B-inlets were sized by modeling the inlets using Hydraflow Express. Please refer to Appendix 17 of this report for exhibits.

The rip rap pads with tributary velocities greater than 5 fps have been sized per the Hydraulic Engineering Circular No. 14 provided by the U.S. Department of Transportation Federal Highway Administration. Please refer to Appendix 18 of this report for exhibits.

The C-value of each basin was determined by taking the area-weighted average of the values of 0.35 for natural D-type soil and of 0.90 for impervious surfaces (please see Table 3-1 of the County Hydrology Manual, included as Appendix 5 of this report). The weighted C-value calculations are provided on the Existing and Proposed Rational Calculations.

The initial time of concentration (Ti) and maximum overland flow length (Lm) were determined using Table 3-2 of the Hydrology Manual included as Appendix 6 on this report. Ti values were selected based off the slope and associated NRSC element and imperviousness of each basin. The 100-yr, 6-hr storm depth (P₆) was determined using the isopluvial map included as Appendix 2 on this report. The 100-yr, 24-hr storm depth (P₂₄) was determined using the isopluvial map included as Appendix 3 on this report.

The effective slope has been determined using Figure 3-5 of the Hydrology Manual included as Appendix 9 on this report.

The total time of concentration was determined by adding the Ti value to the travel time (Tt). Tt for overland flow on impervious surfaces was determined by modeling an asphalt swale or gutter using Hydraflow Express to determine the velocity. Then the length of flow was divided by the flow velocity to determine Tt (See Appendix 11 in this report). The Tt in natural watersheds was determined by using the Kirpich nomograph in Figure 3-4 of the San Diego County Hydrology Manual, included in Appendix 8 in this report. The calculation of the Tt has only been analyzed for the surface flow, not the pipe flow. This results in a more simplified version of the calcs while also providing smaller Tc's. Smaller Tc's result in greater intensities which result in higher Q's. This method provides more conservative results as compared to the nodal process.

$$T_t = \left(\frac{11.9L^3}{E} \right)^{0.385} \quad (\text{Natural Watersheds})$$

$$T_t = \frac{L}{V * \left(60 \frac{\text{sec}}{\text{min}} \right)} \quad (\text{Gutter Velocity})$$

$$T_c = T_i + T_t$$

The Tc and the P₆ values were entered into the peak intensity formula from page 3-7 of the hydrology manual to determine the intensity of the rainfall during the peak of the 100-year, 6-hr storm.

$$I = 7.44 \times P_6 \times T_c^{-0.645}$$

The peak discharge rate was determined using the Rational Method Formula.

$$Q = C \times I \times A$$

See the attached calculations for particulars. The following references have been used in preparation of this report:

- (1) County of San Diego Hydrology Manual, 2003
- (2) Modern Sewer Design, American Iron & Steel Institute, 1st Ed., 1980

Existing Conditions

The existing site is a vacant dirt lot with trees and shrubs on the north, west, and southeast edges of the lot and shrubs across the center of the site. The site accepts runoff from an offsite areas from the south and north of the site via overland flow. There is a well-defined swale along the easterly property line that prevents run-on from the easterly neighboring property.

In the existing conditions, the northern edge of the site drains to the natural small creek immediately north of the site, which connects to the existing storm drain pipes northwest of the project site. This connection is referred to as Discharge Point #1 in this report.

Most of the site - being the central portion of the site - drains via overland flow to northwesterly corner of the property. This portion of the site accepts run-on from the southerly offsite area. The offsite area is a vacant lot with no improvements just south of the project site; this offsite area drains via overland flow to the southernly edge of the site. This central portion of the project site flows to the northwesterly corner of the site, which drains to the existing connection storm drains immediately northwest of the site, being Discharge Point #1.

The northerly offsite area consists of an existing paved road, driveways and portions of landscape areas from the existing single-family house residences to the north of the site. The runoff generated from this offsite area will drain to Discharge Point # 1 where it conflues with the onsite flows.

Proposed Conditions

In the proposed conditions, the northern half of the developed site will drain via rain gutters and surface flow, in a northerly direction to the northeasterly biofiltration basin (BMP-1). The biofiltration basin will have sufficient ponding depth to attenuate the 100-year storm; from the basin, stormwater will drain to the existing storm drain pipes immediately northwest of the project site. This point is referred to as Discharge Point #1 in this report.

The southern half of the developed site will drain via rain gutters and surface flow to a pipe along the central westerly edge of the project site, which will carry the flow from the southern half of the site in a northerly direction to the northwesterly biofiltration basin (BMP-2). The biofiltration basin will have sufficient ponding depth to attenuate the 100-year storm; from the basin, stormwater will flow via an emergency weir to an overflow pipe to the existing storm drain pipes immediately northwest of the project site, being Discharge Point #1.

A brow ditch is proposed around the edges of proposed developed area of the project site, which will collect the offsite run-on from the vacant lot south of the project site and to replace the existing swale along the easterly edge of the project site to redirect any run on from the adjacent SDG&E substation around the project site to the northwestern corner of the site, where it will connect to the proposed (2)-48" culverts immediately northwest, being Discharge Point #1.

The northerly offsite area will drain via overland flow to a proposed inlet on the private road that drains directly to the (2)-48" culvert pipes.

In order to determine the capacity of the proposed 2-48" culverts, we had to calculate the tributary offsite area to them. We used Streamstats to determine the approximate offsite area that drains

towards the area. We then used the Rational Method to calculate the tributary Q. By using the Manning's equation, we have determined that a single 48" pipe has the capacity of 118 cfs (See Appendix 16). The 2-48" pipes will have enough capacity for the total expected offsite flow along with the onsite unmitigated flow.

The two biofiltration basins will follow the flood control and stormwater BMP's conjunctive use criteria (See image below). The proposed biofiltration basins will meet the pollutant control, hydromodification control and flood control (100-year) within the basin layers. The flood control storage volume overlaps the portion of hydromodification control storage volume that is above the lowest above ground outlet. Refer to the following website for guidance on the conjunctive use requirements:

https://www.sandiegocounty.gov/content/dam/sdc/dpw/FLOOD_CONTROL/floodcontroldocuments/Conjunctive%20use%20facilities%20handout.pdf

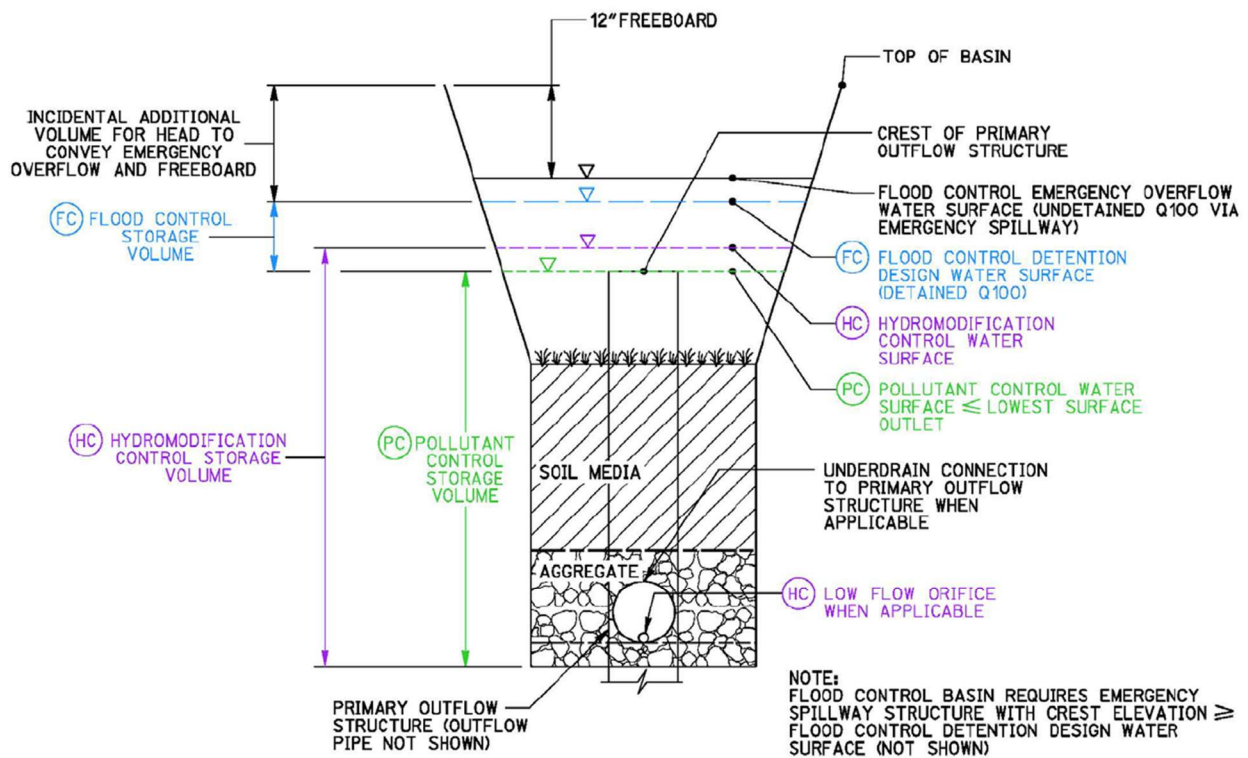


Figure 2
Conjunctive Use Facility for Storm Water Management and Flood Control:
Pollutant Control, Hydromodification Control, and Flood Control Detention; No Mid-flow Outlet

Existing Rational Analysis

The site and the portion of offsite area just south of the site were modeled as two drainage basins in the existing conditions. The existing basins are referred to as E-1 and O-2 in this report. The average slopes of the existing basins vary between 6.1% and 10.7%.

Below is a summary of the input data and resulting flowrates generated by each basin for the 100-year, 6-hr storm.

Existing Rational Calculation Summary

Basin	Area (ac)	Impervious %	C	T _C (mins)	I ₁₀₀ (in/hr)	Q ₁₀₀ (cfs)
E-1	6.43	0%	0.35	10.50	4.57	10.29
O-2	0.57	47%	0.61	7.83	5.52	1.92
O-3	13.80	-	0.49	28.97	2.38	153.42

Below is a summary of the existing confluence flow calculations.

Confluence Pt.	Tributary Flows	T _C (mins)	I ₁₀₀ (in/hr)	Q ₁₀₀ (cfs)	Confluence Flow (cfs)
CP-1	E-1	10.50	4.57	10.29	11.88
	O-2	7.83	5.52	1.92	
DP-1	CP-1	10.50	4.57	11.88	159.59
	O-3	28.97	2.38	153.42	

The peak runoff flowrate discharged by the site is 159.59 cfs at Discharge Point #1.

Proposed Rational Analysis

The proposed site was modeled as six drainage basins. The proposed basins are referred to as P-1, P-2, P-3, O-1, O-2 and O-3 in this report. The average slopes of the basins vary between 1.0% and 10.7%.

Below is a summary of the input data and resulting flowrates generated by each basin for the 100-year, 6-hr storm.

Proposed Rational Calculation Summary

Basin	Area (ac)	Impervious %	C	T _C (mins)	I ₁₀₀ (in/hr)	Q ₁₀₀ (Unmitigated) (cfs)	Q ₁₀₀ (Mitigated) (cfs)
P-1	2.73	86%	0.82	5.00	7.38	16.56	3.04
P-2	2.09	78%	0.78	5.30	7.11	11.60	2.73
P-3	0.48	51%	0.63	5.00	7.38	2.21	-
O-1	1.11	0%	0.35	9.80	4.78	1.85	-
O-2	0.61	44%	0.59	7.83	5.52	2.04	-
O-3	131.80	-	0.49	28.97	2.38	153.42	-

Below is a summary of the proposed confluence flow calculations.

Confluence Pt.	Tributary Flows	T _c (mins)	I ₁₀₀ (in/hr)	Q ₁₀₀ (cfs)	Confluence Flow (cfs)
CP-1	P-1	5.00	7.38	3.04	5.66
	P-2	5.30	7.11	2.73	
CP-2	CP-1	5.30	7.11	5.66	7.79
	P-3	5.00	7.11	2.21	
CP-3	CP-2	5.30	7.11	7.79	8.79
	O-1	9.80	4.78	1.85	
CP-4	CP-3	5.30	7.11	8.79	10.16
	O-2	7.83	5.52	2.04	
DP-1	CP-4	5.30	7.11	10.16	156.82
	O-3	28.97	2.38	153.42	

The peak runoff flowrate discharged by the site is 156.82 cfs at Discharge Point # 1. This demonstrates a decrease of 2.77 cfs. This is due to the attenuation properties of the proposed biofiltration basins.

SWMM Analysis

The 100-year peak flowrate for the project is attenuated by two proposed lined biofiltration basins (please see the BMP details in Appendix 12).

To model the 100-year flowrate generated from Basins P-1 and P-2, hydrographs were required. Rick RatHydro, a hydrograph generating program, was used to produce a hydrograph for each of the tributary basins based on the peak inflows. Please see Appendix 11 for the RatHydro values generated.

The hydrographs generated by Rick RatHydro was input manually into SWMM 5.1 as a time series. The hydrograph was then routed through an orifice link which discharges to the outfall node, DP-1.

The 12" Nyloplast domed grated inlets are modeled as orifice links based upon the capacity and head values provided by Nyloplast; the inlets drain to the project's outfall. The two-outlet links that discharge to DP-1 each represent a 12" Nyloplast Dome Grate riser at 0' offset. This is at the ponding treatment depth elevation within the biofiltration basins.

The storage unit curve within SWMM represents the surface storage of the basins starting at the elevation of the outlet links. This only counts the surface storage that is above the treatment depth. The area at each depth was determined by analyzing the contours within each basin. The proposed volume was determined using the SWMM analysis.

Storage Curve Editor

Curve Name
BMP-1

Description

	Depth (ft)	Area (ft2)
1	0	2850
2	1	3700
3	2	4605

Storage Curve Editor

Curve Name
BMP-2

Description

	Depth (ft)	Area (ft2)
1	0	2405
2	1	3370
3	2	4390

The max ponding depths above the treatment ponding depths of the facilities are 22.20 inches (BMP-1) and 16.92 inches (BMP-2). In the event of clogging, the stormwater will bypass via the precast box grated inlet and will drain to the outlet pipe. During normal operation of the facility, the water level is not anticipated to ever rise high enough to flow through the precast box grated inlet. The precast boxes will provide a pathway if the Nyloplast grated inlets are clogged. The outlet pipes within the precast box have been sized to have enough capacity to drain the unmitigated flow from the basins. In the event that the grated inlet and/or outlets pipes get clogged, a non-erosive overflow spillway has been added to both basins. The spillways will drain to an earthen swale that will route the flow to the rip rap just downstream of the basins.

The peak mitigated outflow for P-1 is 3.04 cfs versus the peak inflow of 16.56 cfs. This is a reduction of 13.52 cfs for the peak flow exiting the node versus entering. The peak mitigated outflow for P-2 is 2.73 cfs versus the peak inflow of 11.60 cfs, which is a reduction of 8.87 cfs.

The attenuated flow values were entered back into the Rational Method Calculation worksheets and confluence to determine the total mitigated peak discharge rate produced by the onsite and offsite basins to Discharge Point #1.

Results and Conclusions

The development of the project site will modify the onsite drainage patterns, but the discharge points locations will remain unchanged. The alterations on the onsite drainage patterns will not result on erosion or flooding. The proposed improvements result in a decrease in peak flowrates at Discharge Point #1 for the 6-hour, 100-year storm due to the attenuation properties of the proposed biofiltration basins.

	Area (ac)	C (ave)	T _c (mins)	I ₁₀₀ (in/hr)	V ₁₀₀ (fps)	Q ₁₀₀ (cfs)
Existing Conditions	138.80	0.48	28.97	2.38	9.57	159.59
Proposed Conditions	138.80	0.64	28.97	2.38		156.82

The project will not place any structures in the 100-year flood hazard areas or flood plain. The project is not located in an area that is exposed to the risk of flooding due to a dam levee failure, thus the

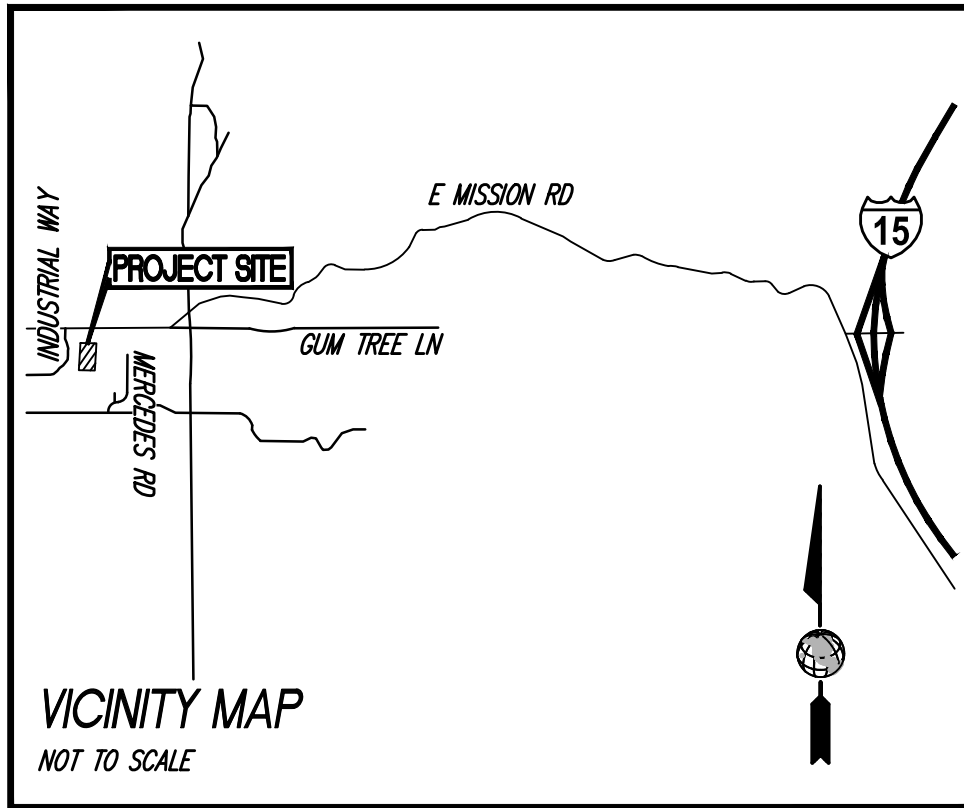
project will not expose people or structures to a significant risk of loss, injury or death involving flooding as a result of a failure of a levee or a dam.

The project is not anticipated to exceed the capacity of the proposed onsite conveyances, as well as the existing offsite storm drain system conveyances. It is the opinion of Omega Engineering Consultants that the project will not cause adverse effects to downstream waterways and conveyances during the 100-year, 6-hour storm.

Project does not propose to discharge fill or dredged materials to the Waters of the State and will not involve construction near or over waters of the state, therefore no CWA 401 or 404 permit is required.

Based on the Temecula Quadrangle 7.5-minute Topo retrieved from the U.S. Department of Interior U.S. Geological Survey (USGS) (See Appendix 14), the location where the project is discharging to is not labelled as a blue line stream. The project will not disturb densely vegetated portions. Therefore, the project does not require 401/404 or 1602 permits.

It is the opinion of Omega Engineering Consultants that a drainage waiver and/or release letter is not required from any downstream property owners.



LEGEND

BASIN NUMBER

AREA LIMITS

DRAINAGE FLOW PATH

BUILDING AREA

PAVEMENT AREA

PERVIOUS AREA

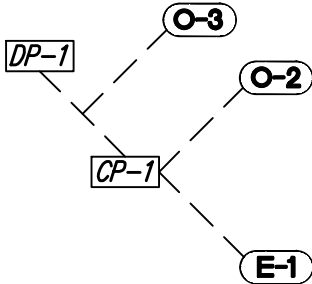
E-#

DRAINAGE BASIN DATA											
BASIN #	AREA (AC)	C	H (FT)	L (FT)	S _{INITIAL} (%)	S _{AVG} (%)	T _i (MINS)	T _t (MINS)	T _c (MINS)	i ₁₀₀ (IN/HR)	Q ₁₀₀ (CFS)
E-1	6.43	0.35	52.0	855	8.0%	6.1%	6.90	3.60	10.50	4.57	10.29
O-2	0.57	0.61	32.0	300	10.0%	10.7%	6.90	0.93	7.83	5.52	1.92
O-3	131.80	0.49	56.0	3528	2.0%	1.6%	8.80	20.17	28.97	2.38	153.42

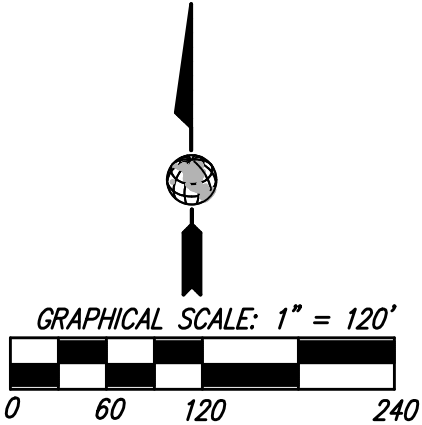
DISCHARGE POINT # 1
Q₁₀₀ = 159.59 CFS
V₁₀₀ = 9.57 FPS

REFER TO APPENDIX 16 FOR
OFFSITE BASIN O-3 CALCULATIONS

EX. DITCH
ALONG PL

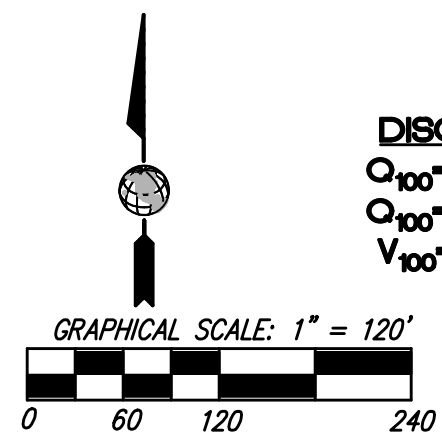


CONFLUENCE SCHEMATIC



FALLBROOK SELF STORAGE
EXISTING HYDROLOGY EXHIBIT





DISCHARGE POINT # 1
Q₁₀₀= 164.13 CFS (UNMITIGATED)
Q₁₀₀= 156.82 CFS (MITIGATED)
V₁₀₀= 9.63 FPS

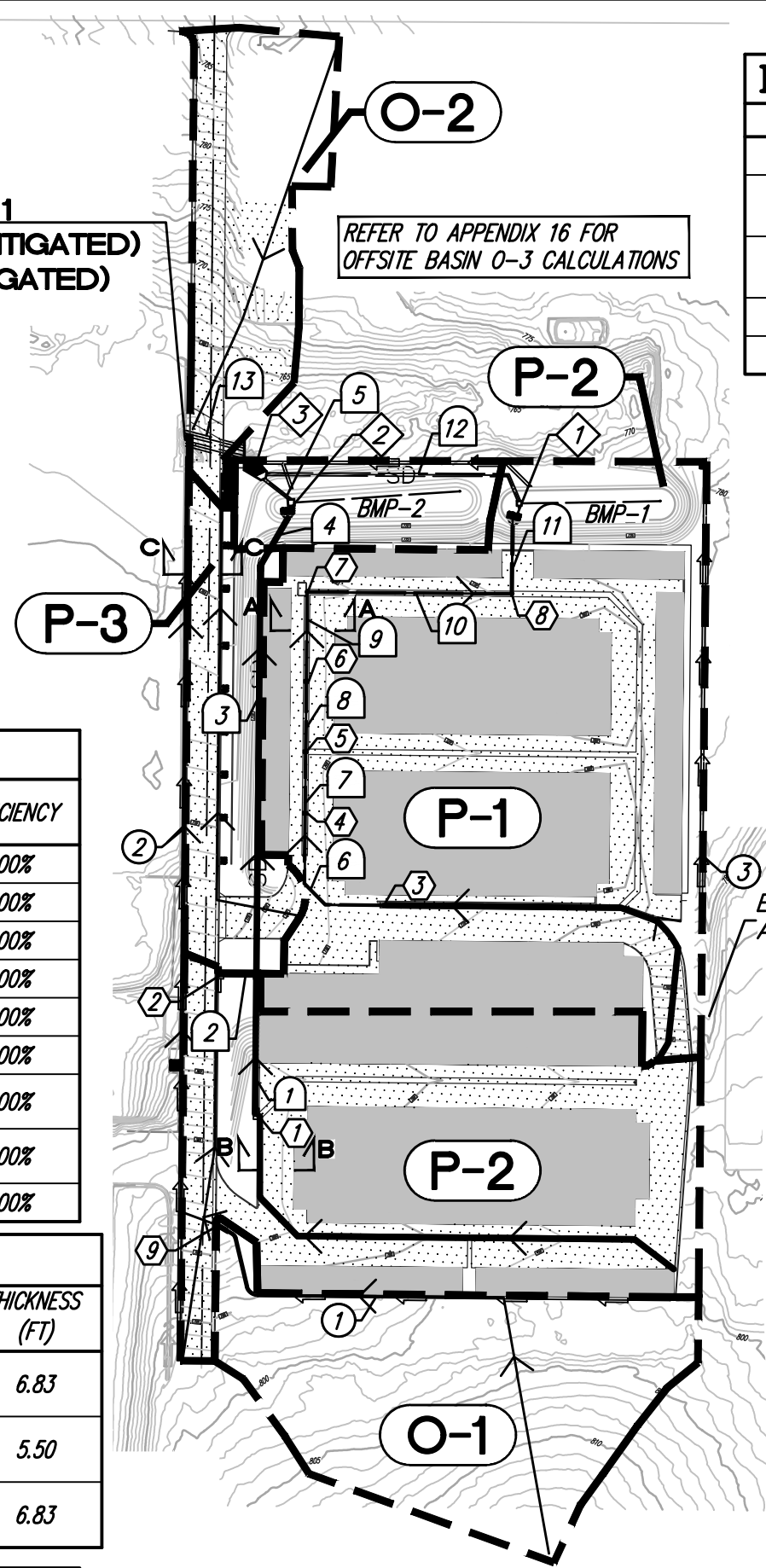
REFER TO APPENDIX 16 FOR
OFFSITE BASIN 0-3 CALCULATIONS

DITCH DATA					
DITCH #	TOP WIDTH (INCHES)	SLOPE (%)	D/T	V ₁₀₀ (FPS)	Q ₁₀₀ (CFS)
1	24	10.0	0.11	9.84	1.85
2	24	5.0	0.13	7.71	1.85
3	24	2.0	0.36	9.15	9.32

INLET DATA TABLE			
INLET #	DESCRIPTION	DEPTH (FT)	EFFICIENCY
1	B-INLET W/ 4" H X 8' W OPENING	0.66	100%
2	B-INLET W/ 4" H X 14' W OPENING	0.27	100%
3	2' X 3' NYLOPLAST GRATED INLET	0.43	100%
4	2' X 3' NYLOPLAST GRATED INLET	0.11	100%
5	2' X 3' NYLOPLAST GRATED INLET	0.42	100%
6	2' X 3' NYLOPLAST GRATED INLET	0.12	100%
7	30" NYLOPLAST STANDARD GRATED INLET	0.35	100%
8	30" NYLOPLAST STANDARD GRATED INLET	0.32	100%
9	2' X 3' NYLOPLAST GRATED INLET	0.21	100%

RIP RAP DATA TABLE						
RIP RAP #	RIP RAP TYPE	Q ₁₀₀ (CFS)	V ₁₀₀ (FPS)	LENGTH (FT)	WIDTH (FT)	THICKNESS (FT)
1	NO. 2 BACKING	16.56	14.59	8.00	1.65	6.83
2	NO. 2 BACKING	11.60	12.19	6.00	1.65	5.50
3	NO. 2 BACKING	27.55	12.19	8.00	1.65	6.83

SEE APPENDIX 10 FOR CHANNEL
ANALYSIS OF DRIVE AISLES A, B & C



BASIN CHARACTERISTICS		
	BMP-1	BMP-2
FG AREA (SF)	2,450	1,940
FG ELEVATION (FT)	769.75	766.75
TOP SLOPE ELEVATION (FT)	772.85	769.41
HEIGHT (FT)	3.10	2.66
VOLUME (CF)	7,426	6,766

DRAINAGE BASIN DATA												
BASIN #	AREA (AC)	C	H (FT)	L (FT)	S _{INITIAL} (%)	S _{AVG} (%)	T _i (MINS)	T _t (MINS)	T _c (MINS)	I ₁₀₀ (IN/HR)	Q ₁₀₀ UNMITIGATED (CFS)	Q ₁₀₀ MITIGATED (CFS)
P-1	2.73	0.82	13.3	310	12.5%	4.3%	2.40	0.99	5.00	7.38	16.56	3.04
P-2	2.09	0.78	3.3	380	1.0%	0.9%	4.10	1.20	5.30	7.11	11.60	2.73
P-3	0.48	0.63	13.2	350	4.7%	3.8%	2.90	1.65	5.00	7.38	2.21	-
O-1	1.11	0.35	49.5	970	8.0%	5.1%	6.90	2.90	9.80	4.78	1.85	-
O-2	0.61	0.59	32.0	300	10.0%	10.7%	6.90	0.93	7.83	5.52	2.04	-
O-3	131.80	0.49	56.0	3528	2.0%	1.6%	8.80	20.17	28.97	2.38	153.42	-

LEGEND

BASIN NUMBER

P-#

AREA LIMITS

DRAINAGE FLOW PATH

→

BUILDING AREA

[Solid Grey Box]

PAVEMENT AREA

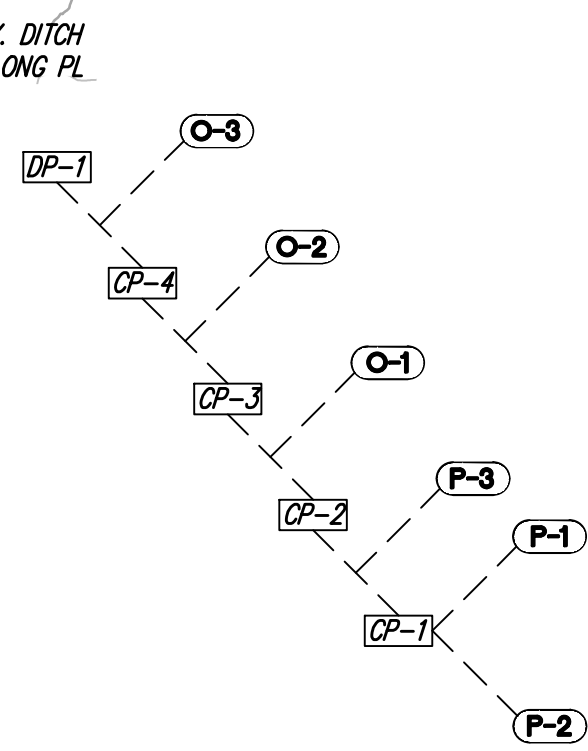
[Dotted Box]

PERVIOUS AREA

[White Box]

PIPE DATA					
PIPE #	DIAMETER (INCHES)	SLOPE (%)	DEPTH/DIA	V ₁₀₀ (FPS)	Q ₁₀₀ (CFS)
1	12	8.7	0.61	15.79	7.93
2	12	0.5	0.59	3.78	1.82
3	18	1.0	0.83	7.40	11.60
4	18	3.4	0.53	12.19	11.60
5	24	7.0	0.28	16.11	11.60
6	18	0.5	0.60	4.92	5.45
7	18	0.5	0.65	5.10	6.19
8	18	1.0	0.81	7.42	11.36
9	18	1.0	0.84	7.45	11.80
10	18	1.0	0.39	7.28	12.09
11	24	4.3	0.46	14.59	16.56
12	24	2.4	0.64	11.74	16.56
13	48	0.5	0.62	9.66	82.07

*NOTE: THE MAX UNMITIGATED TRIB. OFFSITE FLOW TO PIPE # 13 WAS CALCULATED TO BE 164.60 CFS. SEE APPENDIX 16 FOR CALCULATIONS.



**FALLBROOK SELF STORAGE
PROPOSED HYDROLOGY EXHIBIT**



HYDROLOGY AND HYDRAULICS CALCS (Table No. 1)

BASIN	AREA (SF)	AREA (AC)	% Imp	"C" Value
E-1	280,093	6.43	0%	0.35
O-2	24,960	0.57	47%	0.61
O-3	5,741,223	131.80	-	0.49
EX TOTAL	6,046,276	138.80		
P-1	118,724	2.73	86%	0.82
P-2	90,926	2.09	78%	0.78
P-3	20,743	0.51	51%	0.63
O-1	48,200	1.11	0%	0.35
O-2	26,460	0.57	44%	0.59
O-3	5,741,223	131.80	-	0.49
PROP TOTAL	6,046,276	138.80		

Basin Confluence	Symbol
Existing	
(E-1 & O-2)	CP-1
(CP-1 & O-3)	DP-1
Proposed	
(P-1 & P-2)	CP-1
(CP-1 & P-3)	CP-2
(CP-2 & O-1)	CP-3
(CP-3 & O-2)	CP-4
(CP-4 & O-3)	DP-1

(A) CP # - Confluence Point

(B) DP # - Discharge Point

(C) C value for bare ground is 0.35 (Table 3-1 County Hydrology Manual)
(Type 'D' soil)

C value for impervious surfaces is 0.90

Basins with mixed surface type use a weighted average
of these 2 values. (impervious % x 0.90)+(pervious % x 0.35)

FALLBROOK SELF-STORAGE

6/15/2026

EXISTING CONDITIONS - HYDROLOGY AND HYDRAULICS CALCS (Table No. 2)

Sub-Basin	AREA Ac.	"C"	CA	ΣCA	Overland flow length (ft)	Concentrated Flow Length (ft)	S(%) (Initial)	S(%) (avg.)	Ti mins	Tt mins	T _c mins	I in/hr	Q cfs	NOTES 100-year, 6 hr storm
E-1	6.43	0.35	2.25	2.25	100.0	755.0	8.0%	6.1%	6.90	3.60	10.50	4.57	10.29	P(6)= 2.80
O-2	0.57	0.61	0.35	0.35	100.0	200.0	10.0%	10.7%	6.90	0.93	7.83	5.52	1.92	
Confluence calcs for E-1 and O-2											10.50	4.57	11.88	Q(T1)
											7.83	5.52	9.60	Q(T2)
											10.50	4.57	11.88	
O-3	131.80	0.49	64.58	64.58	85.0	3443.0	2.0%	1.6%	8.80	20.17	28.97	2.38	153.42	
											28.97	2.38	159.59	Q(T1)
											10.50	4.57	67.47	Q(T2)
											28.97	2.38	159.59	DP-1

Tt Calculations

Basin	Concentrated Flow Length (ft)	Height (ft)	Slope Avg (%)	Calc Method	V (fps)	Tt (mins)
E-1	755.00	52.00	6.1%	Natural Watershed - Kirpich	-	3.60
O-2	200.00	32.00	10.7%	Natural Watershed - Kirpich	-	0.93
O-3	3443.00	56.00	1.6%	Natural Watershed - Kirpich	-	20.17

$$T_t = \left(\frac{11.9L^3}{E} \right)^{0.385} \text{ (Natural Watersheds)}$$

Composite Runoff Coefficient Calculations

Basin	Total Area (sf)	Imp. Area (sf)	Pervious Area (sf)	Imperv C-Value	Pervious C-Value	Imp. %	Runoff Coefficient Calculations
E-1	280093	0	280093	0.90	0.35	0%	$C = (0.90 * 0) + 0.35 * (1-0) = 0.35$
O-2	24960	11660	13300	0.90	0.35	47%	$C = (0.90 * 0.47) + 0.35 * (1-0.47) = 0.61$
O-3	5741223	-	-	-	-	-	$C = 0.49$, Assumed Medium Density Residential, 2.9 DU/A or less

$$C = 0.90 \times (\% \text{ Impervious}) + C_p \times (1 - \% \text{ Impervious})$$

Where: C_p = Pervious Coefficient Runoff Value for the soil type (shown in Table 3-1 as Undisturbed Natural Terrain/Permanent Open Space, 0% Impervious). Soil type can be determined from the soil type map provided in Appendix A.

FALLBROOK SELF-STORAGE

6/15/2026

PROPOSED CONDITIONS (UNMITIGATED)- HYDROLOGY AND HYDRAULICS CALCS (Table No. 3)

Sub-Basin	AREA Ac.	"C"	CA	ΣCA	Overland flow length (ft)	Concentrated Flow Length (ft)	S(%) (Initial)	S(%) (avg.)	Ti mins	Tt mins	T _c mins	I in/hr	Q cfs	NOTES 100-year, 6 hr storm
P-1	2.73	0.82	2.24	2.24	60.0	250.0	12.5%	4.3%	2.40	0.99	5.00	7.38	16.56	P(6)= 2.80
P-2	2.09	0.78	1.63	1.63	60.0	320.0	1.0%	0.9%	4.10	1.20	5.30	7.11	11.60	
Confluence calcs for P-1 and P-2											5.00	7.38	27.51	
											5.30	7.11	27.55	Q(T1)
											5.30	7.11	27.55	Q(T2)
											5.30	7.11	27.55	CP-1
P-3	0.48	0.63	0.30	0.30	90.0	260.0	4.7%	3.8%	2.90	1.65	5.00	7.38	2.21	
CP-1	-	-	-	-	-	-					5.30	7.11	27.55	
Confluence calcs for CP-1 and P-3											5.00	7.38	28.22	
											5.30	7.11	29.68	Q(T1)
											5.30	7.11	29.68	Q(T2)
											5.30	7.11	29.68	CP-2
O-1	1.11	0.35	0.39	0.39	100.0	870.0	8.0%	5.1%	6.90	2.90	9.80	4.78	1.85	
CP-2	-	-	-	-	-	-					5.30	7.11	29.68	
Confluence calcs for CP-2 and O-1											9.80	4.78	21.81	
											5.30	7.11	30.68	Q(T1)
											5.30	7.11	30.68	Q(T2)
											5.30	7.11	30.68	CP-3
O-2	0.61	0.61	0.37	0.37	100.0	200.0	10.0%	10.7%	6.90	0.93	7.83	5.52	2.04	
Confluence calcs for CP-3 and O-2											5.30	7.11	32.06	
											7.83	5.52	25.87	
											5.30	7.11	32.06	Q(T1)
											7.83	5.52	25.87	Q(T2)
											5.30	7.11	32.06	CP-4
O-3	131.80	0.49	64.58	64.58	85.0	3443	2.0%	1.6%	8.80	20.17	28.97	2.38	153.42	
											5.30	7.11	60.10	
											28.97	2.38	164.13	
											28.97	2.38	164.13	Q(T1)
											28.97	2.38	164.13	Q(T2)
											28.97	2.38	164.13	DP-1
Composite Runoff Coefficient Calculations														
Basin	Total Area (sf)	Imp. Area (sf)	Pervious Area (sf)	Imp C-Value	Perv C-Value	Imp. %	Runoff Coefficient Calculations							
P-1	118724	102188	16536	0.90	0.35	86%	C = (0.90 * 0.86) + 0.35 * (1-0.86) = 0.82							
P-2	90926	71357	19569	0.90	0.35	78%	C = (0.90 * 0.78) + 0.35 * (1-0.78) = 0.78							
P-3	20743	10503	10240	0.90	0.35	51%	C = (0.90 * 0.51) + 0.35 * (1-0.51) = 0.63							
O-1	48200	0	48200	0.90	0.35	0%	C = (0.90 * 0) + 0.35 * (1-0) = 0.35							
O-2	26460	11660	14800	0.90	0.35	44%	C = (0.90 * 0.44) + 0.35 * (1-0.44) = 0.59							
O-3	5741223	-	-	-	-	-	C = 0.49, Assumed Medium Density Residential, 2.9 DU/A or less							

FALLBROOK SELF-STORAGE

6/15/2026

PROPOSED CONDITIONS (MITIGATED)- HYDROLOGY AND HYDRAULICS CALCS (Table No. 4)

Sub-Basin	AREA Ac.	"C"	CA	ΣCA	Overland flow length (ft)	Concentrated Flow Length (ft)	S(%) (Initial)	S(%) (avg.)	Ti mins	Tt mins	T _c mins	I in/hr	Q cfs	NOTES 100-year, 6 hr storm
P-1	2.73	0.82	2.24	2.24	60.0	250.0	12.5%	4.3%	2.40	0.99	5.00	7.38	3.04	P(6)= 2.80
P-2	2.09	0.78	1.63	1.63	60.0	320.0	1.0%	0.9%	4.10	1.20	5.30	7.11	2.73	
Confluence calcs for P-1 and P-2											5.00	7.38	5.62	
											5.30	7.11	5.66	
											5.30	7.11	5.66	CP-1
P-3	0.48	0.63	0.30	0.30	90.0	260.0	4.7%	3.8%	2.90	1.65	5.00	7.38	2.21	
CP-1	-	-	-	-	-	-					5.30	7.11	5.66	
Confluence calcs for CP-1 and P-3											5.00	7.38	7.55	
											5.30	7.11	7.79	
											5.30	7.11	7.79	CP-2
O-1	1.11	0.35	0.39	0.39	100.0	870.0	8.0%	5.1%	6.90	2.90	9.80	4.78	1.85	
CP-2	-	-	-	-	-	-					5.30	7.11	7.79	
Confluence calcs for CP-2 and O-1											9.80	4.78	7.09	
											5.30	7.11	8.79	
											5.30	7.11	8.79	CP-3
O-2	0.61	0.61	0.37	0.37	100.0	200.0	10.0%	10.7%	6.90	0.93	7.83	5.52	2.04	
Confluence calcs for CP-3 and O-2											5.30	7.11	10.16	
											7.83	5.52	8.86	
											5.30	7.11	10.16	
														CP-4
O-3	131.80	0.49	64.58	64.58	85.0	3443	2.0%	1.6%	8.80	20.17	28.97	2.38	153.42	
											5.30	7.11	38.21	
											28.97	2.38	156.82	
											28.97	2.38	156.82	
														DP-1
Composite Runoff Coefficient Calculations														
Basin	Total Area (sf)	Imp. Area (sf)	Pervious Area (sf)	Imp C-Value	Perv C-Value	Imp. %	Runoff Coefficient Calculations							
P-1	118724	102188	16536	0.90	0.35	86%	C = (0.90 * 0.86) + 0.35 * (1-0.86) = 0.82							
P-2	90926	71357	19569	0.90	0.35	78%	C = (0.90 * 0.78) + 0.35 * (1-0.78) = 0.78							
P-3	20743	10503	10240	0.90	0.35	51%	C = (0.90 * 0.51) + 0.35 * (1-0.51) = 0.63							
O-1	48200	0	48200	0.90	0.35	0%	C = (0.90 * 0) + 0.35 * (1-0) = 0.35							
O-2	26460	11660	14800	0.90	0.35	44%	C = (0.90 * 0.44) + 0.35 * (1-0.44) = 0.59							
O-3	5741223	-	-	-	-	-	C = 0.49, Assumed Medium Density Residential, 2.9 DU/A or less							

FALLBROOK SELF-STORAGE
PROPOSED Tt CALCS (Table No. 5)

6/15/2026

Tt Calculations

Basin	Concentrated Flow Length (ft)	Height (ft)	Slope Avg (%)	Calc Method	V (fps)	Tt (mins)	
P-1	250.00	13.30	4.3%	Gutter Velocity	4.23	3.60	$Tt = \frac{L}{V * (60 \frac{sec}{min})} \quad (\text{Gutter Velocity})$
P-2	320.00	3.30	0.9%	Gutter Velocity	4.46	0.93	
P-3	260.00	13.15	3.8%	Gutter Velocity	2.62	20.17	
O-1	870.00	49.5	5.1%	Gutter Velocity	5.00		
O-2	200.00	32.00	10.7%	Natural Watershed - Kirpich	-		$Tt = \left(\frac{11.9L^3}{E} \right)^{0.385} \quad (\text{Natural Watersheds})$
O-3	3443.00	56.00	1.6%	Natural Watershed - Kirpich	-		

Appendix 1

Appendix B: Storm Water Pollutant Control Hydrologic Calculations and Sizing Methods for Structural BMPs

The following table summarizes public data sources available for the infiltration restriction analysis.

Table B.2-2: Public Data Sources for Infiltration Restriction Analysis

Resources	Description
Geotracker	Website: geotracker.waterboards.ca.gov Reference Layers: Groundwater Depths, Contaminated Sites/Soils
SANGIS	Website: sangis.org Reference Layers: Land Use Current, Gas Stations, Wells, Groundwater Basins, Flowlines, Liquefaction, Soils, Steep Slopes, Sewer, Topography, Elevation Grids
Web Soil Survey (NRCS Soil Type)	Website: websoilsurvey.sc.egov.usda.gov/App Reference Layers: Hydrologic Soil Group, Map Unit Names
Watershed Management Area Analysis	Website: projectcleanwater.org/watershed-management-area-analysis-wmaa Reference Layers: Electronic Data from Appendix C of WMAA
Survey Records System	Website: srs.sandiegocounty.gov Reference Layers: Grading Plans, Surveys, Drainage Plans, Topography Maps, Tentative Parcel Maps
Applicant Plans	Website: n/a Reference Layers: Utility Plans, Grading Plans, Existing Site Conditions, Proposed Site Conditions, Nearby geotechnical reports.
Geotechnical Engineer	Website: n/a Reference Layers: At discretion of Geotechnical Engineer

B.2.3 Step 2C – Design Infiltration Rate

The design infiltration rate for each drainage area must be determined through either a basic or advanced analysis. The basic analysis allows the SWQMP Preparer to assign a default design infiltration rate based on the predominant NRCS soil type present within the proposed BMP footprint. The advanced analysis allows for a geotechnical engineer to assign a more specific design infiltration rate based on field testing outlined in Appendix D. Table B.2-3 below identifies the design infiltration rates that can be used for each analysis. Please note that the basic analysis is not permitted for BMPs that lack an underdrain.

Table B.2-3: Design Infiltration Rate

Infiltration Restrictions	Design Infiltration Rate (in/hr)	
	Option 1: Basic Analysis	Option 2: Advanced Analysis
Unrestricted	Type A Soil = 0.300	Rate recommended by geotechnical engineer (Reference Appendix D)
Unrestricted	Type B Soil = 0.200	
Unrestricted	Type C Soil = 0.100	
Unrestricted	Type D Soil = 0.025	
Restricted	Any Soil = 0.000	0.000

B.2.4 Step 2D - Retention Requirement

Using information determined in previous steps, the retention requirement can now be determined. Retention requirement is the percentage of annual runoff that must be retained within the drainage area.

The Geotechnical Investigation performed infiltration testing with the resulting infiltration being of 0.009 inches/hour. Per this table, the resulting infiltration rate if more representative of Type D soils.

Appendix 2

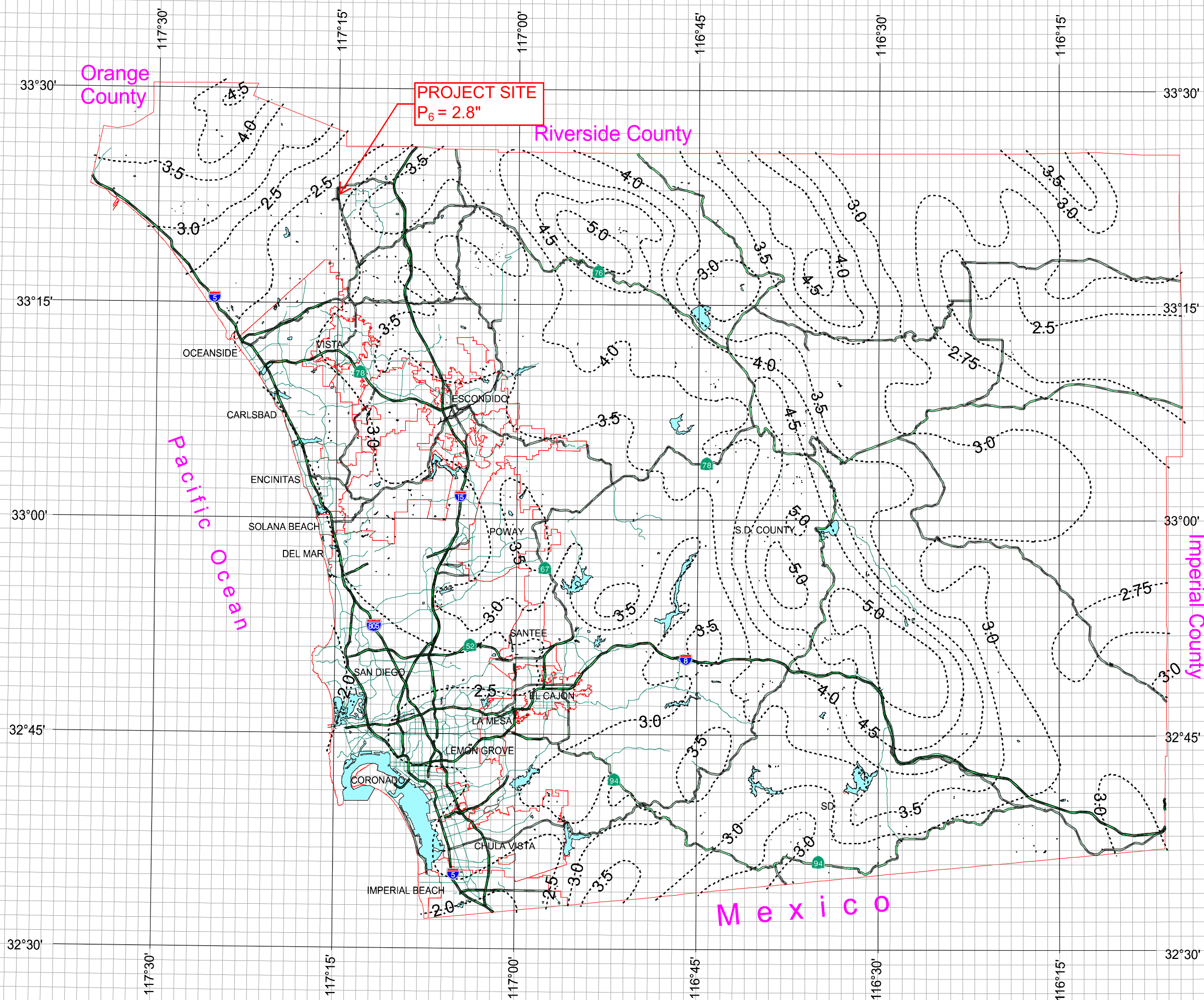
County of San Diego Hydrology Manual



Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

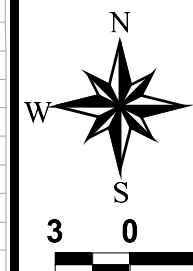
----- Isopluvial (inches)



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Appendix 3

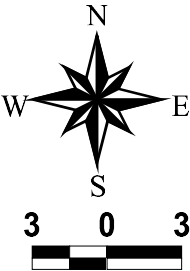
County of San Diego Hydrology Manual



Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

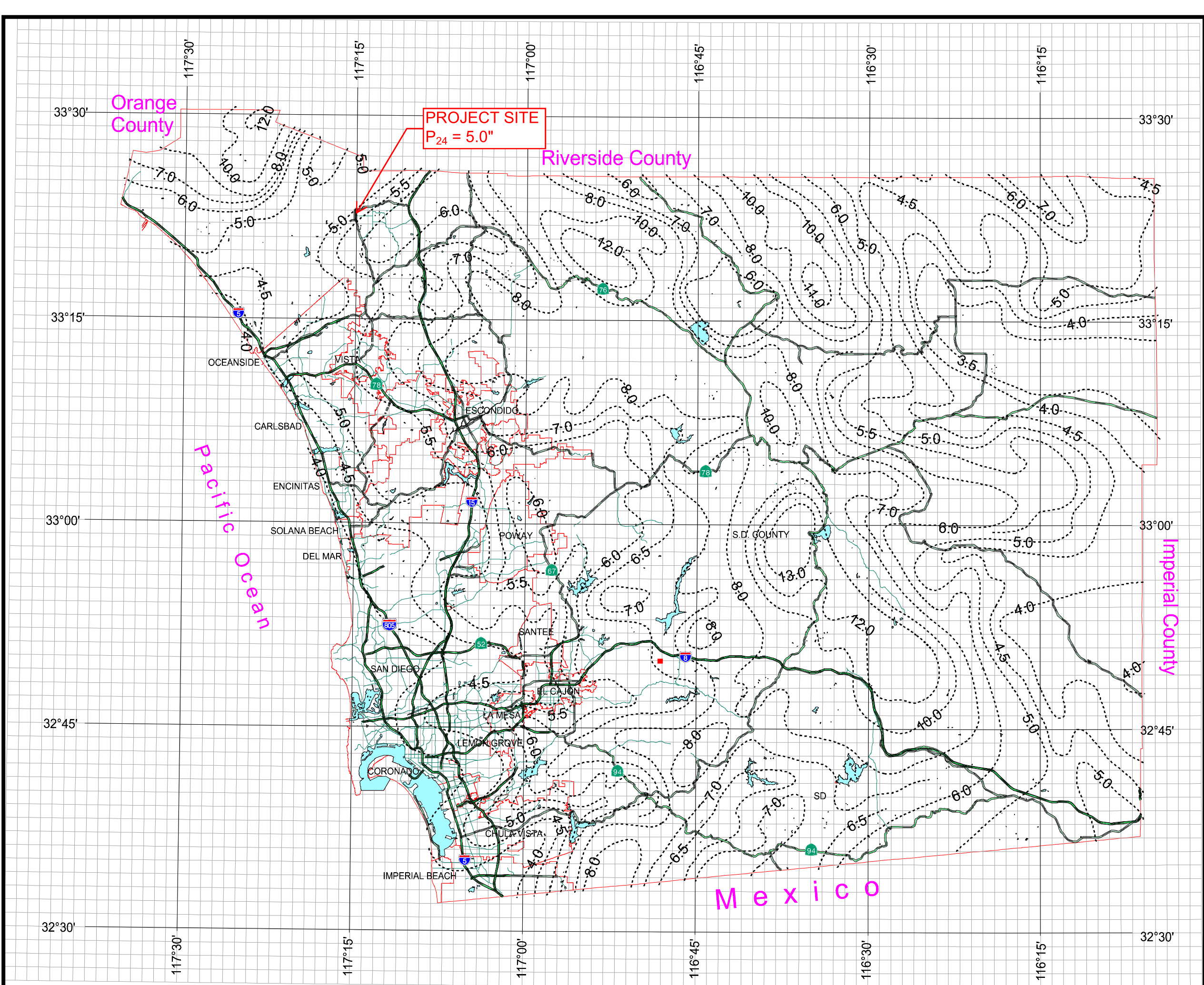
----- Isopluvial (inches)



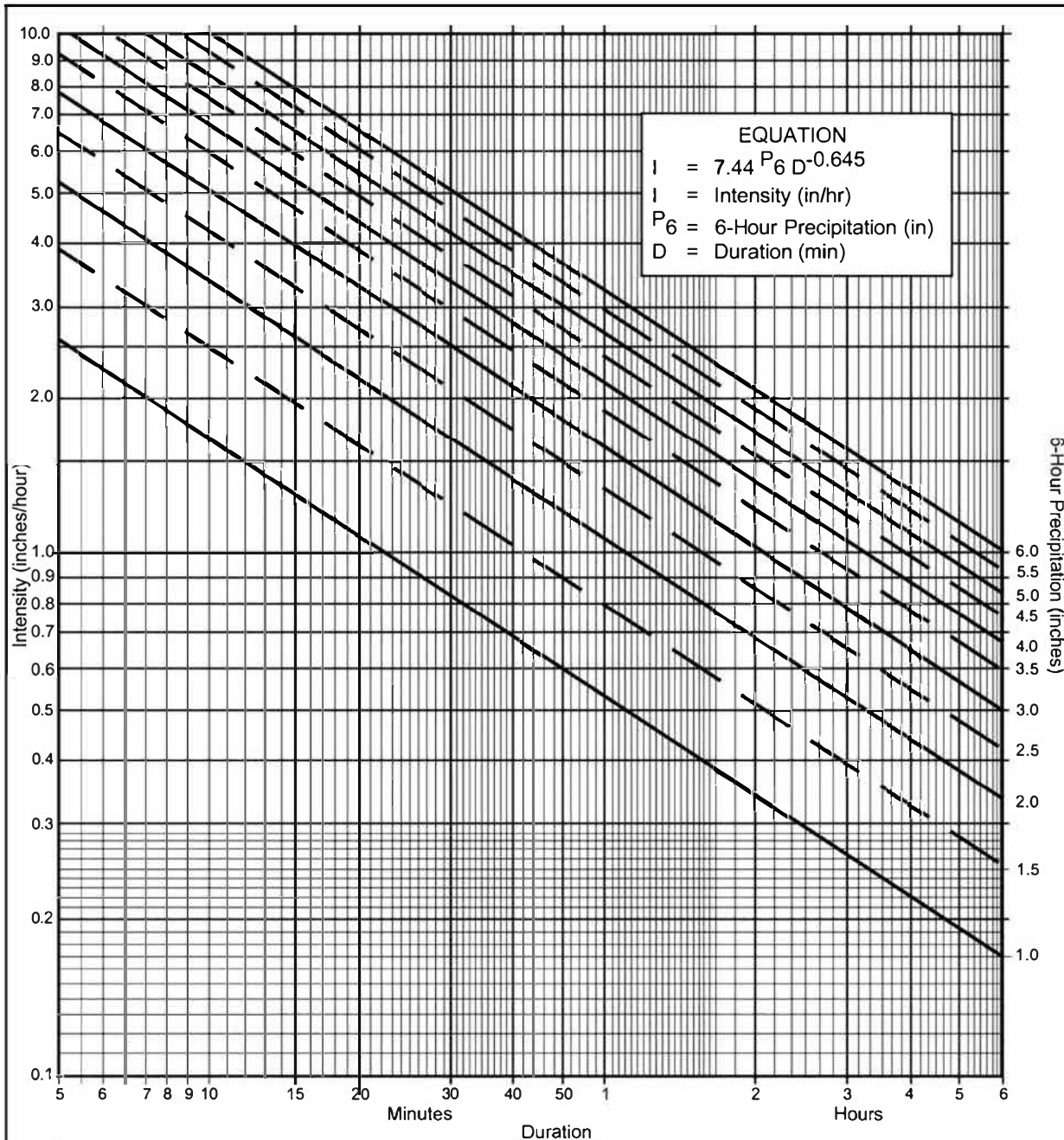
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Appendix 4



Directions for Application:

- (1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).
- (2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicable to Desert).
- (3) Plot 6 hr precipitation on the right side of the chart.
- (4) Draw a line through the point parallel to the plotted lines.
- (5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

- (a) Selected frequency 100 year
- (b) $P_6 = \underline{2.8}$ in., $P_{24} = \underline{5.0}$ in., $\frac{P_6}{P_{24}} = \underline{56} \%^{(2)}$
- (c) Adjusted $P_6^{(2)} = \underline{n/a}$ in.
- (d) $t_x = \underline{\hspace{2cm}}$ min. **T & I per Rational**
- (e) $I = \underline{\hspace{2cm}}$ in./hr. **Calc sheet**

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

FIGURE

3-1

Appendix 5

**Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS**

Land Use		Runoff Coefficient "C"				
NRCS Elements	County Elements	% IMPER.	Soil Type			
			A	B	C	D
Undisturbed Natural Terrain (Natural)	Permanent Open Space	0*	0.20	0.25	0.30	0.35
Low Density Residential (LDR)	Residential, 1.0 DU/A or less	10	0.27	0.32	0.36	0.41
Low Density Residential (LDR)	Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46
Low Density Residential (LDR)	Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49
Medium Density Residential (MDR)	Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52
Medium Density Residential (MDR)	Residential, 7.3 DU/A or less	40	0.48	0.51	0.54	0.57
Medium Density Residential (MDR)	Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60
Medium Density Residential (MDR)	Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63
High Density Residential (HDR)	Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71
High Density Residential (HDR)	Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79
Commercial/Industrial (N. Com)	Neighborhood Commercial	80	0.76	0.77	0.78	0.79
Commercial/Industrial (G. Com)	General Commercial	85	0.80	0.80	0.81	0.82
Commercial/Industrial (O.P. Com)	Office Professional/Commercial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (Limited I.)	Limited Industrial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (General I.)	General Industrial	95	0.87	0.87	0.87	0.87

*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, C_p , for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).

DU/A = dwelling units per acre

NRCS = National Resources Conservation Service

Appendix 6

Note that the Initial Time of Concentration should be reflective of the general land-use at the upstream end of a drainage basin. A single lot with an area of two or less acres does not have a significant effect where the drainage basin area is 20 to 600 acres.

Table 3-2 provides limits of the length (Maximum Length (L_M)) of sheet flow to be used in hydrology studies. Initial T_i values based on average C values for the Land Use Element are also included. These values can be used in planning and design applications as described below. Exceptions may be approved by the “Regulating Agency” when submitted with a detailed study.

Table 3-2

**MAXIMUM OVERLAND FLOW LENGTH (L_M)
& INITIAL TIME OF CONCENTRATION (T_i)**

Element*	DU/ Acre	.5%		1%		2%		3%		5%		10%	
		L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i
Natural		50	13.2	70	12.5	85	10.9	100	10.3	100	8.7	100	6.9
LDR	1	50	12.2	70	11.5	85	10.0	100	9.5	100	8.0	100	6.4
LDR	2	50	11.3	70	10.5	85	9.2	100	8.8	100	7.4	100	5.8
LDR	2.9	50	10.7	70	10.0	85	8.8	95	8.1	100	7.0	100	5.6
MDR	4.3	50	10.2	70	9.6	80	8.1	95	7.8	100	6.7	100	5.3
MDR	7.3	50	9.2	65	8.4	80	7.4	95	7.0	100	6.0	100	4.8
MDR	10.9	50	8.7	65	7.9	80	6.9	90	6.4	100	5.7	100	4.5
MDR	14.5	50	8.2	65	7.4	80	6.5	90	6.0	100	5.4	100	4.2
HDR	24	50	6.7	65	6.1	75	5.1	90	4.9	95	4.3	100	3.5
HDR	43	50	5.3	65	4.7	75	4.0	85	3.8	95	3.4	100	2.7
N. Com		50	5.3	60	4.5	75	4.0	85	3.8	95	3.4	100	2.7
G. Com		50	4.7	60	4.1	75	3.6	85	3.4	90	2.9	100	2.4
O.P./Com		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
Limited I.		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
General I.		50	3.7	60	3.2	70	2.7	80	2.6	90	2.5	100	1.9

Basins E-1,
O-2 & O-1

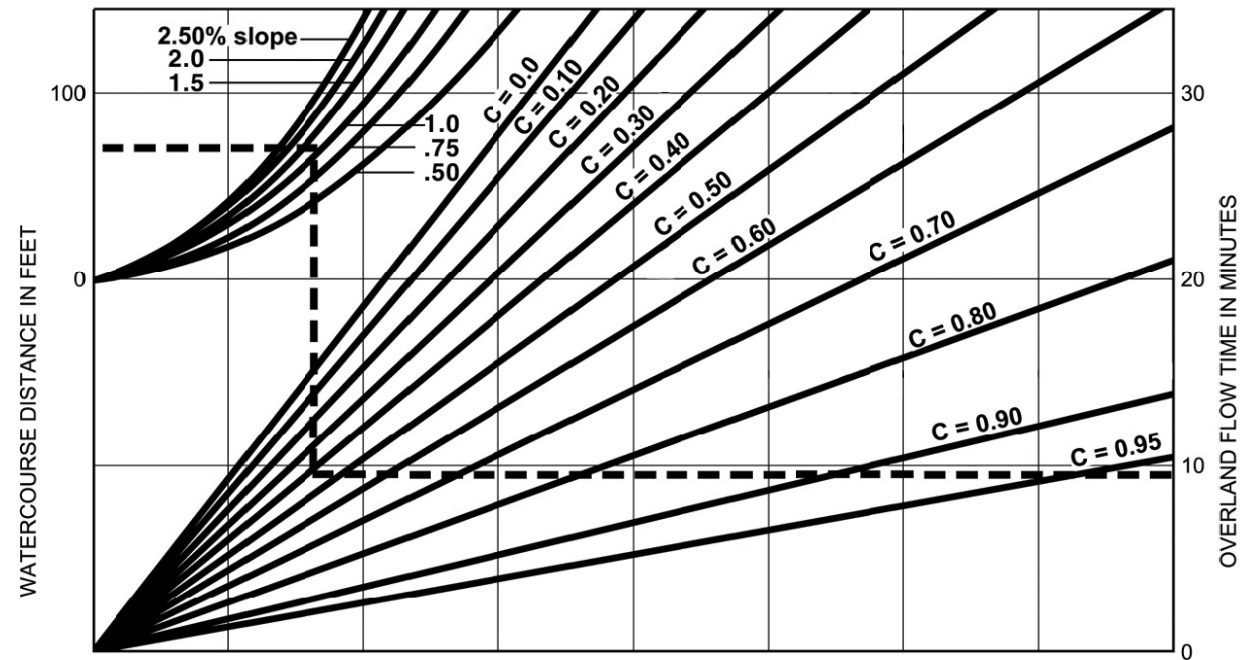
Basin P-2

Basin P-3

Basin P-1

*See Table 3-1 for more detailed description

Appendix 7



EXAMPLE:

Given: Watercourse Distance (D) = 70 Feet
 Slope (s) = 1.3%
 Runoff Coefficient (C) = 0.41
 Overland Flow Time (T) = 9.5 Minutes

$$T = \frac{1.8 (1.1-C) \sqrt{D}}{\sqrt[3]{s}}$$

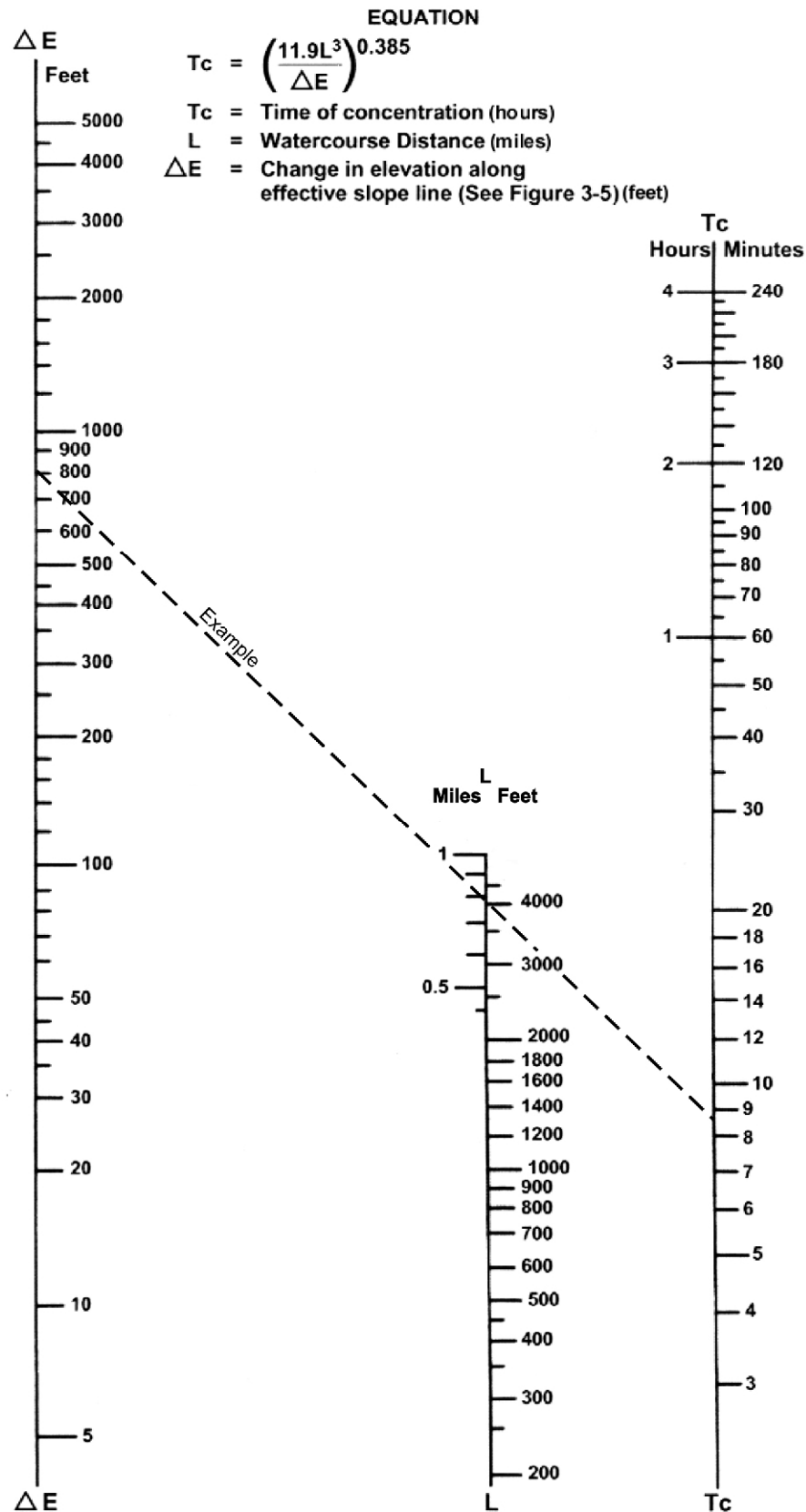
SOURCE: Airport Drainage, Federal Aviation Administration, 1965

F I G U R E

Rational Formula - Overland Time of Flow Nomograph

3-3

Appendix 8



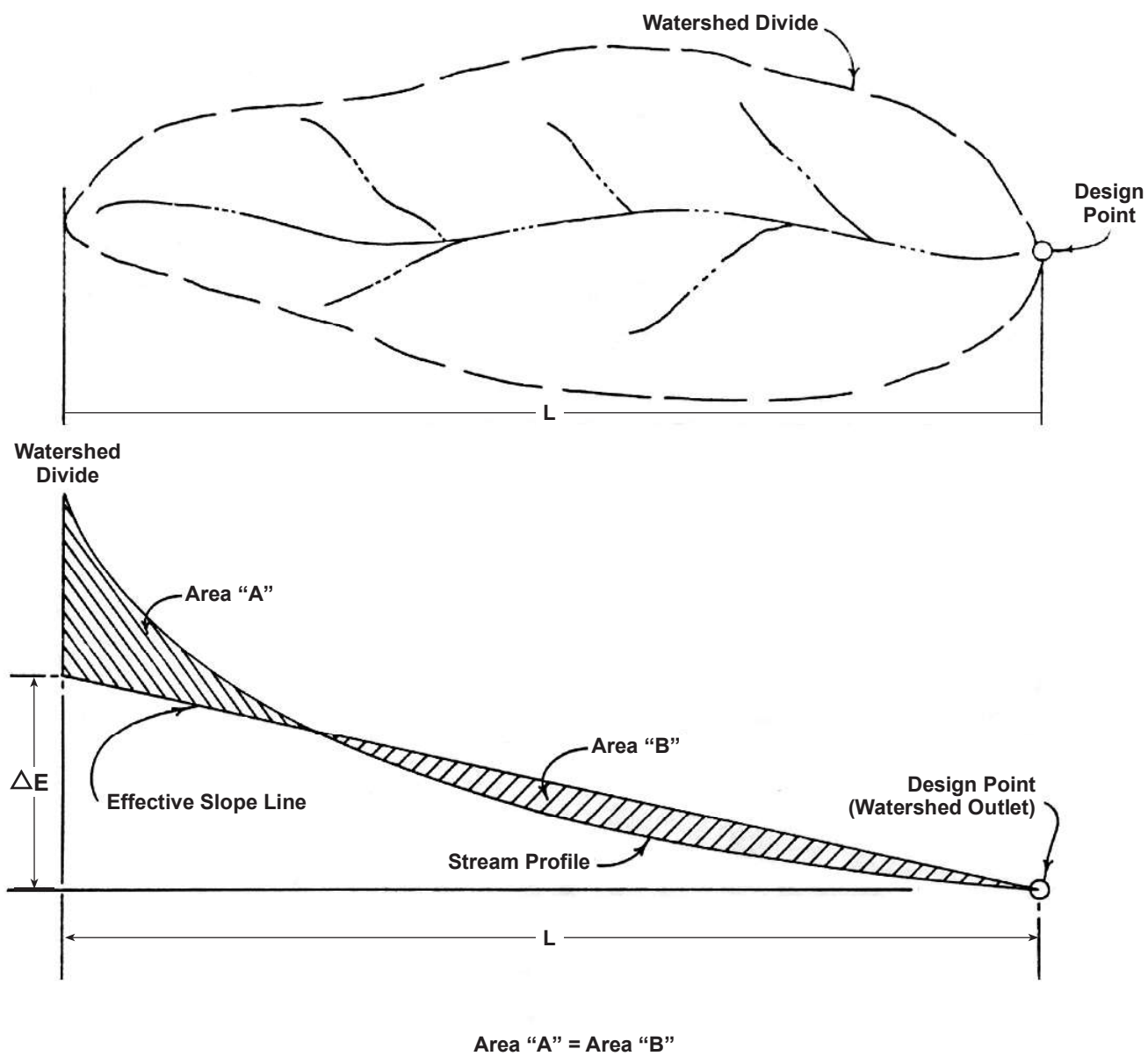
SOURCE: California Division of Highways (1941) and Kirpich (1940)

F I G U R E

Nomograph for Determination of
Time of Concentration (T_c) or Travel Time (T_t) for Natural Watersheds

3-4

Appendix 9



SOURCE: California Division of Highways (1941) and Kirpich (1940)

FIGURE

Computation of Effective Slope for Natural Watersheds

3-5

Appendix 10

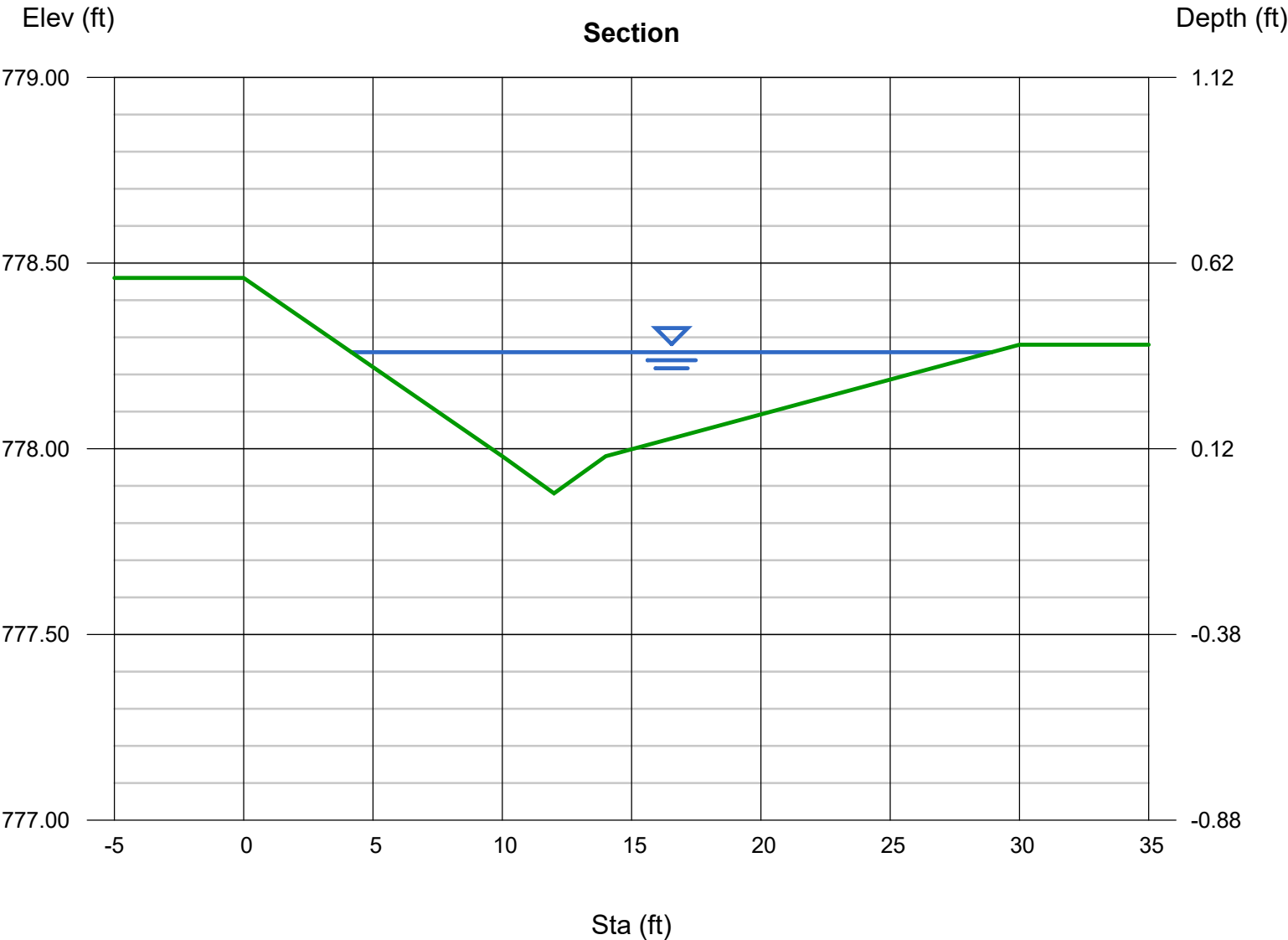
Channel Report

Cross-Section A-A - Basin P-1 Gutter Velocity Calculations

User-defined		Highlighted	
Invert Elev (ft)	= 777.88	Depth (ft)	= 0.38
Slope (%)	= 1.00	Q (cfs)	= 14.00
N-Value	= 0.013	Area (sqft)	= 4.23
		Velocity (ft/s)	= 3.31
		Wetted Perim (ft)	= 24.78
		Crit Depth, Yc (ft)	= 0.43
		Top Width (ft)	= 24.77
		EGL (ft)	= 0.55

(Sta, El, n)-(Sta, El, n)...

(0.00, 778.46)-(10.00, 777.98, 0.013)-(12.00, 777.88, 0.013)-(14.00, 777.98, 0.013)-(30.00, 778.28, 0.013)



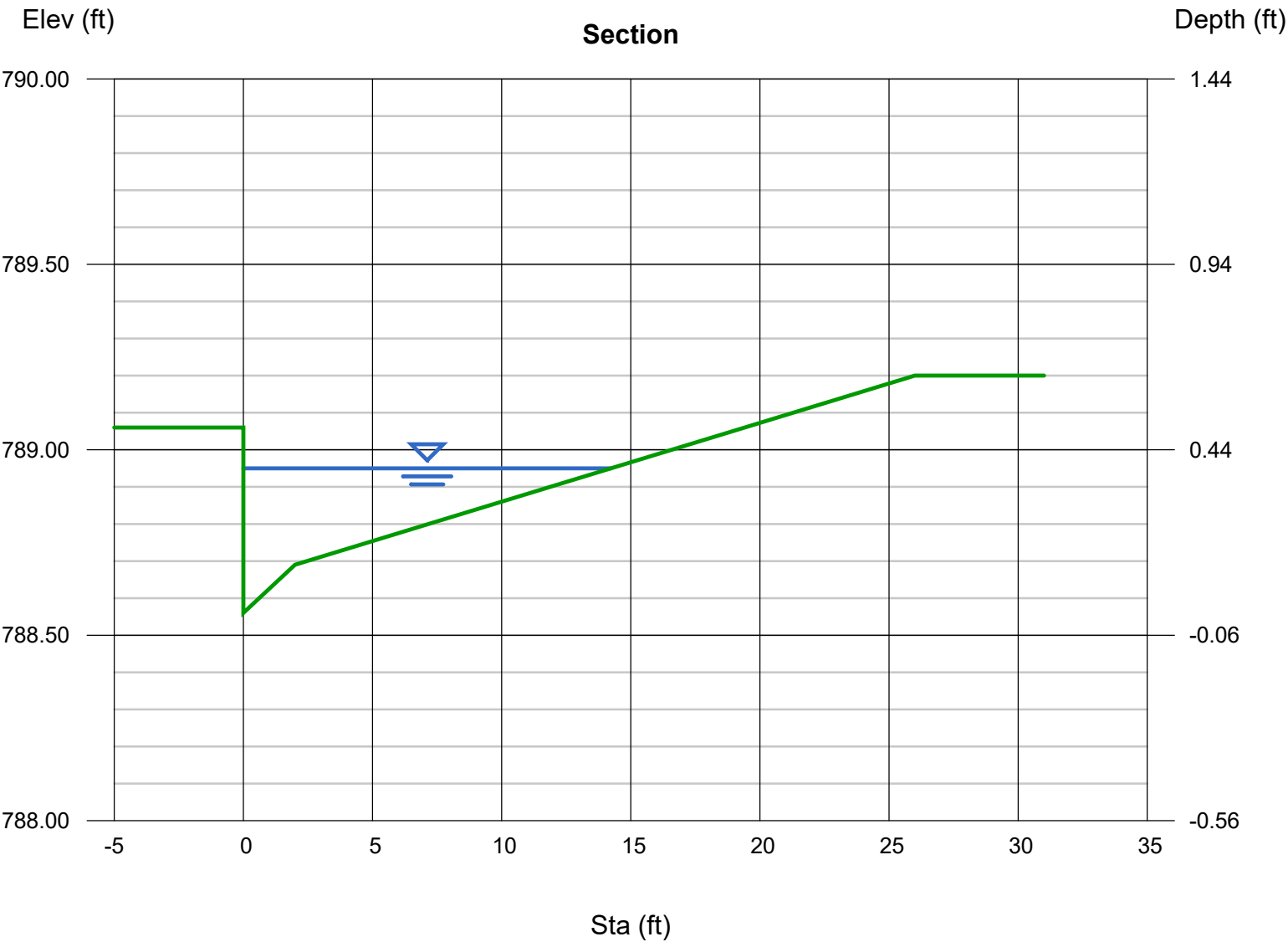
Channel Report

Cross-Section B-B - Basin P-2 Gutter Velocity Calculations

User-defined		Highlighted	
Invert Elev (ft)	= 788.56	Depth (ft)	= 0.39
Slope (%)	= 2.00	Q (cfs)	= 10.00
N-Value	= 0.013	Area (sqft)	= 2.24
		Velocity (ft/s)	= 4.46
		Wetted Perim (ft)	= 14.63
		Crit Depth, Yc (ft)	= 0.49
		Top Width (ft)	= 14.24
		EGL (ft)	= 0.70

Calculations
Compute by: Known Q
Known Q (cfs) = 10.00

(Sta, El, n)-(Sta, El, n)...
(0.00, 789.06)-(0.00, 788.56, 0.013)-(2.00, 788.69, 0.013)-(26.00, 789.20, 0.013)



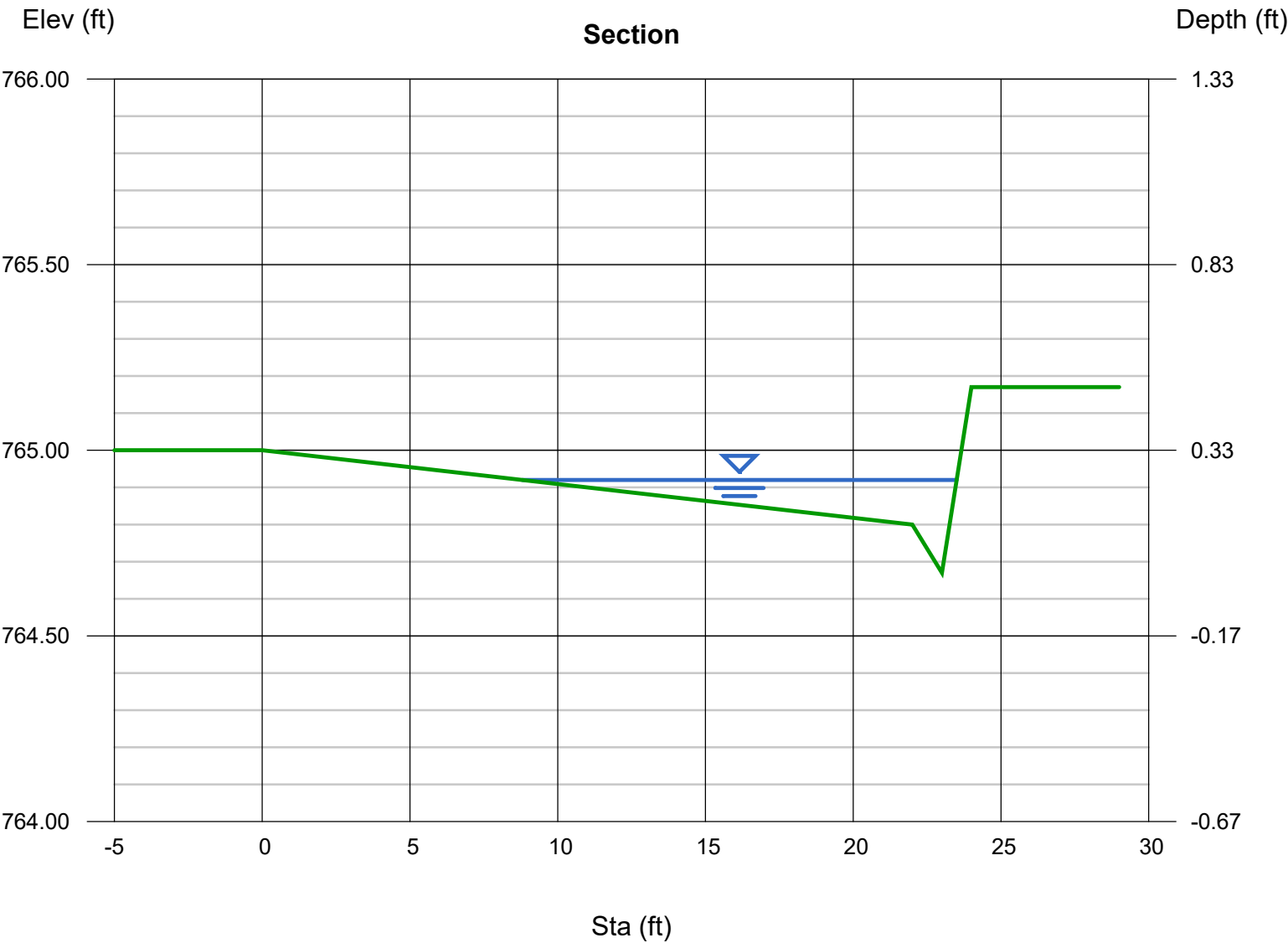
Channel Report

Cross-Section C-C - Basin P-3 Gutter Velocity Calculations

User-defined		Highlighted	
Invert Elev (ft)	= 764.67	Depth (ft)	= 0.25
Slope (%)	= 1.80	Q (cfs)	= 2.721
N-Value	= Composite	Area (sqft)	= 1.04
		Velocity (ft/s)	= 2.62
		Wetted Perim (ft)	= 14.77
		Crit Depth, Yc (ft)	= 0.29
		Top Width (ft)	= 14.70
		EGL (ft)	= 0.36

Calculations
Compute by: Q vs Depth
No. Increments = 10

(Sta, El, n)-(Sta, El, n)...
(0.00, 765.00)-(22.00, 764.80, 0.013)-(23.00, 764.67, 0.013)-(24.00, 765.17, 0.013)



Appendix 11

[TITLE]
;;Project Title/Notes

[OPTIONS]
;;Option Value
FLOW_UNITS CFS
INFILTRATION GREEN_AMPT
FLOW_ROUTING KINWAVE
LINK_OFFSETS DEPTH
MIN_SLOPE 0
ALLOW_PONDING NO
SKIP_STEADY_STATE NO

START_DATE 12/03/2024
START_TIME 00:00:00
REPORT_START_DATE 12/03/2024
REPORT_START_TIME 00:00:00
END_DATE 12/03/2024
END_TIME 12:00:00
SWEEP_START 01/01
SWEEP_END 12/31
DRY_DAYS 0
REPORT_STEP 00:00:01
WET_STEP 00:00:01
DRY_STEP 00:00:01
ROUTING_STEP 0:00:01
RULE_STEP 00:00:00

INERTIAL_DAMPING PARTIAL
NORMAL_FLOW_LIMITED BOTH
FORCE_MAIN_EQUATION H-W
VARIABLE_STEP 0.75
LENGTHENING_STEP 0
MIN_SURFAREA 12.566
MAX_TRIALS 8
HEAD_TOLERANCE 0.005
SYS_FLOW_TOL 5
LAT_FLOW_TOL 5

MINIMUM_STEP 0.5
THREADS 1

[EVAPORATION]

;;Data Source Parameters
;;-----
CONSTANT 0.0
DRY_ONLY NO

[OUTFALLS]

;;Name Elevation Type Stage Data Gated Route To
;;-----
DP-1 0 FREE
DP-2 0 FREE NO
 NO

[STORAGE]

;;Name Elev. MaxDepth InitDepth Shape Curve Name/Params N/A Fevap Psi Ksat
IMD
;;-----
BMP-1 0 2.0 0 TABULAR BMP-1 0 0
BMP-2 0 2.0 0 TABULAR BMP-2 0 0

[OUTLETS]

;;Name From Node To Node Offset Type QTable/Qcoeff Qexpon Gated
;;-----
RISER_1 BMP-1 DP-1 0 TABULAR/HEAD 12_NYLO NO
RISER_2 BMP-2 DP-2 0 TABULAR/HEAD 12_NYLO NO

[INFLOWS]

;;Node Constituent Time Series Type Mfactor Sfactor Baseline Pattern
;;-----
BMP-1 FLOW P-1 FLOW 1.0 1.0
BMP-2 FLOW P-2 FLOW 1.0 1.0

[CURVES]

;;Name Type X-Value Y-Value
;;-----

12_NYLO	Rating	0	0
12_NYLO		0.05	0.05
12_NYLO		0.10	0.30
12_NYLO		0.15	0.55
12_NYLO		0.20	0.85
12_NYLO		0.25	1.15
12_NYLO		0.30	1.27
12_NYLO		0.35	1.35
12_NYLO		0.40	1.47
12_NYLO		0.45	1.57
12_NYLO		0.50	1.65
12_NYLO		0.55	1.72
12_NYLO		0.60	1.80
12_NYLO		0.65	1.85
12_NYLO		0.70	1.95
12_NYLO		0.75	2.02
12_NYLO		0.80	2.07
12_NYLO		0.85	2.12
12_NYLO		0.90	2.22
12_NYLO		0.95	2.27
12_NYLO		1.0	2.32
12_NYLO		1.05	2.37
12_NYLO		1.10	2.45
12_NYLO		1.15	2.50
12_NYLO		1.20	2.54
12_NYLO		1.25	2.58
12_NYLO		1.30	2.62
12_NYLO		1.35	2.68
12_NYLO		1.40	2.72
12_NYLO		1.45	2.76
12_NYLO		1.50	2.80
12_NYLO		1.55	2.84
12_NYLO		1.60	2.88
12_NYLO		1.65	2.92
12_NYLO		1.70	2.96
12_NYLO		1.75	3
12_NYLO		1.80	3.02
12_NYLO		1.85	3.04

12_NYLO		1.90	3.06
12_NYLO		1.95	3.08
12_NYLO		2	3.10
;			
BMP-1	Storage	0	2850
BMP-1		1	3700
BMP-1		2	4605
;			
BMP-2	Storage	0	2405
BMP-2		1	3370
BMP-2		2	4390

[TIMESERIES]

;;Name	Date	Time	Value
;;-----			
P-1		0:00	0
P-1		0:05	0.4
P-1		0:10	0.4
P-1		0:15	0.4
P-1		0:20	0.4
P-1		0:25	0.4
P-1		0:30	0.4
P-1		0:35	0.4
P-1		0:40	0.4
P-1		0:45	0.4
P-1		0:50	0.4
P-1		0:55	0.4
P-1		1:00	0.4
P-1		1:05	0.5
P-1		1:10	0.5
P-1		1:15	0.5
P-1		1:20	0.5
P-1		1:25	0.5
P-1		1:30	0.5
P-1		1:35	0.5
P-1		1:40	0.5
P-1		1:45	0.5
P-1		1:50	0.5

P-1	1:55	0.6
P-1	2:00	0.6
P-1	2:05	0.6
P-1	2:10	0.6
P-1	2:15	0.6
P-1	2:20	0.6
P-1	2:25	0.7
P-1	2:30	0.7
P-1	2:35	0.7
P-1	2:40	0.7
P-1	2:45	0.8
P-1	2:50	0.8
P-1	2:55	0.8
P-1	3:00	0.9
P-1	3:05	0.9
P-1	3:10	1
P-1	3:15	1
P-1	3:20	1.1
P-1	3:25	1.2
P-1	3:30	1.3
P-1	3:35	1.5
P-1	3:40	1.6
P-1	3:45	2
P-1	3:50	2.2
P-1	3:55	3.3
P-1	4:00	4.6
P-1	4:05	16.56
P-1	4:10	2.6
P-1	4:15	1.8
P-1	4:20	1.4
P-1	4:25	1.2
P-1	4:30	1
P-1	4:35	0.9
P-1	4:40	0.8
P-1	4:45	0.7
P-1	4:50	0.7
P-1	4:55	0.6
P-1	5:00	0.6

P-1	5:05	0.6
P-1	5:10	0.5
P-1	5:15	0.5
P-1	5:20	0.5
P-1	5:25	0.5
P-1	5:30	0.5
P-1	5:35	0.4
P-1	5:40	0.4
P-1	5:45	0.4
P-1	5:50	0.4
P-1	5:55	0.4
P-1	6:00	0.4
P-1	6:05	0
;		
P-2	0:00	0
P-2	0:05	0.3
P-2	0:10	0.3
P-2	0:15	0.3
P-2	0:20	0.3
P-2	0:25	0.3
P-2	0:30	0.3
P-2	0:35	0.3
P-2	0:40	0.3
P-2	0:45	0.3
P-2	0:50	0.3
P-2	0:55	0.3
P-2	1:00	0.3
P-2	1:05	0.3
P-2	1:10	0.3
P-2	1:15	0.3
P-2	1:20	0.3
P-2	1:25	0.4
P-2	1:30	0.4
P-2	1:35	0.4
P-2	1:40	0.4
P-2	1:45	0.4
P-2	1:50	0.4
P-2	1:55	0.4

P-2	2:00	0.4
P-2	2:05	0.4
P-2	2:10	0.4
P-2	2:15	0.5
P-2	2:20	0.5
P-2	2:25	0.5
P-2	2:30	0.5
P-2	2:35	0.5
P-2	2:40	0.5
P-2	2:45	0.6
P-2	2:50	0.6
P-2	2:55	0.6
P-2	3:00	0.6
P-2	3:05	0.7
P-2	3:10	0.7
P-2	3:15	0.8
P-2	3:20	0.8
P-2	3:25	0.9
P-2	3:30	0.9
P-2	3:35	1.1
P-2	3:40	1.2
P-2	3:45	1.4
P-2	3:50	1.6
P-2	3:55	2.4
P-2	4:00	3.8
P-2	4:05	11.6
P-2	4:10	1.9
P-2	4:15	1.3
P-2	4:20	1
P-2	4:25	0.8
P-2	4:30	0.7
P-2	4:35	0.7
P-2	4:40	0.6
P-2	4:45	0.5
P-2	4:50	0.5
P-2	4:55	0.4
P-2	5:00	0.4
P-2	5:05	0.4

P-2	5:10	0.4
P-2	5:15	0.4
P-2	5:20	0.4
P-2	5:25	0.3
P-2	5:30	0.3
P-2	5:35	0.3
P-2	5:40	0.3
P-2	5:45	0.3
P-2	5:50	0.3
P-2	5:55	0.3
P-2	6:00	0.3
P-2	6:05	0

[REPORT]
;;Reporting Options
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS 0.000 0.000 10000.000 10000.000
Units None

[COORDINATES]
;;Node X-Coord Y-Coord
;;-----
DP-1 4151.712 3612.514
DP-2 8599.624 3590.226
BMP-1 4144.737 7744.361
BMP-2 8599.624 7857.143

[VERTICES]
;;Link X-Coord Y-Coord
;;-----

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.014)

NOTE: The summary statistics displayed in this report are based on results found at every computational time step, not just on results from each reporting time step.

Analysis Options

Flow Units CFS

Process Models:

Rainfall/Runoff NO

RDII NO

Snowmelt NO

Groundwater NO

Flow Routing YES

Ponding Allowed NO

Water Quality NO

Flow Routing Method KINWAVE

Starting Date 12/03/2024 00:00:00

Ending Date 12/03/2024 12:00:00

Antecedent Dry Days 0.0

Report Time Step 00:00:01

Routing Time Step 1.00 sec

Flow Routing Continuity

Volume

acre-feet

Volume

10^6 gal

Dry Weather Inflow

0.000

0.000

Wet Weather Inflow

0.000

0.000

Groundwater Inflow

0.000

0.000

RDII Inflow

0.000

0.000

External Inflow	0.898	0.293
External Outflow	0.898	0.293
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

Highest Flow Instability Indexes

All links are stable.

Routing Time Step Summary

Minimum Time Step	:	1.00 sec
Average Time Step	:	1.00 sec
Maximum Time Step	:	1.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	1.00
Percent Not Converging	:	0.00

Node Depth Summary

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
DP-1	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
DP-2	OUTFALL	0.00	0.00	0.00	0 00:00	0.00

BMP-1	STORAGE	0.20	1.85	1.85	0	04:09	1.85
BMP-2	STORAGE	0.13	1.41	1.41	0	04:09	1.41

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
DP-1	OUTFALL	0.00	3.04	0 04:09	0	0.17	0.000
DP-2	OUTFALL	0.00	2.73	0 04:09	0	0.123	0.000
BMP-1	STORAGE	16.56	16.56	0 04:05	0.17	0.17	0.000
BMP-2	STORAGE	11.60	11.60	0 04:05	0.123	0.123	0.000

Node Flooding Summary

No nodes were flooded.

Storage Volume Summary

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
BMP-1	0.635	9	0	0	6.728	91	0 04:09	3.04
BMP-2	0.356	5	0	0	4.367	65	0 04:09	2.73

 Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
DP-1	78.94	0.66	3.04	0.170
DP-2	74.13	0.51	2.73	0.123
System	76.54	1.18	2.73	0.293

 Link Flow Summary

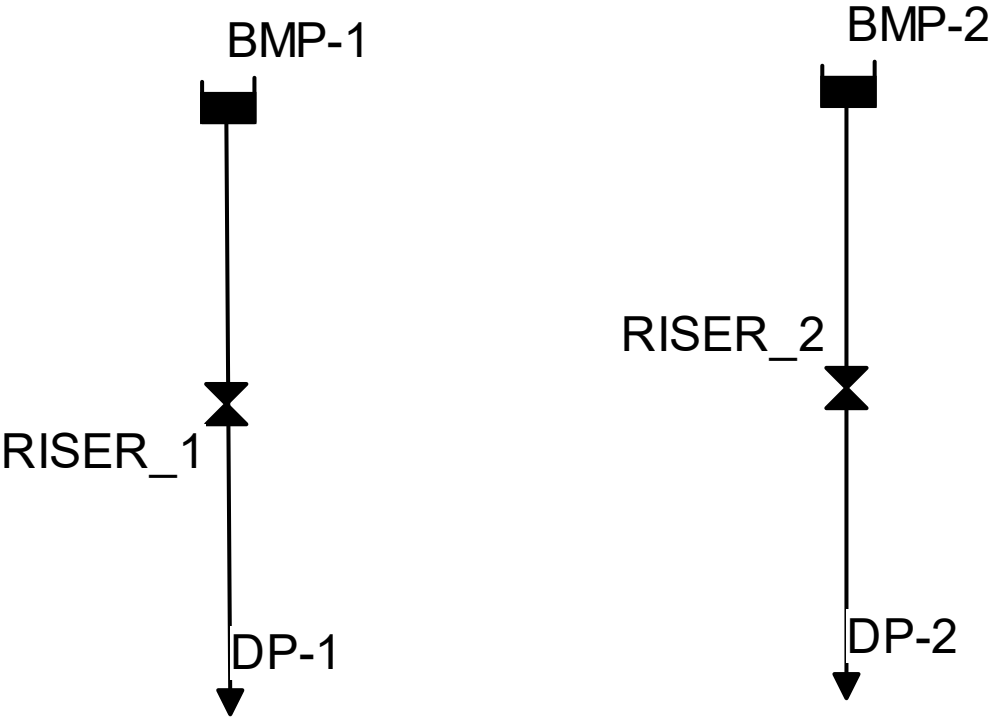
Link	Type	Maximum Flow CFS	Time of Max Occurrence days hr:min	Maximum Veloc ft/sec	Max/ Full Flow	Max/ Full Depth
RISER_1	DUMMY	3.04	0 04:09			
RISER_2	DUMMY	2.73	0 04:09			

 Conduit Surcharge Summary

No conduits were surcharged.

Analysis begun on: Tue Jun 16 09:07:02 2026

Analysis ended on: Tue Jun 16 09:07:02 2026
Total elapsed time: < 1 sec



Node Depth Summary

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Day of Maximum Depth	Hour of Maximum Depth	Maximum Reported Depth Feet
DP-1	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
DP-2	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
BMP-1	STORAGE	0.20	1.85	1.85	0	04:09	1.85
BMP-2	STORAGE	0.13	1.41	1.41	0	04:09	1.41

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Day of Maximum Inflow	Hour of Maximum Inflow	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
DP-1	OUTFALL	0.00	3.04	0	04:09	0	0.17	0.000
DP-2	OUTFALL	0.00	2.73	0	04:09	0	0.123	0.000
BMP-1	STORAGE	16.56	16.56	0	04:05	0.17	0.17	0.000
BMP-2	STORAGE	11.60	11.60	0	04:05	0.123	0.123	0.000

RUN DATE 6/16/2026
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 5 MIN.
6 HOUR RAINFALL 2.8 INCHES
BASIN AREA 2.73 ACRES
RUNOFF COEFFICIENT 0.82
PEAK DISCHARGE 16.56 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 5	DISCHARGE (CFS) = 0.4
TIME (MIN) = 10	DISCHARGE (CFS) = 0.4
TIME (MIN) = 15	DISCHARGE (CFS) = 0.4
TIME (MIN) = 20	DISCHARGE (CFS) = 0.4
TIME (MIN) = 25	DISCHARGE (CFS) = 0.4
TIME (MIN) = 30	DISCHARGE (CFS) = 0.4
TIME (MIN) = 35	DISCHARGE (CFS) = 0.4
TIME (MIN) = 40	DISCHARGE (CFS) = 0.4
TIME (MIN) = 45	DISCHARGE (CFS) = 0.4
TIME (MIN) = 50	DISCHARGE (CFS) = 0.4
TIME (MIN) = 55	DISCHARGE (CFS) = 0.4
TIME (MIN) = 60	DISCHARGE (CFS) = 0.4
TIME (MIN) = 65	DISCHARGE (CFS) = 0.5
TIME (MIN) = 70	DISCHARGE (CFS) = 0.5
TIME (MIN) = 75	DISCHARGE (CFS) = 0.5
TIME (MIN) = 80	DISCHARGE (CFS) = 0.5
TIME (MIN) = 85	DISCHARGE (CFS) = 0.5
TIME (MIN) = 90	DISCHARGE (CFS) = 0.5
TIME (MIN) = 95	DISCHARGE (CFS) = 0.5
TIME (MIN) = 100	DISCHARGE (CFS) = 0.5
TIME (MIN) = 105	DISCHARGE (CFS) = 0.5
TIME (MIN) = 110	DISCHARGE (CFS) = 0.5
TIME (MIN) = 115	DISCHARGE (CFS) = 0.6
TIME (MIN) = 120	DISCHARGE (CFS) = 0.6
TIME (MIN) = 125	DISCHARGE (CFS) = 0.6
TIME (MIN) = 130	DISCHARGE (CFS) = 0.6
TIME (MIN) = 135	DISCHARGE (CFS) = 0.6
TIME (MIN) = 140	DISCHARGE (CFS) = 0.6
TIME (MIN) = 145	DISCHARGE (CFS) = 0.7
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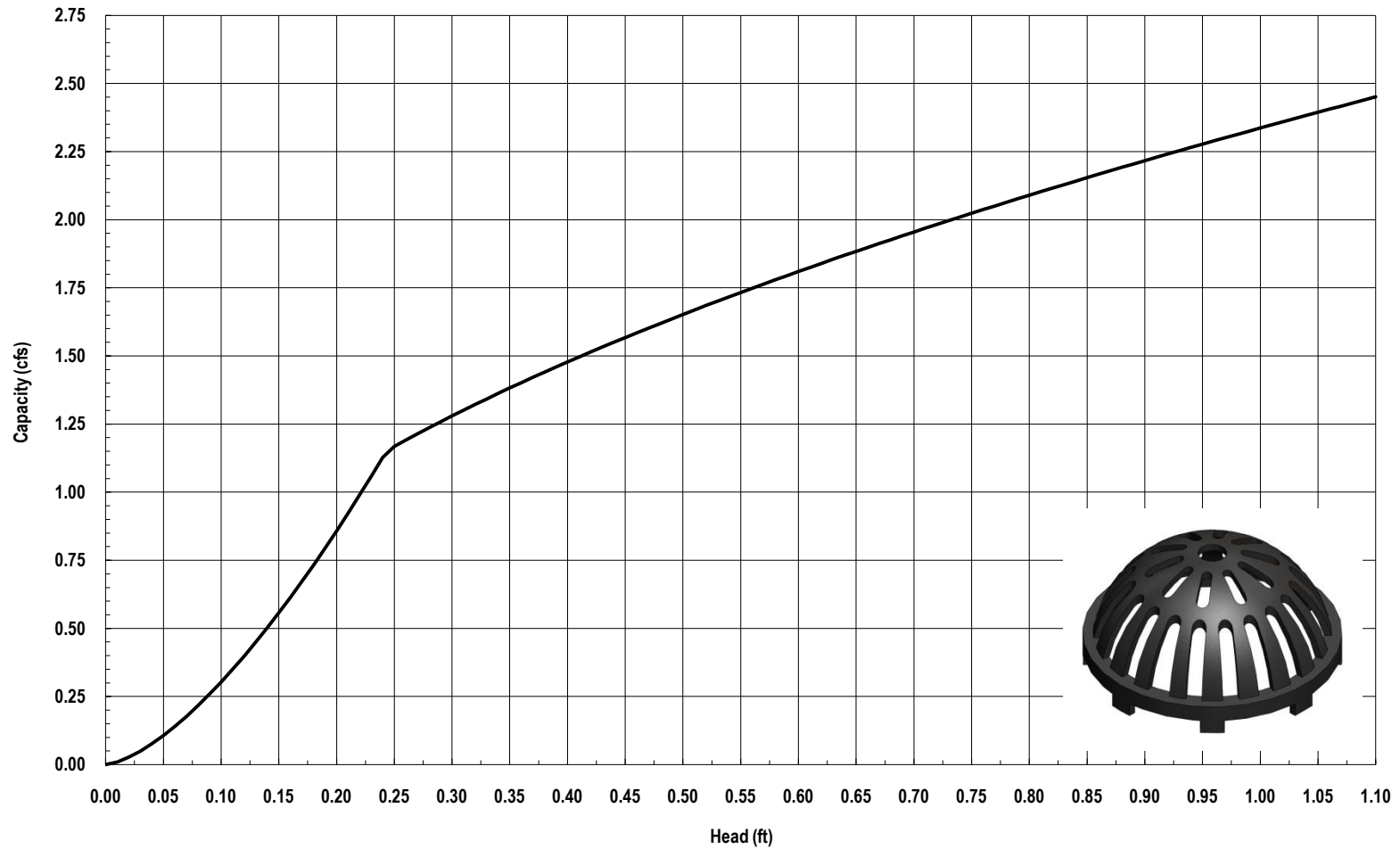
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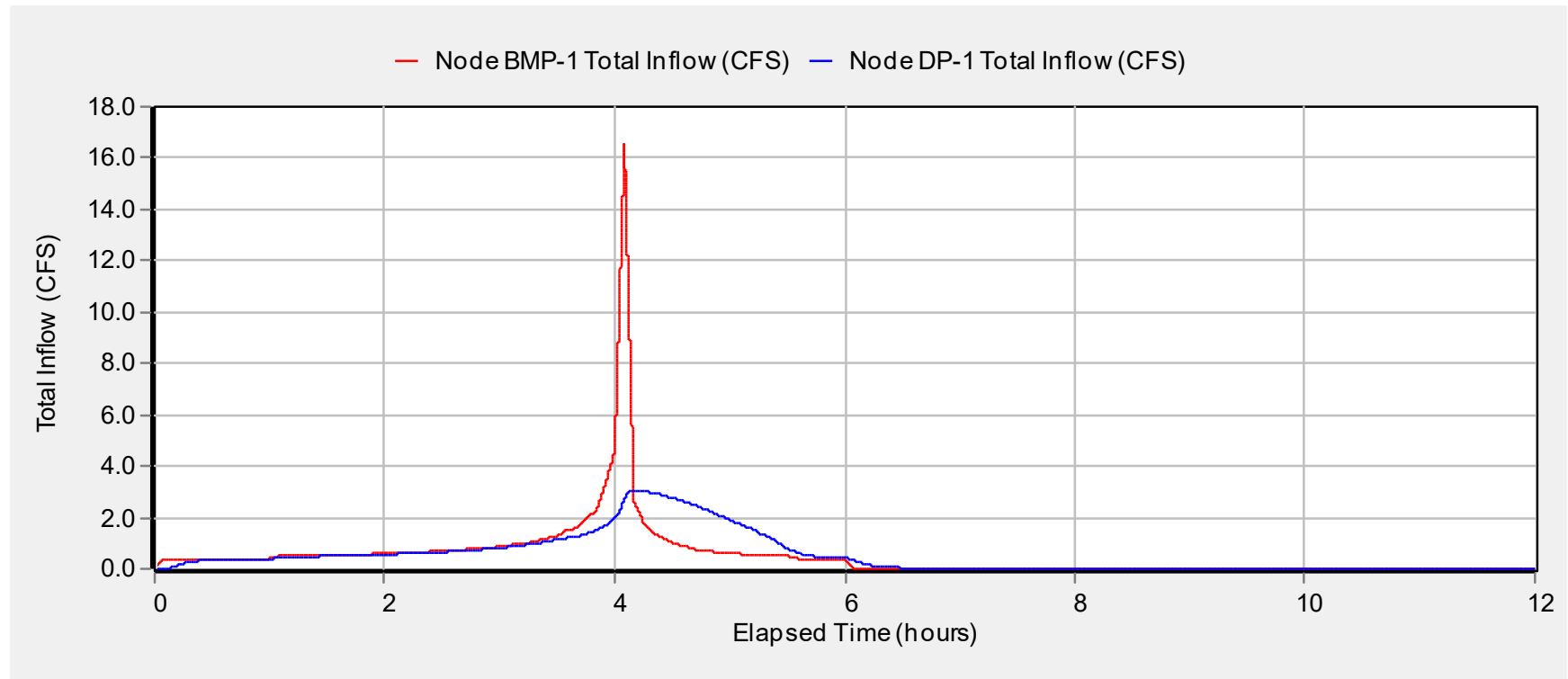
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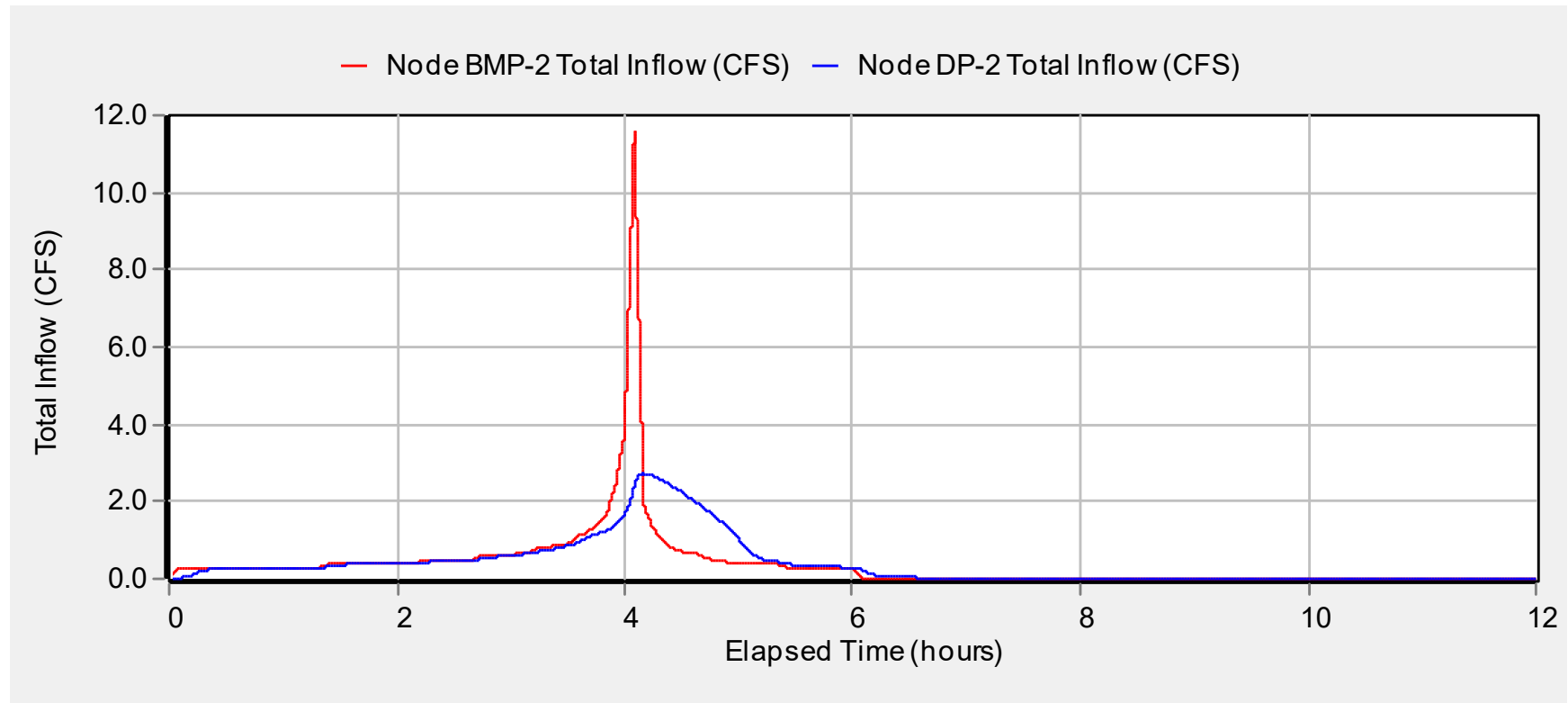
Nyloplast 12" Dome Grate Inlet Capacity Chart



Nyloplast[®]

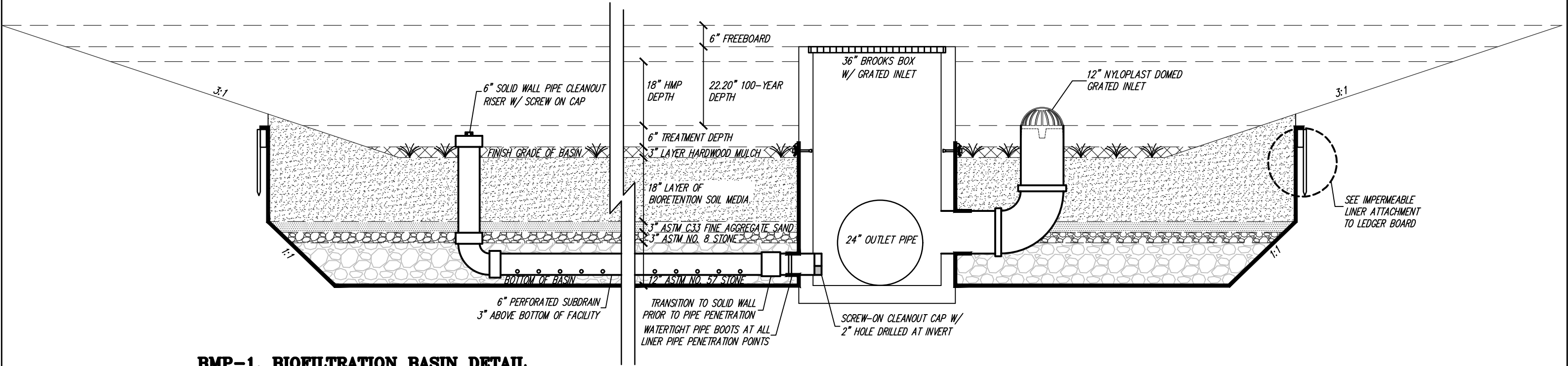
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(866) 888-8479 / (770) 932-2443 • Fax: (770) 932-2490
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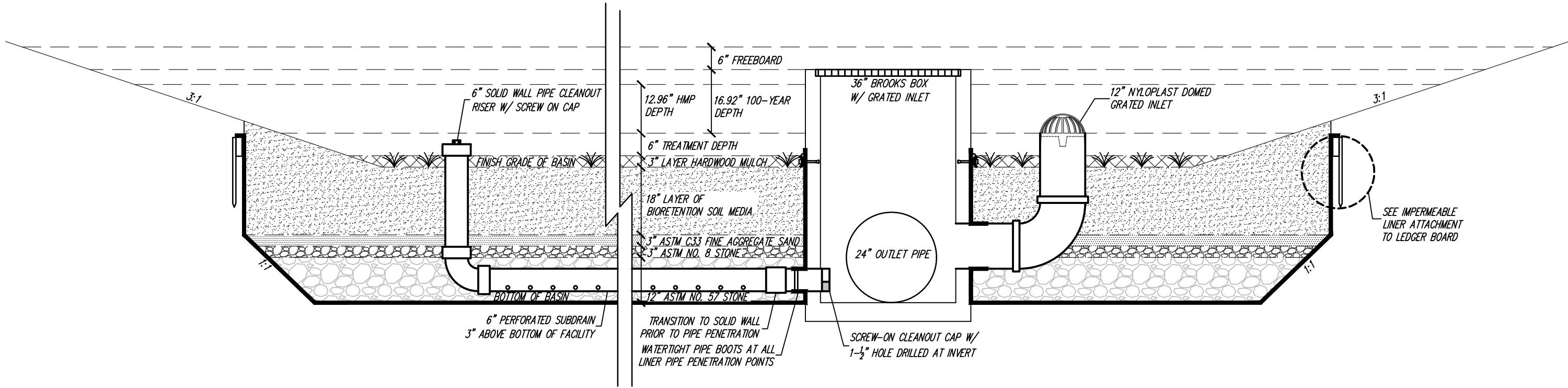
Appendix 12

BMP DETAILS



BMP-1, BIOFILTRATION BASIN DETAIL

NOT TO SCALE



BMP-2, BIOFILTRATION BASIN DETAIL

NOT TO SCALE

Appendix 13



PRELIMINARY GEOTECHNICAL INVESTIGATION

**1305 EAST MISSION ROAD
FALLBROOK, CALIFORNIA**

JUNE 5, 2024

PROJECT NO. G3322-42-01

PREPARED FOR:

**BOULDER RIDGE CAPITAL
CARLSBAD, CALIFORNIA**



Project No. G3322-42-01
June 5, 2024

Boulder Ridge Capital
3220 Grey Hawk Court
Carlsbad, California 92010

Attention: Mr. Andrew Bertha

Subject: PRELIMINARY GEOTECHNICAL INVESTIGATION
1305 EAST MISSION ROAD
FALLBROOK, CALIFORNIA

Dear Mr. Bertha:

In accordance with your request and authorization of our proposal (SD-24-0806-P-GT dated April 23, 2024), we herein submit the results of our preliminary geotechnical investigation for the subject project. We performed our investigation to evaluate the underlying soil and geologic conditions, potential geologic hazards, and to assist in the design of the proposed improvements.

The accompanying report contains the results of our study with conclusions and recommendations pertinent to the geotechnical aspects of the proposed project. The site is suitable for the proposed self-storage facility provided that the recommendations presented in this report are incorporated into the design and construction of the planned project.

Should you have questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

Lilian E. Rodriguez
RCE 83227



LER:RCM:RSA:arm

(e-mail) Addressee

Rodney C. Mikesell
GE 2533



Rupert S. Adams
CEG 2561

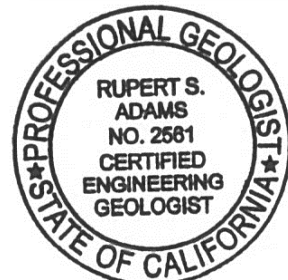


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LIMITATIONS AND UNIFORMITY OF CONDITIONS

MAPS AND ILLUSTRATIONS

Figure 1, Geologic Map

APPENDIX A

FIELD INVESTIGATION

APPENDIX B

LABORATORY TESTING

APPENDIX C

STORMWATER MANAGEMENT INVESTIGATION

APPENDIX D

RECOMMENDED GRADING SPECIFICATIONS

LIST OF REFERENCES

1. PURPOSE AND SCOPE

The purpose of the investigation is to evaluate surface and subsurface soil conditions and general site geology, and to identify geotechnical constraints that could affect construction of the improvements including faulting, liquefaction, and seismic shaking based on the 2022 CBC seismic design criteria. We are providing preliminary recommendations for remedial grading, shallow foundations, concrete slab-on-grade, concrete flatwork, and retaining walls.

June 5, 2024

Field work consisted of excavating 19 exploratory trenches to a maximum depth of about 13 feet; sampling soil; and performing laboratory tests on selected soil samples. Appendix A contains the trench logs and details of the field investigation. The details of the laboratory testing and a summary of the test results are shown in Appendix B and on the boring logs in Appendix A. A storm water management investigation is presented in Appendix C.

The recommendations presented herein are based on our analysis of data and our observations obtained during a previous investigation and our experience with similar soil and geologic conditions.

2. SITE AND PROJECT DESCRIPTION

The rectangular approximately 5-acre property is currently undeveloped and is occupied by grasses, trees, end-dumped piles of trash, and old farming tracks. The site is bounded by residential lots and open space to the north and south, a commercial development to the west, and SDGE facilities to the east and west. Review of historical aerial photographs indicates that the property was used for agricultural purposes, and that several farm or residential buildings were demolished circa 2020. Site topography slopes northwards with elevations ranging from approximately 761 to 804 feet mean sea level (MSL).

Grading and building plans are not yet available; however, based on discussions with you, we understand that the development will consist of a series of prefabricated, single-story, steel framed, storage buildings, with associated utility and surface improvements. Stormwater management devices are also planned.

The locations, site descriptions, and proposed development are based on our site reconnaissance, review of published geologic literature, the previous field investigation, and discussions with project personnel. If development plans differ from those described herein, we should be contacted to review the final plan and possibly provide revisions to the recommendations presented in this report.

3. SOIL AND GEOLOGIC CONDITIONS

We encountered undocumented fill, topsoil, alluvium and granitic rock in our exploratory trenches. The occurrence, distribution, and description of each unit encountered is shown on the Geologic Map, Figure 1 and on the trench logs in Appendix A. The units are described below.

3.1 Undocumented Fill (Qudf)

Undocumented fill was encountered in trenches T-2, T-3, T-9 and T-11 to depths ranging from 1.5 to 5 feet below existing grade. The fill is likely associated with previous site development and generally consisted of loose to medium dense, silty and clayey sand. Various end-dumped piles of trash and landscaping debris are also present across the site. The fill is unsuitable to support the planned improvements and will require remedial grading. This soil may be reused as fill provided debris is removed.

3.2 Topsoil (unmapped)

Topsoil was encountered at grade or below undocumented fill in trenches T-1, T-4 through T-8, T-10, T-11 and T-16 to depths ranging from approximately 1.5 to 4 feet below existing grades. The topsoil encountered consisted of loose, silty sand and stiff, sandy clay. The topsoil is not suitable to support settlement sensitive improvements and should be removed and replaced with properly compacted fill within structural improvement areas. The topsoil can be reused as fill during grading operations provided it is free of roots and debris.

3.3 Alluvium (Qal)

Alluvium was observed at grade in trenches T-12 through T-15, and T-17 through T-19 at the north end of the site to depths ranging from 5.5 to greatest depth explored of 13 feet. The alluvium generally consisted of loose to medium dense, silty to clayey sand, and soft to stiff sandy clay and silt. The alluvium is not suitable to support settlement sensitive improvements and should be removed and replaced with properly compacted fill within structural improvement areas, where practical. Due to depth of the alluvium and presence of groundwater, we expect the removals of alluvium will be limited in some areas, and potentially compressible alluvium may be left in place after grading. Additional evaluation of the alluvium may be warranted based on our review of the site development plan.

3.4 Granitic Rock (Kgr)

We encountered Cretaceous-age granitic rock (mapped as undivided tonalite [Kt] in Kennedy and Tan, 2007) below undocumented fill, topsoil and alluvium. The granitic rock encountered consisted of weak, completely to highly weathered rock, and likely possesses a “very low” to “low” expansion index (expansion index of 50 or less). Buried corestones and zones of strong rock are possible during grading and construction operations, if excavations extend into granitic rock. The granitic rock is suitable to support proposed fill and structural loads.

4. GROUNDWATER

Groundwater was encountered in trench T-18 at a depth of approximately 12.5 feet below existing grade. It is not uncommon for groundwater or seepage conditions to develop where none previously existed. Groundwater and seepage conditions are dependent on seasonal precipitation, irrigation, land use, among other factors, and vary as a result. Proper surface drainage will be important to future performance of the project. Groundwater may be encountered during site grading.

5. GEOLOGIC HAZARDS

5.1 Ground Rupture

The USGS (2016) and Kennedy & Tan (2007) show that there are no mapped Quaternary faults crossing or trending toward the site. The site is not located within a currently established Alquist-Priolo Earthquake Fault Zone (CEG, 2021a). The closest active fault is the Newport-Inglewood-Rose Canyon fault zone located approximately 4.5 miles to the west. The risk associated with ground rupture hazard is low.

There are no active faults, potentially active faults, inactive faults, presumed inactive faults, or activity unknown faults at the site or trending toward the site. The risk associated with ground rupture hazard is low

5.2 Seismicity

Considerations important in seismic design include frequency and duration of motion and soil conditions underlying the site. The seismic design of structures should be evaluated in accordance with the 2022 California Building Code currently adopted by the local agency. The risk associated with strong seismic ground motion hazard is high; however, the risk is no greater than that for the site vicinity.

5.3 Liquefaction

Considering the undocumented fill and alluvium will be removed and replaced as compacted fill, and the density and age of the underlying geologic units, the risk associated with seismically induced soil liquefaction hazard is low.

5.4 Tsunamis, and Seiches

The site is not located within a California Tsunami Hazard Area (CGS, 2021b). There are no lakes or reservoirs located near the site. The risk associated with inundation hazard due to tsunami or seiche is low.

5.5 Landslides

No evidence of landsliding was observed during our investigation. Kennedy & Tan (2007) show that there are no landslides mapped at the site or in an area that could impact the site. The risk associated with ground movement hazard due to landsliding is low.

5.6 Flooding

The site is not mapped in a Special Flood Hazard Area as defined by FEMA (2019). The risk of inundation hazard due to flooding is low.

6. ROCK RIPPABILITY

6.1 General

Evaluation of rock rippability was not part of this study. Based on our experience during grading and utility installation on projects underlain by granitic rock, and the degree of weathering observed at the site, granitic rock encountered during grading should be rippable to a depth of approximately five feet below the bottom of exploratory test pits (Appendix A) using a D-9 Caterpillar Tractor equipped with a single shank hydraulic ripper, or a Caterpillar 345/365 excavator. We did not observe oversize rock (greater than 12-inches in dimension) in test pit spoil piles; therefore we do not anticipate generation of large quantities of oversize rock during site grading.

Further evaluation of rippability using seismic refraction lines, air track borings, or test excavations using a Caterpillar 345/365 excavator, may be necessary, depending planned site grades and the depth of utility installation.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 General

- 7.1.1 It is our opinion that the site is suitable for the planned improvements, provided the recommendations presented herein are implemented during the design and construction of the project.
- 7.1.2 The site is underlain by undocumented fill, topsoil and alluvium overlying granitic rock. The fill, topsoil and alluvium are not suitable to support settlement-sensitive improvements and will require remedial grading. The granitic rock is suitable to support compacted fill and settlement-sensitive improvements.
- 7.1.3 Groundwater was encountered at a depth of 12.5 feet in trench T-12 located in the north end of the site. Groundwater and seepage could be encountered during the grading operations, especially during the rainy seasons.
- 7.1.4 No significant geologic hazards were observed or are known to exist on the site that would adversely impact the site.
- 7.1.5 The proposed structures can be supported on conventional shallow foundations bearing entirely on undisturbed granitic rock or entirely on compacted fill.

7.2 Excavation and Soil Characteristics

- 7.2.1 Excavation of the in-situ soil should be possible with moderate to heavy effort using conventional heavy-duty equipment. Excavation of the granitic rock will require very heavy effort and may generate minor amounts of oversized rock (rocks greater than 12 inches in dimension). Oversize rock, if present, can be buried onsite in accordance with guidelines provided in Appendix D. The grading and improvement contractors should review this report and evaluate the proper equipment to use for the planned excavations.
- 7.2.2 The soil encountered in the field investigation is considered “expansive” (EI of greater than 20) as defined by 2022 California Building Code (CBC) Section 1803.5.3. We expect most of the soil encountered possess a “very low” to “medium” expansion potential (EI of 90 or less) in accordance with ASTM D 4829. The following table presents soil classifications based on the expansion index.

EXPANSION CLASSIFICATION BASED ON EXPANSION INDEX

Expansion Index (EI)	ASTM D 4829 Expansion Classification	2022 CBC Expansion Classification
0 – 20	Very Low	Non-Expansive
21 – 50	Low	Expansive
51 – 90	Medium	
91 – 130	High	
Greater Than 130	Very High	

7.2.3 Laboratory tests were performed on a sample of the site soil to evaluate the percentage of water-soluble sulfate content. Appendix A presents test results, which indicate the on-site soils at the locations tested possess “S0” sulfate exposure to concrete structures as defined by 2022 CBC Section 1904 and ACI 318. The presence of water-soluble sulfates is not a visually discernible characteristic; therefore, other soil samples from the site could yield different concentrations. Over time, landscaping activities (i.e., addition of fertilizers and other additives) may affect the water-soluble sulfate concentration.

7.2.4 Geocon Incorporated does not practice in the field of corrosion engineering; therefore, further evaluation by a corrosion engineer may be needed if improvements susceptible to corrosion are planned.

7.3 Subdrains

7.3.1 Subdrains will not be required for this project.

7.4 Preliminary Grading Recommendations

7.4.1 Grading should be performed in accordance with the recommendations provided in this report, the *Recommended Grading Specifications* contained in Appendix D and the local Grading Ordinances. Where the recommendations of this report conflict with Appendix D, the recommendations of this section take precedence.

7.4.2 Earthwork should be observed, and compacted fill tested by Geocon Incorporated.

7.4.3 A preconstruction conference should be held at the site with the City representative, owner, grading and underground contractors, civil engineer, and geotechnical engineer in attendance. Special soil handling and the grading plans can be discussed at that time.

- 7.4.4 Site preparation should begin with the removal of deleterious material, debris, and vegetation. Material generated during stripping and demolition should be exported from the site and should not be mixed with the fill soil. Existing building foundations and underground improvements within the proposed building area should be removed.
- 7.4.5 Abandoned foundations and buried utilities should be removed and the resulting depressions or trenches backfilled with properly compacted soil as part of the remedial grading.
- 7.4.6 We recommend surficial soil (undocumented fill, topsoil and alluvium) within areas of planned grading be removed to expose the underlying granitic rock and properly compacted prior to placing additional fill and/or structural loads. Overly wet soils, might be encountered near the groundwater table. These soils may require drying and/or mixing with drier soils to facilitate proper compaction.
- 7.4.7 Depending on final development plans and the magnitude of settlement structures can accommodate, partial removal of alluvium may be feasible. Once development plans are prepared, we should review the plans and provide, if warranted, revised recommendations based on discussions with project personnel and the structural engineer.
- 7.4.8 Where grading results in a cut to fill transition within planned building pads, the cut portion of the pad should be undercut at least 3 feet or 1 foot below the deepest footing (whichever is deeper) and replaced with properly compacted “very low” to “medium” expansive soil. The base of the undercuts should be sloped towards the deeper fill area on the pad. The undercut should extend to at least 5 feet beyond the building footprint, where practical. As an alternative to undercutting cut to fill transitions, the footings can be deepened to extend through the fill to bear on the underlying granitic rock.
- 7.4.9 Prior to placing fill, the ground surface should be scarified to a depth of at least 12 inches, moisture conditioned, and compacted. Fill soils should then be placed and compacted in layers to the design finish-grade elevation. The fill layers should be no thicker than will allow for adequate bonding and compaction. Fill (including scarified ground surfaces) should be compacted to at least 90 percent of maximum dry density (as determined by ASTM D 1557) at or slightly above optimum moisture content.

- 7.4.10 Imported soil should have the characteristics presented in the following table. We should be notified of the imported soil source and should be provided with samples in order to perform testing of imported soil prior to its arrival at the site to evaluate its suitability as fill material.

SUMMARY OF IMPORT FILL RECOMMENDATIONS

Soil Characteristic	Values
Expansion Potential	"Very Low" to "Medium" (Expansion Index of 90 or less)
Particle Size	Maximum Dimension Less Than 3 Inches
	Generally Free of Debris

7.5 Excavation Slopes and Shoring

- 7.5.1 The recommendations included herein are provided for stable excavations. Geocon Incorporated is not responsible for site safety and the stability of the proposed excavations. It is the contractor's responsibility to ensure that all excavations, temporary slopes, and trenches are properly constructed and maintained in accordance with applicable OSHA guidelines in order to maintain the safety and stability of the excavations and adjacent improvements. The walls of the excavations should not be allowed to become saturated or to dry out. Surcharge loads should not be permitted to a distance equal to the height of the excavation from the top of the excavation unless the shoring system is designed to accommodate the surcharge loading. The top of sloped excavations should be a minimum of 15 feet from the edge of existing improvements. Vertical excavations should be shored in accordance with applicable OSHA codes and regulations.

7.6 Seismic Design Criteria – 2022 California Building Code

- 7.6.1 The following table summarizes site-specific design criteria obtained from the 2022 California Building Code (CBC; Based on the 2021 International Building Code [IBC] and ASCE 7-16), Chapter 16 Structural Design, Section 1613 Earthquake Loads. We used SEAOC (2020) to calculate the seismic design parameters. The short spectral response uses a period of 0.2 second. We evaluated the Site Class based on the discussion in Section 1613.2.2 of the 2022 CBC and Table 20.3-1 of ASCE 7-16. The values presented herein are for the risk-targeted maximum considered earthquake (MCE_R).

2022 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	2022 CBC Reference
Site Class	C	Section 1613.2.2
MCE _R Ground Motion Spectral Response Acceleration – Class B (short), S_s	1.066g	Figure 1613.2.1(1)
MCE _R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.388g	Figure 1613.2.1(2)
Site Coefficient, F_A	1.2	Table 1613.2.3(1)
Site Coefficient, F_V	1.5	Table 1613.2.3(2)
Site Class Modified MCE _R Spectral Response Acceleration (short), S_{MS}	1.279g	Section 1613.2.3 (Eqn 16-36)
Site Class Modified MCE _R Spectral Response Acceleration – (1 sec), S_{M1}	0.582	Section 1613.2.3 (Eqn 16-37)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.853g	Section 1613.2.4 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.388g	Section 1613.2.4 (Eqn 16-39)

7.6.2 The following table presents the mapped maximum considered geometric mean (MCE_G) seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-16.

ASCE 7-16 PEAK GROUND ACCELERATION

Parameter	Value	ASCE 7-16 Reference
Site Class	C	Section 1613.2.2 (2022 CBC)
Mapped MCE _G Peak Ground Acceleration, PGA	0.459g	Figure 22-7
Site Coefficient, F_{PGA}	1.2	Table 11.8-1
Site Class Modified MCE _G Peak Ground Acceleration, PGA_M	0.551g	Section 11.8.3 (Eqn 11.8-1)

7.6.3 Conformance to the seismic design criteria presented in the above tables does not constitute a guarantee or assurance that significant structural damage or ground failure will not occur in the event of a large earthquake. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

7.6.4 The project structural engineer or architect should determine the appropriate Risk Category and Seismic Design Category for the planned structures. The values presented herein

assume a Risk Category of II resulting in a Seismic Design Category D. The following table presents a summary of the risk categories in accordance with ASCE 7-16.

ASCE 7-16 RISK CATEGORIES

Risk Category	Building Use	Examples
I	Low risk to Human Life at Failure	Barn, Storage Shelter
II	Nominal Risk to Human Life at Failure (Buildings Not Designated as I, III or IV)	Residential, Commercial and Industrial Buildings
III	Substantial Risk Human Life at Failure	Theaters, Lecture Halls, Dining Halls, Schools, Prisons, Small Healthcare Facilities, Infrastructure Plants, Storage for Explosives/Toxins
IV	Essential Facilities	Hazardous Material Facilities, Hospitals, Fire and Rescue, Emergency Shelters, Police Stations, Power Stations, Aviation Control Facilities, National Defense, Water Storage

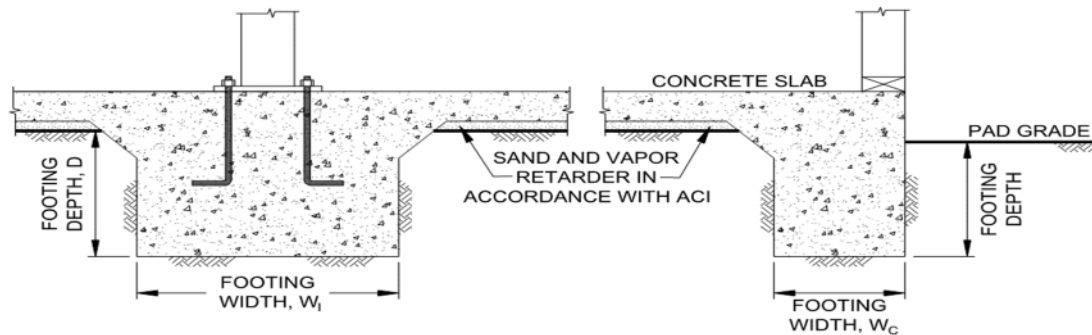
7.7 Preliminary Shallow Foundation Recommendations

7.7.1 The proposed structures can be supported on a shallow foundation system founded entirely on granitic rock or entirely on properly compacted fill. Foundations for the structures should consist of continuous strip footings or isolated spread footings. The table below provides a summary of the foundation design recommendations.

SUMMARY OF FOUNDATION RECOMMENDATIONS

Parameter	Value
Minimum Continuous Foundation Width, W_c	12 inches
Minimum Isolated Foundation Width, W_i	24 inches
Minimum Foundation Depth, D	24 Inches Below Lowest Adjacent Grade
Minimum Concrete Reinforcement	4 No. 5 Bars, 2 at the Top and 2 at the Bottom
Allowable Bearing Capacity (Compacted Fill)	2,500 psf
Allowable Bearing Capacity (Granitic Rock)	8,000 psf
Bearing Capacity Increase	500 psf per Foot of Depth
	300 psf per Foot of Width
Maximum Allowable Bearing Capacity (Compacted fill)	4,000 psf
Maximum Allowable Bearing Capacity (Granitic Rock)	10,000 psf
Estimated Total Settlement	TBD
Estimated Differential Settlement	TBD
Design Expansion Index	90 or less

- 7.7.2 The foundations should be embedded in accordance with the recommendations herein and the Wall/Column Footing Dimension Detail. The embedment depths should be measured from the lowest adjacent pad grade for both interior and exterior footings. Footings should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope (unless designed with a post-tensioned foundation system as discussed herein).



Wall/Column Footing Dimension Detail

- 7.7.3 The bearing capacity values presented herein are for dead plus live loads and may be increased by one-third when considering transient loads due to wind or seismic forces.
- 7.7.4 We should observe the foundation excavations prior to the placement of reinforcing steel and concrete to check that the exposed soil conditions are similar to those expected and that they have been extended to the appropriate bearing strata. Foundation modifications may be required if unexpected soil conditions are encountered.
- 7.7.5 We should be consulted to provide additional design parameters as required by the structural engineer.

7.8 Interior Concrete Slabs on Grade

- 7.8.1 Interior concrete slabs on grade for the structure should be constructed in accordance with the following table.

MINIMUM INTERIOR CONCRETE SLAB-ON-GRADE RECOMMENDATIONS

Parameter	Value
Minimum Concrete Slab Thickness	5 inches
Minimum Concrete Reinforcement	No. 3 Bars 18 Inches on Center, Both Directions
Typical Slab Underlayment	3 to 4 Inches of Sand/Gravel
Design Expansion Index	90 or less

- 7.8.2 A vapor retarder should underlie slabs that receive moisture-sensitive floor coverings or could be used to store moisture-sensitive materials. The vapor retarder design should be consistent with the guidelines presented in the American Concrete Institute's (ACI) *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (ACI 302.2R-06). The vapor retarder should be installed in a manner that prevents puncture in accordance with manufacturer's requirements and ASTM recommendations. The project architect or developer should specify the vapor retarder used based on the type of floor covering that will be installed and if the structure will possess a humidity-controlled environment.
- 7.8.3 The project foundation engineer, architect, or developer should determine the bedding sand thickness. It is common to have 3 to 4 inches of sand in the southern California region. We should be contacted to provide recommendations if the bedding sand is thicker than 6 inches.
- 7.8.4 The foundation-design engineer should provide appropriate concrete-mix-design criteria and curing measures to assure proper curing of the slab including reducing potential rapid moisture loss which could result in shrinkage cracking and slab curl.
- 7.8.5 The foundation-design engineer should present the concrete-mix design and proper concrete-curing methods on the foundation plans. It is critical that the foundation contractor understands and follows the recommendations presented on the foundation plans.
- 7.8.6 Concrete slabs should be provided with adequate crack-control joints, construction joints and expansion joints to reduce concrete-shrinkage cracking. The American Concrete Institute (ACI) criteria should be used when establishing crack-control spacing. Crack-control joints should be spaced at intervals no greater than 12 feet. Additional concrete reinforcement, concrete admixtures or closer crack control joint spacing should be considered where exposed-concrete finished floors are planned.

- 7.8.7 Subgrade presaturation prior to placing concrete is not deemed necessary; however, the subgrade soil should be moisturized to maintain a moist condition as would be expected in any such concrete placement.
- 7.8.8 The concrete-slab-on-grade recommendations are based on soil support characteristics only. The project structural engineer should evaluate the structural requirements of the concrete slabs for supporting expected loads.
- 7.8.9 The recommendations of this report are intended to reduce potential cracking of slabs due to expansive soil, differential settlement of existing soil or soil with varying thicknesses. Even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade placed on such conditions may still exhibit cracking due to soil movement and/or shrinkage. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be controlled by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entrant slab corners occur.

7.9 Exterior Concrete Flatwork

- 7.9.1 Exterior concrete flatwork not subject to vehicular traffic should be constructed in accordance with the recommendations presented in the following table. The recommended reinforcing steel could help reduce potential cracking.

MINIMUM CONCRETE FLATWORK RECOMMENDATIONS

Expansion Index, EI	Minimum Concrete Reinforcement* Options	Minimum Thickness
EI $\leq$ 90	6x6-W2.9/W2.9 (6x6-6/6) welded wire mesh	4 Inches
	No. 3 Bars 24 inches on center, Both Directions	

*In excess of 8 feet square.

- 7.9.2 The subgrade soil should be properly moisturized and compacted prior to the placement of reinforcing steel and concrete. The subgrade soil should be compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content in accordance with ASTM D 1557.

- 7.9.3 Even with the incorporation of the recommendations presented in this report, the exterior concrete flatwork can experience differential movement. Flatwork should be structurally connected to the curbs, where practical, to reduce potential offset between the curb and the flatwork.
- 7.9.4 Concrete flatwork should be provided with crack-control joints. The project structural engineer should determine the spacing of the crack-control joints based on the slab thickness and the intended use. American Concrete Institute (ACI) criteria should be used when establishing crack control spacing.
- 7.9.5 Subgrade soil for exterior slabs that are not subjected to vehicle loads should be compacted in accordance with criteria presented in the grading section prior section of this report. Subgrade soil should be properly compacted, and the moisture content of subgrade soil should be verified prior to placing concrete.
- 7.9.6 Where exterior flatwork abuts the structure at entrance or exit points, the exterior slab should be dowelled into the foundation stem wall. This recommendation is intended to reduce potential differential elevations that could result from differential settlement or minor heave of the flatwork. The project structural engineer should provide dowelling details.
- 7.9.7 The recommendations presented herein are intended to reduce potential cracking of exterior slabs resulting from differential movement; however, even with the incorporation of the recommendations presented herein, slabs-on-grade could still crack. The occurrence of concrete shrinkage cracks is independent of the soil supporting characteristics. Their occurrence may be controlled by limiting the slump of the concrete; the use of crack control joints; and proper concrete placement and curing. Crack control joints should be spaced at intervals no greater than 12 feet. The Portland Concrete Association (PCA) and American Concrete Institute (ACI) provide recommendations for proper concrete mix, construction, and curing practices, and should be incorporated into project construction.

7.10 Preliminary Retaining Wall Recommendations

- 7.10.1 Walls that are allowed to rotate more than $0.001H$ (where H equals the height of the retaining portion of the wall) at the top of the wall should be designed using the values

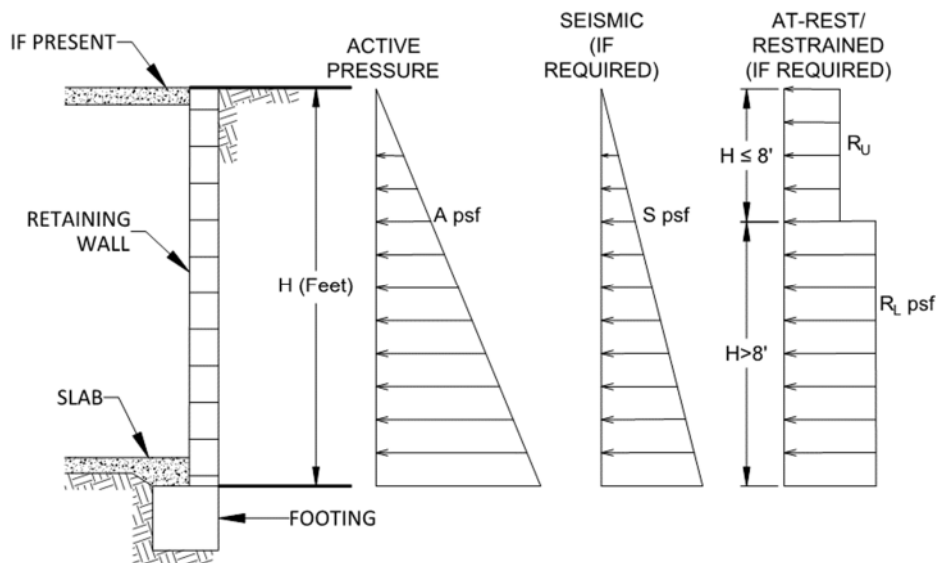
presented in the following table. Soil with an expansion index (EI) greater than 90 should not be used as backfill material behind retaining walls.

RETAINING WALL DESIGN RECOMMENDATIONS

Parameter	Value
Active Soil Pressure, A (Level Backfill)	40H psf
Active Soil Pressure, A (2:1 max Sloping Backfill)	55H psf
Seismic Pressure, S	15H psf
At-Rest/Restrained Walls Additional Uniform Pressure (0 to 8 Feet High)	7H psf
At-Rest/Restrained Walls Additional Uniform Pressure (8+ Feet High)	13H psf
Expected Expansion Index for the Subject Property	$EI \leq 90$

H equals the height of the retaining portion of the wall in feet.

- 7.10.2 The project retaining walls should be designed as shown in the Retaining Wall Loading Diagram.

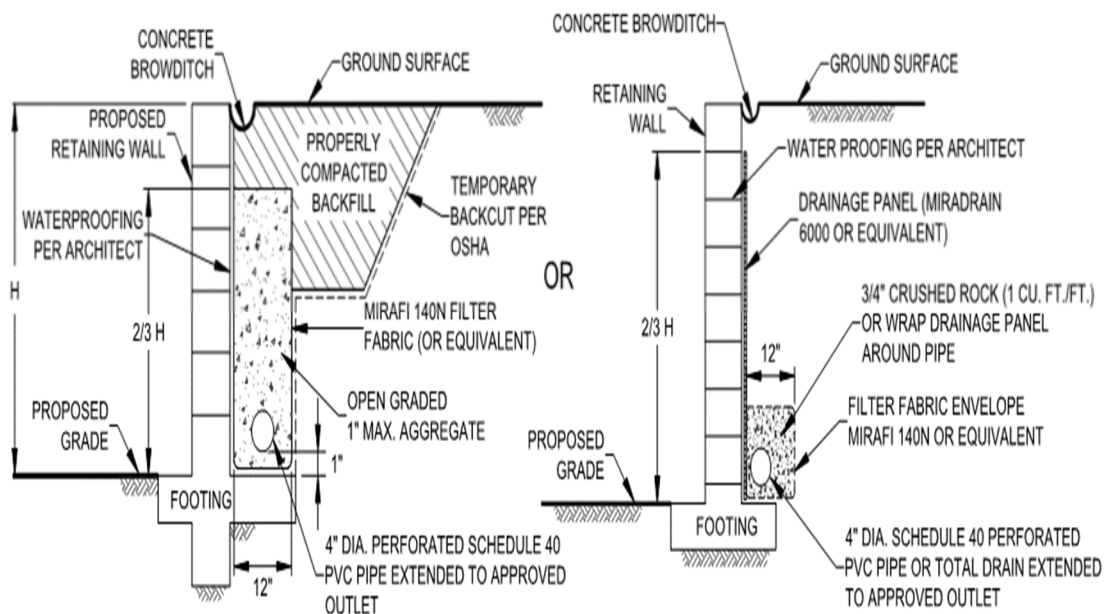


Retaining Wall Loading Diagram

- 7.10.3 Where walls are restrained from movement at the top (at-rest condition), an additional uniform pressure should be applied to the wall.
- 7.10.4 The structural engineer should determine the Seismic Design Category for the project in accordance with Section 1613.3.5 of the 2022 CBC or Section 11.6 of ASCE 7-10. For

structures assigned to Seismic Design Category of D, E, or F, retaining walls that support more than 6 feet of backfill should be designed with seismic lateral pressure in accordance with Section 1803.5.12 of the 2022 CBC. The seismic load is dependent on the retained height where H is the height of the wall, in feet, and the calculated loads result in pounds per square foot (psf) exerted at the base of the wall and zero at the top of the wall.

- 7.10.5 Retaining walls should be designed to ensure stability against overturning sliding, and excessive foundation pressure. Where a keyway is extended below the wall base with the intent to engage passive pressure and enhance sliding stability, it is not necessary to consider active pressure on the keyway.
- 7.10.6 Drainage openings through the base of the wall (weep holes) should not be used where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall.
- 7.10.7 The recommendations herein assume a properly compacted, granular (EI of 50 or less), free-draining backfill soil and that no hydrostatic forces or imposed surcharge load. The retaining wall should be properly drained as shown in the Typical Retaining Wall Drainage Detail. If conditions different than those described are expected, or if specific drainage details are desired, Geocon should be contacted for additional recommendations.



Typical Retaining Wall Drainage Detail

- 7.10.8 In general, wall foundations should be designed in accordance with the following table. The proximity of the foundation to the top of a slope steeper than 3:1 could impact the allowable soil bearing pressure. Therefore, retaining wall foundations should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope.

SUMMARY OF RETAINING WALL FOUNDATION RECOMMENDATIONS

Parameter	Value
Minimum Retaining Wall Foundation Width	12 inches
Minimum Retaining Wall Foundation Depth	12 Inches
Minimum Concrete Reinforcement	Per Structural Engineer
Allowable Bearing Capacity	2,500 psf
Bearing Capacity Increase	500 psf per Foot of Depth
	300 psf per Foot of Width
Maximum Allowable Bearing Capacity	4,000 psf
Estimated Total Settlement	TBD
Estimated Differential Settlement	TBD

- 7.10.9 The recommendations presented herein are applicable for the design of rigid concrete or masonry retaining walls. Should other types of walls (such as mechanically stabilized earth [MSE] walls) be planned, Geocon should be consulted for additional recommendations.
- 7.10.10 Soil contemplated for use as retaining wall backfill, including imported soils, should be identified in the field prior to backfill. At that time, Geocon should be provided samples for laboratory testing to evaluate its suitability. Modified lateral earth pressures may be necessary if the backfill soil does not meet the required expansion index or shear strength.
- 7.10.11 City or regional standard wall designs, if used, are based on a specific active lateral earth pressure and/or soil friction angle. In this regard, on-site soil to be used as backfill may or may not meet the values for standard wall designs. Geocon should be consulted to assess the suitability of the on-site soil for use as wall backfill if standard wall designs are used.

7.11 Lateral Loading

- 7.11.1 The following table provides design parameters to resist lateral loads and for the design of footings or shear keys. The allowable passive pressure assumes a horizontal surface

extending at least 5 feet, or three times the surface generating the passive pressure, whichever is greater. The upper 12 inches of soil in areas not covered by floor slabs or pavement should not be included in the determination of passive resistance.

SUMMARY OF LATERAL LOAD DESIGN RECOMMENDATIONS

Parameter	Value
Passive Pressure Fluid Density	350 pcf
Coefficient of Friction (Concrete and Soil)	0.35
Coefficient of Friction (Along Vapor Barrier)	0.2 to 0.25*

*Per manufacturer's recommendations.

- 7.11.2 The passive and frictional resistant loads can be combined for design purposes. The lateral passive pressures may be increased by one-third when considering transient loads due to wind or seismic forces.

7.12 Site Drainage and Moisture Protection

- 7.12.1 Adequate site drainage is critical to reduce the risk for differential soil movement, erosion, and subsurface seepage. Under no circumstances should water be allowed to pond adjacent to footings. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2022 CBC 1804.4. In addition, surface drainage should be directed away from the top of slopes into swales or other controlled drainage devices. Roof and pavement drainage should be directed into conduits that carry runoff away from the proposed structure.
- 7.12.2 In the case of basement walls or building walls retaining landscaping areas, a water-proofing system should be used on the wall and joints, and a Miradrain drainage panel (or similar) should be placed over the waterproofing. The project architect or civil engineer should provide detailed specifications on the plans for all waterproofing and drainage.
- 7.12.3 Underground utilities should be leak free. Utility and irrigation lines should be checked at appropriate intervals for leaks. Detected leaks should be promptly repaired. Detrimental soil movement could occur if water is allowed to infiltrate the soil for prolonged periods of time.

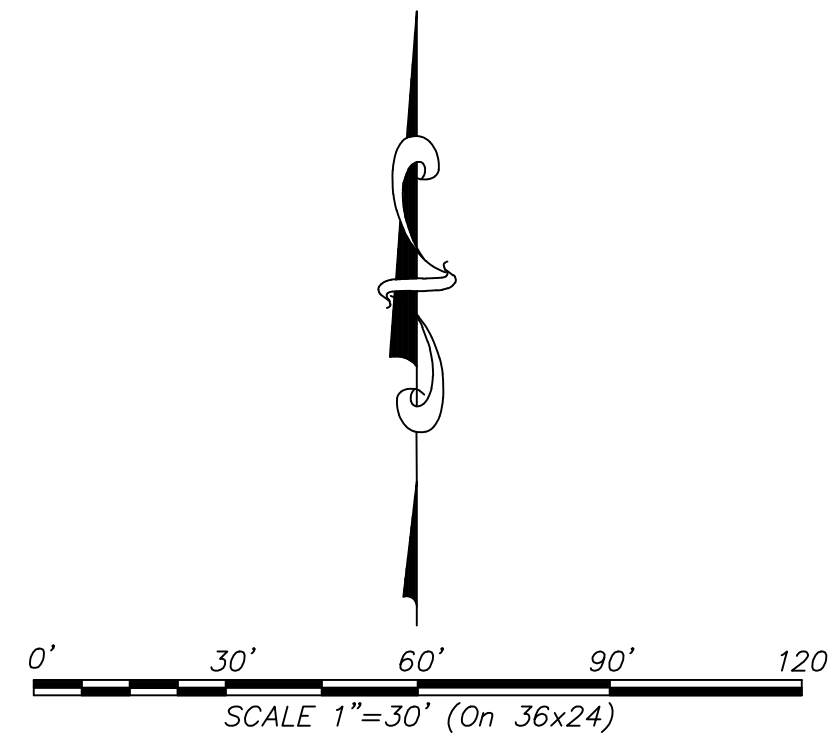
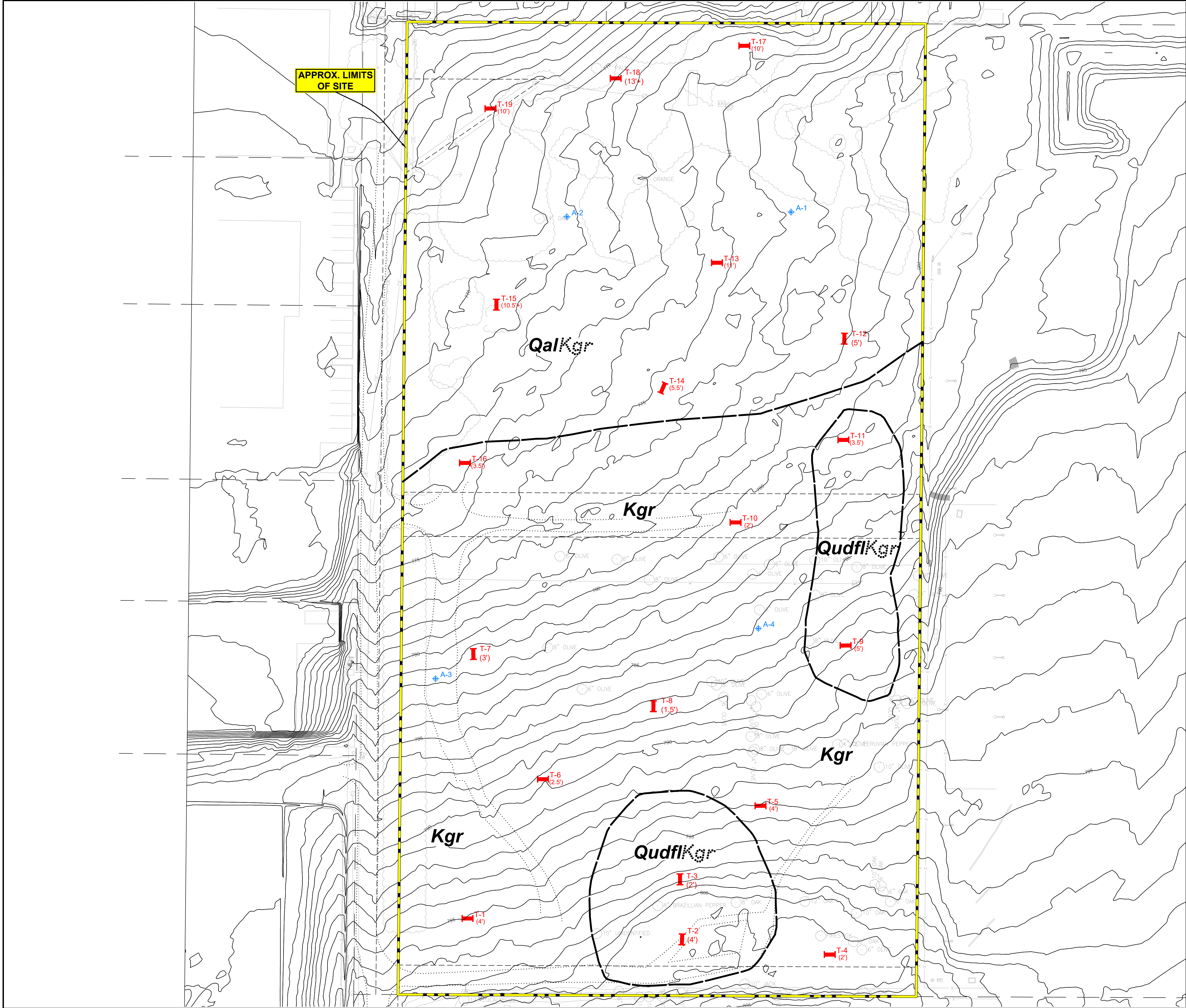
- 7.12.4 Landscaping planters adjacent to paved areas are not recommended due to the risk for surface or irrigation water to infiltrate the pavement subgrade and base course. Area drains to collect excess irrigation water and transmit it to drainage structures, or impervious above-grade planter boxes should be used. A cutoff wall along the edge of the pavement that extends at least 6 inches below the bottom of the base material should be considered where landscaping is planned next to pavement.
- 7.12.5 We have prepared a storm water management investigation and it is included in Appendix C herein.

7.13 Future Geotechnical Investigation

- 7.13.1 We recommend performing additional field work in areas of the site where alluvium is present, and buildings are planned. The field investigation would consist of sampling the soil conditions during excavation of the test borings, examining the soil conditions encountered, and evaluating the depth of surficial soils and groundwater.
- 7.13.2 Laboratory tests should be performed on selected soil samples to evaluate shear strength, consolidation, and in-situ dry density and moisture content.
- 7.13.3 We can prepare an updated geotechnical investigation report presenting our findings, conclusions, and recommendations regarding the geotechnical aspects of planned structures, after we receive grading and building plans and perform the additional field investigation. Final foundation and concrete slab on-grade design criteria, 2022 California Building Code seismic design parameters, excavation characteristics, geologic hazard analyses, and remedial grading measures at the site would be included in the report.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The firm that performed the geotechnical investigation for the project should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to check that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. A copy of the letter should be provided to the regulatory agency for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development, or a written acknowledgement of their concurrence with the recommendations presented in our report. They should also perform additional analyses deemed necessary to assume the role of Geotechnical Engineer of Record.
2. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon Incorporated should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon Incorporated.
3. This report is issued with the understanding that it is the responsibility of the owner or his representative to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.
4. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.



- GEOCON LEGEND**
- UNDOCUMENTED FILL
 - Qudf** ALLUVIUM
 - Qal** GRANITIC ROCK (Dotted Where Buried)
 - Kgr** GRANITIC ROCK (Dotted Where Buried)
 - A-4** APPROX. LOCATION OF INFILTRATION TEST
 - T-19** APPROX. LOCATION OF TRENCH
 - (5)** DEPTH TO GRANITIC ROCK (in Feet)
 - APPROX. LOCATION OF GEOLOGIC CONTACT

GEOLOGIC MAP
1305 E. MISSION ROAD
FALLBROOK, CALIFORNIA

GEOCON
INCORPORATED

GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 658.558-6900 - FAX 658.558-6159

SCALE 1" = 30'
PROJECT NO. G3322 - 42 - 01
SHEET 1 OF 1

DATE 06 - 05 - 2024
FIGURE 1

Printed: 06/05/2024 11:16AM | By: ALVIN LACRELL | File Location: Y:\PROJECTS\G3322-42-01\1305 E. Mission Road\FIGURES\G3322-42-01 GeoMap.dwg

APPENDIX

A

APPENDIX A

FIELD INVESTIGATION

We performed the trenching operations on May 6, 2024. The approximate locations of the exploratory trenches are shown on the Geologic Map, Figure 1 and the trench logs are presented in this appendix. The trenches were excavated to a maximum depth of approximately 13 feet below existing grade using a CAT 430F rubber tire backhoe equipped with an 18-inch bucket.

We collected bulk and chunk soil samples from the trench spoils. The type of sample is noted on the trench logs. We visually examined, classified, and logged the soil encountered in the borings in general accordance with American Society for Testing and Materials (ASTM) practice for Description and Identification of Soils (Visual-Manual Procedure D 2488). The logs depict the soil and geologic conditions observed and the depth at which samples were obtained.

PROJECT NAME	E. Mission Road		
PROJECT NUMBER	G3322-42-01		
DATE STARTED	05-06-2024	COMPLETED	05-06-2024
TRENCHING CONTRACTOR	Dave's Backhoe		
EQUIPMENT TYPE	CAT 430F RT Backhoe W/18" Bucket		
LOGGED BY	N. Borja		

LATITUDE	33.384884	LONGITUDE	-117.236147
TRENCH DEPTH	7.0 ft		
TOP OF TRENCH ELEVATION	795.0 ft		

GROUNDWATER DEPTHS

▼ GROUNDWATER ENCOUNTERED NA

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE NUMBER	LITHOLOGY	USCS	MATERIAL DESCRIPTION	BLOW COUNTS (Blows per 6")
				SM	TOPSOIL ; Loose, moist, dark brown, Silty, fine to medium SAND	
				1.50 793.5		
		CHNK T1-1		SC-SM	Medium dense, moist, reddish brown, Silty and Clayey, fine to medium SAND	
				3.50 791.5		
					GRANITIC ROCK (Kgr) ; Weak, highly weathered, damp, light brown to brown, GRANITIC ROCK; excavates as Silty, fine to coarse SAND	
5	790	B T1-2		7.00 788.0		
					TRENCH TERMINATED AT 7 FEET No groundwater encountered Backfilled on 05/06/2024.	
10	785					
15	780					

THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.



TRENCH NUMBER T-2

Sheet 1 of 1

PROJECT NAME E. Mission Road
PROJECT NUMBER G3322-42-01
DATE STARTED 05-06-2024 COMPLETED 05-06-2024
TRENCHING CONTRACTOR Dave's Backhoe
EQUIPMENT TYPE CAT 430F RT Backhoe W/18" Bucket
LOGGED BY N. Borja +N. Borja

LATITUDE 33.384849 LONGITUDE -117.235669
TRENCH DEPTH 7.0 ft
TOP OF TRENCH ELEVATION 800.0 ft
GROUNDWATER DEPTHS
GROUNDWATER ENCOUNTERED NA

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE NUMBER	LITHOLOGY	USCS	MATERIAL DESCRIPTION	BLOW COUNTS (Blows per 6")
		B T2-1		SM	UNDOCUMENTED FILL (Qudf); Loose, damp, dark grayish brown, Silty, fine to medium SAND	
				2.00 798.0		
				SP-SC	Loose to medium dense, moist, reddish brow, Clayey, fine to coarse SAND; trace gravel	
				4.00 796.0		
5	795				GRANITIC ROCK (Kgr); Weak, highly weathered, damp, brown to yellowish brown, GRANITIC ROCK; excavates as silty, fine to coarse sand	
				7.00 793.0		
					TRENCH TERMINATED AT 7 FEET No groundwater Backfilled on 05-06-2024.	
10	790					
15	785					

THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.



TRENCH NUMBER T-3

Sheet 1 of 1

PROJECT NAME E. Mission Road
PROJECT NUMBER G3322-42-01
DATE STARTED 05-06-2024 **COMPLETED** 05-06-2024
TRENCHING CONTRACTOR Dave's Backhoe
EQUIPMENT TYPE CAT 430F RT Backhoe w/18" Bucket
LOGGED BY N. Borja

LATITUDE 33.384960 **LONGITUDE** -117.235674
TRENCH DEPTH 4.5 ft
TOP OF TRENCH ELEVATION 798.0 ft
GROUNDWATER DEPTHS
▼ **GROUNDWATER ENCOUNTERED** NA

DEPTH (ft)	ELEVATION (ft)	LITHOLOGY	USCS	MATERIAL DESCRIPTION	BLOW COUNTS (Blows per 6")
			SM	UNDOCUMENTED FILL (Qudf); Loose, damp, dark brown, Silty, fine to medium SAND - -Becomes brown to dark reddish brown	
				2.00 796.0	
				GRANITIC ROCK (Kgr); Weak, highly weathered, damp, brown to yellowish brown, GRANITIC ROCK; excavates as Silty, fine to coarse SAND	
				4.50 793.5	
5	793			TRENCH TERMINATED AT 4.5 FEET No groundwater encountered Backfilled on 05/06/2024.	
10	788				
15	783				

THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.



TRENCH NUMBER T-4

Sheet 1 of 1

PROJECT NAME E. Mission Road
PROJECT NUMBER G3322-42-01
DATE STARTED 05-06-2024 **COMPLETED** 05-06-2024
TRENCHING CONTRACTOR Dave's Backhoe
EQUIPMENT TYPE CAT 430F RT Backhoe w/18" Bucket
LOGGED BY N. Borja

LATITUDE 33.384823 **LONGITUDE** -117.235341
TRENCH DEPTH 4.0 ft
TOP OF TRENCH ELEVATION 801.0 ft

GROUNDWATER DEPTHS

▼ **GROUNDWATER ENCOUNTERED** NA

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE NUMBER	LITHOLOGY	USCS	MATERIAL DESCRIPTION	BLOW COUNTS (Blows per 6")
		B T4-1		SM	TOPSOIL ; Loose, moist, dark brown, Silty, fine to medium SAND	
					2.00 799.0	
					GRANITIC ROCK (Kgr) ; Weak, highly weathered, damp, light brown, GRANITIC ROCK; excavates as Silty, fine to coarse SAND	
				4.00 797.0		
5	796				TRENCH TERMINATED AT 4 FEET No groundwater encountered Backfilled on 05/06/2024.	
10	791					
15	786					

THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.



TRENCH NUMBER T-5

Sheet 1 of 1

PROJECT NAME E. Mission Road
PROJECT NUMBER G3322-42-01
DATE STARTED 05-06-2024 **COMPLETED** 05-06-2024
TRENCHING CONTRACTOR Dave's Backhoe
EQUIPMENT TYPE CAT 430F RT Backhoe W/18" Bucket
LOGGED BY N. Borja

LATITUDE 33.385099 **LONGITUDE** -117.235498
TRENCH DEPTH 6.0 ft
TOP OF TRENCH ELEVATION 794.0 ft
GROUNDWATER DEPTHS
▼ **GROUNDWATER ENCOUNTERED** NA

DEPTH (ft)	ELEVATION (ft)	LITHOLOGY	USCS	MATERIAL DESCRIPTION	BLOW COUNTS (Blows per 6")
			SM	TOPSOIL ; Loose, moist, dark brown, Silty, fine to medium SAND; trace clay	
			SM	3.00 791.0 Loose to medium dense, damp, dark brown, Silty, fine to coarse SAND	
				4.00 790.0 GRANITIC ROCK (Kgr) ; Weak, highly weathered, damp, brown, GRANITIC ROCK; excavates as Silty, fine to coarse SAND	
5	789			6.00 788.0 TRENCH TERMINATED AT 6 FEET No groundwater encountered Backfilled on 05/06/2024.	
10	784				
15	779				

THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.



TRENCH NUMBER T-6

Sheet 1 of 1

PROJECT NAME E. Mission Road
PROJECT NUMBER G3322-42-01
DATE STARTED 05-06-2024 **COMPLETED** 05-06-2024
TRENCHING CONTRACTOR Dave's Backhoe
EQUIPMENT TYPE CAT 430F RT Backhoe W/18" Bucket
LOGGED BY N. Borja

LATITUDE 33.385145 **LONGITUDE** -117.235982
TRENCH DEPTH 4.0 ft
TOP OF TRENCH ELEVATION 790.0 ft
GROUNDWATER DEPTHS
▼ **GROUNDWATER ENCOUNTERED** NA

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE NUMBER	LITHOLOGY	USCS	MATERIAL DESCRIPTION	BLOW COUNTS (Blows per 6")
				SM	TOPSOIL ; Loose, dry to damp, dark brown, Silty, fine to medium SAND	
				SM	2.00 788.0 Loose to medium dense, damp, brown to dark brown, Silty, fine to coarse SAND; trace clay	
					2.50 787.5 GRANITIC ROCK (Kgr) ; Weak, highly weathered, damp, brown, GRANITIC ROCK; excavates as Silty, fine to coarse SAND	
					4.00 786.0 TRENCH TERMINATED AT 4 FEET No groundwater encountered Backfilled on 05/06/2024.	
5	785					
10	780					
15	775					

THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

**TRENCH NUMBER T-7**

Sheet 1 of 1

PROJECT NAME E. Mission Road
PROJECT NUMBER G3322-42-01
DATE STARTED 05-06-2024 **COMPLETED** 05-06-2024
TRENCHING CONTRACTOR Dave's Backhoe
EQUIPMENT TYPE CAT 430F RT Backhoe W/18" Bucket
LOGGED BY N. Borja

LATITUDE 33.385377 **LONGITUDE** -117.236139
TRENCH DEPTH 4.5 ft
TOP OF TRENCH ELEVATION 781.0 ft
GROUNDWATER DEPTHS
▼ **GROUNDWATER ENCOUNTERED** NA

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE NUMBER	LITHOLOGY	USCS	MATERIAL DESCRIPTION	BLOW COUNTS (Blows per 6")
				SM	TOPSOIL ; Loose, moist, dark brown, Silty, fine to medium SAND	
				CL	1.50 779.5 Stiff, moist, dark reddish brown and olive brown, Sandy CLAY	
					3.00 778.0 GRANITIC ROCK (Kgr) ; Weak, highly weathered, brown to light brown, GRANITIC ROCK; excavates as Silty, fine to coarse SAND	
					4.50 776.5 TRENCH TERMINATED AT 4.5 FEET No groundwater encountered Backfilled on 05/06/2024.	
5	776					
10	771					
15	766					

THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

**TRENCH NUMBER T-8**

Sheet 1 of 1

PROJECT NAME E. Mission Road
PROJECT NUMBER G3322-42-01
DATE STARTED 05-06-2024 **COMPLETED** 05-06-2024
TRENCHING CONTRACTOR Dave's Backhoe
EQUIPMENT TYPE CAT 430F RT Backhoe w/18" Bucket
LOGGED BY N. Borja

LATITUDE 33.385283 **LONGITUDE** -117.235738
TRENCH DEPTH 4.5 ft
TOP OF TRENCH ELEVATION 788.0 ft
GROUNDWATER DEPTHS
▼ **GROUNDWATER ENCOUNTERED** NA

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE NUMBER	LITHOLOGY	USCS	MATERIAL DESCRIPTION	BLOW COUNTS (Blows per 6")
				SM	TOPSOIL ; Loose, damp, brown, Silty, fine to medium SAND	
				1.50 786.5	GRANITIC ROCK (Kgr) ; Weak, highly weathered, damp, brown, GRANITIC ROCK; excavates as Silty, fine to coarse SAND	
				4.50 783.5		
5 783					TRENCH TERMINATED AT 4.5 FEET No groundwater encountered Backfilled on 05/06/2024.	
10 778						
15 773						

THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

**TRENCH NUMBER T-9**

Sheet 1 of 1

PROJECT NAME E. Mission Road
PROJECT NUMBER G3322-42-01
DATE STARTED 05-06-2024 **COMPLETED** 05-06-2024
TRENCHING CONTRACTOR Dave's Backhoe
EQUIPMENT TYPE CAT 430F RT Backhoe w/18" Bucket
LOGGED BY N. Borja

LATITUDE 33.385400 **LONGITUDE** -117.235312
TRENCH DEPTH 7.0 ft
TOP OF TRENCH ELEVATION 789.0 ft

GROUNDWATER DEPTHS

▼ **GROUNDWATER ENCOUNTERED** NA

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE NUMBER	LITHOLOGY	USCS	MATERIAL DESCRIPTION	BLOW COUNTS (Blows per 6")
5	784	B T9-1		SM	UNDOCUMENTED FILL (Qudf) ; Loose, damp, dark brown, Silty, fine to medium SAND - Contains chunks of granitic rock 5.00 784.0 GRANITIC ROCK (Kgr) ; Weak, highly weathered, damp, brown, GRANITIC ROCK; excavates as Silty, fine to coarse SAND 7.00 782.0	
10	779				TRENCH TERMINATED AT 7 FEET No groundwater encountered Backfilled on 05/06/2024.	
15	774					

THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.



PROJECT NAME E. Mission Road
PROJECT NUMBER G3322-42-01
DATE STARTED 05-06-2024 COMPLETED 05-06-2024
TRENCHING CONTRACTOR Dave's Backhoe
EQUIPMENT TYPE CAT 430F RT Backhoe w/18" Bucket
LOGGED BY N. Borja

LATITUDE 33.385627 LONGITUDE -117.235559
TRENCH DEPTH 3.5 ft
TOP OF TRENCH ELEVATION 781.0 ft
GROUNDWATER DEPTHS
GROUNDWATER ENCOUNTERED NA

DEPTH (ft)	ELEVATION (ft)	LITHOLOGY	USCS	MATERIAL DESCRIPTION	BLOW COUNTS (Blows per 6")
			SM	TOPSOIL; Loose, damp, brown to dark brown, Silty, fine to coarse SAND; metal pipe encountered below surface	
			2.00 779.0	GRANITIC ROCK (Kgr); Weak, highly weathered, damp, brown, GRANITIC ROCK; excavates as Silty, fine to coarse SAND	
			3.50 777.5	TRENCH TERMINATED AT 3.5 FEET No groundwater encountered Backfilled on 05/06/2024.	
5	776				
10	771				
15	766				

THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

**TRENCH NUMBER T-11**

Sheet 1 of 1

PROJECT NAME E. Mission Road
PROJECT NUMBER G3322-42-01
DATE STARTED 05-06-2024 **COMPLETED** 05-06-2024
TRENCHING CONTRACTOR Dave's Backhoe
EQUIPMENT TYPE CAT 430F RT Backhoe W/18" Bucket
LOGGED BY N. Borja

LATITUDE 33.385783 **LONGITUDE** -117.235321
TRENCH DEPTH 5.5 ft
TOP OF TRENCH ELEVATION 780.0 ft
GROUNDWATER DEPTHS
▼ **GROUNDWATER ENCOUNTERED** NA

DEPTH (ft)	ELEVATION (ft)	LITHOLOGY	USCS	MATERIAL DESCRIPTION	BLOW COUNTS (Blows per 6")
			SM	UNDOCUMENTED FILL (Qudf); Loose, moist, brown to grayish brown, Silty, fine to medium SAND	
	1.50		778.5		
			CL	TOPSOIL; Stiff, moist, dark reddish brown and olive brown, Sandy CLAY	
	3.50		776.5		
				GRANITIC ROCK (Kgr); Weak, highly weathered, damp, brown, GRANITIC ROCK; excavates as Silty, fine to coarse SAND	
5	775		5.50	774.5	
				TRENCH TERMINATED AT 5.5 FEET No groundwater encountered Backfilled on 05/06/2024.	
10	770				
15	765				

THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.



TRENCH NUMBER T-12

Sheet 1 of 1

PROJECT NAME E. Mission Road
PROJECT NUMBER G3322-42-01
DATE STARTED 05-06-2024 COMPLETED 05-06-2024
TRENCHING CONTRACTOR Dave's Backhoe
EQUIPMENT TYPE CAT 430F RT Backhoe W/18" Bucket
LOGGED BY N. Borja

LATITUDE 33.385972 LONGITUDE -117.235321
TRENCH DEPTH 10.0 ft
TOP OF TRENCH ELEVATION 778.0 ft
GROUNDWATER DEPTHS
GROUNDWATER ENCOUNTERED NA

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE NUMBER	LITHOLOGY	USCS	MATERIAL DESCRIPTION	BLOW COUNTS (Blows per 6")
				SM	ALLUVIUM (Qal); Loose, dry to damp, brown to light brown, Silty, fine to medium SAND	
				CL	2.00 776.0 Stiff, moist, dark brown and dark grayish brown, Sandy CLAY	
				SM	4.00 774.0 Medium dense, moist, mottled grayish brown and reddish brown, Silty, fine to medium SAND	
5	773				7.00 771.0 GRANITIC ROCK (Kgr); Weak, highly weathered, moist, grayish brown, GRANITIC ROCK; excavates as Silty, fine to coarse SAND	
10	768				10.00 768.0 - Hard digging	
					TRENCH TERMINATED AT 10 FEET No groundwater encountered Backfilled on 05/06/2024.	
15	763					

THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

**TRENCH NUMBER T-13**

Sheet 1 of 1

PROJECT NAME E. Mission Road
PROJECT NUMBER G3322-42-01
DATE STARTED 05-06-2024 **COMPLETED** 05-06-2024
TRENCHING CONTRACTOR Dave's Backhoe
EQUIPMENT TYPE CAT 430F RT Backhoe W/18" Bucket
LOGGED BY N. Borja

LATITUDE 33.386111 **LONGITUDE** -117.235606
TRENCH DEPTH 12.0 ft
TOP OF TRENCH ELEVATION 775.0 ft
GROUNDWATER DEPTHS
▼ **GROUNDWATER ENCOUNTERED** NA

DEPTH (ft)	ELEVATION (ft)	LITHOLOGY	USCS	MATERIAL DESCRIPTION	BLOW COUNTS (Blows per 6")
			CL	ALLUVIUM (Qal) ; Soft to firm, moist, dark, Sandy CLAY	
			SM-ML	3.00 772.0 Loose, moist, mottled tan brown and gray, Silty, fine to medium SAND to Sandy SILT	
5	770			- Becomes gray; increase in fines content	
			SM	9.50 765.5 Loose, moist to wet, gray, fine to coarse SAND; little silt	
10	765			11.00 764.0 GRANITIC ROCK (Kgr) ; Weak, weathered, moist, brown, GRANITIC ROCK; excavates as Silty, fine to coarse SAND	
				12.00 763.0 TRENCH TERMINATED AT 12 FEET No groundwater encountered Backfilled on 05/06/2024.	
15	760				

THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.



TRENCH NUMBER T-14

Sheet 1 of 1

PROJECT NAME E. Mission Road
PROJECT NUMBER G3322-42-01
DATE STARTED 05-06-2024 **COMPLETED** 05-06-2024
TRENCHING CONTRACTOR Dave's Backhoe
EQUIPMENT TYPE CAT 430F RT Backhoe W/18" Bucket
LOGGED BY N. Borja

LATITUDE 33.385877 **LONGITUDE** -117.235723
TRENCH DEPTH 8.0 ft
TOP OF TRENCH ELEVATION 775.0 ft
GROUNDWATER DEPTHS
▼ **GROUNDWATER ENCOUNTERED** NA

DEPTH (ft)	ELEVATION (ft)	LITHOLOGY	USCS	MATERIAL DESCRIPTION	BLOW COUNTS (Blows per 6")
			SM	ALLUVIUM (Qal); Loose, moist, dark brown, Silty, fine to medium SAND; few clay	
			SC	Loose, moist, mottled gray and brown, Clayey, fine to medium SAND	
5	770			GRANITIC ROCK (Kgr); Weak, highly weathered, moist, tan brown, GRANITIC ROCK; excavates as Silty, fine to coarse SAND	
				TRENCH TERMINATED AT 8 FEET No groundwater encountered Backfilled on 05/06/2024.	
10	765				
15	760				

THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NAME	E. Mission Road		
PROJECT NUMBER	G3322-42-01		
DATE STARTED	05-06-2024	COMPLETED	05-06-2024
TRENCHING CONTRACTOR	Dave's Backhoe		
EQUIPMENT TYPE	CAT 430F RT Backhoe W/18" Bucket		
LOGGED BY	N. Borja		

LATITUDE	33.386029	LONGITUDE	-117.236095
TRENCH DEPTH	10.5 ft		
TOP OF TRENCH ELEVATION	770.0 ft		
GROUNDWATER DEPTHS			
▼ GROUNDWATER ENCOUNTERED	NA		

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE NUMBER	LITHOLOGY	USCS	MATERIAL DESCRIPTION	BLOW COUNTS (Blows per 6")
				SM	ALLUVIUM (Qal); Loose, damp, dark brown, Silty, fine to medium SAND	
				CL	1.50 768.5 Firm to stiff, moist, dark brown, Sandy CLAY	
5	765			SC	5.50 764.5 Medium dense, moist, brown to dark brown, Clayey, fine to medium SAND	
				SM	7.00 763.0 Medium dense to dense, damp, tan brown, Silty, fine to medium SAND; hard digging	
10	760	B T15-1			10.50 759.5 TRENCH TERMINATED AT 10.5 FEET No groundwater encountered Backfilled on 05/06/2024.	
15	755					

THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

**TRENCH NUMBER T-16**

Sheet 1 of 1

PROJECT NAME E. Mission Road
PROJECT NUMBER G3322-42-01
DATE STARTED 05-06-2024 **COMPLETED** 05-06-2024
TRENCHING CONTRACTOR Dave's Backhoe
EQUIPMENT TYPE CAT 430F RT Backhoe W/18" Bucket
LOGGED BY N. Borja

LATITUDE 33.385734 **LONGITUDE** -117.236162
TRENCH DEPTH 4.5 ft
TOP OF TRENCH ELEVATION 773.0 ft
GROUNDWATER DEPTHS
▼ **GROUNDWATER ENCOUNTERED** NA

DEPTH (ft)	ELEVATION (ft)	LITHOLOGY	USCS	MATERIAL DESCRIPTION	BLOW COUNTS (Blows per 6")
			SM	TOPSOIL ; Loose, moist, dark brown, Silty, fine to medium SAND	
	1.50		CL	771.5 Stiff, moist, dark brown, Sandy CLAY	
	3.50			769.5	
	4.50			GRANITIC ROCK (Kgr) ; Weak, highly weathered, damp, brown, GRANITIC ROCK; excavates as Silty, fine to coarse SAND	
5	768			TRENCH TERMINATED AT 4.5 FEET No groundwater encountered Backfilled on 05/06/2024.	
10	763				
15	758				

THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

**TRENCH NUMBER T-17**

Sheet 1 of 1

PROJECT NAME E. Mission Road
PROJECT NUMBER G3322-42-01
DATE STARTED 05-06-2024 **COMPLETED** 05-06-2024
TRENCHING CONTRACTOR Dave's Backhoe
EQUIPMENT TYPE CAT 430F RT Backhoe W/18" Bucket
LOGGED BY N. Borja

LATITUDE 33.386516 **LONGITUDE** -117.235550
TRENCH DEPTH 12.5 ft
TOP OF TRENCH ELEVATION 774.0 ft
GROUNDWATER DEPTHS
▼ **GROUNDWATER ENCOUNTERED** NA

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE NUMBER	LITHOLOGY	USCS	MATERIAL DESCRIPTION	BLOW COUNTS (Blows per 6")
				SM	ALLUVIUM (Qal) ; Loose, damp, dark brown, Silty, fine to medium SAND	
				ML	1.50 772.5 Firm, moist, brown to reddish brown, Sandy SILT	
				SM	4.00 770.0 Medium dense, moist, mottled gray and brown, Silty, fine to medium SAND	
5	769	B T17-1			- Becomes medium dense to dense below 5 feet	
					- -Becomes reddish brown to brown	
10	764	CHNK T17-2			10.00 764.0 GRANITIC ROCK (Kgr) ; Weak, completely weathered, moist, brown to tan brown, GRANITIC ROCK; excavates as Silty, fine to coarse SAND	
					12.50 761.5 TRENCH TERMINATED AT 12.5 FEET No groundwater encountered Backfilled on 05/06/2024.	
15	759					

THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

**TRENCH NUMBER T-18**

Sheet 1 of 1

PROJECT NAME E. Mission Road
PROJECT NUMBER G3322-42-01
DATE STARTED 05-06-2024 **COMPLETED** 05-06-2024
TRENCHING CONTRACTOR Dave's Backhoe
EQUIPMENT TYPE CAT 430F RT Backhoe W/18" Bucket
LOGGED BY N. Borja

LATITUDE 33.386453 **LONGITUDE** -117.235835
TRENCH DEPTH 13.0 ft
TOP OF TRENCH ELEVATION 771.0 ft
GROUNDWATER DEPTHS
▼ **GROUNDWATER ENCOUNTERED** 12.5

DEPTH (ft)	ELEVATION (ft)	LITHOLOGY	USCS	MATERIAL DESCRIPTION	BLOW COUNTS (Blows per 6")
			SM	ALLUVIUM (Qal) ; Loose, damp, dark brown, Silty, fine to medium SAND	
			1.50 769.5		
			CL	Firm, moist, dark brown, Sandy CLAY	
			4.00 767.0		
			SM	Loose to medium dense, moist, mottled gray and tan brown, Silty, fine to medium SAND	
5	766			- Becomes gray, fine to coarse	
				- Becomes medium dense to dense, brown to grayish brown	
10	761				
			12.50 758.5	▼	
			13.00 758.0		
				TRENCH TERMINATED AT 13 FEET Groundwater encountered at 12.5 feet Backfilled on 05/06/2024.	
15	756				

THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

**TRENCH NUMBER T-19**

Sheet 1 of 1

PROJECT NAME E. Mission Road
PROJECT NUMBER G3322-42-01
DATE STARTED 05-06-2024 **COMPLETED** 05-06-2024
TRENCHING CONTRACTOR Dave's Backhoe
EQUIPMENT TYPE CAT 430F RT Backhoe W/18" Bucket
LOGGED BY N. Borja

LATITUDE 33.386395 **LONGITUDE** -117.236113
TRENCH DEPTH 11.0 ft
TOP OF TRENCH ELEVATION 768.0 ft
GROUNDWATER DEPTHS
▼ **GROUNDWATER ENCOUNTERED** NA

DEPTH (ft)	ELEVATION (ft)	LITHOLOGY	USCS	MATERIAL DESCRIPTION	BLOW COUNTS (Blows per 6")
			SM	ALLUVIUM (Qal) ; Loose, damp, dark brown, Silty, fine to medium SAND	
			CL	2.00 766.0 Soft to firm, moist, dark brown, Sandy CLAY	
			SM	4.00 764.0 Loose, moist, brown, Silty, fine to coarse SAND	
5	763				
10	758			10.00 758.0 GRANITIC ROCK (Kgr) ; Weak, highly weathered, moist, brown to yellowish brown and reddish brown, GRANITIC ROCK; excavates as Silty, fine to coarse SAND	
				11.00 757.0 TRENCH TERMINATED AT 11 FEET No groundwater encountered Backfilled on 05/06/2024.	
15	753				

THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

APPENDIX

B

APPENDIX B

LABORATORY TESTING

We performed laboratory tests in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. We tested selected soil samples for maximum density/optimum moisture content, expansion index, water-soluble sulfate, chloride, plasticity index, and grain size characteristics. The results of our laboratory tests are presented herein.

SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS ASTM D 1557

Sample No.	Description (Geologic Unit)	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
T1-2	Reddish brown, Silty, fine to medium SAND (Topsoil)	129.1	10.0
T12-1	Dark brown, Sandy CLAY (Qal)	127.0	10.0

SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS ASTM D 4829

Sample No.	Moisture Content (%)		Dry Density (pcf)	Expansion Index	2022 CBC Expansion Classification	ASTM Soil Expansion Classification
	Before Test	After Test				
T7-1	13.3	29.2	97.3	73	Expansive	Medium
T12-1	9.6	21.0	109.6	38	Expansive	Low

SUMMARY OF LABORATORY WATER-SOLUBLE SULFATE TEST RESULTS CALIFORNIA TEST NO. 417

Sample No.	Depth (feet)	Geologic Unit	Water-Soluble Sulfate (%)	ACI 318 Sulfate Exposure
T7-1	1.5-3	Topsoil	0.001	S0
T12-1	2-4	Qal	0.008	S0

**SUMMARY OF LABORATORY CHLORIDE TEST RESULTS
AASHTO T 291**

Sample No.	Depth (Feet)	Geologic Unit	Chloride Ion Content (ppm)	Chloride Ion Content (%)
T7-1	1.5-3	Topsoil	83	0.008
T12-1	2-4	Qal	88	0.009

**SUMMARY OF LABORATORY PLASTICITY INDEX TEST RESULTS
ASTM D 4318**

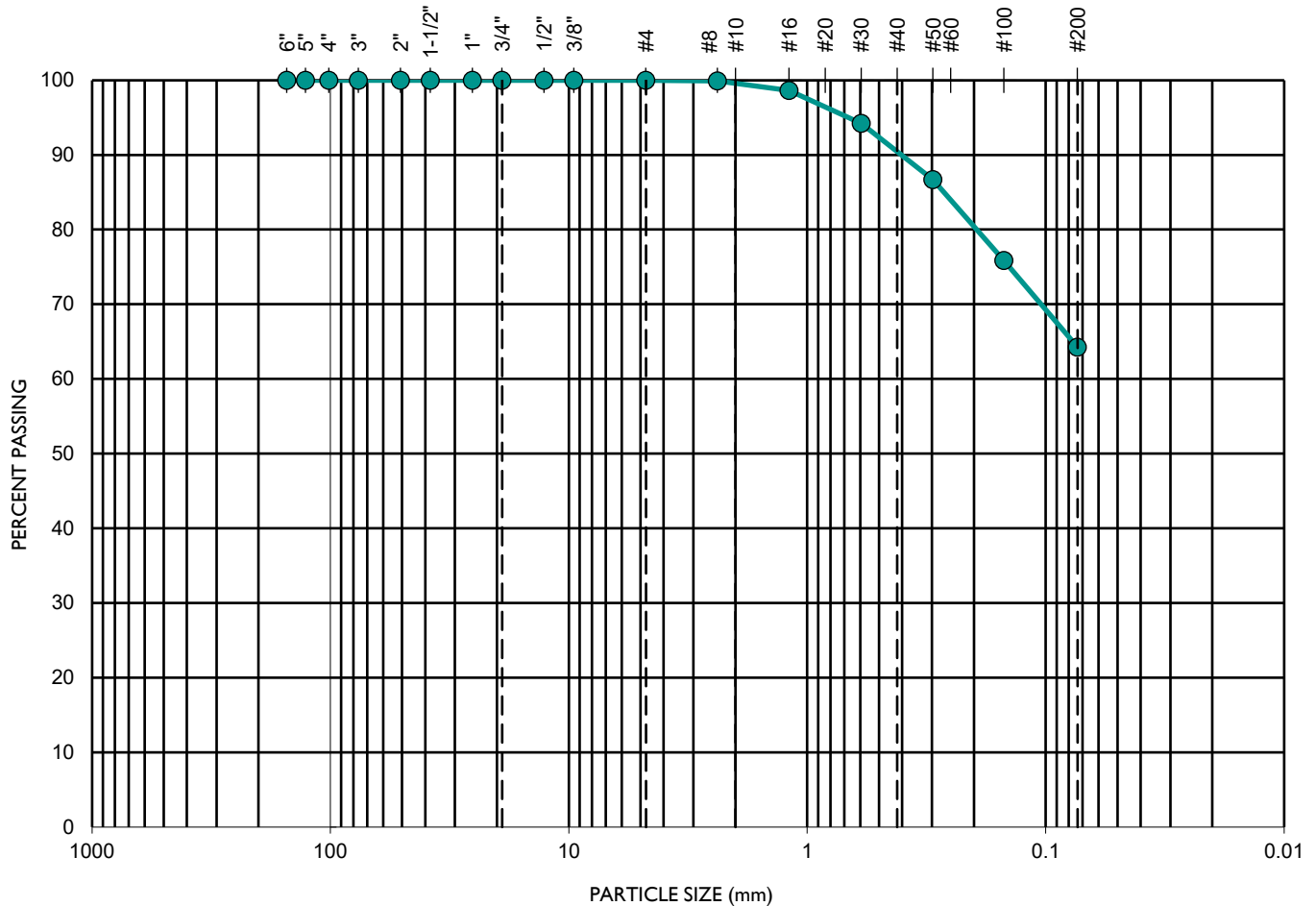
Sample No.	Depth (Feet)	Geologic Unit	Liquid Limit	Plastic Limit	Plasticity Index	Soil Classification
T7-1	1.5-3	Topsoil	51	21	30	CH
T12-1	2-4	Qal	31	15	16	CL

SAMPLE NO.: **T7-1**
 SAMPLE DEPTH (FT.): **1.5-3'**

GEOLOGIC UNIT: **Topsoil**

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE



TEST DATA					
D ₁₀ (mm)	D ₃₀ (mm)	D ₆₀ (mm)	C _c	C _u	SOIL DESCRIPTION
0.012	0.034	0.069	1.5	6.0	CH - Sandy, fat CLAY

GEOCON
INCORPORATED



GEOTECHNICAL CONSULTANTS
 6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
 PHONE 858 558-6900 - FAX 858 558-6159

SIEVE ANALYSES - ASTM D 6913

1305 EAST MISSION ROAD

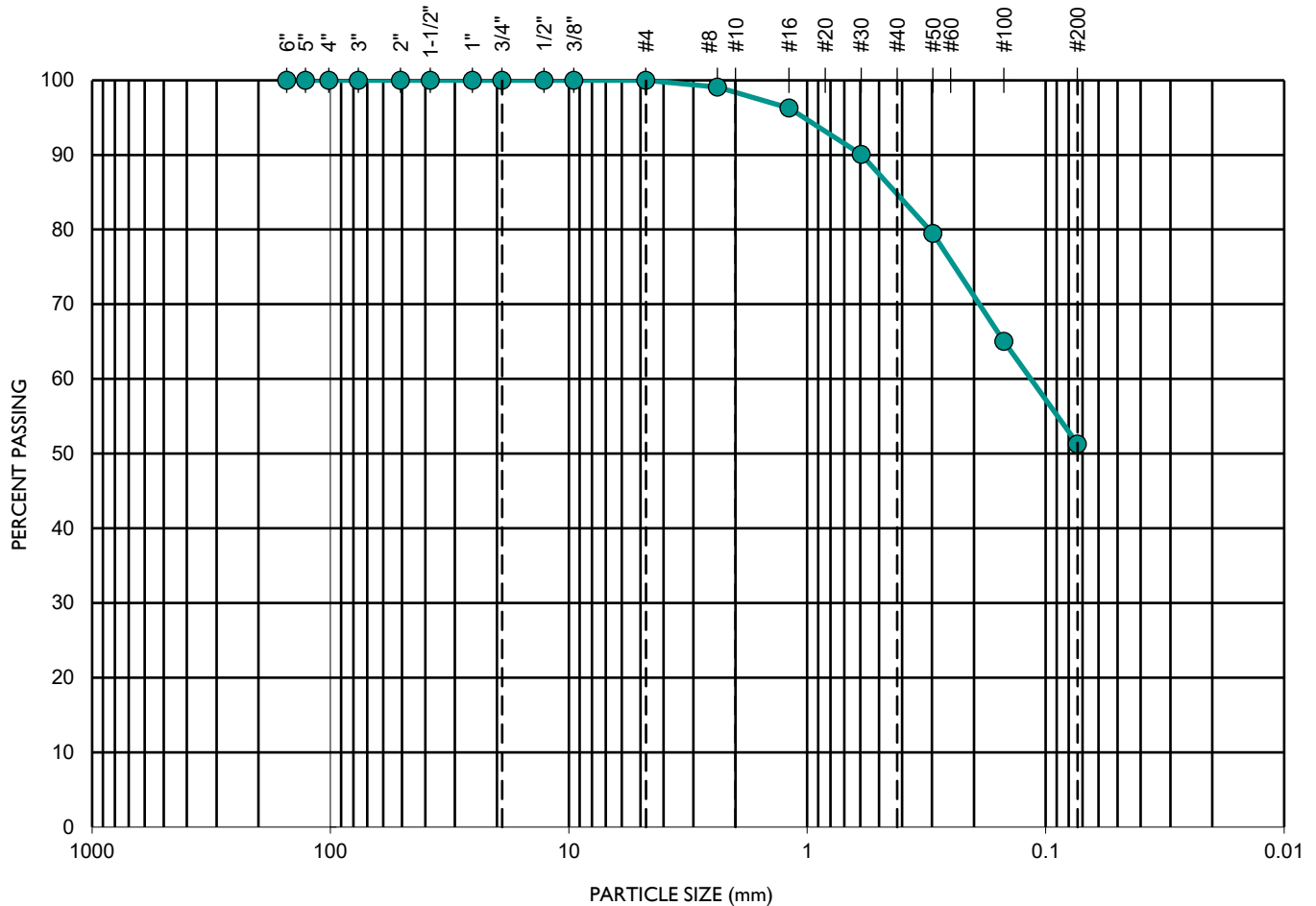
PROJECT NO.: G3322-42-01

SAMPLE NO.: **T12-1**
 SAMPLE DEPTH (FT.): **2-4'**

GEOLOGIC UNIT: **Qal**

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE



TEST DATA					
D ₁₀ (mm)	D ₃₀ (mm)	D ₆₀ (mm)	C _c	C _u	SOIL DESCRIPTION
0.014	0.043	0.122	1.1	8.4	CL - Sandy, lean CLAY

GEOCON
INCORPORATED



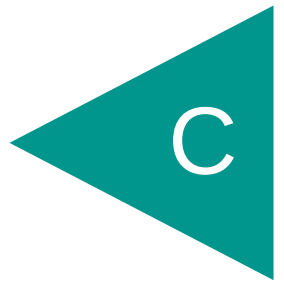
GEOTECHNICAL CONSULTANTS
 6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
 PHONE 858 558-6900 - FAX 858 558-6159

SIEVE ANALYSES - ASTM D 6913

1305 EAST MISSION ROAD

PROJECT NO.: G3322-42-01

APPENDIX



APPENDIX C

STORMWATER MANAGEMENT INVESTIGATION

We understand storm water management devices are being proposed in accordance with the 2020 County of San Diego BMP Design Manual. If not properly constructed, there is a risk for potential distress to improvements and properties located hydrologically down gradient or adjacent to these devices. Factors such as the amount of water to be detained, its residence time, and soil permeability have an important effect on seepage transmission and the potential adverse impacts that may occur if the storm water management features are not properly designed and constructed. We have not performed a hydrogeological study at the site. If infiltration of storm water runoff occurs, downstream properties may be subjected to seeps, springs, slope instability, raised groundwater, movement of foundations and slabs, or other undesirable impacts as a result of water infiltration.

Hydrologic Soil Group

The United States Department of Agriculture (USDA), Natural Resources Conservation Services, possesses general information regarding the existing soil conditions for areas within the United States. The USDA website also provides the Hydrologic Soil Group. The table below presents the descriptions of the hydrologic soil groups. In addition, the USDA website also provides an estimated saturated hydraulic conductivity for the existing soil.

HYDROLOGIC SOIL GROUP DEFINITIONS

Soil Group	Soil Group Definition
A	Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.
B	Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.
C	Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.
D	Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

The table below presents the information from the USDA website for the subject property.

USDA WEB SOIL SURVEY – HYDROLOGIC SOIL GROUP

Map Unit Name	Map Unit Symbol	Approximate Percentage of Property	Hydrologic Soil Group	k _{SAT} of Most Limiting Layer (Inches/ Hour)
Fallbrook-Vista sandy loams, 9 to 15 percent slopes	FvD	36	B	0.20 – 0.57
Placentia sandy loam, 2 to 9 percent slopes, warm MAAT MLRA 19	PeC	64	C	0.06 – 0.60

Infiltration Testing

We performed infiltration tests at the locations shown on the *Geologic Map*, Figure 1. The table below presents the results of the infiltration tests. Data sheets are attached. We applied an estimated feasibility factor of safety of 2.0 to our estimated infiltration rates to provide input in Table D.2-1 of Appendix B in the BMP manual. Soil infiltration rates from in-situ tests can vary significantly from one location to another due to the heterogeneous characteristics inherent to most soil.

INFILTRATION TEST RESULTS

Test No.	Geologic Unit	Test Elevation (feet, MSL)	Field-Saturated Hydraulic Conductivity/Infiltration Rate, k _{sat} (inch/hour)	Infiltration Rate ¹ (inch/hour)
A-1	Qal	776	0.011	0.005
A-2	Qal	771	0.009	0.004
A-3	Kgr	782	0.043	0.021
A-4	Kgr	785	0.010	0.005
Average			0.018	0.009

¹ Using a Factor of Safety of 2.

GEOTECHNICAL CONSIDERATIONS

Groundwater Elevations

We encountered groundwater at a depth of 12.5 feet below existing grade trench T-18. It is not uncommon for shallow seepage conditions to develop where none previously existed when sites are irrigated or infiltration is implemented. Groundwater and seepage are dependent on seasonal precipitation, irrigation, land use, among other factors, and varies as a result.

New or Existing Utilities

Utilities are located on the property and adjacent to the property within roadways. Infiltration within the areas near these utilities should be considered infeasible. Setbacks for infiltration should be incorporated if infiltration were to be considered. The setback for infiltration devices should be a minimum of 10 feet and a 1:1 plane of 1 foot below the closest edge of the deepest adjacent utility.

Existing and Planned Structures

Existing and proposed buildings are present on and adjacent to the site. In addition, water should not be allowed to infiltrate in areas where it could affect the neighboring properties and existing adjacent structures, improvements, and roadway. Mitigation for existing structures consists of not allowing water infiltration within a lateral distance of at least 10 feet from the new or existing foundations and property lines. The planned structure will extend over most of the property, and there will be no locations onsite that will be outside of a 10-foot setback from the planned building. Therefore, infiltration should be restricted.

Soil or Groundwater Contamination

We are unaware of contaminated soil on the property. Therefore, infiltration associated with this risk is considered unrestricted. In addition, groundwater mounding would not be a concern due to the lack of a near surface groundwater table.

CONCLUSIONS AND RECOMMENDATIONS

Infiltration Rates

Our test results indicated relatively low infiltration rates, with an average rate of 0.018 in/hr, which can be used as the corrected infiltration rate on Table D.2-1 of the County of San Diego Storm Water Manual. The table below provides the information from Table D.2-1 of the storm water manual.

ELEMENTS FOR DETERMINATION OF DESIGN INFILTRATION RATES
(TABLE D.2-1 OF APPENDIX D)

Item	Value	Unit
Initial Infiltration Rate: Identify per Section D.2.1	0.018	in/hr
Corrected Infiltration Rate: Identify per Section D.2.2	0.018	in/hr
*Safety Factor: Identify per Section D.2.3	2	unitless
Design Infiltration Rate: Corrected Infiltration Rate ÷ Safety Factor	0.009	in/hr

*The final Safety Factor should be determined by the civil engineer.

Infiltration Restrictions

We have evaluated proposed BMPs with respect to the infiltration restrictions contained in Form 4 in Appendix D of the City of Oceanside Storm Water Manual. The table below provides the information.

**INFILTRATION RESTRICTIONS FOR BASIC INFILTRATION ANALYSIS
(TABLE D.1-1 OF APPENDIX D)**

Restriction Element		Is Element Applicable? (Yes/No)
Mandatory Considerations	BMP is within 100' of Contaminated Soils	No
	BMP is within 100' of Industrial Activities Lacking Source Control	No
	BMP is within 100' of Well/Groundwater Basin	No
	BMP is within 50' of Septic Tanks/Leach Fields	No
	BMP is within 10' of Structures/Tanks/Walls	No
	BMP is within 10' of Sewer Utilities	No
	BMP is within 10' of Seasonal High Groundwater	No
	BMP is within Hydric Soils	No
	BMP is within Highly Liquefiable Soils and has Connectivity to Structures	No
	BMP is within 1.5 Times the Height of Adjacent Steep Slopes ($\geq 25\%$)	No
	County Staff has Assigned "Restricted" Infiltration Category	No
Optional Considerations	BMP is within Predominantly Type D Soil	No
	BMP is within 5' of Property Line	No
	BMP is within Fill Depths of $\geq 5'$ (Existing or Proposed)	No
	BMP is within 10' of Underground Utilities	No
	BMP is within 250' of Ephemeral Stream	No
Result	Based on examination of the best available information, I have not identified any restrictions above.	X
	Based on examination of the best available information, I have identified one or more restrictions above.	

Storm Water Evaluation Conclusion

Based on the information in the table above, there are no restrictions identified and the site is considered "unrestricted" for infiltration based on the County's guideline. However, infiltration tests performed within the existing alluvium and granitic rock indicate a very low average rate of 0.009 inches per hour (with a factor of safety of 2).

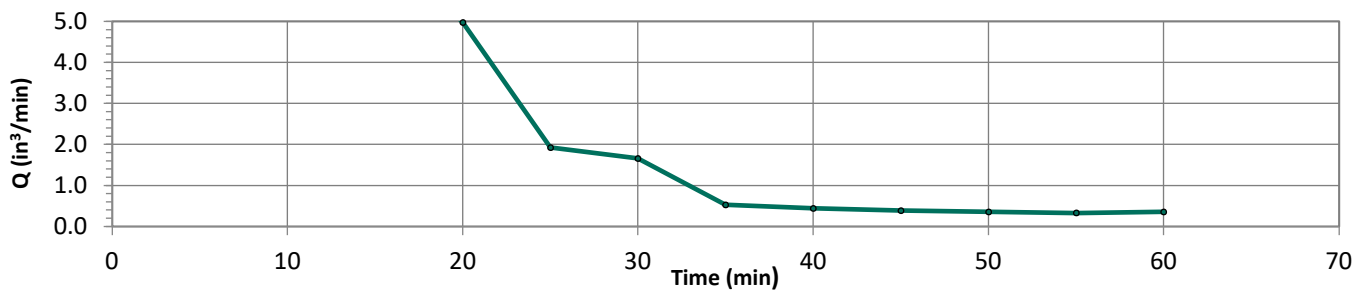
Storm Water Management Devices

Liners and subdrains should be incorporated into the design and construction of the planned storm water devices. The liners should be impermeable (e.g. High-density polyethylene, HDPE, with a thickness of about 30 mil or equivalent Polyvinyl Chloride, PVC) to prevent water migration. The subdrains should be perforated within the liner area, installed at the base and above the liner, be at least 3 inches in diameter and consist of Schedule 40 PVC pipe. The subdrains outside of the liner should consist of solid pipe. The penetration of the liners at the subdrains should be properly waterproofed. The subdrains should be connected to a proper outlet. The devices should also be installed in accordance with the manufacturer's recommendations.

TEST NO.: **A-1**GEOLOGIC UNIT: **Qal**EXCAVATION ELEVATION (MSL, FT): **776**

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	8
BOREHOLE DEPTH (FT):	4.5
TEST/BOTTOM ELEVATION (MSL, FT):	772
MEASURED HEAD HEIGHT (IN):	4.3
CALCULATED HEAD HEIGHT (IN):	6.2
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN ³ /MIN):	0.351
FIELD-SATURATED INFILTRATION RATE (IN/HR):	0.011
FACTORED INFILTRATION RATE (IN/HR):	0.005



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in ³)	Q (in ³ /min)
1	0.00	0.000	0.00	0.00
2	5.00	7.925	219.46	43.892
3	5.00	1.895	52.48	10.495
4	5.00	1.315	36.42	7.283
5	5.00	1.300	36.00	7.200
6	5.00	0.898	24.87	4.974
7	5.00	0.347	9.61	1.922
8	5.00	0.300	8.31	1.662
9	5.00	0.095	2.63	0.526
10	5.00	0.080	2.22	0.443
11	5.00	0.070	1.94	0.388
12	5.00	0.065	1.80	0.360
13	5.00	0.060	1.66	0.332
14	5.00	0.065	1.80	0.360

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AARDVARK PERMEAMETER TEST RESULTS

1305 EAST MISSION ROAD

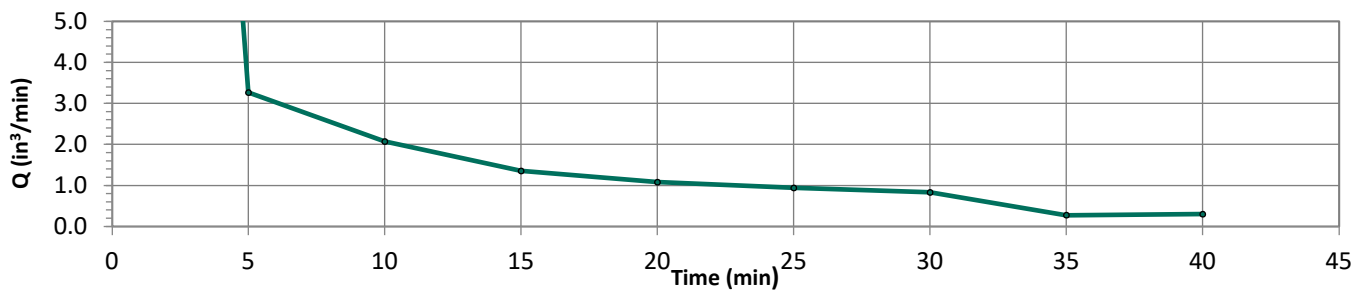
PROJECT NO.:

G3322-42-01

TEST NO.: A-2GEOLOGIC UNIT: QalEXCAVATION ELEVATION (MSL, FT): 771

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	8
BOREHOLE DEPTH (FT):	4.0
TEST/BOTTOM ELEVATION (MSL, FT):	767
MEASURED HEAD HEIGHT (IN):	4.3
CALCULATED HEAD HEIGHT (IN):	6.1
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN ³ /MIN):	0.286
FIELD-SATURATED INFILTRATION RATE (IN/HR):	0.009
FACTORED INFILTRATION RATE (IN/HR):	0.004



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in ³)	Q (in ³ /min)
1	0.00	0.000	0.00	0.00
2	5.00	8.590	237.88	47.575
3	5.00	0.590	16.34	3.268
4	5.00	0.375	10.38	2.077
5	5.00	0.245	6.78	1.357
6	5.00	0.195	5.40	1.080
7	5.00	0.170	4.71	0.942
8	5.00	0.150	4.15	0.831
9	5.00	0.050	1.38	0.277
10	5.00	0.055	1.52	0.305
11	5.00	0.050	1.38	0.277

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AARDVARK PERMEAMETER TEST RESULTS

1305 EAST MISSION ROAD

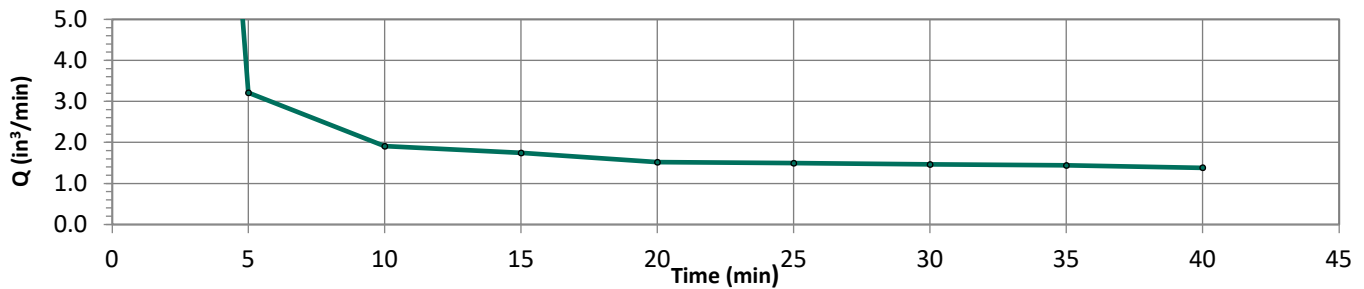
PROJECT NO.:

G3322-42-01

TEST NO.: A-3GEOLOGIC UNIT: KgrEXCAVATION ELEVATION (MSL, FT): 782

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	8
BOREHOLE DEPTH (FT):	3.0
TEST/BOTTOM ELEVATION (MSL, FT):	779
MEASURED HEAD HEIGHT (IN):	4.3
CALCULATED HEAD HEIGHT (IN):	5.9
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN ³ /MIN):	1.394
FIELD-SATURATED INFILTRATION RATE (IN/HR):	0.043
FACTORED INFILTRATION RATE (IN/HR):	0.021



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in ³)	Q (in ³ /min)
1	0.00	0.000	0.00	0.00
2	5.00	8.395	232.48	46.495
3	5.00	0.580	16.06	3.212
4	5.00	0.345	9.55	1.911
5	5.00	0.315	8.72	1.745
6	5.00	0.275	7.62	1.523
7	5.00	0.270	7.48	1.495
8	5.00	0.265	7.34	1.468
9	5.00	0.260	7.20	1.440
10	5.00	0.250	6.92	1.385
11	5.00	0.250	6.92	1.385
12	5.00	0.255	7.06	1.412

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AARDVARK PERMEAMETER TEST RESULTS

1305 EAST MISSION ROAD

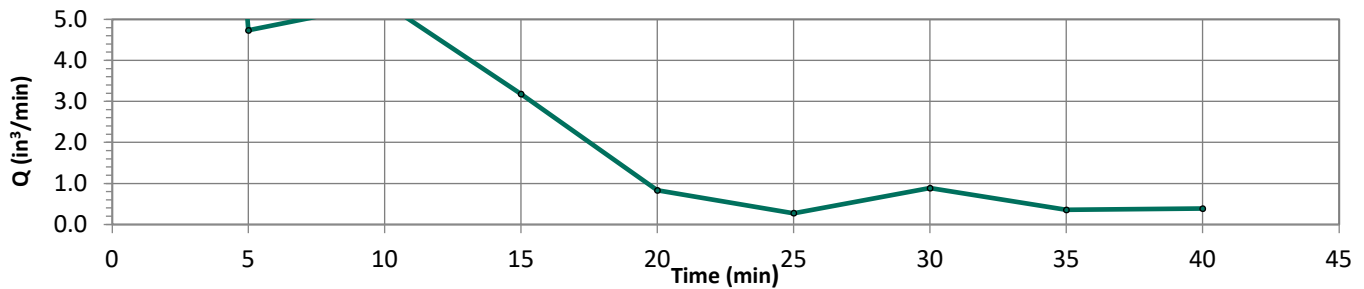
PROJECT NO.:

G3322-42-01

TEST NO.: A-4GEOLOGIC UNIT: KgrEXCAVATION ELEVATION (MSL, FT): 785

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	8
BOREHOLE DEPTH (FT):	3.5
TEST/BOTTOM ELEVATION (MSL, FT):	782
MEASURED HEAD HEIGHT (IN):	4.3
CALCULATED HEAD HEIGHT (IN):	6.0
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN ³ /MIN):	0.342
FIELD-SATURATED INFILTRATION RATE (IN/HR):	0.010
FACTORED INFILTRATION RATE (IN/HR):	0.005



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in ³)	Q (in ³ /min)
1	0.00	0.000	0.00	0.00
2	5.00	9.095	251.86	50.372
3	5.00	0.855	23.68	4.735
4	5.00	0.975	27.00	5.400
5	5.00	0.575	15.92	3.185
6	5.00	0.150	4.15	0.831
7	5.00	0.050	1.38	0.277
8	5.00	0.160	4.43	0.886
9	5.00	0.065	1.80	0.360
10	5.00	0.070	1.94	0.388
11	5.00	0.060	1.66	0.332
12	5.00	0.065	1.80	0.360
13	5.00	0.060	1.66	0.332

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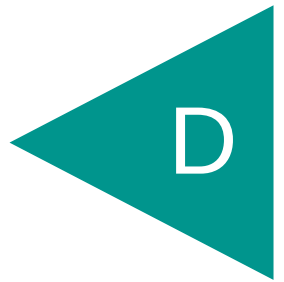
AARDVARK PERMEAMETER TEST RESULTS

1305 EAST MISSION ROAD

PROJECT NO.:

G3322-42-01

APPENDIX



APPENDIX D

RECOMMENDED GRADING SPECIFICATIONS

FOR

1305 EAST MISSION ROAD
FALLBROOK, CALIFORNIA

PROJECT NO. G3322-42-01

RECOMMENDED GRADING SPECIFICATIONS

1. GENERAL

- 1.1 These Recommended Grading Specifications shall be used in conjunction with the Geotechnical Report for the project prepared by Geocon. The recommendations contained in the text of the Geotechnical Report are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict.
- 1.2 Prior to the commencement of grading, a geotechnical consultant (Consultant) shall be employed for the purpose of observing earthwork procedures and testing the fills for substantial conformance with the recommendations of the Geotechnical Report and these specifications. The Consultant should provide adequate testing and observation services so that they may assess whether, in their opinion, the work was performed in substantial conformance with these specifications. It shall be the responsibility of the Contractor to assist the Consultant and keep them apprised of work schedules and changes so that personnel may be scheduled accordingly.
- 1.3 It shall be the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes or agency ordinances, these specifications and the approved grading plans. If, in the opinion of the Consultant, unsatisfactory conditions such as questionable soil materials, poor moisture condition, inadequate compaction, and/or adverse weather result in a quality of work not in conformance with these specifications, the Consultant will be empowered to reject the work and recommend to the Owner that grading be stopped until the unacceptable conditions are corrected.

2. DEFINITIONS

- 2.1 **Owner** shall refer to the owner of the property or the entity on whose behalf the grading work is being performed and who has contracted with the Contractor to have grading performed.
- 2.2 **Contractor** shall refer to the Contractor performing the site grading work.
- 2.3 **Civil Engineer** or **Engineer of Work** shall refer to the California licensed Civil Engineer or consulting firm responsible for preparation of the grading plans, surveying and verifying as-graded topography.

- 2.4 **Consultant** shall refer to the soil engineering and engineering geology consulting firm retained to provide geotechnical services for the project.
- 2.5 **Soil Engineer** shall refer to a California licensed Civil Engineer retained by the Owner, who is experienced in the practice of geotechnical engineering. The Soil Engineer shall be responsible for having qualified representatives on-site to observe and test the Contractor's work for conformance with these specifications.
- 2.6 **Engineering Geologist** shall refer to a California licensed Engineering Geologist retained by the Owner to provide geologic observations and recommendations during the site grading.
- 2.7 **Geotechnical Report** shall refer to a soil report (including all addenda) which may include a geologic reconnaissance or geologic investigation that was prepared specifically for the development of the project for which these Recommended Grading Specifications are intended to apply.

3. MATERIALS

- 3.1 Materials for compacted fill shall consist of any soil excavated from the cut areas or imported to the site that, in the opinion of the Consultant, is suitable for use in construction of fills. In general, fill materials can be classified as *soil* fills, *soil-rock* fills or *rock* fills, as defined below.
- 3.1.1 **Soil fills** are defined as fills containing no rocks or hard lumps greater than 12 inches in maximum dimension and containing at least 40 percent by weight of material smaller than $\frac{3}{4}$ inch in size.
- 3.1.2 **Soil-rock fills** are defined as fills containing no rocks or hard lumps larger than 4 feet in maximum dimension and containing a sufficient matrix of soil fill to allow for proper compaction of soil fill around the rock fragments or hard lumps as specified in Paragraph 6.2. **Oversize rock** is defined as material greater than 12 inches.
- 3.1.3 **Rock fills** are defined as fills containing no rocks or hard lumps larger than 3 feet in maximum dimension and containing little or no fines. Fines are defined as material smaller than $\frac{3}{4}$ inch in maximum dimension. The quantity of fines shall be less than approximately 20 percent of the rock fill quantity.

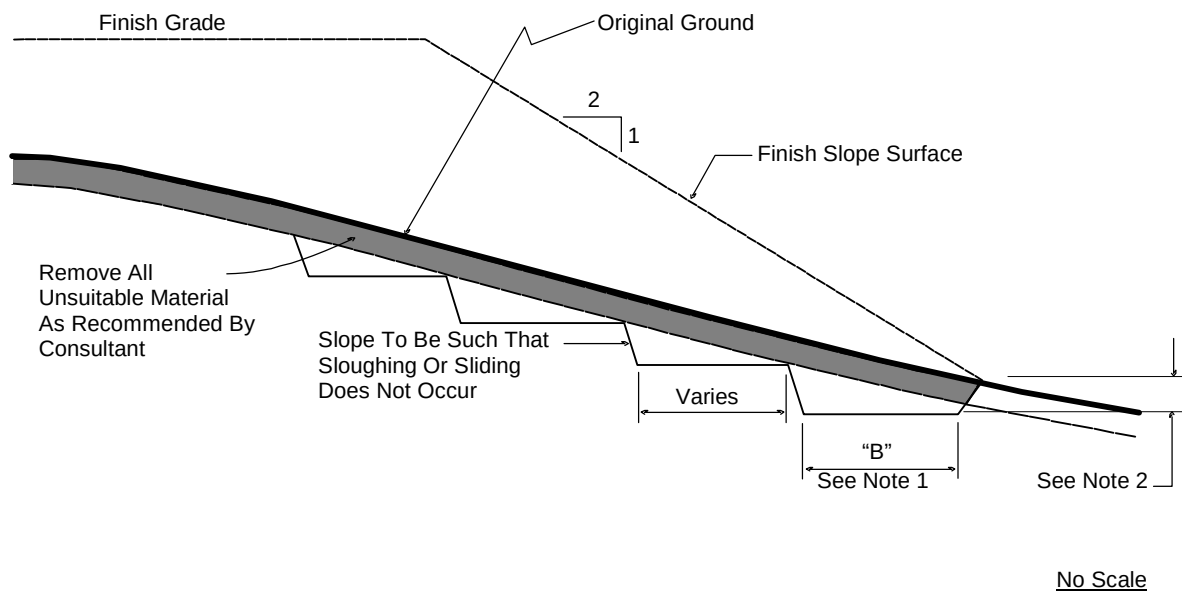
- 3.2 Material of a perishable, spongy, or otherwise unsuitable nature as determined by the Consultant shall not be used in fills.
- 3.3 Materials used for fill, either imported or on-site, shall not contain hazardous materials as defined by the California Code of Regulations, Title 22, Division 4, Chapter 30, Articles 9 and 10; 40CFR; and any other applicable local, state or federal laws. The Consultant shall not be responsible for the identification or analysis of the potential presence of hazardous materials. However, if observations, odors or soil discoloration cause Consultant to suspect the presence of hazardous materials, the Consultant may request from the Owner the termination of grading operations within the affected area. Prior to resuming grading operations, the Owner shall provide a written report to the Consultant indicating that the suspected materials are not hazardous as defined by applicable laws and regulations.
- 3.4 The outer 15 feet of *soil-rock* fill slopes, measured horizontally, should be composed of properly compacted *soil* fill materials approved by the Consultant. *Rock* fill may extend to the slope face, provided that the slope is not steeper than 2:1 (horizontal:vertical) and a soil layer no thicker than 12 inches is track-walked onto the face for landscaping purposes. This procedure may be utilized provided it is acceptable to the governing agency, Owner and Consultant.
- 3.5 Samples of soil materials to be used for fill should be tested in the laboratory by the Consultant to determine the maximum density, optimum moisture content, and, where appropriate, shear strength, expansion, and gradation characteristics of the soil.
- 3.6 During grading, soil or groundwater conditions other than those identified in the Geotechnical Report may be encountered by the Contractor. The Consultant shall be notified immediately to evaluate the significance of the unanticipated condition.

4. CLEARING AND PREPARING AREAS TO BE FILLED

- 4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material and shall be performed in areas to be graded. Roots and other projections exceeding 1½ inches in diameter shall be removed to a depth of 3 feet below the surface of the ground. Borrow areas shall be grubbed to the extent necessary to provide suitable fill materials.

- 4.2 Asphalt pavement material removed during clearing operations should be properly disposed at an approved off-site facility or in an acceptable area of the project evaluated by Geocon and the property owner. Concrete fragments that are free of reinforcing steel may be placed in fills, provided they are placed in accordance with Section 6.2 or 6.3 of this document.
- 4.3 After clearing and grubbing of organic matter and other unsuitable material, loose or porous soils shall be removed to the depth recommended in the Geotechnical Report. The depth of removal and compaction should be observed and approved by a representative of the Consultant. The exposed surface shall then be plowed or scarified to a minimum depth of 6 inches and until the surface is free from uneven features that would tend to prevent uniform compaction by the equipment to be used.
- 4.4 Where the slope ratio of the original ground is steeper than 5:1 (horizontal:vertical), or where recommended by the Consultant, the original ground should be benched in accordance with the following illustration.

TYPICAL BENCHING DETAIL



- DETAIL NOTES:
- (1) Key width "B" should be a minimum of 10 feet, or sufficiently wide to permit complete coverage with the compaction equipment used. The base of the key should be graded horizontal, or inclined slightly into the natural slope.
 - (2) The outside of the key should be below the topsoil or unsuitable surficial material and at least 2 feet into dense formational material. Where hard rock is exposed in the bottom of the key, the depth and configuration of the key may be modified as approved by the Consultant.

- 4.5 After areas to receive fill have been cleared and scarified, the surface should be moisture conditioned to achieve the proper moisture content, and compacted as recommended in Section 6 of these specifications.

5. COMPACTION EQUIPMENT

- 5.1 Compaction of *soil* or *soil-rock* fill shall be accomplished by sheepsfoot or segmented-steel wheeled rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers, or other types of acceptable compaction equipment. Equipment shall be of such a design that it will be capable of compacting the *soil* or *soil-rock* fill to the specified relative compaction at the specified moisture content.
- 5.2 Compaction of *rock* fills shall be performed in accordance with Section 6.3.

6. PLACING, SPREADING AND COMPACTION OF FILL MATERIAL

- 6.1 *Soil* fill, as defined in Paragraph 3.1.1, shall be placed by the Contractor in accordance with the following recommendations:
- 6.1.1 *Soil* fill shall be placed by the Contractor in layers that, when compacted, should generally not exceed 8 inches. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to obtain uniformity of material and moisture in each layer. The entire fill shall be constructed as a unit in nearly level lifts. Rock materials greater than 12 inches in maximum dimension shall be placed in accordance with Section 6.2 or 6.3 of these specifications.
- 6.1.2 In general, the *soil* fill shall be compacted at a moisture content at or above the optimum moisture content as determined by ASTM D 1557.
- 6.1.3 When the moisture content of *soil* fill is below that specified by the Consultant, water shall be added by the Contractor until the moisture content is in the range specified.
- 6.1.4 When the moisture content of the *soil* fill is above the range specified by the Consultant or too wet to achieve proper compaction, the *soil* fill shall be aerated by the Contractor by blading/mixing, or other satisfactory methods until the moisture content is within the range specified.

- 6.1.5 After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted by the Contractor to a relative compaction of at least 90 percent. Relative compaction is defined as the ratio (expressed in percent) of the in-place dry density of the compacted fill to the maximum laboratory dry density as determined in accordance with ASTM D 1557. Compaction shall be continuous over the entire area, and compaction equipment shall make sufficient passes so that the specified minimum relative compaction has been achieved throughout the entire fill.
- 6.1.6 Where practical, soils having an Expansion Index greater than 50 should be placed at least 3 feet below finish pad grade and should be compacted at a moisture content generally 2 to 4 percent greater than the optimum moisture content for the material.
- 6.1.7 Properly compacted *soil* fill shall extend to the design surface of fill slopes. To achieve proper compaction, it is recommended that fill slopes be over-built by at least 3 feet and then cut to the design grade. This procedure is considered preferable to track-walking of slopes, as described in the following paragraph.
- 6.1.8 As an alternative to over-building of slopes, slope faces may be back-rolled with a heavy-duty loaded sheepsfoot or vibratory roller at maximum 4-foot fill height intervals. Upon completion, slopes should then be track-walked with a D-8 dozer or similar equipment, such that a dozer track covers all slope surfaces at least twice.
- 6.2 *Soil-rock* fill, as defined in Paragraph 3.1.2, shall be placed by the Contractor in accordance with the following recommendations:
- 6.2.1 Rocks larger than 12 inches but less than 4 feet in maximum dimension may be incorporated into the compacted *soil* fill, but shall be limited to the area measured 15 feet minimum horizontally from the slope face and 5 feet below finish grade or 3 feet below the deepest utility, whichever is deeper.
- 6.2.2 Rocks or rock fragments up to 4 feet in maximum dimension may either be individually placed or placed in windrows. Under certain conditions, rocks or rock fragments up to 10 feet in maximum dimension may be placed using similar methods. The acceptability of placing rock materials greater than 4 feet in

maximum dimension shall be evaluated during grading as specific cases arise and shall be approved by the Consultant prior to placement.

- 6.2.3 For individual placement, sufficient space shall be provided between rocks to allow for passage of compaction equipment.
- 6.2.4 For windrow placement, the rocks should be placed in trenches excavated in properly compacted *soil* fill. Trenches should be approximately 5 feet wide and 4 feet deep in maximum dimension. The voids around and beneath rocks should be filled with approved granular soil having a Sand Equivalent of 30 or greater and should be compacted by flooding. Windrows may also be placed utilizing an "open-face" method in lieu of the trench procedure, however, this method should first be approved by the Consultant.
- 6.2.5 Windrows should generally be parallel to each other and may be placed either parallel to or perpendicular to the face of the slope depending on the site geometry. The minimum horizontal spacing for windrows shall be 12 feet center-to-center with a 5-foot stagger or offset from lower courses to next overlying course. The minimum vertical spacing between windrow courses shall be 2 feet from the top of a lower windrow to the bottom of the next higher windrow.
- 6.2.6 Rock placement, fill placement and flooding of approved granular soil in the windrows should be continuously observed by the Consultant.
- 6.3 *Rock* fills, as defined in Section 3.1.3, shall be placed by the Contractor in accordance with the following recommendations:
 - 6.3.1 The base of the *rock* fill shall be placed on a sloping surface (minimum slope of 2 percent). The surface shall slope toward suitable subdrainage outlet facilities. The *rock* fills shall be provided with subdrains during construction so that a hydrostatic pressure buildup does not develop. The subdrains shall be permanently connected to controlled drainage facilities to control post-construction infiltration of water.
 - 6.3.2 *Rock* fills shall be placed in lifts not exceeding 3 feet. Placement shall be by rock trucks traversing previously placed lifts and dumping at the edge of the currently placed lift. Spreading of the *rock* fill shall be by dozer to facilitate *seating* of the

rock. The *rock* fill shall be watered heavily during placement. Watering shall consist of water trucks traversing in front of the current rock lift face and spraying water continuously during rock placement. Compaction equipment with compactive energy comparable to or greater than that of a 20-ton steel vibratory roller or other compaction equipment providing suitable energy to achieve the required compaction or deflection as recommended in Paragraph 6.3.3 shall be utilized. The number of passes to be made should be determined as described in Paragraph 6.3.3. Once a *rock* fill lift has been covered with *soil* fill, no additional *rock* fill lifts will be permitted over the *soil* fill.

- 6.3.3 Plate bearing tests, in accordance with ASTM D 1196, may be performed in both the compacted *soil* fill and in the *rock* fill to aid in determining the required minimum number of passes of the compaction equipment. If performed, a minimum of three plate bearing tests should be performed in the properly compacted *soil* fill (minimum relative compaction of 90 percent). Plate bearing tests shall then be performed on areas of *rock* fill having two passes, four passes and six passes of the compaction equipment, respectively. The number of passes required for the *rock* fill shall be determined by comparing the results of the plate bearing tests for the *soil* fill and the *rock* fill and by evaluating the deflection variation with number of passes. The required number of passes of the compaction equipment will be performed as necessary until the plate bearing deflections are equal to or less than that determined for the properly compacted *soil* fill. In no case will the required number of passes be less than two.
- 6.3.4 A representative of the Consultant should be present during *rock* fill operations to observe that the minimum number of “passes” have been obtained, that water is being properly applied and that specified procedures are being followed. The actual number of plate bearing tests will be determined by the Consultant during grading.
- 6.3.5 Test pits shall be excavated by the Contractor so that the Consultant can state that, in their opinion, sufficient water is present and that voids between large rocks are properly filled with smaller rock material. In-place density testing will not be required in the *rock* fills.
- 6.3.6 To reduce the potential for “piping” of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock*

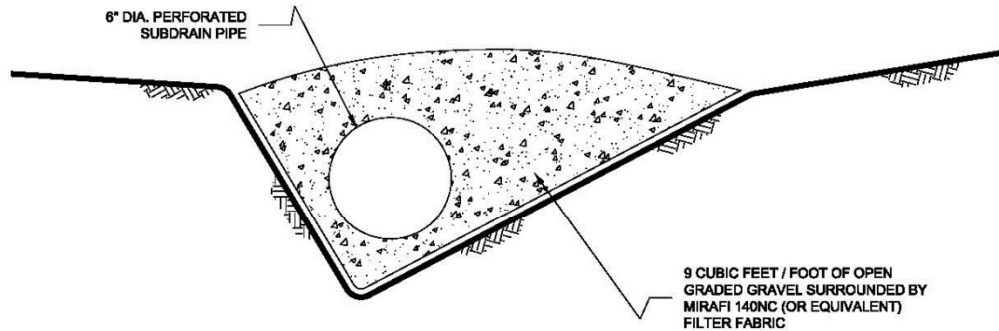
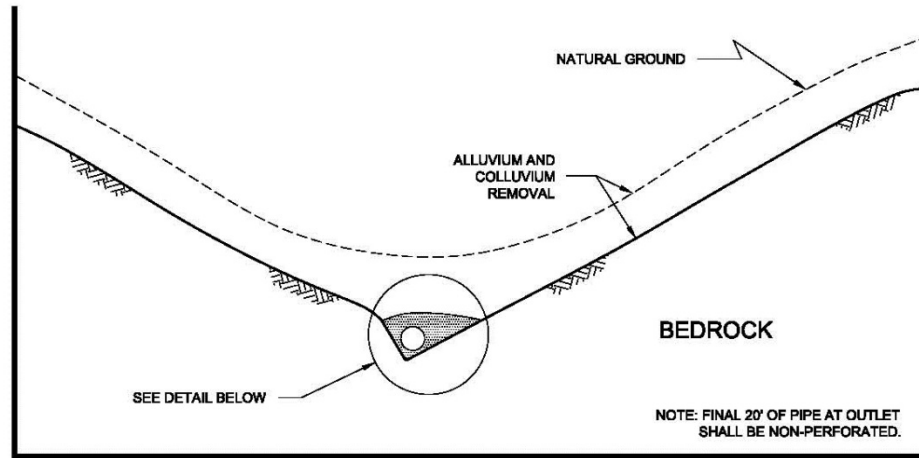
should be determined by the Consultant prior to commencing grading. The gradation of the graded filter material will be determined at the time the *rock* fill is being excavated. Materials typical of the *rock* fill should be submitted to the Consultant in a timely manner, to allow design of the graded filter prior to the commencement of *rock* fill placement.

- 6.3.7 *Rock* fill placement should be continuously observed during placement by the Consultant.

7. SUBDRAINS

- 7.1 The geologic units on the site may have permeability characteristics and/or fracture systems that could be susceptible under certain conditions to seepage. The use of canyon subdrains may be necessary to mitigate the potential for adverse impacts associated with seepage conditions. Canyon subdrains with lengths in excess of 500 feet or extensions of existing offsite subdrains should use 8-inch-diameter pipes. Canyon subdrains less than 500 feet in length should use 6-inch-diameter pipes.

TYPICAL CANYON DRAIN DETAIL



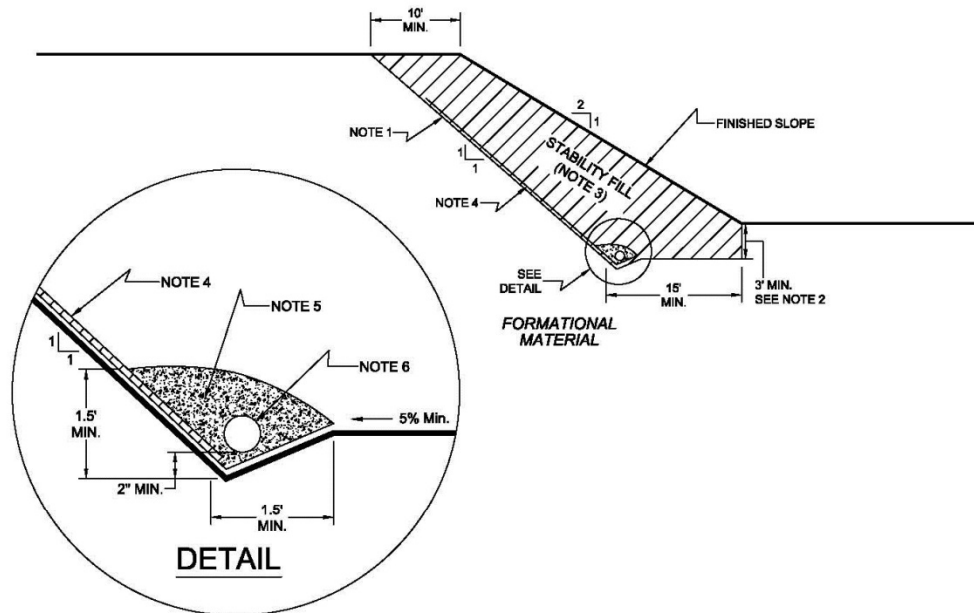
NOTES:

- 1.....8-INCH DIAMETER, SCHEDULE 80 PVC PERFORATED PIPE FOR FILLS
IN EXCESS OF 100-FEET IN DEPTH OR A PIPE LENGTH OF LONGER THAN 500 FEET.
- 2.....8-INCH DIAMETER, SCHEDULE 40 PVC PERFORATED PIPE FOR FILLS
LESS THAN 100-FEET IN DEPTH OR A PIPE LENGTH SHORTER THAN 500 FEET.

NO SCALE

7.2 Slope drains within stability fill keyways should use 4-inch-diameter (or larger) pipes.

TYPICAL STABILITY FILL DETAIL



NOTES:

- 1.....EXCAVATE BACKCUT AT 1:1 INCLINATION (UNLESS OTHERWISE NOTED).
- 2.....BASE OF STABILITY FILL TO BE 3 FEET INTO FORMATIONAL MATERIAL, SLOPING A MINIMUM 5% INTO SLOPE.
- 3.....STABILITY FILL TO BE COMPOSED OF PROPERLY COMPACTED GRANULAR SOIL.
- 4.....CHIMNEY DRAINS TO BE APPROVED PREFABRICATED CHIMNEY DRAIN PANELS (MIRADRAIN G200N OR EQUIVALENT) SPACED APPROXIMATELY 20 FEET CENTER TO CENTER AND 4 FEET WIDE. CLOSER SPACING MAY BE REQUIRED IF SEEPAGE IS ENCOUNTERED.
- 5.....FILTER MATERIAL TO BE 3/4-INCH, OPEN-GRADED CRUSHED ROCK ENCLOSED IN APPROVED FILTER FABRIC (MIRAFI 140NC).
- 6.....COLLECTOR PIPE TO BE 4-INCH MINIMUM DIAMETER, PERFORATED, THICK-WALLED PVC SCHEDULE 40 OR EQUIVALENT, AND SLOPED TO DRAIN AT 1 PERCENT MINIMUM TO APPROVED OUTLET.

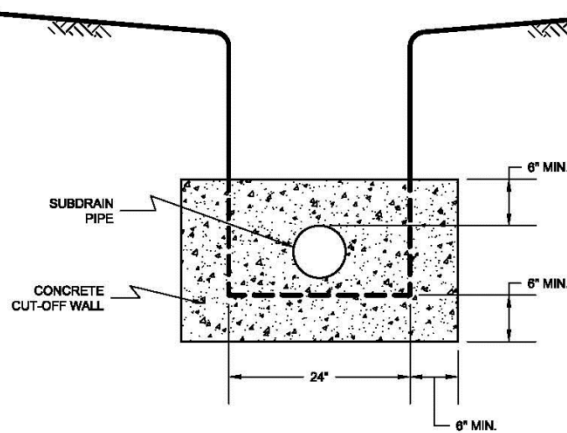
NO SCALE

- 7.3 The actual subdrain locations will be evaluated in the field during the remedial grading operations. Additional drains may be necessary depending on the conditions observed and the requirements of the local regulatory agencies. Appropriate subdrain outlets should be evaluated prior to finalizing 40-scale grading plans.
- 7.4 *Rock fill or soil-rock fill areas may require subdrains along their down-slope perimeters to mitigate the potential for buildup of water from construction or landscape irrigation. The subdrains should be at least 6-inch-diameter pipes encapsulated in gravel and filter fabric. Rock fill drains should be constructed using the same requirements as canyon subdrains.*

- 7.5 Prior to outletting, the final 20-foot segment of a subdrain that will not be extended during future development should consist of non-perforated drainpipe. At the non-perforated/ perforated interface, a seepage cutoff wall should be constructed on the downslope side of the pipe.

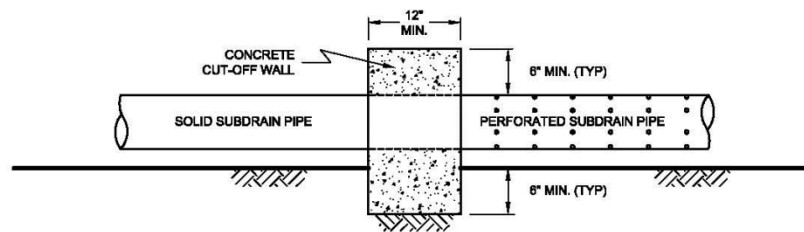
TYPICAL CUT OFF WALL DETAIL

FRONT VIEW



NO SCALE

SIDE VIEW

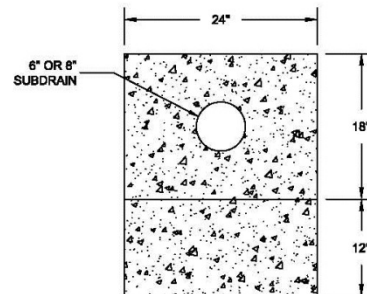


NO SCALE

- 7.6 Subdrains that discharge into a natural drainage course or open space area should be provided with a permanent headwall structure.

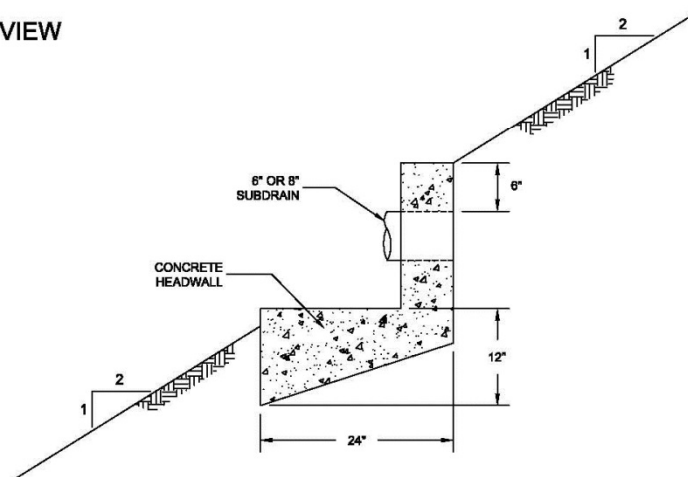
TYPICAL HEADWALL DETAIL

FRONT VIEW



NO SCALE

SIDE VIEW



NOTE: HEADWALL SHOULD OUTLET AT TOE OF FILL SLOPE
OR INTO CONTROLLED SURFACE DRAINAGE

NO SCALE

- 7.7 The final grading plans should show the location of the proposed subdrains. After completion of remedial excavations and subdrain installation, the project civil engineer should survey the drain locations and prepare an "as-built" map showing the drain locations. The final outlet and connection locations should be determined during grading operations. Subdrains that will be extended on adjacent projects after grading can be placed on formational material and a vertical riser should be placed at the end of the subdrain. The grading contractor should consider videoing the subdrains shortly after

burial to check proper installation and functionality. The contractor is responsible for the performance of the drains.

8. OBSERVATION AND TESTING

- 8.1 The Consultant shall be the Owner's representative to observe and perform tests during clearing, grubbing, filling, and compaction operations. In general, no more than 2 feet in vertical elevation of *soil* or *soil-rock* fill should be placed without at least one field density test being performed within that interval. In addition, a minimum of one field density test should be performed for every 2,000 cubic yards of *soil* or *soil-rock* fill placed and compacted.
- 8.2 The Consultant should perform a sufficient distribution of field density tests of the compacted *soil* or *soil-rock* fill to provide a basis for expressing an opinion whether the fill material is compacted as specified. Density tests shall be performed in the compacted materials below any disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below that specified, the particular layer or areas represented by the test shall be reworked until the specified density has been achieved.
- 8.3 During placement of *rock* fill, the Consultant should observe that the minimum number of passes have been obtained per the criteria discussed in Section 6.3.3. The Consultant should request the excavation of observation pits and may perform plate bearing tests on the placed *rock* fills. The observation pits will be excavated to provide a basis for expressing an opinion as to whether the *rock* fill is properly seated and sufficient moisture has been applied to the material. When observations indicate that a layer of *rock* fill or any portion thereof is below that specified, the affected layer or area shall be reworked until the *rock* fill has been adequately seated and sufficient moisture applied.
- 8.4 A settlement monitoring program designed by the Consultant may be conducted in areas of *rock* fill placement. The specific design of the monitoring program shall be as recommended in the Conclusions and Recommendations section of the project Geotechnical Report or in the final report of testing and observation services performed during grading.
- 8.5 We should observe the placement of subdrains, to check that the drainage devices have been placed and constructed in substantial conformance with project specifications.
- 8.6 Testing procedures shall conform to the following Standards as appropriate:

8.6.1 Soil and Soil-Rock Fills:

- 8.6.1.1 Field Density Test, ASTM D 1556, *Density of Soil In-Place By the Sand-Cone Method*.
- 8.6.1.2 Field Density Test, Nuclear Method, ASTM D 6938, *Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth)*.
- 8.6.1.3 Laboratory Compaction Test, ASTM D 1557, *Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Pound Hammer and 18-Inch Drop*.
- 8.6.1.4. Expansion Index Test, ASTM D 4829, *Expansion Index Test*.

9. PROTECTION OF WORK

- 9.1 During construction, the Contractor shall properly grade all excavated surfaces to provide positive drainage and prevent ponding of water. Drainage of surface water shall be controlled to avoid damage to adjoining properties or to finished work on the site. The Contractor shall take remedial measures to prevent erosion of freshly graded areas until such time as permanent drainage and erosion control features have been installed. Areas subjected to erosion or sedimentation shall be properly prepared in accordance with the Specifications prior to placing additional fill or structures.
- 9.2 After completion of grading as observed and tested by the Consultant, no further excavation or filling shall be conducted except in conjunction with the services of the Consultant.

10. CERTIFICATIONS AND FINAL REPORTS

- 10.1 Upon completion of the work, Contractor shall furnish Owner a certification by the Civil Engineer stating that the lots and/or building pads are graded to within 0.1 foot vertically of elevations shown on the grading plan and that all tops and toes of slopes are within 0.5 foot horizontally of the positions shown on the grading plans. After installation of a section of subdrain, the project Civil Engineer should survey its location and prepare an *as-built* plan of the subdrain location. The project Civil Engineer should verify the proper outlet for the subdrains and the Contractor should ensure that the drain system is free of obstructions.
- 10.2 The Owner is responsible for furnishing a final as-graded soil and geologic report satisfactory to the appropriate governing or accepting agencies. The as-graded report should be prepared and signed by a California licensed Civil Engineer experienced in

geotechnical engineering and by a California Certified Engineering Geologist, indicating that the geotechnical aspects of the grading were performed in substantial conformance with the Specifications or approved changes to the Specifications.

LIST OF REFERENCES

- American National (2024), *Topographic Detail Sheet, 1305 East Mission Road, Fallbrook, California*, dated May 8, 2024;
- CGS (2021a), *EQ Zapp: California Earthquake Hazards Zone Application*, online map that queries California Geological Survey mapped earthquake hazard zones, <https://www.conservation.ca.gov/cgs/geohazards/eq-zapp>, accessed May 31, 2024;
- CGS (2021b), *Tsunami Inundation Maps and Data*, web application for accessing tsunami inundation hazard, <https://www.conservation.ca.gov/cgs/tsunami/maps>, accessed May 31, 2024;
- FEMA (2019), *Flood Map Service Center*, FEMA website, <https://msc.fema.gov/portal/home>, flood map number 06073C0165G, effective May 16, 2012, accessed May 31, 2024;
- Kennedy, M. P., and Tan, S. S., (2007), *Geologic Map of the Oceanside 30' x 60' Quadrangle, California*, USGS Regional Geologic Map Series, 1:100,000 Scale, Map No. 3;
- SEAOCC (2020), *Seismic Design Maps*, website interface that queries the U.S. Geological Survey (USGS) web servers and retrieves the seismic design variables using ASCE 7-16, ASCE 7-10, ASCE 41-13, ASCE 41-17, IBC 2015, IBC 2012, NEHRP-2015, and NEHRP 2009 seismic design map data, <http://seismicmaps.org>, accessed May 31, 2024;
- USGS (2019), *Quaternary Fault and Fold Database of the United States*: U.S. Geological Survey website, <https://www.usgs.gov/natural-hazards/earthquake-hazards/faults>, accessed May 31, 2024.

Appendix 14



U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY



TEMECULA QUADRANGLE
CALIFORNIA
7.5-MINUTE TOPO

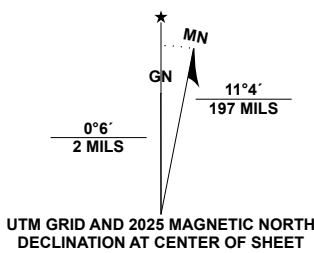


Produced by the United States Geological Survey

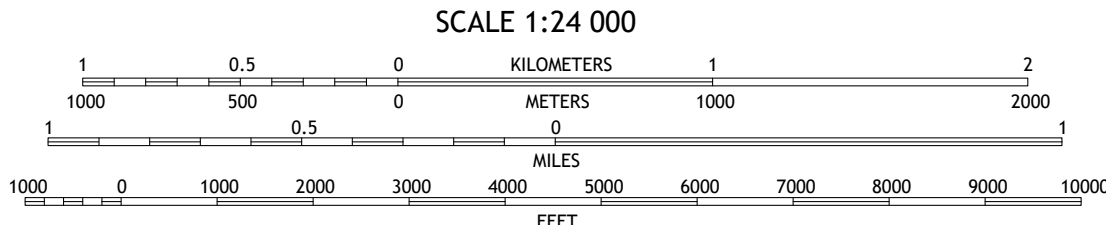
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid: UNIVERSAL TRANSVERSE MERCATOR, ZONE 11S
Data is provided by The National Map (TNM), is the best available at the time of map
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U.S. National Grid
100,000 - m Square ID
MT
MS
Grid Zone Designation
11S



CONTOUR INTERVAL 20 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988
CONTOUR SMOOTHNESS - Medium



Wildomar	Murietta	Bachelor Mountain
Fallbrook	Temecula	Pechanga
Morjo Hill	Bonsall	Pala

ADJOINING QUADRANGLES

ROAD CLASSIFICATION	
Expressway	Local Connector
Secondary Hwy	Local Road
Ramp	4WD
Interstate Route	US Route
	State Route

TEMECULA, CA
2025

Appendix 15

CONDUIT AND DITCH SIZING CALCULATIONS

The following chart details the sizing parameters and for conduits that convey runoff on the site.

K'= Discharge factor	=	$(Q*n)/(d^{8/3}*s^{1/2})$
n= Mannings coefficient	=	0.012 for PVC & HDPE and 0.013 for concrete channels
d=diameter of conduit (ft)	=	per chart
Q= Discharge	=	based off portions of basins tributary to outlet
s=Minimum Pipe Slope (ft/ft)	=	per chart
D=depth of flow	=	From table 7-4 See right
C _a = Flow factor	=	From table 7-14 See right
A=Cross sectional area of flow	=	C_a*d^2
V=Velocity	=	Q/A

Pipe Flow

Pipe	Tributary Areas	Q (cfs)	S (%)	d (in)	K'	D/d	C _a	A (sf)	V (fps)
1	Buildings and drive aisles on Basin P-2	6.64	8.7	12	0.2700	0.54	0.4330	0.4330	15.33
2	Southerly portion of private road	1.52	0.5	12	0.2586	0.53	0.4230	0.4230	3.60
3	Entire Basin P-2	9.71	1.0	18	0.3952	0.71	0.5960	1.3410	7.24
4	Entire Basin P-2	9.71	3.4	18	0.2143	0.47	0.3627	0.8161	11.90
5	Entire Basin P-2	9.71	7.0	24	0.0694	0.26	0.1623	0.6492	14.96
6	Portion of Basin P-1	4.39	0.5	18	0.2526	0.52	0.4130	0.9293	4.72
7	Portion of Basin P-1	4.99	0.5	18	0.2871	0.57	0.4620	1.0395	4.80
8	Portion of Basin P-1	9.15	1.0	18	0.3723	0.67	0.5590	1.2578	7.27
9	Portion of Basin P-1	9.73	1.0	18	0.3960	0.71	0.5960	1.3410	7.26
10	Portion of Basin P-1	11.88	1.0	18	0.4833	0.86	0.7190	1.6178	7.34
11	Portion of Basin P-1	13.33	4.3	24	0.1215	0.34	0.2355	0.9420	14.15
12	Entire Basin P-1	13.33	2.4	24	0.1626	0.40	0.2934	1.1736	11.36
13	Entire onsite areas	24.94	0.5	48	0.1050	0.31	0.2074	3.3184	7.52
14	Offsite trib. Area to culverts divided by 2	104.92	0.5	48	0.4416	0.78	0.6570	10.5120	9.98
-	Max capacity of single 48" pipe	118.00	0.5	48	0.4967	0.91	0.7500	12.0000	9.83

*Note: The max trib. offsite flow to pipe # 14 was calculated to be 209.83 cfs

Brow Ditch

Ditch	Tributary Areas	Q (cfs)	S (%)	d (in)	K'	D/T	C _a	A (sf)	V (fps)
1	Offsite Basin O-1	1.85	10.0	24	0.0120	0.11	0.0470	0.1880	9.84
2	Offsite Basin O-1	1.85	5.0	24	0.0169	0.13	0.0600	0.2400	7.71
3	Neighboring offsite SDGE Facility	9.32	2.0	24	0.1349	0.36	0.2546	1.0184	9.15

Table 7-4. For Determining the Area *a* of the Cross Section of a Circular Conduit Flowing Part Full

Let $\frac{\text{depth of water}}{\text{diameter of channel}} = \frac{D}{d}$ and *C_a* = the tabulated value. Then $a = C_a d^2$.

$\frac{D}{d}$	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0	.0000	.0013	.0037	.0069	.0105	.0147	.0192	.0242	.0294	.0350
.1	.0409	.0470	.0534	.0600	.0668	.0739	.0811	.0885	.0961	.1039
.2	.1118	.1199	.1281	.1365	.1449	.1535	.1623	.1711	.1800	.1890
.3	.1982	.2074	.2167	.2260	.2355	.2450	.2546	.2642	.2739	.2836
.4	.2934	.3032	.3130	.3229	.3328	.3428	.3527	.3627	.3727	.3827
.5	.393	.403	.413	.423	.433	.443	.453	.462	.472	.482
.6	.492	.502	.512	.521	.531	.540	.550	.559	.569	.578
.7	.587	.596	.605	.614	.623	.632	.640	.649	.657	.666
.8	.674	.681	.689	.697	.704	.712	.719	.725	.732	.738
.9	.745	.750	.756	.761	.766	.771	.775	.779	.782	.784

Table 7-14. Values of *K'* for Circular Channels in the Formula

$Q = \frac{K'}{n} d^{8/3} s^{1/2}$

D = depth of water *d* = diameter of channel

$\frac{D}{d}$	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0		.00007	.00031	.00074	.00138	.00222	.00328	.00455	.00604	.00775
.1	.00967	.0118	.0142	.0167	.0195	.0225	.0257	.0291	.0327	.0366
.2	.0406	.0448	.0492	.0537	.0585	.0634	.0686	.0738	.0793	.0849
.3	.0907	.0966	.1027	.1089	.1153	.1218	.1284	.1352	.1420	.1490
.4	.1561	.1633	.1705	.1779	.1854	.1929	.2005	.2082	.2160	.2238
.5	.232	.239	.247	.255	.263	.271	.279	.287	.295	.303
.6	.311	.319	.327	.335	.343	.350	.358	.366	.373	.380
.7	.388	.395	.402	.409	.416	.422	.429	.435	.441	.447
.8	.453	.458	.463	.468	.473	.477	.481	.485	.488	.491
.9	.494	.496	.497	.498	.498	.498	.496	.494	.489	.483
1.0	.463									

Reference: page 7-78 & 7-18 of The Handbook of Hydraulics, by Brater & King

Appendix 16

StreamStats Report

Region ID:

Workspace ID:

Clicked Point (Latitude, Longitude):

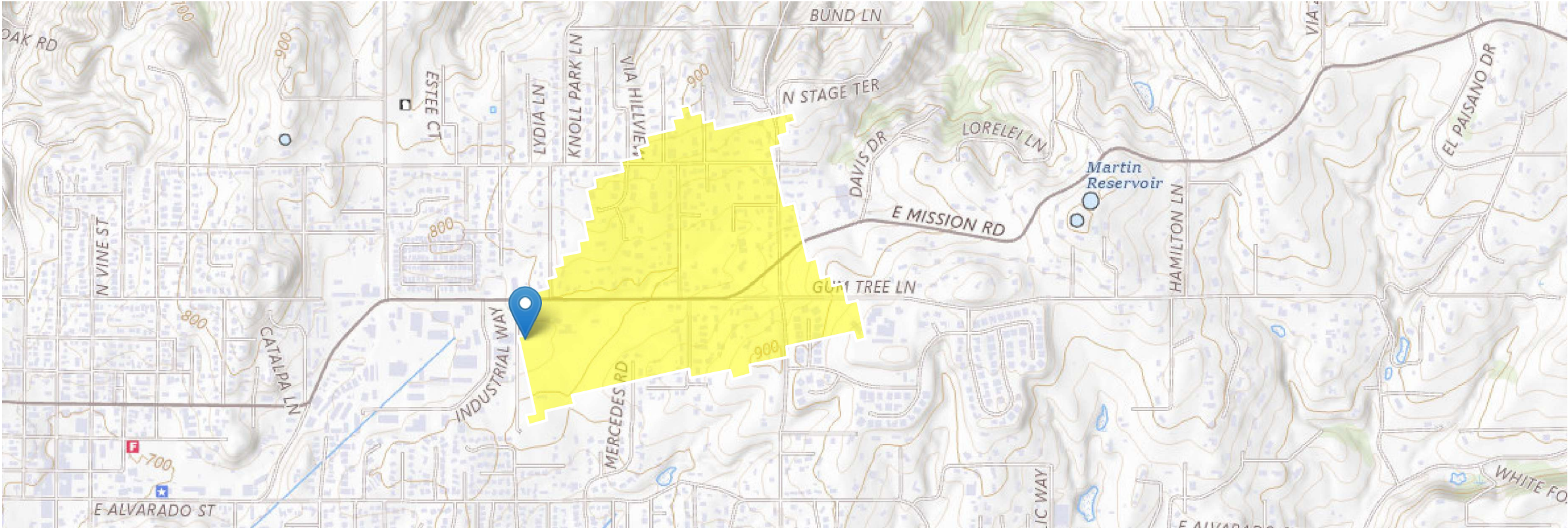
Time:

CA

CA20251121220820694000

33.38647, -117.23631

2025-11-21 14:08:44 -0800



+ Collapse All

➤ Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.22	square miles
PRECIP	Mean Annual Precipitation	17.7	inches

➤ Peak-Flow Statistics

Peak-Flow Statistics Parameters [2012 5113 Region 5 South Coast]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.22	square miles	0.04	850
PRECIP	Mean Annual Precipitation	17.7	inches	10	45

Peak-Flow Statistics Flow Report [2012 5113 Region 5 South Coast]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error, PC: Percent Correct, RMSE: Root Mean Squared Error, PseudoR^2: Pseudo R Squared (other -- see report)

Statistic	Value	Unit	PIL	PIU	ASEp
50-percent AEP flood	11.3	ft^3/s	1.96	65.1	134
20-percent AEP flood	29.7	ft^3/s	8.52	103	83.1
10-percent AEP flood	43.4	ft^3/s	15.7	120	64
4-percent AEP flood	59.3	ft^3/s	25.5	138	51.5
2-percent AEP flood	70.9	ft^3/s	32.4	155	47.6
1-percent AEP flood	82.1	ft^3/s	37.5	180	47.2
0.5-percent AEP flood	94	ft^3/s	42.4	208	47.7
0.2-percent AEP flood	106	ft^3/s	45.4	248	52

Peak-Flow Statistics Citations

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles,2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl. (<http://pubs.usgs.gov/sir/2012/5113/>)

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Application Version: 4.29.3
StreamStats Services Version: 1.2.22

Note that the Initial Time of Concentration should be reflective of the general land-use at the upstream end of a drainage basin. A single lot with an area of two or less acres does not have a significant effect where the drainage basin area is 20 to 600 acres.

Table 3-2 provides limits of the length (Maximum Length (L_M)) of sheet flow to be used in hydrology studies. Initial T_i values based on average C values for the Land Use Element are also included. These values can be used in planning and design applications as described below. Exceptions may be approved by the "Regulating Agency" when submitted with a detailed study.

Table 3-2

**MAXIMUM OVERLAND FLOW LENGTH (L_M)
& INITIAL TIME OF CONCENTRATION (T_i)**

Element*	DU/ Acre	.5%		1%		2%		3%		5%		10%	
		L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i
Natural		50	Offsite Basin, O-3	85	10.9	100	10.3	100	8.7	100	6.9		
LDR	1	50	12.2	70	11.5	85	10.0	100	9.5	100	8.0	100	6.4
LDR	2	50	11.3	70	10.5	85	9.2	100	8.8	100	7.4	100	5.8
LDR	2.9	50	10.7	70	10.0	85	8.8	95	8.1	100	7.0	100	5.6
MDR	4.3	50	10.2	70	9.6	80	8.1	95	7.8	100	6.7	100	5.3
MDR	7.3	50	9.2	65	8.4	80	7.4	95	7.0	100	6.0	100	4.8
MDR	10.9	50	8.7	65	7.9	80	6.9	90	6.4	100	5.7	100	4.5
MDR	14.5	50	8.2	65	7.4	80	6.5	90	6.0	100	5.4	100	4.3
HDR	24	50	6.7	65	6.1	75	5.1	90	4.9	95	4.3	100	3.5
HDR	43	50	5.3	65	4.7	75	4.0	85	3.8	95	3.4	100	2.7
N. Com		50	5.3	60	4.5	75	4.0	85	3.8	95	3.4	100	2.7
G. Com		50	4.7	60	4.1	75	3.6	85	3.4	90	2.9	100	2.4
O.P./Com		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
Limited I.		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
General I.		50	3.7	60	3.2	70	2.7	80	2.6	90	2.3	100	1.9

*See Table 3-1 for more detailed description

**Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS**

Land Use		Runoff Coefficient "C"				
NRCS Elements	County Elements	% IMPER.	Soil Type			
			A	B	C	D
Undisturbed Natural Terrain (Natural)	Permanent Open Space	0*	0.20	0.25	0.30	0.35
Low Density Residential (LDR)	Residential, 1.0 DU/A or less	10	0.27	0.32	0.35	0.41
Low Density Residential (LDR)	Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46
Low Density Residential (LDR)	Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49
Medium Density Residential (MDR)	Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52
Medium Density Residential (MDR)	Residential, 7.3 DU/A or less	40	0.48	0.51	0.54	0.57
Medium Density Residential (MDR)	Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60
Medium Density Residential (MDR)	Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63
High Density Residential (HDR)	Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71
High Density Residential (HDR)	Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79
Commercial/Industrial (N. Com)	Neighborhood Commercial	80	0.76	0.77	0.78	0.79
Commercial/Industrial (G. Com)	General Commercial	85	0.80	0.80	0.81	0.82
Commercial/Industrial (O.P. Com)	Office Professional/Commercial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (Limited I.)	Limited Industrial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (General I.)	General Industrial	95	0.87	0.87	0.87	0.87

*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, C_p , for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).

DU/A = dwelling units per acre

NRCS = National Resources Conservation Service

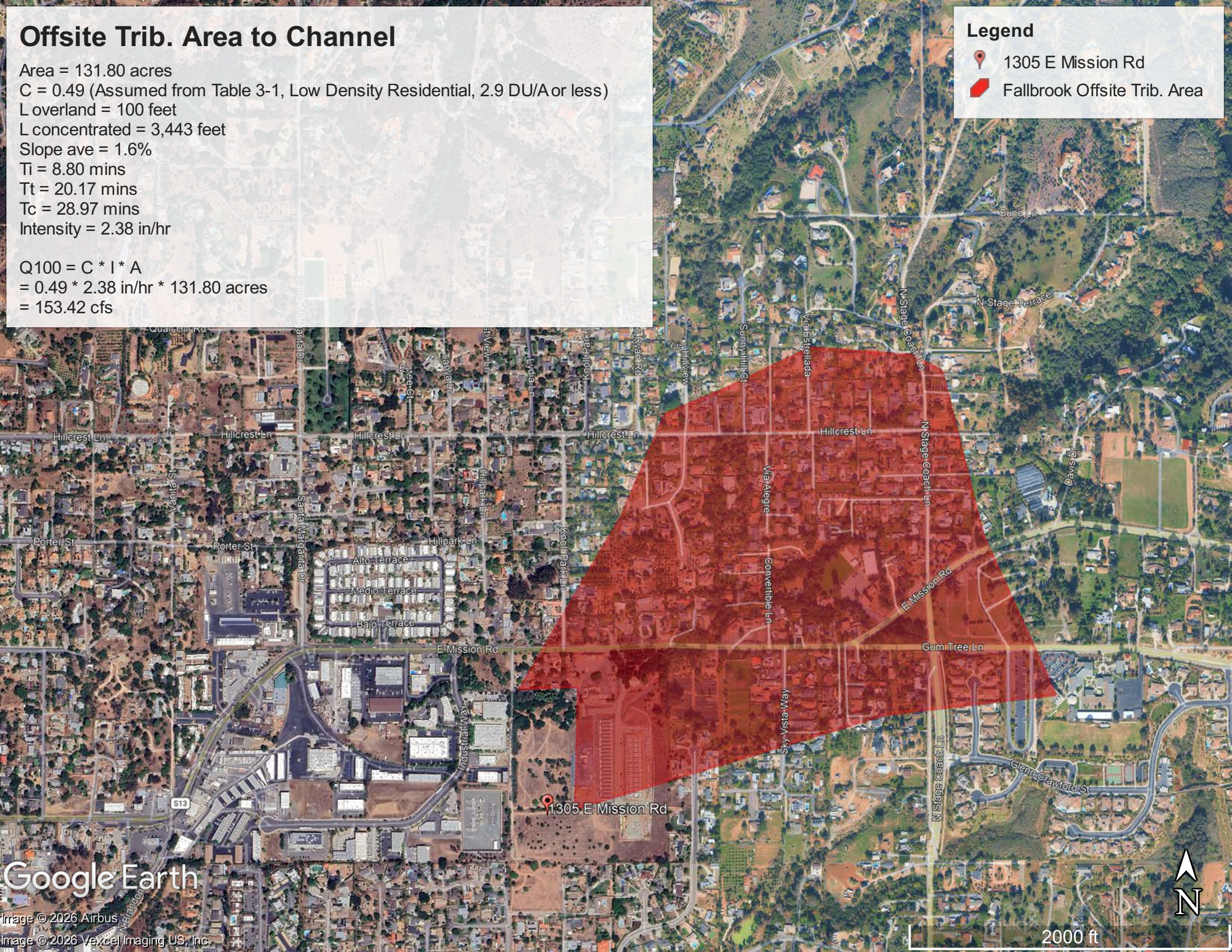
Offsite Trib. Area to Channel

Area = 131.80 acres
C = 0.49 (Assumed from Table 3-1, Low Density Residential, 2.9 DU/A or less)
L overland = 100 feet
L concentrated = 3,443 feet
Slope ave = 1.6%
Ti = 8.80 mins
Tt = 20.17 mins
Tc = 28.97 mins
Intensity = 2.38 in/hr

$$Q_{100} = C * I * A$$
$$= 0.49 * 2.38 \text{ in/hr} * 131.80 \text{ acres}$$
$$= 153.42 \text{ cfs}$$

Legend

-  1305 E Mission Rd
-  Fallbrook Offsite Trib. Area



Google Earth

Image © 2026 Airbus
Image © 2026 Vexcel Imaging US, Inc.



2000 ft

Appendix 17

Inlet Report

Inlet # 1 Capacity

Curb Inlet

Location	= Sag
Curb Length (ft)	= 8.00
Throat Height (in)	= 4.00
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

Slope, Sw (ft/ft)	= 0.065
Slope, Sx (ft/ft)	= 0.034
Local Depr (in)	= 1.00
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= -0-
Gutter n-value	= -0-

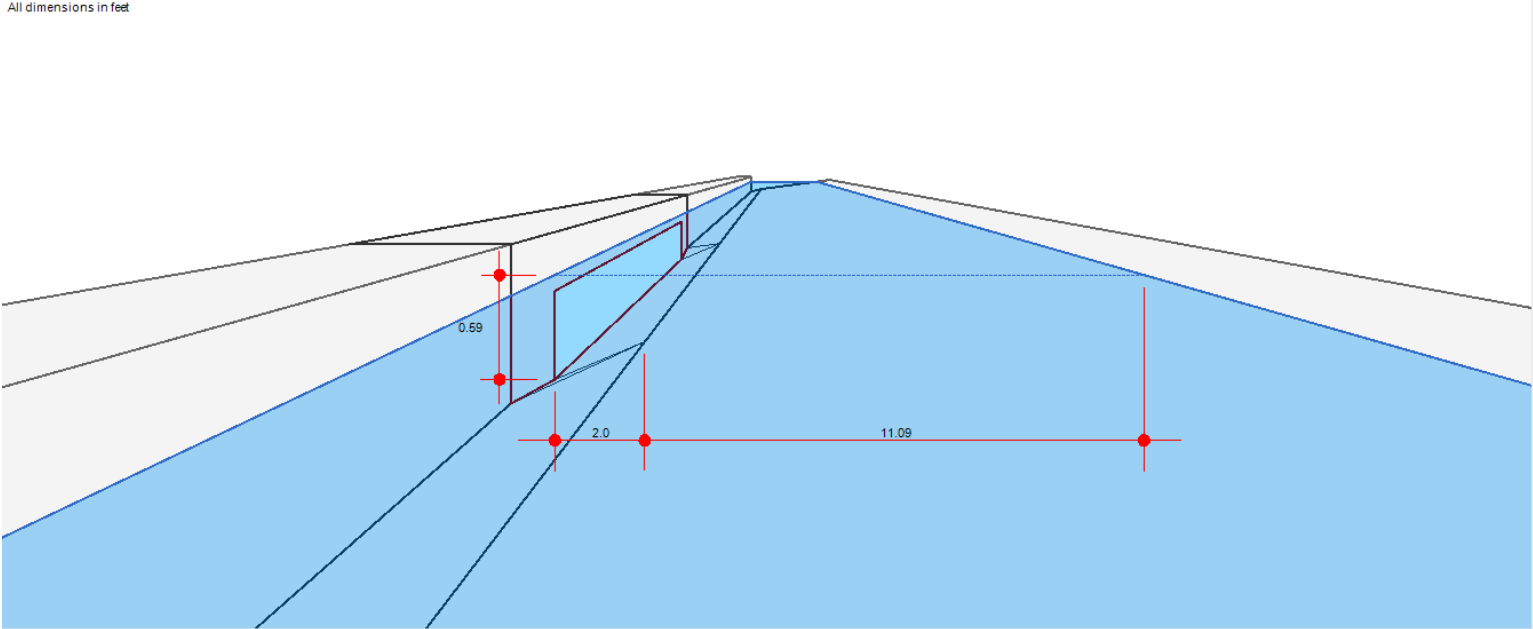
Calculations

Compute by:	Known Q
Q (cfs)	= 7.93

Highlighted

Q Total (cfs)	= 7.93
Q Capt (cfs)	= 7.93
Q Bypass (cfs)	= -0-
Depth at Inlet (in)	= 7.09
Efficiency (%)	= 100
Gutter Spread (ft)	= 13.09
Gutter Vel (ft/s)	= -0-
Bypass Spread (ft)	= -0-
Bypass Depth (in)	= -0-

All dimensions in feet



Inlet Report

Inlet # 2 Capacity

Curb Inlet

Location	= On grade
Curb Length (ft)	= 14.00
Throat Height (in)	= 4.00
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

Slope, Sw (ft/ft)	= 0.065
Slope, Sx (ft/ft)	= 0.034
Local Depr (in)	= 1.00
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 5.00
Gutter n-value	= 0.016

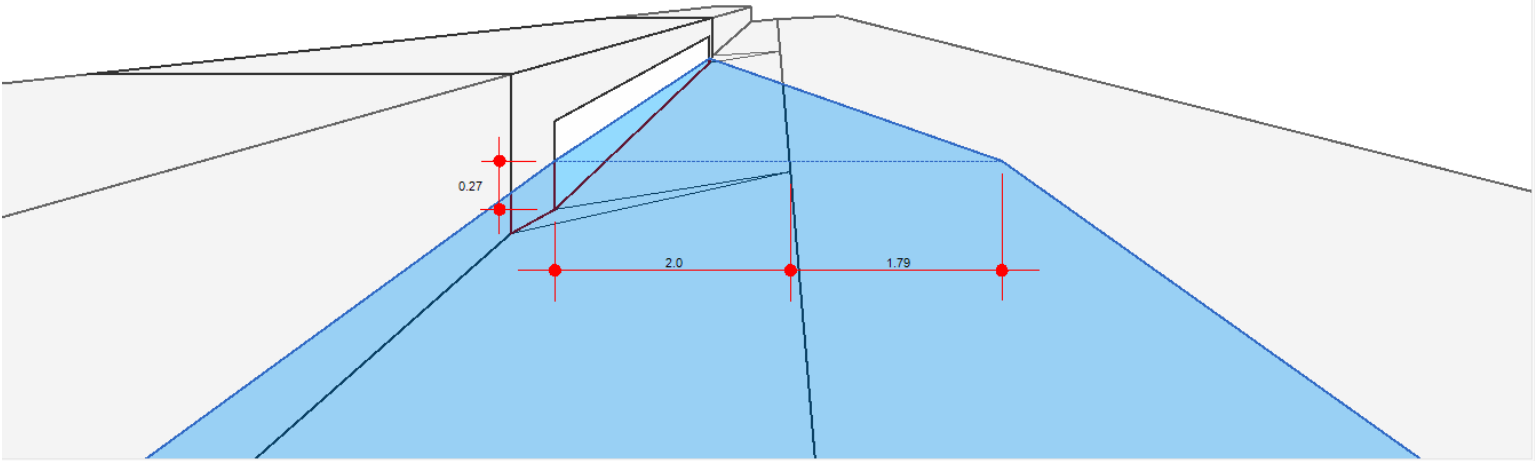
Calculations

Compute by:	Known Q
Q (cfs)	= 1.52

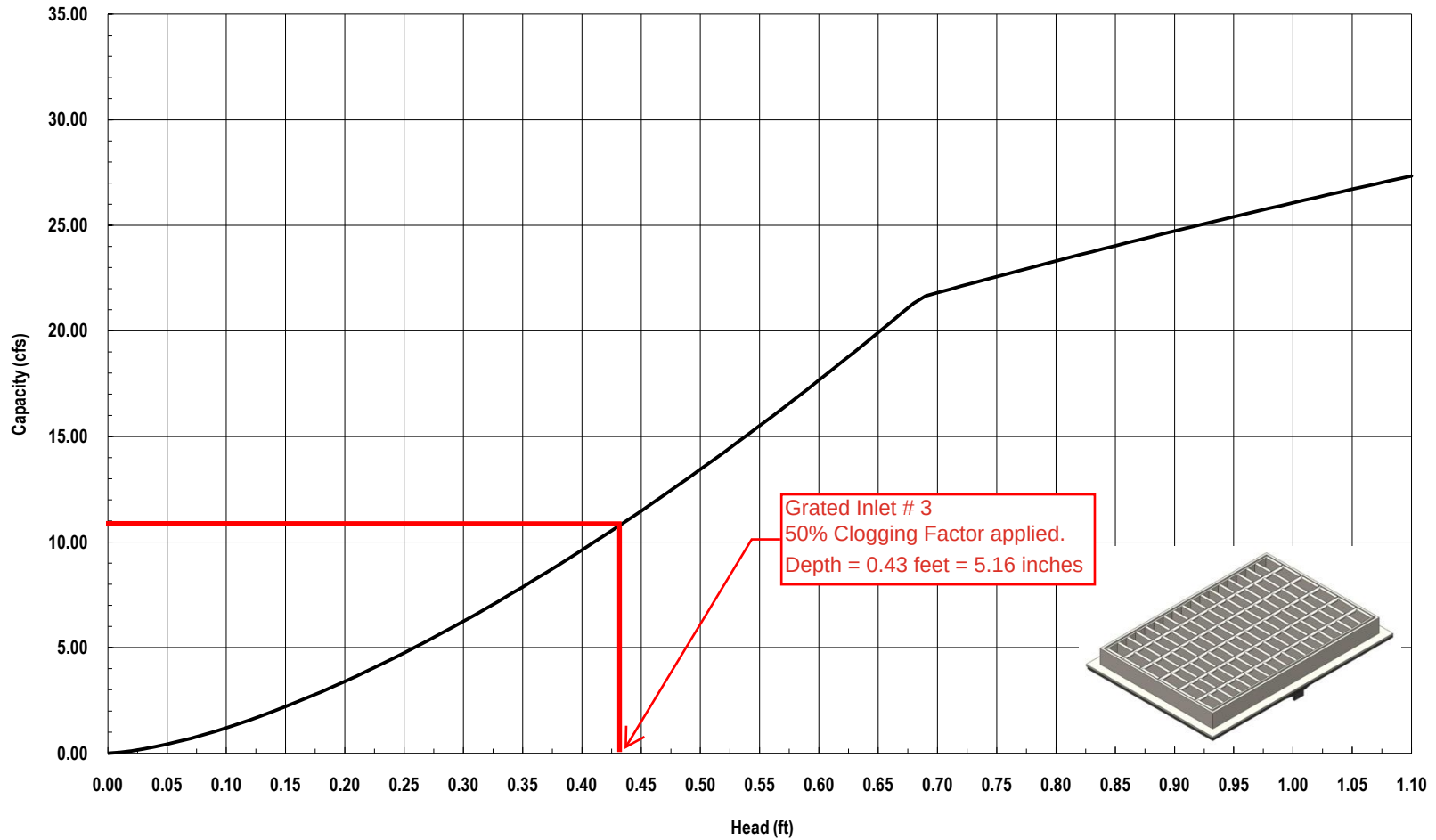
Highlighted

Q Total (cfs)	= 1.52
Q Capt (cfs)	= 1.52
Q Bypass (cfs)	= -0-
Depth at Inlet (in)	= 3.29
Efficiency (%)	= 100
Gutter Spread (ft)	= 3.79
Gutter Vel (ft/s)	= 4.96
Bypass Spread (ft)	= -0-
Bypass Depth (in)	= -0-

All dimensions in feet



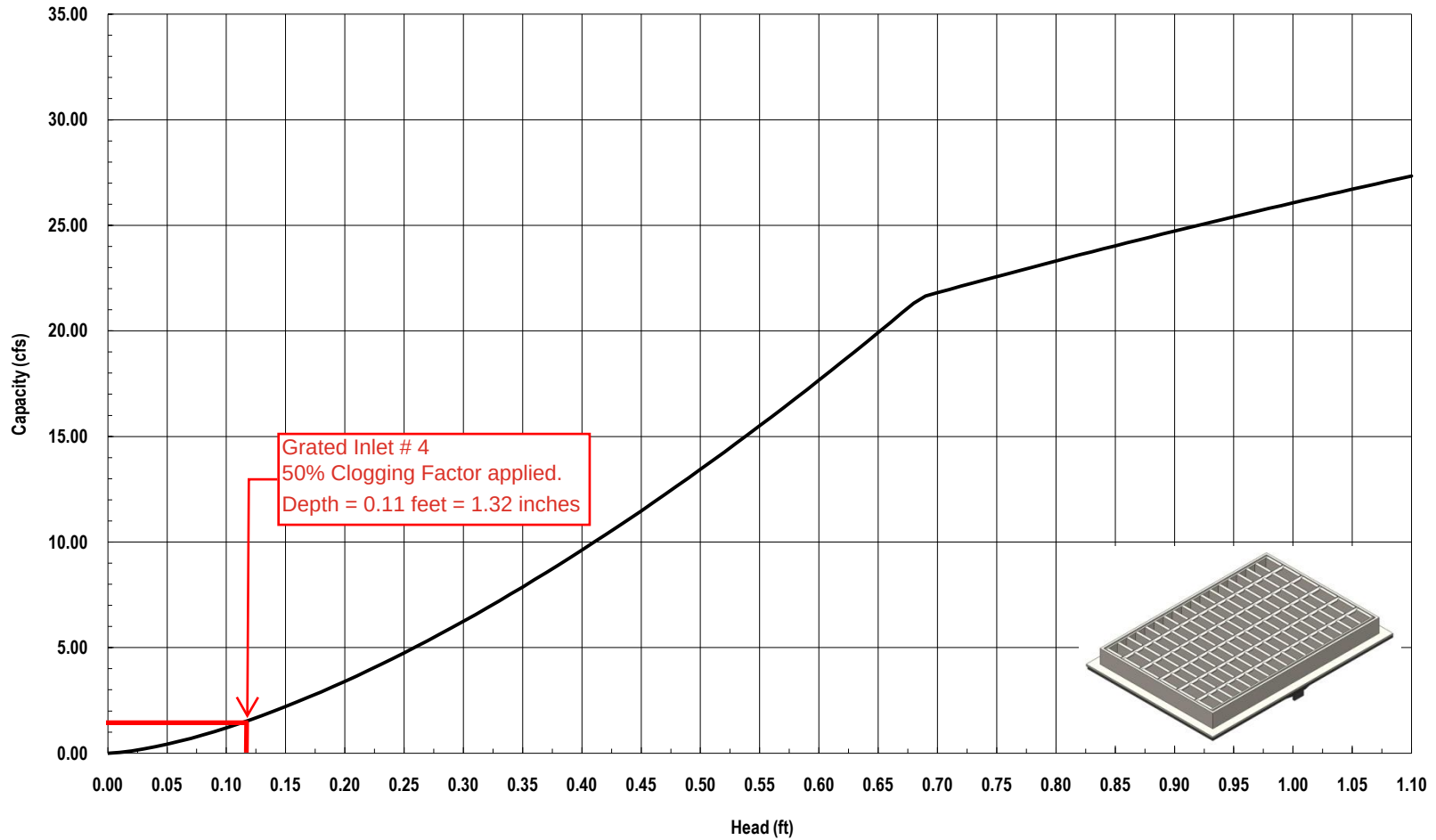
Nyloplast 2' x 3' Steel Bar / MAG Grate Inlet Capacity Chart



Nyloplast

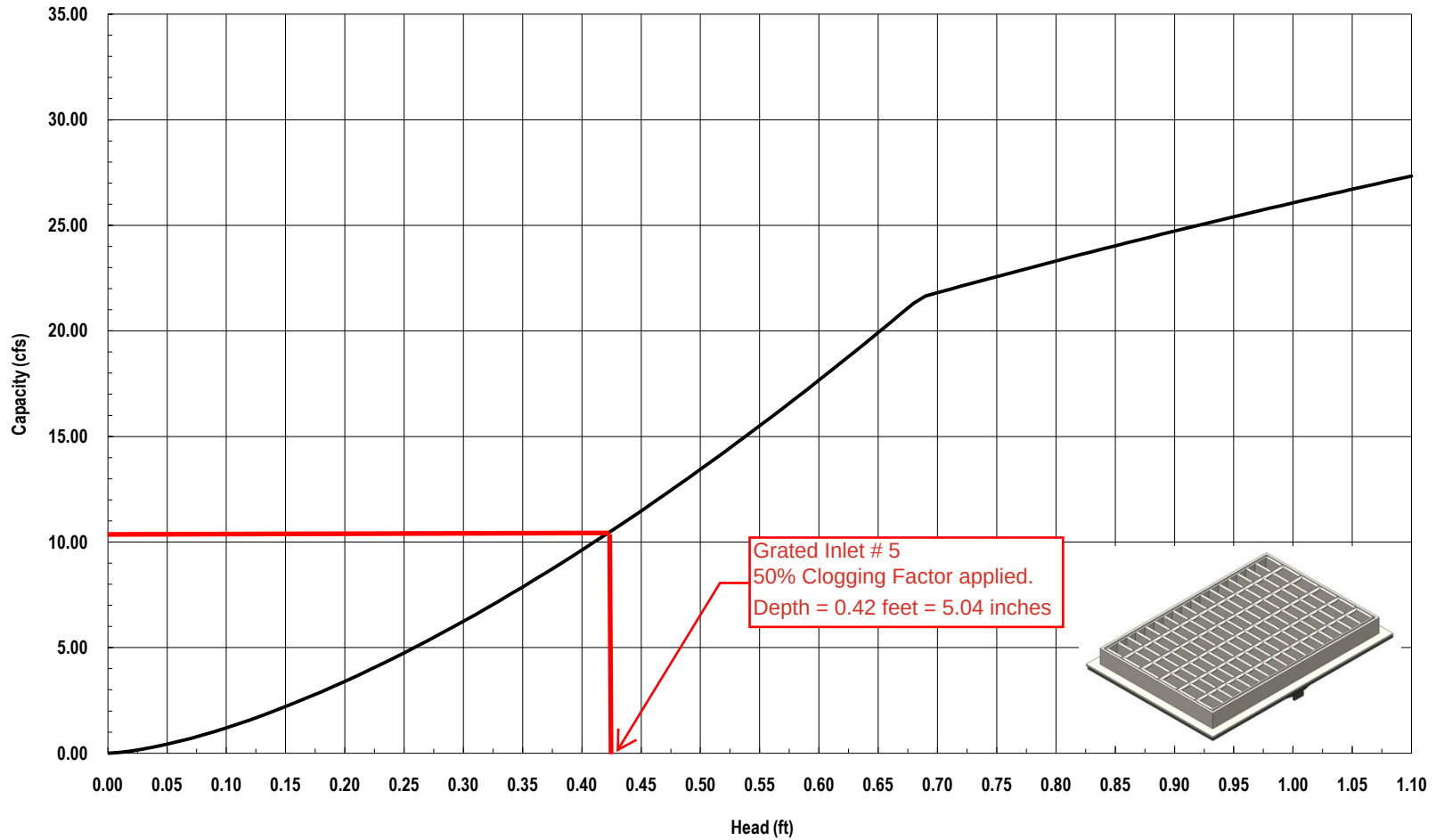
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Nyloplast 2' x 3' Steel Bar / MAG Grate Inlet Capacity Chart



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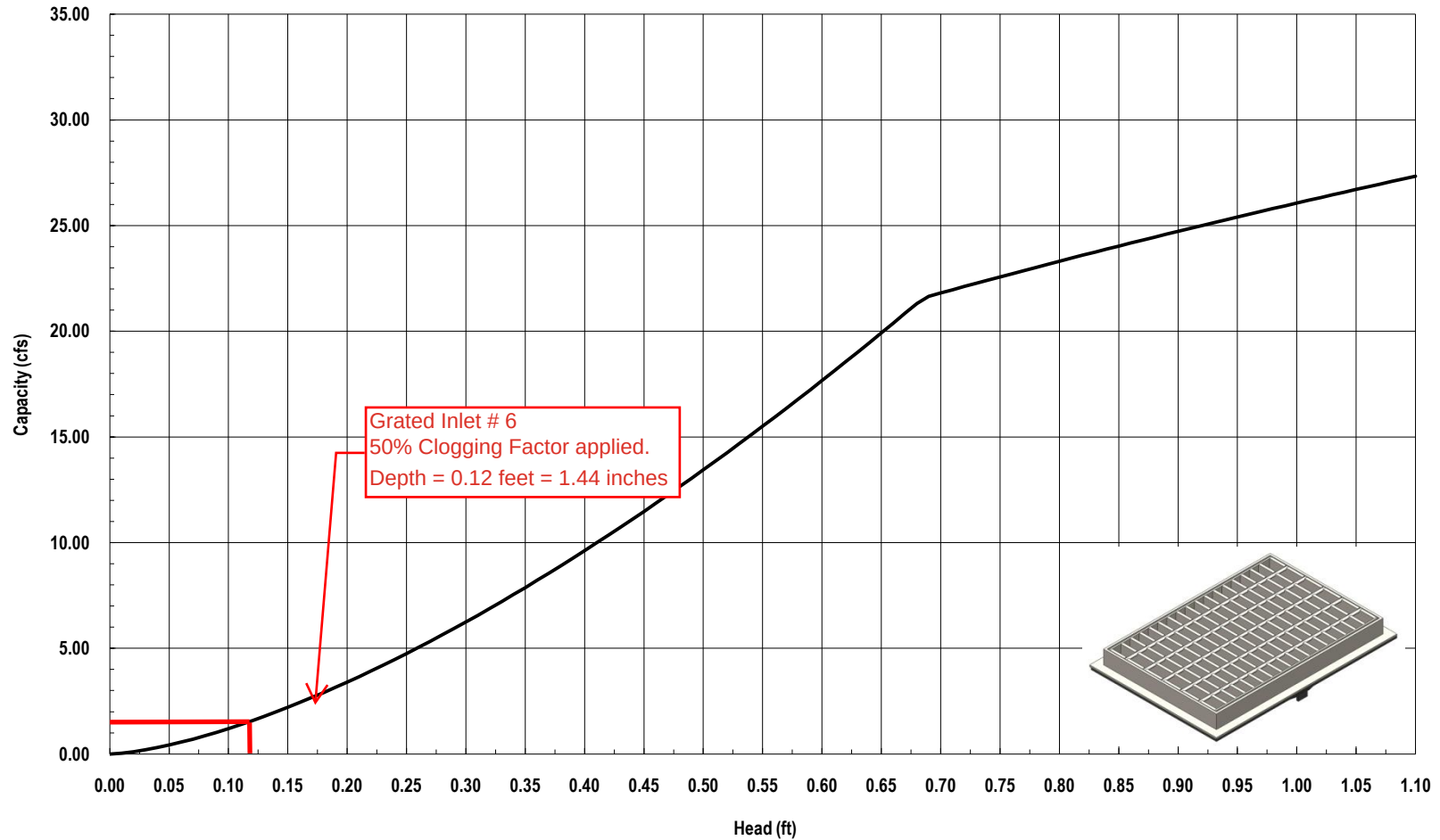
Nyloplast 2' x 3' Steel Bar / MAG Grate Inlet Capacity Chart



Nyloplast

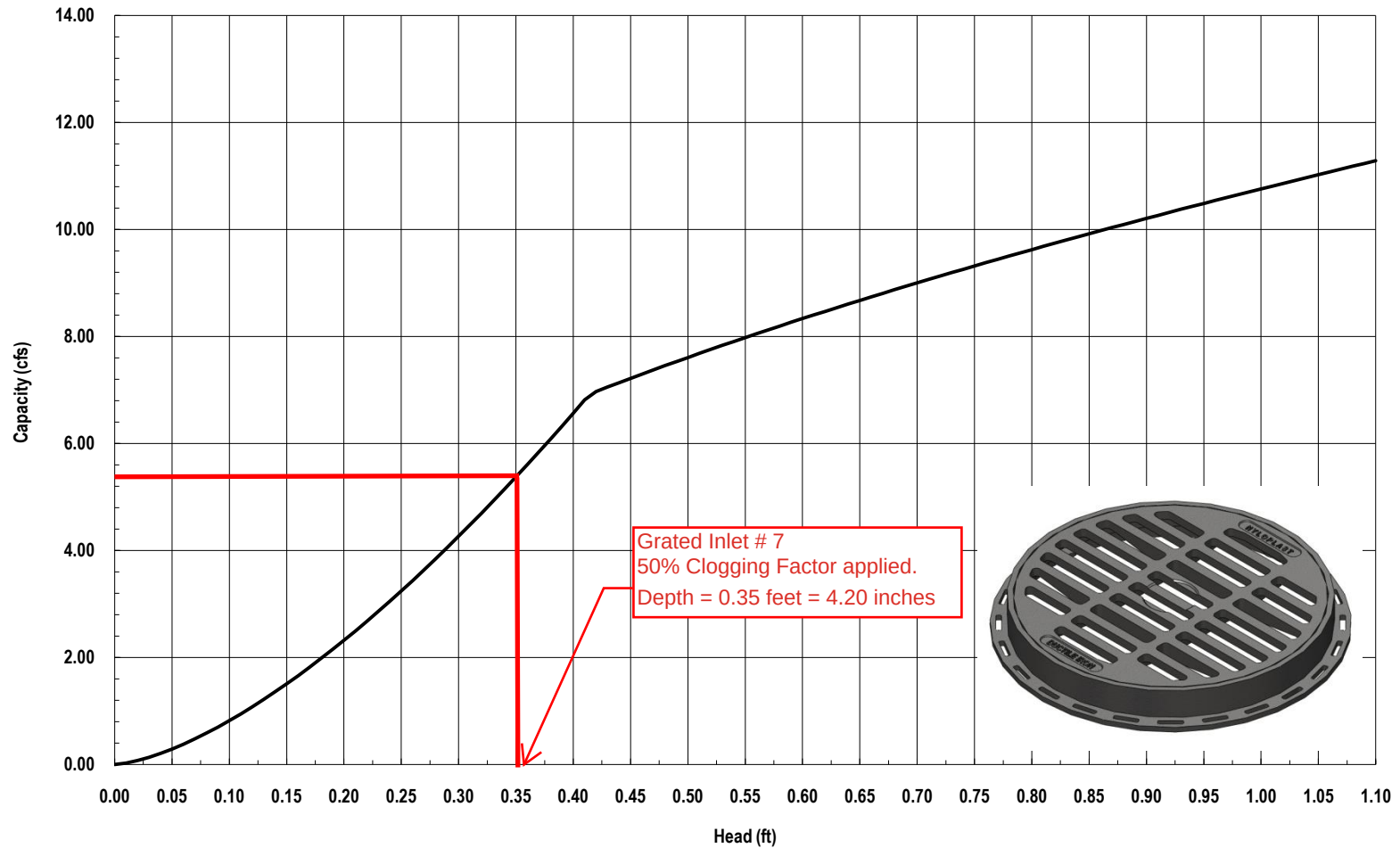
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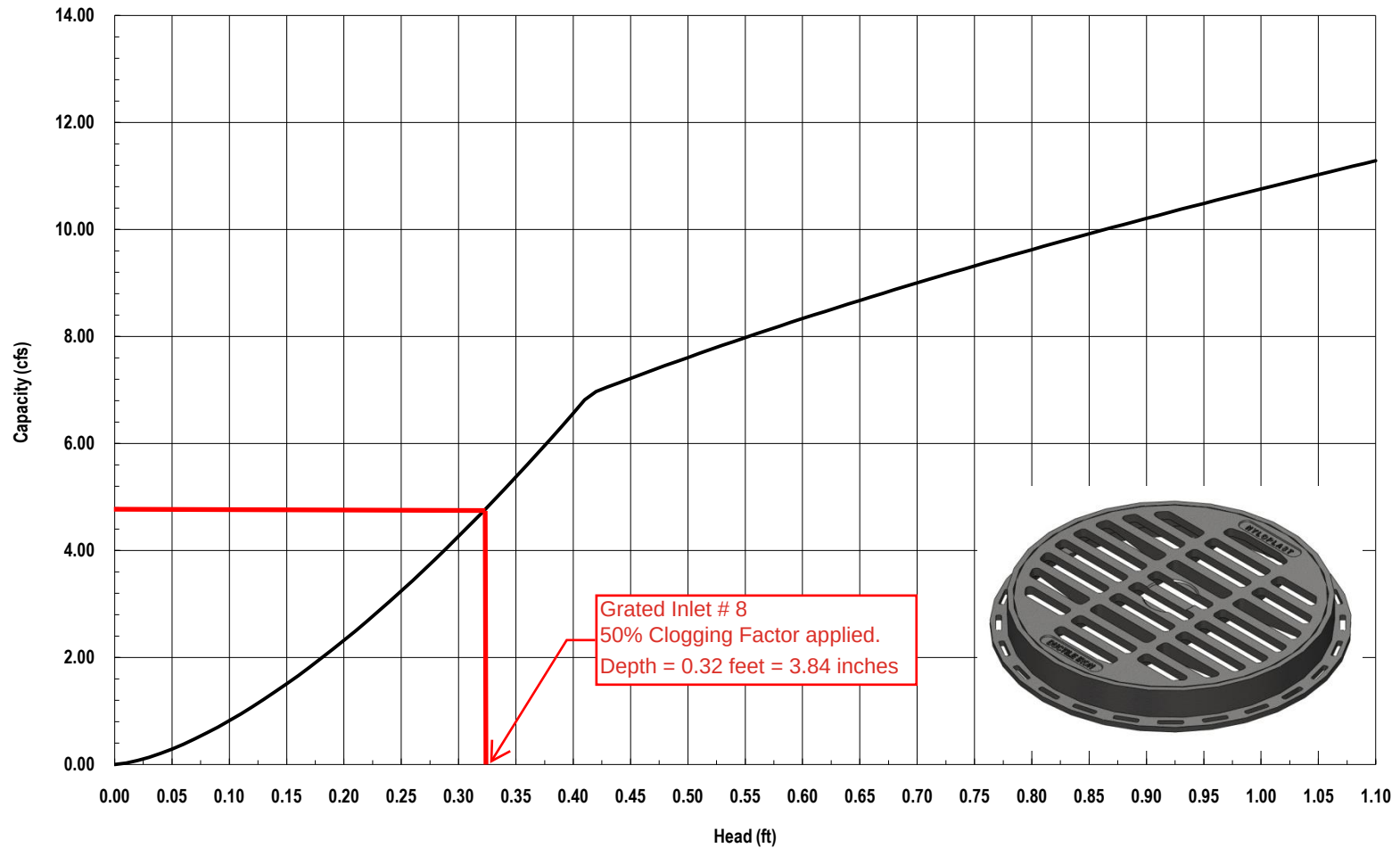
Nyloplast 30" Standard Grate Inlet Capacity Chart



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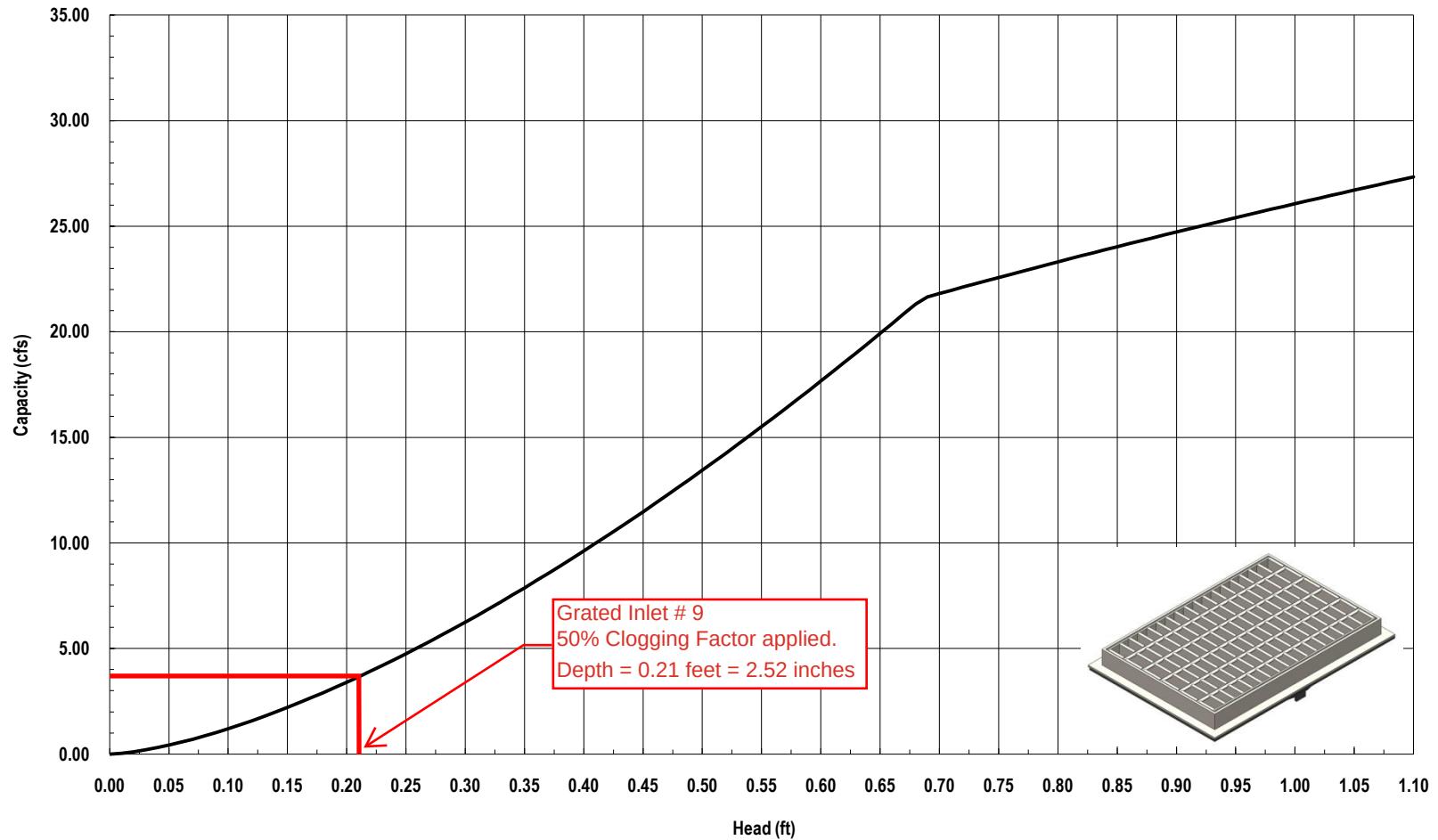
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Weir Report

3 inch X 2 feet Curb Cut on Mow Curbs

Rectangular Weir

Crest = Sharp
Bottom Length (ft) = 2.00
Total Depth (ft) = 0.25

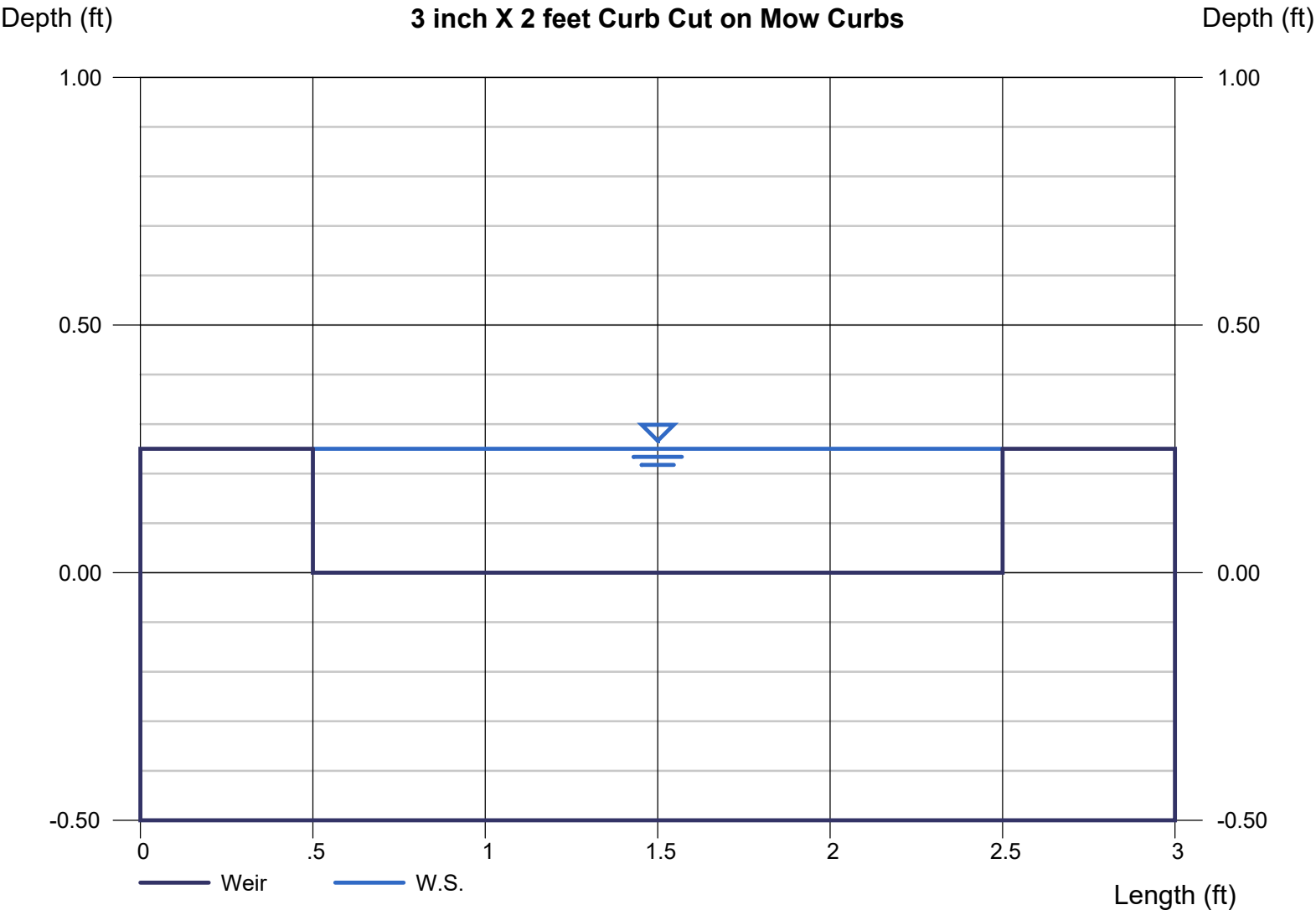
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Depth (ft) = 0.25
Q (cfs) = 0.833
Area (sqft) = 0.50
Velocity (ft/s) = 1.67
Top Width (ft) = 2.00

Calculations

Weir Coeff. Cw = 3.33
Compute by: Q vs Depth
No. Increments = 10

Each curb cut on the mow curbs are required to drain the treatment flow of approximately 0.15 cfs per tree well. Based on this exhibit, the 3" x 2' curb cuts will drain approximately 0.83 cfs per curb cut.



Inlet Report

Curb cut on Private Road

Curb Inlet

Location	= On grade
Curb Length (ft)	= 3.00
Throat Height (in)	= 6.00
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

Slope, Sw (ft/ft)	= 0.015
Slope, Sx (ft/ft)	= 0.015
Local Depr (in)	= -0-
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 2.00
Gutter n-value	= 0.016

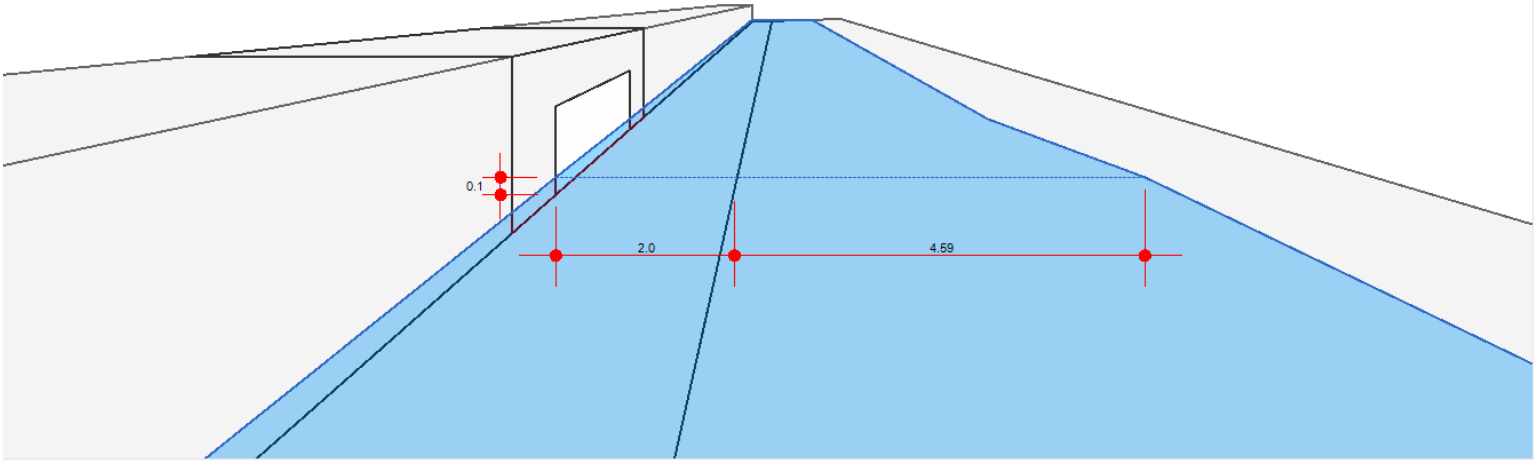
Calculations

Compute by:	Known Q
Q (cfs)	= 0.69

Highlighted

Q Total (cfs)	= 0.69
Q Capt (cfs)	= 0.15
Q Bypass (cfs)	= 0.54
Depth at Inlet (in)	= 1.19
Efficiency (%)	= 22
Gutter Spread (ft)	= 6.59
Gutter Vel (ft/s)	= 2.12
Bypass Spread (ft)	= 6.02
Bypass Depth (in)	= 1.08

All dimensions in feet



The 85th Q tributary to the tree wells on DMA-3 is approximately 0.69 cfs. Each tree well will have a 3' x 6" curb cut that will have the capacity to collect approximately 0.15 cfs. The 8 curb cuts within the tree wells will have enough capacity to collect the treatment flow.

Appendix 18

HEC-14 Rip-Rap Sizing Calculations - Rip Rap # 1

From US DOT HEC-14, July 2006:

Table 10.1. Example Riprap Classes and Apron Dimensions

Class	D ₅₀ (mm)	D ₅₀ (in)	Apron Length ¹	Apron Depth
1	125	5	4D	3.5D ₅₀
2	150	6	4D	3.3D ₅₀
3	250	10	5D	2.4D ₅₀
4	350	14	6D	2.2D ₅₀
5	500	20	7D	2.0D ₅₀
6	550	22	8D	2.0D ₅₀

¹D is the culvert rise.

Site Specific Characteristic

Q	16.56 cfs
D	2.00 ft
Tw	0.8 ft
g	32.2 ft/sec ²

Calculations Example:

Length, $L = 4D = 4(1.5) = 6 \text{ m}$

Depth = $3.3D_{50} = 3.3 (0.15) = 0.50 \text{ m}$

Width (at apron end) = $3D + (2/3)L = 3(1.5) + (2/3)(6) = 8.5 \text{ m}$

Apron Length = 8.00 ft

Apron Depth = 1.65 ft

Apron Width = 6.83 ft

HEC-14 Rip-Rap Sizing Calculations - Rip Rap # 2

From US DOT HEC-14, July 2006:

Table 10.1. Example Riprap Classes and Apron Dimensions

Class	D ₅₀ (mm)	D ₅₀ (in)	Apron Length ¹	Apron Depth
1	125	5	4D	3.5D ₅₀
2	150	6	4D	3.3D ₅₀
3	250	10	5D	2.4D ₅₀
4	350	14	6D	2.2D ₅₀
5	500	20	7D	2.0D ₅₀
6	550	22	8D	2.0D ₅₀

¹D is the culvert rise.

Site Specific Characteristic

Q	11.60	cfs
D	1.50	ft
Tw	0.6	ft
g	32.2	ft/sec ²

Calculations Example:

Length, $L = 4D = 4(1.5) = 6 \text{ m}$

Depth = $3.3D_{50} = 3.3 (0.15) = 0.50 \text{ m}$

Width (at apron end) = $3D + (2/3)L = 3(1.5) + (2/3)(6) = 8.5 \text{ m}$

Apron Length = 6.00 ft

Apron Depth = 1.65 ft

Apron Width = 5.50 ft

HEC-14 Rip-Rap Sizing Calculations - Rip Rap # 3

From US DOT HEC-14, July 2006:

Table 10.1. Example Riprap Classes and Apron Dimensions

Class	D ₅₀ (mm)	D ₅₀ (in)	Apron Length ¹	Apron Depth
1	125	5	4D	3.5D ₅₀
2	150	6	4D	3.3D ₅₀
3	250	10	5D	2.4D ₅₀
4	350	14	6D	2.2D ₅₀
5	500	20	7D	2.0D ₅₀
6	550	22	8D	2.0D ₅₀

¹D is the culvert rise.

Site Specific Characteristic

Q	27.55	cfs
D	2.00	ft
Tw	0.8	ft
g	32.2	ft/sec ²

Calculations Example:

Length, $L = 4D = 4(1.5) = 6 \text{ m}$

Depth = $3.3D_{50} = 3.3 (0.15) = 0.50 \text{ m}$

Width (at apron end) = $3D + (2/3)L = 3(1.5) + (2/3)(6) = 8.5 \text{ m}$

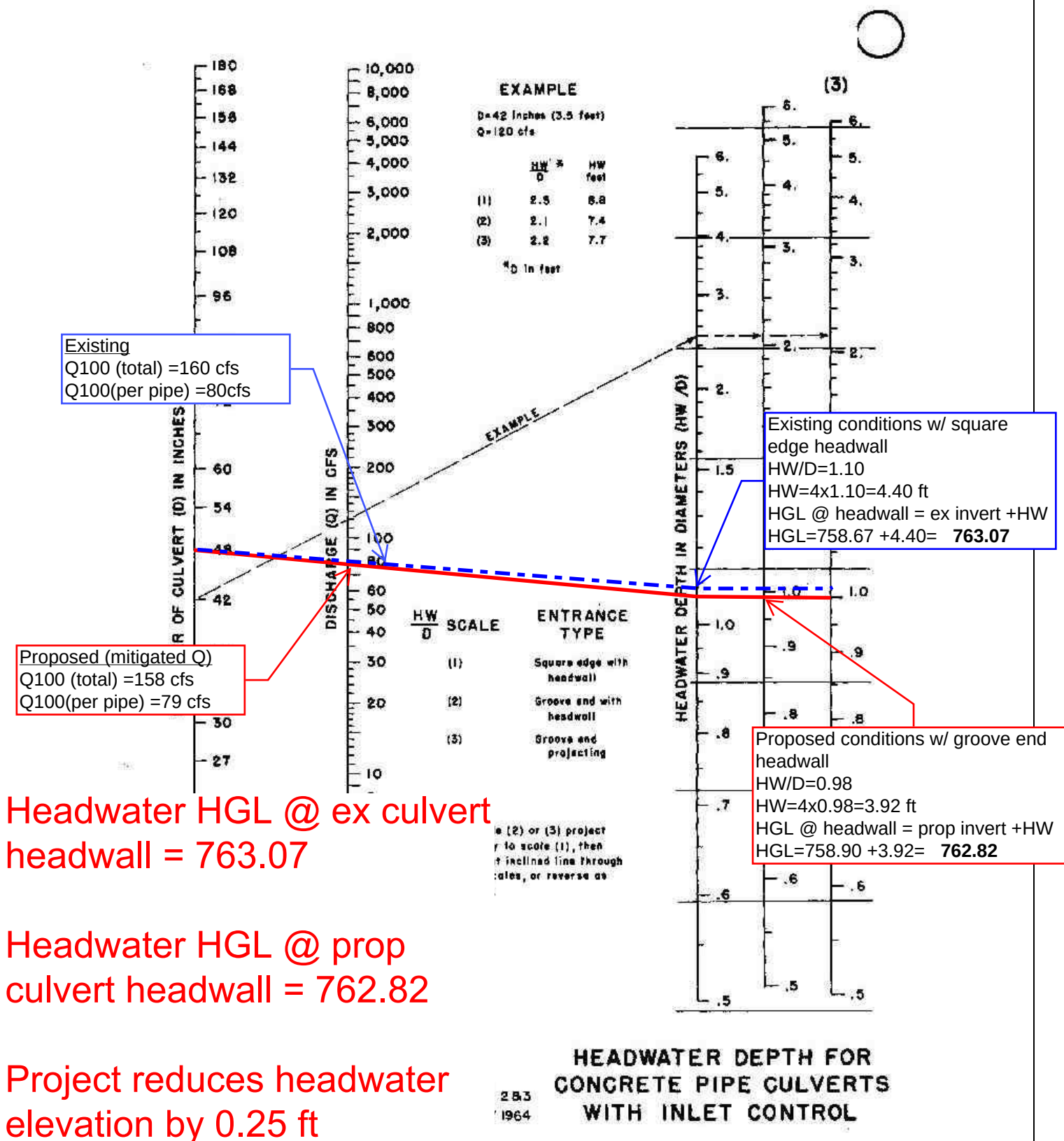
Apron Length = 8.00 ft

Apron Depth = 1.65 ft

Apron Width = 6.83 ft

Appendix 19

Figure 4-3



Headwater HGL @ ex culvert headwall = 763.07

Headwater HGL @ prop culvert headwall = 762.82

Project reduces headwater elevation by 0.25 ft

Proposed headwater is BELOW crown of pipe.