2018

PRELIMINARY DRAINAGE STUDY

LIGHTHOUSE WAY

May 10, 2018

PREPARED BY: LATITUDE 33 PLANNING & ENGINEERING
PREPARED FOR: PACIFIC LEGACY HOMES
JOB NUMBER: 1380.00

PRELIMINARY DRAINAGE STUDY

FOR

LIGHTHOUSE RIDGE

(PTS NO.513356)

MAY 10, 2018

PREPARED FOR: PACIFIC LEGACY HOMES
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Matthew J. Semic, P.E. Date
P.E. 71075 Expires:

Prepared by: SDD
Checked by: MJS

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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 PROJECT DRAWINGS AND SPECIFICATIONS BY THE CITY OF SAN DIEGO IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITIES FOR PROJECT DESIGN.

Matthew J. Semic. P.E 71075 DATE

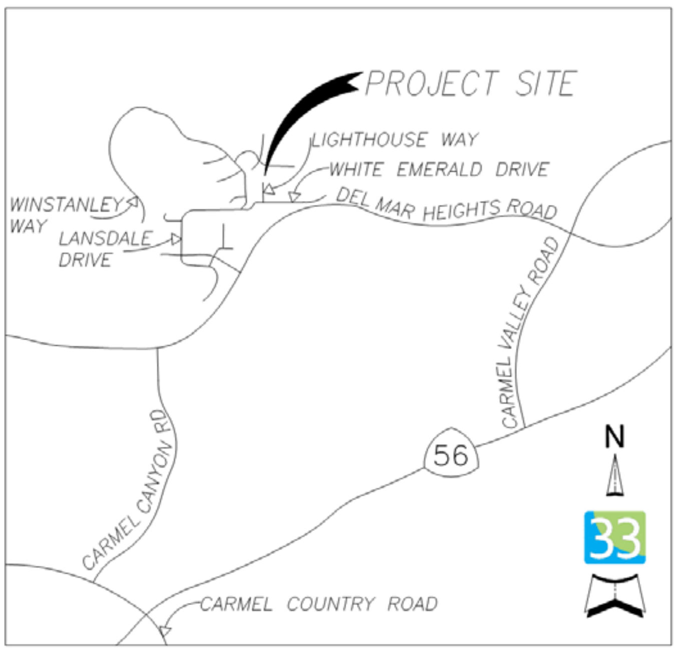
I. PURPOSE

The purpose of this Preliminary Drainage Report is to evaluate and analyze the existing and proposed drainage conditions (i.e. anticipated runoff peak flows) associated with the Lighthouse Ridge development. The intent of this report is to provide a preliminary assessment of any hydrologic impacts that result from this development. This study is not intended to satisfy final engineering (hydraulic) requirements in support of public or private onsite permits. A separate drainage study will be submitted for those purposes upon project entitlement, staff approval and preparation of construction documents.

II. PROJECT DESCRIPTION

The project is located within the City of San Diego city limits, north of State Route 56, east of Interstate 5 and north of Lighthouse Way. The subject property is part of the Pacific Highlands Ranch Community Plan Development. A vicinity map is shown as Figure 1.

Figure 1: Site Vicinity Map



This project proposes 10 residential units with an average lot size of 0.16 acres within a developable site area of 2.86 ac. A 32' private, residential street will provide access to the units. The remainder of the site is 1.9 acres of designated open space (undevelopable). Additional considerations include off-site drainage traveling across the project site.

III. HYDROLOGIC METHODOLOGY

Hydrology calculations presented in this preliminary drainage report were performed using the Rational Method consistent with Appendix I of the City of San Diego Drainage Design Manual (April 1984). Rainfall intensities for the design storms are taken from data tabulated for the San Diego region (see Appendix C). As recommended by the Drainage Design Manual, design runoff shall be based upon the 50-year frequency storm. Calculations were computed for, both, the existing and developed conditions.

The Rational Method calculates a specific drainage area's peak flow, by taking into account three primary factors; the run-off coefficient (C), the rainfall intensity (I) and the area of the basin (A). These three factors are multiplied together resulting in a peak discharge (Q). See the Rational Method Equation as Figure 1 below:

Figure 2 - Rational Method Equation (from County of San Diego Hydrology Manual)

$$Q = C\,I\,A$$

Where:
- Q = peak discharge, in cubic feet per second (cfs)
- C = runoff coefficient, proportion of the rainfall that runs off the surface (no units)
- I = average rainfall intensity for a duration equal to the T_c for the area, in inches per hour (Note: If the computed T_c is less than 5 minutes, use 5 minutes for computing the peak discharge, Q)
- A = drainage area contributing to the design location, in acres

The run-off coefficient (C-Value) for a particular drainage area depends on the soil type and land use. Different surface treatments (concrete, asphalt, grass) in drainage areas will yield varying run-off rates, as their ability to absorb or infiltrate storm water is closely tied to the surface type. For example, a paved impervious surface may have a C-Value of 0.9 or 0.95, would produce more run-off than an undeveloped pervious sandy surface that may be assigned a C-Value of 0.2. Many drainage areas have a combination of impervious and pervious areas, therefore it is necessary to calculate a weighted C-Value based on the various areas, and their associated C-Values. The weighted C-Value is referred to as the Composite C-Value. This calculation is shown below as Figure 2.

Figure 3 - C-Value Calculation (from the County of San Diego Hydrology Manual)

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

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.

Rainfall intensity (I) is measured in inches per hour and varies based on the selected storm frequency (2 year, 10 year, etc.), as well as the Time of Concentration (described below). Once a design storm has been selected, the 6 hour precipitation total for that storm should be established, this is accomplished using the County's isopluvial maps (included in Appendix C). This value, along with the Time of Concentration are inserted into the equation below to get the resultant rainfall intensity.

Figure 4 - Intensity Equation (from County of San Diego Hydrology Manual)

$$I = 7.44\ P_6\ D^{-0.645}$$

Where: P_6 = adjusted 6-hour storm rainfall amount (see discussion below)
D = duration in minutes (use T_c)

Time of concentration (Tc) is defined as the time it takes run-off from the most remote part of the drainage area to reach the point being analyzed (typically an inlet or other discharge point). Tc is divided into two main components, Initial Time of Concentration (Ti), and Travel Time (Tt). There are a number of ways and formulas used to calculate these values, which are described in more detail in the County of San Diego Hydrology Manual. For this analysis, Ti was modeled as overland flow, using the FAA "Overland Flow Nomograph" (as shown below as Figure 4). Tt was calculated using the "Nomograph for Determination of Time of Concentration (Tc) or Travel Time (Tt) for Natural Watersheds" (also shown below as Figure 5).

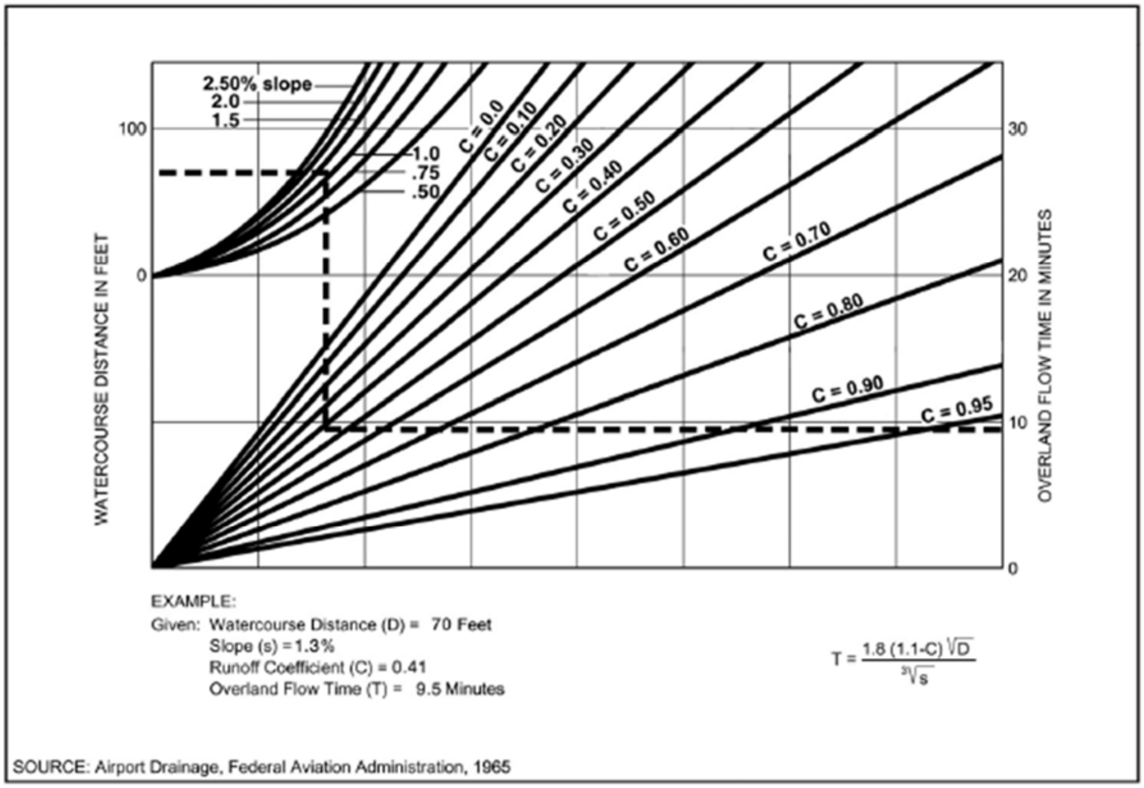


Figure 5- FAA Nomograph (from County of San Diego Hydrology Manual)

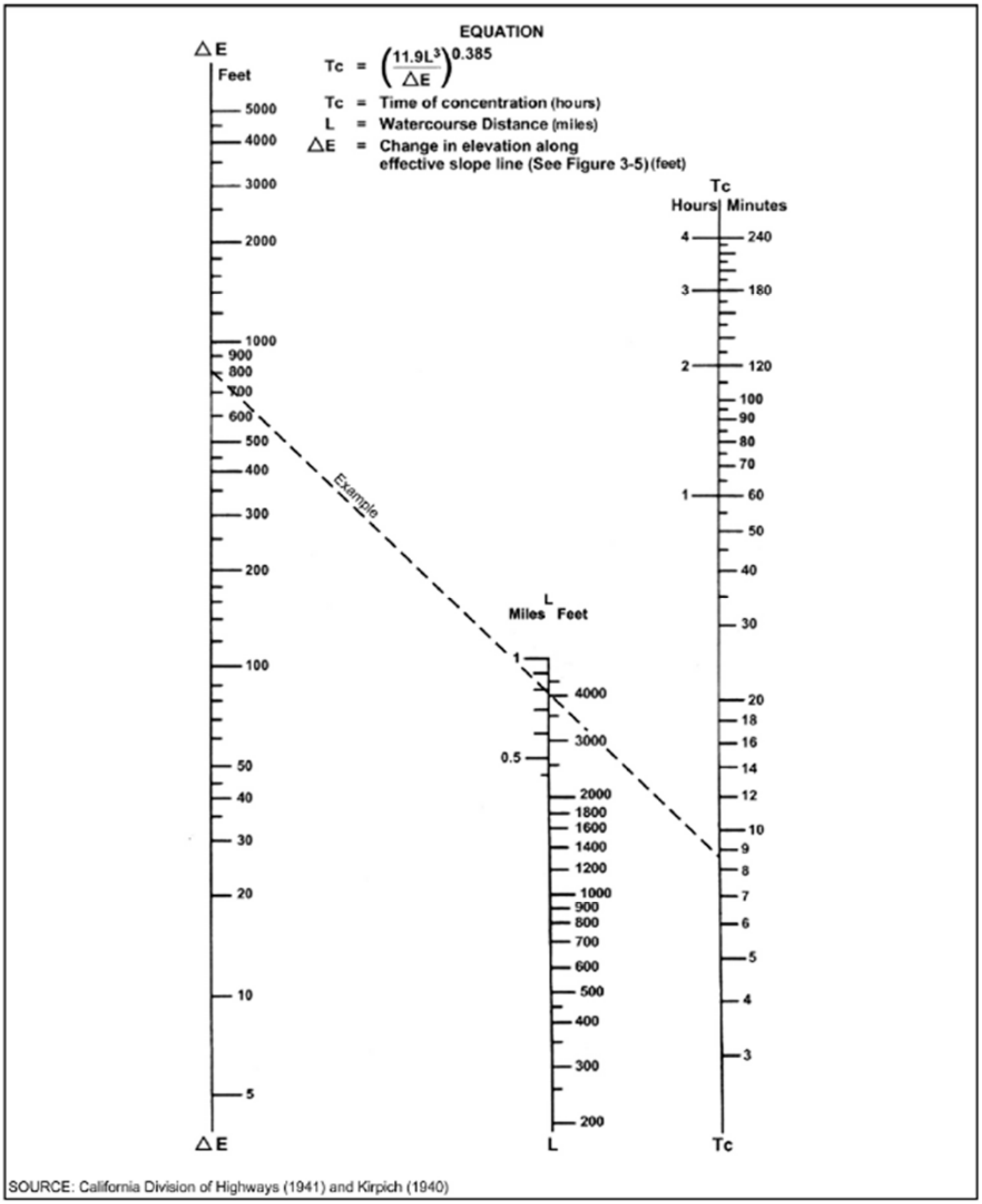


Figure 6 - Travel Time Nomograph (from County of San Diego Hydrology Manual)

After all of the necessary data have been collected, the original formula Q=CIA can be used to calculate the flow rate of stormwater on the site; in the pre and post construction conditions. Project specific results can be viewed in the discussion section of this report.

IV. EXISTING & PROPOSED DRAINAGE PATTERNS

GENERAL DESCRIPTION:

In the current condition stormwater that falls on site travels in one of two directions; a small amount of water leaves the site via a concrete v-ditch to the west while the majority of water leaves the site through the canyon to the east. The account below describes the pre and post project stormwater drainage patterns with respect to each POC.

*Note: Astric denotes peak discharge calculated for a 50 year storm.

POC 1 (WEST):

Pre-Project:

DMA E1: 0.34ac, 0.53cfs*

In the pre-project condition, this point of connectivity collects water from 0.34ac of undeveloped, graded, land once used for construction staging. When water falls in this area, it sheet flows off the site via the west property line. Directly abutting the west property line is a private concrete V-ditch which catches the stormwater and prevents it from traveling down the adjacent 2:1 slope. The V-ditch leads to a private 12" PVC stormdrain which outlets onto the abutting Winstanley Way through a private sidewalk underdrain per EMRA No. 871059-2 as seen on City Dwg No. 24275-D. Roughly 100' later, the water is picked up in a Type B-2 Catch Basin inlet (Dwg No 24275-D). From there, stormwater travels through an underground stormdrain system until its outlet point; into the nearby canyon about a half a mile northwest of the site.

Proposed Design:

In the proposed condition all stormwater generated on site will leave the project through the canyon on the north east property line. There will be no stormwater directed towards the existing concrete V-ditch on the west.

POC 2 (EAST):

Pre-project:

DMA E2:

On-site Stormwater 4.80ac, 4.71cfs*

In the current condition, most of the parcel drains to POC 2. Water in this DMA drains towards a stream that runs down the center of the project and then leaves the property in the northeast corner as a shallow concentrated flow. The land that feeds this water source consists of half the flat compacted pad on the west side of the site and the hilly vegetated, open space area across the middle and east portions of the site. Some water sheet flows from the neighboring southern properties as this area is steep and vegetated and no distinct property line is defined in the topography.

Off-site Stormwater, 24.67cfs*:

In addition to the stormwater generated within DMA E2, there are 3 off-site stormdrains that outlet into the vegetated edges of DMA E2. These 3 outlets, located across the southern boundary, generate roughly a combined 26cfs* of stormwater. The stormwater from these three drains meander across the site and enter the existing water course in the central portion of the property. It is in this stream that the on-site stormwater from DMA E2 and off-site stormwataer comingle. All water from DMA E2 leaves the site in the existing stream bed in the northeast corner of the property. Information on the 3 off-site stormwater flows is as follows and is labeled on the map:

1) A private 24” RCP stormdrain per Dwg No. 25746-D in a public stormdrain easement (FM No. 13005) outlets onto a rip rap pad and then travels for roughly 100’ in a shallow concentrated flow before crossing into the subject property. Flowrate listed as Q_{50}=3.08cfs.

2) A public 18” RCP stormdrain per Dwg No. 28470-D in a public stormdrain easement (18556-B) outlets onto a rip rap pad at the property boundary. It then flows onto the subject property in a shallow concentrated flow. The flowrate is listed as Q_{100}=21.29cfs.

3) A concrete V-ditch (SDRSD D-75) catches water from behind a retaining wall that borders the southwest corner of the site. The water discharges onto riprap at the property line before discharging onto the subject property in a shallow concentrated flow. The V-ditch and associated retaining wall were built per Dwg No. 28472-D. The stormwater is listed as Q_{100}=0.3cfs.

Proposed Design:

In the proposed condition, the land within E2 is divided into 4 DMAs. Each proposed DMA is described below.

DMA P1: 0.78ac, 0.58cfs*

Stormwater generated on proposed lots 1 & 2 will be directed towards the front of the property, into a catch basin, and routed through a storm drain into a biofiltration basin (Basin 1). The runoff from the private street will be collected into reverse curb outlets and discharged into the basin. After filtering through the biofiltration basin, water will outlet into a reconstructed, ungrouted cobblestone-lined stream bed. The reconstructed stream bed is being used to mimic the existing stream bed and is not used for treatment of the water. The stream bed will lead down a developed slope and outlet the stormwater into an existing streambed within the project’s proposed dedicated open space. The ungrouted cobblestone within the stream bed will dissipate the runoff velocity to prevent erosion of soil along and around the stream bed. From this point, the water will use the pre-project course of conveyance to exit the site at POC 2; it will leave the site in a shallow concentrated flow on the northeast edge of the property.

DMA P2: 1.83 acres 1.13cfs*

Stormwater on lots 3-7 will be directed to the rear of each lot and will drain to a buried 12" PVC stormdrain. This stormdrain is proposed to run parallel to the north property line against lots 3-7. The stormdrain will sit in an HOA dedicated drainage easement. The storm drains will outlet to a 3' wide concrete v-ditch with 1.5:1 side slopes, which will lead to a biofiltration basin located at the bottom of the fill slope (Basin 2). Runoff from lots 8-10 will be directed to the back of the lots and north towards the v-ditch where it will be collected and conveyed down to the basin for treatment. From here, the stormwater will make its way off-site through the existing stream bed to the canyon in the northeast corner of the site.

DMA P3: 2.44ac, 2.58cfs*

DMA P4 is considered a self-mitigating area due to the full pervious cover. Stormwater drainage patterns and vegetation cover in the central and southern area of the parcel will not be affected by the project as this area will not be developed. Runoff from a portion of the fully vegetated proposed slope will flow down into the existing wetlands area as the existing condition did. There is no change in pre vs post conditions in this area. All three of the off-site stormwater conveyances are included in this basin. All three of the off-site stormwater conveyances can continue in their current design in an undisturbed manner.

POC 3 (EAST):

Pre-Project:

DMA E3: 0.36ac, 0.80cfs*

Stormwater that falls on 0.45 acers of land in the most northeast corner of the site sheet flows off site down a graded hillside. This flow does not become concentrated while on site. As such, there is no true POC, but a special DMA has been created to account for this flow condition.

Proposed Design:

DMA P4: 0.37cfs, 0.54cfs*

In the proposed condition this area is unchanged. No development is planned and therefore the pre and post flow rates will remain the same.

From the Site to the Ocean:

Stormwater that leaves the property at POC 2 & 3 will continue down the canyon heading north and then west. About 0.7 miles down the canyon, the piped conveyance system carrying stormwater from POC 1 joins the conveyance of the canyon. From here, the stormwater will journey through a creek, a marshy area, and lastly the San Dieguito River before entering the Pacific Ocean.

TOTAL:

In all, the proposed project will utilize new curb and gutter, (2) new biofiltration basins totalizing an area of 2525sf, (1) reconstructed ungrouted cobblestone- lined stream bed, and (1) existing stream bed.

V. WATER QUALITY AND HYDROMODIFICATION

In accordance with City of San Diego Stormwater requirements, all Priority Development Projects are subject to the Permit Low Impact Development (LID) and water quality treatment requirements. As such, the redevelopment of the property will include Best Management Practices (BMPs) to treat all anticipated developed runoff from primary and secondary pollutants of concern on-site before being discharged into the neighboring canyon. The proposed water quality BMPs for the project are anticipated to include a combination of natural features designed to treat anticipated pollutants prior to discharge to the maximum extent practicable.

Hydromodification measures will be utilized including collecting all storm water runoff into two biofiltration basins where the water will be treated, stored, and slowly released back into the existing drainage channel to mimic current conditions. All proposed storm water conveyance systems, including the cobblestone-lined streambed, the concrete v-ditch, and storm drains, will be sized for the 50-year storm event.

A separate Storm Water Quality Management Plan (SWQMP) has been prepared for this project. It addresses the adequacy of the proposed stormwater treatment measures and proposed hydromodification measures. Refer to the SWQMP for a technical analysis and detailed discussion.

VI. DISCUSSION

Impermeable Surface Increase:

This project will substantially increase the amount of impervious area on site. This is almost unavoidable given that the existing condition of the site is fully pervious. Adding any development will decrease the amount of pervious surface.

Table 1: Change in Pervious Condition

PERCENT PERVIOUS		
	EXISTING SITE	PROPOSED SITE
PROJECT SITE	100	78

Stormwater Flow:

The pre-development and post-development flow rates of 50 & 100 year storms have been compared at all three locations where stormwater leaves the project site. Analysis confirms that flow rates will remain the same or decrease, post-development. As previously mentioned, the rational method was used to calculate flow rates. A table detailing the decrease in flow, per P.O.C is included below. Locations of P.O.C.'s are shown on Exhibit 1 & 2 in Appendix A.

Table 2: 50 And 100-Year Flow Rate Summary

	50 yr Peak Discharge (CFS)			*100 yr Peak Discharge (CFS)*		
Point of Connection	**Existing**	**Proposed**	**Increase**	**Existing**	**Proposed**	**Increase**
POC # 1	0.53	0	-0.53	0.61	0	-0.61
POC # 2	4.72	4.29	-0.43	5.50	4.46	-1.04
Off-site Flow	20.52	20.52	0.00	25.35	25.35	0.00
POC # 3	0.80	0.80	0.00	0.94	0.94	0.00
Total	**26.56**	**25.61**	**-0.96**	**32.39**	**30.75**	**-1.65**

**Locations of P.O.C.'s are shown on exhibits in Appendix A*

Streambed Restoration:

Although jurisdictional wetlands have been avoided, the project will impact ~350 linear feet of California Department of Fish and Wildlife (CDFW)- and U.S. Army Corps of Engineers (USACE)-jurisdictional non-vegetated streambed. Because the width of CDFW jurisdiction is wider than USACE jurisdiction, the project would impact 0.01 acre of non-wetland waters of the U.S. and 0.02 acre of CDFW non-vegetated streambed. A Streambed Alteration Agreement is required for impacts to 0.02 acre of CDFW jurisdictional waters pursuant to Section 1600 et seq. of the California Fish and Game Code. The project will require a Section 404 permit from the USACE and a Section 401 Certification from the RWQCB for impacts to 0.01 acre of USACE jurisdiction.

As discussed above, this project has natural stream beds running through the site. The 350' of which will be disturbed during development. As such, the streambed will be replaced in kind, with at least 80% of the lineal footage of what was disturbed. The replacement streambed is planned to run along the south edge of the property and will outlet into the Environmentally Sensitive Area that is being dedicated as open land.

The replacement streambed will be 3' wide with 3:1 side slopes. It will be lined with ungrouted cobblestone (or similar energy dissipater) to reduce soil erosion along and around the proposed stream bed and will outlet to riprap (designed per SDD-104 standards) used for dissipation which will decrease potential erosion to existing drainage channels. The streambed will be fed by water exiting the biofiltration pond at the south edge of the site and the storage vaults. This will ensure that only clean water enters the streambed restoration. Additionally, the streambed will not serve as biofiltration, and will not contain engineered soil. It is designed to be as natural as possible to mimic the predevelopment condition of the stream bed while still providing energy dissipation. The capacity of the proposed streambed for a 50-year storm was verified using Hydroflow Express. The Hydroflow report can be found in Appendix B.

VII. CONCLUSIONS

This Preliminary Drainage Study has been prepared to identify existing and proposed drainage conditions and analyze potential impacts as a result of the Lighthouse Ridge development. Based on the calculations provided, it has been determined that the post-development peak flows are less than the pre-development flows.

Though the project is proposing the addition of impervious surfaces to a fully pervious site, the overall runoff rate is decreased by directing the flow across the almost flat pads and into the treatment basins. All runoff from the site will be directed away from any natural steep slopes and will flow through energy dissipating riprap prior to flowing across existing ground.

A final hydraulic analysis will be prepared and submitted along with a final drainage study upon discretionary approval of this project.

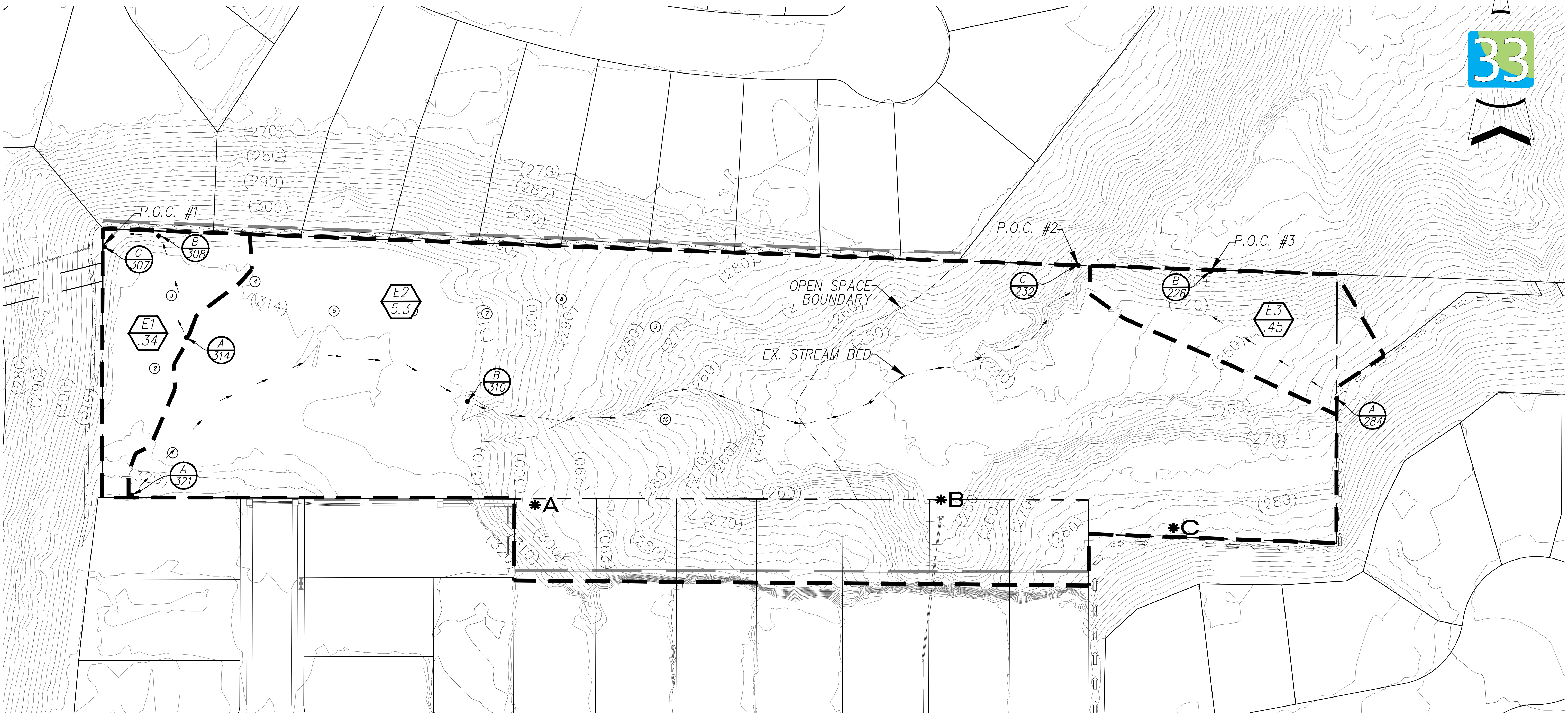
APPENDIX A

EXISTING & PROPOSED DRAINAGE BASINS

LIGHTHOUSE WAY

EXISTING DRAINAGE BASIN MAP

N



LEGEND

PROPERTY

BASIN BOUNDARY

FLOW LINE FOR TIME OF CONCENTRATION (T_C)

SEGMENT ID

ELEVATION

EXISTING DRAINAGE BASIN

AREA (ACRES)

P.O.C. (POINT OF CONNECTIVITY) .... P.O.C. #

OFF-SITE STORMWATER DISCHARGE LOCATION .... *A

TREATMENT TYPE

- DMAs 1–3: SELF TREATING

NOTE

- ENTIRE PARCEL IS WITHIN HYDROLIC SOIL GROUP D
- APROX. DEPTH TO GROUND WATER UNKNOWN
- NO CCSYA WITHIN PROJECT SITE

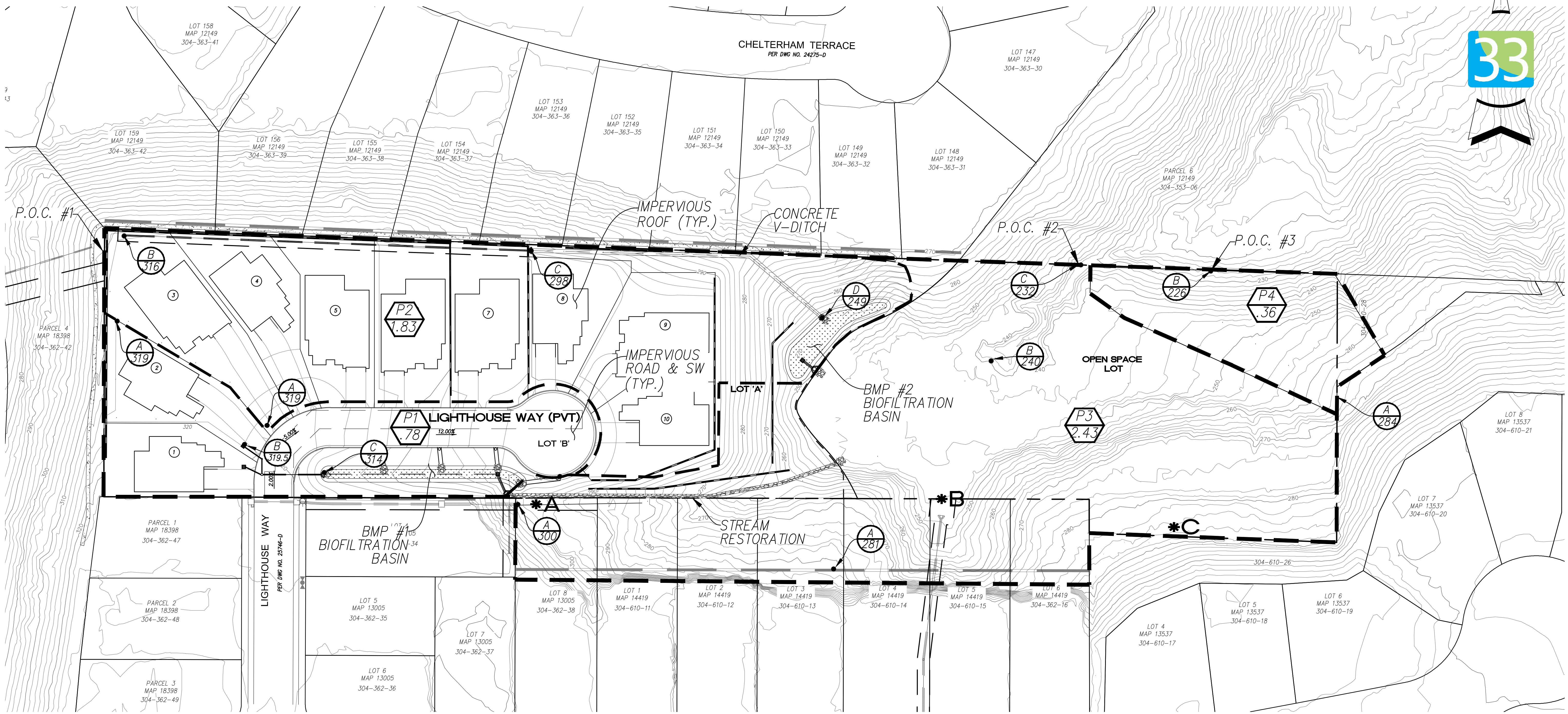
SCALE: 1"=80'		DRAWN BY: EHW
DATE: 06/16/16		CHECKED BY: SDD
JOB NO.: 1380.0		
SHEET: EXHIBIT 1		

latitude 33
PLANNING & ENGINEERING
9968 Hibert Street 2nd Floor, San Diego, CA 92131
Tel 858.751.0633

LIGHTHOUSE WAY

PROPOSED DRAINAGE BASIN MAP

N



LEGEND

LOT LINE

BASIN BOUNDARY

FLOW LINE FOR TIME OF CONCENTRATION (T_C)

SEGMENT ID / ELEVATION

PROPOSED DRAINAGE BASIN / AREA (ACRES) — P# / #

P.O.C. (POINT OF CONNECTIVITY) — P.O.C. #

OFF-SITE STORMWATER DISCHARGE LOCATION — *A

TREATMENT TYPE

- DMAs 3 & 4: SELF TREATING
- DMAs 1 & 2: DRAIN TO BMPs

NOTE

- ENTIRE PARCEL IS WITHIN HYDROLIC SOIL GROUP D
- APROX. DEPTH TO GROUND WATER UNKNOWN
- NO CCSYA WITHIN PROJECT SITE

SCALE:	1"=80'	DRAWN BY:	EHW
DATE:	05/10/18	CHECKED BY:	SDD
JOB NO.:	1380.0		
SHEET:	EXHIBIT 1		

latitude 33
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9968 Hibert Street 2nd Floor, San Diego, CA 92131
Tel 858.751.0633

H:\1300\1380.00 - LIGHTHOUSE WAY\ENGINEERING\REPORTS\DRAINAGE\DRAINAGE BASIN MAP\1380.0 - PROPOSED DRAINAGE.DWG 10/11/2017 12:09 PM

APPENDIX B

STORMWATER ANALYSIS

Peak Discharge Summary - Existing Condition										
Basin Name	*C- Value*	*2 yr Intensity (I)(in/hr)*	*10 yr Intensity (I)(in/hr)*	*50 yr Intensity (I)(in/hr)*	*100 yr Intensity (I)(in/hr)*	*Area (ac)*	*2 yr Peak Discharge (CFS)*	*10 yr Peak Discharge (CFS)*	*50 yr Peak Discharge (CFS)*	*100 yr Peak Discharge (CFS)*
Existing 1 - E1	0.35	2.43	3.55	4.49	5.23	0.34	0.29	0.42	0.53	0.61
Existing 2 - E2	0.35	1.52	2.22	2.81	3.28	4.80	2.56	3.74	4.72	5.51
Existing 3 - E3	0.35	3.39	4.95	6.26	7.30	0.37	0.44	0.64	0.80	0.94
				TOTAL=		5.51	3.28	4.79	6.05	7.06

Peak Discharge Summary - Proposed Condition										
Basin Name	*C- Value*	*2 yr Intensity (I)(in/hr)*	*10 yr Intensity (I)(in/hr)*	*50 yr Intensity (I)(in/hr)*	*100 yr Intensity (I)(in/hr)*	*Area (ac)*	*2 yr Peak Discharge (CFS)*	*10 yr Peak Discharge (CFS)*	*50 yr Peak Discharge (CFS)*	*100 yr Peak Discharge (CFS)*
Proposed 1 - P1	0.67	1.10	1.10	1.10	1.10	0.78	0.58	0.58	0.58	0.58
Proposed 2 - P2	0.56	1.10	1.10	1.10	1.10	1.83	1.13	1.13	1.13	1.13
Proposed 3 - P3	0.35	1.62	2.42	3.02	3.22	2.44	1.39	2.07	2.58	2.75
Proposed 4 - P4	0.35	2.48	3.38	4.18	4.37	0.37	0.32	0.43	0.54	0.56
				TOTAL=		5.42	3.41	4.21	4.83	5.02

TIME OF CONCENTRATION

Project Information

Project	County	Date	Project No.
Lighthouse Way	San Diego	6/13/2016	1380.00
Location/Basin	**Condtion**	**By**	**Checked**
E1	Existing	SDD	

Initial Time (T_i)

Segment ID		AB				
Flow Length, D	ft	120				
Land Slope, S	ft/ft	0.058				
Runoff Coefficient, C		0.35				
Travel Time, Ti	hr	0.137	+		=	0.137

Shallow Concentrated Flow

Segment ID		BC						
Surface Description		U						
Flow Length, L	ft	42						
Watercourse Slope, S	ft/ft	0.024						
Average Velocity, V	ft/s	2.500						
Travel Time, T_t	hr	0.005	+		+		+	

Combined Travel Time, T_t = 0.005

Channel Flow

Segment ID		CD						
Cross Sectional Flow Area, A	ft^2							
Wetted Perimeter, P	ft							
Hydraulic Radius, R	ft							
Channel Slope, S	ft/ft							
Manning's Roughness Coefficient, n								
Velocity, V	ft/s							
Flow Length, L	ft							
Travel Time, T_t	hr		+		+		+	

Combined Travel Time, T_t hr =

Time of Concetration, T_c **hr** = *0.142*

min = ***8.5***

Legend

Sheet Flow Surface Codes

A	Smooth Surfaces	F	Grass, Dense
B	Fallow (No Residue)	G	Grass, Bermuda
C	Cultivated (< 20% Residue)	H	Woods, Light
D	Cultivated (> 20% Residue)	I	Woods, Dense
E	Grass-Range, Short	J	Range, Natural

Shallow Concentrated Surface Codes

P Paved — U Unpaved

Channel Flow Roughness Condtion

A	Clean Earth	D	Dense Brush
B	Short Grass	E	Natural Channel
C	Dense Weeds	F	Concrete

TIME OF CONCENTRATION

Project Information

Project	County	Date	Project No.
Lighthouse Way	San Diego	6/13/2016	1380.00
Location/Basin	**Condtion**	**By**	**Checked**
E2	Existing	SDD	

Initial Time (T_i)

Segment ID		AB				
Flow Length, D	ft	322				
Land Slope, S	ft/ft	0.034				
Runoff Coefficient, C		0.35				
Travel Time, Ti	hr	0.269	+		=	0.269

Shallow Concentrated Flow

Segment ID		BC								
Surface Description		U								
Flow Length, L	ft	543								
Watercourse Slope, S	ft/ft	0.144								
Average Velocity, V	ft/s	6.123								
Travel Time, T_t	hr	0.025	+		+		+			

Combined Travel Time, T_t = 0.025

Channel Flow

Segment ID		CD						
Cross Sectional Flow Area, A	ft^2							
Wetted Perimeter, P	ft							
Hydraulic Radius, R	ft							
Channel Slope, S	ft/ft							
Manning's Roughness Coefficient, n								
Velocity, V	ft/s							
Flow Length, L	ft							
Travel Time, T_t	hr		+		+		+	

Combined Travel Time, T_t hr =

Time of Concetration, T_c **hr** = *0.293*

min = ***17.6***

Legend

Sheet Flow Surface Codes

A	Smooth Surfaces	F	Grass, Dense
B	Fallow (No Residue)	G	Grass, Bermuda
C	Cultivated (< 20% Residue)	H	Woods, Light
D	Cultivated (> 20% Residue)	I	Woods, Dense
E	Grass-Range, Short	J	Range, Natural

Shallow Concentrated Surface Codes

P	Paved	U	Unpaved

Channel Flow Roughness Condtion

A	Clean Earth	D	Dense Brush
B	Short Grass	E	Natural Channel
C	Dense Weeds	F	Concrete

TIME OF CONCENTRATION

Project Information

Project	County	Date	Project No.
Lighthouse Way	San Diego	6/13/2016	1380.00
Location/Basin	**Condtion**	**By**	**Checked**
E3	Existing	SDD	

Initial Time (T_i)

Segment ID		AB			
Flow Length, D	ft	157			
Land Slope, S	ft/ft	0.369			
Runoff Coefficient, C		0.35			
Travel Time, Ti	hr	0.085	+		= 0.085

Shallow Concentrated Flow

Segment ID		BC						
Surface Description								
Flow Length, L	ft							
Watercourse Slope, S	ft/ft							
Average Velocity, V	ft/s							
Travel Time, T_t	hr		+		+		+	

Combined Travel Time, T_t =

Channel Flow

Segment ID		CD						
Cross Sectional Flow Area, A	ft^2							
Wetted Perimeter, P	ft							
Hydraulic Radius, R	ft							
Channel Slope, S	ft/ft							
Manning's Roughness Coefficient, n								
Velocity, V	ft/s							
Flow Length, L	ft							
Travel Time, T_t	hr		+		+		+	

Combined Travel Time, T_t hr =

Time of Concetration, T_c hr = *0.085*

min = ***5.1***

Legend

Sheet Flow Surface Codes

A	Smooth Surfaces	F	Grass, Dense
B	Fallow (No Residue)	G	Grass, Bermuda
C	Cultivated (< 20% Residue)	H	Woods, Light
D	Cultivated (> 20% Residue)	I	Woods, Dense
E	Grass-Range, Short	J	Range, Natural

Shallow Concentrated Surface Codes

P	Paved	U	Unpaved

Channel Flow Roughness Condtion

A	Clean Earth	D	Dense Brush
B	Short Grass	E	Natural Channel
C	Dense Weeds	F	Concrete

TIME OF CONCENTRATION

Project Information

Project	County	Date	Project No.
Lighthouse Way	San Diego	2/9/2017	1380.00
Location/Basin	**Condtion**	**By**	**Checked**
P1	Proposed	SDD	

Initial Time (T_i)

Segment ID		AB				
Flow Length, D	ft	190				
Land Slope, S	ft/ft	0.010				
Runoff Coefficient, C		0.58				
Travel Time, Ti	hr	0.216	+	0.000	=	0.216

Shallow Concentrated Flow

Segment ID		Basin								
Surface Description										
Flow Length, L	ft									
Watercourse Slope, S	ft/ft									
Average Velocity, V	ft/s			0.000		0.000		0.000		
Travel Time, T_t	hr	0.167	+	0.000	+	0.000	+	0.000		
				Combined Travel Time, T_t			=	0.167		

Channel Flow

Segment ID		BC						
Cross Sectional Flow Area, A	ft^2	0.79						
Wetted Perimeter, P	ft	3.14						
Hydraulic Radius, R	ft	0.250						
Channel Slope, S	ft/ft	0.112						
Manning's Roughness Coefficient, n		0.013						
Velocity, V	ft/s	15.22		0.000		0.000		0.000
Flow Length, L	ft	100						
Travel Time, T_t	hr	0.002	+	0.000	+	0.000	+	0.000

Combined Travel Time, T_t	hr	=	0.002
Time of Concetration, T_c	**hr**	=	*0.384*
	min	=	***23.1***

Legend

Sheet Flow Surface Codes		Shallow Concentrated Surface Codes	
A Smooth Surfaces	F Grass, Dense	P Paved	U Unpaved
B Fallow (No Residue)	G Grass, Bermuda	**Channel Flow Roughness Condtion**	
C Cultivated (< 20% Residue)	H Woods, Light	A Clean Earth	D Dense Brush
D Cultivated (> 20% Residue)	I Woods, Dense	B Short Grass	E Natural Channel
E Grass-Range, Short	J Range, Natural	C Dense Weeds	F Concrete

TIME OF CONCENTRATION

Project Information

Project	County	Date	Project No.
Lighthouse Way	San Diego	6/13/2016	1380.00
Location/Basin	**Condtion**	**By**	**Checked**
P2	Proposed	SDD	

Initial Time (T_i)

	Segment ID	AB					
Flow Length, D	ft	219					
Land Slope, S	ft/ft	0.010					
Runoff Coefficient, C		0.56					
Travel Time, Ti	hr	0.239	+	0.000	=	0.239	

Shallow Concentrated Flow

	Segment ID	CD							
Surface Description		P							
Flow Length, L	ft	250							
Watercourse Slope, S	ft/ft	0.112							
Average Velocity, V	ft/s	6.803		0.000		0.000		0.000	
Travel Time, T_t	hr	0.010	+	0.167	+	0.000	+	0.000	

Combined Travel Time, T_t = 0.177

Channel Flow

	Segment ID	BC						
Cross Sectional Flow Area, A	ft^2	0.79						
Wetted Perimeter, P	ft	3.14						
Hydraulic Radius, R	ft	0.250						
Channel Slope, S	ft/ft	0.112						
Manning's Roughness Coefficient, n		0.013						
Velocity, V	ft/s	15.22		0.000		0.000		0.000
Flow Length, L	ft	330						
Travel Time, T_t	hr	0.006	+	0.000	+	0.000	+	0.000

Combined Travel Time, T_t hr = 0.006

Time of Concetration, T_c hr = *0.422*

min = ***25.3***

Legend

Sheet Flow Surface Codes

A	Smooth Surfaces	F	Grass, Dense
B	Fallow (No Residue)	G	Grass, Bermuda
C	Cultivated (< 20% Residue)	H	Woods, Light
D	Cultivated (> 20% Residue)	I	Woods, Dense
E	Grass-Range, Short	J	Range, Natural

Shallow Concentrated Surface Codes

P Paved   U Unpaved

Channel Flow Roughness Condtion

A	Clean Earth	D	Dense Brush
B	Short Grass	E	Natural Channel
C	Dense Weeds	F	Concrete

TIME OF CONCENTRATION

Project Information

Project	County	Date	Project No.
Lighthouse Way	San Diego	6/13/2016	1380.00
Location/Basin	**Condtion**	**By**	**Checked**
P3	Proposed	SDD	

Initial Time (T_i)

Segment ID		AB				
Flow Length, D	ft	421				
Land Slope, S	ft/ft	0.143				
Runoff Coefficient, C		0.35				
Travel Time, Ti	hr	0.190	+		=	0.190

Shallow Concentrated Flow

Segment ID		BC						
Surface Description		U						
Flow Length, L	ft	110						
Watercourse Slope, S	ft/ft	0.072						
Average Velocity, V	ft/s	4.329						
Travel Time, T_t	hr	0.007	+		+		+	

Combined Travel Time, T_t = 0.007

Channel Flow

Segment ID								
Cross Sectional Flow Area, A	ft^2							
Wetted Perimeter, P	ft							
Hydraulic Radius, R	ft							
Channel Slope, S	ft/ft							
Manning's Roughness Coefficient, n								
Velocity, V	ft/s							
Flow Length, L	ft							
Travel Time, T_t	hr		+		+		+	

Combined Travel Time, T_t hr =

Time of Concetration, T_c **hr** = *0.197*

min = ***11.8***

Legend

Sheet Flow Surface Codes

A	Smooth Surfaces	F	Grass, Dense
B	Fallow (No Residue)	G	Grass, Bermuda
C	Cultivated (< 20% Residue)	H	Woods, Light
D	Cultivated (> 20% Residue)	I	Woods, Dense
E	Grass-Range, Short	J	Range, Natural

Shallow Concentrated Surface Codes

P	Paved	U	Unpaved

Channel Flow Roughness Condtion

A	Clean Earth	D	Dense Brush
B	Short Grass	E	Natural Channel
C	Dense Weeds	F	Concrete

TIME OF CONCENTRATION

Project Information

Project	County	Date	Project No.
Lighthouse Way	San Diego	6/13/2016	1380.00
Location/Basin	**Condtion**	**By**	**Checked**
P4	Proposed	SDD	

Initial Time (T_i)

Segment ID		AB				
Flow Length, D	ft	157				
Land Slope, S	ft/ft	0.369				
Runoff Coefficient, C		0.35				
Travel Time, Ti	hr	0.085	+		=	0.085

Shallow Concentrated Flow

Segment ID								
Surface Description								
Flow Length, L	ft							
Watercourse Slope, S	ft/ft							
Average Velocity, V	ft/s							
Travel Time, T_t	hr		+		+		+	

Combined Travel Time, T_t =

Channel Flow

Segment ID								
Cross Sectional Flow Area, A	ft^2							
Wetted Perimeter, P	ft							
Hydraulic Radius, R	ft							
Channel Slope, S	ft/ft							
Manning's Roughness Coefficient, n								
Velocity, V	ft/s							
Flow Length, L	ft							
Travel Time, T_t	hr		+		+		+	

Combined Travel Time, T_t hr =

Time of Concetration, T_c **hr** = *0.085*

min = ***5.1***

Legend

Sheet Flow Surface Codes

A	Smooth Surfaces	F	Grass, Dense
B	Fallow (No Residue)	G	Grass, Bermuda
C	Cultivated (< 20% Residue)	H	Woods, Light
D	Cultivated (> 20% Residue)	I	Woods, Dense
E	Grass-Range, Short	J	Range, Natural

Shallow Concentrated Surface Codes

P	Paved	U	Unpaved

Channel Flow Roughness Condtion

A	Clean Earth	D	Dense Brush
B	Short Grass	E	Natural Channel
C	Dense Weeds	F	Concrete

TABLE 1-104.14A

DESIGN VALUES FOR MANNINGS ROUGHNESS COEFFICIENT (n)

TYPE OF CHANNEL	N VALUE
Unlined Channels:	
Clay Loam	0.023
Sand	0.020
Gravel	0.030
Rock	0.040
Lined Channels:	
Portland Cement Concrete	0.015
Air Blown Mortar	0.018
Asphalt Concrete	0.018
Grass Lined Channels: (Shallow depths)	
2 inch length	0.050
4 - 6 inch length	0.060
6 - 12 inch length	0.120
12 - 24 inch + length	0.200
Pavement and Gutters:	
Concrete	0.015
Asphalt Concrete	0.018
Natural Streams: (Less than 100 feet wide at flood stage)	
1. Regular section	
a. Some grass and weeds, little or no brush	0.030
b. Dense growth of weeds, depth of flow substantially greater than weed height	0.040
c. Some weeds, light brush on bank	0.040
d. Some weeds, heavy brush on banks	0.060
e. With trees in channel, branches submerged at flood stage, increase above values by	0.015

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Sep 25 2017

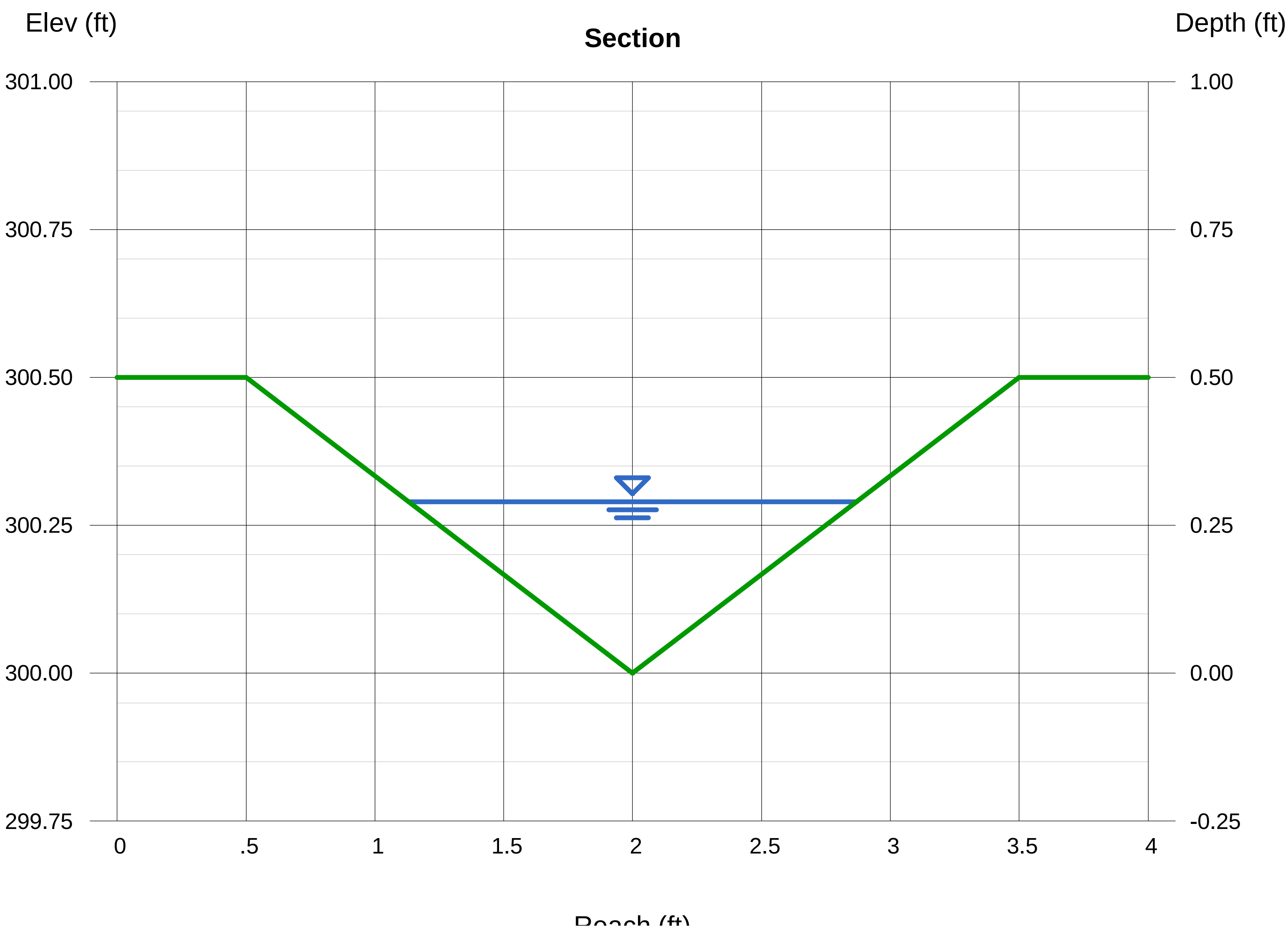
Streambed

Triangular
Side Slopes (z:1) = 3.00, 3.00
Total Depth (ft) = 0.50

Invert Elev (ft) = 300.00
Slope (%) = 19.00
N-Value = 0.040

Calculations
Compute by: Known Q
Known Q (cfs) = 1.00

Highlighted
Depth (ft) = 0.29
Q (cfs) = 1.000
Area (sqft) = 0.25
Velocity (ft/s) = 3.96
Wetted Perim (ft) = 1.83
Crit Depth, Yc (ft) = 0.37
Top Width (ft) = 1.74
EGL (ft) = 0.53



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Sep 25 2017

Concrete V-Ditch

Triangular		**Highlighted**	
Side Slopes (z:1)	= 1.50, 1.50	Depth (ft)	= 0.36
Total Depth (ft)	= 1.00	Q (cfs)	= 1.130
		Area (sqft)	= 0.19
Invert Elev (ft)	= 198.00	Velocity (ft/s)	= 5.81
Slope (%)	= 18.00	Wetted Perim (ft)	= 1.30
N-Value	= 0.030	Crit Depth, Yc (ft)	= 0.52
		Top Width (ft)	= 1.08
Calculations		EGL (ft)	= 0.89
Compute by:	Known Q		
Known Q (cfs)	= 1.13		

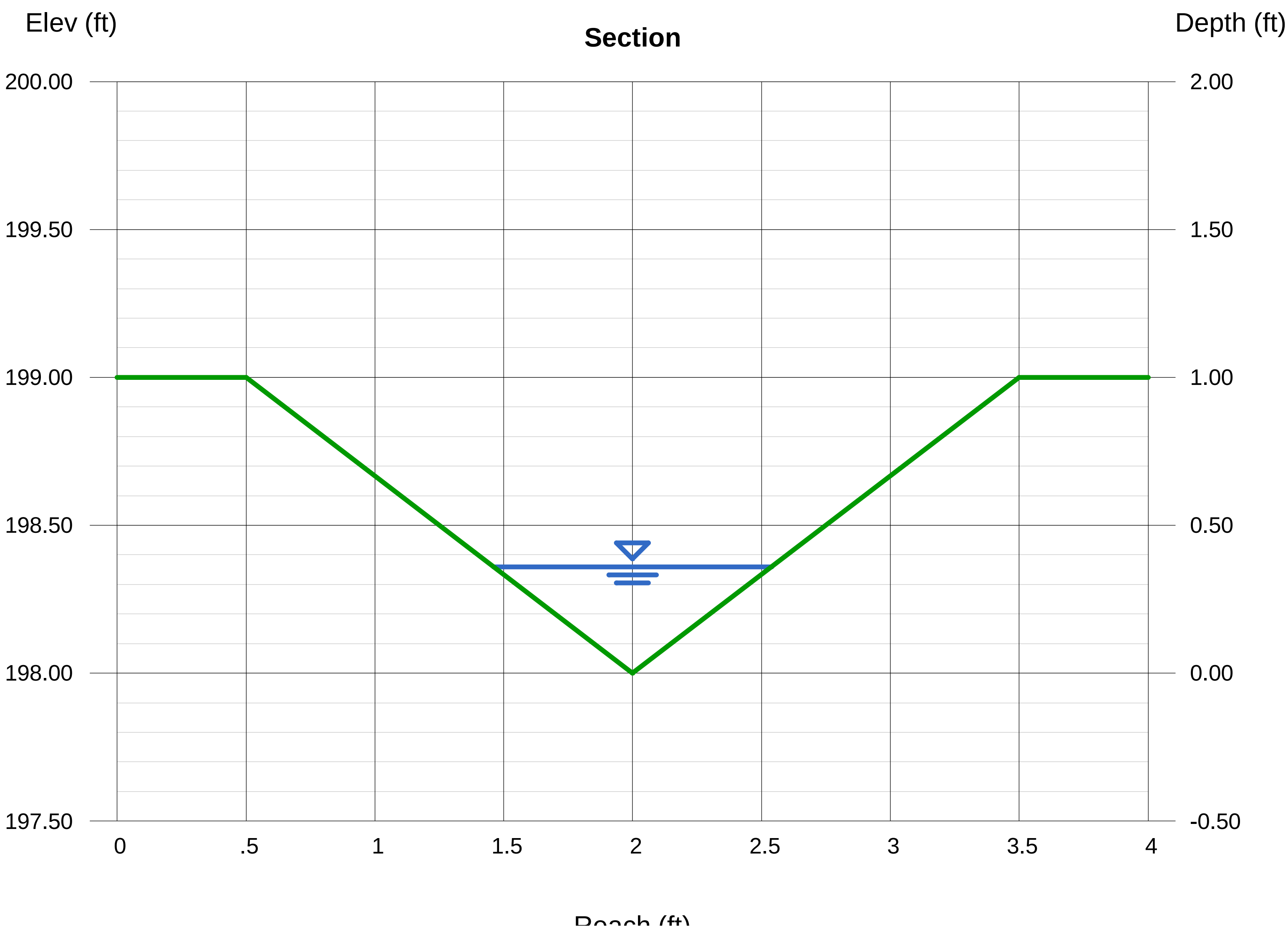


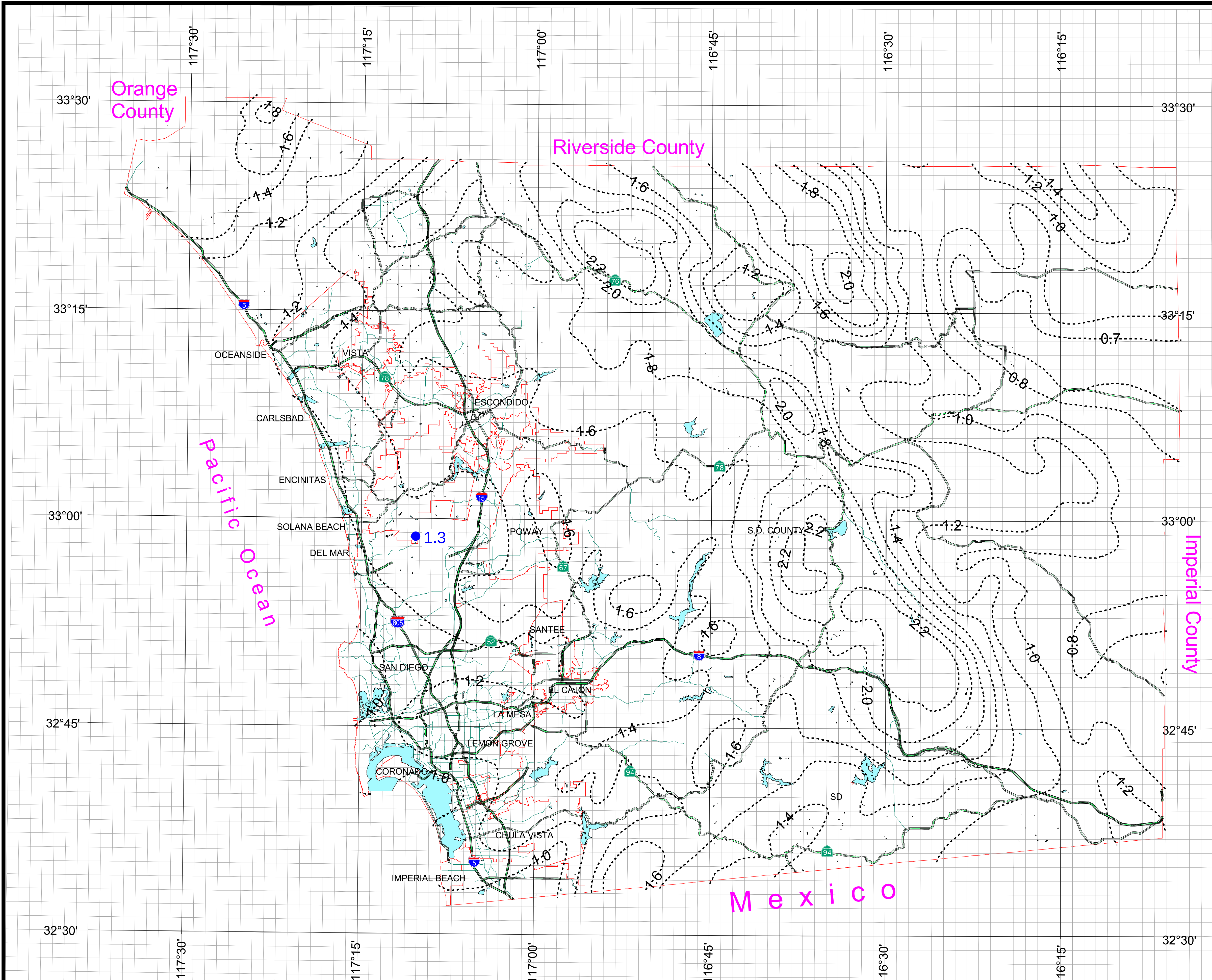
Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

Land Use		Runoff Coefficient "C"				
			Soil Type			
NRCS Elements	County Elements	% IMPER.	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, Cp, 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

County of San Diego Hydrology Manual

Rainfall Isopluvials



2 Year Rainfall Event - 6 Hours

Isopluvial (inches)

DPW GIS
Department of Public Works Geographic Information Services

SanGIS
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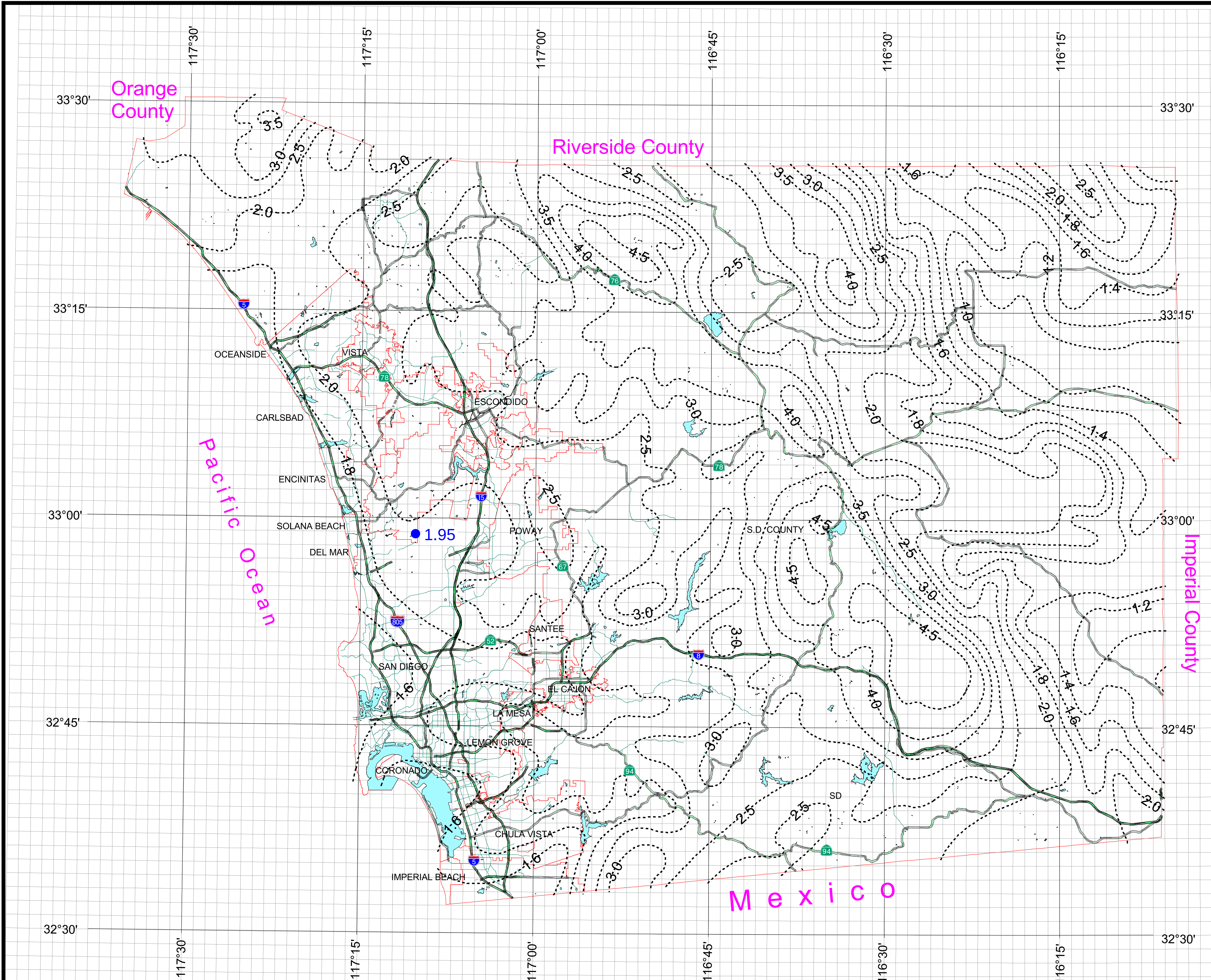
N W E S

3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

2 Year Rainfall Event - 24 Hours



Isopluvial (inches)

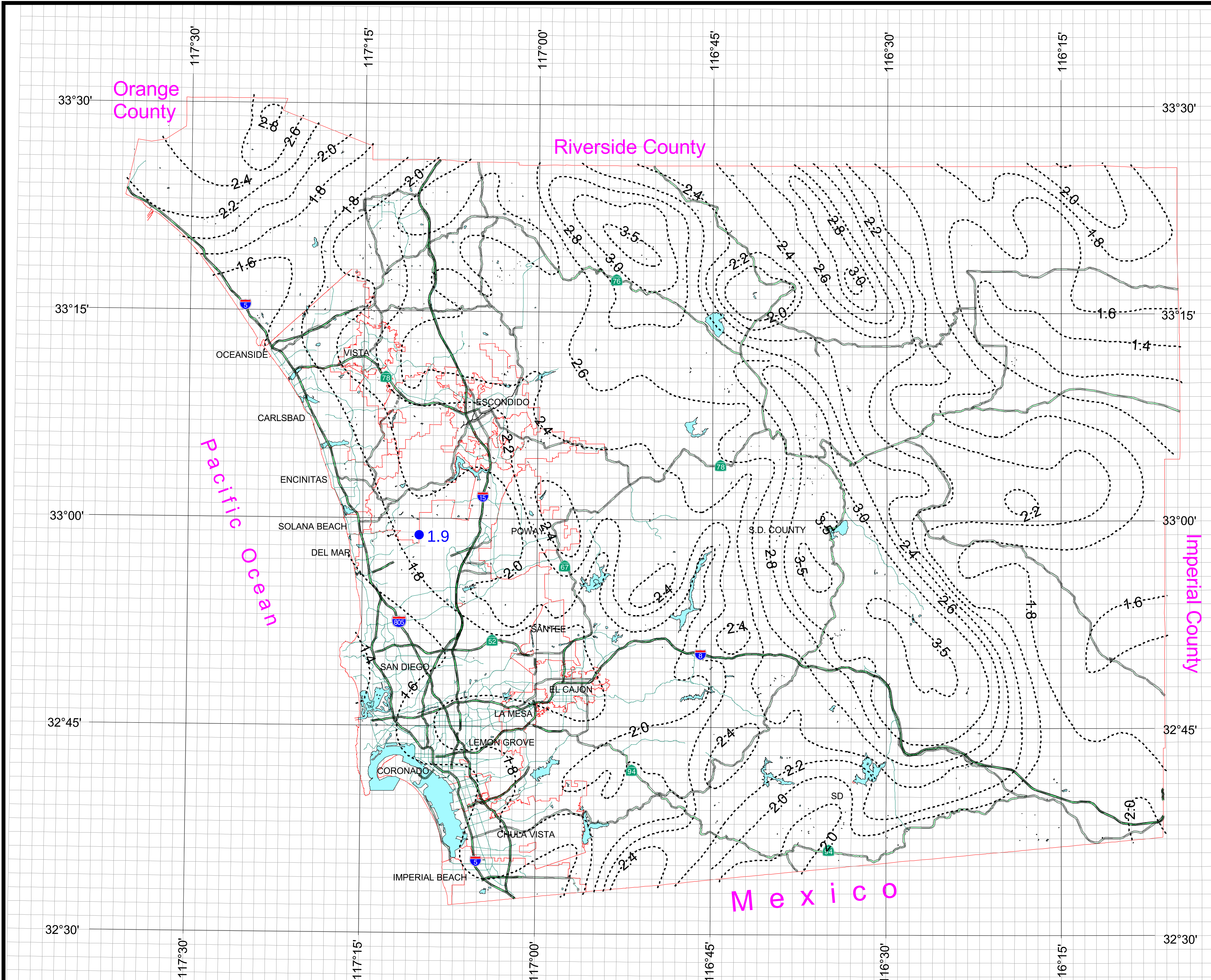
N
W E
S

3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

10 Year Rainfall Event - 6 Hours



Isopluvial (inches)

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Geographic Information Services

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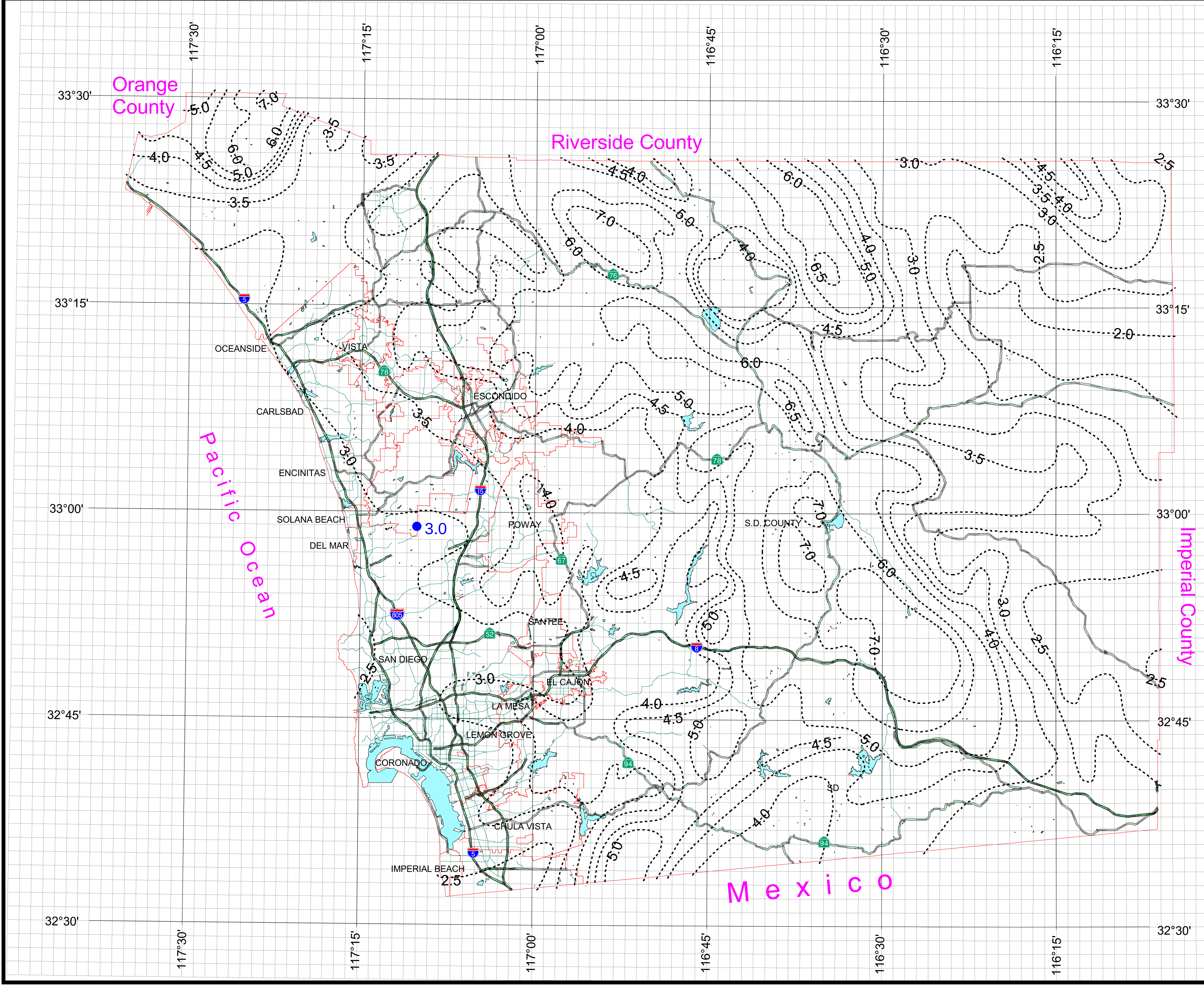
N
W
E
S

3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

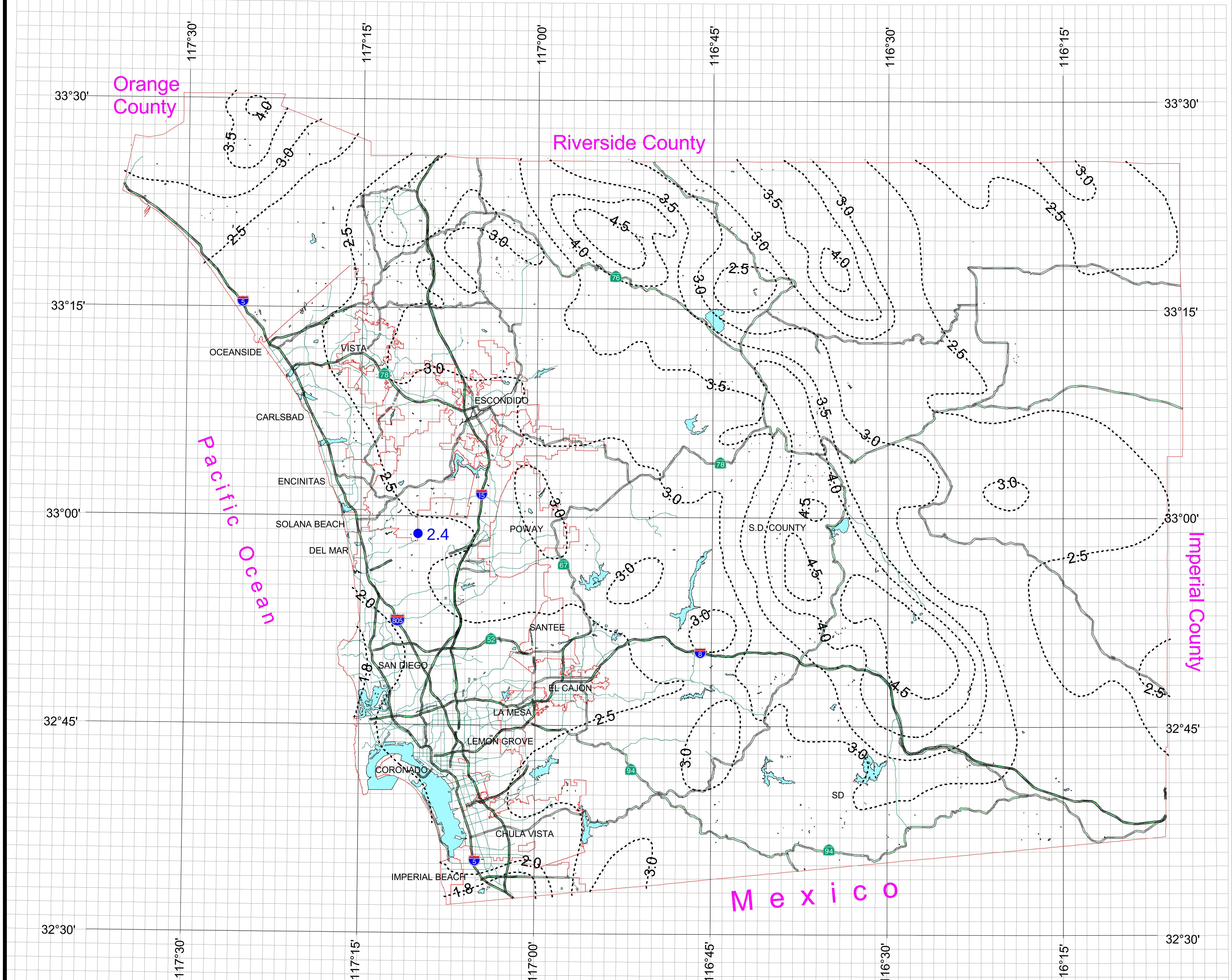
10 Year Rainfall Event - 24 Hours



Isopluvial (inches)

N
W
E
S

3 0 3 Miles



County of San Diego Hydrology Manual

Rainfall Isopluvials

50 Year Rainfall Event - 6 Hours

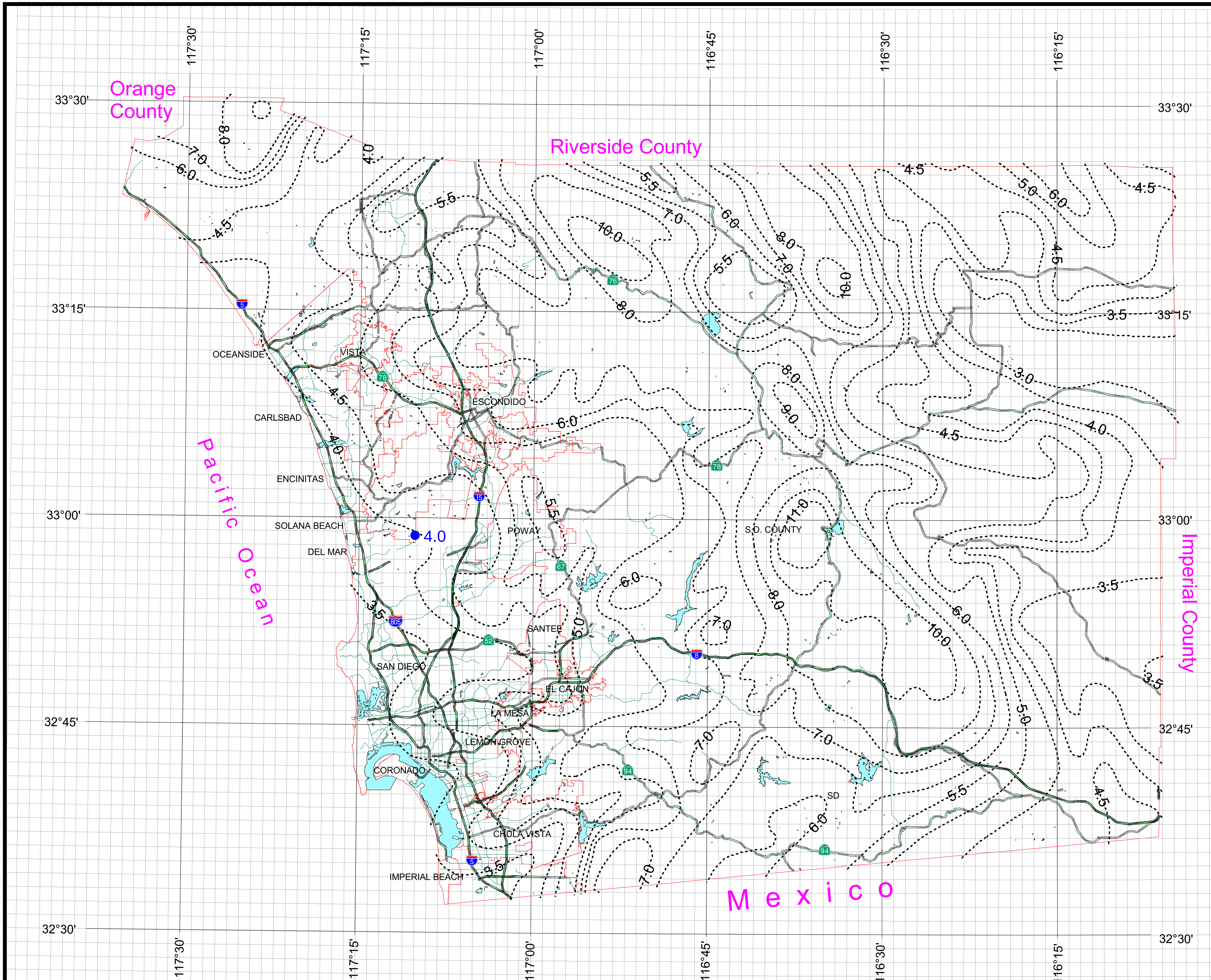
Isopluvial (inches)

N
W E
S

3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials



50 Year Rainfall Event - 24 Hours

Isopluvial (inches)

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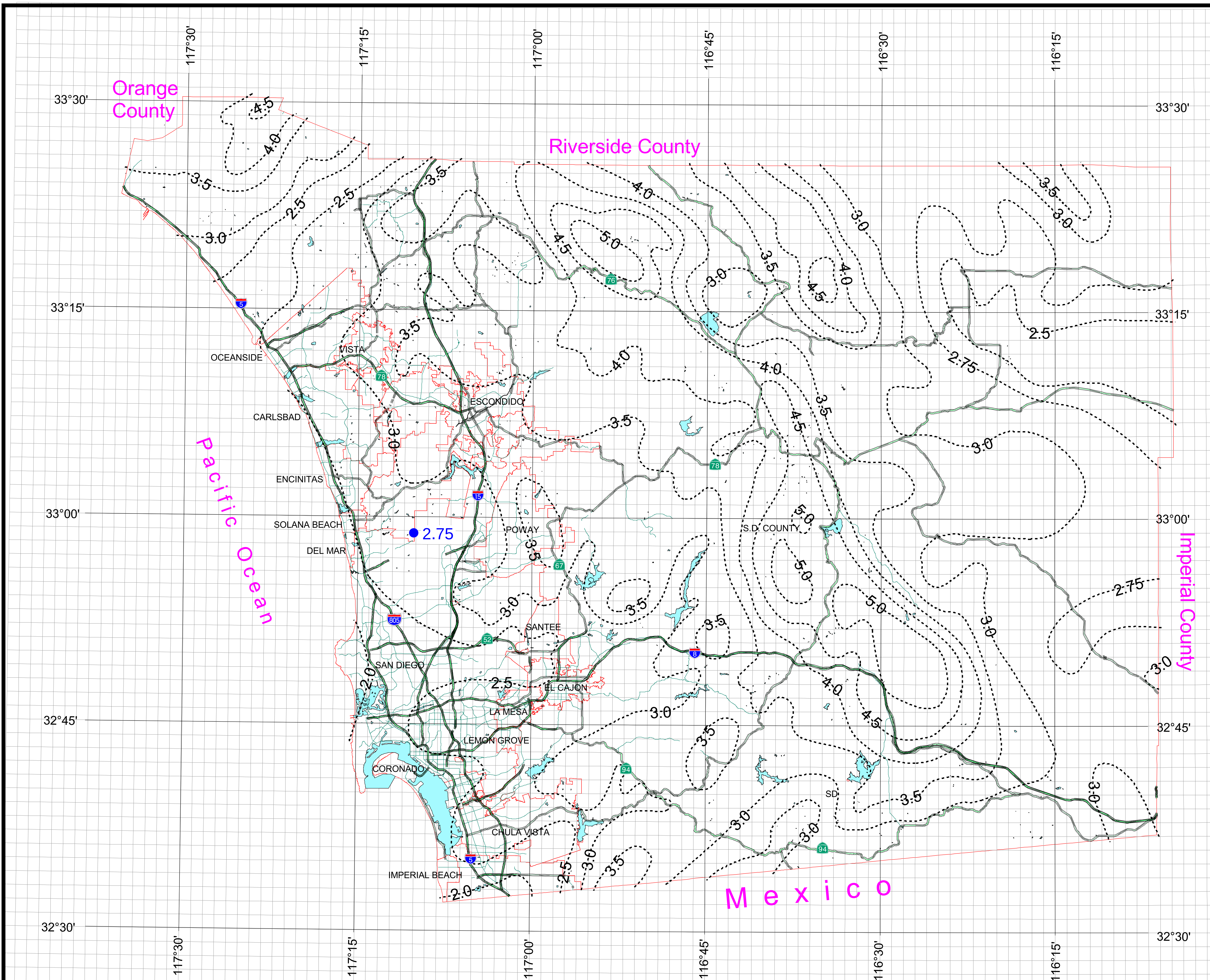
N
W E
S

3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours



Isopluvial (inches)

Department of Public Works
Geographic Information Services

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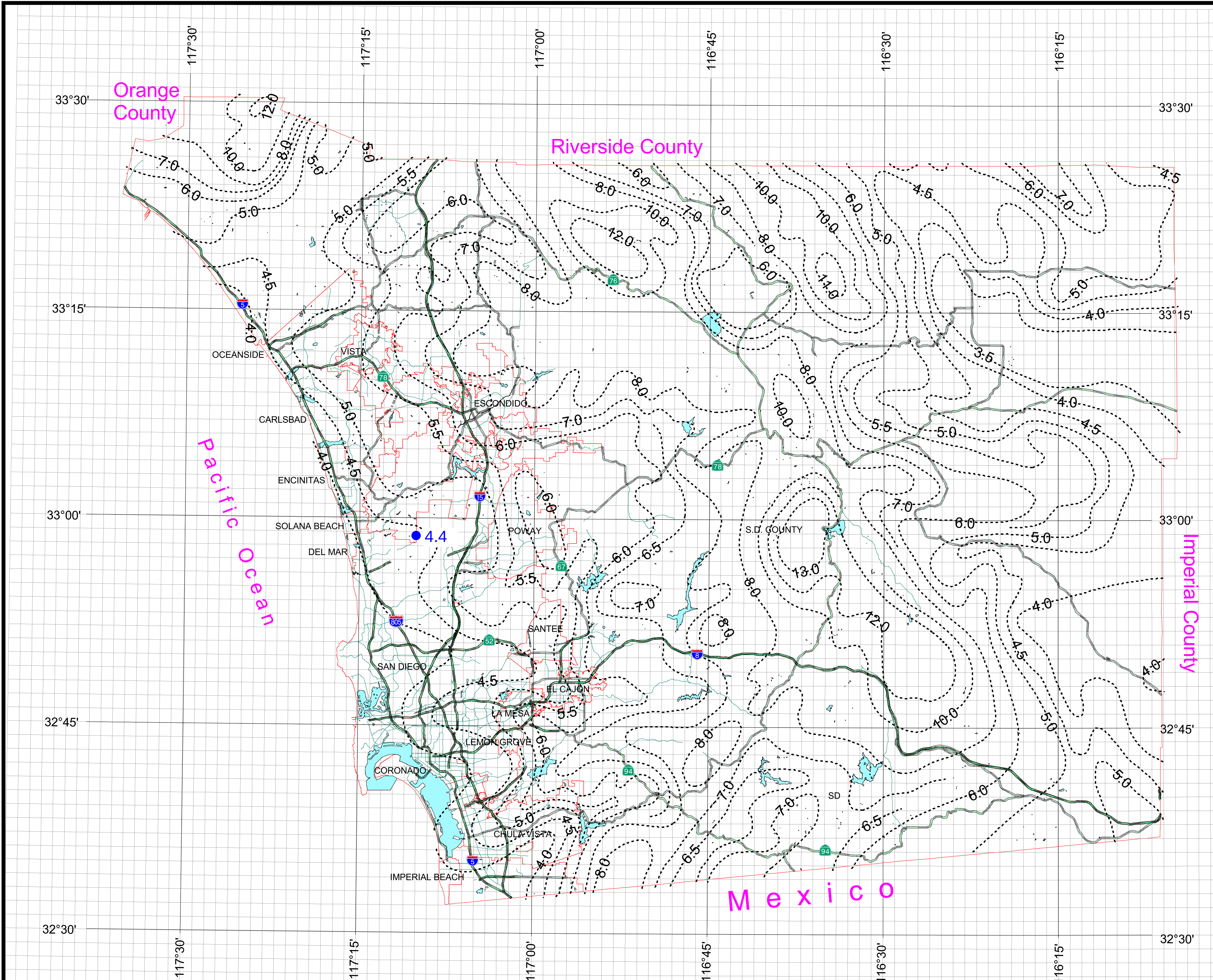
N
W
E
S

3 0 3 Miles



County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

- - - - Isopluvial (inches)

DPW GIS Department of Public Works Geographic Information Services

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N S E W

3 0 3 Miles

The City of San Diego	**PRIORITY DEVELOPMENT PROJECT (PDP) STORM WATER QUALITY MANAGEMENT PLAN (SWQMP) FOR**

Lighthouse Ridge
Planned Development Permit No., Site Development Permit No.
Vesting Tentative Map No.

ENGINEER OF WORK:

Matthew J. Semic, PE | RCE C71075

PREPARED FOR:
Pacific Legacy Homes
16870 West Bernardo Drive, Suite 400
San Diego, CA 92127

PREPARED BY:

Latitude 33 Planning & Engineering
9968 Hibert Street Second Floor
San Diego, CA 92131
(858) 751-0633

DATE:
May 2018

Approved by: City of San Diego   Date

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TABLE OF CONTENTS

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ACRONYMS

APN	Assessor's Parcel Number
ASBS	Area of Special Biological Significance
BMP	Best Management Practice
CEQA	California Environmental Quality Act
CGP	Construction General Permit
DCV	Design Capture Volume
DMA	Drainage Management Areas
ESA	Environmentally Sensitive Area
GLU	Geomorphic Landscape Unit
GW	Ground Water
HMP	Hydromodification Management Plan
HSG	Hydrologic Soil Group
HU	Harvest and Use
INF	Infiltration
LID	Low Impact Development
LUP	Linear Underground/Overhead Projects
MS4	Municipal Separate Storm Sewer System
N/A	Not Applicable
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
PDP	Priority Development Project
PE	Professional Engineer
POC	Pollutant of Concern
SC	Source Control
SD	Site Design
SDRWQCB	San Diego Regional Water Quality Control Board
SIC	Standard Industrial Classification
SWPPP	Stormwater Pollutant Protection Plan
SWQMP	Storm Water Quality Management Plan
TMDL	Total Maximum Daily Load
WMAA	Watershed Management Area Analysis
WPCP	Water Pollution Control Program
WQIP	Water Quality Improvement Plan

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CERTIFICATION PAGE

Project Name:
Permit Application Number:

I hereby declare that I am the Engineer in Responsible Charge of design of storm water BMPs for this project, and 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 the requirements of the Storm Water Standards, which is based on the requirements of SDRWQCB Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100 (MS4 Permit).

I have read and understand that the City Engineer has adopted minimum requirements for managing urban runoff, including storm water, from land development activities, as described in the Storm Water Standards. I certify that this PDP SWQMP has been completed to the best of my ability and accurately reflects the project being proposed and the applicable source control and site design BMPs proposed to minimize the potentially negative impacts of this project's land development activities on water quality. I understand and acknowledge that the plan check review of this PDP SWQMP by the City Engineer is confined to a review and does not relieve me, as the Engineer in Responsible Charge of design of storm water BMPs for this project, of my responsibilities for project design.

Engineer of Work's Signature, PE Number & Expiration Date

Matthew J. Semic

Print Name

Latitude 33 Planning & Engineering

Company

Date

Engineer's Stamp

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SUBMITTAL RECORD

Use this Table to keep a record of submittals of this PDP SWQMP. Each time the PDP SWQMP is re-submitted, provide the date and status of the project. In last column indicate changes that have been made or indicate if response to plan check comments is included. When applicable, insert response to plan check comments.

Submittal Number	Date	Project Status	Changes
1	07/29/2016	☒ Preliminary Design/Planning/CEQA ☐ Final Design	Initial Submittal
2	02/17/2017	☒ Preliminary Design/Planning/CEQA ☐ Final Design	Second Submittal
3	9/25/2017	☒ Preliminary Design/Planning/CEQA ☐ Final Design	Third Submittal
4		☐ Preliminary Design/Planning/CEQA ☐ Final Design	

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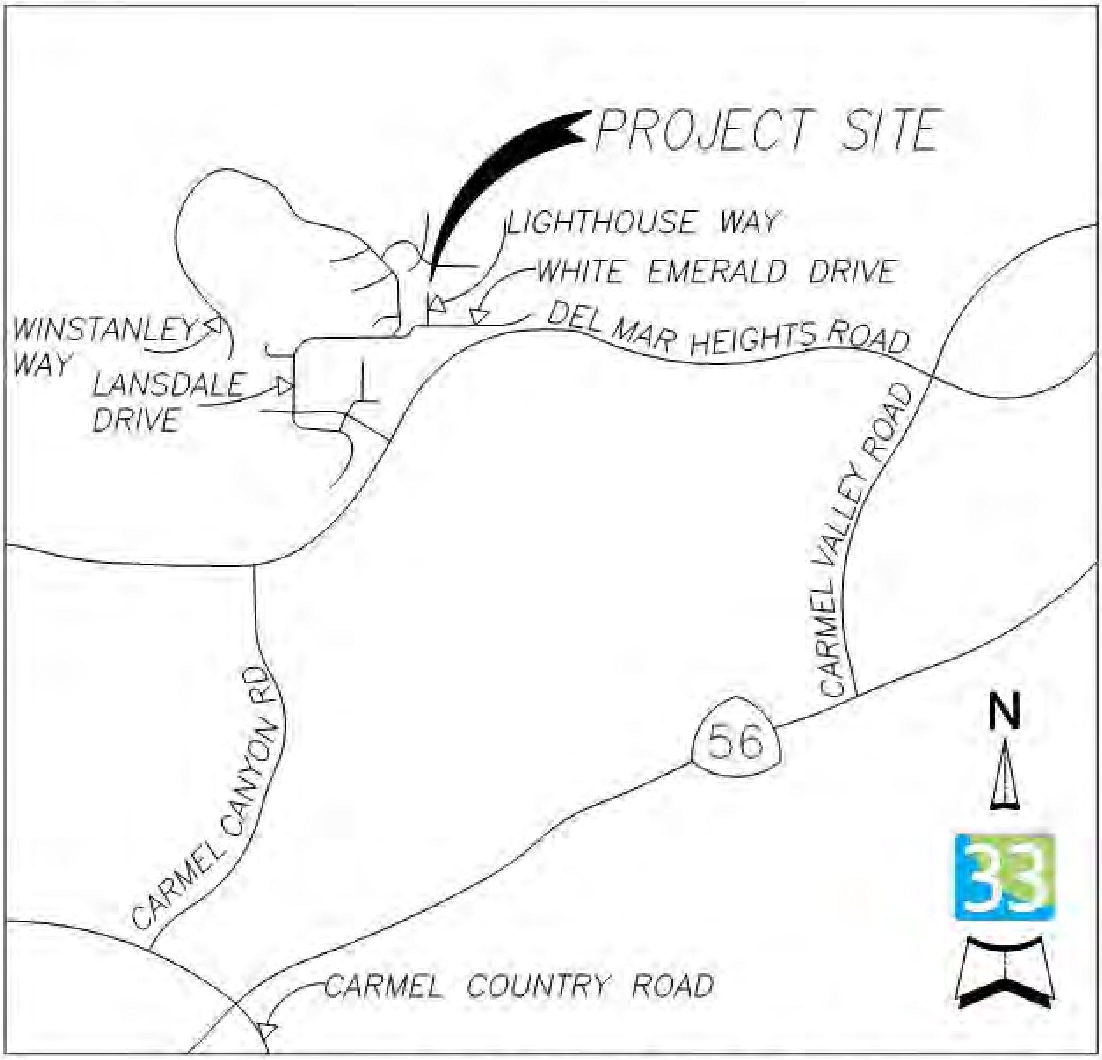
PROJECT VICINITY MAP

Project Name: Lighthouse Ridge
Permit Application Number: SDP 1798552, VTM 1798551



VICINITY MAP
NOT TO SCALE

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THE CITY OF SAN DIEGO	City of San Diego **Development Services** 1222 First Ave., MD-302 San Diego, CA 92101 (619) 446-5000	**Storm Water Requirements Applicability Checklist**	FORM **DS-560** January 2016

Project Address: North of Lighthouse Way	Project Number *(for the City Use Only)*:

SECTION 1. Construction Storm Water BMP Requirements:

All construction sites are required to implement construction BMPs in accordance with the performance standards in the Storm Water Standards Manual. Some sites are additionally required to obtain coverage under the State Construction General Permit (CGP)[1], which is administrated by the State Water Resources Control Board.

For all projects complete PART A: If project is required to submit a SWPPP or WPCP, continue to PART B.

PART A: Determine Construction Phase Storm Water Requirements.

1. Is the project subject to California's statewide General NPDES permit for Storm Water Discharges Associated with construction activities, also known as the State Construction General Permit (CGP)? (Typically projects with land disturbance greater than or equal to 1 acre.)

   ☒ Yes; SWPPP required, skip questions 2-4 ☐ No; next question

2. Does the project propose construction or demolition activity, including but not limited to, clearing, grading, grubbing, excavation, or any other activity that results in ground disturbance and contact with storm water runoff?

   ☐ Yes; WPCP required, skip questions 3-4 ☐ No; next question

3. Does the project propose routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of the facility? (projects such as pipeline/utility replacement)

   ☐ Yes; WPCP required, skip question 4 ☐ No; next question

4. Does the project only include the following Permit types listed below?
   - Electrical Permit, Fire Alarm Permit, Fire Sprinkler Permit, Plumbing Permit, Sign Permit, Mechanical Permit, Spa Permit, Right of Way Permit for pot holing.
   - Individual Right of Way Permits that exclusively include one of the following activities and associated curb/ sidewalk repair: water services, sewer lateral, storm drain lateral, or dry utility service.
   - Right of Way Permits with a project footprint less than 150 linear feet that exclusively include only ONE of the following activities: curb ramp, sidewalk and driveway apron replacement, curb and gutter replacement, and retaining wall encroachments.

   ☐ Yes; no document required

Check one of the boxes to the right, and continue to PART B:

☒ If you checked "Yes" for question 1,
a SWPPP is REQUIRED. Continue to PART B

☐ If you checked "No" for question 1, and checked "Yes" for question 2 or 3, **a WPCP is REQUIRED.** If the project processes less than 5,000 square feet of ground disturbance AND has less than a 5-foot elevation change over the entire project area, a Minor WPCP may be required instead. **Continue to PART B.**

☐ If you checked "No" for all question 1-3, and checked "Yes" for question 4
PART B **does not apply and no document is required. Continue to Section 2.**

[1]More information on the City's construction BMP requirements as well as CGP requirements can be found at: www.sandiego.gov/stormwater/regulations/swguide/constructing.shtml

PART B: Determine Construction Site Priority.
This prioritization must be completed within this form, noted on the plans, and included in the SWPPP or WPCP. The city reserves the right to adjust the priority of projects both before and after construction. Construction projects are assigned an inspection frequency based on if the project has a "high threat to water quality." The City has aligned the local definition of "high threat to water quality" to the risk. Determination approach of the State Construction General Permit (CGP). The CGP determines risk level based on project specific sediment risk and receiving water risk. Additional inspection is required for projects within the Areas of Special Biological Significance (ASBS) watershed. **NOTE:** The construction priority does **NOT** change construction BMP requirements that apply to projects; rather, it determines the frequency of inspections that will be conducted by city staff.

Complete PART B and continued to Section 2

1. ☐ **ASBS**
   a. Projects located in the ASBS watershed. A map of the ASBS watershed can he found here *<placeholder for ASBS map link>*

2. ☒ **High Priority**
   a. Projects 1 acre or more determined to be Risk Level 2 or Risk Level 3 per the Construction General Permit and not located in the ASBS watershed.
   b. Projects 1 acre or more determined to be LUP Type 2 or LUP Type 3 per the Construction General Permit and not located in the ASBS watershed.

3. ☐ **Medium Priority**
   a. Projects 1 acre or more but not subject to an ASBS or high priority designation.
   b. Projects determined to be Risk Level 1 or LUP Type 1 per the Construction General Permit and not located in the ASBS watershed.

4. ☐ **Low Priority**
   a. Projects not subject to ASBS, high or medium priority designation.

SECTION 2. Permanent Storm Water BMP Requirements.

Additional information for determining the requirements is found in the Storm Water Standards Manual.

PART C: Determine if Not Subject to Permanent Storm Water Requirements.
Projects that are considered maintenance, or otherwise not categorized as "new development projects" or "redevelopment projects" according to the Storm Water Standards Manual are not subject to Permanent Storm Water BMPs.

If "yes" is checked for any number in Part C, proceed to Part F and check "Not Subject to Permanent Storm Water BMP Requirements".

If "no" is checked for all of the numbers in Part C continue to Part D.

1.	Does the project only include interior remodels and/or is the project entirely within an existing enclosed structure and does not have the potential to contact storm water?	☐ Yes ☒ No
2.	Does the project only include the construction of overhead or underground utilities without creating new impervious surfaces?	☐ Yes ☒ No
3.	Does the project fall under routine maintenance? Examples include, but are not limited to: roof or exterior structure surface replacement, resurfacing or reconfiguring surface parking lots or existing roadways without expanding the impervious footprint, and routine replacement of damaged pavement (grinding, overlay, and pothole repair).	☐ Yes ☒ No

PART D: PDP Exempt Requirements.

PDP Exempt projects are required to implement site design and source control BMPs.

If "yes" was checked for any questions in Part D, continue to Part F and check the box labeled "PDP Exempt."
If "no" was checked for all questions in Part D, continue to Part E.

1. Does the project ONLY include new or retrofit sidewalks, bicycle lanes, or trails that:

   • Are designed and constructed to direct storm water runoff to adjacent vegetated areas, or other non-erodible permeable areas? Or;
   • Are designed and constructed to be hydraulically disconnected from paved streets and roads? Or;
   • Are designed and constructed with permeable pavements or surfaces in accordance with the Green Streets guidance in the City's Storm Water Standards manual?

   ☐ Yes; PDP exempt requirements apply ☒ No; next question

2. Does the project ONLY include retrofitting or redeveloping existing paved alleys, streets or roads designed and constructed in accordance with the Green Streets guidance in the City's Storm Water Standards Manual?

   ☐ Yes; PDP exempt requirements apply ☒ No; project not exempt. PDP requirements apply

PART E: Determine if Project is a Priority Development Project (PDP). Projects that match one of the definitions below are subject to additional requirements including preparation of a Storm Water Quality Management Plan (SWQMP).

If "yes" is checked for any number in PART E, continue to PART F and check the box labeled "Priority Development Project".
If "no" is checked for every number in PART E, continue to PART F and check the box labeled "Standard Project".

1. **New Development that creates 10,000 square feet or more of impervious surfaces collectively over the project site.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land. ☒ Yes ☐ No

2. **Redevelopment project that creates and/or replaces 5,000 square feet or more of impervious surfaces on an existing site of 10,000 square feet or more of impervious surfaces.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land. ☐ Yes ☒ No

3. **New development or redevelopment of a restaurant.** Facilities that sell prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC 5812), and where the land development creates and/or replace 5,000 square feet or more of impervious surface. ☐ Yes ☒ No

4. **New development or redevelopment on a hillside.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site) and where the development will grade on any natural slope that is twenty-five percent or greater. ☒ Yes ☐ No

5. **New development or redevelopment of a parking lot that creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site).**	☐ Yes ☒ No
6. **New development or redevelopment of streets, roads, highways, freeways, and driveways.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site).	☒ Yes ☐ No
7. **New development or redevelopment discharging directly to an Environmentally Sensitive Area.** The project creates and/or replaces 2,500 square feet of impervious surface (collectively over project site), and discharges directly to an Environmentally Sensitive Area (ESA). "Discharging- directly to" includes flow that is conveyed overland a distance of 200 feet or less from the project to the ESA, or conveyed in a pipe or open channel any distance as an isolated flow from the project to the ESA (i.e. not commingled with flows from adjacent lands).	☒ Yes ☐ No
8. **New development regardless of size or redevelopment projects that create and/or replace 5,000 square feet of impervious surface of a retail gasoline outlet.** The development project meets the following criteria: (a) 5,000 square feet or more or (b) has a projected Average Daily Traffic of 100 or more vehicles per day.	☐ Yes ☒ No
9. **New development regardless of size or redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface of an automotive repair shops.** Development projects categorized in any one of Standard Industrial Classification (SIC) codes 5013, 5014, 5541, 7532-7534, or 7536-7539.	☐ Yes ☒ No
10. **Other Pollutant Generating Project.** The project is not covered in the categories above, results in the disturbance of one or more acres of land and is expected to generate pollutants post construction, such as fertilizers and pesticides. This does not include projects creating less than 5,000 sf of impervious surface and where added landscaping does not require regular use of pesticides and fertilizers, such as slope stabilization using native plants. Calculation of the square footage of impervious surface need not include linear pathways that are for infrequent vehicle use, such as emergency maintenance access or bicycle pedestrian use, if they are built with pervious surfaces of if they sheet flow to surrounding pervious surfaces.	☐ Yes ☒ No
PART F: Select the appropriate category based on the outcomes of PART C through PART E.	
1. The project is **NOT SUBJECT TO PERMANENT STORM WATER REQUIREMENTS**.	☐
2. The project is a **STANDARD PROJECT**. Site design and source control BMP requirements apply. See the Storm Water Standards Manual for guidance.	☐
3. The project is **PDP EXEMPT**. Site design and source control BMP requirements apply. See the Storm Water Standards Manual for guidance.	☐
4. The project is a **PRIORITY DEVELOPMENT PROJECT**. Site design, source control, and structural pollutant control BMP requirements apply. See the Storm Water Standards Manual for guidance on determining if project requires hydromodification management.	☒
Name of Owner or Agent *(Please Print)*: Shannon D. Davis, PE	Title: Project Engineer
Signature:	Date:

Applicability of Permanent, Post-Construction Storm Water BMP Requirements			Form I-1
Project Identification			
Project Name: Lighthouse Ridge			
Permit Application Number: PDP, SDP, VTM			Date: 07/29/2016
Determination of Requirements			
The purpose of this form is to identify permanent, post-construction requirements that apply to the project. This form serves as a short summary of applicable requirements, in some cases referencing separate forms that will serve as the backup for the determination of requirements. Answer each step below, starting with Step 1 and progressing through each step until reaching "Stop". Refer to Part 1 of Storm Water Standards sections and/or separate forms referenced in each step below.			
Step	Answer	Progression	
Step 1: Is the project a "development project"? See Section 1.3 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	☒ Yes	Go to Step 2.	
	☐ No	Stop. Permanent BMP requirements do not apply. No SWQMP will be required. Provide discussion below.	
Discussion / justification if the project is not a "development project" (e.g., the project includes only interior remodels within an existing building):			
Step 2: Is the project a Standard Project, Priority Development Project (PDP), or exception to PDP definitions? To answer this item, see Section 1.4 of the BMP Design Manual (Part 1 of Storm Water Standards) in its entirety for guidance, AND complete Storm Water Requirements Applicability Checklist.	☐ Standard Project	Stop. Standard Project requirements apply.	
	☒ PDP	PDP requirements apply, including PDP SWQMP. Go to Step 3.	
	☐ PDP Exempt	Stop. Standard Project requirements apply. Provide discussion and list any additional requirements below.	
Discussion / justification, and additional requirements for exceptions to PDP definitions, if applicable:			

Form I-1 Page 2		
Step	Answer	Progression
Step 3. Is the project subject to earlier PDP requirements due to a prior lawful approval? See Section 1.10 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	☐ Yes	Consult the City Engineer to determine requirements. Provide discussion and identify requirements below. Go to Step 4.
	☒ No	BMP Design Manual PDP requirements apply. Go to Step 4.
Discussion / justification of prior lawful approval, and identify requirements (<u>not required if prior lawful approval does not apply</u>):		
Step 4. Do hydromodification control requirements apply? See Section 1.6 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	☒ Yes	PDP structural BMPs required for pollutant control (Chapter 5) and hydromodification control (Chapter 6). Go to Step 5.
	☐ No	Stop. PDP structural BMPs required for pollutant control (Chapter 5) only. Provide brief discussion of exemption to hydromodification control below.
Discussion / justification if hydromodification control requirements do <u>not</u> apply:		
Step 5. Does protection of critical coarse sediment yield areas apply? See Section 6.2 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	☐ Yes	Management measures required for protection of critical coarse sediment yield areas (Chapter 6.2). Stop.
	☒ No	Management measures not required for protection of critical coarse sediment yield areas. Provide brief discussion below. Stop.
Discussion / justification if protection of critical coarse sediment yield areas does <u>not</u> apply: There are no existing Critical Course Sediment Yield Areas (CCSYAs) onsite or upstream per the Watershed Management Area Analysis.		

Site Information Checklist For PDPs	Form I-3B
Project Summary Information	
Project Name	Lighthouse Ridge
Project Address	North of Lighthouse Way
Assessor's Parcel Number(s) (APN(s))	304-080-01
Permit Application Number	PTS#
Project Watershed	Select One: ☒ San Dieguito River ☐ Penasquitos ☐ Mission Bay ☐ San Diego River ☐ San Diego Bay ☐ Tijuana River
Hydrologic subarea name with Numeric Identifier up to two decimal places (9XX.XX)	905.10 Solana Beach
Project Area (total area of Assessor's Parcel(s) associated with the project or total area of the right-of-way)	4.74 Acres (206,590 Square Feet)
Area to be disturbed by the project (Project Footprint)	2.86 Acres (130,701 Square Feet)
Project Proposed Impervious Area (subset of Project Footprint)	1.20 Acres (52,279 Square Feet)
Project Proposed Pervious Area (subset of Project Footprint)	1.66 Acres (72,310 Square Feet)
Note: Proposed Impervious Area + Proposed Pervious Area = Area to be Disturbed by the Project. This may be less than the Project Area.	
The proposed increase or decrease in impervious area in the proposed condition as compared to the pre-project condition.	+40.0% Impervious

Form I-3B Page 2 of 11
Description of Existing Site Condition and Drainage Patterns
Current Status of the Site (select all that apply): ☐ Existing development ☐ Previously graded but not built out ☐ Agricultural or other non-impervious use ☒ Vacant, undeveloped/natural Description / Additional Information: West half of the site has previously been disturbed for construction staging. East half of site is natural and undeveloped.
Existing Land Cover Includes (select all that apply): ☒ Vegetative Cover ☒ Non-Vegetated Pervious Areas ☐ Impervious Areas Description / Additional Information: West half of the site has been clear & grubbed with partial revegetation and east half of the site consists of native undisturbed vegetation.
Underlying Soil belongs to Hydrologic Soil Group (select all that apply): ☐ NRCS Type A ☐ NRCS Type B ☐ NRCS Type C ☒ NRCS Type D
Approximate Depth to Groundwater (GW): ☐ GW Depth < 5 feet ☐ 5 feet < GW Depth < 10 feet ☐ 10 feet < GW Depth < 20 feet ☒ GW Depth > 20 feet
Existing Natural Hydrologic Features (select all that apply): ☒ Watercourses ☐ Seeps ☐ Springs ☒ Wetlands ☐ None Description / Additional Information: There are watercourses within the site and there are identified wetlands on the eastern half of the site. The water courses are being replaced in kind, 80% of what is proposed to be disturbed; 280'. The reconstructed water course will run along the south side of the property and will be fed with clean water exiting the biofiltration pond. The water course is designed to be 3' wide and vegetated with grass with rocks and gravel at the outlet location, for dissipation.

Form I-3B Page 3 of 11

Description of Existing Site Topography and Drainage:

How is storm water runoff conveyed from the site? At a minimum, this description should answer:

1. Whether existing drainage conveyance is natural or urban;
2. If runoff from offsite is conveyed through the site? If yes, quantification of all offsite drainage areas, design flows, and locations where offsite flows enter the project site and summarize how such flows are conveyed through the site;
3. regarding existing project site drainage conveyance network, including storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, and natural and constructed channels;
4. Identify all discharge locations from the existing project along with a summary of the conveyance system size and capacity for each of the discharge locations. Provide summary of the pre-project drainage areas and design flows to each of the existing runoff discharge locations.

Description / Additional Information:

1. In the pre-development condition, the stormwater conveyance is classified as 'natural' runoff because the site is undeveloped. A majority of the runoff sheets flow easterly to a stream bed. The stream bed then navigates through open space on the site before reaching the property line at the northeast corner of the project. The remaining runoff drains to the northwest project boundary and is captured by a concrete v-ditch. Private V-ditch leads to a 12" private PVC stormdrain which carries stormwater down to Winstanley Way.

2. This project does have offsite runoff conveyed through the site. Stormwater generated from 7 privately owned lots south of the site sheet flow onto the proposed project site and into the proposed open space. This area of offsite runoff is calculated to generate a total of 1.6cfs during a 50 year storm.

   Additionally, stormwater from the existing portion of Lighthouse Way and one private lot collect in an 18" RCP stormdrain and discharge onto the proposed site south of lot 10. This is not expected to affect the design as it is an existing condition and it discharges in the open space that will not be developed. The design per Dwg No. 25746 reports that the stormdrain carries a flow of 3.05cfs for a 50 year storm.

   All offsite runoff runs through the undeveloped area, soon to be the dedicated open space and leaves the property at the northeastern corner in the stream bed.

3. Currently, most stormwater on site drains off site via sheet flow and shallow concentrated flow at the northeast corner through a seasonal stream bed. A small area of the site 0.34acres collects in a concrete V-dich and leaves the property at the northwest corner. In the proposed condition of the site, the amount leaving through the same V-ditch will be reduced to 0.1 acres, while all the remaining stormwater generated will travel offsite in the streambed at the northeast corner.

4. As described above, there are currently 2 discharge locations; an 18” RCP pipe that outlets water from the V-ditch in the northwest corner of the site, and a shallow stream bed that outlets water in the northeast corner of the site.

   A table showing pre and post project drainage areas and design flows can be viewed below. A discussion about the differences can be viewed in the drainage study, attached to this report as ‘Attachment 5’.

50 yr Peak Discharge	Ex (cfs)	Post (cfs)
POC # 1 (NW V-ditch/ 18" RCP pipe)	0.53	0
POC # 2 (NE Corner-Concentrated channel)	4.72	4.66
POC # 3 (NE Corner- Sheet flow)	0.80	0.80
Total	6.04	5.46

Form I-3B Page 4 of 11
Description of Proposed Site Development and Drainage Patterns
Project Description / Proposed Land Use and/or Activities: The proposed project will be a 10 lot subdivision with street improvements. The easterly portion of the site will be dedicated open space.
List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features): Project impervious features include the following: • Single family homes • Driveways • Sidewalks • Street
List/describe proposed pervious features of the project (e.g., landscape areas): Project pervious features include the following: • Landscaped areas • Vegetated slopes • Open space
Does the project include grading and changes to site topography? ☒ Yes ☐ No Description / Additional Information: The site will need to be re-graded in order provide pads for the subdivision lots.

Does the project include changes to site drainage (e.g., installation of new storm water conveyance systems)?

☒ Yes

☐ No

If yes, provide details regarding the proposed project site drainage conveyance network, including storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, natural and constructed channels, and the method for conveying offsite flows through or around the proposed project site. Identify all discharge locations from the proposed project site along with a summary of the conveyance system size and capacity for each of the discharge locations. Provide a summary of pre and post-project drainage areas and design flows to each of the runoff discharge locations. Reference the drainage study for detailed calculations.

Description / Additional Information:

GENERAL DESCRIPTION:

In the current condition stormwater that falls on site travels in one of two directions; a small amount of water leaves the site via a concrete v-ditch to the west while the majority of water leaves the site through the canyon to the east. The account below describes the pre and post project stormwater drainage patterns with respect to each POC.

*Note: Asterisk denotes peak discharge calculated for a 50 year storm.

POC 1 (WEST):

Pre-Project:

DMA E1: 0.34ac, 0.53cfs*

In the pre-project condition, this point of connectivity collects water from 0.34ac of undeveloped, graded, land once used for construction staging. When water falls in this area, it sheet flows off the site via the west property line. Directly abutting the west property line is a private concrete V-ditch which catches the stormwater and prevents it from traveling down the adjacent 2:1 slope. The V-ditch leads to a private 12" PVC stormdrain which outlets onto the abutting Winstanley Way through a private sidewalk underdrain per EMRA No. 871059-2 as seen on City Dwg No. 24275-D. Roughly 100' later, the water is picked up in a Type B-2 Catch Basin inlet (Dwg No 24275-D). From there, stormwater travels through an underground stormdrain system until its outlet point; into the nearby canyon about a half a mile northwest of the site.

Proposed Design:

In the proposed condition all stormwater generated on site will leave the project through the canyon on the north east property line. There will be no stormwater directed towards the existing concrete V-ditch on the west.

POC 2 (EAST):

Pre-project:

DMA E2:

On-site Stormwater 4.80ac, 4.71cfs*

In the current condition, most of the parcel drains to POC 2. Water in this DMA drains towards a stream that runs down the center of the project and then leaves the property in the northeast corner as a shallow concentrated flow. The land that feeds this water source consists of half the flat compacted pad on the west side of the site and the hilly vegetated, open space area across the middle and east portions of the site. Some water sheet flows from the neighboring southern properties as this area is steep and vegetated and no distinct property line is defined in the topography.

Off-site Stormwater, 24.67cfs*:

In addition to the stormwater generated within DMA E2, there are 3 off-site stormdrains that outlet into the vegetated edges of DMA E2. These 3 outlets, located across the southern boundary, generate roughly a combined 26cfs* of stormwater. The stormwater from these three drains meander across the site and enter the existing water course in the central portion of the property. It is in this stream that the on-site stormwater from DMA E2 and off-site stormwataer comingle. All water from DMA E2 leaves the site in the existing stream bed in the northeast corner of the property. Information on the 3 off-site stormwater flows is as follows and is labeled on the map:

1) A private 24" RCP stormdrain per Dwg No. 25746-D in a public stormdrain easement (FM No. 13005) outlets onto a rip rap pad and then travels for roughly 100' in a shallow concentrated flow before crossing into the subject property. Flowrate listed as Q50=3.08cfs.

2) A public 18" RCP stormdrain per Dwg No. 28470-D in a public stormdrain easement (18556-B) outlets onto a rip rap pad at the property boundary. It then flows onto the subject property in a shallow concentrated flow. The flowrate is listed as Q100=21.29cfs.

3) A concrete V-ditch (SDRSD D-75) catches water from behind a retaining wall that borders the southwest corner of the site. The water discharges onto riprap at the property line before discharging onto the subject property in a shallow concentrated flow. The V-ditch and associated retaining wall were built per Dwg No. 28472-D. The stormwater is listed as Q100=0.3cfs.

Proposed Design:

In the proposed condition, the land within E2 is divided into 4 DMAs. Each proposed DMA is described below.

DMA P1: 0.78ac, 0.58cfs*

Stormwater generated on proposed lots 1 & 2 will be directed towards the front of the property, into a catch basin, and routed through a storm drain into a biofiltration basin (Basin 1). The runoff from the private street will be collected into reverse curb outlets and discharged into the basin. After filtering through the biofiltration basin, water will outlet into a reconstructed, ungrouted cobblestone-lined stream bed. The reconstructed stream bed is being used to mimic the existing stream bed and is not used for treatment of the water. The stream bed will lead down a developed slope and outlet the stormwater into an existing streambed within the project's proposed dedicated open space. The ungrouted cobblestone within the stream bed will dissipate the runoff velocity to prevent erosion of soil along and around the stream bed. From this point, the water will use the pre-project course of conveyance to exit the site at POC 2; it will leave the site in a shallow concentrated flow on the northeast edge of the property.

DMA P2: 1.83 acres 1.13cfs*

Stormwater on lots 3-7 will be directed to the rear of each lot and will drain to a buried 12" PVC stormdrain. This stormdrain is proposed to run parallel to the north property line against lots 3-7. The stormdrain will sit in an HOA dedicated drainage easement. The storm drains will outlet to a 3' wide concrete v-ditch with 1.5:1 side slopes, which will lead to a biofiltration basin located at the bottom of the fill slope (Basin 2). Runoff from lots 8-10 will be directed to the back of the lots and north towards the v-ditch where it will be collected and conveyed down to the basin for treatment. From here, the stormwater will make its way off-site through the existing stream bed to the canyon in the northeast corner of the site.

DMA P3: 2.44ac, 2.58cfs*

DMA P3 is considered a self-mitigating area due to the full pervious cover. Stormwater drainage patterns and vegetation cover in the central and southern area of the parcel will not be affected by the project as this area will not be developed. Runoff from a portion of the fully vegetated proposed slope will flow down into the existing wetlands area as the existing condition did. There is no change in pre vs post conditions in this area. All three of the off-site stormwater conveyances are included in this basin. All three of the off-site stormwater conveyances can continue in their current design in an undisturbed manner.

POC 3 (EAST):

Pre-Project:

DMA E3: 0.36ac, 0.80cfs*

Stormwater that falls on 0.45 acers of land in the most northeast corner of the site sheet flows off site down a graded hillside. This flow does not become concentrated while on site. As such, there is no true POC, but a special DMA has been created to account for this flow condition.

Proposed Design:

DMA P5: 0.37cfs, 0.80cfs*

In the proposed condition this area is unchanged. No development is planned and therefore the pre and post flow rates will remain the same.

From the Site to the Ocean:

Stormwater that leaves the property at POC 2 & 3 will continue down the canyon heading north and then west. About 0.7 miles down the canyon, the piped conveyance system carrying stormwater from POC 1 joins the conveyance of the canyon. From here, the stormwater will journey through a creek, a marshy area, and lastly the San Dieguito River before entering the Pacific Ocean.

TOTAL:

In all, the proposed project will utilize new curb and gutter, (2) new biofiltration basins totalizing an area of 2525sf, (1) reconstructed stream bed, and (1) existing stream bed.

Detailed calculations, existing and proposed DMA exhibits, and further narrative on drainage basins can be viewed in the Drainage Study; attached to this report as 'Attachment 5'.

Form I-3B Page 6 of 11

Identify whether any of the following features, activities, and/or pollutant source areas will be present (select all that apply):

- ☒ On-site storm drain inlets
- ☐ Interior floor drains and elevator shaft sump pumps
- ☐ Interior parking garages
- ☒ Need for future indoor & structural pest control
- ☒ Landscape/Outdoor Pesticide Use
- ☒ Pools, spas, ponds, decorative fountains, and other water features
- ☐ Food service
- ☐ Refuse areas
- ☐ Industrial processes
- ☐ Outdoor storage of equipment or materials
- ☐ Vehicle and Equipment Cleaning
- ☐ Vehicle/Equipment Repair and Maintenance
- ☐ Fuel Dispensing Areas
- ☐ Loading Docks
- ☐ Fire Sprinkler Test Water
- ☐ Miscellaneous Drain or Wash Water
- ☒ Plazas, sidewalks, and parking lots
- ☐ Large Trash Generating Facilities
- ☐ Animal Facilities
- ☐ Plant Nurseries and Garden Centers
- ☐ Automotive-related Uses

Description / Additional Information:

Form I-3B Page 7 of 11

Identification and Narrative of Receiving Water

Narrative describing flow path from discharge location(s), through urban storm conveyance system, to receiving creeks, rivers, and lagoons and ultimate discharge location to Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable)

After proposed onsite treatment, project related runoff will be discharged to the existing on-site water courses. Water generally flows to the northeast and outlets to an existing creek north of the property. This creek flows to the west towards Interstate 5 where it crosses under the freeway via culverts. Flow continues west until it discharges into the San Dieguito Lagoon. The lagoon discharges into the San Dieguito River (impaired waterbody) which immediately feeds into the Pacific Ocean Shoreline at San Dieguito Lagoon Mouth (impaired waterbody).

Provide a summary of all beneficial uses of receiving waters downstream of the project discharge locations.

● Existing Beneficial Use
○ Potential Beneficial Use
+ Except from Municipal Use

Beneficial Use

Receiving Water (Hydrologic Unit Code)	MUN	ARG	IND	PROC	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	AQUA	SPWN	MIGR	SHELL
San Dieguito River (905.11)	●	●	●	●	●	●	●	●	●	●	●		●		

Receiving Water (Hydrologic Unit Code)	IND	NAV	REC1	REC2	COMM	BIOL	MUN	WILD	RARE	MAR	AQUA	MIGR	SPWN	WARM	SHELL
Pacific Ocean Shoreline at San Dieguito Lagoon Mouth (905.11)	●	●	●	●	●	●		●	●	●	●	●	●		●

Identify all ASBS (areas of special biological significance) receiving waters downstream of the project discharge locations.

No areas of ASBS have been identified for this project.

Provide distance from project outfall location to impaired or sensitive receiving waters.

From the project discharge location, the San Dieguito River lies downstream 2.9 miles.

Summarize information regarding the proximity of the permanent, post-construction storm water BMPs to the City's Multi-Habitat Planning Area and environmentally sensitive lands

There are existing environmentally sensitive lands within the Lighthouse Ridge property. Biofiltration basins are proposed in order to treat runoff before discharging to environmentally sensitive lands. The environmentally sensitive lands are approximately 300' downstream from treatment sources.

Form I-3B Page 8 of 11		
Identification of Receiving Water Pollutants of Concern		
List any 303(d) impaired water bodies within the path of storm water from the project site to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable), identify the pollutant(s)/stressor(s) causing impairment, and identify any TMDLs and/or Highest Priority Pollutants from the WQIP for the impaired water bodies:		
303(d) Impaired Water Body	Pollutant(s)/Stressor(s)	TMDLs/ WQIP Highest Priority Pollutant
San Dieguito River	Benthic Community Effects/Enterococcus/Fecal Coliform/Nitrogen/Phosphorus/ Total Dissolved Solids/Toxicity	N/A
Pacific Ocean Shoreline at San Dieguito Lagoon Mouth	Enterococcus/Fecal Coliform/ Total Coliform	N/A

Identification of Project Site Pollutants*			
*Identification of project site pollutants is only required if flow-thru treatment BMPs are implemented onsite in lieu of retention or biofiltration BMPs (note the project must also participate in an alternative compliance program unless prior lawful approval to meet earlier PDP requirements is demonstrated) Identify pollutants anticipated from the project site based on all proposed use(s) of the site (see BMP Design Manual (Part 1 of Storm Water Standards) Appendix B.6):			
Pollutant	Not Applicable to the Project Site	Anticipated from the Project Site	Also a Receiving Water Pollutant of Concern
Sediment			
Nutrients			
Heavy Metals			
Organic Compounds			
Trash & Debris			
Oxygen Demanding Substances			
Oil & Grease			
Bacteria & Viruses			
Pesticides			

The subject project proposed biofiltration BMPs. No flow-thru treatment BMPs are proposed. Section not completed.

Form I-3B Page 9 of 11
Hydromodification Management Requirements
Do hydromodification management requirements apply (see Section 1.6 of the BMP Design Manual)? ☒ Yes, hydromodification management flow control structural BMPs required. ☐ No, the project will discharge runoff directly to existing underground storm drains discharging directly to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean. ☐ No, the project will discharge runoff directly to conveyance channels whose bed and bank are concrete-lined all the way from the point of discharge to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean. ☐ No, the project will discharge runoff directly to an area identified as appropriate for an exemption by the WMAA for the watershed in which the project resides. Description / Additional Information (to be provided if a 'No' answer has been selected above):
Critical Coarse Sediment Yield Areas* *This Section only required if hydromodification management requirements apply
Based on Section 6.2 and Appendix H does CCSYA exist on the project footprint or in the upstream area draining through the project footprint? ☐ Yes ☒ No Discussion / Additional Information: There are no existing Course Sediment Yield Areas (CCYAs) onsite or upstream.

Form I-3B Page 10 of 11
Flow Control for Post-Project Runoff* *This Section only required if hydromodification management requirements apply
List and describe point(s) of compliance (POCs) for flow control for hydromodification management (see Section 6.3.1). For each POC, provide a POC identification name or number correlating to the project's HMP Exhibit and a receiving channel identification name or number correlating to the project's HMP Exhibit. The project will have three points of compliance described as follows: • POC #1 is an existing water course/stream bed that meanders through the site and off of the property in the north east corner. In the proposed condition of the project, stormwater will enter this watercourse at the edge of the development. Stormwater will travel in the water course through the designated open space and exit the property in the existing water course. • POC #2 is an area of the site where, due to the natural drainage pattern, water sheet flows off the property in the northeast corner. This area of the property is not within the project boundary and will be dedicated as open space. Therefore, the drainage will remain as-is in the proposed condition. • POC #3 is 0.45 acers of land in the most northeast corner of the site that sheet flows off site down a graded hillside. This flow does not become concentrated while on site. As such, there is no true POC, but a special DMA has been created to account for this flow condition.
Has a geomorphic assessment been performed for the receiving channel(s)? ☒ No, the low flow threshold is 0.1Q2 (default low flow threshold) ☐ Yes, the result is the low flow threshold is 0.1Q2 ☐ Yes, the result is the low flow threshold is 0.3Q2 ☐ Yes, the result is the low flow threshold is 0.5Q2 If a geomorphic assessment has been performed, provide title, date, and preparer:
Discussion / Additional Information: (optional)

Form I-3B Page 11 of 11

Other Site Requirements and Constraints

When applicable, list other site requirements or constraints that will influence storm water management design, such as zoning requirements including setbacks and open space, or local codes governing minimum street width, sidewalk construction, allowable pavement types, and drainage requirements.

Optional Additional Information or Continuation of Previous Sections as Needed

Site layout played a large role in the design and placement of the site drainage. The most developable land is on top of the hill on the west side of the project. All development was located here as to not disrupt the open space on the east side of the parcel.

Because the development is at the top of the hill to the west, and the stormwater outlet locations are at the bottom of the hill to the east, biofiltration basins were placed east of their receiving source and at a lower elevation. To meet the square footage requirement for biofiltration basins while accommodating elevation fall and minimizing the development footprint, treatment was broken into 2 basins which are located at different areas across the site.

The required size of the biofiltration basins were calculated taking into consideration the amount of pervious surfaces such as grass and open space, and the amount of impervious surfaces, such as roofs, sidewalks, and asphalt roads.

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Source Control BMP Checklist for All Development Projects			Form I-4
Source Control BMPs			
All development projects must implement source control BMPs SC-1 through SC-6 where applicable and feasible. See Chapter 4 and Appendix E of the BMP Design Manual (Part 1 of the Storm Water Standards) for information to implement source control BMPs shown in this checklist. Answer each category below pursuant to the following. • "Yes" means the project will implement the source control BMP as described in Chapter 4 and/or Appendix E of the BMP Design Manual. Discussion / justification is not required. • "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided. • "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project has no outdoor materials storage areas). Discussion / justification may be provided.			
Source Control Requirement	Applied?		
SC-1 Prevention of Illicit Discharges into the MS4	☒ Yes	☐ No	☐ N/A
Discussion / justification if SC-1 not implemented:			
SC-2 Storm Drain Stenciling or Signage	☒ Yes	☐ No	☐ N/A
Discussion / justification if SC-2 not implemented:			
SC-3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☒ N/A
Discussion / justification if SC-3 not implemented: The proposed project does not include outdoor material storage.			
SC-4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☒ N/A
Discussion / justification if SC-4 not implemented: The proposed project does not include outdoor work area.			
SC-5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☒ Yes	☐ No	☐ N/A
Discussion / justification if SC-5 not implemented:			

Form I-4 Page 2 of 2			
Source Control Requirement	**Applied?**		
SC-6 Additional BMPs Based on Potential Sources of Runoff Pollutants (must answer for each source listed below)			
On-site storm drain inlets	☐ Yes	☐ No	☒ N/A
Interior floor drains and elevator shaft sump pumps	☐ Yes	☐ No	☒ N/A
Interior parking garages	☐ Yes	☐ No	☒ N/A
Need for future indoor & structural pest control	☒ Yes	☐ No	☐ N/A
Landscape/Outdoor Pesticide Use	☒ Yes	☐ No	☐ N/A
Pools, spas, ponds, decorative fountains, and other water features	☐ Yes	☐ No	☒ N/A
Food service	☐ Yes	☐ No	☒ N/A
Refuse areas	☐ Yes	☐ No	☒ N/A
Industrial processes	☐ Yes	☐ No	☒ N/A
Outdoor storage of equipment or materials	☐ Yes	☐ No	☒ N/A
Vehicle/Equipment Repair and Maintenance	☐ Yes	☐ No	☒ N/A
Fuel Dispensing Areas	☐ Yes	☐ No	☒ N/A
Loading Docks	☐ Yes	☐ No	☒ N/A
Fire Sprinkler Test Water	☐ Yes	☐ No	☒ N/A
Miscellaneous Drain or Wash Water	☐ Yes	☐ No	☒ N/A
Plazas, sidewalks, and parking lots	☒ Yes	☐ No	☐ N/A
SC-6A: Large Trash Generating Facilities	☐ Yes	☐ No	☒ N/A
SC-6B: Animal Facilities	☐ Yes	☐ No	☒ N/A
SC-6C: Plant Nurseries and Garden Centers	☐ Yes	☐ No	☒ N/A
SC-6D: Automotive-related Uses	☐ Yes	☐ No	☒ N/A
Discussion / justification if SC-6 not implemented. Clearly identify which sources of runoff pollutants are discussed. Justification must be provided for <u>all</u> "No" answers shown above.			

Source Control BMP Checklist for All Development Projects	Form I-5		
Site Design BMPs			

All development projects must implement site design BMPs SD-1 through SD-8 where applicable and feasible. See Chapter 4 and Appendix E of the BMP Design Manual (Part 1 of Storm Water Standards) for information to implement site design BMPs shown in this checklist.

Answer each category below pursuant to the following.

- "Yes" means the project will implement the site design BMP as described in Chapter 4 and/or Appendix E of the BMP Design Manual. Discussion / justification is not required.
- "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided.
- "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project site has no existing natural areas to conserve). Discussion / justification may be provided.

A site map with implemented site design BMPs must be included at the end of this checklist.

Site Design Requirement	Applied?		
SD-1 Maintain Natural Drainage Pathways and Hydrologic Features	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-1 not implemented: The project proposes to disturb almost half of the parcel and associated natural drainage pathways. In response to this disturbance, stream restoration areas and bio filtration basins are being implemented in the design. The biofiltration basins will treat storm water and the streambed restoration will be used to replace a portion (66%) of the water courses affected by the development.			
1-1 Are existing natural drainage pathways and hydrologic features mapped on the site map?	☒ Yes	☐ No	
1-2 Are trees implemented? If yes, are they shown on the site map?	☒ Yes	☐ No	
1-3 Implemented trees meet the design criteria in SD-1 Fact Sheet (e.g. soil volume, maximum credit, etc.)?	☐ Yes	☒ No	
1-4 Is tree credit volume calculated using Appendix B.2.2.1 and SD-1 Fact Sheet in Appendix E?	☐ Yes	☒ No	
SD-2 Have natural areas, soils and vegetation been conserved?	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-2 not implemented:			

Form I-5 Page 2 of 4			
Site Design Requirement	Applied?		
SD-3 Minimize Impervious Area	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-3 not implemented:			
SD-4 Minimize Soil Compaction	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-4 not implemented:			
SD-5 Impervious Area Dispersion	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-5 not implemented:			
5-1 Is the pervious area receiving runon from impervious area identified on the site map?	☒ Yes	☐ No	
5-2 Does the pervious area satisfy the design criteria in SD-5 Fact Sheet in Appendix E (e.g. maximum slope, minimum length, etc.)	☒ Yes	☐ No	
5-3 Is impervious area dispersion credit volume calculated using Appendix B.2.1.1 and SD-5 Fact Sheet in Appendix E?	☒ Yes	☐ No	

Form I-5 Page 3 of 4			
Site Design Requirement	Applied?		
SD-6 Runoff Collection	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-6 not implemented:			
6a-1 Are green roofs implemented in accordance with design criteria in SD-6A Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☒ No	
6a-2 Is green roof credit volume calculated using Appendix B.2.1.2 and SD-6A Fact Sheet in Appendix E?	☐ Yes	☐ No	
6b-1 Are permeable pavements implemented in accordance with design criteria in SD-6B Fact Sheet? If yes, are they shown on the site	☐ Yes	☒ No	
6b-2 Is permeable pavement credit volume calculated using Appendix B.2.1.3 and SD-6B Fact Sheet in Appendix E?	☐ Yes	☐ No	
SD-7 Landscaping with Native or Drought Tolerant Species	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-7 not implemented:			
SD-8 Harvesting and Using Precipitation	☐ Yes	☐ No	☒ N/A
Discussion / justification if SD-8 not implemented: Per the included harvest and use worksheet harvest and use demand is limited and is considered infeasible for the project.			
8-1 Are rain barrels implemented in accordance with design criteria in SD-8 Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☒ No	
8-2 Is rain barrel credit volume calculated using Appendix B.2.2.2 and SD-8 Fact Sheet in Appendix E?	☐ Yes	☒ No	

Form I-5 Page 4 of 4
Insert Site Map with all site design BMPs identified:
(PVT.)

Summary of PDP Structural BMPs	Form I-6

PDP Structural BMPs

All PDPs must implement structural BMPs for storm water pollutant control (see Chapter 5 of the BMP Design Manual, Part 1 of Storm Water Standards). Selection of PDP structural BMPs for storm water pollutant control must be based on the selection process described in Chapter 5. PDPs subject to hydromodification management requirements must also implement structural BMPs for flow control for hydromodification management (see Chapter 6 of the BMP Design Manual). Both storm water pollutant control and flow control for hydromodification management can be achieved within the same structural BMP(s).

PDP structural BMPs must be verified by the City at the completion of construction. This includes requiring the project owner or project owner's representative to certify construction of the structural BMPs (complete Form DS-563). PDP structural BMPs must be maintained into perpetuity (see Chapter 7 of the BMP Design Manual).

Use this form to provide narrative description of the general strategy for structural BMP implementation at the project site in the box below. Then complete the PDP structural BMP summary information sheet (page 3 of this form) for each structural BMP within the project (copy the BMP summary information page as many times as needed to provide summary information for each individual structural BMP).

Describe the general strategy for structural BMP implementation at the site. This information must describe how the steps for selecting and designing storm water pollutant control BMPs presented in Section 5.1 of the BMP Design Manual were followed, and the results (type of BMPs selected). For projects requiring hydromodification flow control BMPs, indicate whether pollutant control and flow control BMPs are integrated or separate.

The unmitigated Design Capture Volume (DCV) for the proposed project has been calculated to be 2,729 ft^3. Based on the calculated DCV the following steps for selecting storm water pollutant control BMPs and hydromodification flow control BMPs, as presented in Section 5.1 of the BMP Design Manual, were followed:

Step 1. A portion of the site (3.08ac) is considered self-mitigating as it is undeveloped land and will be dedicated as open space. The rest of the site (2.86ac) will generate stormwater that needs to be treated.

Step 2. Per the included Harvest and Use feasibility screening the proposed project is considered to be infeasible for harvest and use.

Step 3. Per the Geotechnical Investigation, "full and partial infiltration is infeasible on this site". Based on this condition, the proposed project has selected PR-1: Biofiltration with Partial Retention to mitigate for pollutant control requirements.

Biofiltration basins will be sized for both pollution control and hydromodification. Sizing calculations for the biofiltration basins were performed using Storm Water Management Modeling.

(Continue on page 2 as necessary.)

Form I-6 Page 2 of 8
(Page reserved for continuation of description of general strategy for structural BMP implementation at the site)
(Continued from page 1) **Step 4.** Biofiltration basins have been placed to intercept the runoff from the proposed design. Two basins have been designed to collect water from different areas of the site.

Form I-6 Page 3 of 8 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No.	IMP #1
Construction Plan Sheet No.	Sheet 2

Type of structural BMP:

- ☐ Retention by harvest and use (HU-1)
- ☐ Retention by infiltration basin (INF-1)
- ☐ Retention by bioretention (INF-2)
- ☐ Retention by permeable pavement (INF-3)
- ☒ Partial retention by biofiltration with partial retention (PR-1)
- ☐ Biofiltration (BF-1)
- ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (Provide BMP type / Description in discussion section below
- ☐ Flow-thru treatment control included as pre-treatment / forebay for an onsite retention or biofiltration BMP (provide BMP type / description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
- ☐ Flow-thru treatment control with alternative compliance (provide BMP type / description in discussion section below
- ☐ Detention pond of vault for hydromodification management
- ☐ Other (describe in discussion section below)

Purpose:

- ☐ Pollutant control only
- ☐ Hydromodification control only
- ☒ Combined pollutant control and hydromodification control
- ☐ Pre-treatment / forebay for another structural BMP
- ☐ Other (describe in discussion section below

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Matthew J. Semic, PE | RCE 54564 Latitude 33 Planning & Engineering 9968 Hibert Street Second Floor San Diego, CA 92131 (858) 751-0633
Who will be the final owner of this BMP?	Pacific Legacy Homes
Who will maintain this BMP into perpetuity?	Pacific Legacy Homes
What is the funding mechanism for maintenance?	Storm Water Maintenance Agreement with Pacific Legacy Homes

Form I-6 Page 4 of 8 (Copy as many as needed)	
Structural BMP ID No.	IMP #1
Construction Plan Sheet No.	Sheet 2

Discussion (as needed):

BMP #1s will consist of a PR-1 Proprietary Biofiltration basin for pollutant control and hydromodification mitigation. Biofiltration basins will include 10-inches of surface ponding, an 18-inch amended soil layer and a 24-inch deep gravel storage layer with a perforated pipe underdrain. Larger flow events will be collected by an 18-inch diameter overflow inlet in basin and will be safely bypassed to the storm drain system.

Using the Figure B.5-2 Volume Retention Performance Standard for Partial Infiltration Condition and Figure B.5-3 Fraction of DCV versus Average Annual Capture of the BMP Design Manual the alternative DCV fraction retained was calculated to be 0.09. Using the field infiltration rate of 0.09 in/hr in Figure B.5-2, the percent average annual retention is 14. Then using the 14% average annual capture in Figure B.5-3, the fraction of DCV is 0.09. The Figures can be found in Attachment 1.

Required Treatment Area = 685 sf
BMP #1 = **1,170 sf > 685 sf OK**

Form I-6 Page 5 of 8 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. IMP #2	
Construction Plan Sheet No. Sheet 2	
Type of structural BMP: ☐ Retention by harvest and use (HU-1) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☒ Partial retention by biofiltration with partial retention (PR-1) ☐ Biofiltration (BF-1) ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (Provide BMP type / Description in discussion section below ☐ Flow-thru treatment control included as pre-treatment / forebay for an onsite retention or biofiltration BMP (provide BMP type / description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type / description in discussion section below ☐ Detention pond of vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ☒ Combined pollutant control and hydromodification control ☐ Pre-treatment / forebay for another structural BMP ☐ Other (describe in discussion section below	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Matthew J. Semic, PE | RCE 54564 Latitude 33 Planning & Engineering 9968 Hibert Street Second Floor San Diego, CA 92131 (858) 751-0633
Who will be the final owner of this BMP?	Pacific Legacy Homes
Who will maintain this BMP into perpetuity?	Pacific Legacy Homes
What is the funding mechanism for maintenance?	Storm Water Maintenance Agreement with Pacific Legacy Homes

Form I-6 Page 6 of 8 (Copy as many as needed)	
Structural BMP ID No.	IMP #2
Construction Plan Sheet No.	Sheet 2

Discussion (as needed):

BMP #2 will consist of a PR-1 Proprietary Biofiltration basin for pollutant control and hydromodification mitigation. Biofiltration basin will include 10-inches of surface ponding, an 18-inch amended soil layer and a 30-inch deep gravel storage layer with a perforated pipe underdrain. Larger flow events will be collected by an 18-inch diameter overflow inlet in the basin and will be bypassed into the wetlands.

Using the Figure B.5-2 Volume Retention Performance Standard for Partial Infiltration Condition and Figure
Using the Figure B.5-2 Volume Retention Performance Standard for Partial Infiltration Condition and Figure
B.5-3 Fraction of DCV versus Average Annual Capture of the BMP Design Manual the alternative DCV fraction retained was calculated to be 0.09. Using the field infiltration rate of 0.09 in/hr in Figure B.5-2, the percent average annual retention is 14. Then using the 14% average annual capture in Figure B.5-3, the fraction of DCV is 0.09. The Figures can be found in Attachment 1.

Required Treatment Area = 1335 sf
BMP #3 = **1,355 sf > 1335 sf OK**

City of San Diego **Development Services** 1222 First Ave., MD-302 San Diego, CA 92101 (619) 446-5000	**Permanent BMP Construction** **Self Certification Form**	FORM DS-563 January 2016

THE CITY OF SAN DIEGO

Date Prepared:	Project No.:
Project Applicant:	Phone:
Project Address:	
Project Engineer:	Phone:

The purpose of this form is to verify that the site improvements for the project, identified above, have been constructed in conformance with the approved Storm Water Quality Management Plan (SWQMP) documents and drawings.

This form must be completed by the engineer and submitted prior to final inspection of the construction permit. Completion and submittal of this form is required for all new development and redevelopment projects in order to comply with the City's Storm Water ordinances and NDPES Permit Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100. Final inspection for occupancy and/or release of grading or public improvement bonds may be delayed if this form is not submitted and approved by the City of San Diego.

CERTIFICATION:
As the professional in responsible charge for the design of the above project, I certify that I have inspected all constructed Low Impact Development (LID) site design, source control and structural BMP's required per the approved SWQMP and Construction Permit No.________________________; and that said BMP's have been constructed in compliance with the approved plans and all applicable specifications, permits, ordinances and Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100 of the San Diego Regional Water Quality Control Board.

I understand that this BMP certification statement does not constitute an operation and maintenance verification.

Signature: ______________________________

Date of Signature: ______________________________

Printed Name: ______________________________

Title: ______________________________

Phone No. ______________________________

Engineer's Stamp

DS-563 (01-16)

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ATTACHMENT 1
BACKUP FOR PDP POLLUTANT CONTROL BMPS

This is the cover sheet for Attachment 1.

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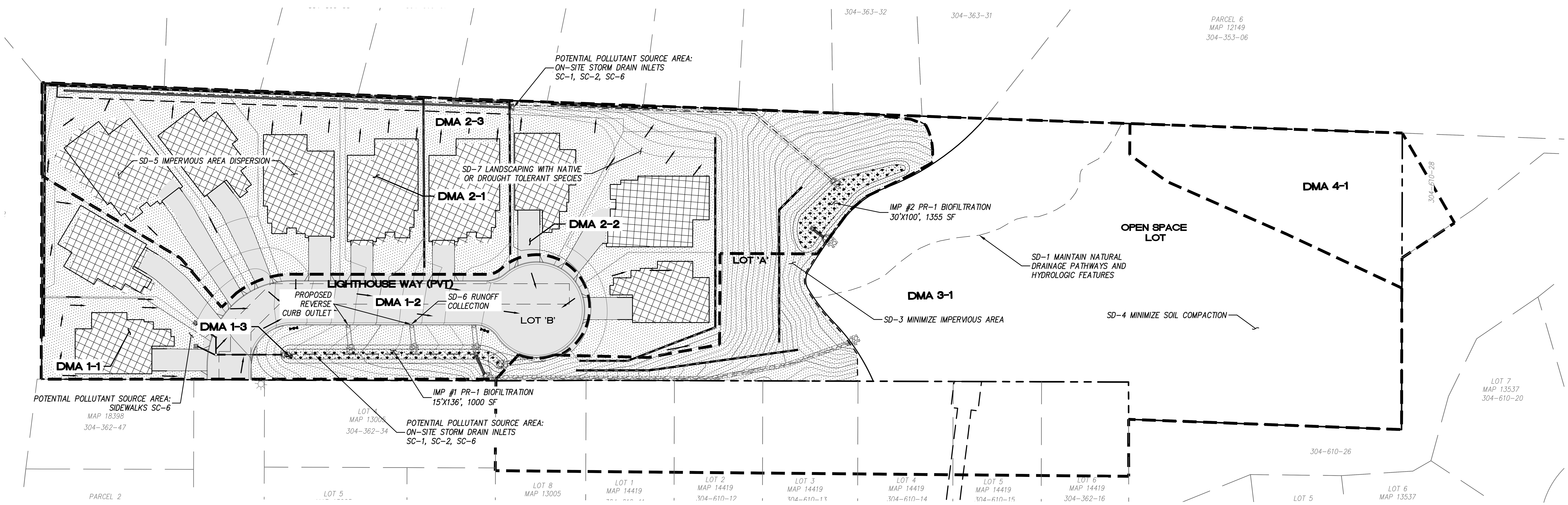
Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 1a	DMA Exhibit (Required) See DMA Exhibit Checklist.	☒ Included
Attachment 1b	Tabular Summary of DMAs Showing DMA ID matching DMA Exhibit, DMA Area, and DMA Type (Required)* *Provide table in this Attachment OR on DMA Exhibit in Attachment 1a	☒ Included on DMA Exhibit in Attachment 1a ☐ Included as Attachment 1b, separate from DMA Exhibit
Attachment 1c	Form I-7, Harvest and Use Feasibility Screening Checklist (Required unless the entire project will use infiltration BMPs) Refer to Appendix B.3-1 of the BMP Design Manual to complete Form I-7.	☒ Included ☐ Not included because the entire project will use infiltration BMPs
Attachment 1d	Form I-8, Categorization of Infiltration Feasibility Condition (Required unless the project will use harvest and use BMPs) Refer to Appendices C and D of the BMP Design Manual to complete Form I-8.	☒ Included ☐ Not included because the entire project will use harvest and use BMPs
Attachment 1e	Pollutant Control BMP Design Worksheets / Calculations (Required) Refer to Appendices B and E of the BMP Design Manual for structural pollutant control BMP design guidelines and site design credit calculations	☒ Included

Use this checklist to ensure the required information has been included on the DMA Exhibit:

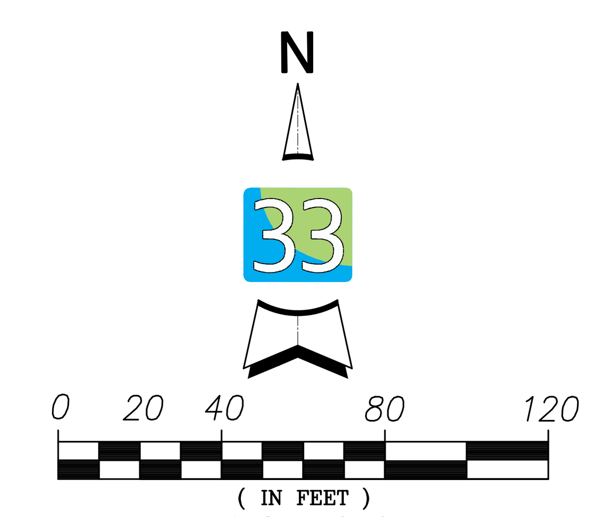
The DMA Exhibit must identify:

- ☒ Underlying hydrologic soil group
- ☒ Approximate depth to groundwater
- ☒ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
- ☒ Critical coarse sediment yield areas to be protected
- ☒ Existing topography and impervious areas
- ☒ Existing and proposed site drainage network and connections to drainage offsite
- ☒ Proposed grading
- ☒ Proposed impervious features
- ☒ Proposed design features and surface treatments used to minimize imperviousness
- ☒ Drainage management area (DMA) boundaries, DMA ID numbers, and DMA areas (square footage or acreage), and DMA type (i.e., drains to BMP, self-retaining, or self-mitigating)
- ☒ Potential pollutant source areas and corresponding required source controls (see Chapter 4, Appendix E.1, and Form I-3B)
- ☒ Structural BMPs (identify location, type of BMP, and size/detail)



LIGHTHOUSE RIDGE

1" = 40'



DMA SUMMARY TABLE

BMP #1 - TREATMENT AREA		
NAME	AREA (SF)	PROPOSED SURFACE
DMA 1-1	4,942	IMPERVIOUS BUILDING
DMA 1-2	14,919	IMPERVIOUS HARDSCAPE
DMA 1-3	14,235	PERVIOUS LANDSCAPE
TOTAL AREA	34,096	
BMP #2 - TREATMENT AREA		
NAME	AREA (SF)	PROPOSED SURFACE
DMA 3-1	24,822	IMPERVIOUS BUILDING
DMA 3-2	5,836	IMPERVIOUS HARDSCAPE
DMA 3-3	48,844	PERVIOUS LANDSCAPE
TOTAL AREA	79,502	
SELF-MITIGATING AREA #3		
NAME	AREA (SF)	PROPOSED SURFACE
DMA 4-1	106,465	PERVIOUS LANDSCAPE
TOTAL AREA	106,465	
SELF-MITIGATING AREA #4		
NAME	AREA (SF)	PROPOSED SURFACE
DMA 5-1	16,004	PERVIOUS LANDSCAPE
TOTAL AREA	16,004	

AREA SUMMARY TABLE

	EXISTING CONDITION	PROPOSED CONDITION	DIFFERENCE
IMPERVIOUS AREA	0 SF (0.00 AC) - 0%	51,694 SF (1.19 AC) - 19%	+51,694 SF
PERVIOUS AREA	239,837 (5.51 AC) - 85%	188,143 SF (4.32 AC) - 81%	-51,694 SF
TOTAL AREA	239,837 SF (5.51 AC)	239,837 SF (5.51 AC)	---

LEGEND

- PROJECT BOUNDARY
- SHEET FLOW PATH
- CONCENTRATED FLOW PATH
- EXISTING WATERCOURSE
- WATERSHED BOUNDARY
- BF-1 BIOFILTRATION BASIN
- IMPERVIOUS HARDSCAPE
- PERVIOUS LANDSCAPE
- IMPERVIOUS BUILDING
- SD — PROPOSED PRIVATE STORM DRAIN
- EXISTING PRIVATE STORM DRAIN

PROPOSED SITE INFORMATION

PROPOSED DRAINAGE: LOT AND STREET RUNOFF WILL BE DIVERTED TO PROPOSED ON-SITE BIOFILTRATION BASINS. TREATED RUNOFF WILL THEN BE CONVEYED BY A SWALE TO EXISTING DRAINAGE PATTERNS.

PROPOSED GRADING: SHOWN HEREON.

PROPOSED IMPERVIOUS FEATURES: SHOWN HEREON.

PROPOSED DRAINAGE: SHOWN HEREON.

PROPOSED DESIGN FEATURES: SITE DESIGN REQUIREMENTS SHOWN HEREON. SEE FORM I-4 FOR EXPLANATION.

DRAINAGE MANAGEMENT AREAS: SHOWN HEREON.

PROPOSED DRAINAGE AREA TO EACH POC: SHOWN HEREON.

STRUCTURAL BMPS: PR-1 BIOFILTRATION WITH PARTIAL INFILTRATION SHOWN HEREON.

EXISTING SITE INFORMATION

HYDROLOGIC SOIL GROUP: "D"

GROUNDWATER: N/A

EXISTING NATURAL HYDROLOGIC FEATURES: EXISTING SITE CONTAINS WATERCOURSES AND WETLANDS.

CRITICAL COARSE SEDIMENT YIELD AREAS: NO CRITICAL COARSE SEDIMENT YIELD AREAS (CCSYAS) EXIST ONSITE OR UPSTREAM. NO PROTECTION OF CCSYAS REQUIRED.

EXISTING TOPOGRAPHY: EXISTING TOPOGRAPHY SHOWN HEREON.

EXISTING DRAINAGE: EXISTING LOT PRIMARILY SHEET FLOWS WESTERLY THEN CATCHING A STEEP SLOPE AND ENTERING A WATERCOURSE THROUGH WETLANDS BEFORE EXITING THE SITE IN THE NORTHEAST CORNER.

POST-CONSTRUCTION BMP NOTES

- ANY MODIFICATION(S) TO THE PERMANENT POST CONSTRUCTION BMP DEVICES/STRUCTURE SHOWN ON PLAN REQUIRES A CONSTRUCTION CHANGE TO BE PROCESSED AND APPROVED THOUGH DEVELOPMENT SERVICE DEPARTMENT BY THE ENGINEERING OF WORK. APPROVAL OF THE CONSTRUCTION CHANGE IS REQUIRED PRIOR TO CONSTRUCTION OF THE PERMANENT BMP.

SITE MAP NOTES

- NO MATERIALS TO BE EXPOSED TO STORMWATER RUNOFF
- NO BUILDING OR POLLUTANT GENERATING ACTIVITY AREAS ARE PROPOSED (FUELING, GARAGES, WASTE CONTAINERS, WASH RACKS, HAZARDOUS MATERIALS)
- NO EXISTING DRINKING WATER WELLS

SHEET 1 OF 1

LIGHTHOUSE WAY
DMA EXHIBIT

SCALE: 1" = 40'
DATE: 05/10/2018
JOB NO.: 1380.00
DRAWN BY: MJL
CHECKED BY: MJS

latitude 33
PLANNING & ENGINEERING
9968 Hibert Street 2nd Floor, San Diego, CA 92131
Tel 858.751.0633

H:\1300\1380.00 - LIGHTHOUSE WAY\ENGINEERING\REPORTS\WATER QUALITY\APPENDIX\ATTACHMENT 1\ATTACHMENT 1A & 1B - DMA EXHIBIT\1380.00 DMA EXHIBIT.DWG

<table>
<tr><th colspan="2">Harvest and Use Feasibility Screening</th><th>Form I-7</th></tr>
<tr><td colspan="3">1. Is there a demand for harvested water (check all that apply) at the project site that is reliably present during the wet season?
☒ Toilet and urinal flushing
☒ Landscape Irrigation
☐ Other: _______________</td></tr>
<tr><td colspan="3">2. If there is a demand; estimate the anticipated average wet season demand over a period of 36 hours. Guidance for planning level demand calculations for toilet/urinal flushing and landscape irrigation is provided in Section B.3.2.
Residential:
This is a new development which will employ the use of low-flow toilets therefore:
Total use = (9.3 gallons/resident-day)*(55 residents) = (511.5 gallons/day)
(511.5 gallons/day)*1.5 = 767.3 gallons 36 hour demand
(767.3 gallons)*(1 cubic foot/7.48 gallons) => 36 Hour Demand = 102.6 Cubic Feet
Landscape Irrigation:
Assume moderate plant water use from Table B.3-3: 1,470 gallons per irrigated acre per 36 hour period
(1,470 gallons/acre irrigated)*(1.07 acres irrigated) = 1,573 gallon 36 hour demand
(1,573 gallons)*(1 cubic foot/7.48 gallons) => 36 Hour Demand = 210.3 Cubic Feet

Total 36 Hour Demand = 102.6 ft^3 + 210.3 ft^3 = <u>312.9 Cubic Feet</u></td></tr>
<tr><td colspan="3">3. Calculate the DCV using worksheet B-2.1.
DCV = 2,729 cubic feet > 312.9 cubic feet
0.25 DCV = 682.3 cubic feet > 312.9 cubic feet</td></tr>
<tr><td>3a. Is the 36-hour demand greater than or equal to the DCV?
Yes / No ➡
⇩</td><td>3b. Is the 36-hour demand greater than 0.25 DCV but less than the full DCV?
Yes / No ➡
⇩</td><td>3c. Is the 36-hour demand less than 0.25DCV?
Yes
⬇</td></tr>
<tr><td>Harvest and use appears to be feasible. Conduct more detailed evaluation and sizing calculations to confirm that DCV can be used at an adequate rate to meet drawdown criteria.</td><td>Harvest and use may be feasible. Conduct more detailed evaluation and sizing calculations to determine feasibility. Harvest and use may only be able to be used for a portion of the site, or (optionally) the storage may need to be upsized to meet long term capture targets while draining in longer than 36 hours.</td><td>Harvest and use is considered to be infeasible.</td></tr>
<tr><td colspan="3">Is harvest and use feasible based on further evaluation?
☐ Yes, refer to appendix E to select and size harvest and use BMPs
☒ No, select alternate BMPs</td></tr>
</table>

Categorization of Infiltration Feasibility Condition		Form I-8	
Part 1 - Full Infiltration Feasibility Screening Criteria Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?			
Criteria	Screening Question	Yes	No
1	Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.	☐	☒
Provide basis: The geotechnical engineer performed 4 infiltration tests in the Mission Valley formation. The results of the infiltration tests show rates ranging from 0.004 to 0.17 inches per hour with an average of 0.12 inches per hour. This shows the soil has very slow infiltration characteristics. Full infiltration is considered infeasible. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
2	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	☐	☒
Provide basis: The site underlain by dense formational soil of the Mission Valley Formation. It is the geotechnical engineer's opinion, considering the proximity of the proposed basins to the adjacent properties and the high probability for uncontrolled lateral water migration, that infiltration could impact adjacent slopes and properties. Therefore, full infiltration is considered infeasible. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			

<table>
<tr><th colspan="4">Form I-8 Page 2 of 4</th></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>3</td><td>Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>☒</td><td>☐</td></tr>
<tr><td colspan="4">Provide basis:

Groundwater is assumed to be in excess of 50 feet below the proposed basin locations.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>4</td><td>Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>☒</td><td>☐</td></tr>
<tr><td colspan="4">Provide basis:

Infiltration is not anticipated to have a negative impact on nearby water balance or discharge of contaminated groundwater to surface waters.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>Part 1 Result*</td><td colspan="2">If all answers to rows 1 - 4 are “Yes” a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration

If any answer from row 1-4 is “No”, infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a “full infiltration” design. Proceed to Part 2</td><td></td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

Form I-8 Page 3 of 4

Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria
Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
5	Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.	☒	☐

Provide basis:

The unfactored infiltration rates are:

A1: 0.09 in/hr
A2: 0.17 in/hr
A3: 0.09 in/hr
A4: 0.004 in/hr

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

Criteria	Screening Question	Yes	No
6	Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	☒ Limited	☐

Provide basis:

At the proposed basin locations, infiltration is considered infeasible due to the proximity of the adjacent residences and slopes, and the high potential for uncontrolled lateral water migration. Additionally, the preliminary plan shows the construction of a fill slope at the east side of the site. Based on our slope stability analysis, the slope will have a factor of safety less than 1.5 under saturated conditions for deep seated failure.

The natural land in the open space area on the east side of the site, east of proposed fill slopes, may be suitable for partial infiltration, provided infiltration basins are located beyond the toe of proposed fill slopes.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

Form I-8 Page 4 of 4			
Criteria	Screening Question	Yes	No
7	Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	☒	☐
Provide basis: Groundwater is assumed to be in excess of 50 feet below the proposed basin locations. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
8	Can infiltration be allowed without violating downstream water rights? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	☒	☐
Provide basis: Infiltration is not anticipated to have a negative impact on nearby water balance or discharge of contaminated groundwater to surface waters. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
Part 2 Result*	If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration. If any answer from row 5-8 is no, then infiltration of any volume is considered to be infeasible within the drainage area. The feasibility screening category is No Infiltration.		

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

C Value	Runoff Factor	Area	Weighted Area
Roof	0.9	4,942	4,447.80
Concrete of Asphalt	0.9	14,919	13,427.10
Unit Pavers (Grouted)	0.9	-	-
Decomposed Granite	0.3	-	-
Cobbles or Crushed Aggregate	0.3	-	-
Ammended, Mulched soils or Landscape	0.35	14,235	4,982.25
CompactedSoils (Unpaved Parking	0.3	-	-
Natural (A Soil)	0.1	-	-
Natural (B Soil)	0.14	-	-
Natural (C Soil)	0.23	-	-
Natural (D Soil)	0.3	-	-
Total		34,096	22,857.15
Composite C	0.67		

Worksheet B.2-1 DCV (IMP#1 Adjusted Areas)

Design Capture Volume		Worksheet B.2-1		
1	85_{th} percentile 24-hr storm depth from Figure B.1-1	d=	0.5	inches
2	Area tributary to BMP (s)	A=	0.78	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.67	unitless
4	Trees Credit Volume	TCV=	0	cubic-feet
5	Rain barrels Credit Volume	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	952	cubic-feet

C Value	Runoff Factor	Area	Weighted Area
Roof	0.9	-	-
Concrete of Asphalt	0.9	30,658	27,592.20
Unit Pavers (Grouted)	0.9	-	-
Decomposed Granite	0.3	-	-
Cobbles or Crushed Aggregate	0.3	-	-
Ammended, Mulched soils or Landscape	0.35	48,844	17,095.40
CompactedSoils (Unpaved Parking	0.3	-	-
Natural (A Soil)	0.1	-	-
Natural (B Soil)	0.14	-	-
Natural (C Soil)	0.23	-	-
Natural (D Soil)	0.3	-	-
Total		79,502	44,687.60
Composite C	0.56		

Worksheet D.5.1: Factor of Safety and Design Infiltration Rate Worksheet (DMA 1)

Factor of Safety and Design Infiltration Rate Worksheet				Worksheet D.5-1	
Factor Category		**Factor Description**	**Assigned Weight (w)**	**Factor Value (v)**	**Product (p) p = w x v**
A	Suitability Assessment	Soil assessment methods	0.25	3	0.75
		Predominant soil texture	0.25	2	0.5
		Site soil variability	0.25	3	0.75
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			**2.25**
B	Design	Level of pretreatment / expected sediment loads	0.5	1	0.5
		Redundancy / resiliency	0.25	2	0.5
		Compaction during construction	0.25	2	0.5
		Design Safety Factor, $S_B = \Sigma p$			**1.5**
Combined Safety Factor, $S_{total}=S_A \times S_B$				3.375	
Observed Infiltration Rate, inch/hr, $K_{observed}$ (corrected for test-specific bias)				0.09	
Design Infiltration Rate, in/hr, $K_{design}=K_{observed} / S_{total}$				**0.027**	
Supporting Data					

Briefly describe infiltration test and provide reference to test forms:
Tests performed at depths of approximately 3 feet to 4.5 feet below the ground surface using a Soil Moisture Corp Aardvark Permeameter at the locations shown on Figure 2 of the Geotech Report. See Table A-3 of the Geotech Report for infiltration test results.

Worksheet D.5.1: Factor of Safety and Design Infiltration Rate Worksheet (DMA 2)

Factor of Safety and Design Infiltration Rate Worksheet				Worksheet D.5-1	
Factor Category		**Factor Description**	**Assigned Weight (w)**	**Factor Value (v)**	**Product (p) p = w x v**
A	Suitability Assessment	Soil assessment methods	0.25	3	0.75
		Predominant soil texture	0.25	2	0.5
		Site soil variability	0.25	3	0.75
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			**2.25**
B	Design	Level of pretreatment / expected sediment loads	0.5	1	0.5
		Redundancy / resiliency	0.25	2	0.5
		Compaction during construction	0.25	2	0.5
		Design Safety Factor, $S_B = \Sigma p$			**1.5**
Combined Safety Factor, $S_{total}=S_A \times S_B$				3.375	
Observed Infiltration Rate, inch/hr, $K_{observed}$ (corrected for test-specific bias)				0.09	
Design Infiltration Rate, in/hr, $K_{design}=K_{observed} / S_{total}$				**0.027**	
Supporting Data					

<u>Briefly describe infiltration test and provide reference to test forms</u>:
Tests performed at depths of approximately 3 feet to 4.5 feet below the ground surface using a Soil Moisture Corp Aardvark Permeameter at the locations shown on Figure 2 of the Geotech Report. See Table A-3 of the Geotech Report for infiltration test results.

The numeric sizing criteria in this appendix are subdivided into:

- **Appendix B.5.1:** Standard[1] biofiltration BMP sizing; and
- **Appendix B.5.2:** Non-Standard[2] and Compact[3] biofiltration BMP sizing.

If a BMP meets the criteria in **Appendix B.5.1**, then it is considered compliant with the required pollutant control performance standard (i.e., for both retention and pollutant removal). It is not necessary to complete worksheets in this appendix for BMPs that meet the criteria in **Appendix B.5.1**. The volume retention performance standard for partial retention BMPs is presented in Figure B.5-2.

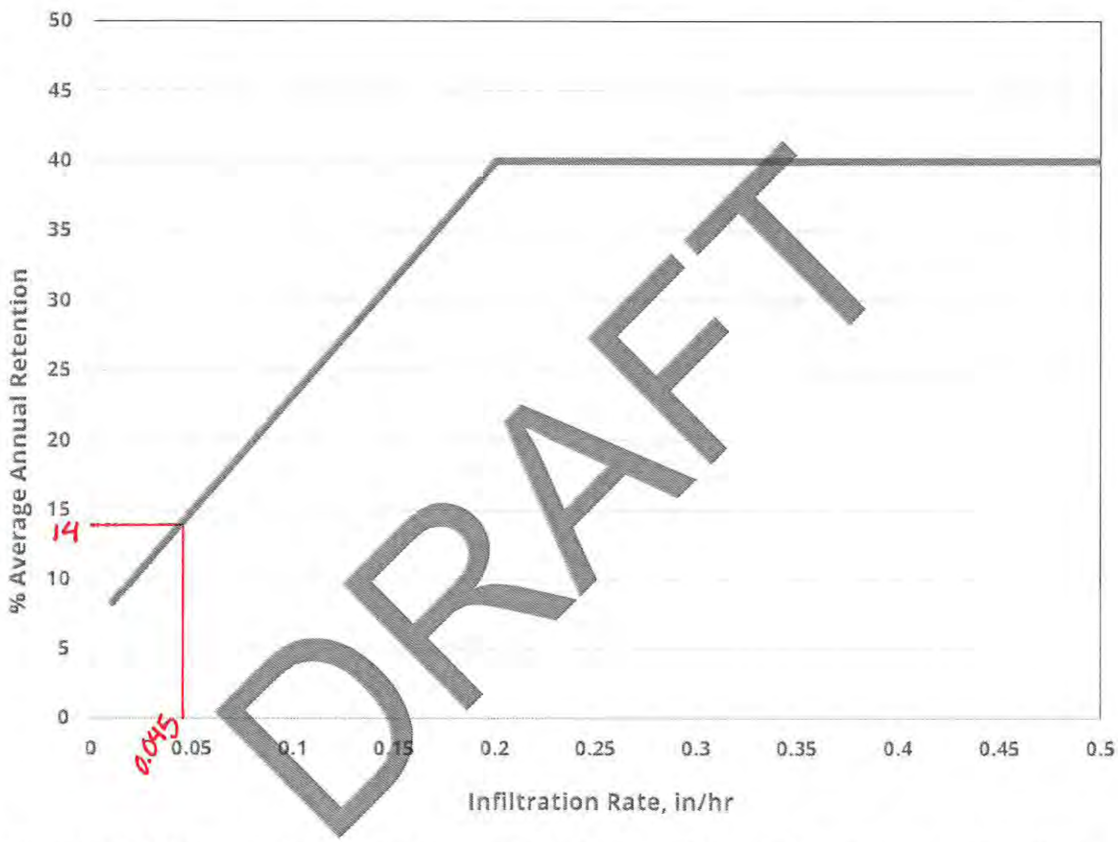


Figure B.5-2 Volume Retention Performance Standard for Partial Infiltration Condition

Note: For biofiltration BMP sizing, the design infiltration rate must be calculated using a factor of safety of 2 i.e., **Design infiltration rate = Measured infiltration rate/2**

= 0.09 in/hr / 2 = 0.045 in/hr

The required performance standards for different biofiltration BMPs are summarized in **Table B.5-1** below:

[1] Standard biofiltration BMPs have a media filtration rate equal to or smaller than 5 in/hr. and a media surface area of 3% of contributing area times adjusted runoff factor or greater.

[2] Non-Standard biofiltration BMPs have a media filtration rate equal to or smaller than 5 in/hr. and a media surface area smaller than 3% of contributing area times adjusted runoff factor.

[3] Compact (high rate) biofiltration BMPs have a media filtration rate greater than 5 in/hr. and a media surface area smaller than 3% of contributing area times adjusted runoff factor.

B.5.2 Non-Standard and Compact Biofiltration BMP Sizing

The following worksheets were developed for project applicants electing to use non-standard non-proprietary biofiltration BMPs and/or use compact biofiltration BMPs.

- Worksheet B.5.1: Sizing Method for Pollutant Removal Criteria
- Worksheet B.5.2: Sizing Method for Volume Retention Criteria
- Worksheet B.5.3: Calculation of Alternative Minimum Sizing Factor
- Worksheet B.5.4: Optimized Biofiltration BMP Footprint when Downstream of a Storage Unit
- Worksheet B.5.5: Volume Retention for No Infiltration Condition
- Worksheet B.5.6: Volume Retention from Amended Soils

Note: Project applicants that meet the criteria in Appendix B.5.1 are not required to complete the worksheets in Appendix B.5.2.

The 36-hour drawdown percent capture nomograph that can be used to estimate the fraction of the DCV that must be retained to meet the average annual capture performance standard is presented in Figure B.5-3 below.

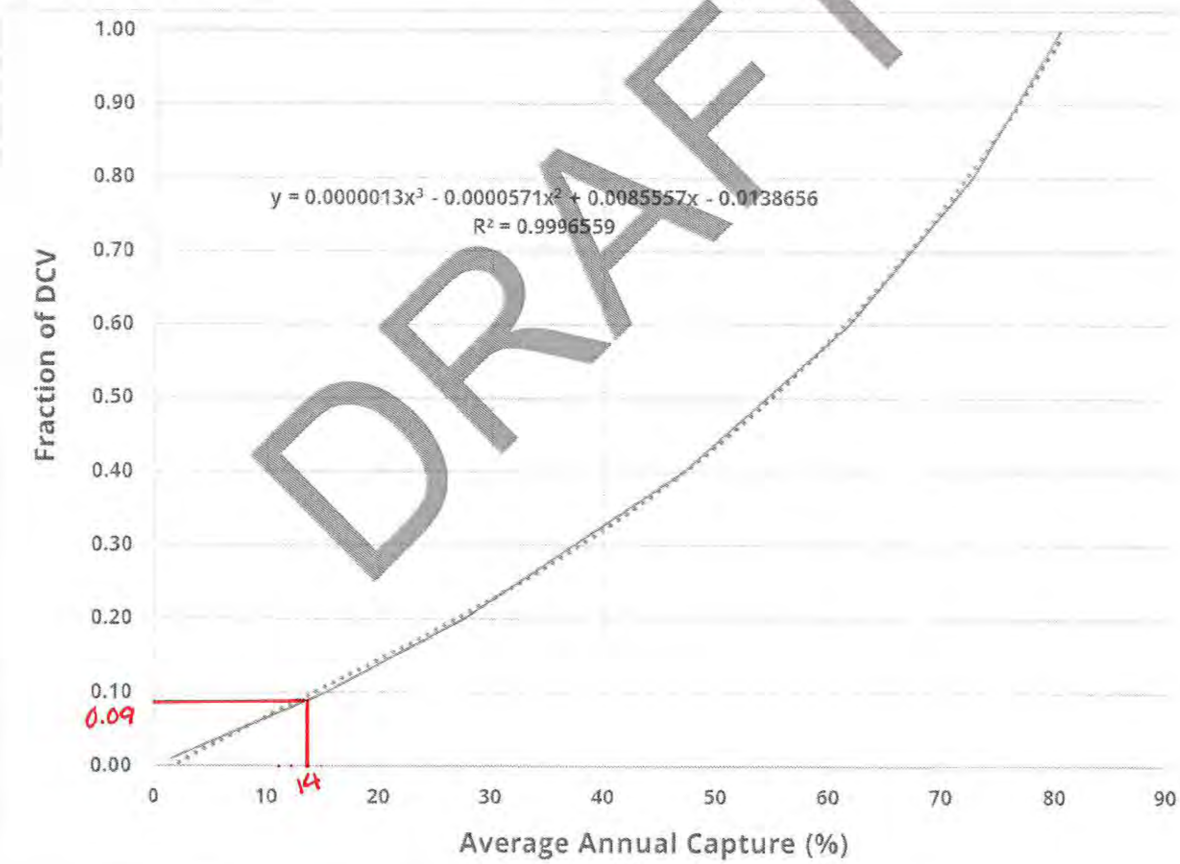


Figure B.5-3. Fraction of DCV versus Average Annual Capture

⇒ FRACTION OF DCV: 0.09

Worksheet B.2-1 DCV (IMP#2 Adjusted Areas)

Design Capture Volume		Worksheet B.2-1		
1	85_{th} percentile 24-hr storm depth from Figure B.1-1	d=	0.5	inches
2	Area tributary to BMP (s)	A=	1.83	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.56	unitless
4	Trees Credit Volume	TCV=	0	cubic-feet
5	Rain barrels Credit Volume	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	1862	cubic-feet

Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs (IMP#1)

Simple Sizing Method for Biofiltration BMPs			
1	Remaining DCV after implementing retention BMPs	952	cubic- feet
Partial Retention			
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible	0.027	in/hr.
3	Allowable drawdown time for aggregate storage below the underdrain	36	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]	0.972	inches
5	Aggregate pore space	0.40	in/in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]	2.43	inches
7	Assumed surface area of the biofiltration BMP	1170	sq-ft
8	Media retained pore storage	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7	270.27	cubic- feet
10	DCV that requires biofiltration [Line 1 – Line 9]	681.7	cubic- feet
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	12	inches
12	Media Thickness [18 inches minimum], also add mulch layer thickness to this line for sizing calculations	18	inches
13	Aggregate Storage above underdrain invert (12 inches typical) – use 0 inches for sizing if the aggregate is not over the entire bottom surface area	24	inches
14	Freely drained pore storage	0.5	in/in
15	Media filtration rate to be used for sizing (5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate which will be less than 5 in/hr.)	5	in/hr.
Baseline Calculations			
16	Allowable Routing Time for sizing	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	30	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]	30.6	inches
19	Total Depth Treated [Line 17 + Line 18]	60.6	inches

Note: Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until its equivalent to the required biofiltration footprint (either Line 21 or Line 23)

Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs (continued)

Simple Sizing Method for Biofiltration BMPs			Worksheet B.5-1 (Page 2 of 2)
Option 1 – Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	1022.6	cubic-feet
21	Required Footprint [Line 20/ Line 19] x 12	202.5	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	511.3	cubic-feet
23	Required Footprint [Line 22/ Line 18] x 12	200.5	sq-ft
Footprint of the BMP			
24	Area draining to the BMP	34096	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.67	
26	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Worksheet B.5-2, Line 11)	0.03	
27	Minimum BMP Footprint [Line 24 x Line 25 x Line 26]	685.3	sq-ft
28	Footprint of the BMP = Maximum(Minimum(Line 21, Line 23), Line 27)	685.3	sq-ft
Check for Volume Reduction [Not applicable for No Infiltration Condition]			
29	Calculate the fraction of DCV retained in the BMP [Line 9/Line 1]	0.28389706	unitless
30	Minimum required fraction of DCV retained for partial infiltration condition	0.090	unitless
31	Is the retained DCV ≥ 0.09? If the answer is no increase the footprint sizing factor in Line 26 until the answer is yes for this criterion.	**YES**	No

Note:

1. Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until its equivalent to the required biofiltration footprint (either Line 21 or Line 23)

2. The DCV fraction of 0.09 is based on Figure B.5-2 Volume Retention Performance Standard for Partial Infiltration Condition and Figure B.5-3 Fraction of DCV versus Average Annual Capture of the BMP Design Manual.

3. The increase in footprint for volume reduction can be optimized using the approach presented in Appendix B.5.2. The optimized footprint cannot be smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2.

4. If the proposed biofiltration BMP footprint is smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2, but satisfies Option 1 or Option 2 sizing, it is considered a compact biofiltration BMP and may be allowed at the discretion of the City Engineer, if it meets the requirements in Appendix F.

Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs (IMP#2)

Simple Sizing Method for Biofiltration BMPs			
1	Remaining DCV after implementing retention BMPs	1862	cubic- feet
Partial Retention			
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible	0.027	in/hr.
3	Allowable drawdown time for aggregate storage below the underdrain	36	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]	0.972	inches
5	Aggregate pore space	0.40	in/in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]	2.43	inches
7	Assumed surface area of the biofiltration BMP	1291	sq-ft
8	Media retained pore storage	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7	298.221	cubic- feet
10	DCV that requires biofiltration [Line 1 – Line 9]	1563.8	cubic- feet
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	12	inches
12	Media Thickness [18 inches minimum], also add mulch layer thickness to this line for sizing calculations	18	inches
13	Aggregate Storage above underdrain invert (12 inches typical) – use 0 inches for sizing if the aggregate is not over the entire bottom surface area	24	inches
14	Freely drained pore storage	0.5	in/in
15	Media filtration rate to be used for sizing (5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate which will be less than 5 in/hr.)	5	in/hr.
Baseline Calculations			
16	Allowable Routing Time for sizing	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	30	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]	30.6	inches
19	Total Depth Treated [Line 17 + Line 18]	60.6	inches

Note: Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until its equivalent to the required biofiltration footprint (either Line 21 or Line 23)

Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs (continued)

Simple Sizing Method for Biofiltration BMPs			Worksheet B.5-1 (Page 2 of 2)
Option 1 – Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	2345.7	cubic-feet
21	Required Footprint [Line 20/ Line 19] x 12	464.5	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	1172.8	cubic-feet
23	Required Footprint [Line 22/ Line 18] x 12	459.9	sq-ft
Footprint of the BMP			
24	Area draining to the BMP	79502	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.56	
26	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Worksheet B.5-2, Line 11)	0.03	
27	Minimum BMP Footprint [Line 24 x Line 25 x Line 26]	1335.6	sq-ft
28	Footprint of the BMP = Maximum(Minimum(Line 21, Line 23), Line 27)	1335.6	sq-ft
Check for Volume Reduction [Not applicable for No Infiltration Condition]			
29	Calculate the fraction of DCV retained in the BMP [Line 9/Line 1]	0.16016165	unitless
30	Minimum required fraction of DCV retained for partial infiltration condition	0.090	unitless
31	Is the retained DCV ≥ 0.090? If the answer is no increase the footprint sizing factor in Line 26 until the answer is yes for this criterion.	**YES**	No

Note:

1. Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until its equivalent to the required biofiltration footprint (either Line 21 or Line 23)

2. The DCV fraction of 0.09 is based on Figure B.5-2 Volume Retention Performance Standard for Partial Infiltration Condition and Figure B.5-3 Fraction of DCV versus Average Annual Capture of the BMP Design Manual.

3. The increase in footprint for volume reduction can be optimized using the approach presented in Appendix B.5.2. The optimized footprint cannot be smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2.

4. If the proposed biofiltration BMP footprint is smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2, but satisfies Option 1 or Option 2 sizing, it is considered a compact biofiltration BMP and may be allowed at the discretion of the City Engineer, if it meets the requirements in Appendix F.

ATTACHMENT 2
BACKUP FOR PDP HYDROMODIFICATION CONTROL MEASURES

This is the cover sheet for Attachment 2.

☐ Mark this box if this attachment is empty because the project is exempt from PDP hydromodification management requirements.

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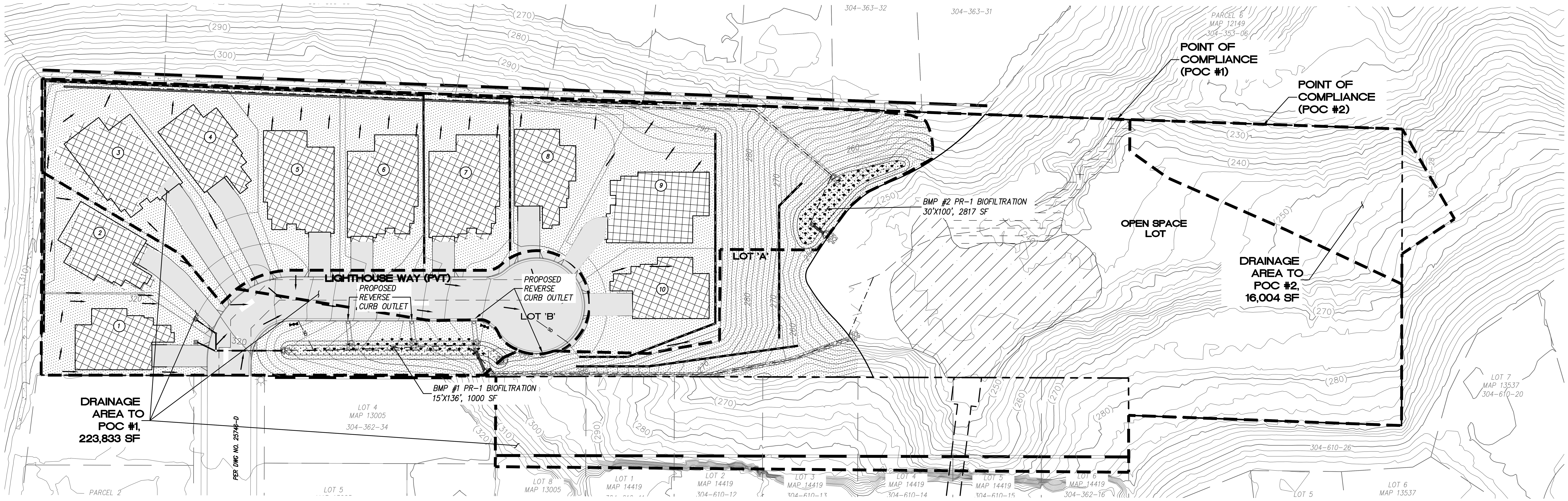
Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 2a	Hydromodification Management Exhibit (Required)	☒ Included See Hydromodification Management Exhibit Checklist
Attachment 2b	Management of Critical Coarse Sediment Yield Areas (WMAA Exhibit is required, additional analyses are optional) See Section 6.2 of the BMP Design Manual.	☒ Exhibit showing project drainage boundaries marked on WMAA Critical Coarse Sediment Yield Area Map (Required) Optional analyses for Critical Coarse Sediment Yield Area Determination ☐ 6.2.1 Verification of Geomorphic Landscape Units Onsite ☐ 6.2.2 Downstream Systems Sensitivity to Coarse Sediment ☐ 6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite
Attachment 2c	Geomorphic Assessment of Receiving Channels (Optional) See Section 6.3.4 of the BMP Design Manual.	☒ Not Performed ☐ Included ☐ Submitted as separate stand-alone document
Attachment 2d	Flow Control Facility Design and Structural BMP Drawdown Calculations (Required) Overflow Design Summary for each structural BMP See Chapter 6 and Appendix G of the BMP Design Manual	☒ Included ☐ Submitted as separate stand-alone document
Attachment 2e	Vector Control Plan (Required when structural BMPs will not drain in 96 hours)	☐ Included ☒ Not required because BMPs will drain in less than 96 hours

Use this checklist to ensure the required information has been included on the Hydromodification Management Exhibit:

The Hydromodification Management Exhibit must identify:

☒ Underlying hydrologic soil group
☒ Approximate depth to groundwater
☒ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
☒ Critical coarse sediment yield areas to be protected
☒ Existing topography
☒ Existing and proposed site drainage network and connections to drainage offsite
☒ Proposed grading
☒ Proposed impervious features
☒ Proposed design features and surface treatments used to minimize imperviousness
☒ Point(s) of Compliance (POC) for Hydromodification Management
☒ Existing and proposed drainage boundary and drainage area to each POC (when necessary, create separate exhibits for pre-development and post-project conditions)
☒ Structural BMPs for hydromodification management (identify location, type of BMP, and size/detail)



LIGHTHOUSE RIDGE

1" = 40'

N

0 20 40 80 120

(IN FEET)
1 inch = 40 ft.

LEGEND

- PROJECT BOUNDARY
- SHEET FLOW PATH
- CONCENTRATED FLOW PATH
- EXISTING WATERCOURSE
- WATERSHED BOUNDARY
- BF-1 BIOFILTRATION BASIN
- IMPERVIOUS HARDSCAPE
- PERVIOUS LANDSCAPE
- WETLANDS
- IMPERVIOUS BUILDING
- SD — PROPOSED PRIVATE STORM DRAIN
- EXISTING PRIVATE STORM DRAIN

POST-CONSTRUCTION PERMANENT BMP OPERATION + MAINTENANCE PROCEDURE DETAILS

STORM WATER MANAGEMENT AND DISCHARGE CONTROL MAINTENANCE AGREEMENT APPROVAL NO.:

O&M RESPONSIBLE PARTY DESIGNEE: PROPERTY OWNER / HOA / CITY / OTHER

BMP DESCRIPTION	TASK	FREQUENCY	MAINTENANCE NOTES	QUANTITY	SHEET NUMBER(S)
BIOFILTRATION BASIN (PR-1)	PRUNING	1-2 TIMES/YEAR	NUTRIENTS IN RUNOFF OFTEN CAUSE BIOFILTRATION VEGETATION TO FLOURISH.	2	2
	MOWING	2-12 TIMES/YEAR	FREQUENCY DEPENDS ON LOCATION AND DESIRED AESTHETIC APPEAL.		
	MULCHING	1-2 TIMES/YEAR	RECOMMEND MAINTAINING A 1"-3" UNIFORM MULCH LAYER.		
	MULCH REMOVAL	1 TIME/2-3 YEARS	MULCH ACCUMULATION REDUCES AVAILABLE WATER STORAGE VOLUME. REMOVAL OF MULCH ALSO INCREASES SURFACE INFILTRATION RATE OF FILL SOIL.		
	WATERING	1 TIME/2-3 DAYS FOR FIRST 1-2 MONTHS; SPORADICALLY AFTER ESTABLISHMENT	IF DROUGHT CONDITIONS EXIST, WATERING AFTER THE INITIAL YEAR MAY BE REQUIRED.		
	FERTILIZATION	1 TIME INITIALLY	ONE TIME SPOT FERTILIZATION FOR FIRST YEAR MAY BE REQUIRED TO ESTABLISH VEGETATION.		
	REMOVE AND REPLACE DEAD PLANTS	1 TIME/YEAR	WITHIN THE FIRST YEAR, 10% OF PLANTS CAN DIE. SURVIVAL RATES INCREASE WITH TIME.		
	INLET INSPECTION	ONCE AFTER FIRST RAIN OF THE SEASON, THEN MONTHLY DURING THE RAINY SEASON	CHECK FOR SEDIMENT ACCUMULATION TO ENSURE THAT FLOW INTO THE PLANTER BOX IS AS DESIGNED. REMOVE ANY ACCUMULATED SEDIMENT.		
	OUTLET INSPECTION	ONCE AFTER FIRST RAIN OF THE SEASON, THEN MONTHLY DURING THE RAINY SEASON	CHECK FOR EROSION AT THE OUTLET AND REMOVE ANY ACCUMULATED MULCH OR SEDIMENT.		
	MISCELLANEOUS UPKEEP	12 TIMES/YEAR	TASKS INCLUDE TRASH COLLECTION, PLANT HEALTH, SPOT WEEDING, REMOVING INVASIVE SPECIES AND REMOVING MULCH FROM THE OVERFLOW DEVICE.		

PROPOSED SITE INFORMATION

PROPOSED DRAINAGE: LOT AND STREET RUNOFF WILL BE DIVERTED TO PROPOSED ON-SITE BIOFILTRATION BASINS AND MODULAR WETLANDS TREATMENT DEVICE. TREATED RUNOFF WILL THEN BE EITHER CONVEYED BY A STREAM BED TO EXISTING DRAINAGE PATTERNS OR DISCHARGED DIRECTLY FROM THE TREATMENT BASIN.

PROPOSED GRADING: SHOWN HEREON.

PROPOSED IMPERVIOUS FEATURES: SHOWN HEREON.

PROPOSED DRAINAGE: SHOWN HEREON.

PROPOSED DESIGN FEATURES: SITE DESIGN REQUIREMENTS SHOWN HEREON. SEE FORM I-4 FOR EXPLANATION.

POINTS OF COMPLIANCE (POC): SHOWN HEREON.

PROPOSED DRAINAGE AREA TO EACH POC: SHOWN HEREON.

STRUCTURAL BMPS: PR-1 BIOFILTRATION WITH PARTIAL INFILTRATION SHOWN HEREON.

EXISTING SITE INFORMATION

HYDROLOGIC SOIL GROUP: "D"

GROUNDWATER: N/A

EXISTING NATURAL HYDROLOGIC FEATURES: EXISTING SITE CONTAINS WATERCOURSES AND WETLANDS.

CRITICAL COARSE SEDIMENT YIELD AREAS: NO CRITICAL COARSE SEDIMENT YIELD AREAS (CCSYAS) EXIST ONSITE OR UPSTREAM. NO PROTECTION OF CCSYAS REQUIRED.

EXISTING TOPOGRAPHY: EXISTING TOPOGRAPHY SHOWN HEREON.

EXISTING DRAINAGE: EXISTING LOT PRIMARILY SHEET FLOWS WESTERLY THEN CATCHING A STEEP SLOPE AND ENTERING A WATERCOURSE THROUGH WETLANDS BEFORE EXITING THE SITE IN THE NORTHEAST CORNER.

POST-CONSTRUCTION BMP NOTES

- ANY MODIFICATION(S) TO THE PERMANENT POST CONSTRUCTION BMP DEVICES/STRUCTURE SHOWN ON PLAN REQUIRES A CONSTRUCTION CHANGE TO BE PROCESSED AND APPROVED THOUGH DEVELOPMENT SERVICE DEPARTMENT BY THE ENGINEERING OF WORK. APPROVAL OF THE CONSTRUCTION CHANGE IS REQUIRED PRIOR TO CONSTRUCTION OF THE PERMANENT BMP.

SITE MAP NOTES

- NO MATERIALS TO BE EXPOSED TO STORMWATER RUNOFF
- NO BUILDING OR POLLUTANT GENERATING ACTIVITY AREAS ARE PROPOSED (FUELING, GARAGES, WASTE CONTAINERS, WASH RACKS, HAZARDOUS MATERIALS)
- NO EXISTING DRINKING WATER WELLS

SHEET 1 OF 1

LIGHTHOUSE RIDGE
HYDROMODIFICATION MANAGEMENT EXHIBIT

SCALE: 1" = 40'
DATE: 05/10/2018 DRAWN BY: MJL
JOB NO.: 1380.00 CHECKED BY: MJS

latitude 33
PLANNING & ENGINEERING
9968 Hibert Street 2nd Floor, San Diego, CA 92131
Tel 858.751.0633

WMAA EXHIBIT

= PROJECT FOOTPRINT

= CRITICAL COURSE SEDIMENT YIELD AREAS

N

SCALE:	1"=50'		
DATE:	7/14/16	DRAWN BY:	MJL
JOB NO:	1380.00	CHECKED BY:	SDD
SHEET:	1 OF 1		

latitude 33
PLANNING & ENGINEERING
9968 Hibert Street 2nd Floor, San Diego, CA 92131
Tel 858.751.0633

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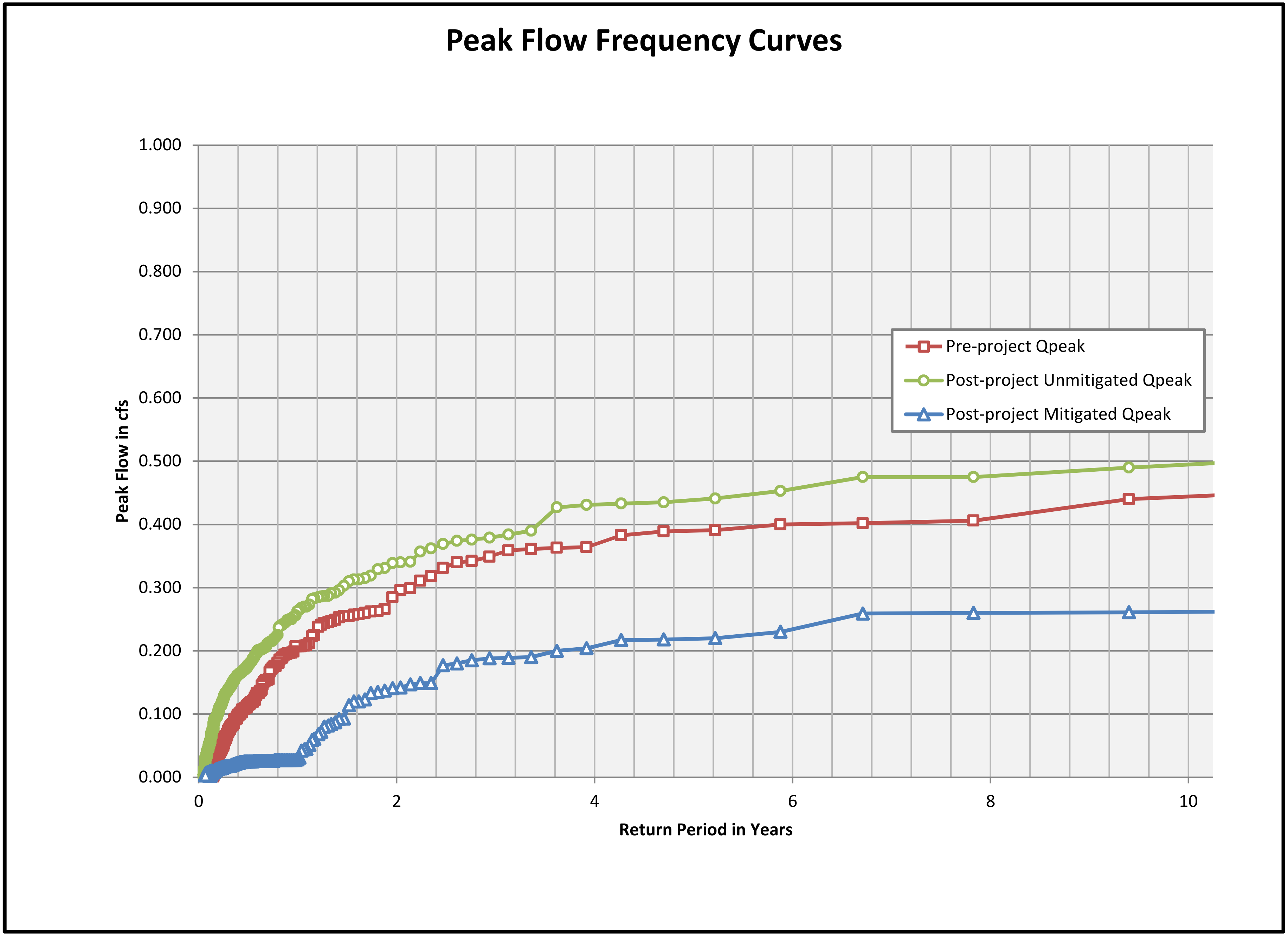
BMP #1

Peak Flow Frequency Summary

Return Period	Pre-project Qpeak (cfs)	Post-project - Unmitigated Q (cfs)	Post-project - Mitigated Q (cfs)
LF = 0.1xQ2	0.029	0.034	0.014
2-year	0.291	0.340	0.142
5-year	0.390	0.438	0.219
10-year	0.444	0.495	0.262



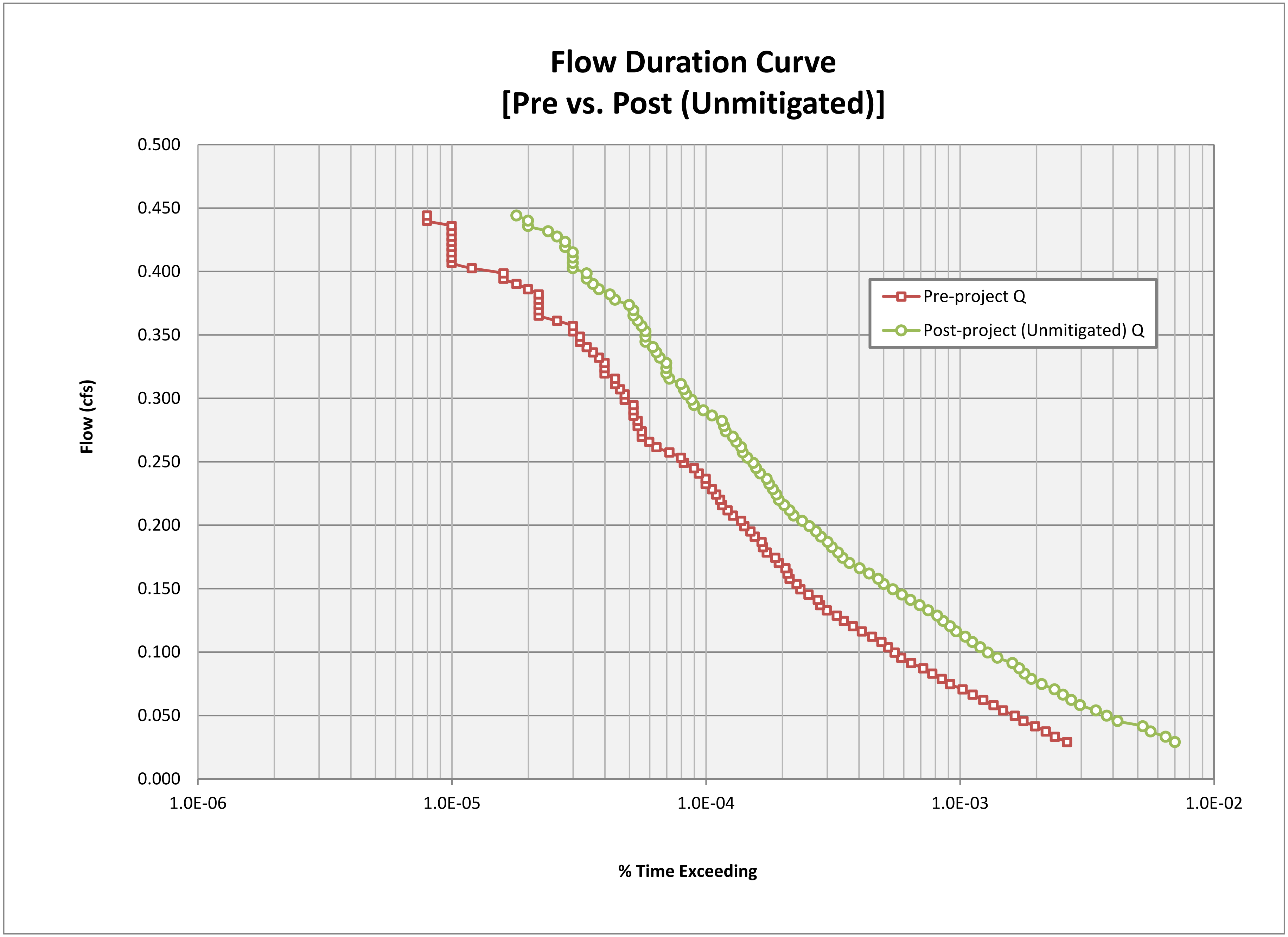
Peak Flow Frequency Curves
1.000
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
Peak Flow in cfs
0
2
4
6
8
10
Return Period in Years
Pre-project Qpeak
Post-project Unmitigated Qpeak
Post-project Mitigated Qpeak

Lower Flow Threshold:	10%	
0.1xQ2 (Pre):	0.029	cfs
Q10 (Pre):	0.444	cfs
# of Ordinates:	100	
Incremental Q (Pre):	0.00415	cfs
Total Hourly Data:	501456	hours

The proposed BMP: FAILED

Interval	Pre-project Flow (cfs)	Pre-project Hours	Pre-project % Time Exceeding	Post-project Hours	Post-project % Time Exceeding	Percentage	Pass/Fail
0	0.029	1323	2.64E-03	3512	7.00E-03	265%	Fail
1	0.033	1185	2.36E-03	3232	6.45E-03	273%	Fail
2	0.037	1090	2.17E-03	2823	5.63E-03	259%	Fail
3	0.042	989	1.97E-03	2626	5.24E-03	266%	Fail
4	0.046	891	1.78E-03	2090	4.17E-03	235%	Fail
5	0.050	824	1.64E-03	1896	3.78E-03	230%	Fail
6	0.054	740	1.48E-03	1718	3.43E-03	232%	Fail
7	0.058	679	1.35E-03	1489	2.97E-03	219%	Fail
8	0.062	619	1.23E-03	1375	2.74E-03	222%	Fail
9	0.066	562	1.12E-03	1275	2.54E-03	227%	Fail
10	0.071	513	1.02E-03	1181	2.36E-03	230%	Fail
11	0.075	458	9.13E-04	1051	2.10E-03	229%	Fail
12	0.079	425	8.48E-04	957	1.91E-03	225%	Fail
13	0.083	390	7.78E-04	899	1.79E-03	231%	Fail
14	0.087	359	7.16E-04	858	1.71E-03	239%	Fail
15	0.091	322	6.42E-04	806	1.61E-03	250%	Fail
16	0.095	294	5.86E-04	704	1.40E-03	239%	Fail
17	0.100	277	5.52E-04	645	1.29E-03	233%	Fail
18	0.104	261	5.20E-04	603	1.20E-03	231%	Fail
19	0.108	246	4.91E-04	561	1.12E-03	228%	Fail
20	0.112	226	4.51E-04	526	1.05E-03	233%	Fail
21	0.116	206	4.11E-04	484	9.65E-04	235%	Fail
22	0.120	190	3.79E-04	458	9.13E-04	241%	Fail
23	0.125	175	3.49E-04	430	8.58E-04	246%	Fail
24	0.129	164	3.27E-04	408	8.14E-04	249%	Fail
25	0.133	150	2.99E-04	376	7.50E-04	251%	Fail
26	0.137	141	2.81E-04	348	6.94E-04	247%	Fail
27	0.141	138	2.75E-04	320	6.38E-04	232%	Fail
28	0.145	127	2.53E-04	296	5.90E-04	233%	Fail
29	0.149	118	2.35E-04	273	5.44E-04	231%	Fail
30	0.154	114	2.27E-04	251	5.01E-04	220%	Fail
31	0.158	107	2.13E-04	239	4.77E-04	223%	Fail
32	0.162	105	2.09E-04	220	4.39E-04	210%	Fail
33	0.166	103	2.05E-04	202	4.03E-04	196%	Fail
34	0.170	97	1.93E-04	184	3.67E-04	190%	Fail
35	0.174	94	1.87E-04	173	3.45E-04	184%	Fail
36	0.178	87	1.73E-04	166	3.31E-04	191%	Fail
37	0.183	84	1.68E-04	157	3.13E-04	187%	Fail
38	0.187	83	1.66E-04	151	3.01E-04	182%	Fail
39	0.191	78	1.56E-04	142	2.83E-04	182%	Fail
40	0.195	75	1.50E-04	136	2.71E-04	181%	Fail
41	0.199	71	1.42E-04	128	2.55E-04	180%	Fail
42	0.203	69	1.38E-04	120	2.39E-04	174%	Fail
43	0.208	64	1.28E-04	111	2.21E-04	173%	Fail
44	0.212	61	1.22E-04	107	2.13E-04	175%	Fail
45	0.216	58	1.16E-04	102	2.03E-04	176%	Fail
46	0.220	57	1.14E-04	97	1.93E-04	170%	Fail
47	0.224	55	1.10E-04	95	1.89E-04	173%	Fail
48	0.228	53	1.06E-04	92	1.83E-04	174%	Fail
49	0.232	50	9.97E-05	89	1.77E-04	178%	Fail
50	0.237	50	9.97E-05	87	1.73E-04	174%	Fail
51	0.241	47	9.37E-05	82	1.64E-04	174%	Fail
52	0.245	45	8.97E-05	79	1.58E-04	176%	Fail
53	0.249	41	8.18E-05	77	1.54E-04	188%	Fail
54	0.253	40	7.98E-05	73	1.46E-04	183%	Fail

55	0.257	36	7.18E-05	70	1.40E-04	194%	Fail
56	0.261	32	6.38E-05	69	1.38E-04	216%	Fail
57	0.266	30	5.98E-05	66	1.32E-04	220%	Fail
58	0.270	28	5.58E-05	64	1.28E-04	229%	Fail
59	0.274	28	5.58E-05	60	1.20E-04	214%	Fail
60	0.278	27	5.38E-05	59	1.18E-04	219%	Fail
61	0.282	27	5.38E-05	58	1.16E-04	215%	Fail
62	0.286	26	5.18E-05	53	1.06E-04	204%	Fail
63	0.291	26	5.18E-05	49	9.77E-05	188%	Fail
64	0.295	26	5.18E-05	45	8.97E-05	173%	Fail
65	0.299	24	4.79E-05	44	8.77E-05	183%	Fail
66	0.303	24	4.79E-05	42	8.38E-05	175%	Fail
67	0.307	23	4.59E-05	41	8.18E-05	178%	Fail
68	0.311	22	4.39E-05	40	7.98E-05	182%	Fail
69	0.315	22	4.39E-05	36	7.18E-05	164%	Fail
70	0.320	20	3.99E-05	35	6.98E-05	175%	Fail
71	0.324	20	3.99E-05	35	6.98E-05	175%	Fail
72	0.328	20	3.99E-05	35	6.98E-05	175%	Fail
73	0.332	19	3.79E-05	33	6.58E-05	174%	Fail
74	0.336	18	3.59E-05	32	6.38E-05	178%	Fail
75	0.340	17	3.39E-05	31	6.18E-05	182%	Fail
76	0.344	16	3.19E-05	29	5.78E-05	181%	Fail
77	0.349	16	3.19E-05	29	5.78E-05	181%	Fail
78	0.353	15	2.99E-05	29	5.78E-05	193%	Fail
79	0.357	15	2.99E-05	28	5.58E-05	187%	Fail
80	0.361	13	2.59E-05	27	5.38E-05	208%	Fail
81	0.365	11	2.19E-05	26	5.18E-05	236%	Fail
82	0.369	11	2.19E-05	26	5.18E-05	236%	Fail
83	0.374	11	2.19E-05	25	4.99E-05	227%	Fail
84	0.378	11	2.19E-05	22	4.39E-05	200%	Fail
85	0.382	11	2.19E-05	21	4.19E-05	191%	Fail
86	0.386	10	1.99E-05	19	3.79E-05	190%	Fail
87	0.390	9	1.79E-05	18	3.59E-05	200%	Fail
88	0.394	8	1.60E-05	17	3.39E-05	213%	Fail
89	0.398	8	1.60E-05	17	3.39E-05	213%	Fail
90	0.403	6	1.20E-05	15	2.99E-05	250%	Fail
91	0.407	5	9.97E-06	15	2.99E-05	300%	Fail
92	0.411	5	9.97E-06	15	2.99E-05	300%	Fail
93	0.415	5	9.97E-06	15	2.99E-05	300%	Fail
94	0.419	5	9.97E-06	14	2.79E-05	280%	Fail
95	0.423	5	9.97E-06	14	2.79E-05	280%	Fail
96	0.427	5	9.97E-06	13	2.59E-05	260%	Fail
97	0.432	5	9.97E-06	12	2.39E-05	240%	Fail
98	0.436	5	9.97E-06	10	1.99E-05	200%	Fail
99	0.440	4	7.98E-06	10	1.99E-05	250%	Fail
100	0.444	4	7.98E-06	9	1.79E-05	225%	Fail



Flow Duration Curve
[Pre vs. Post (Unmitigated)]
Pre-project Q
Post-project (Unmitigated) Q
Flow (cfs)
0.500
0.450
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
1.0E-06
1.0E-05
1.0E-04
1.0E-03
1.0E-02
% Time Exceeding

Metropolitan Airpark
J-15818-B
6/5/15

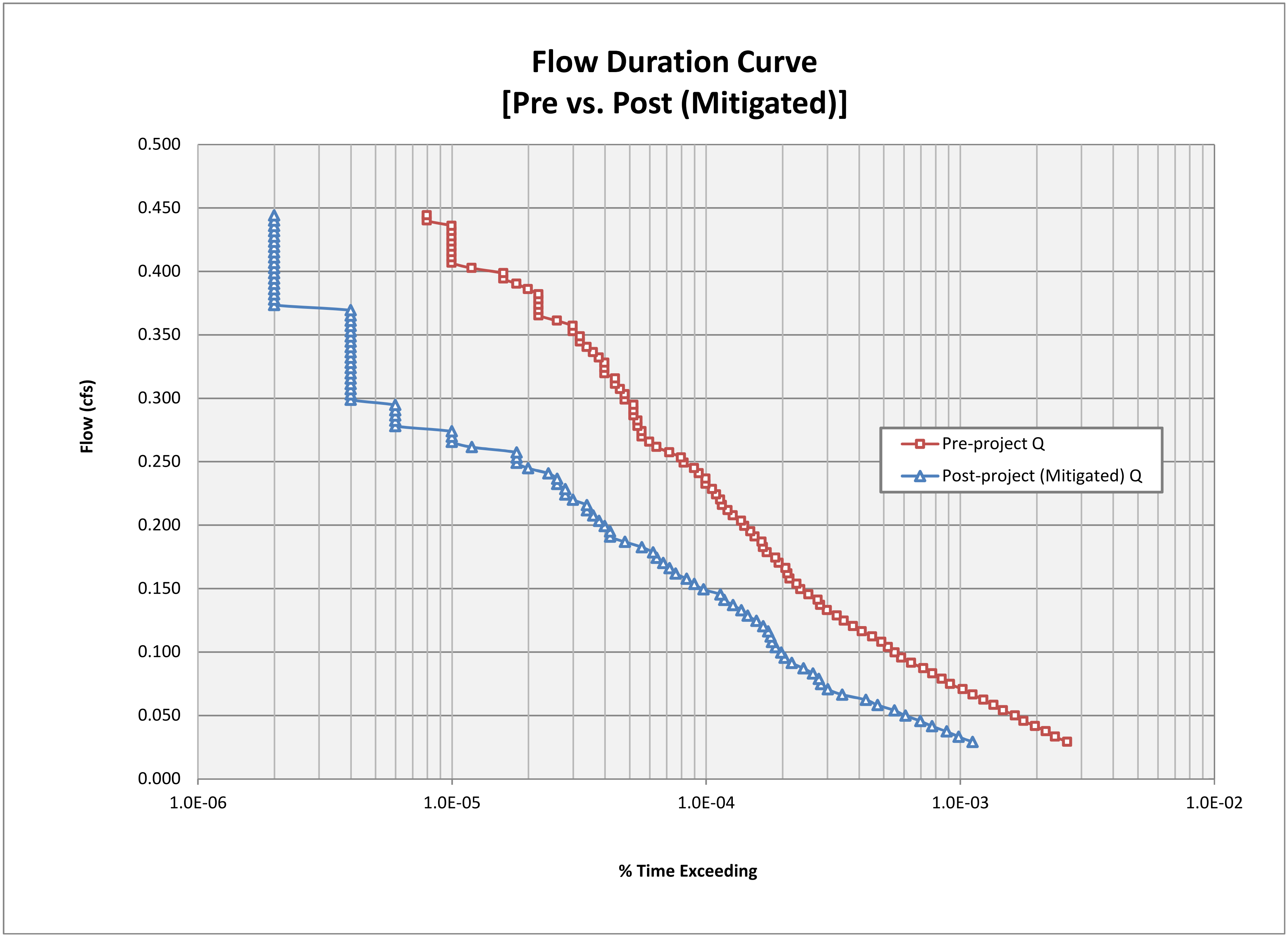
Basin600

Low-flow Threshold:	10%	
0.1xQ2 (Pre):	0.029	cfs
Q10 (Pre):	0.444	cfs
Ordinate #:	100	
Incremental Q (Pre):	0.00415	cfs
Total Hourly Data:	501456	hours

The proposed BMP: PASSED

Interval	Pre-project Flow (cfs)	Pre-project Hours	Pre-project % Time Exceeding	Post-project Hours	Post-project % Time Exceeding	Percentage	Pass/Fail
0	0.029	1323	2.64E-03	560	1.12E-03	42%	Pass
1	0.033	1185	2.36E-03	494	9.85E-04	42%	Pass
2	0.037	1090	2.17E-03	443	8.83E-04	41%	Pass
3	0.042	989	1.97E-03	388	7.74E-04	39%	Pass
4	0.046	891	1.78E-03	349	6.96E-04	39%	Pass
5	0.050	824	1.64E-03	305	6.08E-04	37%	Pass
6	0.054	740	1.48E-03	276	5.50E-04	37%	Pass
7	0.058	679	1.35E-03	237	4.73E-04	35%	Pass
8	0.062	619	1.23E-03	213	4.25E-04	34%	Pass
9	0.066	562	1.12E-03	172	3.43E-04	31%	Pass
10	0.071	513	1.02E-03	151	3.01E-04	29%	Pass
11	0.075	458	9.13E-04	142	2.83E-04	31%	Pass
12	0.079	425	8.48E-04	139	2.77E-04	33%	Pass
13	0.083	390	7.78E-04	132	2.63E-04	34%	Pass
14	0.087	359	7.16E-04	121	2.41E-04	34%	Pass
15	0.091	322	6.42E-04	109	2.17E-04	34%	Pass
16	0.095	294	5.86E-04	102	2.03E-04	35%	Pass
17	0.100	277	5.52E-04	99	1.97E-04	36%	Pass
18	0.104	261	5.20E-04	94	1.87E-04	36%	Pass
19	0.108	246	4.91E-04	91	1.81E-04	37%	Pass
20	0.112	226	4.51E-04	90	1.79E-04	40%	Pass
21	0.116	206	4.11E-04	88	1.75E-04	43%	Pass
22	0.120	190	3.79E-04	84	1.68E-04	44%	Pass
23	0.125	175	3.49E-04	79	1.58E-04	45%	Pass
24	0.129	164	3.27E-04	73	1.46E-04	45%	Pass
25	0.133	150	2.99E-04	69	1.38E-04	46%	Pass
26	0.137	141	2.81E-04	64	1.28E-04	45%	Pass
27	0.141	138	2.75E-04	59	1.18E-04	43%	Pass
28	0.145	127	2.53E-04	57	1.14E-04	45%	Pass
29	0.149	118	2.35E-04	49	9.77E-05	42%	Pass
30	0.154	114	2.27E-04	45	8.97E-05	39%	Pass
31	0.158	107	2.13E-04	42	8.38E-05	39%	Pass
32	0.162	105	2.09E-04	38	7.58E-05	36%	Pass
33	0.166	103	2.05E-04	36	7.18E-05	35%	Pass
34	0.170	97	1.93E-04	34	6.78E-05	35%	Pass
35	0.174	94	1.87E-04	32	6.38E-05	34%	Pass
36	0.178	87	1.73E-04	31	6.18E-05	36%	Pass
37	0.183	84	1.68E-04	28	5.58E-05	33%	Pass
38	0.187	83	1.66E-04	24	4.79E-05	29%	Pass
39	0.191	78	1.56E-04	21	4.19E-05	27%	Pass
40	0.195	75	1.50E-04	21	4.19E-05	28%	Pass
41	0.199	71	1.42E-04	20	3.99E-05	28%	Pass
42	0.203	69	1.38E-04	19	3.79E-05	28%	Pass
43	0.208	64	1.28E-04	18	3.59E-05	28%	Pass
44	0.212	61	1.22E-04	17	3.39E-05	28%	Pass
45	0.216	58	1.16E-04	17	3.39E-05	29%	Pass
46	0.220	57	1.14E-04	15	2.99E-05	26%	Pass
47	0.224	55	1.10E-04	14	2.79E-05	25%	Pass
48	0.228	53	1.06E-04	14	2.79E-05	26%	Pass
49	0.232	50	9.97E-05	13	2.59E-05	26%	Pass
50	0.237	50	9.97E-05	13	2.59E-05	26%	Pass
51	0.241	47	9.37E-05	12	2.39E-05	26%	Pass
52	0.245	45	8.97E-05	10	1.99E-05	22%	Pass
53	0.249	41	8.18E-05	9	1.79E-05	22%	Pass
54	0.253	40	7.98E-05	9	1.79E-05	23%	Pass

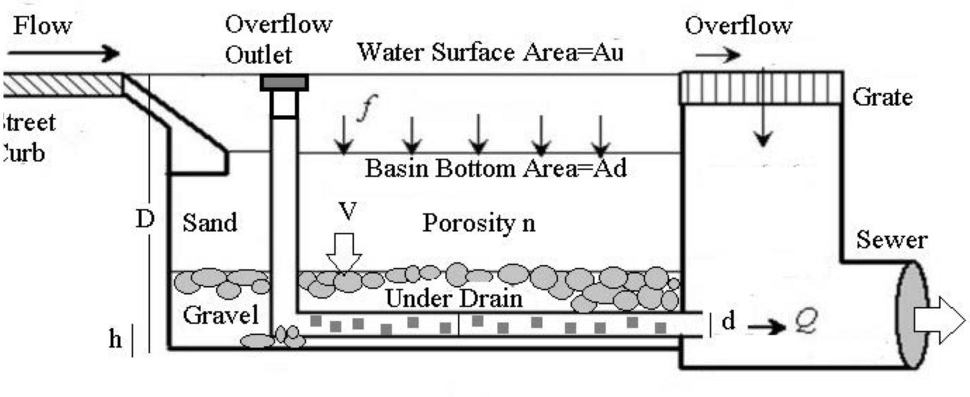
Interval	Pre-project Flow (cfs)	Pre-project Hours	Pre-project % Time Exceeding	Post-project Hours	Post-project % Time Exceeding	Percentage	Pass/Fail
55	0.257	36	7.18E-05	9	1.79E-05	25%	Pass
56	0.261	32	6.38E-05	6	1.20E-05	19%	Pass
57	0.266	30	5.98E-05	5	9.97E-06	17%	Pass
58	0.270	28	5.58E-05	5	9.97E-06	18%	Pass
59	0.274	28	5.58E-05	5	9.97E-06	18%	Pass
60	0.278	27	5.38E-05	3	5.98E-06	11%	Pass
61	0.282	27	5.38E-05	3	5.98E-06	11%	Pass
62	0.286	26	5.18E-05	3	5.98E-06	12%	Pass
63	0.291	26	5.18E-05	3	5.98E-06	12%	Pass
64	0.295	26	5.18E-05	3	5.98E-06	12%	Pass
65	0.299	24	4.79E-05	2	3.99E-06	8%	Pass
66	0.303	24	4.79E-05	2	3.99E-06	8%	Pass
67	0.307	23	4.59E-05	2	3.99E-06	9%	Pass
68	0.311	22	4.39E-05	2	3.99E-06	9%	Pass
69	0.315	22	4.39E-05	2	3.99E-06	9%	Pass
70	0.320	20	3.99E-05	2	3.99E-06	10%	Pass
71	0.324	20	3.99E-05	2	3.99E-06	10%	Pass
72	0.328	20	3.99E-05	2	3.99E-06	10%	Pass
73	0.332	19	3.79E-05	2	3.99E-06	11%	Pass
74	0.336	18	3.59E-05	2	3.99E-06	11%	Pass
75	0.340	17	3.39E-05	2	3.99E-06	12%	Pass
76	0.344	16	3.19E-05	2	3.99E-06	13%	Pass
77	0.349	16	3.19E-05	2	3.99E-06	13%	Pass
78	0.353	15	2.99E-05	2	3.99E-06	13%	Pass
79	0.357	15	2.99E-05	2	3.99E-06	13%	Pass
80	0.361	13	2.59E-05	2	3.99E-06	15%	Pass
81	0.365	11	2.19E-05	2	3.99E-06	18%	Pass
82	0.369	11	2.19E-05	2	3.99E-06	18%	Pass
83	0.374	11	2.19E-05	1	1.99E-06	9%	Pass
84	0.378	11	2.19E-05	1	1.99E-06	9%	Pass
85	0.382	11	2.19E-05	1	1.99E-06	9%	Pass
86	0.386	10	1.99E-05	1	1.99E-06	10%	Pass
87	0.390	9	1.79E-05	1	1.99E-06	11%	Pass
88	0.394	8	1.60E-05	1	1.99E-06	13%	Pass
89	0.398	8	1.60E-05	1	1.99E-06	13%	Pass
90	0.403	6	1.20E-05	1	1.99E-06	17%	Pass
91	0.407	5	9.97E-06	1	1.99E-06	20%	Pass
92	0.411	5	9.97E-06	1	1.99E-06	20%	Pass
93	0.415	5	9.97E-06	1	1.99E-06	20%	Pass
94	0.419	5	9.97E-06	1	1.99E-06	20%	Pass
95	0.423	5	9.97E-06	1	1.99E-06	20%	Pass
96	0.427	5	9.97E-06	1	1.99E-06	20%	Pass
97	0.432	5	9.97E-06	1	1.99E-06	20%	Pass
98	0.436	5	9.97E-06	1	1.99E-06	20%	Pass
99	0.440	4	7.98E-06	1	1.99E-06	25%	Pass
100	0.444	4	7.98E-06	1	1.99E-06	25%	Pass


Flow Duration Curve
[Pre vs. Post (Mitigated)]
Flow (cfs)
% Time Exceeding
0.500
0.450
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
1.0E-06
1.0E-05
1.0E-04
1.0E-03
1.0E-02
Pre-project Q
Post-project (Mitigated) Q

SWMM Model Flow Coefficient Calculation

PARAMETER	ABBREV.	Bio-Retention Cell LID BMP	
Ponding Depth	PD	10	in
Bioretention Soil Layer	S	18	in
Gravel Layer	G	24	in
TOTAL		4.3	ft
		52	in
Orifice Coefficient	c_g	0.6	--
Low Flow Orifice Diameter	D	0.45	in
Drain exponent	n	0.5	--
Flow Rate (volumetric)	Q	0.011	cfs
Ponding Depth Surface Area	A_{PD}	1170	ft^2
Bioretention Surface Area	$A_{S,} A_G$	1170	ft^2
	$A_{S,} A_G$	0.0269	ac
Porosity of Bioretention Soil	n	0.40	-
Flow Rate (per unit area)	q	1.020	in/hr
Effective Ponding Depth	PD_{eff}	**10.00**	in
Flow Coefficient	C	**0.1417**	--

DRAIN TIME AND FLOW COEFFICIENT for SWMM



Determine the Drain Time and Flow Coeff (SWMM Method)

Surface area of Basin	A-LID=	1170.00	sq ft
Depth of Basin	D=HT=	52.00	inch
Porosity of Sand-mix	n=	0.40	
Dia of Sub-Drain	D=	0.45	inch
Discharge coefficient	Co=	0.61	
Location of Drain Center	h=	0.50	inch
Drain Time Calculated	T=	99.62	hour
SWMM Flow Coefficient	C=	0.14	inch^.5/hr

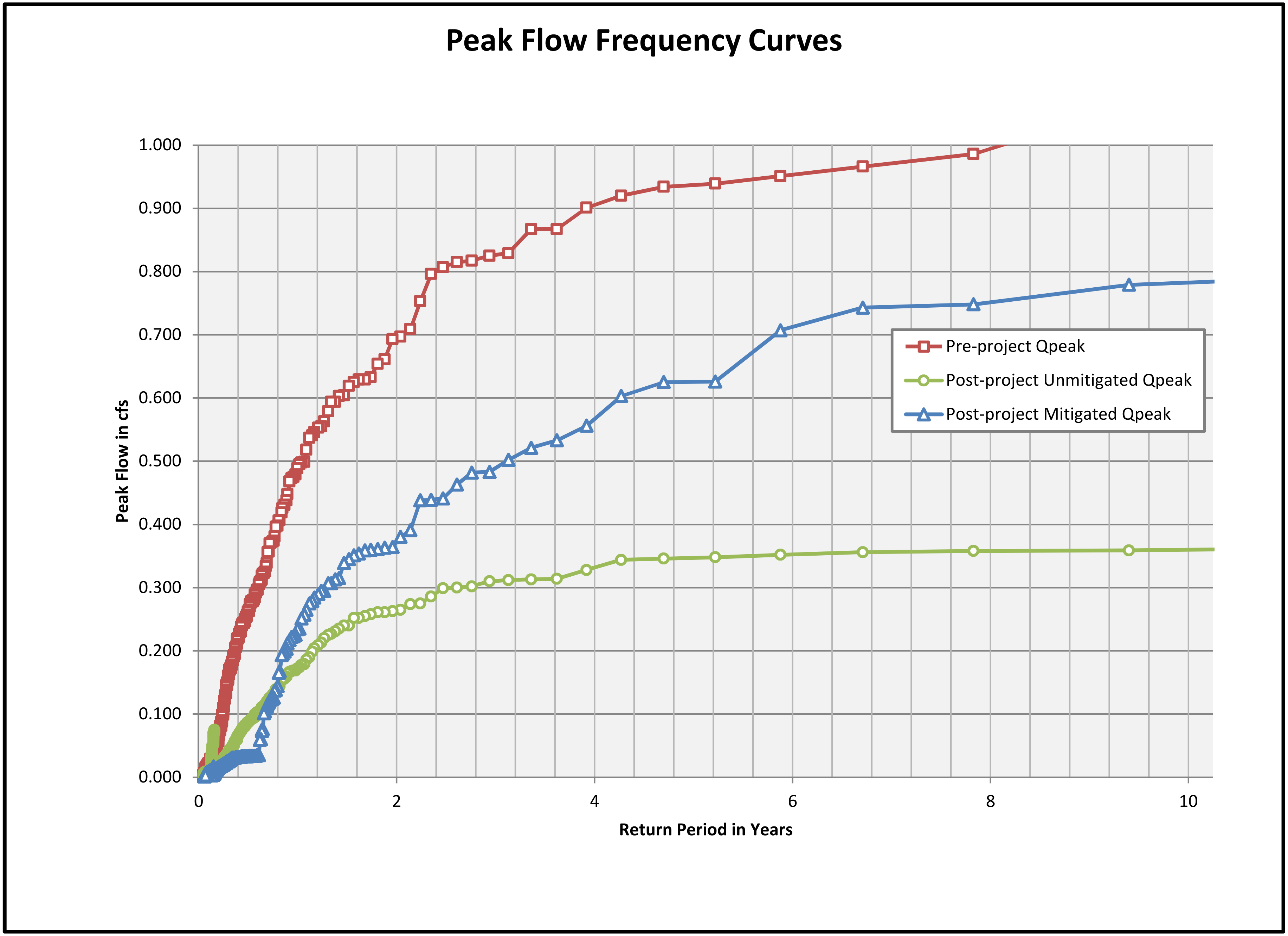
$$T = \frac{2nA(D-h)^{1/2}}{C_o a\sqrt{2g}} / 3600 \ (hr)$$

$$C\,(inch^{0.5}/hr) = C_o \frac{a}{nA}\sqrt{2g} \times 12^{0.5} \times 3600 = \frac{2(D-h)^{1/2}}{T}\ inch^{0.5}/hour$$

BMP #2

Peak Flow Frequency Summary

Return Period	Pre-project Qpeak (cfs)	Post-project - Unmitigated Q (cfs)	Post-project - Mitigated Q (cfs)
LF = 0.1xQ2	0.070	0.026	0.037
2-year	0.695	0.264	0.372
5-year	0.937	0.347	0.626
10-year	1.072	0.360	0.783

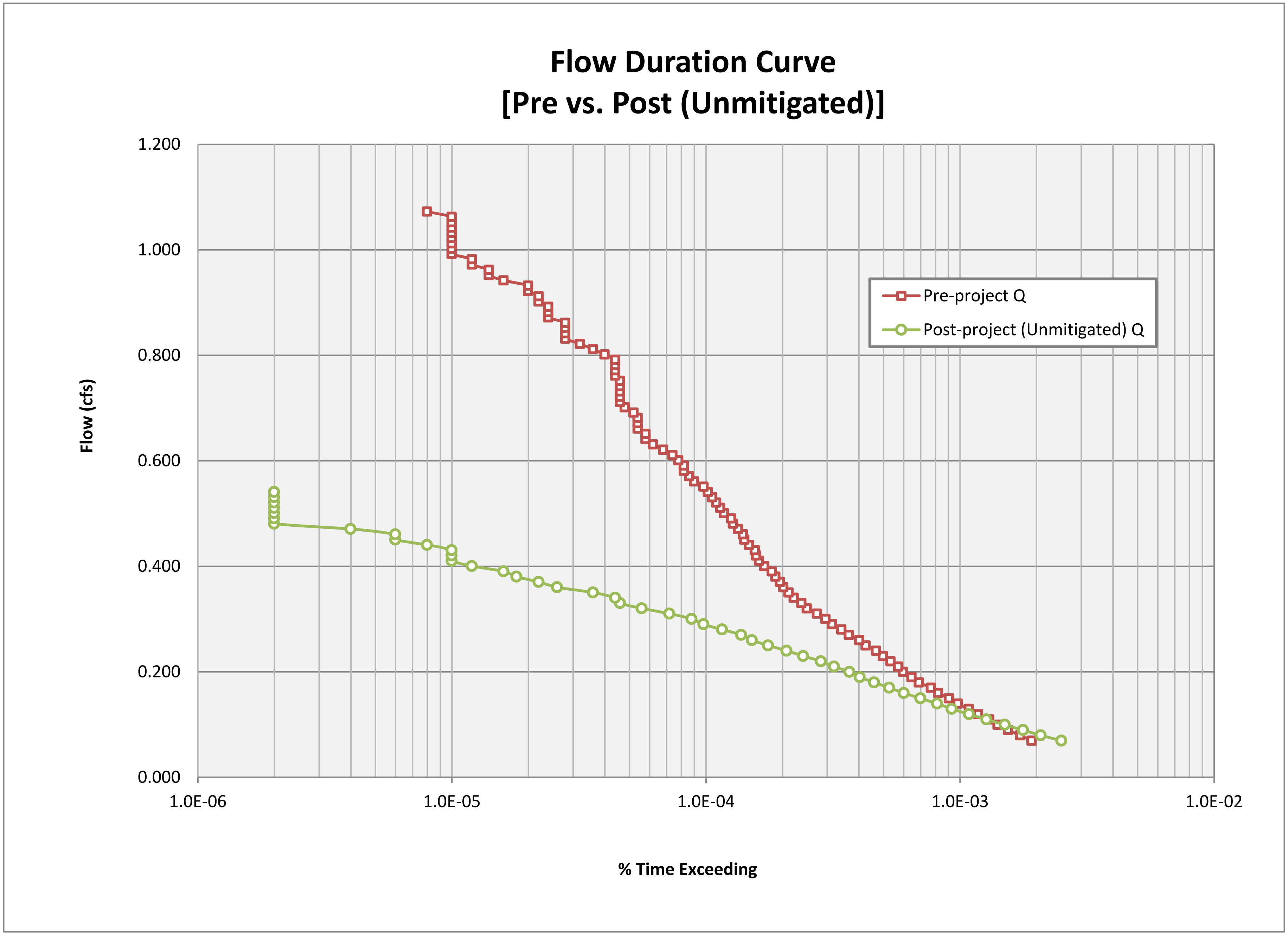

Peak Flow Frequency Curves
1.000
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
Peak Flow in cfs
0
2
4
6
8
10
Return Period in Years
Pre-project Qpeak
Post-project Unmitigated Qpeak
Post-project Mitigated Qpeak

Lower Flow Threshold:	10%	
0.1xQ2 (Pre):	0.070	cfs
Q10 (Pre):	1.072	cfs
# of Ordinates:	100	
Incremental Q (Pre):	0.01003	cfs
Total Hourly Data:	501456	hours

The proposed BMP: FAILED

Interval	Pre-project Flow (cfs)	Pre-project Hours	Pre-project % Time Exceeding	Post-project Hours	Post-project % Time Exceeding	Percentage	Pass/Fail
0	0.070	959	1.91E-03	1257	2.51E-03	131%	Fail
1	0.080	865	1.72E-03	1042	2.08E-03	120%	Fail
2	0.090	774	1.54E-03	887	1.77E-03	115%	Fail
3	0.100	705	1.41E-03	752	1.50E-03	107%	Pass
4	0.110	653	1.30E-03	637	1.27E-03	98%	Pass
5	0.120	591	1.18E-03	544	1.08E-03	92%	Pass
6	0.130	543	1.08E-03	465	9.27E-04	86%	Pass
7	0.140	491	9.79E-04	407	8.12E-04	83%	Pass
8	0.150	453	9.03E-04	350	6.98E-04	77%	Pass
9	0.160	411	8.20E-04	301	6.00E-04	73%	Pass
10	0.170	385	7.68E-04	264	5.26E-04	69%	Pass
11	0.180	345	6.88E-04	230	4.59E-04	67%	Pass
12	0.190	323	6.44E-04	202	4.03E-04	63%	Pass
13	0.200	299	5.96E-04	184	3.67E-04	62%	Pass
14	0.210	286	5.70E-04	160	3.19E-04	56%	Pass
15	0.220	267	5.32E-04	142	2.83E-04	53%	Pass
16	0.230	249	4.97E-04	121	2.41E-04	49%	Pass
17	0.240	234	4.67E-04	104	2.07E-04	44%	Pass
18	0.250	213	4.25E-04	88	1.75E-04	41%	Pass
19	0.260	201	4.01E-04	76	1.52E-04	38%	Pass
20	0.270	183	3.65E-04	69	1.38E-04	38%	Pass
21	0.280	171	3.41E-04	58	1.16E-04	34%	Pass
22	0.290	157	3.13E-04	49	9.77E-05	31%	Pass
23	0.300	148	2.95E-04	44	8.77E-05	30%	Pass
24	0.310	137	2.73E-04	36	7.18E-05	26%	Pass
25	0.320	125	2.49E-04	28	5.58E-05	22%	Pass
26	0.330	119	2.37E-04	23	4.59E-05	19%	Pass
27	0.340	111	2.21E-04	22	4.39E-05	20%	Pass
28	0.350	106	2.11E-04	18	3.59E-05	17%	Pass
29	0.360	101	2.01E-04	13	2.59E-05	13%	Pass
30	0.370	98	1.95E-04	11	2.19E-05	11%	Pass
31	0.380	94	1.87E-04	9	1.79E-05	10%	Pass
32	0.390	91	1.81E-04	8	1.60E-05	9%	Pass
33	0.400	85	1.70E-04	6	1.20E-05	7%	Pass
34	0.411	81	1.62E-04	5	9.97E-06	6%	Pass
35	0.421	79	1.58E-04	5	9.97E-06	6%	Pass
36	0.431	78	1.56E-04	5	9.97E-06	6%	Pass
37	0.441	74	1.48E-04	4	7.98E-06	5%	Pass
38	0.451	71	1.42E-04	3	5.98E-06	4%	Pass
39	0.461	70	1.40E-04	3	5.98E-06	4%	Pass
40	0.471	67	1.34E-04	2	3.99E-06	3%	Pass
41	0.481	64	1.28E-04	1	1.99E-06	2%	Pass
42	0.491	63	1.26E-04	1	1.99E-06	2%	Pass
43	0.501	59	1.18E-04	1	1.99E-06	2%	Pass
44	0.511	57	1.14E-04	1	1.99E-06	2%	Pass
45	0.521	55	1.10E-04	1	1.99E-06	2%	Pass
46	0.531	53	1.06E-04	1	1.99E-06	2%	Pass
47	0.541	51	1.02E-04	1	1.99E-06	2%	Pass
48	0.551	49	9.77E-05	0	0.00E+00	0%	Pass
49	0.561	45	8.97E-05	0	0.00E+00	0%	Pass
50	0.571	43	8.58E-05	0	0.00E+00	0%	Pass
51	0.581	41	8.18E-05	0	0.00E+00	0%	Pass
52	0.591	41	8.18E-05	0	0.00E+00	0%	Pass
53	0.601	39	7.78E-05	0	0.00E+00	0%	Pass
54	0.611	37	7.38E-05	0	0.00E+00	0%	Pass

55	0.621	34	6.78E-05	0	0.00E+00	0%	Pass
56	0.631	31	6.18E-05	0	0.00E+00	0%	Pass
57	0.641	29	5.78E-05	0	0.00E+00	0%	Pass
58	0.651	29	5.78E-05	0	0.00E+00	0%	Pass
59	0.661	27	5.38E-05	0	0.00E+00	0%	Pass
60	0.671	27	5.38E-05	0	0.00E+00	0%	Pass
61	0.681	27	5.38E-05	0	0.00E+00	0%	Pass
62	0.691	26	5.18E-05	0	0.00E+00	0%	Pass
63	0.701	24	4.79E-05	0	0.00E+00	0%	Pass
64	0.711	23	4.59E-05	0	0.00E+00	0%	Pass
65	0.721	23	4.59E-05	0	0.00E+00	0%	Pass
66	0.731	23	4.59E-05	0	0.00E+00	0%	Pass
67	0.741	23	4.59E-05	0	0.00E+00	0%	Pass
68	0.752	23	4.59E-05	0	0.00E+00	0%	Pass
69	0.762	22	4.39E-05	0	0.00E+00	0%	Pass
70	0.772	22	4.39E-05	0	0.00E+00	0%	Pass
71	0.782	22	4.39E-05	0	0.00E+00	0%	Pass
72	0.792	22	4.39E-05	0	0.00E+00	0%	Pass
73	0.802	20	3.99E-05	0	0.00E+00	0%	Pass
74	0.812	18	3.59E-05	0	0.00E+00	0%	Pass
75	0.822	16	3.19E-05	0	0.00E+00	0%	Pass
76	0.832	14	2.79E-05	0	0.00E+00	0%	Pass
77	0.842	14	2.79E-05	0	0.00E+00	0%	Pass
78	0.852	14	2.79E-05	0	0.00E+00	0%	Pass
79	0.862	14	2.79E-05	0	0.00E+00	0%	Pass
80	0.872	12	2.39E-05	0	0.00E+00	0%	Pass
81	0.882	12	2.39E-05	0	0.00E+00	0%	Pass
82	0.892	12	2.39E-05	0	0.00E+00	0%	Pass
83	0.902	11	2.19E-05	0	0.00E+00	0%	Pass
84	0.912	11	2.19E-05	0	0.00E+00	0%	Pass
85	0.922	10	1.99E-05	0	0.00E+00	0%	Pass
86	0.932	10	1.99E-05	0	0.00E+00	0%	Pass
87	0.942	8	1.60E-05	0	0.00E+00	0%	Pass
88	0.952	7	1.40E-05	0	0.00E+00	0%	Pass
89	0.962	7	1.40E-05	0	0.00E+00	0%	Pass
90	0.972	6	1.20E-05	0	0.00E+00	0%	Pass
91	0.982	6	1.20E-05	0	0.00E+00	0%	Pass
92	0.992	5	9.97E-06	0	0.00E+00	0%	Pass
93	1.002	5	9.97E-06	0	0.00E+00	0%	Pass
94	1.012	5	9.97E-06	0	0.00E+00	0%	Pass
95	1.022	5	9.97E-06	0	0.00E+00	0%	Pass
96	1.032	5	9.97E-06	0	0.00E+00	0%	Pass
97	1.042	5	9.97E-06	0	0.00E+00	0%	Pass
98	1.052	5	9.97E-06	0	0.00E+00	0%	Pass
99	1.062	5	9.97E-06	0	0.00E+00	0%	Pass
100	1.072	4	7.98E-06	0	0.00E+00	0%	Pass


Flow Duration Curve
[Pre vs. Post (Unmitigated)]
Flow (cfs)
1.200
1.000
0.800
0.600
0.400
0.200
0.000
1.0E-06
1.0E-05
1.0E-04
1.0E-03
1.0E-02
% Time Exceeding
Pre-project Q
Post-project (Unmitigated) Q

Metropolitan Airpark
J-15818-B
6/5/15

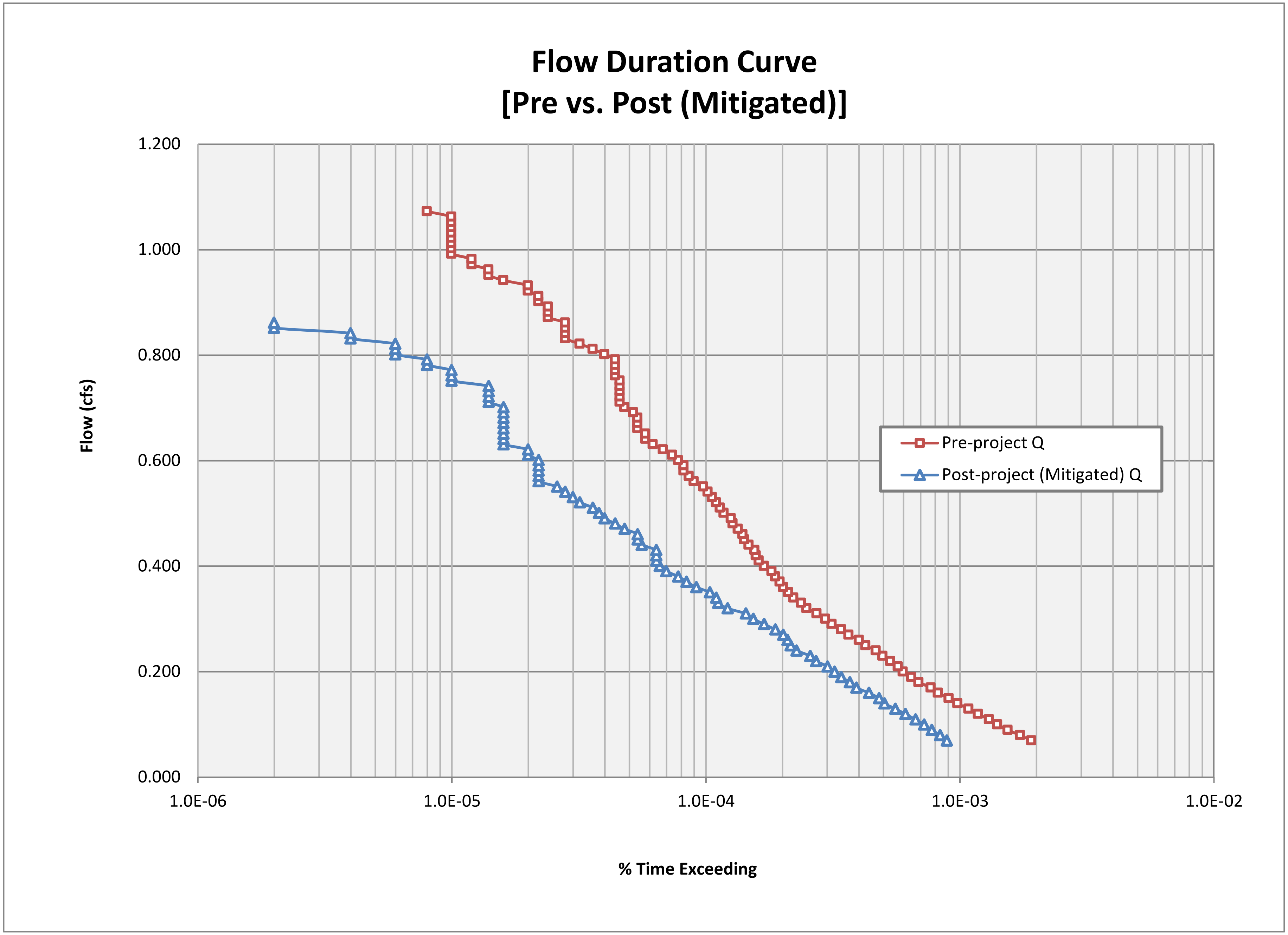
Basin600

Low-flow Threshold:	10%	
0.1xQ2 (Pre):	0.070	cfs
Q10 (Pre):	1.072	cfs
Ordinate #:	100	
Incremental Q (Pre):	0.01003	cfs
Total Hourly Data:	501456	hours

The proposed BMP: PASSED

Interval	Pre-project Flow (cfs)	Pre-project Hours	Pre-project % Time Exceeding	Post-project Hours	Post-project % Time Exceeding	Percentage	Pass/Fail
0	0.070	959	1.91E-03	445	8.87E-04	46%	Pass
1	0.080	865	1.72E-03	419	8.36E-04	48%	Pass
2	0.090	774	1.54E-03	388	7.74E-04	50%	Pass
3	0.100	705	1.41E-03	362	7.22E-04	51%	Pass
4	0.110	653	1.30E-03	335	6.68E-04	51%	Pass
5	0.120	591	1.18E-03	306	6.10E-04	52%	Pass
6	0.130	543	1.08E-03	279	5.56E-04	51%	Pass
7	0.140	491	9.79E-04	253	5.05E-04	52%	Pass
8	0.150	453	9.03E-04	241	4.81E-04	53%	Pass
9	0.160	411	8.20E-04	220	4.39E-04	54%	Pass
10	0.170	385	7.68E-04	196	3.91E-04	51%	Pass
11	0.180	345	6.88E-04	185	3.69E-04	54%	Pass
12	0.190	323	6.44E-04	171	3.41E-04	53%	Pass
13	0.200	299	5.96E-04	161	3.21E-04	54%	Pass
14	0.210	286	5.70E-04	151	3.01E-04	53%	Pass
15	0.220	267	5.32E-04	136	2.71E-04	51%	Pass
16	0.230	249	4.97E-04	129	2.57E-04	52%	Pass
17	0.240	234	4.67E-04	114	2.27E-04	49%	Pass
18	0.250	213	4.25E-04	108	2.15E-04	51%	Pass
19	0.260	201	4.01E-04	105	2.09E-04	52%	Pass
20	0.270	183	3.65E-04	101	2.01E-04	55%	Pass
21	0.280	171	3.41E-04	94	1.87E-04	55%	Pass
22	0.290	157	3.13E-04	85	1.70E-04	54%	Pass
23	0.300	148	2.95E-04	77	1.54E-04	52%	Pass
24	0.310	137	2.73E-04	72	1.44E-04	53%	Pass
25	0.320	125	2.49E-04	61	1.22E-04	49%	Pass
26	0.330	119	2.37E-04	56	1.12E-04	47%	Pass
27	0.340	111	2.21E-04	55	1.10E-04	50%	Pass
28	0.350	106	2.11E-04	52	1.04E-04	49%	Pass
29	0.360	101	2.01E-04	46	9.17E-05	46%	Pass
30	0.370	98	1.95E-04	42	8.38E-05	43%	Pass
31	0.380	94	1.87E-04	39	7.78E-05	41%	Pass
32	0.390	91	1.81E-04	35	6.98E-05	38%	Pass
33	0.400	85	1.70E-04	33	6.58E-05	39%	Pass
34	0.411	81	1.62E-04	32	6.38E-05	40%	Pass
35	0.421	79	1.58E-04	32	6.38E-05	41%	Pass
36	0.431	78	1.56E-04	32	6.38E-05	41%	Pass
37	0.441	74	1.48E-04	28	5.58E-05	38%	Pass
38	0.451	71	1.42E-04	27	5.38E-05	38%	Pass
39	0.461	70	1.40E-04	27	5.38E-05	39%	Pass
40	0.471	67	1.34E-04	24	4.79E-05	36%	Pass
41	0.481	64	1.28E-04	22	4.39E-05	34%	Pass
42	0.491	63	1.26E-04	20	3.99E-05	32%	Pass
43	0.501	59	1.18E-04	19	3.79E-05	32%	Pass
44	0.511	57	1.14E-04	18	3.59E-05	32%	Pass
45	0.521	55	1.10E-04	16	3.19E-05	29%	Pass
46	0.531	53	1.06E-04	15	2.99E-05	28%	Pass
47	0.541	51	1.02E-04	14	2.79E-05	27%	Pass
48	0.551	49	9.77E-05	13	2.59E-05	27%	Pass
49	0.561	45	8.97E-05	11	2.19E-05	24%	Pass
50	0.571	43	8.58E-05	11	2.19E-05	26%	Pass
51	0.581	41	8.18E-05	11	2.19E-05	27%	Pass
52	0.591	41	8.18E-05	11	2.19E-05	27%	Pass
53	0.601	39	7.78E-05	11	2.19E-05	28%	Pass
54	0.611	37	7.38E-05	10	1.99E-05	27%	Pass

Interval	Pre-project Flow (cfs)	Pre-project Hours	Pre-project % Time Exceeding	Post-project Hours	Post-project % Time Exceeding	Percentage	Pass/Fail
55	0.621	34	6.78E-05	10	1.99E-05	29%	Pass
56	0.631	31	6.18E-05	8	1.60E-05	26%	Pass
57	0.641	29	5.78E-05	8	1.60E-05	28%	Pass
58	0.651	29	5.78E-05	8	1.60E-05	28%	Pass
59	0.661	27	5.38E-05	8	1.60E-05	30%	Pass
60	0.671	27	5.38E-05	8	1.60E-05	30%	Pass
61	0.681	27	5.38E-05	8	1.60E-05	30%	Pass
62	0.691	26	5.18E-05	8	1.60E-05	31%	Pass
63	0.701	24	4.79E-05	8	1.60E-05	33%	Pass
64	0.711	23	4.59E-05	7	1.40E-05	30%	Pass
65	0.721	23	4.59E-05	7	1.40E-05	30%	Pass
66	0.731	23	4.59E-05	7	1.40E-05	30%	Pass
67	0.741	23	4.59E-05	7	1.40E-05	30%	Pass
68	0.752	23	4.59E-05	5	9.97E-06	22%	Pass
69	0.762	22	4.39E-05	5	9.97E-06	23%	Pass
70	0.772	22	4.39E-05	5	9.97E-06	23%	Pass
71	0.782	22	4.39E-05	4	7.98E-06	18%	Pass
72	0.792	22	4.39E-05	4	7.98E-06	18%	Pass
73	0.802	20	3.99E-05	3	5.98E-06	15%	Pass
74	0.812	18	3.59E-05	3	5.98E-06	17%	Pass
75	0.822	16	3.19E-05	3	5.98E-06	19%	Pass
76	0.832	14	2.79E-05	2	3.99E-06	14%	Pass
77	0.842	14	2.79E-05	2	3.99E-06	14%	Pass
78	0.852	14	2.79E-05	1	1.99E-06	7%	Pass
79	0.862	14	2.79E-05	1	1.99E-06	7%	Pass
80	0.872	12	2.39E-05	0	0.00E+00	0%	Pass
81	0.882	12	2.39E-05	0	0.00E+00	0%	Pass
82	0.892	12	2.39E-05	0	0.00E+00	0%	Pass
83	0.902	11	2.19E-05	0	0.00E+00	0%	Pass
84	0.912	11	2.19E-05	0	0.00E+00	0%	Pass
85	0.922	10	1.99E-05	0	0.00E+00	0%	Pass
86	0.932	10	1.99E-05	0	0.00E+00	0%	Pass
87	0.942	8	1.60E-05	0	0.00E+00	0%	Pass
88	0.952	7	1.40E-05	0	0.00E+00	0%	Pass
89	0.962	7	1.40E-05	0	0.00E+00	0%	Pass
90	0.972	6	1.20E-05	0	0.00E+00	0%	Pass
91	0.982	6	1.20E-05	0	0.00E+00	0%	Pass
92	0.992	5	9.97E-06	0	0.00E+00	0%	Pass
93	1.002	5	9.97E-06	0	0.00E+00	0%	Pass
94	1.012	5	9.97E-06	0	0.00E+00	0%	Pass
95	1.022	5	9.97E-06	0	0.00E+00	0%	Pass
96	1.032	5	9.97E-06	0	0.00E+00	0%	Pass
97	1.042	5	9.97E-06	0	0.00E+00	0%	Pass
98	1.052	5	9.97E-06	0	0.00E+00	0%	Pass
99	1.062	5	9.97E-06	0	0.00E+00	0%	Pass
100	1.072	4	7.98E-06	0	0.00E+00	0%	Pass

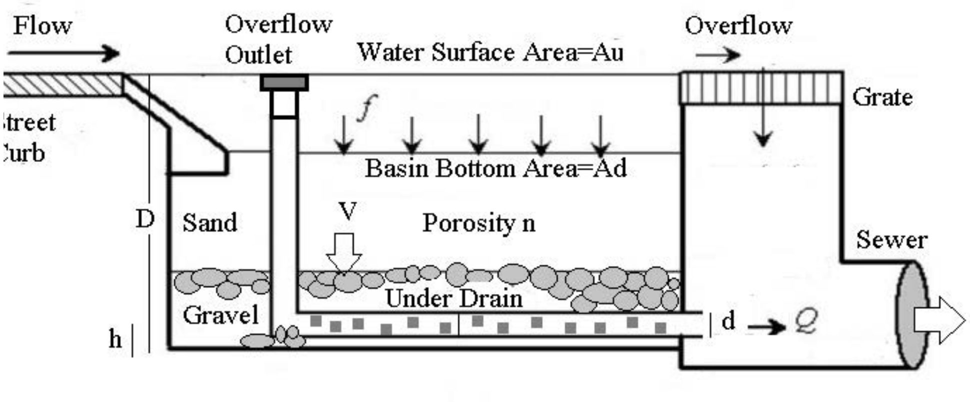


Flow Duration Curve
[Pre vs. Post (Mitigated)]
1.200
1.000
0.800
0.600
0.400
0.200
0.000
Flow (cfs)
1.0E-06
1.0E-05
1.0E-04
1.0E-03
1.0E-02
% Time Exceeding
Pre-project Q
Post-project (Mitigated) Q

SWMM Model Flow Coefficient Calculation

PARAMETER	ABBREV.	Bio-Retention Cell LID BMP	
Ponding Depth	PD	10	in
Bioretention Soil Layer	S	18	in
Gravel Layer	G	30	in
TOTAL		4.8	ft
		58	in
Orifice Coefficient	c_g	0.6	--
Low Flow Orifice Diameter	D	0.5	in
Drain exponent	n	0.5	--
Flow Rate (volumetric)	Q	0.014	cfs
Ponding Depth Surface Area	A_{PD}	1355	ft^2
Bioretention Surface Area	$A_{S,} A_G$	1355	ft^2
	$A_{S,} A_G$	0.0311	ac
Porosity of Bioretention Soil	n	0.40	-
Flow Rate (per unit area)	q	1.148	in/hr
Effective Ponding Depth	PD_{eff}	**10.00**	in
Flow Coefficient	C	**0.1511**	--

DRAIN TIME AND FLOW COEFFICIENT for SWMM

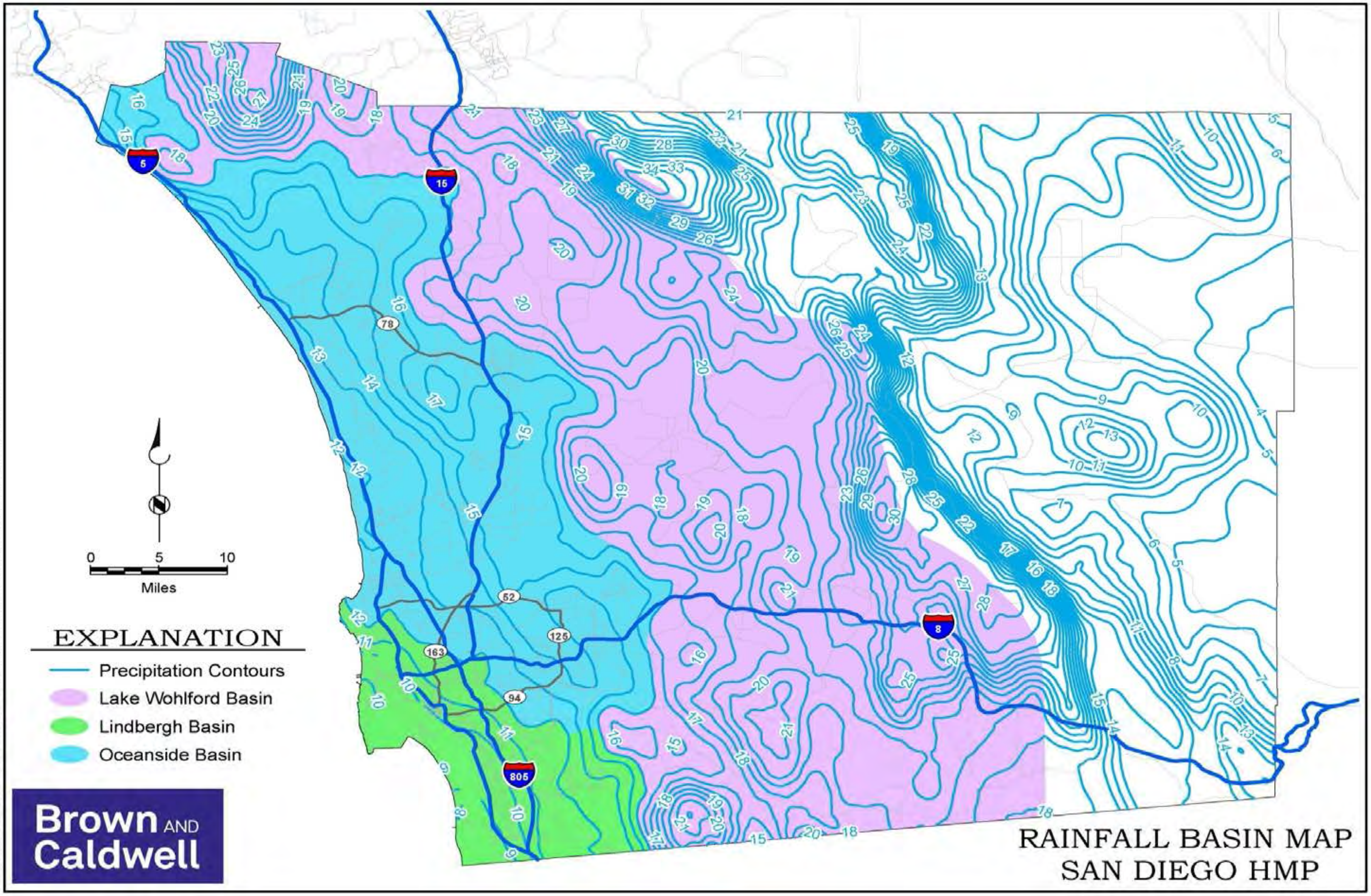


Determine the Drain Time and Flow Coeff (SWMM Method)

Surface area of Basin	A-LID=	1355.00	sq ft
Depth of Basin	D=HT=	52.00	inch
Porosity of Sand-mix	n=	0.40	
Dia of Sub-Drain	D=	0.50	inch
Discharge coefficient	Co=	0.61	
Location of Drain Center	h=	0.50	inch
Drain Time Calculated	T=	93.45	hour
SWMM Flow Coefficient	C=	0.15	inch^.5/hr

$$T = \frac{2nA(D-h)^{1/2}}{C_o a\sqrt{2g}} / 3600\ (hr)$$

$$C\ (inch^{0.5}/hr) = C_o \frac{a}{nA}\sqrt{2g} \times 12^{0.5} \times 3600 = \frac{2(D-h)^{1/2}}{T}\ inch^{0.5}/hour$$



RAINFALL BASIN MAP
SAN DIEGO HMP

Table 7-1. Sizing Factors for Bioretention Facilities						
Lower Flow Threshold	Soil Group	Slope	Rain Gauge	A	V_1	V_2
$0.5Q_2$	A	Flat	Lindbergh	0.06	0.05	N/A
$0.5Q_2$	A	Moderate	Lindbergh	0.055	0.0458	N/A
$0.5Q_2$	A	Steep	Lindbergh	0.045	0.0375	N/A
$0.5Q_2$	B	Flat	Lindbergh	0.093	0.0771	N/A
$0.5Q_2$	B	Moderate	Lindbergh	0.085	0.0708	N/A
$0.5Q_2$	B	Steep	Lindbergh	0.065	0.0542	N/A
$0.5Q_2$	C	Flat	Lindbergh	0.1	0.0833	0.06
$0.5Q_2$	C	Moderate	Lindbergh	0.1	0.0833	0.06
$0.5Q_2$	C	Steep	Lindbergh	0.075	0.0625	0.045
$0.5Q_2$	D	Flat	Lindbergh	0.08	0.0667	0.048
$0.5Q_2$	D	Moderate	Lindbergh	0.08	0.0667	0.048
$0.5Q_2$	D	Steep	Lindbergh	0.06	0.05	0.036
$0.5Q_2$	A	Flat	Oceanside	0.07	0.0583	N/A
$0.5Q_2$	A	Moderate	Oceanside	0.065	0.0542	N/A
$0.5Q_2$	A	Steep	Oceanside	0.06	0.05	N/A
$0.5Q_2$	B	Flat	Oceanside	0.098	0.0813	N/A
$0.5Q_2$	B	Moderate	Oceanside	0.09	0.075	N/A
$0.5Q_2$	B	Steep	Oceanside	0.075	0.0625	N/A
$0.5Q_2$	C	Flat	Oceanside	0.075	0.0625	0.045
$0.5Q_2$	C	Moderate	Oceanside	0.075	0.0625	0.045
$0.5Q_2$	C	Steep	Oceanside	0.06	0.05	0.036
$0.5Q_2$	D	Flat	Oceanside	0.065	0.0542	0.039
$0.5Q_2$	D	Moderate	Oceanside	0.065	0.0542	0.039
$0.5Q_2$	D	Steep	Oceanside	0.05	0.0417	0.03
$0.5Q_2$	A	Flat	Lake Wohlford	0.05	0.0417	N/A
$0.5Q_2$	A	Moderate	Lake Wohlford	0.045	0.0375	N/A
$0.5Q_2$	A	Steep	Lake Wohlford	0.04	0.0333	N/A
$0.5Q_2$	B	Flat	Lake Wohlford	0.048	0.0396	N/A
$0.5Q_2$	B	Moderate	Lake Wohlford	0.045	0.0375	N/A
$0.5Q_2$	B	Steep	Lake Wohlford	0.04	0.0333	N/A
$0.5Q_2$	C	Flat	Lake Wohlford	0.065	0.0542	0.039
$0.5Q_2$	C	Moderate	Lake Wohlford	0.065	0.0542	0.039
$0.5Q_2$	C	Steep	Lake Wohlford	0.05	0.0417	0.03
$0.5Q_2$	D	Flat	Lake Wohlford	0.055	0.0458	0.033
$0.5Q_2$	D	Moderate	Lake Wohlford	0.055	0.0458	0.033
$0.5Q_2$	D	Steep	Lake Wohlford	0.045	0.0375	0.027
$0.3Q_2$	A	Flat	Lindbergh	0.06	0.05	N/A
$0.3Q_2$	A	Moderate	Lindbergh	0.055	0.0458	N/A
$0.3Q_2$	A	Steep	Lindbergh	0.045	0.0375	N/A
$0.3Q_2$	B	Flat	Lindbergh	0.098	0.0813	N/A
$0.3Q_2$	B	Moderate	Lindbergh	0.09	0.075	N/A
$0.3Q_2$	B	Steep	Lindbergh	0.07	0.0583	N/A
$0.3Q_2$	C	Flat	Lindbergh	0.11	0.0917	0.066
$0.3Q_2$	C	Moderate	Lindbergh	0.11	0.0917	0.066
$0.3Q_2$	C	Steep	Lindbergh	0.085	0.0708	0.051
$0.3Q_2$	D	Flat	Lindbergh	0.1	0.0833	0.06
$0.3Q_2$	D	Moderate	Lindbergh	0.1	0.0833	0.06

$0.3Q_2$	D	Steep	Lindbergh	0.07	0.0583	0.042
$0.3Q_2$	A	Flat	Oceanside	0.07	0.0583	N/A
$0.3Q_2$	A	Moderate	Oceanside	0.065	0.0542	N/A
$0.3Q_2$	A	Steep	Oceanside	0.06	0.05	N/A
$0.3Q_2$	B	Flat	Oceanside	0.098	0.0813	N/A
$0.3Q_2$	B	Moderate	Oceanside	0.09	0.075	N/A
$0.3Q_2$	B	Steep	Oceanside	0.075	0.0625	N/A
$0.3Q_2$	C	Flat	Oceanside	0.1	0.0833	0.06
$0.3Q_2$	C	Moderate	Oceanside	0.1	0.0833	0.06
$0.3Q_2$	C	Steep	Oceanside	0.08	0.0667	0.048
$0.3Q_2$	D	Flat	Oceanside	0.085	0.0708	0.051
$0.3Q_2$	D	Moderate	Oceanside	0.085	0.0708	0.051
$0.3Q_2$	D	Steep	Oceanside	0.065	0.0542	0.039
$0.3Q_2$	A	Flat	Lake Wohlford	0.05	0.0417	N/A
$0.3Q_2$	A	Moderate	Lake Wohlford	0.045	0.0375	N/A
$0.3Q_2$	A	Steep	Lake Wohlford	0.04	0.0333	N/A
$0.3Q_2$	B	Flat	Lake Wohlford	0.06	0.05	N/A
$0.3Q_2$	B	Moderate	Lake Wohlford	0.055	0.0458	N/A
$0.3Q_2$	B	Steep	Lake Wohlford	0.045	0.0375	N/A
$0.3Q_2$	C	Flat	Lake Wohlford	0.075	0.0625	0.045
$0.3Q_2$	C	Moderate	Lake Wohlford	0.075	0.0625	0.045
$0.3Q_2$	C	Steep	Lake Wohlford	0.06	0.05	0.036
$0.3Q_2$	D	Flat	Lake Wohlford	0.065	0.0542	0.039
$0.3Q_2$	D	Moderate	Lake Wohlford	0.065	0.0542	0.039
$0.3Q_2$	D	Steep	Lake Wohlford	0.05	0.0417	0.03
$0.1Q_2$	A	Flat	Lindbergh	0.06	0.05	N/A
$0.1Q_2$	A	Moderate	Lindbergh	0.055	0.0458	N/A
$0.1Q_2$	A	Steep	Lindbergh	0.045	0.0375	N/A
$0.1Q_2$	B	Flat	Lindbergh	0.1	0.0833	N/A
$0.1Q_2$	B	Moderate	Lindbergh	0.095	0.0792	N/A
$0.1Q_2$	B	Steep	Lindbergh	0.08	0.0667	N/A
$0.1Q_2$	C	Flat	Lindbergh	0.145	0.1208	0.087
$0.1Q_2$	C	Moderate	Lindbergh	0.145	0.1208	0.087
$0.1Q_2$	C	Steep	Lindbergh	0.12	0.1	0.072
$0.1Q_2$	D	Flat	Lindbergh	0.16	0.1333	0.096
$0.1Q_2$	D	Moderate	Lindbergh	0.16	0.1333	0.096
$0.1Q_2$	D	Steep	Lindbergh	0.115	0.0958	0.069
$0.1Q_2$	A	Flat	Oceanside	0.07	0.0583	N/A
$0.1Q_2$	A	Moderate	Oceanside	0.065	0.0542	N/A
$0.1Q_2$	A	Steep	Oceanside	0.06	0.05	N/A
$0.1Q_2$	B	Flat	Oceanside	0.103	0.0854	N/A
$0.1Q_2$	B	Moderate	Oceanside	0.09	0.075	N/A
$0.1Q_2$	B	Steep	Oceanside	0.075	0.0625	N/A
$0.1Q_2$	C	Flat	Oceanside	0.13	0.1083	0.078
$0.1Q_2$	C	Moderate	Oceanside	0.13	0.1083	0.078
$0.1Q_2$	C	Steep	Oceanside	0.11	0.0917	0.066
$0.1Q_2$	D	Flat	Oceanside	0.13	0.1083	0.078
$0.1Q_2$	D	Moderate	Oceanside	0.13	0.1083	0.078
$0.1Q_2$	D	Steep	Oceanside	0.065	0.0542	0.039

0.1Q_2	A	Flat	Lake Wohlford	0.05	0.0417	N/A
0.1Q_2	A	Moderate	Lake Wohlford	0.045	0.0375	N/A
0.1Q_2	A	Steep	Lake Wohlford	0.04	0.0333	N/A
0.1Q_2	B	Flat	Lake Wohlford	0.09	0.075	N/A
0.1Q_2	B	Moderate	Lake Wohlford	0.085	0.0708	N/A
0.1Q_2	B	Steep	Lake Wohlford	0.065	0.0542	N/A
0.1Q_2	C	Flat	Lake Wohlford	0.11	0.0917	0.066
0.1Q_2	C	Moderate	Lake Wohlford	0.11	0.0917	0.066
0.1Q_2	C	Steep	Lake Wohlford	0.09	0.075	0.054
0.1Q_2	D	Flat	Lake Wohlford	0.1	0.0833	0.06
0.1Q_2	D	Moderate	Lake Wohlford	0.1	0.0833	0.06
0.1Q_2	D	Steep	Lake Wohlford	0.075	0.0625	0.045

Table 7-2. Sizing Factors for Bioretention Plus Cistern Facilities

Lower Flow Threshold	Soil Group	Slope	Rain Gauge	A	V_1	V_2
0.5Q_2	A	Flat	Lindbergh	0.02	0.12	N/A
0.5Q_2	A	Moderate	Lindbergh	0.02	0.1	N/A
0.5Q_2	A	Steep	Lindbergh	0.02	0.1	N/A
0.5Q_2	B	Flat	Lindbergh	0.02	0.39	N/A
0.5Q_2	B	Moderate	Lindbergh	0.02	0.2	N/A
0.5Q_2	B	Steep	Lindbergh	0.02	0.12	N/A
0.5Q_2	C	Flat	Lindbergh	0.02	0.12	N/A
0.5Q_2	C	Moderate	Lindbergh	0.02	0.12	N/A
0.5Q_2	C	Steep	Lindbergh	0.02	0.1	N/A
0.5Q_2	D	Flat	Lindbergh	0.02	0.1	N/A
0.5Q_2	D	Moderate	Lindbergh	0.02	0.1	N/A
0.5Q_2	D	Steep	Lindbergh	0.03	0.08	N/A
0.5Q_2	A	Flat	Oceanside	0.02	0.16	N/A
0.5Q_2	A	Moderate	Oceanside	0.02	0.14	N/A
0.5Q_2	A	Steep	Oceanside	0.03	0.12	N/A
0.5Q_2	B	Flat	Oceanside	0.02	0.19	N/A
0.5Q_2	B	Moderate	Oceanside	0.025	0.16	N/A
0.5Q_2	B	Steep	Oceanside	0.035	0.14	N/A
0.5Q_2	C	Flat	Oceanside	0.03	0.14	N/A
0.5Q_2	C	Moderate	Oceanside	0.035	0.14	N/A
0.5Q_2	C	Steep	Oceanside	0.04	0.12	N/A
0.5Q_2	D	Flat	Oceanside	0.035	0.12	N/A
0.5Q_2	D	Moderate	Oceanside	0.04	0.12	N/A
0.5Q_2	D	Steep	Oceanside	0.04	0.1	N/A
0.5Q_2	A	Flat	Lake Wohlford	0.025	0.18	N/A
0.5Q_2	A	Moderate	Lake Wohlford	0.04	0.14	N/A
0.5Q_2	A	Steep	Lake Wohlford	0.04	0.08	N/A
0.5Q_2	B	Flat	Lake Wohlford	0.04	0.21	N/A
0.5Q_2	B	Moderate	Lake Wohlford	0.04	0.2	N/A
0.5Q_2	B	Steep	Lake Wohlford	0.04	0.14	N/A
0.5Q_2	C	Flat	Lake Wohlford	0.04	0.14	N/A
0.5Q_2	C	Moderate	Lake Wohlford	0.04	0.14	N/A
0.5Q_2	C	Steep	Lake Wohlford	0.04	0.1	N/A
0.5Q_2	D	Flat	Lake Wohlford	0.04	0.1	N/A

$0.5Q_2$	D	Moderate	Lake Wohlford	0.04	0.1	N/A
$0.5Q_2$	D	Steep	Lake Wohlford	0.04	0.08	N/A
$0.3Q_2$	A	Flat	Lindbergh	0.02	0.12	N/A
$0.3Q_2$	A	Moderate	Lindbergh	0.02	0.1	N/A
$0.3Q_2$	A	Steep	Lindbergh	0.02	0.1	N/A
$0.3Q_2$	B	Flat	Lindbergh	0.02	0.59	N/A
$0.3Q_2$	B	Moderate	Lindbergh	0.02	0.36	N/A
$0.3Q_2$	B	Steep	Lindbergh	0.02	0.18	N/A
$0.3Q_2$	C	Flat	Lindbergh	0.02	0.18	N/A
$0.3Q_2$	C	Moderate	Lindbergh	0.02	0.18	N/A
$0.3Q_2$	C	Steep	Lindbergh	0.02	0.14	N/A
$0.3Q_2$	D	Flat	Lindbergh	0.02	0.14	N/A
$0.3Q_2$	D	Moderate	Lindbergh	0.02	0.14	N/A
$0.3Q_2$	D	Steep	Lindbergh	0.02	0.08	N/A
$0.3Q_2$	A	Flat	Oceanside	0.02	0.16	N/A
$0.3Q_2$	A	Moderate	Oceanside	0.02	0.14	N/A
$0.3Q_2$	A	Steep	Oceanside	0.02	0.12	N/A
$0.3Q_2$	B	Flat	Oceanside	0.02	0.22	N/A
$0.3Q_2$	B	Moderate	Oceanside	0.02	0.18	N/A
$0.3Q_2$	B	Steep	Oceanside	0.02	0.16	N/A
$0.3Q_2$	C	Flat	Oceanside	0.02	0.16	N/A
$0.3Q_2$	C	Moderate	Oceanside	0.02	0.16	N/A
$0.3Q_2$	C	Steep	Oceanside	0.025	0.14	N/A
$0.3Q_2$	D	Flat	Oceanside	0.02	0.14	N/A
$0.3Q_2$	D	Moderate	Oceanside	0.025	0.14	N/A
$0.3Q_2$	D	Steep	Oceanside	0.03	0.12	N/A
$0.3Q_2$	A	Flat	Lake Wohlford	0.02	0.18	N/A
$0.3Q_2$	A	Moderate	Lake Wohlford	0.025	0.14	N/A
$0.3Q_2$	A	Steep	Lake Wohlford	0.03	0.08	N/A
$0.3Q_2$	B	Flat	Lake Wohlford	0.025	0.26	N/A
$0.3Q_2$	B	Moderate	Lake Wohlford	0.025	0.24	N/A
$0.3Q_2$	B	Steep	Lake Wohlford	0.03	0.18	N/A
$0.3Q_2$	C	Flat	Lake Wohlford	0.03	0.18	N/A
$0.3Q_2$	C	Moderate	Lake Wohlford	0.03	0.18	N/A
$0.3Q_2$	C	Steep	Lake Wohlford	0.035	0.14	N/A
$0.3Q_2$	D	Flat	Lake Wohlford	0.03	0.14	N/A
$0.3Q_2$	D	Moderate	Lake Wohlford	0.035	0.14	N/A
$0.3Q_2$	D	Steep	Lake Wohlford	0.04	0.1	N/A
$0.1Q_2$	A	Flat	Lindbergh	0.02	0.12	N/A
$0.1Q_2$	A	Moderate	Lindbergh	0.02	0.1	N/A
$0.1Q_2$	A	Steep	Lindbergh	0.02	0.1	N/A
$0.1Q_2$	B	Flat	Lindbergh	0.02	0.54	N/A
$0.1Q_2$	B	Moderate	Lindbergh	0.02	0.78	N/A
$0.1Q_2$	B	Steep	Lindbergh	0.02	0.34	N/A
$0.1Q_2$	C	Flat	Lindbergh	0.02	0.36	N/A
$0.1Q_2$	C	Moderate	Lindbergh	0.02	0.36	N/A
$0.1Q_2$	C	Steep	Lindbergh	0.02	0.24	N/A
$0.1Q_2$	D	Flat	Lindbergh	0.02	0.26	N/A
$0.1Q_2$	D	Moderate	Lindbergh	0.02	0.26	N/A

$0.1Q_2$	D	Steep	Lindbergh	0.02	0.16	N/A
$0.1Q_2$	A	Flat	Oceanside	0.02	0.16	N/A
$0.1Q_2$	A	Moderate	Oceanside	0.02	0.14	N/A
$0.1Q_2$	A	Steep	Oceanside	0.02	0.12	N/A
$0.1Q_2$	B	Flat	Oceanside	0.02	0.51	N/A
$0.1Q_2$	B	Moderate	Oceanside	0.02	0.34	N/A
$0.1Q_2$	B	Steep	Oceanside	0.02	0.24	N/A
$0.1Q_2$	C	Flat	Oceanside	0.02	0.26	N/A
$0.1Q_2$	C	Moderate	Oceanside	0.02	0.26	N/A
$0.1Q_2$	C	Steep	Oceanside	0.02	0.2	N/A
$0.1Q_2$	D	Flat	Oceanside	0.02	0.2	N/A
$0.1Q_2$	D	Moderate	Oceanside	0.02	0.2	N/A
$0.1Q_2$	D	Steep	Oceanside	0.02	0.18	N/A
$0.1Q_2$	A	Flat	Lake Wohlford	0.02	0.18	N/A
$0.1Q_2$	A	Moderate	Lake Wohlford	0.02	0.14	N/A
$0.1Q_2$	A	Steep	Lake Wohlford	0.02	0.08	N/A
$0.1Q_2$	B	Flat	Lake Wohlford	0.02	0.44	N/A
$0.1Q_2$	B	Moderate	Lake Wohlford	0.02	0.4	N/A
$0.1Q_2$	B	Steep	Lake Wohlford	0.02	0.32	N/A
$0.1Q_2$	C	Flat	Lake Wohlford	0.02	0.32	N/A
$0.1Q_2$	C	Moderate	Lake Wohlford	0.02	0.32	N/A
$0.1Q_2$	C	Steep	Lake Wohlford	0.02	0.22	N/A
$0.1Q_2$	D	Flat	Lake Wohlford	0.02	0.24	N/A
$0.1Q_2$	D	Moderate	Lake Wohlford	0.02	0.24	N/A
$0.1Q_2$	D	Steep	Lake Wohlford	0.02	0.18	N/A

Table 7-3. Sizing Factors for Bioretention Plus Vault Facilities

Lower Flow Threshold	Soil Group	Slope	Rain Gauge	A	V_1	V_2
$0.5Q_2$	A	Flat	Lindbergh	N/A	N/A	N/A
$0.5Q_2$	A	Moderate	Lindbergh	N/A	N/A	N/A
$0.5Q_2$	A	Steep	Lindbergh	N/A	N/A	N/A
$0.5Q_2$	B	Flat	Lindbergh	0.04	0.36	N/A
$0.5Q_2$	B	Moderate	Lindbergh	0.04	0.24	N/A
$0.5Q_2$	B	Steep	Lindbergh	0.04	0.14	N/A
$0.5Q_2$	C	Flat	Lindbergh	0.04	0.16	N/A
$0.5Q_2$	C	Moderate	Lindbergh	0.04	0.16	N/A
$0.5Q_2$	C	Steep	Lindbergh	0.04	0.12	N/A
$0.5Q_2$	D	Flat	Lindbergh	0.04	0.14	N/A
$0.5Q_2$	D	Moderate	Lindbergh	0.04	0.14	N/A
$0.5Q_2$	D	Steep	Lindbergh	0.04	0.1	N/A
$0.5Q_2$	A	Flat	Oceanside	N/A	N/A	N/A
$0.5Q_2$	A	Moderate	Oceanside	N/A	N/A	N/A
$0.5Q_2$	A	Steep	Oceanside	N/A	N/A	N/A
$0.5Q_2$	B	Flat	Oceanside	0.04	0.21	N/A
$0.5Q_2$	B	Moderate	Oceanside	0.04	0.18	N/A
$0.5Q_2$	B	Steep	Oceanside	0.04	0.14	N/A
$0.5Q_2$	C	Flat	Oceanside	0.04	0.14	N/A
$0.5Q_2$	C	Moderate	Oceanside	0.04	0.14	N/A

$0.5Q_2$	C	Steep	Oceanside	0.04	0.12	N/A
$0.5Q_2$	D	Flat	Oceanside	0.04	0.14	N/A
$0.5Q_2$	D	Moderate	Oceanside	0.04	0.14	N/A
$0.5Q_2$	D	Steep	Oceanside	0.04	0.12	N/A
$0.5Q_2$	A	Flat	Lake Wohlford	N/A	N/A	N/A
$0.5Q_2$	A	Moderate	Lake Wohlford	N/A	N/A	N/A
$0.5Q_2$	A	Steep	Lake Wohlford	N/A	N/A	N/A
$0.5Q_2$	B	Flat	Lake Wohlford	0.04	0.26	N/A
$0.5Q_2$	B	Moderate	Lake Wohlford	0.04	0.22	N/A
$0.5Q_2$	B	Steep	Lake Wohlford	0.04	0.12	N/A
$0.5Q_2$	C	Flat	Lake Wohlford	0.04	0.14	N/A
$0.5Q_2$	C	Moderate	Lake Wohlford	0.04	0.14	N/A
$0.5Q_2$	C	Steep	Lake Wohlford	0.04	0.1	N/A
$0.5Q_2$	D	Flat	Lake Wohlford	0.04	0.12	N/A
$0.5Q_2$	D	Moderate	Lake Wohlford	0.04	0.12	N/A
$0.5Q_2$	D	Steep	Lake Wohlford	0.04	0.08	N/A
$0.3Q_2$	A	Flat	Lindbergh	N/A	N/A	N/A
$0.3Q_2$	A	Moderate	Lindbergh	N/A	N/A	N/A
$0.3Q_2$	A	Steep	Lindbergh	N/A	N/A	N/A
$0.3Q_2$	B	Flat	Lindbergh	0.04	0.45	N/A
$0.3Q_2$	B	Moderate	Lindbergh	0.04	0.32	N/A
$0.3Q_2$	B	Steep	Lindbergh	0.04	0.18	N/A
$0.3Q_2$	C	Flat	Lindbergh	0.04	0.18	N/A
$0.3Q_2$	C	Moderate	Lindbergh	0.04	0.18	N/A
$0.3Q_2$	C	Steep	Lindbergh	0.04	0.14	N/A
$0.3Q_2$	D	Flat	Lindbergh	0.04	0.16	N/A
$0.3Q_2$	D	Moderate	Lindbergh	0.04	0.16	N/A
$0.3Q_2$	D	Steep	Lindbergh	0.04	0.12	N/A
$0.3Q_2$	A	Flat	Oceanside	N/A	N/A	N/A
$0.3Q_2$	A	Moderate	Oceanside	N/A	N/A	N/A
$0.3Q_2$	A	Steep	Oceanside	N/A	N/A	N/A
$0.3Q_2$	B	Flat	Oceanside	0.04	0.25	N/A
$0.3Q_2$	B	Moderate	Oceanside	0.04	0.2	N/A
$0.3Q_2$	B	Steep	Oceanside	0.04	0.16	N/A
$0.3Q_2$	C	Flat	Oceanside	0.04	0.16	N/A
$0.3Q_2$	C	Moderate	Oceanside	0.04	0.16	N/A
$0.3Q_2$	C	Steep	Oceanside	0.04	0.14	N/A
$0.3Q_2$	D	Flat	Oceanside	0.04	0.14	N/A
$0.3Q_2$	D	Moderate	Oceanside	0.04	0.14	N/A
$0.3Q_2$	D	Steep	Oceanside	0.04	0.12	N/A
$0.3Q_2$	A	Flat	Lake Wohlford	N/A	N/A	N/A
$0.3Q_2$	A	Moderate	Lake Wohlford	N/A	N/A	N/A
$0.3Q_2$	A	Steep	Lake Wohlford	N/A	N/A	N/A
$0.3Q_2$	B	Flat	Lake Wohlford	0.04	0.29	N/A
$0.3Q_2$	B	Moderate	Lake Wohlford	0.04	0.26	N/A
$0.3Q_2$	B	Steep	Lake Wohlford	0.04	0.16	N/A
$0.3Q_2$	C	Flat	Lake Wohlford	0.04	0.16	N/A
$0.3Q_2$	C	Moderate	Lake Wohlford	0.04	0.16	N/A
$0.3Q_2$	C	Steep	Lake Wohlford	0.04	0.12	N/A

$0.3Q_2$	D	Flat	Lake Wohlford	0.04	0.12	N/A
$0.3Q_2$	D	Moderate	Lake Wohlford	0.04	0.12	N/A
$0.3Q_2$	D	Steep	Lake Wohlford	0.04	0.08	N/A
$0.1Q_2$	A	Flat	Lindbergh	N/A	N/A	N/A
$0.1Q_2$	A	Moderate	Lindbergh	N/A	N/A	N/A
$0.1Q_2$	A	Steep	Lindbergh	N/A	N/A	N/A
$0.1Q_2$	B	Flat	Lindbergh	0.04	0.59	N/A
$0.1Q_2$	B	Moderate	Lindbergh	0.04	0.5	N/A
$0.1Q_2$	B	Steep	Lindbergh	0.04	0.32	N/A
$0.1Q_2$	C	Flat	Lindbergh	0.04	0.34	N/A
$0.1Q_2$	C	Moderate	Lindbergh	0.04	0.34	N/A
$0.1Q_2$	C	Steep	Lindbergh	0.04	0.24	N/A
$0.1Q_2$	D	Flat	Lindbergh	0.04	0.26	N/A
$0.1Q_2$	D	Moderate	Lindbergh	0.04	0.26	N/A
$0.1Q_2$	D	Steep	Lindbergh	0.04	0.18	N/A
$0.1Q_2$	A	Flat	Oceanside	N/A	N/A	N/A
$0.1Q_2$	A	Moderate	Oceanside	N/A	N/A	N/A
$0.1Q_2$	A	Steep	Oceanside	N/A	N/A	N/A
$0.1Q_2$	B	Flat	Oceanside	0.04	0.43	N/A
$0.1Q_2$	B	Moderate	Oceanside	0.04	0.34	N/A
$0.1Q_2$	B	Steep	Oceanside	0.04	0.24	N/A
$0.1Q_2$	C	Flat	Oceanside	0.04	0.26	N/A
$0.1Q_2$	C	Moderate	Oceanside	0.04	0.26	N/A
$0.1Q_2$	C	Steep	Oceanside	0.04	0.2	N/A
$0.1Q_2$	D	Flat	Oceanside	0.04	0.22	N/A
$0.1Q_2$	D	Moderate	Oceanside	0.04	0.22	N/A
$0.1Q_2$	D	Steep	Oceanside	0.04	0.16	N/A
$0.1Q_2$	A	Flat	Lake Wohlford	N/A	N/A	N/A
$0.1Q_2$	A	Moderate	Lake Wohlford	N/A	N/A	N/A
$0.1Q_2$	A	Steep	Lake Wohlford	N/A	N/A	N/A
$0.1Q_2$	B	Flat	Lake Wohlford	0.04	0.43	N/A
$0.1Q_2$	B	Moderate	Lake Wohlford	0.04	0.38	N/A
$0.1Q_2$	B	Steep	Lake Wohlford	0.04	0.28	N/A
$0.1Q_2$	C	Flat	Lake Wohlford	0.04	0.28	N/A
$0.1Q_2$	C	Moderate	Lake Wohlford	0.04	0.28	N/A
$0.1Q_2$	C	Steep	Lake Wohlford	0.04	0.2	N/A
$0.1Q_2$	D	Flat	Lake Wohlford	0.04	0.22	N/A
$0.1Q_2$	D	Moderate	Lake Wohlford	0.04	0.22	N/A
$0.1Q_2$	D	Steep	Lake Wohlford	0.04	0.14	N/A

Table 7-4. Sizing Factors for Flow-Through Planters

Lower Flow Threshold	Soil Group	Slope	Rain Gauge	A	V_1	V_2
0.5Q2	A	Flat	Lindbergh	N/A	N/A	N/A
0.5Q2	A	Moderate	Lindbergh	N/A	N/A	N/A
0.5Q2	A	Steep	Lindbergh	N/A	N/A	N/A
0.5Q2	B	Flat	Lindbergh	N/A	N/A	N/A
0.5Q2	B	Moderate	Lindbergh	N/A	N/A	N/A
0.5Q2	B	Steep	Lindbergh	N/A	N/A	N/A

0.5Q2	C	Flat	Lindbergh	0.115	0.0958	0.069
0.5Q2	C	Moderate	Lindbergh	0.115	0.0958	0.069
0.5Q2	C	Steep	Lindbergh	0.08	0.0667	0.048
0.5Q2	D	Flat	Lindbergh	0.085	0.0708	0.051
0.5Q2	D	Moderate	Lindbergh	0.085	0.0708	0.051
0.5Q2	D	Steep	Lindbergh	0.065	0.0542	0.039
0.5Q2	A	Flat	Oceanside	N/A	N/A	N/A
0.5Q2	A	Moderate	Oceanside	N/A	N/A	N/A
0.5Q2	A	Steep	Oceanside	N/A	N/A	N/A
0.5Q2	B	Flat	Oceanside	N/A	N/A	N/A
0.5Q2	B	Moderate	Oceanside	N/A	N/A	N/A
0.5Q2	B	Steep	Oceanside	N/A	N/A	N/A
0.5Q2	C	Flat	Oceanside	0.075	0.0625	0.045
0.5Q2	C	Moderate	Oceanside	0.075	0.0625	0.045
0.5Q2	C	Steep	Oceanside	0.065	0.0542	0.039
0.5Q2	D	Flat	Oceanside	0.07	0.0583	0.042
0.5Q2	D	Moderate	Oceanside	0.07	0.0583	0.042
0.5Q2	D	Steep	Oceanside	0.05	0.0417	0.03
0.5Q2	A	Flat	Lake Wohlford	N/A	N/A	N/A
0.5Q2	A	Moderate	Lake Wohlford	N/A	N/A	N/A
0.5Q2	A	Steep	Lake Wohlford	N/A	N/A	N/A
0.5Q2	B	Flat	Lake Wohlford	N/A	N/A	N/A
0.5Q2	B	Moderate	Lake Wohlford	N/A	N/A	N/A
0.5Q2	B	Steep	Lake Wohlford	N/A	N/A	N/A
0.5Q2	C	Flat	Lake Wohlford	0.07	0.0583	0.042
0.5Q2	C	Moderate	Lake Wohlford	0.07	0.0583	0.042
0.5Q2	C	Steep	Lake Wohlford	0.05	0.0417	0.03
0.5Q2	D	Flat	Lake Wohlford	0.055	0.0458	0.033
0.5Q2	D	Moderate	Lake Wohlford	0.055	0.0458	0.033
0.5Q2	D	Steep	Lake Wohlford	0.045	0.0375	0.027
0.3Q2	A	Flat	Lindbergh	N/A	N/A	N/A
0.3Q2	A	Moderate	Lindbergh	N/A	N/A	N/A
0.3Q2	A	Steep	Lindbergh	N/A	N/A	N/A
0.3Q2	B	Flat	Lindbergh	N/A	N/A	N/A
0.3Q2	B	Moderate	Lindbergh	N/A	N/A	N/A
0.3Q2	B	Steep	Lindbergh	N/A	N/A	N/A
0.3Q2	C	Flat	Lindbergh	0.13	0.1083	0.078
0.3Q2	C	Moderate	Lindbergh	0.13	0.1083	0.078
0.3Q2	C	Steep	Lindbergh	0.1	0.0833	0.06
0.3Q2	D	Flat	Lindbergh	0.105	0.0875	0.063
0.3Q2	D	Moderate	Lindbergh	0.105	0.0875	0.063
0.3Q2	D	Steep	Lindbergh	0.075	0.0625	0.045
0.3Q2	A	Flat	Oceanside	N/A	N/A	N/A
0.3Q2	A	Moderate	Oceanside	N/A	N/A	N/A
0.3Q2	A	Steep	Oceanside	N/A	N/A	N/A
0.3Q2	B	Flat	Oceanside	N/A	N/A	N/A
0.3Q2	B	Moderate	Oceanside	N/A	N/A	N/A
0.3Q2	B	Steep	Oceanside	N/A	N/A	N/A
0.3Q2	C	Flat	Oceanside	0.105	0.0875	0.063

0.3Q2	C	Moderate	Oceanside	0.105	0.0875	0.063
0.3Q2	C	Steep	Oceanside	0.085	0.0708	0.051
0.3Q2	D	Flat	Oceanside	0.09	0.075	0.054
0.3Q2	D	Moderate	Oceanside	0.09	0.075	0.054
0.3Q2	D	Steep	Oceanside	0.07	0.0583	0.042
0.3Q2	A	Flat	Lake Wohlford	N/A	N/A	N/A
0.3Q2	A	Moderate	Lake Wohlford	N/A	N/A	N/A
0.3Q2	A	Steep	Lake Wohlford	N/A	N/A	N/A
0.3Q2	B	Flat	Lake Wohlford	N/A	N/A	N/A
0.3Q2	B	Moderate	Lake Wohlford	N/A	N/A	N/A
0.3Q2	B	Steep	Lake Wohlford	N/A	N/A	N/A
0.3Q2	C	Flat	Lake Wohlford	0.085	0.0708	0.051
0.3Q2	C	Moderate	Lake Wohlford	0.085	0.0708	0.051
0.3Q2	C	Steep	Lake Wohlford	0.06	0.05	0.036
0.3Q2	D	Flat	Lake Wohlford	0.065	0.0542	0.039
0.3Q2	D	Moderate	Lake Wohlford	0.065	0.0542	0.039
0.3Q2	D	Steep	Lake Wohlford	0.05	0.0417	0.03
0.1Q2	A	Flat	Lindbergh	N/A	N/A	N/A
0.1Q2	A	Moderate	Lindbergh	N/A	N/A	N/A
0.1Q2	A	Steep	Lindbergh	N/A	N/A	N/A
0.1Q2	B	Flat	Lindbergh	N/A	N/A	N/A
0.1Q2	B	Moderate	Lindbergh	N/A	N/A	N/A
0.1Q2	B	Steep	Lindbergh	N/A	N/A	N/A
0.1Q2	C	Flat	Lindbergh	0.25	0.2083	0.15
0.1Q2	C	Moderate	Lindbergh	0.25	0.2083	0.15
0.1Q2	C	Steep	Lindbergh	0.185	0.1542	0.111
0.1Q2	D	Flat	Lindbergh	0.2	0.1667	0.12
0.1Q2	D	Moderate	Lindbergh	0.2	0.1667	0.12
0.1Q2	D	Steep	Lindbergh	0.13	0.1083	0.078
0.1Q2	A	Flat	Oceanside	N/A	N/A	N/A
0.1Q2	A	Moderate	Oceanside	N/A	N/A	N/A
0.1Q2	A	Steep	Oceanside	N/A	N/A	N/A
0.1Q2	B	Flat	Oceanside	N/A	N/A	N/A
0.1Q2	B	Moderate	Oceanside	N/A	N/A	N/A
0.1Q2	B	Steep	Oceanside	N/A	N/A	N/A
0.1Q2	C	Flat	Oceanside	0.19	0.1583	0.114
0.1Q2	C	Moderate	Oceanside	0.19	0.1583	0.114
0.1Q2	C	Steep	Oceanside	0.14	0.1167	0.084
0.1Q2	D	Flat	Oceanside	0.16	0.1333	0.096
0.1Q2	D	Moderate	Oceanside	0.16	0.1333	0.096
0.1Q2	D	Steep	Oceanside	0.105	0.0875	0.063
0.1Q2	A	Flat	Lake Wohlford	N/A	N/A	N/A
0.1Q2	A	Moderate	Lake Wohlford	N/A	N/A	N/A
0.1Q2	A	Steep	Lake Wohlford	N/A	N/A	N/A
0.1Q2	B	Flat	Lake Wohlford	N/A	N/A	N/A
0.1Q2	B	Moderate	Lake Wohlford	N/A	N/A	N/A
0.1Q2	B	Steep	Lake Wohlford	N/A	N/A	N/A
0.1Q2	C	Flat	Lake Wohlford	0.135	0.1125	0.081
0.1Q2	C	Moderate	Lake Wohlford	0.135	0.1125	0.081

0.1Q2	C	Steep	Lake Wohlford	0.105	0.0875	0.063
0.1Q2	D	Flat	Lake Wohlford	0.11	0.0917	0.066
0.1Q2	D	Moderate	Lake Wohlford	0.11	0.0917	0.066
0.1Q2	D	Steep	Lake Wohlford	0.08	0.0667	0.048

Table 7-5. Sizing Factors for Infiltration Facilities

Lower Flow Threshold	Soil Group	Slope	Rain Gauge	A	V_1	V_2
0.5Q2	A	Flat	Lindbergh	0.04	0.104	N/A
0.5Q2	A	Moderate	Lindbergh	0.04	0.104	N/A
0.5Q2	A	Steep	Lindbergh	0.035	0.091	N/A
0.5Q2	B	Flat	Lindbergh	0.058	0.1495	N/A
0.5Q2	B	Moderate	Lindbergh	0.055	0.143	N/A
0.5Q2	B	Steep	Lindbergh	0.05	0.13	N/A
0.5Q2	C	Flat	Lindbergh	N/A	N/A	N/A
0.5Q2	C	Moderate	Lindbergh	N/A	N/A	N/A
0.5Q2	C	Steep	Lindbergh	N/A	N/A	N/A
0.5Q2	D	Flat	Lindbergh	N/A	N/A	N/A
0.5Q2	D	Moderate	Lindbergh	N/A	N/A	N/A
0.5Q2	D	Steep	Lindbergh	N/A	N/A	N/A
0.5Q2	A	Flat	Oceanside	0.045	0.117	N/A
0.5Q2	A	Moderate	Oceanside	0.045	0.117	N/A
0.5Q2	A	Steep	Oceanside	0.04	0.104	N/A
0.5Q2	B	Flat	Oceanside	0.065	0.169	N/A
0.5Q2	B	Moderate	Oceanside	0.065	0.169	N/A
0.5Q2	B	Steep	Oceanside	0.06	0.156	N/A
0.5Q2	C	Flat	Oceanside	N/A	N/A	N/A
0.5Q2	C	Moderate	Oceanside	N/A	N/A	N/A
0.5Q2	C	Steep	Oceanside	N/A	N/A	N/A
0.5Q2	D	Flat	Oceanside	N/A	N/A	N/A
0.5Q2	D	Moderate	Oceanside	N/A	N/A	N/A
0.5Q2	D	Steep	Oceanside	N/A	N/A	N/A
0.5Q2	A	Flat	Lake Wohlford	0.05	0.13	N/A
0.5Q2	A	Moderate	Lake Wohlford	0.05	0.13	N/A
0.5Q2	A	Steep	Lake Wohlford	0.04	0.104	N/A
0.5Q2	B	Flat	Lake Wohlford	0.078	0.2015	N/A
0.5Q2	B	Moderate	Lake Wohlford	0.075	0.195	N/A
0.5Q2	B	Steep	Lake Wohlford	0.065	0.169	N/A
0.5Q2	C	Flat	Lake Wohlford	N/A	N/A	N/A
0.5Q2	C	Moderate	Lake Wohlford	N/A	N/A	N/A
0.5Q2	C	Steep	Lake Wohlford	N/A	N/A	N/A
0.5Q2	D	Flat	Lake Wohlford	N/A	N/A	N/A
0.5Q2	D	Moderate	Lake Wohlford	N/A	N/A	N/A
0.5Q2	D	Steep	Lake Wohlford	N/A	N/A	N/A
0.3Q2	A	Flat	Lindbergh	0.04	0.104	N/A
0.3Q2	A	Moderate	Lindbergh	0.04	0.104	N/A
0.3Q2	A	Steep	Lindbergh	0.035	0.091	N/A
0.3Q2	B	Flat	Lindbergh	0.058	0.1495	N/A
0.3Q2	B	Moderate	Lindbergh	0.055	0.143	N/A
0.3Q2	B	Steep	Lindbergh	0.05	0.13	N/A

0.3Q2	C	Flat	Lindbergh	N/A	N/A	N/A
0.3Q2	C	Moderate	Lindbergh	N/A	N/A	N/A
0.3Q2	C	Steep	Lindbergh	N/A	N/A	N/A
0.3Q2	D	Flat	Lindbergh	N/A	N/A	N/A
0.3Q2	D	Moderate	Lindbergh	N/A	N/A	N/A
0.3Q2	D	Steep	Lindbergh	N/A	N/A	N/A
0.3Q2	A	Flat	Oceanside	0.045	0.117	N/A
0.3Q2	A	Moderate	Oceanside	0.045	0.117	N/A
0.3Q2	A	Steep	Oceanside	0.04	0.104	N/A
0.3Q2	B	Flat	Oceanside	0.065	0.169	N/A
0.3Q2	B	Moderate	Oceanside	0.065	0.169	N/A
0.3Q2	B	Steep	Oceanside	0.06	0.156	N/A
0.3Q2	C	Flat	Oceanside	N/A	N/A	N/A
0.3Q2	C	Moderate	Oceanside	N/A	N/A	N/A
0.3Q2	C	Steep	Oceanside	N/A	N/A	N/A
0.3Q2	D	Flat	Oceanside	N/A	N/A	N/A
0.3Q2	D	Moderate	Oceanside	N/A	N/A	N/A
0.3Q2	D	Steep	Oceanside	N/A	N/A	N/A
0.3Q2	A	Flat	Lake Wohlford	0.05	0.13	N/A
0.3Q2	A	Moderate	Lake Wohlford	0.05	0.13	N/A
0.3Q2	A	Steep	Lake Wohlford	0.04	0.104	N/A
0.3Q2	B	Flat	Lake Wohlford	0.078	0.2015	N/A
0.3Q2	B	Moderate	Lake Wohlford	0.075	0.195	N/A
0.3Q2	B	Steep	Lake Wohlford	0.065	0.169	N/A
0.3Q2	C	Flat	Lake Wohlford	N/A	N/A	N/A
0.3Q2	C	Moderate	Lake Wohlford	N/A	N/A	N/A
0.3Q2	C	Steep	Lake Wohlford	N/A	N/A	N/A
0.3Q2	D	Flat	Lake Wohlford	N/A	N/A	N/A
0.3Q2	D	Moderate	Lake Wohlford	N/A	N/A	N/A
0.3Q2	D	Steep	Lake Wohlford	N/A	N/A	N/A
0.1Q2	A	Flat	Lindbergh	0.04	0.104	N/A
0.1Q2	A	Moderate	Lindbergh	0.04	0.104	N/A
0.1Q2	A	Steep	Lindbergh	0.035	0.091	N/A
0.1Q2	B	Flat	Lindbergh	0.058	0.1495	N/A
0.1Q2	B	Moderate	Lindbergh	0.055	0.143	N/A
0.1Q2	B	Steep	Lindbergh	0.05	0.13	N/A
0.1Q2	C	Flat	Lindbergh	N/A	N/A	N/A
0.1Q2	C	Moderate	Lindbergh	N/A	N/A	N/A
0.1Q2	C	Steep	Lindbergh	N/A	N/A	N/A
0.1Q2	D	Flat	Lindbergh	N/A	N/A	N/A
0.1Q2	D	Moderate	Lindbergh	N/A	N/A	N/A
0.1Q2	D	Steep	Lindbergh	N/A	N/A	N/A
0.1Q2	A	Flat	Oceanside	0.045	0.117	N/A
0.1Q2	A	Moderate	Oceanside	0.045	0.117	N/A
0.1Q2	A	Steep	Oceanside	0.04	0.104	N/A
0.1Q2	B	Flat	Oceanside	0.065	0.169	N/A
0.1Q2	B	Moderate	Oceanside	0.065	0.169	N/A
0.1Q2	B	Steep	Oceanside	0.06	0.156	N/A
0.1Q2	C	Flat	Oceanside	N/A	N/A	N/A

0.1Q2	C	Moderate	Oceanside	N/A	N/A	N/A
0.1Q2	C	Steep	Oceanside	N/A	N/A	N/A
0.1Q2	D	Flat	Oceanside	N/A	N/A	N/A
0.1Q2	D	Moderate	Oceanside	N/A	N/A	N/A
0.1Q2	D	Steep	Oceanside	N/A	N/A	N/A
0.1Q2	A	Flat	Lake Wohlford	0.05	0.13	N/A
0.1Q2	A	Moderate	Lake Wohlford	0.05	0.13	N/A
0.1Q2	A	Steep	Lake Wohlford	0.04	0.104	N/A
0.1Q2	B	Flat	Lake Wohlford	0.078	0.2015	N/A
0.1Q2	B	Moderate	Lake Wohlford	0.075	0.195	N/A
0.1Q2	B	Steep	Lake Wohlford	0.065	0.169	N/A
0.1Q2	C	Flat	Lake Wohlford	N/A	N/A	N/A
0.1Q2	C	Moderate	Lake Wohlford	N/A	N/A	N/A
0.1Q2	C	Steep	Lake Wohlford	N/A	N/A	N/A
0.1Q2	D	Flat	Lake Wohlford	N/A	N/A	N/A
0.1Q2	D	Moderate	Lake Wohlford	N/A	N/A	N/A
0.1Q2	D	Steep	Lake Wohlford	N/A	N/A	N/A

ATTACHMENT 3
STRUCTURAL BMP MAINTENANCE INFORMATION

This is the cover sheet for Attachment 3.

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Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 3a	Structural BMP Maintenance Thresholds and Actions (Required)	☒ Included See Structural BMP Maintenance Information Checklist.
Attachment 3b	Maintenance Agreement (Form DS-3247) (when applicable)	☐ Included ☒ Not Applicable

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Use this checklist to ensure the required information has been included in the Structural BMP Maintenance Information Attachment:

Preliminary Design / Planning / CEQA level submittal:

- Attachment 3a must identify:
  - ☒ Typical maintenance indicators and actions for proposed structural BMP(s) based on Section 7.7 of the BMP Design Manual
- Attachment 3b is not required for preliminary design / planning / CEQA level submittal.

Final Design level submittal:

Attachment 3a must identify:

- ☐ Specific maintenance indicators and actions for proposed structural BMP(s). This shall be based on Section 7.7 of the BMP Design Manual and enhanced to reflect actual proposed components of the structural BMP(s)
- ☐ How to access the structural BMP(s) to inspect and perform maintenance
- ☐ Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
- ☐ Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
- ☐ Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)
- ☐ When applicable, frequency of bioretention soil media replacement.
- ☐ Recommended equipment to perform maintenance
- ☐ When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management

Attachment 3b: For private entity operation and maintenance, Attachment 3b must include a Storm Water Management and Discharge Control Maintenance Agreement (Form DS-3247). The following information must be included in the exhibits attached to the maintenance agreement:

- ☐ Vicinity map
- ☐ Site design BMPs for which DCV reduction is claimed for meeting the pollutant control obligations.
- ☐ BMP and HMP location and dimensions
- ☐ BMP and HMP specifications/cross section/model
- ☐ Maintenance recommendations and frequency
- ☐ LID features such as (permeable paver and LS location, dim, SF).

Structural BMP Maintenance Information

PR-1 | Biofiltration w/ Partial Retention

Typical Maintenance Indicator(s) for Proprietary Biofiltration Units	Maintenance Actions
Accumulation of sediment, litter, or debris	Remove and properly dispose of accumulated materials, without damage to the vegetation.
Poor vegetation establishment	Re-seed, re-plant, or re-establish vegetation per original plans.
Overgrown vegetation	Mow or trim as appropriate, but not less than the design height of the vegetation per original plans when applicable (e.g. a vegetated swale may require a minimum vegetation height).
Erosion due to concentrated irrigation flow	Repair/re-seed/re-plant eroded areas and adjust the irrigation system.
Erosion due to concentrated storm water runoff flow	Repair/re-seed/re-plant eroded areas, and make appropriate corrective measures such as adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan. If the issue is not corrected by restoring the BMP to the original plan and grade, the City Engineer shall be contacted prior to any additional repairs or reconstruction.
Standing water in vegetated swales	Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, loosening or replacing top soil to allow for better infiltration, or minor re-grading for proper drainage. If the issue is not corrected by restoring the BMP to the original plan and grade, the City Engineer shall be contacted prior to any additional repairs or reconstruction.
Standing water in bioretention, biofiltration with partial retention, or biofiltration areas, or flow-through planter boxes for longer than 96 hours following a storm event*	Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, clearing underdrains (where applicable), or repairing/replacing clogged or compacted soils.
Obstructed inlet or outlet structure	Clear obstructions.
Damage to structural components such as weirs, inlet or outlet structures	Repair or replace as applicable.
Clogged Biofiltration Media Mix	Remove and properly dispose media and replace with fresh media.
*These BMPs typically include a surface ponding layer as part of their function which may take 96 hours to drain following a storm event.	

E.11 PR-1 Biofiltration with Partial Retention

Location: 805 and Bonita Road, Chula vista, CA.

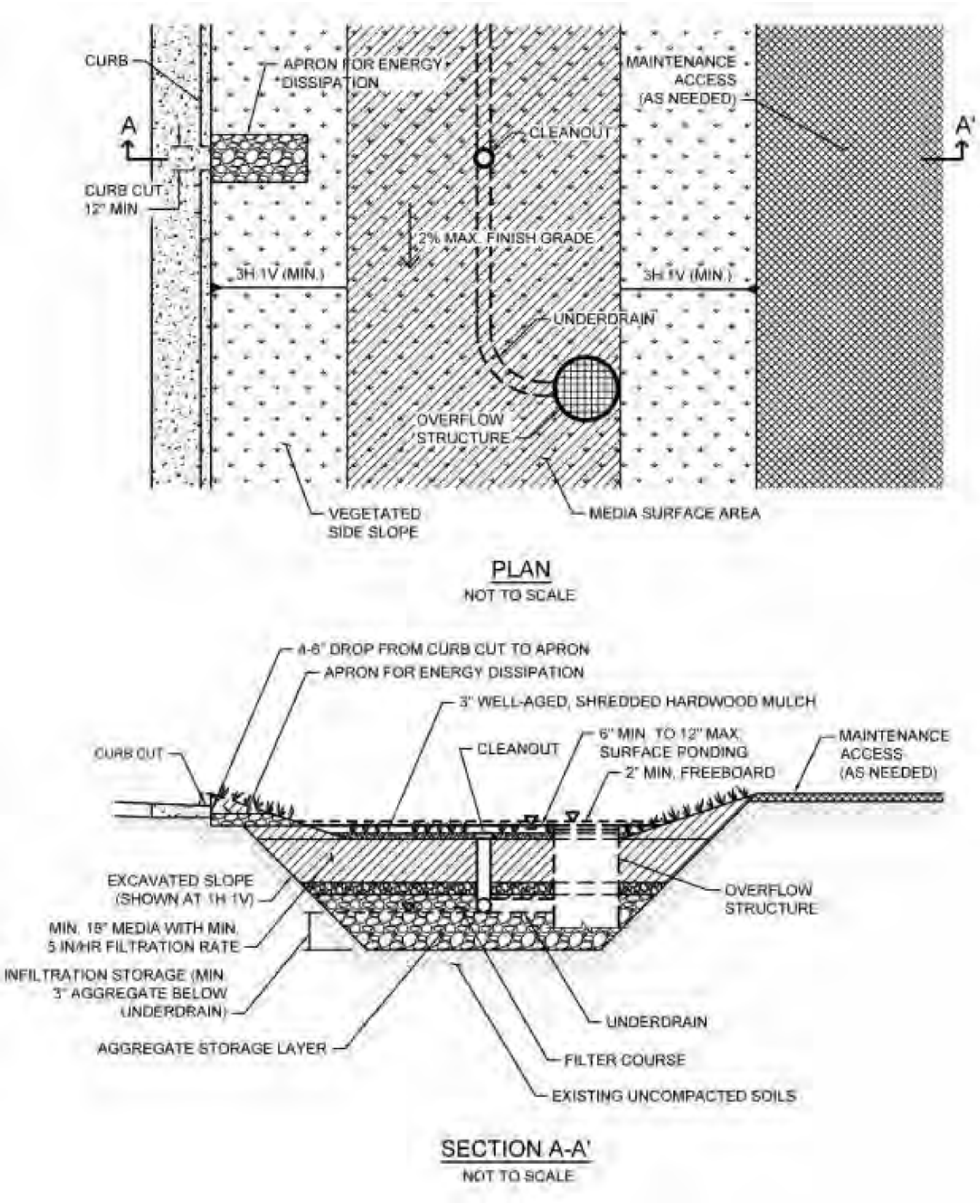
MS4 Permit Category
NA
Manual Category
Partial Retention
Applicable Performance Standard
Pollutant Control Flow Control
Primary Benefits
Volume Reduction Treatment Peak Flow Attenuation

Description

Biofiltration with partial retention (partial infiltration and biofiltration) facilities are vegetated surface water systems that filter water through vegetation, and soil or engineered media prior to infiltrating into native soils, discharge via underdrain, or overflow to the downstream conveyance system. Where feasible, these BMPs have an elevated underdrain discharge point that creates storage capacity in the aggregate storage layer. Biofiltration with partial retention facilities are commonly incorporated into the site within parking lot landscaping, along roadsides, and in open spaces. They can be constructed in ground or partially aboveground, such as planter boxes with open bottoms to allow infiltration. Treatment is achieved through filtration, sedimentation, sorption, infiltration, biochemical processes and plant uptake.

Typical biofiltration with partial retention components include:

- Inflow distribution mechanisms (e.g, perimeter flow spreader or filter strips)
- Energy dissipation mechanism for concentrated inflows (e.g., splash blocks or riprap)
- Shallow surface ponding for captured flows
- Side Slope and basin bottom vegetation selected based on climate and ponding depth
- Non-floating mulch layer (Optional)
- Media layer (planting mix or engineered media) capable of supporting vegetation growth
- Filter course layer consisting of aggregate to prevent the migration of fines into uncompacted native soils or the optional aggregate storage layer
- Aggregate storage layer with underdrain(s)
- Uncompacted native soils at the bottom of the facility
- Overflow structure



Typical plan and Section view of a Biofiltration with Partial Retention BMP

Design Adaptations for Project Goals

Partial infiltration BMP with biofiltration treatment for storm water pollutant control. Biofiltration with partial retention can be designed so that a portion of the DCV is infiltrated by providing infiltration storage below the underdrain invert. The infiltration storage depth should be determined by the volume that can be reliably infiltrated within drawdown time limitations. Water discharged through the underdrain is considered biofiltration treatment. Storage provided above the underdrain within surface ponding, media, and aggregate storage is included in the biofiltration treatment volume.

Integrated storm water flow control and pollutant control configuration. The system can be designed to provide flow rate and duration control by primarily providing increased surface ponding and/or having a deeper aggregate storage layer. This will allow for significant detention storage, which can be controlled via inclusion of an orifice in an outlet structure at the downstream end of the underdrain.

Design Criteria and Considerations

Biofiltration with partial retention must meet the following design criteria and considerations. Deviations from the below criteria may be approved at the discretion of the [City Engineer] if it is determined to be appropriate:

Siting and Design		*Intent/Rationale*
☐	Placement observes geotechnical recommendations regarding potential hazards (e.g., slope stability, landslides, liquefaction zones) and setbacks (e.g., slopes, foundations, utilities).	Must not negatively impact existing site geotechnical concerns.
☐	Selection and design of basin is based on infiltration feasibility criteria and appropriate design infiltration rate (See Appendix C and D).	Must operate as a partial infiltration design and must be supported by drainage area and in-situ infiltration rate feasibility findings.
☐	Contributing tributary area shall be ≤ 5 acres (≤ 1 acre preferred).	Bigger BMPs require additional design features for proper performance. Contributing tributary area greater than 5 acres may be allowed at the discretion of the [City Engineer} if the following conditions are met: 1) incorporate design features (e.g. flow spreaders) to minimizing short circuiting of flows in the BMP and 2) incorporate additional design

Siting and Design		Intent/Rationale
		features requested by the [City Engineer] for proper performance of the regional BMP.
☐	Finish grade of the facility is ≤ 2%.	Flatter surfaces reduce erosion and channelization within the facility.
Surface Ponding		
☐	Surface ponding is limited to a 24-hour drawdown time.	Surface ponding limited to 24 hours for plant health. Surface ponding drawdown time greater than 24-hours but less than 96 hours may be allowed at the discretion of the [City Engineer] if certified by a landscape architect or agronomist.
☐	Surface ponding depth is ≥ 6 and ≤ 12 inches.	Surface ponding capacity lowers subsurface storage requirements. Deep surface ponding raises safety concerns. Surface ponding depth greater than 12 inches (for additional pollutant control or surface outlet structures or flow-control orifices) may be allowed at the discretion of the [City Engineer] if the following conditions are met: 1) surface ponding depth drawdown time is less than 24 hours; and 2) safety issues and fencing requirements are considered (typically ponding greater than 18" will require a fence and/or flatter side slopes) and 3) potential for elevated clogging risk is considered.
☐	A minimum of 12 inches of freeboard is provided.	Freeboard provides room for head over overflow structures and minimizes risk of uncontrolled surface discharge.
☐	Side slopes are stabilized with vegetation and are = 3H:1V or shallower.	Gentler side slopes are safer, less prone to erosion, able to establish vegetation more quickly and easier to maintain.
Vegetation		
☐	Plantings are suitable for the climate and expected ponding depth. A plant list to aid in	Plants suited to the climate and ponding depth are more likely to survive.

	Siting and Design	***Intent/Rationale***
	selection can be found in Appendix E.20	
☐	An irrigation system with a connection to water supply should be provided as needed.	Seasonal irrigation might be needed to keep plants healthy.
Mulch (Optional or Mandatory – Dependent on jurisdiction)		
☐	A minimum of 3 inches of well-aged, shredded hardwood mulch that has been stockpiled or stored for at least 12 months is provided. Mulch must be non-floating to avoid clogging of overflow structure.	Mulch will suppress weeds and maintain moisture for plant growth. Aging mulch kills pathogens and weed seeds and allows the beneficial microbes to multiply.
Media Layer		
☐	Media maintains a minimum filtration rate of 5 in/hr over lifetime of facility. An initial filtration rate of 8 to 12 in/hr is recommended to allow for clogging over time; the initial filtration rate should not exceed 12 inches per hour.	A filtration rate of at least 5 inches per hour allows soil to drain between events, and allows flows to relatively quickly enter the aggregate storage layer, thereby minimizing bypass. The initial rate should be higher than long term target rate to account for clogging over time. However an excessively high initial rate can have a negative impact on treatment performance, therefore an upper limit is needed.
☐	Media is a minimum 18 inches deep, meeting either of these two media specifications: City of San Diego Storm Water Standards Appendix F (February 2016, unless superseded by more recent edition) **<u>or</u>** County of San Diego Low Impact Development Handbook: Appendix G -Bioretention Soil Specification (June 2014, unless superseded by more recent edition). Alternatively, for proprietary designs and custom media mixes not meeting the media specifications contained in the 2016 City Storm Water Standards or County LID Manual, the media meets the pollutant treatment performance criteria in Section F.1.	A deep media layer provides additional filtration and supports plants with deeper roots. Standard specifications shall be followed. For non-standard or proprietary designs, compliance with Appendix F.1 ensures that adequate treatment performance will be provided.

	Siting and Design	***Intent/Rationale***
☐	Media surface area is 3% of contributing area times adjusted runoff factor or greater. Unless demonstrated that the BMP surface area can be smaller than 3%.	Greater surface area to tributary area ratios: a) maximizes volume retention as required by the MS4 Permit and b) decrease loading rates per square foot and therefore increase longevity. Adjusted runoff factor is to account for site design BMPs implemented upstream of the BMP (such as rain barrels, impervious area dispersion, etc.). Refer to Appendix B.2 guidance. Use Worksheet B.5-1 Line 26 to estimate the minimum surface area required per this criteria.
☐	Where receiving waters are impaired or have a TMDL for nutrients, the system is designed with nutrient sensitive media design (see fact sheet BF-2).	Potential for pollutant export is partly a function of media composition; media design must minimize potential for export of nutrients, particularly where receiving waters are impaired for nutrients.
	Filter Course Layer	
☐	A filter course is used to prevent migration of fines through layers of the facility. Filter fabric is not used.	Migration of media can cause clogging of the aggregate storage layer void spaces or subgrade. Filter fabric is more likely to clog.
☐	Filter course is washed and free of fines.	Washing aggregate will help eliminate fines that could clog the facility
☐	Filter course calculations assessing suitability for particle migration prevention have been completed.	Gradation relationship between layers can evaluate factors (e.g., bridging, permeability, and uniformity) to determine if particle sizing is appropriate or if an intermediate layer is needed.
	Aggregate Storage Layer	
☐	Class 2 Permeable per Caltrans specification 68-1.025 is recommended for the storage layer. Washed, open-graded crushed rock may be used, however a 4-6 inch washed pea gravel filter course layer at the top of the crushed rock is required.	Washing aggregate will help eliminate fines that could clog the aggregate storage layer void spaces or subgrade.

	Siting and Design	*Intent/Rationale*
☐	Maximum aggregate storage layer depth below the underdrain invert is determined based on the infiltration storage volume that will infiltrate within a 36-hour drawdown time.	A maximum drawdown time is needed for vector control and to facilitate providing storm water storage for the next storm event.
	Inflow, Underdrain, and Outflow Structures	
☐	Inflow, underdrains and outflow structures are accessible for inspection and maintenance.	Maintenance will prevent clogging and ensure proper operation of the flow control structures.
☐	Inflow velocities are limited to 3 ft/s or less or use energy dissipation methods. (e.g., riprap, level spreader) for concentrated inflows.	High inflow velocities can cause erosion, scour and/or channeling.
☐	Curb cut inlets are at least 12 inches wide, have a 4-6 inch reveal (drop) and an apron and energy dissipation as needed.	Inlets must not restrict flow and apron prevents blockage from vegetation as it grows in. Energy dissipation prevents erosion.
☐	Underdrain outlet elevation should be a minimum of 3 inches above the bottom elevation of the aggregate storage layer.	A minimal separation from subgrade or the liner lessens the risk of fines entering the underdrain and can improve hydraulic performance by allowing perforations to remain unblocked.
☐	Minimum underdrain diameter is 6 inches.	Smaller diameter underdrains are prone to clogging.
☐	Underdrains are made of slotted, PVC pipe conforming to ASTM D 3034 or equivalent or corrugated, HDPE pipe conforming to AASHTO 252M or equivalent.	Slotted underdrains provide greater intake capacity, clog resistant drainage, and reduced entrance velocity into the pipe, thereby reducing the chances of solids migration.
☐	An underdrain cleanout with a minimum 6-inch diameter and lockable cap is placed every 250 to 300 feet as required based on underdrain length.	Properly spaced cleanouts will facilitate underdrain maintenance.
☐	Overflow is safely conveyed to a downstream storm drain system or discharge point. Size overflow structure to pass 100-year peak flow for on-line infiltration basins and water quality peak flow for off-line basins.	Planning for overflow lessens the risk of property damage due to flooding.

Nutrient Sensitive Media Design

To design biofiltration with partial retention with underdrain for storm water pollutant control only (no flow control required), the following steps should be taken:

Conceptual Design and Sizing Approach for Storm Water Pollutant Control Only

To design biofiltration with partial retention and an underdrain for storm water pollutant control only (no flow control required), the following steps should be taken:

1. Verify that siting and design criteria have been met, including placement requirements, contributing tributary area, maximum side and finish grade slopes, and the recommended media surface area tributary ratio.
2. Calculate the DCV per Appendix B based on expected site design runoff for tributary areas.
3. Generalized sizing procedure is presented in Appendix B.5. The surface ponding should be verified to have a maximum 24-hour drawdown time.

Conceptual Design and Sizing Approach when Storm Water Flow Control is Applicable

Control of flow rates and/or durations will typically require significant surface ponding and/or aggregate storage volumes, and therefore the following steps should be taken prior to determination of storm water pollutant control design. Pre-development and allowable post-project flow rates and durations should be determined as discussed in Chapter 6 of the manual.

1. Verify that siting and design criteria have been met, including placement requirements, contributing tributary area, maximum side and finish grade slopes, and the recommended media surface area tributary ratio.
2. Iteratively determine the facility footprint area, surface ponding and/or aggregate storage layer depth required to provide detention and/or infiltration storage to reduce flow rates and durations to allowable limits. Flow rates and durations can be controlled from detention storage by altering outlet structure orifice size(s) and/or water control levels. Multi-level orifices can be used within an outlet structure to control the full range of flows.
3. If biofiltration with partial retention cannot fully provide the flow rate and duration control required by this manual, an upstream or downstream structure with significant storage volume such as an underground vault can be used to provide remaining controls.
4. After biofiltration with partial retention has been designed to meet flow control requirements, calculations must be completed to verify if storm water pollutant control requirements to treat the DCV have been met.

ATTACHMENT 4
COPY OF PLAN SHEETS SHOWING PERMANENT STORM WATER BMPS

This is the cover sheet for Attachment 4.

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Use this checklist to ensure the required information has been included on the plans:

The plans must identify:

- ☒ Structural BMP(s) with ID numbers matching Form I-6 Summary of PDP Structural BMPs
- ☒ The grading and drainage design shown on the plans must be consistent with the delineation of DMAs shown on the DMA exhibit
- ☒ Details and specifications for construction of structural BMP(s)
- ☐ Signage indicating the location and boundary of structural BMP(s) as required by the City Engineer
- ☐ How to access the structural BMP(s) to inspect and perform maintenance
- ☐ Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
- ☐ Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
- ☐ Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)
- ☐ Recommended equipment to perform maintenance
- ☐ When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management
- ☐ Include landscaping plan sheets showing vegetation requirements for vegetated structural BMP(s)
- ☒ All BMPs must be fully dimensioned on the plans
- ☐ When proprietary BMPs are used, site specific cross section with outflow, inflow and model number shall be provided. Boucher photocopies are not allowed.

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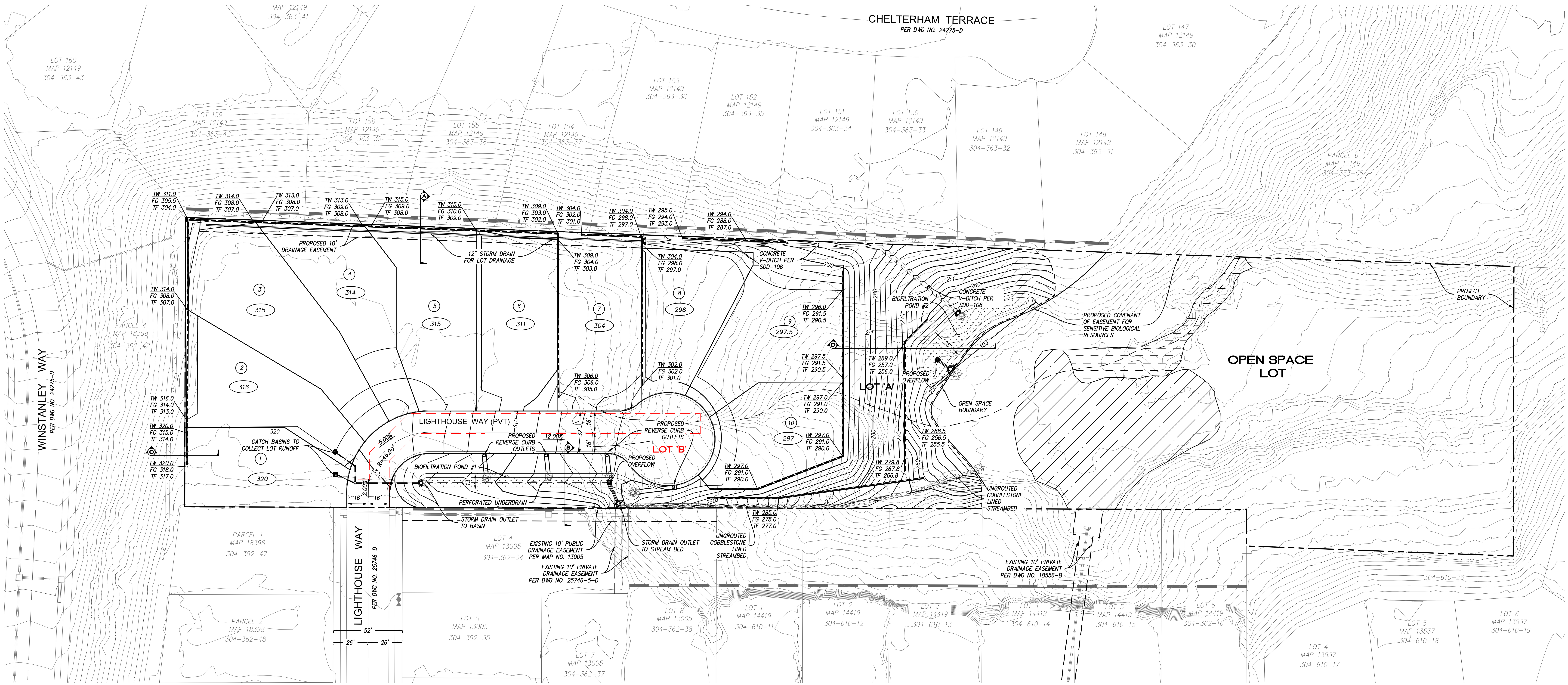
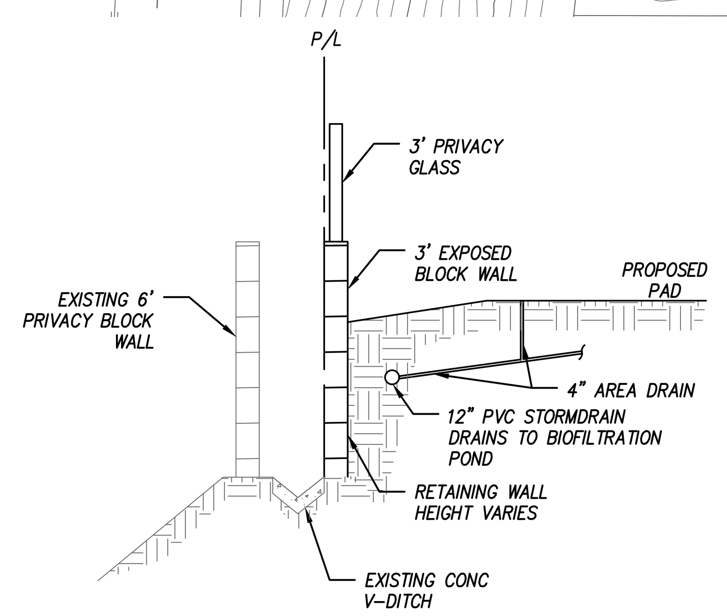
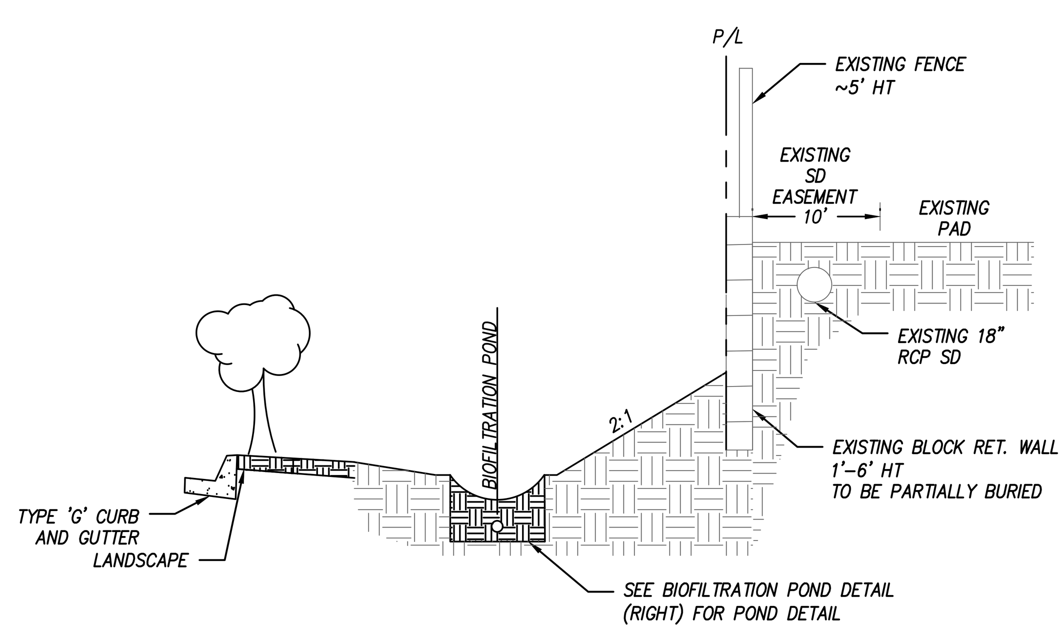




SECTION A - A
NO SCALE



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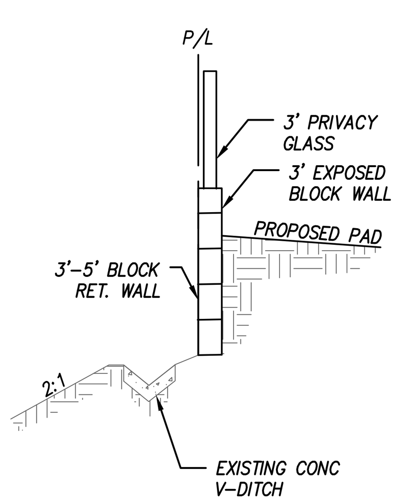

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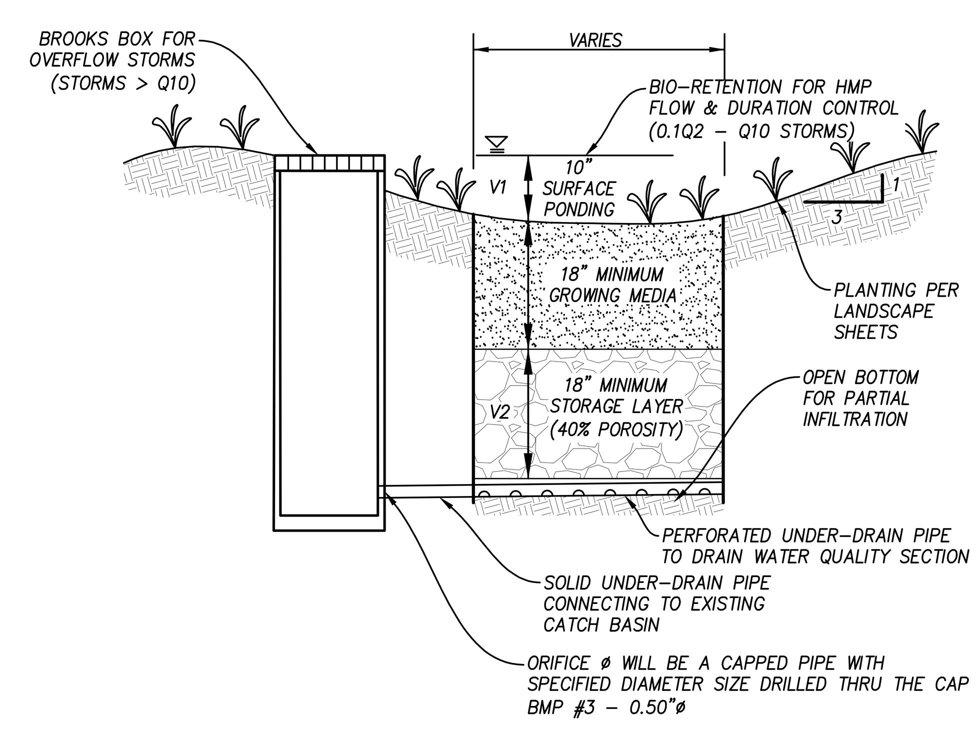
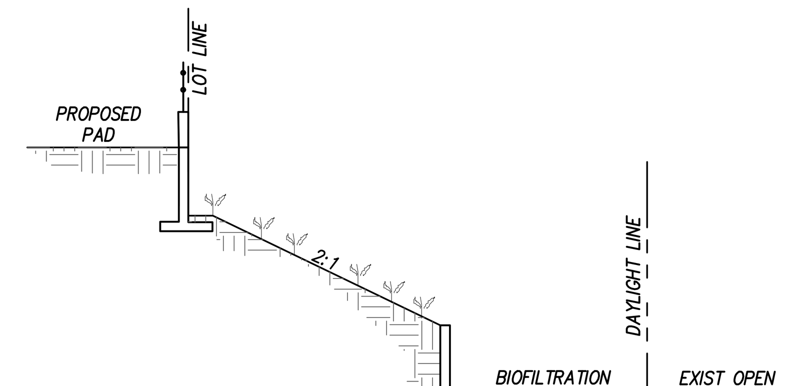


BIOFILTRATION POND DETAIL



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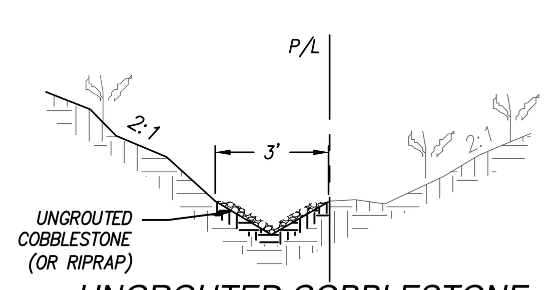

UNGROUTED COBBLESTONE LINED STREAM BED
NO SCALE

NOTE: PROJECT SHALL INSTALL UN-GROUTED COBBLESTONES, OR OTHER SUITABLE ENERGY DISSIPATER, ALONG ENTIRE LENGTH OF STREAMBED TO REDUCE DISCHARGE TO NON-ERODIBLE VELOCITIES.

STORM WATER NOTES:

1. ALL GRADED, DISTURBED OR ERODED AREAS THAT WILL NOT BE PERMANENTLY PAVED OR COVERED BY STRUCTURES SHALL BE PERMANENTLY REVEGETATED AND IRRIGATED AS SHOWN IN TABLE 14204F AND IN ACCORDANCE WITH THE STANDARDS IN THE SAN DIEGO MUNICIPAL CODE, SECTION 142.0411. ALL REQUIRED REVEGETATION AND EROSION CONTROL SHALL BE COMPLETED WITHIN 90 CALENDAR DAYS OF THE COMPLETION OF GRADING OR DISTURBANCE.

2. THIS PROJECT WILL NOT DISCHARGE ANY INCREASE IN STORM WATER RUN-OFF ONTO THE EXISTING HILLSIDE AREAS.

3. AT THE STORM WATER DISCHARGE LOCATIONS, SUITABLE ENERGY DISSIPATERS ARE TO BE INSTALLED TO REDUCE THE DISCHARGE TO NON-ERODIBLE VELOCITIES.

4. MULTIPLE STORM WATER DISCHARGE LOCATIONS WILL BE USED TO MIMIC THE EXISTING DRAINAGE PATTERN.

5. NO ADDITIONAL RUN-OFF IS PROPOSED FOR THE DISCHARGE LOCATIONS.

BIOFILTRATION POND NOTES:

1. AMENDED SOIL SHALL CONFORM TO THE STANDARD SPECIFICATION PER APPENDIX F.4 OF THE CITY OF SAN DIEGO STORM WATER STANDARDS MANUAL AND SHALL MAINTAIN A MINIMUM INFILTRATION RATE OF 5 IN/HR OVER THE LIFETIME OF THE FACILITY.

2. GRAVEL STORAGE LAYER SHALL CONFORM TO THE STANDARD SPECIFICATION PER APPENDIX F.5 OF THE CITY OF SAN DIEGO STORM WATER STANDARDS MANUAL AND SHALL CONSIST OF A MINIMUM 6" FILTER COURSE OVER 12" OF CLEAN WASHED ASTM #57 OPEN GRADED STONE. FILTER COURSE SHALL CONSIST OF 3" LAYER OF CLEAN WASHED ASTM 33 FINE AGGREGATE SAND OVERLYING A 3" LAYER OF ASTM NO 8 STONE.

3. UNDERDRAINS SHALL BE MINIMUM 6" SLOTTED PVC PIPE CONFORMING TO ASTM D3034 OR CORRUGATED HDP CONFORMING TO AASHTO 252M. CLEANOUT PORTS SHALL BE A MINIMUM 8" DIAMETER WITH LOCKABLE CAP AND PLACED EVERY 50' OF UNDERDRAIN LENGTH.

4. BIOFILTRATION BASINS SHALL BE PLANTED WITH ADEQUATE GROUNDCOVER AS OUTLINED IN APPENDIX E OF THE SAN DIEGO LOW IMPACT DEVELOPMENT DESIGN MANUAL. SEE LANDSCAPE PLAN SHEETS.

BENCHMARK

2.5" BRASS DISK MARKED "GPS, 0195, 1992" LOCATED ON VIA DE LA VALLE AND SAN ANDRES, PER CITY OF SAN DIEGO RECORD OF SURVEY 14492 DATED MARCH 31, 1994

ELEVATION: 32.572 FT

SOURCE: FIELD SURVEY BY TERRASCRIBE, INC. DATED 09/22/2017

BASIS OF BEARINGS

BASIS OF BEARING IS THE CALIFORNIA COORDINATE SYSTEM, NAD 83 (EPOCH 1993.35) ZONE 6, PER FOUND CONTROL MONUMENTS 2006 AS SHOWN ON RECORD OF SURVEY 18971 AND 117 AS SHOWN ON RECORD OF SURVEY 14492 RECORDED IN THE COUNTY OF SAN DIEGO.

N

0 15 30 60 90
(IN FEET)
1 inch = 30 ft.

Prepared By:
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Address: 9968 HIBERT STREET 2ND FLOOR
SAN DIEGO, CA 92131
Phone #: (858) 751-0633
Fax #: (858) 751-0634

Project Address:
LIGHTHOUSE WAY, SAN DIEGO, CALIFORNIA, 92130

Project Name:
LIGHTHOUSE RIDGE

Sheet Title:
VTM/SDP
GRADING

Revision 14:	
Revision 13:	
Revision 12:	
Revision 11:	
Revision 10:	
Revision 9:	
Revision 8:	
Revision 7:	
Revision 6:	
Revision 5:	2018-04-19
Revision 4:	2017-12-05
Revision 3:	2017-10-12
Revision 2:	2017-09-26
Revision 1:	2017-02-10
Original Date:	2016-09-13

PTS # 513356
I.O. # 24007007

ATTACHMENT 5
DRAINAGE REPORT

Attach project's drainage report. Refer to Drainage Design Manual to determine the reporting requirements.

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2018

PRELIMINARY DRAINAGE STUDY

LIGHTHOUSE WAY

May 10, 2018

PREPARED BY: LATITUDE 33 PLANNING & ENGINEERING
PREPARED FOR: PACIFIC LEGACY HOMES
JOB NUMBER: 1380.00

PRELIMINARY DRAINAGE STUDY

FOR

LIGHTHOUSE RIDGE

(PTS NO.513356)

MAY 10, 2018

PREPARED FOR: PACIFIC LEGACY HOMES
1926 KELLOGG AVENUE, SUITE 101
CARLSBAD, CALIFORNIA 92008
(858) 775-4382

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9968 HIBERT STREET 2ND FLOOR
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JOB NO. 1380.00

Matthew J. Semic, P.E.	Date
P.E. 71075	Expires:

Prepared by: SDD
Checked by: MJS

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APPENDICES

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 PROJECT DRAWINGS AND SPECIFICATIONS BY THE CITY OF SAN DIEGO IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITIES FOR PROJECT DESIGN.

Matthew J. Semic. P.E 71075 DATE

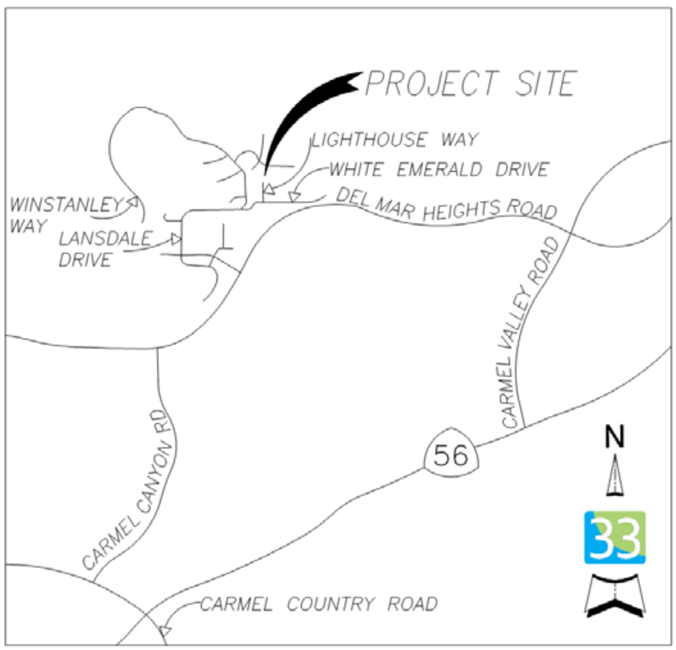
I. PURPOSE

The purpose of this Preliminary Drainage Report is to evaluate and analyze the existing and proposed drainage conditions (i.e. anticipated runoff peak flows) associated with the Lighthouse Ridge development. The intent of this report is to provide a preliminary assessment of any hydrologic impacts that result from this development. This study is not intended to satisfy final engineering (hydraulic) requirements in support of public or private onsite permits. A separate drainage study will be submitted for those purposes upon project entitlement, staff approval and preparation of construction documents.

II. PROJECT DESCRIPTION

The project is located within the City of San Diego city limits, north of State Route 56, east of Interstate 5 and north of Lighthouse Way. The subject property is part of the Pacific Highlands Ranch Community Plan Development. A vicinity map is shown as Figure 1.

Figure 1: Site Vicinity Map



This project proposes 10 residential units with an average lot size of 0.16 acres within a developable site area of 2.86 ac. A 32' private, residential street will provide access to the units. The remainder of the site is 1.9 acres of designated open space (undevelopable). Additional considerations include off-site drainage traveling across the project site.

III. HYDROLOGIC METHODOLOGY

Hydrology calculations presented in this preliminary drainage report were performed using the Rational Method consistent with Appendix I of the City of San Diego Drainage Design Manual (April 1984). Rainfall intensities for the design storms are taken from data tabulated for the San Diego region (see Appendix C). As recommended by the Drainage Design Manual, design runoff shall be based upon the 50-year frequency storm. Calculations were computed for, both, the existing and developed conditions.

The Rational Method calculates a specific drainage area's peak flow, by taking into account three primary factors; the run-off coefficient (C), the rainfall intensity (I) and the area of the basin (A). These three factors are multiplied together resulting in a peak discharge (Q). See the Rational Method Equation as Figure 1 below:

Figure 2 - Rational Method Equation (from County of San Diego Hydrology Manual)

$$Q = C\,I\,A$$

Where:
- Q = peak discharge, in cubic feet per second (cfs)
- C = runoff coefficient, proportion of the rainfall that runs off the surface (no units)
- I = average rainfall intensity for a duration equal to the T_c for the area, in inches per hour (Note: If the computed T_c is less than 5 minutes, use 5 minutes for computing the peak discharge, Q)
- A = drainage area contributing to the design location, in acres

The run-off coefficient (C-Value) for a particular drainage area depends on the soil type and land use. Different surface treatments (concrete, asphalt, grass) in drainage areas will yield varying run-off rates, as their ability to absorb or infiltrate storm water is closely tied to the surface type. For example, a paved impervious surface may have a C-Value of 0.9 or 0.95, would produce more run-off than an undeveloped pervious sandy surface that may be assigned a C-Value of 0.2. Many drainage areas have a combination of impervious and pervious areas, therefore it is necessary to calculate a weighted C-Value based on the various areas, and their associated C-Values. The weighted C-Value is referred to as the Composite C-Value. This calculation is shown below as Figure 2.

Figure 3 - C-Value Calculation (from the County of San Diego Hydrology Manual)

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

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.

Rainfall intensity (I) is measured in inches per hour and varies based on the selected storm frequency (2 year, 10 year, etc.), as well as the Time of Concentration (described below). Once a design storm has been selected, the 6 hour precipitation total for that storm should be established, this is accomplished using the County's isopluvial maps (included in Appendix C). This value, along with the Time of Concentration are inserted into the equation below to get the resultant rainfall intensity.

Figure 4 - Intensity Equation (from County of San Diego Hydrology Manual)

$$I = 7.44\, P_6\, D^{-0.645}$$

Where: P_6 = adjusted 6-hour storm rainfall amount (see discussion below)
D = duration in minutes (use T_c)

Time of concentration (Tc) is defined as the time it takes run-off from the most remote part of the drainage area to reach the point being analyzed (typically an inlet or other discharge point). Tc is divided into two main components, Initial Time of Concentration (Ti), and Travel Time (Tt). There are a number of ways and formulas used to calculate these values, which are described in more detail in the County of San Diego Hydrology Manual. For this analysis, Ti was modeled as overland flow, using the FAA "Overland Flow Nomograph" (as shown below as Figure 4). Tt was calculated using the "Nomograph for Determination of Time of Concentration (Tc) or Travel Time (Tt) for Natural Watersheds" (also shown below as Figure 5).

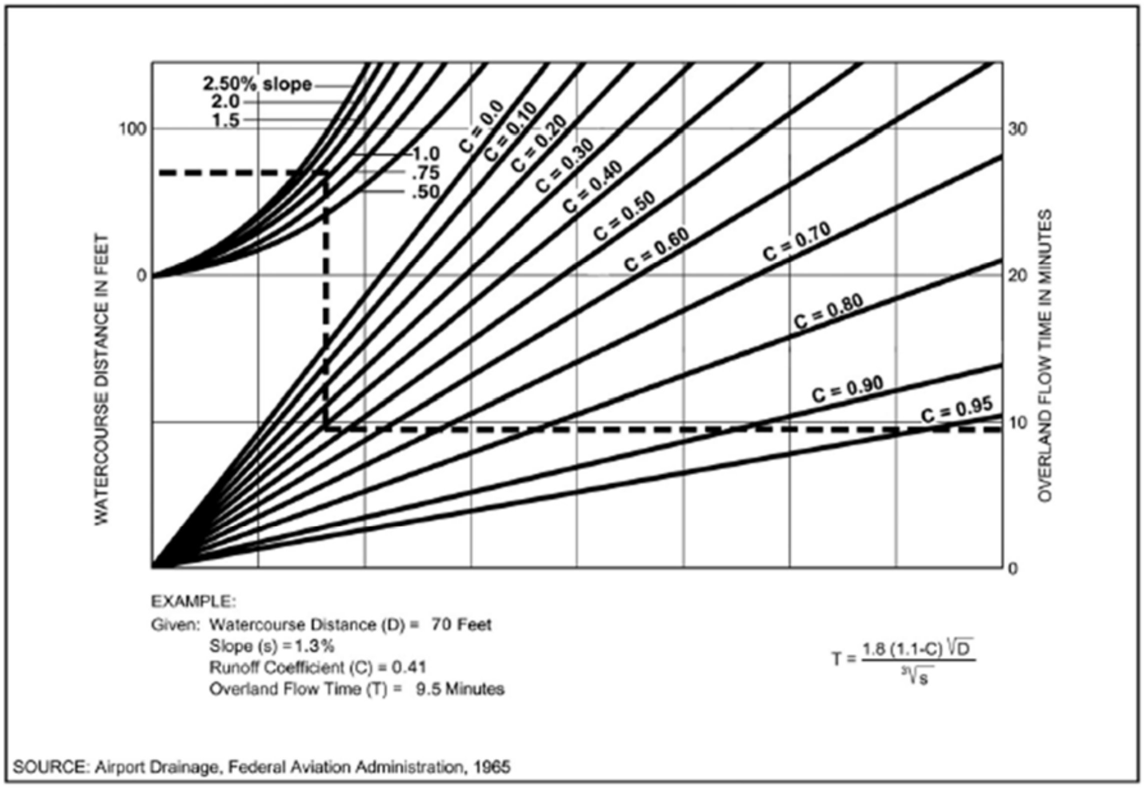


Figure 5- FAA Nomograph (from County of San Diego Hydrology Manual)

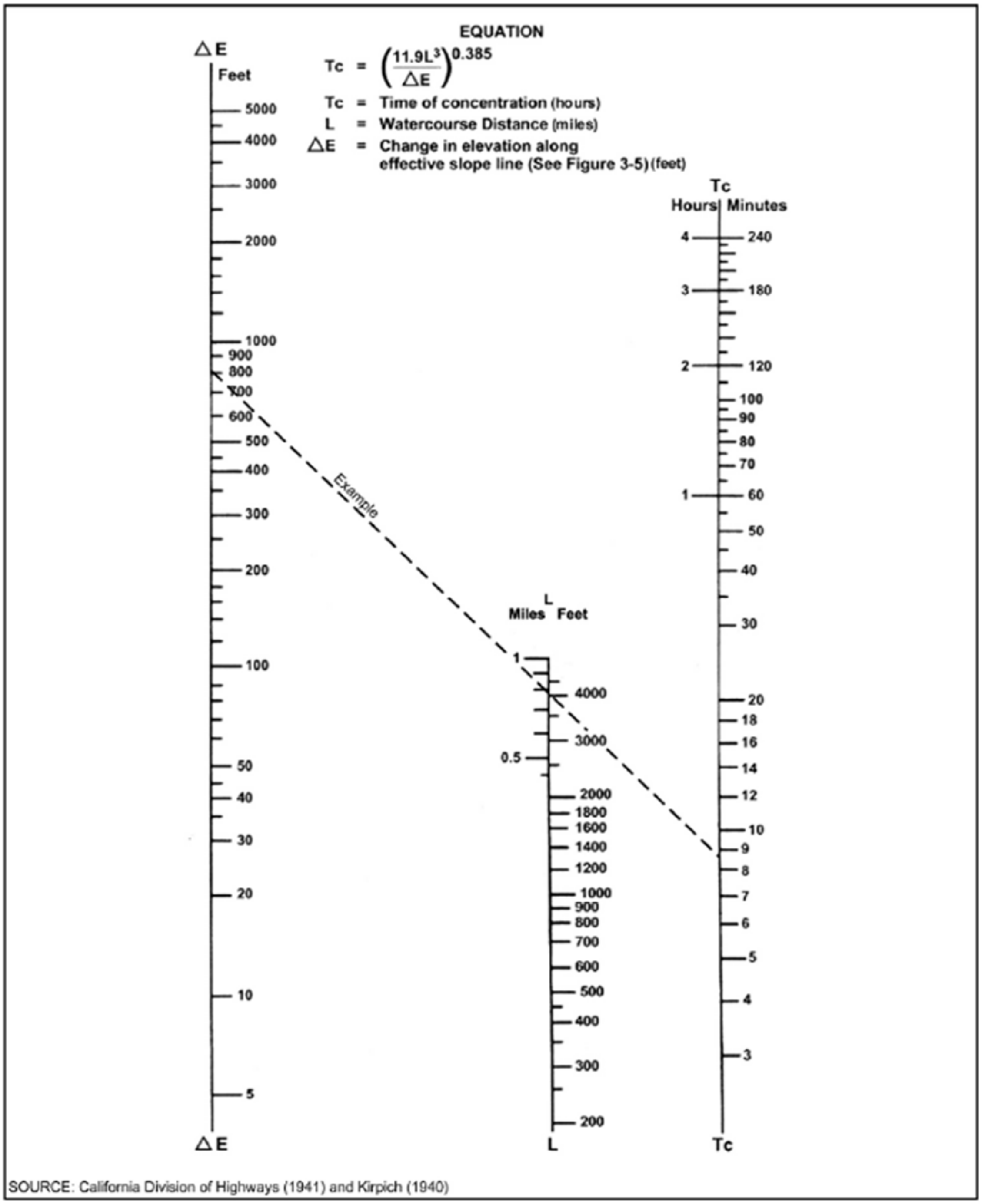


Figure 6 - Travel Time Nomograph (from County of San Diego Hydrology Manual)

After all of the necessary data have been collected, the original formula Q=CIA can be used to calculate the flow rate of stormwater on the site; in the pre and post construction conditions. Project specific results can be viewed in the discussion section of this report.

IV. EXISTING & PROPOSED DRAINAGE PATTERNS

GENERAL DESCRIPTION:

In the current condition stormwater that falls on site travels in one of two directions; a small amount of water leaves the site via a concrete v-ditch to the west while the majority of water leaves the site through the canyon to the east. The account below describes the pre and post project stormwater drainage patterns with respect to each POC.

*Note: Astric denotes peak discharge calculated for a 50 year storm.

POC 1 (WEST):

Pre-Project:

DMA E1: 0.34ac, 0.53cfs*

In the pre-project condition, this point of connectivity collects water from 0.34ac of undeveloped, graded, land once used for construction staging. When water falls in this area, it sheet flows off the site via the west property line. Directly abutting the west property line is a private concrete V-ditch which catches the stormwater and prevents it from traveling down the adjacent 2:1 slope. The V-ditch leads to a private 12" PVC stormdrain which outlets onto the abutting Winstanley Way through a private sidewalk underdrain per EMRA No. 871059-2 as seen on City Dwg No. 24275-D. Roughly 100' later, the water is picked up in a Type B-2 Catch Basin inlet (Dwg No 24275-D). From there, stormwater travels through an underground stormdrain system until its outlet point; into the nearby canyon about a half a mile northwest of the site.

Proposed Design:

In the proposed condition all stormwater generated on site will leave the project through the canyon on the north east property line. There will be no stormwater directed towards the existing concrete V-ditch on the west.

POC 2 (EAST):

Pre-project:

DMA E2:

On-site Stormwater 4.80ac, 4.71cfs*

In the current condition, most of the parcel drains to POC 2. Water in this DMA drains towards a stream that runs down the center of the project and then leaves the property in the northeast corner as a shallow concentrated flow. The land that feeds this water source consists of half the flat compacted pad on the west side of the site and the hilly vegetated, open space area across the middle and east portions of the site. Some water sheet flows from the neighboring southern properties as this area is steep and vegetated and no distinct property line is defined in the topography.

Off-site Stormwater, 24.67cfs*:

In addition to the stormwater generated within DMA E2, there are 3 off-site stormdrains that outlet into the vegetated edges of DMA E2. These 3 outlets, located across the southern boundary, generate roughly a combined 26cfs* of stormwater. The stormwater from these three drains meander across the site and enter the existing water course in the central portion of the property. It is in this stream that the on-site stormwater from DMA E2 and off-site stormwataer comingle. All water from DMA E2 leaves the site in the existing stream bed in the northeast corner of the property. Information on the 3 off-site stormwater flows is as follows and is labeled on the map:

1) A private 24" RCP stormdrain per Dwg No. 25746-D in a public stormdrain easement (FM No. 13005) outlets onto a rip rap pad and then travels for roughly 100' in a shallow concentrated flow before crossing into the subject property. Flowrate listed as Q_{50}=3.08cfs.

2) A public 18" RCP stormdrain per Dwg No. 28470-D in a public stormdrain easement (18556-B) outlets onto a rip rap pad at the property boundary. It then flows onto the subject property in a shallow concentrated flow. The flowrate is listed as Q_{100}=21.29cfs.

3) A concrete V-ditch (SDRSD D-75) catches water from behind a retaining wall that borders the southwest corner of the site. The water discharges onto riprap at the property line before discharging onto the subject property in a shallow concentrated flow. The V-ditch and associated retaining wall were built per Dwg No. 28472-D. The stormwater is listed as Q_{100}=0.3cfs.

Proposed Design:

In the proposed condition, the land within E2 is divided into 4 DMAs. Each proposed DMA is described below.

DMA P1: 0.78ac, 0.58cfs*

Stormwater generated on proposed lots 1 & 2 will be directed towards the front of the property, into a catch basin, and routed through a storm drain into a biofiltration basin (Basin 1). The runoff from the private street will be collected into reverse curb outlets and discharged into the basin. After filtering through the biofiltration basin, water will outlet into a reconstructed, ungrouted cobblestone-lined stream bed. The reconstructed stream bed is being used to mimic the existing stream bed and is not used for treatment of the water. The stream bed will lead down a developed slope and outlet the stormwater into an existing streambed within the project's proposed dedicated open space. The ungrouted cobblestone within the stream bed will dissipate the runoff velocity to prevent erosion of soil along and around the stream bed. From this point, the water will use the pre-project course of conveyance to exit the site at POC 2; it will leave the site in a shallow concentrated flow on the northeast edge of the property.

DMA P2: 1.83 acres 1.13cfs*

Stormwater on lots 3-7 will be directed to the rear of each lot and will drain to a buried 12” PVC stormdrain. This stormdrain is proposed to run parallel to the north property line against lots 3-7. The stormdrain will sit in an HOA dedicated drainage easement. The storm drains will outlet to a 3’ wide concrete v-ditch with 1.5:1 side slopes, which will lead to a biofiltration basin located at the bottom of the fill slope (Basin 2). Runoff from lots 8-10 will be directed to the back of the lots and north towards the v-ditch where it will be collected and conveyed down to the basin for treatment. From here, the stormwater will make its way off-site through the existing stream bed to the canyon in the northeast corner of the site.

DMA P3: 2.44ac, 2.58cfs*

DMA P4 is considered a self-mitigating area due to the full pervious cover. Stormwater drainage patterns and vegetation cover in the central and southern area of the parcel will not be affected by the project as this area will not be developed. Runoff from a portion of the fully vegetated proposed slope will flow down into the existing wetlands area as the existing condition did. There is no change in pre vs post conditions in this area. All three of the off-site stormwater conveyances are included in this basin. All three of the off-site stormwater conveyances can continue in their current design in an undisturbed manner.

POC 3 (EAST):

Pre-Project:

DMA E3: 0.36ac, 0.80cfs*

Stormwater that falls on 0.45 acers of land in the most northeast corner of the site sheet flows off site down a graded hillside. This flow does not become concentrated while on site. As such, there is no true POC, but a special DMA has been created to account for this flow condition.

Proposed Design:

DMA P4: 0.37cfs, 0.54cfs*

In the proposed condition this area is unchanged. No development is planned and therefore the pre and post flow rates will remain the same.

From the Site to the Ocean:

Stormwater that leaves the property at POC 2 & 3 will continue down the canyon heading north and then west. About 0.7 miles down the canyon, the piped conveyance system carrying stormwater from POC 1 joins the conveyance of the canyon. From here, the stormwater will journey through a creek, a marshy area, and lastly the San Dieguito River before entering the Pacific Ocean.

TOTAL:

In all, the proposed project will utilize new curb and gutter, (2) new biofiltration basins totalizing an area of 2525sf, (1) reconstructed ungrouted cobblestone- lined stream bed, and (1) existing stream bed.

V. WATER QUALITY AND HYDROMODIFICATION

In accordance with City of San Diego Stormwater requirements, all Priority Development Projects are subject to the Permit Low Impact Development (LID) and water quality treatment requirements. As such, the redevelopment of the property will include Best Management Practices (BMPs) to treat all anticipated developed runoff from primary and secondary pollutants of concern on-site before being discharged into the neighboring canyon. The proposed water quality BMPs for the project are anticipated to include a combination of natural features designed to treat anticipated pollutants prior to discharge to the maximum extent practicable.

Hydromodification measures will be utilized including collecting all storm water runoff into two biofiltration basins where the water will be treated, stored, and slowly released back into the existing drainage channel to mimic current conditions. All proposed storm water conveyance systems, including the cobblestone-lined streambed, the concrete v-ditch, and storm drains, will be sized for the 50-year storm event.

A separate Storm Water Quality Management Plan (SWQMP) has been prepared for this project. It addresses the adequacy of the proposed stormwater treatment measures and proposed hydromodification measures. Refer to the SWQMP for a technical analysis and detailed discussion.

VI. DISCUSSION

Impermeable Surface Increase:
This project will substantially increase the amount of impervious area on site. This is almost unavoidable given that the existing condition of the site is fully pervious. Adding any development will decrease the amount of pervious surface.

Table 1: Change in Pervious Condition

PERCENT PERVIOUS		
	EXISTING SITE	PROPOSED SITE
PROJECT SITE	100	78

Stormwater Flow:
The pre-development and post-development flow rates of 50 & 100 year storms have been compared at all three locations where stormwater leaves the project site. Analysis confirms that flow rates will remain the same or decrease, post-development. As previously mentioned, the

rational method was used to calculate flow rates. A table detailing the decrease in flow, per P.O.C is included below. Locations of P.O.C.'s are shown on Exhibit 1 & 2 in Appendix A.

Table 2: 50 And 100-Year Flow Rate Summary

	50 yr Peak Discharge (CFS)			*100 yr Peak Discharge (CFS)*		
Point of Connection	**Existing**	**Proposed**	**Increase**	**Existing**	**Proposed**	**Increase**
POC # 1	0.53	0	-0.53	0.61	0	-0.61
POC # 2	4.72	4.29	-0.43	5.50	4.46	-1.04
Off-site Flow	20.52	20.52	0.00	25.35	25.35	0.00
POC # 3	0.80	0.80	0.00	0.94	0.94	0.00
Total	**26.56**	**25.61**	**-0.96**	**32.39**	**30.75**	**-1.65**

**Locations of P.O.C.'s are shown on exhibits in Appendix A*

Streambed Restoration:

Although jurisdictional wetlands have been avoided, the project will impact ~350 linear feet of California Department of Fish and Wildlife (CDFW)- and U.S. Army Corps of Engineers (USACE)-jurisdictional non-vegetated streambed. Because the width of CDFW jurisdiction is wider than USACE jurisdiction, the project would impact 0.01 acre of non-wetland waters of the U.S. and 0.02 acre of CDFW non-vegetated streambed. A Streambed Alteration Agreement is required for impacts to 0.02 acre of CDFW jurisdictional waters pursuant to Section 1600 et seq. of the California Fish and Game Code. The project will require a Section 404 permit from the USACE and a Section 401 Certification from the RWQCB for impacts to 0.01 acre of USACE jurisdiction.

As discussed above, this project has natural stream beds running through the site. The 350' of which will be disturbed during development. As such, the streambed will be replaced in kind, with at least 80% of the lineal footage of what was disturbed. The replacement streambed is planned to run along the south edge of the property and will outlet into the Environmentally Sensitive Area that is being dedicated as open land.

The replacement streambed will be 3' wide with 3:1 side slopes. It will be lined with ungrouted cobblestone (or similar energy dissipater) to reduce soil erosion along and around the proposed stream bed and will outlet to riprap (designed per SDD-104 standards) used for dissipation which will decrease potential erosion to existing drainage channels. The streambed will be fed by water exiting the biofiltration pond at the south edge of the site and the storage vaults. This will ensure that only clean water enters the streambed restoration. Additionally, the streambed will not serve as biofiltration, and will not contain engineered soil. It is designed to be as natural as possible to mimic the predevelopment condition of the stream bed while still providing energy dissipation. The capacity of the proposed streambed for a 50-year storm was verified using Hydroflow Express. The Hydroflow report can be found in Appendix B.

VII. CONCLUSIONS

This Preliminary Drainage Study has been prepared to identify existing and proposed drainage conditions and analyze potential impacts as a result of the Lighthouse Ridge development. Based on the calculations provided, it has been determined that the post-development peak flows are less than the pre-development flows.

Though the project is proposing the addition of impervious surfaces to a fully pervious site, the overall runoff rate is decreased by directing the flow across the almost flat pads and into the treatment basins. All runoff from the site will be directed away from any natural steep slopes and will flow through energy dissipating riprap prior to flowing across existing ground.

A final hydraulic analysis will be prepared and submitted along with a final drainage study upon discretionary approval of this project.

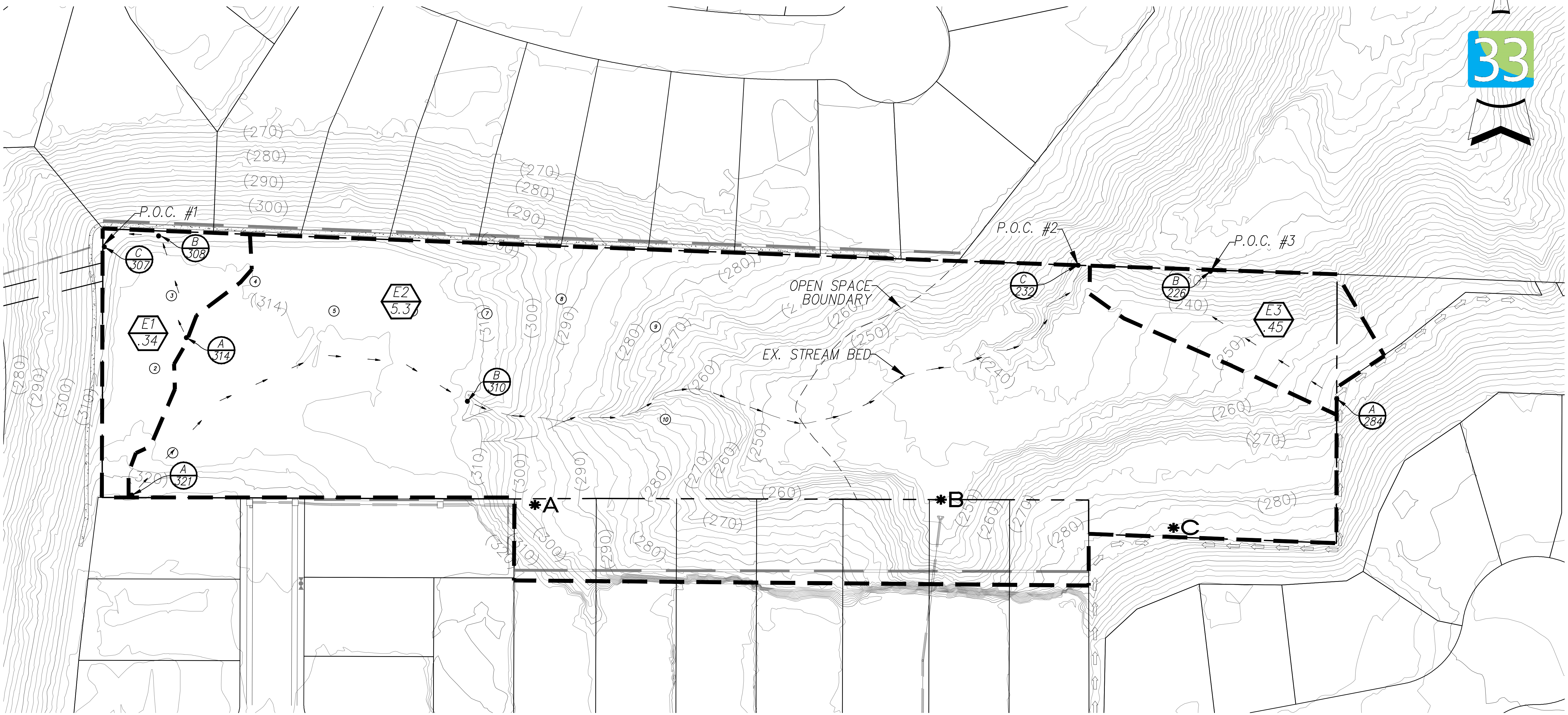
APPENDIX A

EXISTING & PROPOSED DRAINAGE BASINS

LIGHTHOUSE WAY

EXISTING DRAINAGE BASIN MAP

N



LEGEND

PROPERTY

BASIN BOUNDARY

FLOW LINE FOR TIME OF CONCENTRATION (T_C)

SEGMENT ID / ELEVATION

EXISTING DRAINAGE BASIN / AREA (ACRES)

P.O.C. (POINT OF CONNECTIVITY) — P.O.C. #

OFF-SITE STORMWATER DISCHARGE LOCATION — *A

TREATMENT TYPE

- DMAs 1–3: SELF TREATING

NOTE

- ENTIRE PARCEL IS WITHIN HYDROLIC SOIL GROUP D
- APROX. DEPTH TO GROUND WATER UNKNOWN
- NO CCSYA WITHIN PROJECT SITE

SCALE: 1"=80'		DRAWN BY: EHW
DATE: 06/16/16		CHECKED BY: SDD
JOB NO.: 1380.0		
SHEET: EXHIBIT 1		

latitude 33
PLANNING & ENGINEERING
9968 Hibert Street 2nd Floor, San Diego, CA 92131
Tel 858.751.0633

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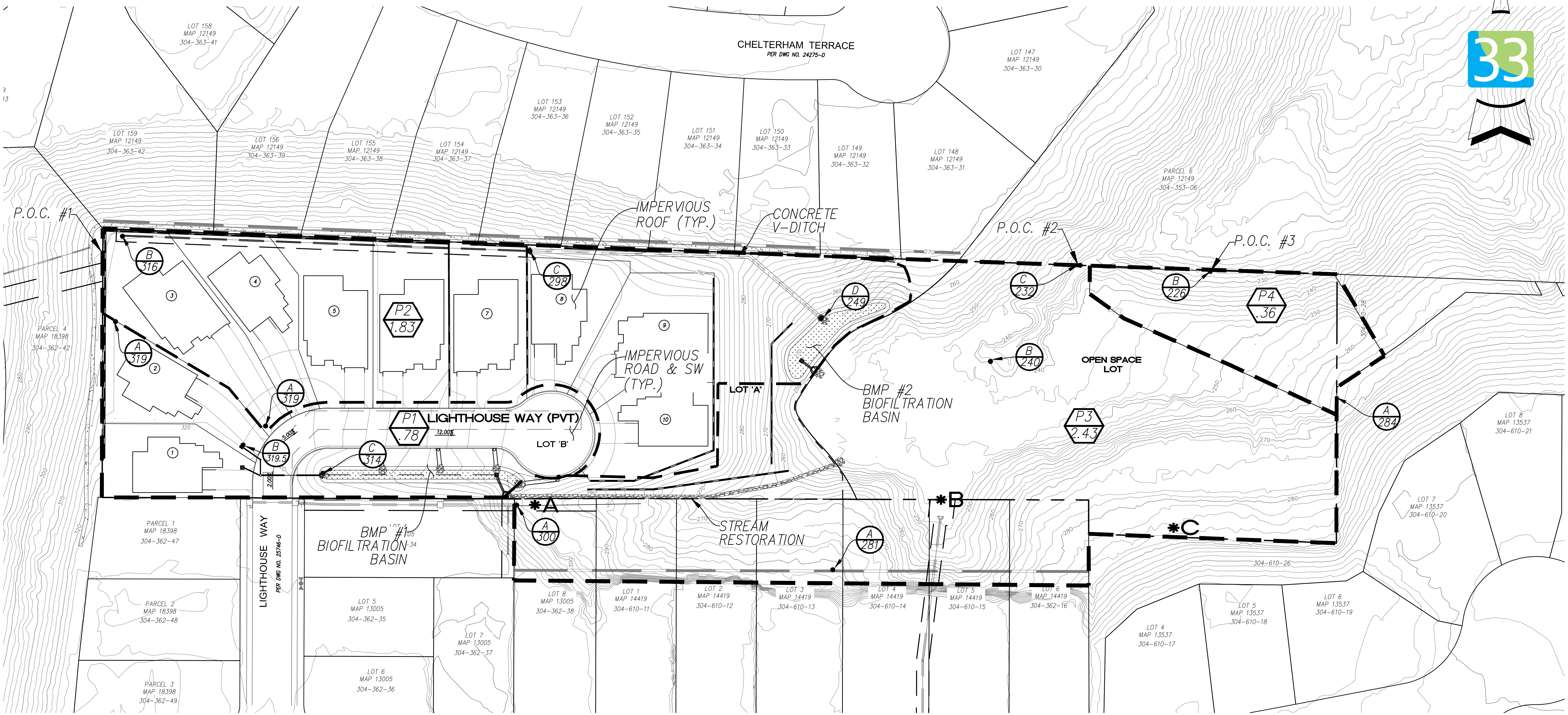
LIGHTHOUSE WAY

PROPOSED DRAINAGE BASIN MAP



LEGEND

- LOT LINE
- BASIN BOUNDARY
- FLOW LINE FOR TIME OF CONCENTRATION (T_C)
- SEGMENT ID / ELEVATION
- PROPOSED DRAINAGE BASIN / AREA (ACRES)
- P.O.C. (POINT OF CONNECTIVITY) — P.O.C. #
- OFF-SITE STORMWATER DISCHARGE LOCATION — *A

TREATMENT TYPE

- DMAs 3 & 4: SELF TREATING
- DMAs 1 & 2: DRAIN TO BMPs

NOTE

- ENTIRE PARCEL IS WITHIN HYDROLIC SOIL GROUP D
- APROX. DEPTH TO GROUND WATER UNKNOWN
- NO CCSYA WITHIN PROJECT SITE

SCALE: 1"=80'	DRAWN BY: EHW	
DATE: 05/10/18	CHECKED BY: SDD	
JOB NO.: 1380.0		
SHEET: EXHIBIT 1		

latitude 33
PLANNING & ENGINEERING
9968 Hibert Street 2nd Floor, San Diego, CA 92131
Tel 858.751.0633

H:\1300\1380.00 – LIGHTHOUSE WAY\ENGINEERING\REPORTS\DRAINAGE\DRAINAGE BASIN MAP\1380.0 – PROPOSED DRAINAGE.DWG 10/11/2017 12:09 PM

APPENDIX B

STORMWATER ANALYSIS

Peak Discharge Summary - Existing Condition										
Basin Name	*C- Value*	*2 yr Intensity (I)(in/hr)*	*10 yr Intensity (I)(in/hr)*	*50 yr Intensity (I)(in/hr)*	*100 yr Intensity (I)(in/hr)*	*Area (ac)*	*2 yr Peak Discharge (CFS)*	*10 yr Peak Discharge (CFS)*	*50 yr Peak Discharge (CFS)*	*100 yr Peak Discharge (CFS)*
Existing 1 - E1	0.35	2.43	3.55	4.49	5.23	0.34	0.29	0.42	0.53	0.61
Existing 2 - E2	0.35	1.52	2.22	2.81	3.28	4.80	2.56	3.74	4.72	5.51
Existing 3 - E3	0.35	3.39	4.95	6.26	7.30	0.37	0.44	0.64	0.80	0.94
				TOTAL=		5.51	3.28	4.79	6.05	7.06

Peak Discharge Summary - Proposed Condition										
Basin Name	*C- Value*	*2 yr Intensity (I)(in/hr)*	*10 yr Intensity (I)(in/hr)*	*50 yr Intensity (I)(in/hr)*	*100 yr Intensity (I)(in/hr)*	*Area (ac)*	*2 yr Peak Discharge (CFS)*	*10 yr Peak Discharge (CFS)*	*50 yr Peak Discharge (CFS)*	*100 yr Peak Discharge (CFS)*
Proposed 1 - P1	0.67	1.10	1.10	1.10	1.10	0.78	0.58	0.58	0.58	0.58
Proposed 2 - P2	0.56	1.10	1.10	1.10	1.10	1.83	1.13	1.13	1.13	1.13
Proposed 3 - P3	0.35	1.62	2.42	3.02	3.22	2.44	1.39	2.07	2.58	2.75
Proposed 4 - P4	0.35	2.48	3.38	4.18	4.37	0.37	0.32	0.43	0.54	0.56
				TOTAL=		5.42	3.41	4.21	4.83	5.02

TIME OF CONCENTRATION

Project Information

Project	County	Date	Project No.
Lighthouse Way	San Diego	6/13/2016	1380.00
Location/Basin	**Condtion**	**By**	**Checked**
E1	Existing	SDD	

Initial Time (T_i)

Segment ID		AB				
Flow Length, D	ft	120				
Land Slope, S	ft/ft	0.058				
Runoff Coefficient, C		0.35				
Travel Time, Ti	hr	0.137	+		=	0.137

Shallow Concentrated Flow

Segment ID		BC								
Surface Description		U								
Flow Length, L	ft	42								
Watercourse Slope, S	ft/ft	0.024								
Average Velocity, V	ft/s	2.500								
Travel Time, T_t	hr	0.005	+		+		+			

Combined Travel Time, T_t = 0.005

Channel Flow

Segment ID		CD						
Cross Sectional Flow Area, A	ft^2							
Wetted Perimeter, P	ft							
Hydraulic Radius, R	ft							
Channel Slope, S	ft/ft							
Manning's Roughness Coefficient, n								
Velocity, V	ft/s							
Flow Length, L	ft							
Travel Time, T_t	hr		+		+		+	

Combined Travel Time, T_t hr =

Time of Concetration, T_c **hr** = *0.142*

min = ***8.5***

Legend

Sheet Flow Surface Codes

A	Smooth Surfaces	F	Grass, Dense
B	Fallow (No Residue)	G	Grass, Bermuda
C	Cultivated (< 20% Residue)	H	Woods, Light
D	Cultivated (> 20% Residue)	I	Woods, Dense
E	Grass-Range, Short	J	Range, Natural

Shallow Concentrated Surface Codes

P Paved — U Unpaved

Channel Flow Roughness Condtion

A	Clean Earth	D	Dense Brush
B	Short Grass	E	Natural Channel
C	Dense Weeds	F	Concrete

TIME OF CONCENTRATION

Project Information

Project	County	Date	Project No.
Lighthouse Way	San Diego	6/13/2016	1380.00
Location/Basin	**Condtion**	**By**	**Checked**
E2	Existing	SDD	

Initial Time (T_i)

Segment ID		AB				
Flow Length, D	ft	322				
Land Slope, S	ft/ft	0.034				
Runoff Coefficient, C		0.35				
Travel Time, Ti	hr	0.269	+		=	0.269

Shallow Concentrated Flow

Segment ID		BC								
Surface Description		U								
Flow Length, L	ft	543								
Watercourse Slope, S	ft/ft	0.144								
Average Velocity, V	ft/s	6.123								
Travel Time, T_t	hr	0.025	+		+		+			

Combined Travel Time, T_t = 0.025

Channel Flow

Segment ID		CD						
Cross Sectional Flow Area, A	ft^2							
Wetted Perimeter, P	ft							
Hydraulic Radius, R	ft							
Channel Slope, S	ft/ft							
Manning's Roughness Coefficient, n								
Velocity, V	ft/s							
Flow Length, L	ft							
Travel Time, T_t	hr		+		+		+	

Combined Travel Time, T_t hr =

Time of Concetration, T_c **hr** = *0.293*

min = ***17.6***

Legend

Sheet Flow Surface Codes

A Smooth Surfaces	F Grass, Dense
B Fallow (No Residue)	G Grass, Bermuda
C Cultivated (< 20% Residue)	H Woods, Light
D Cultivated (> 20% Residue)	I Woods, Dense
E Grass-Range, Short	J Range, Natural

Shallow Concentrated Surface Codes

P Paved	U Unpaved

Channel Flow Roughness Condtion

A Clean Earth	D Dense Brush
B Short Grass	E Natural Channel
C Dense Weeds	F Concrete

TIME OF CONCENTRATION

Project Information

Project	County	Date	Project No.
Lighthouse Way	San Diego	6/13/2016	1380.00
Location/Basin	**Condtion**	**By**	**Checked**
E3	Existing	SDD	

Initial Time (T_i)

Segment ID		AB				
Flow Length, D	ft	157				
Land Slope, S	ft/ft	0.369				
Runoff Coefficient, C		0.35				
Travel Time, Ti	hr	0.085	+		=	0.085

Shallow Concentrated Flow

Segment ID		BC						
Surface Description								
Flow Length, L	ft							
Watercourse Slope, S	ft/ft							
Average Velocity, V	ft/s							
Travel Time, T_t	hr		+		+		+	

Combined Travel Time, T_t =

Channel Flow

Segment ID		CD						
Cross Sectional Flow Area, A	ft^2							
Wetted Perimeter, P	ft							
Hydraulic Radius, R	ft							
Channel Slope, S	ft/ft							
Manning's Roughness Coefficient, n								
Velocity, V	ft/s							
Flow Length, L	ft							
Travel Time, T_t	hr		+		+		+	

Combined Travel Time, T_t hr =

Time of Concetration, T_c **hr** = *0.085*

min = ***5.1***

Legend

Sheet Flow Surface Codes			
A	Smooth Surfaces	F	Grass, Dense
B	Fallow (No Residue)	G	Grass, Bermuda
C	Cultivated (< 20% Residue)	H	Woods, Light
D	Cultivated (> 20% Residue)	I	Woods, Dense
E	Grass-Range, Short	J	Range, Natural

Shallow Concentrated Surface Codes			
P	Paved	U	Unpaved

Channel Flow Roughness Condtion			
A	Clean Earth	D	Dense Brush
B	Short Grass	E	Natural Channel
C	Dense Weeds	F	Concrete

TIME OF CONCENTRATION

Project Information

Project	County	Date	Project No.
Lighthouse Way	San Diego	2/9/2017	1380.00
Location/Basin	**Condtion**	**By**	**Checked**
P1	Proposed	SDD	

Initial Time (T_i)

Segment ID		AB				
Flow Length, D	ft	190				
Land Slope, S	ft/ft	0.010				
Runoff Coefficient, C		0.58				
Travel Time, Ti	hr	0.216	+	0.000	=	0.216

Shallow Concentrated Flow

Segment ID		Basin								
Surface Description										
Flow Length, L	ft									
Watercourse Slope, S	ft/ft									
Average Velocity, V	ft/s			0.000		0.000		0.000		
Travel Time, T_t	hr	0.167	+	0.000	+	0.000	+	0.000		
				Combined Travel Time, T_t			=	0.167		

Channel Flow

Segment ID		BC						
Cross Sectional Flow Area, A	ft^2	0.79						
Wetted Perimeter, P	ft	3.14						
Hydraulic Radius, R	ft	0.250						
Channel Slope, S	ft/ft	0.112						
Manning's Roughness Coefficient, n		0.013						
Velocity, V	ft/s	15.22		0.000		0.000		0.000
Flow Length, L	ft	100						
Travel Time, T_t	hr	0.002	+	0.000	+	0.000	+	0.000

Combined Travel Time, T_t	hr	=	0.002
Time of Concetration, T_c	**hr**	=	*0.384*
	min	=	***23.1***

Legend

Sheet Flow Surface Codes

A	Smooth Surfaces	F	Grass, Dense
B	Fallow (No Residue)	G	Grass, Bermuda
C	Cultivated (< 20% Residue)	H	Woods, Light
D	Cultivated (> 20% Residue)	I	Woods, Dense
E	Grass-Range, Short	J	Range, Natural

Shallow Concentrated Surface Codes

P	Paved	U	Unpaved

Channel Flow Roughness Condtion

A	Clean Earth	D	Dense Brush
B	Short Grass	E	Natural Channel
C	Dense Weeds	F	Concrete

TIME OF CONCENTRATION

Project Information

Project	County	Date	Project No.
Lighthouse Way	San Diego	6/13/2016	1380.00
Location/Basin	**Condtion**	**By**	**Checked**
P2	Proposed	SDD	

Initial Time (T_i)

Segment ID		AB					
Flow Length, D	ft	219					
Land Slope, S	ft/ft	0.010					
Runoff Coefficient, C		0.56					
Travel Time, Ti	hr	0.239	+	0.000	=	0.239	

Shallow Concentrated Flow

Segment ID		CD							
Surface Description		P							
Flow Length, L	ft	250							
Watercourse Slope, S	ft/ft	0.112							
Average Velocity, V	ft/s	6.803		0.000		0.000		0.000	
Travel Time, T_t	hr	0.010	+	0.167	+	0.000	+	0.000	

Combined Travel Time, T_t = 0.177

Channel Flow

Segment ID		BC						
Cross Sectional Flow Area, A	ft^2	0.79						
Wetted Perimeter, P	ft	3.14						
Hydraulic Radius, R	ft	0.250						
Channel Slope, S	ft/ft	0.112						
Manning's Roughness Coefficient, n		0.013						
Velocity, V	ft/s	15.22		0.000		0.000		0.000
Flow Length, L	ft	330						
Travel Time, T_t	hr	0.006	+	0.000	+	0.000	+	0.000

Combined Travel Time, T_t hr = 0.006

Time of Concetration, T_c hr = *0.422*

min = ***25.3***

Legend

Sheet Flow Surface Codes

A	Smooth Surfaces	F	Grass, Dense
B	Fallow (No Residue)	G	Grass, Bermuda
C	Cultivated (< 20% Residue)	H	Woods, Light
D	Cultivated (> 20% Residue)	I	Woods, Dense
E	Grass-Range, Short	J	Range, Natural

Shallow Concentrated Surface Codes

P Paved — U Unpaved

Channel Flow Roughness Condtion

A	Clean Earth	D	Dense Brush
B	Short Grass	E	Natural Channel
C	Dense Weeds	F	Concrete

TIME OF CONCENTRATION

Project Information

Project	County	Date	Project No.
Lighthouse Way	San Diego	6/13/2016	1380.00
Location/Basin	**Condtion**	**By**	**Checked**
P3	Proposed	SDD	

Initial Time (T_i)

Segment ID		AB				
Flow Length, D	ft	421				
Land Slope, S	ft/ft	0.143				
Runoff Coefficient, C		0.35				
Travel Time, Ti	hr	0.190	+		=	0.190

Shallow Concentrated Flow

Segment ID		BC						
Surface Description		U						
Flow Length, L	ft	110						
Watercourse Slope, S	ft/ft	0.072						
Average Velocity, V	ft/s	4.329						
Travel Time, T_t	hr	0.007	+		+		+	

Combined Travel Time, T_t = 0.007

Channel Flow

Segment ID								
Cross Sectional Flow Area, A	ft^2							
Wetted Perimeter, P	ft							
Hydraulic Radius, R	ft							
Channel Slope, S	ft/ft							
Manning's Roughness Coefficient, n								
Velocity, V	ft/s							
Flow Length, L	ft							
Travel Time, T_t	hr		+		+		+	

Combined Travel Time, T_t hr =

Time of Concetration, T_c **hr** = *0.197*

min = ***11.8***

Legend

Sheet Flow Surface Codes			
A	Smooth Surfaces	F	Grass, Dense
B	Fallow (No Residue)	G	Grass, Bermuda
C	Cultivated (< 20% Residue)	H	Woods, Light
D	Cultivated (> 20% Residue)	I	Woods, Dense
E	Grass-Range, Short	J	Range, Natural

Shallow Concentrated Surface Codes			
P	Paved	U	Unpaved

Channel Flow Roughness Condtion			
A	Clean Earth	D	Dense Brush
B	Short Grass	E	Natural Channel
C	Dense Weeds	F	Concrete

TIME OF CONCENTRATION

Project Information

Project	County	Date	Project No.
Lighthouse Way	San Diego	6/13/2016	1380.00
Location/Basin	**Condtion**	**By**	**Checked**
P4	Proposed	SDD	

Initial Time (T_i)

Segment ID		AB				
Flow Length, D	ft	157				
Land Slope, S	ft/ft	0.369				
Runoff Coefficient, C		0.35				
Travel Time, Ti	hr	0.085	+		=	0.085

Shallow Concentrated Flow

Segment ID								
Surface Description								
Flow Length, L	ft							
Watercourse Slope, S	ft/ft							
Average Velocity, V	ft/s							
Travel Time, T_t	hr		+		+		+	

Combined Travel Time, T_t =

Channel Flow

Segment ID								
Cross Sectional Flow Area, A	ft^2							
Wetted Perimeter, P	ft							
Hydraulic Radius, R	ft							
Channel Slope, S	ft/ft							
Manning's Roughness Coefficient, n								
Velocity, V	ft/s							
Flow Length, L	ft							
Travel Time, T_t	hr		+		+		+	

Combined Travel Time, T_t hr =

Time of Concetration, T_c **hr** = *0.085*

min = ***5.1***

Legend

Sheet Flow Surface Codes

A	Smooth Surfaces	F	Grass, Dense
B	Fallow (No Residue)	G	Grass, Bermuda
C	Cultivated (< 20% Residue)	H	Woods, Light
D	Cultivated (> 20% Residue)	I	Woods, Dense
E	Grass-Range, Short	J	Range, Natural

Shallow Concentrated Surface Codes

P Paved U Unpaved

Channel Flow Roughness Condtion

A	Clean Earth	D	Dense Brush
B	Short Grass	E	Natural Channel
C	Dense Weeds	F	Concrete

TABLE 1-104.14A

DESIGN VALUES FOR MANNINGS ROUGHNESS COEFFICIENT (n)

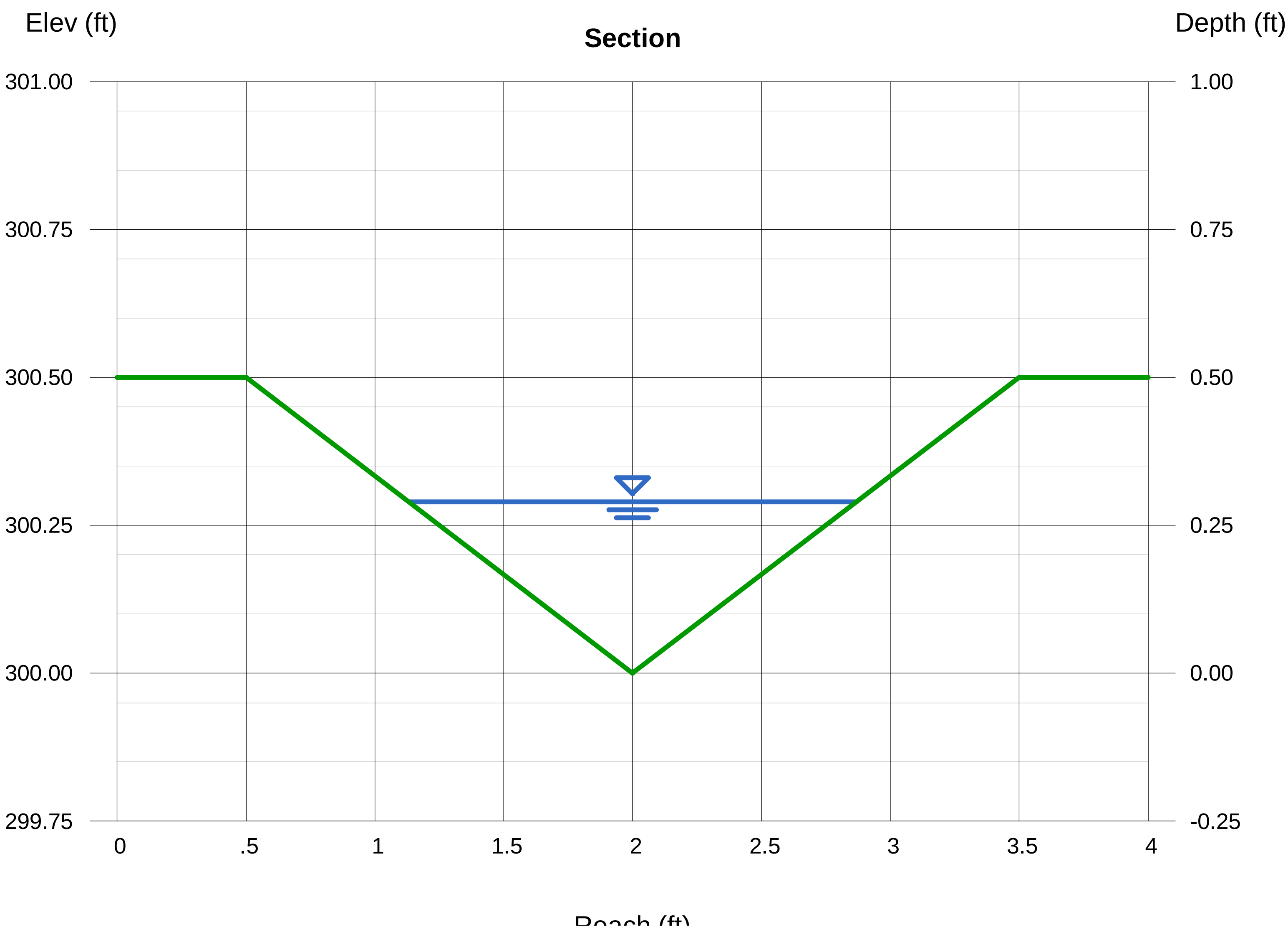
TYPE OF CHANNEL	N VALUE
Unlined Channels:	
Clay Loam	0.023
Sand	0.020
Gravel	0.030
Rock	0.040
Lined Channels:	
Portland Cement Concrete	0.015
Air Blown Mortar	0.018
Asphalt Concrete	0.018
Grass Lined Channels: (Shallow depths)	
2 inch length	0.050
4 - 6 inch length	0.060
6 - 12 inch length	0.120
12 - 24 inch + length	0.200
Pavement and Gutters:	
Concrete	0.015
Asphalt Concrete	0.018
Natural Streams: (Less than 100 feet wide at flood stage)	
1. Regular section	
a. Some grass and weeds, little or no brush	0.030
b. Dense growth of weeds, depth of flow substantially greater than weed height	0.040
c. Some weeds, light brush on bank	0.040
d. Some weeds, heavy brush on banks	0.060
e. With trees in channel, branches submerged at flood stage, increase above values by	0.015

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Sep 25 2017

Streambed

Triangular		**Highlighted**	
Side Slopes (z:1)	= 3.00, 3.00	Depth (ft)	= 0.29
Total Depth (ft)	= 0.50	Q (cfs)	= 1.000
		Area (sqft)	= 0.25
Invert Elev (ft)	= 300.00	Velocity (ft/s)	= 3.96
Slope (%)	= 19.00	Wetted Perim (ft)	= 1.83
N-Value	= 0.040	Crit Depth, Yc (ft)	= 0.37
		Top Width (ft)	= 1.74
Calculations		EGL (ft)	= 0.53
Compute by:	Known Q		
Known Q (cfs)	= 1.00		



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Sep 25 2017

Concrete V-Ditch

Triangular		**Highlighted**	
Side Slopes (z:1)	= 1.50, 1.50	Depth (ft)	= 0.36
Total Depth (ft)	= 1.00	Q (cfs)	= 1.130
		Area (sqft)	= 0.19
Invert Elev (ft)	= 198.00	Velocity (ft/s)	= 5.81
Slope (%)	= 18.00	Wetted Perim (ft)	= 1.30
N-Value	= 0.030	Crit Depth, Yc (ft)	= 0.52
		Top Width (ft)	= 1.08
Calculations		EGL (ft)	= 0.89
Compute by:	Known Q		
Known Q (cfs)	= 1.13		

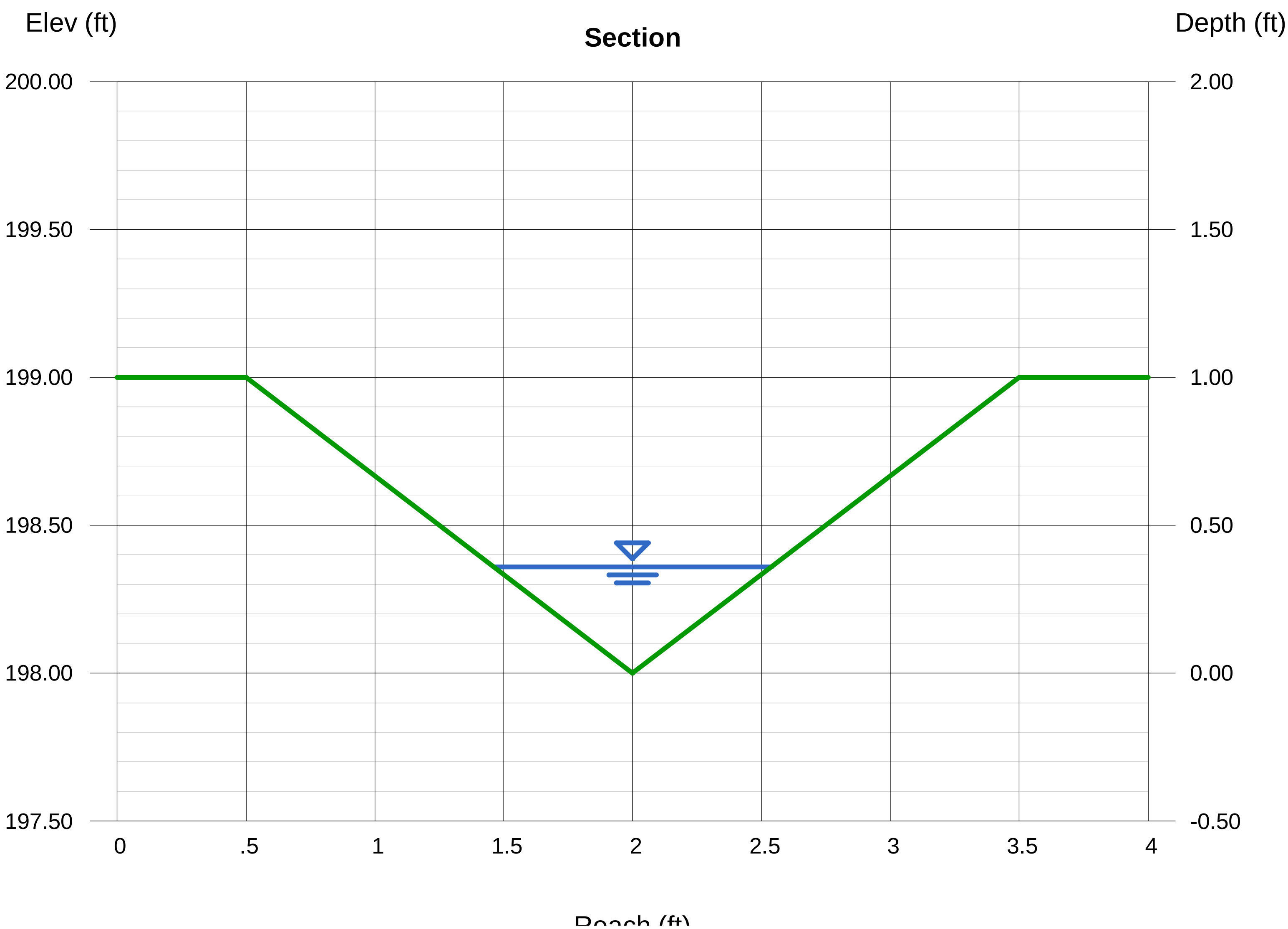


Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

Land Use		Runoff Coefficient "C"				
			Soil Type			
NRCS Elements	County Elements	% IMPER.	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

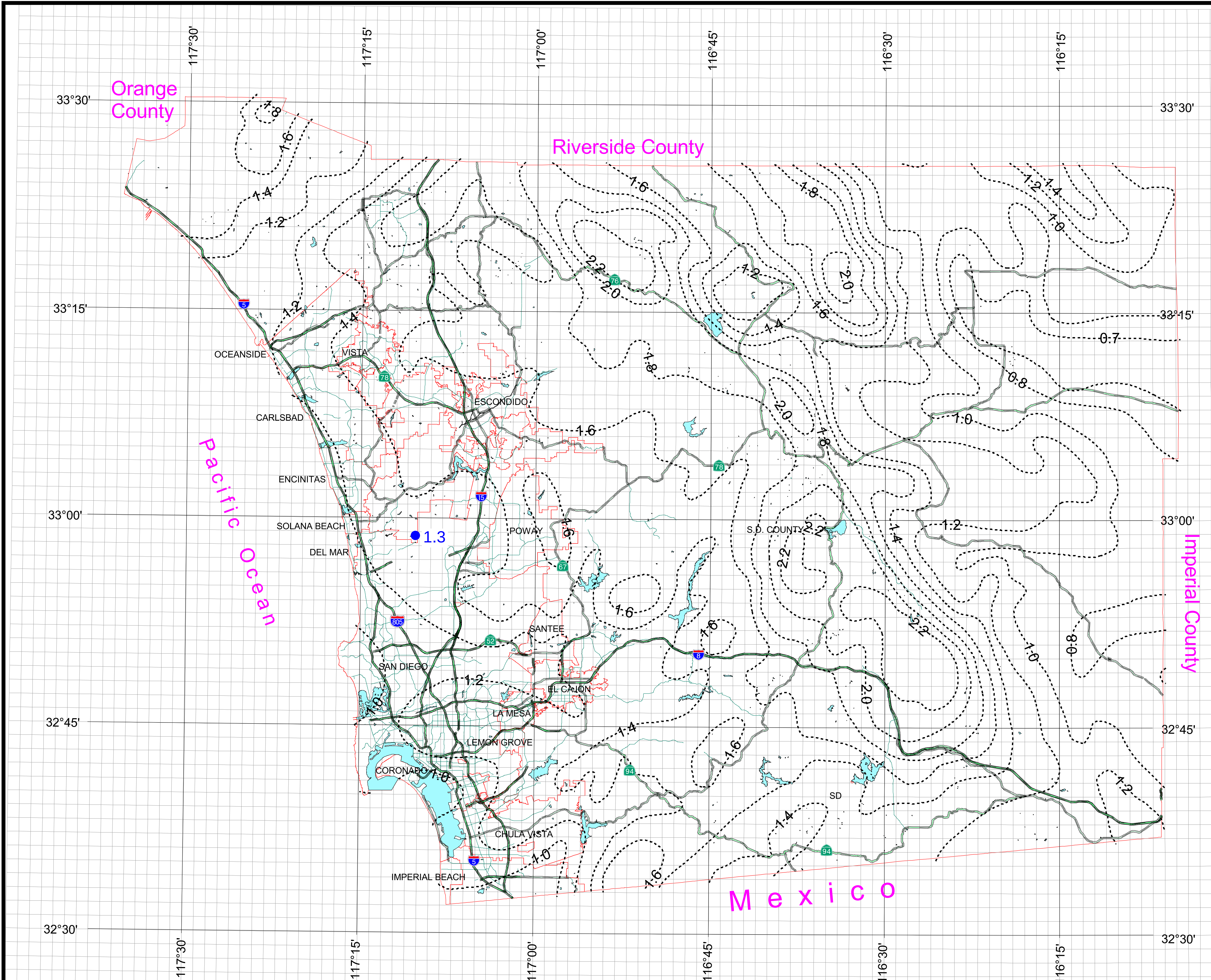
*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area 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

County of San Diego Hydrology Manual

Rainfall Isopluvials

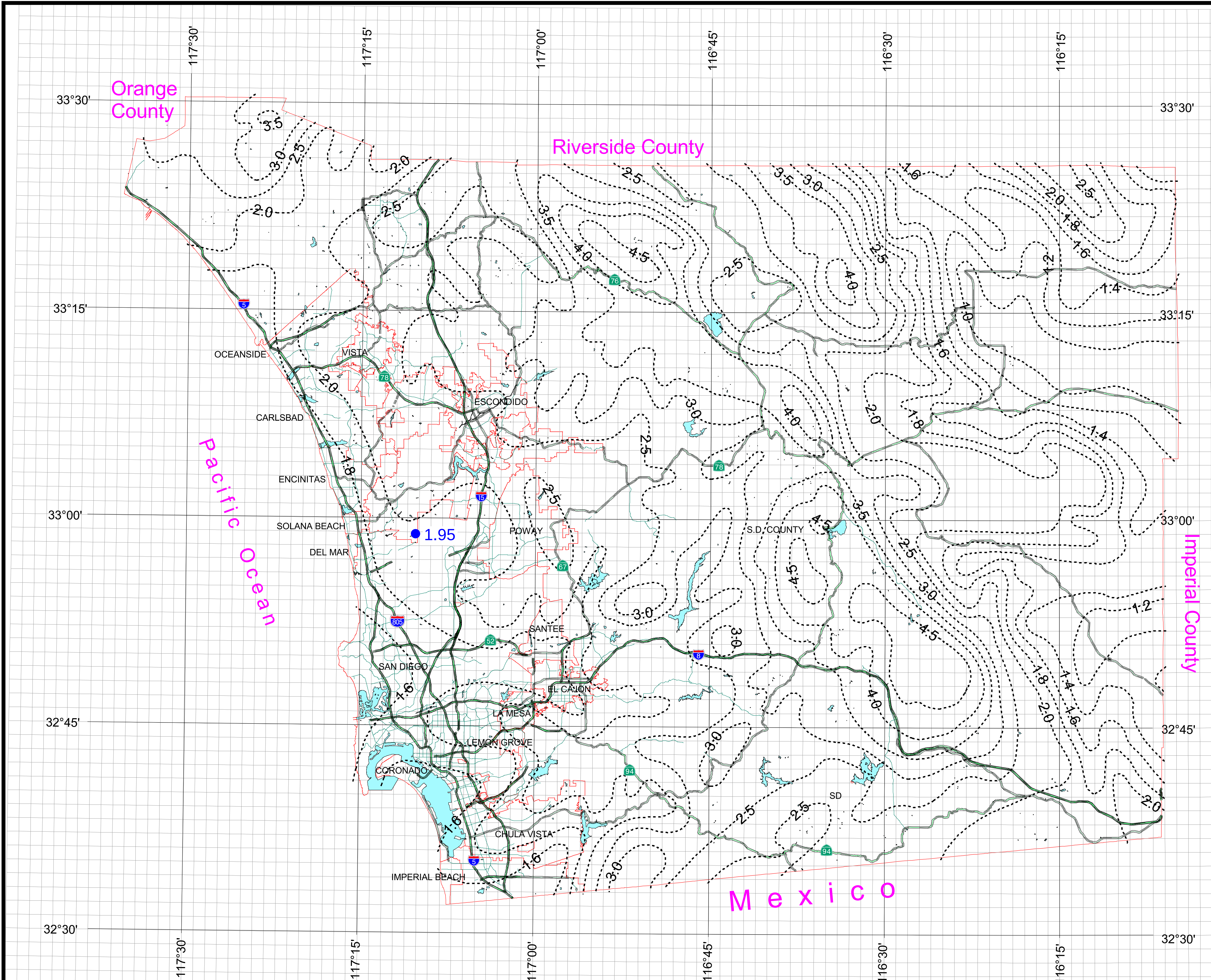
2 Year Rainfall Event - 6 Hours

Isopluvial (inches)



N
W E
S

3 0 3 Miles



County of San Diego Hydrology Manual

Rainfall Isopluvials

2 Year Rainfall Event - 24 Hours

Isopluvial (inches)

DPW GIS
Department of Public Works Geographic Information Services

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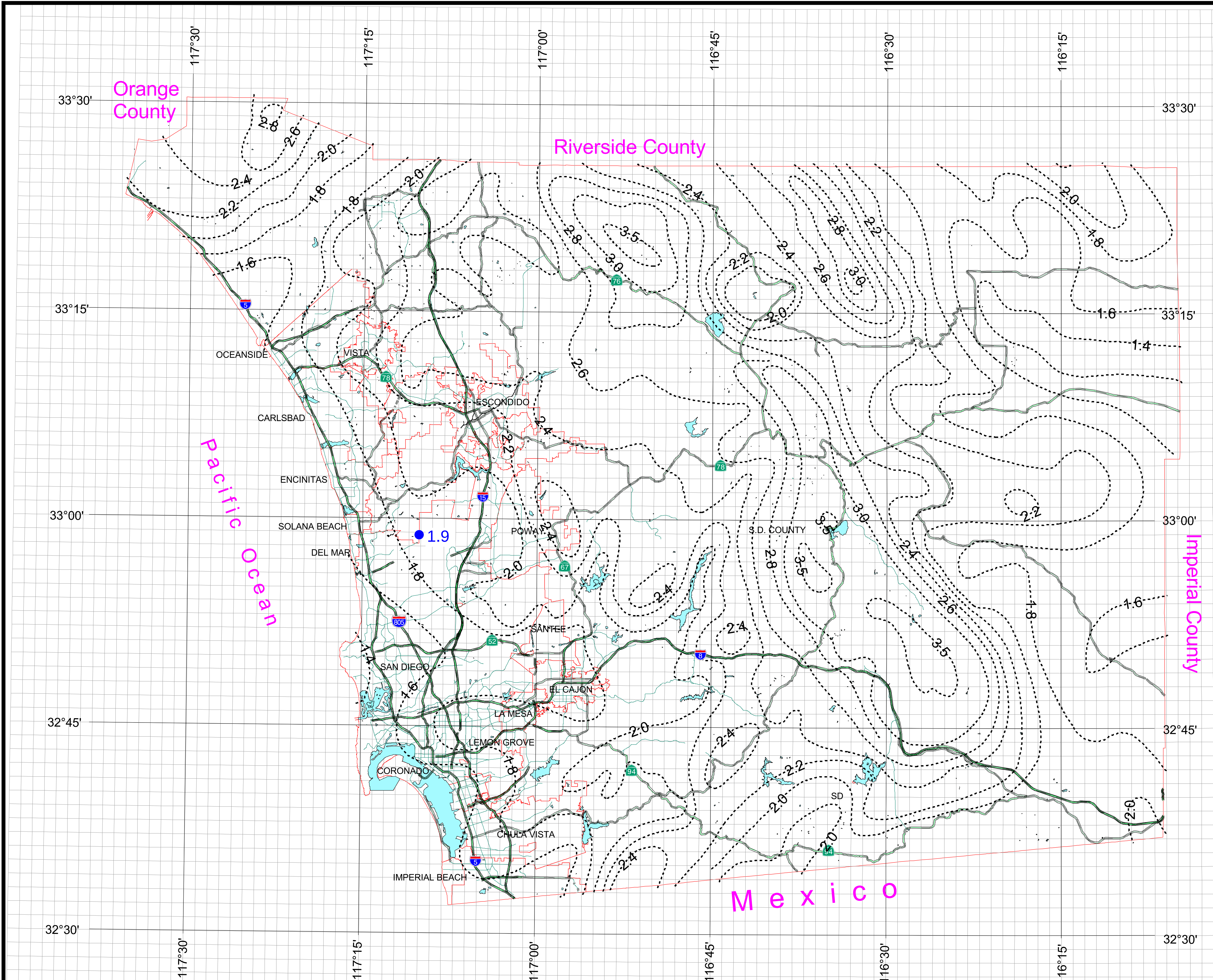
N E S W

3 0 3 Miles



County of San Diego Hydrology Manual

Rainfall Isopluvials

10 Year Rainfall Event - 6 Hours

- - - - - -	Isopluvial (inches)

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Department of Public Works Geographic Information Services

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N W E S

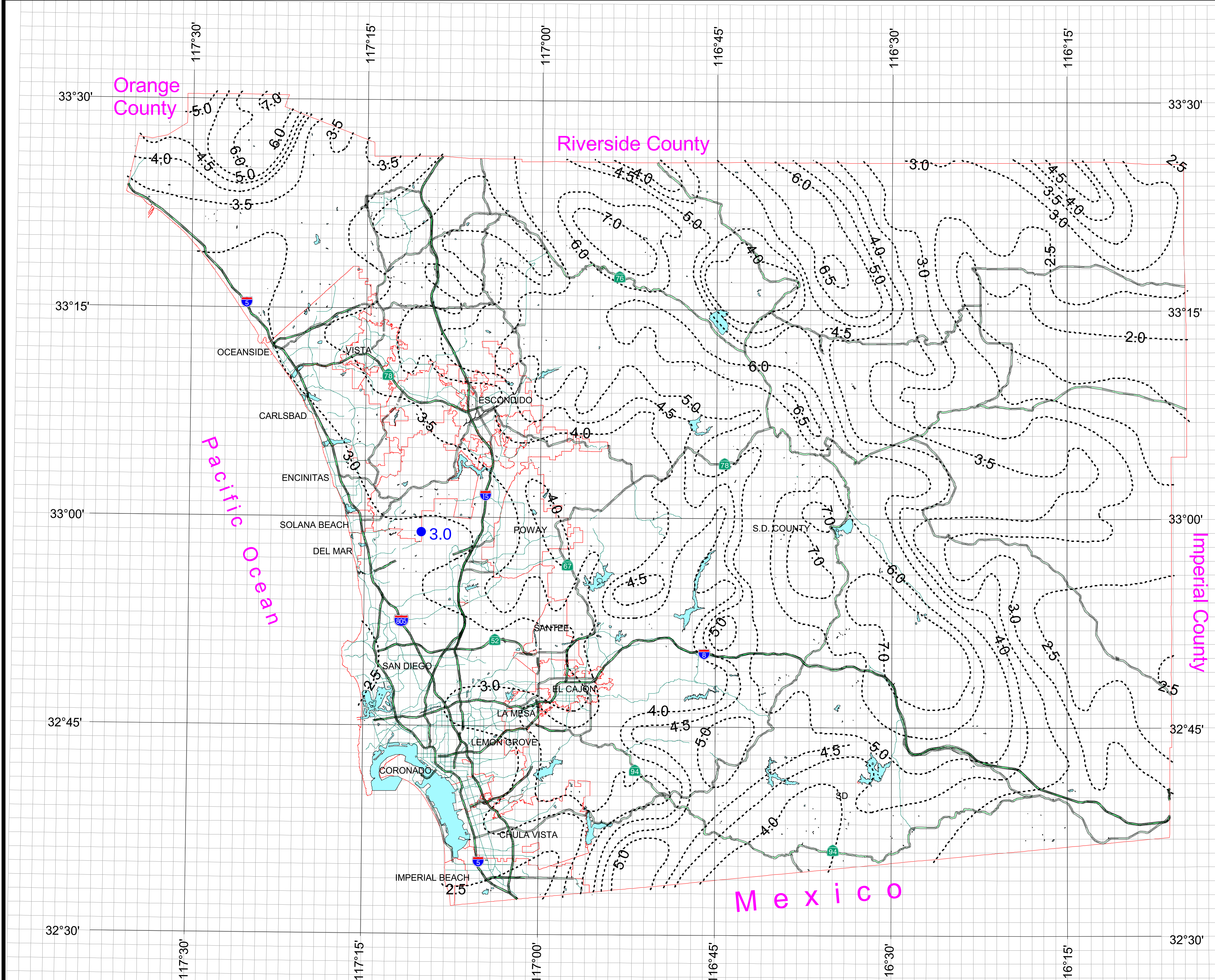
3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

10 Year Rainfall Event - 24 Hours

Isopluvial (inches)



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Geographic Information Services

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N
W
E
S

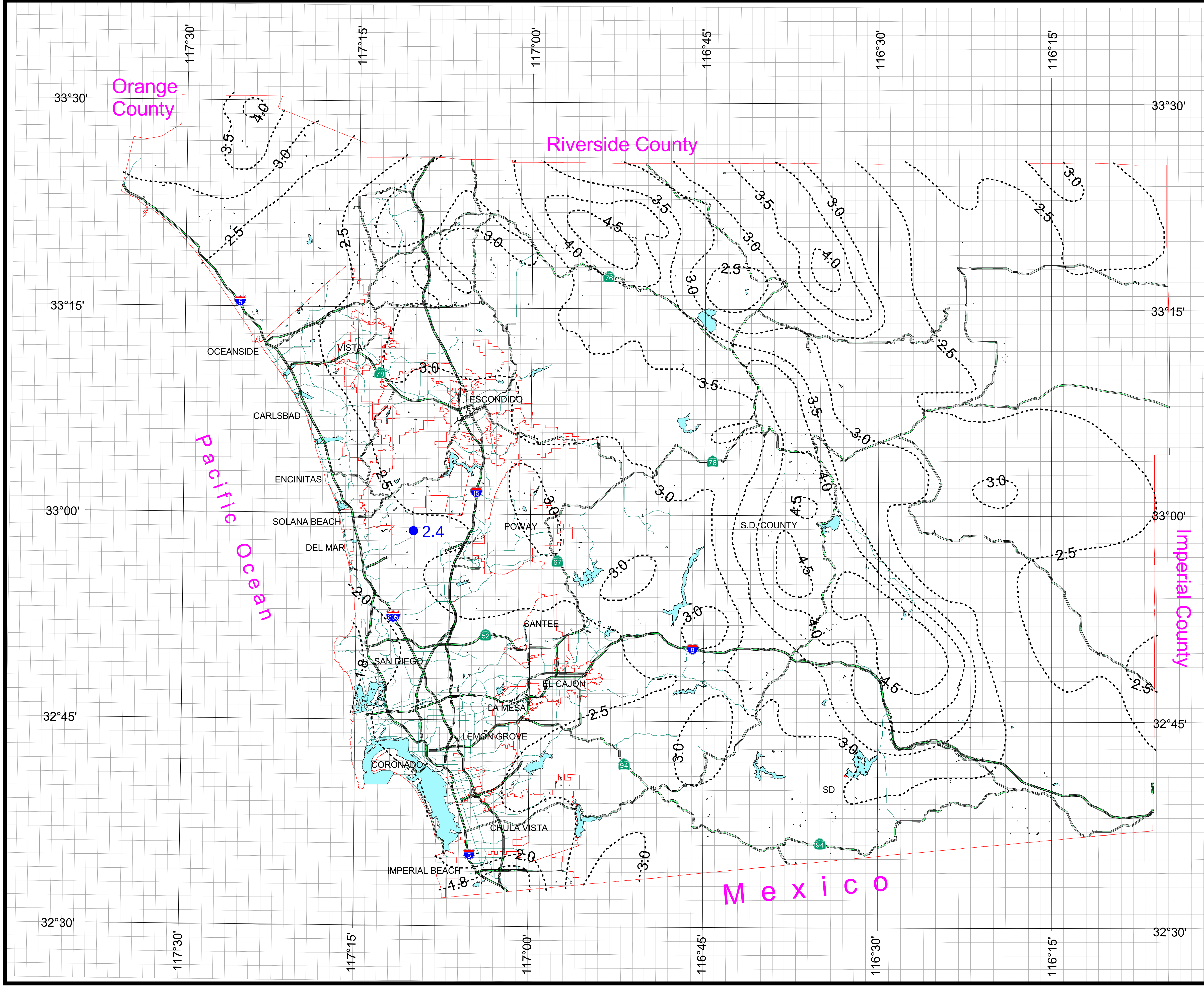
3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

50 Year Rainfall Event - 6 Hours

Isopluvial (inches)



N
W E
S

3 0 3 Miles

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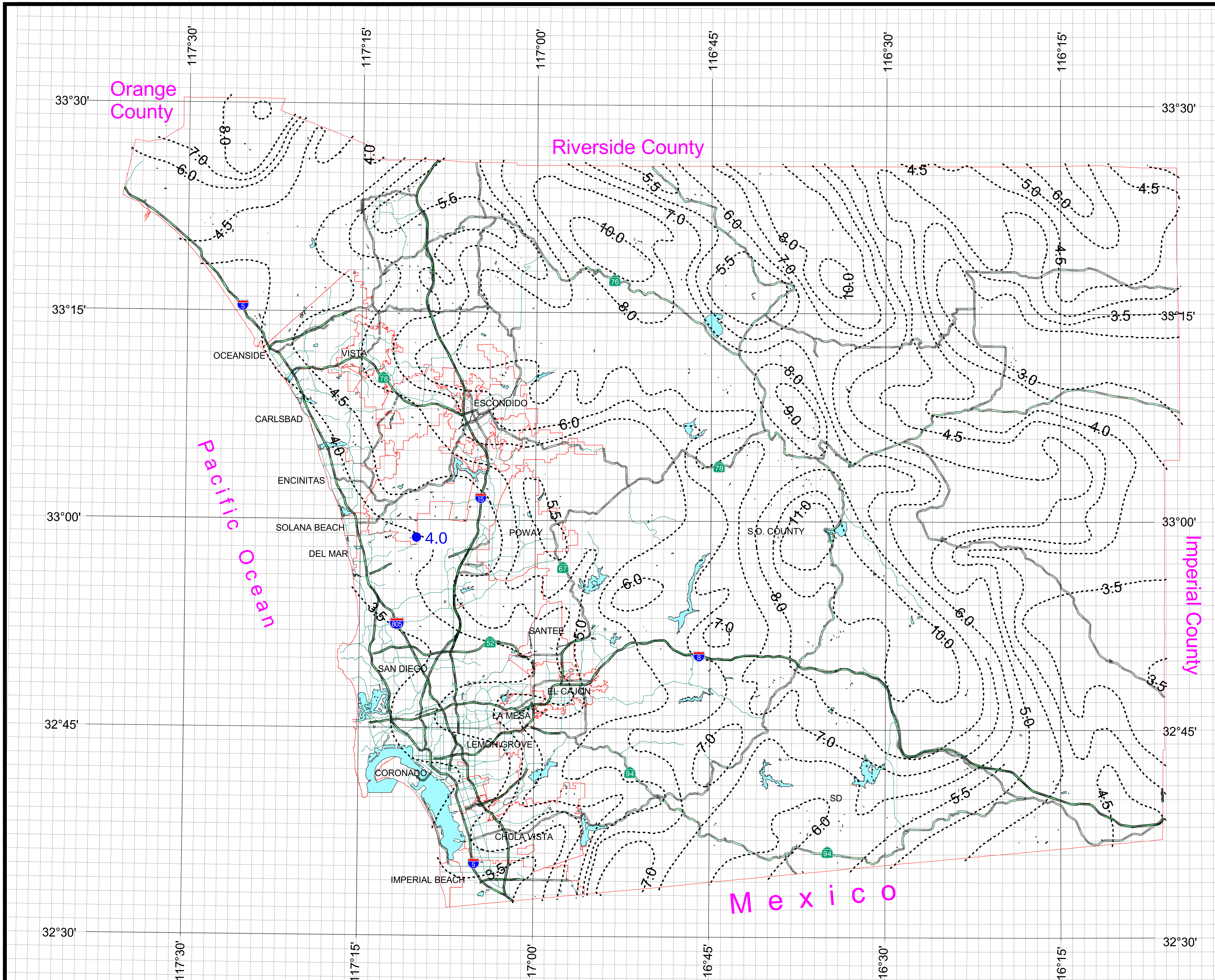
County of San Diego Hydrology Manual

Rainfall Isopluvials

50 Year Rainfall Event - 24 Hours



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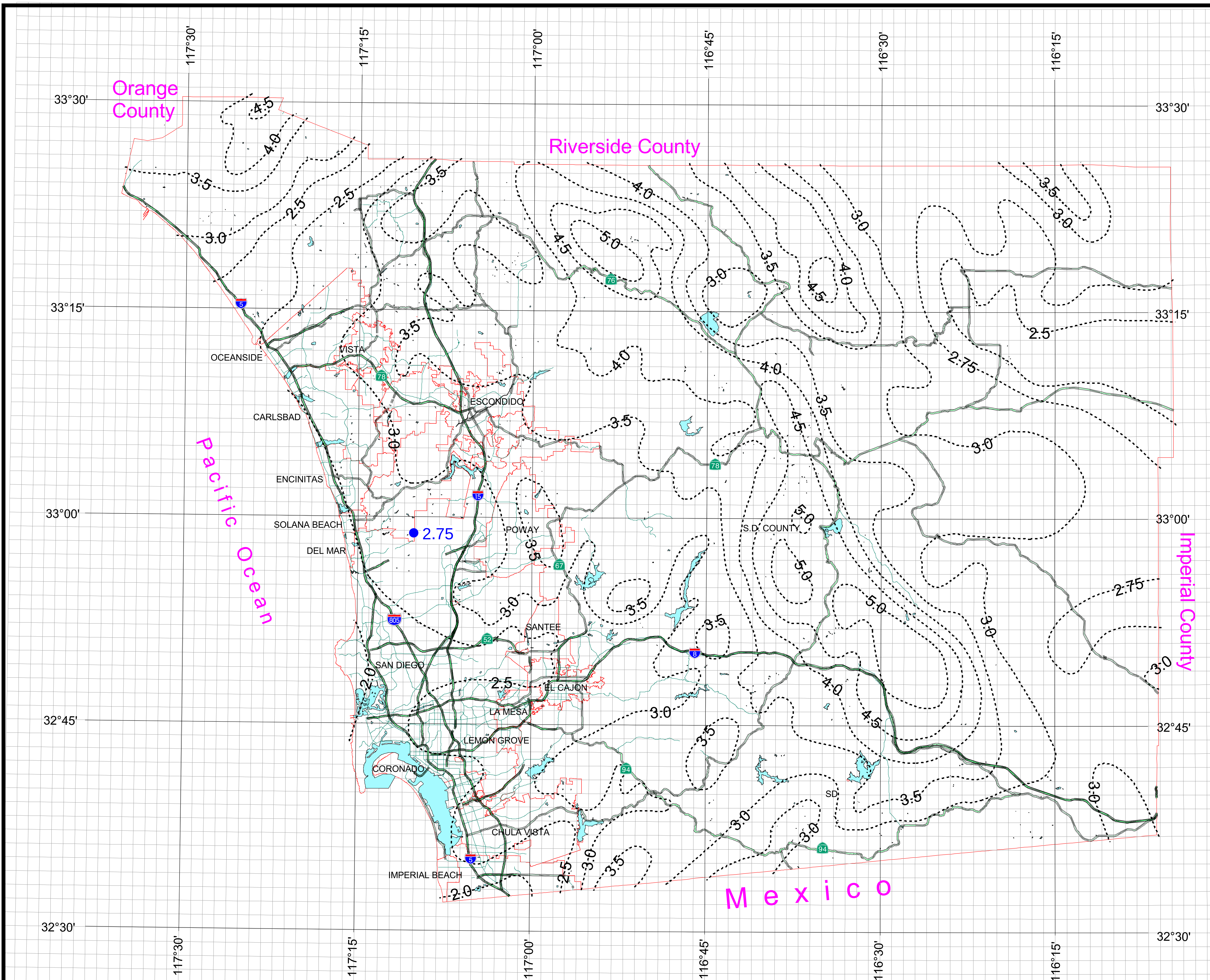
County of San Diego Hydrology Manual

Rainfall Isopluvials



100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

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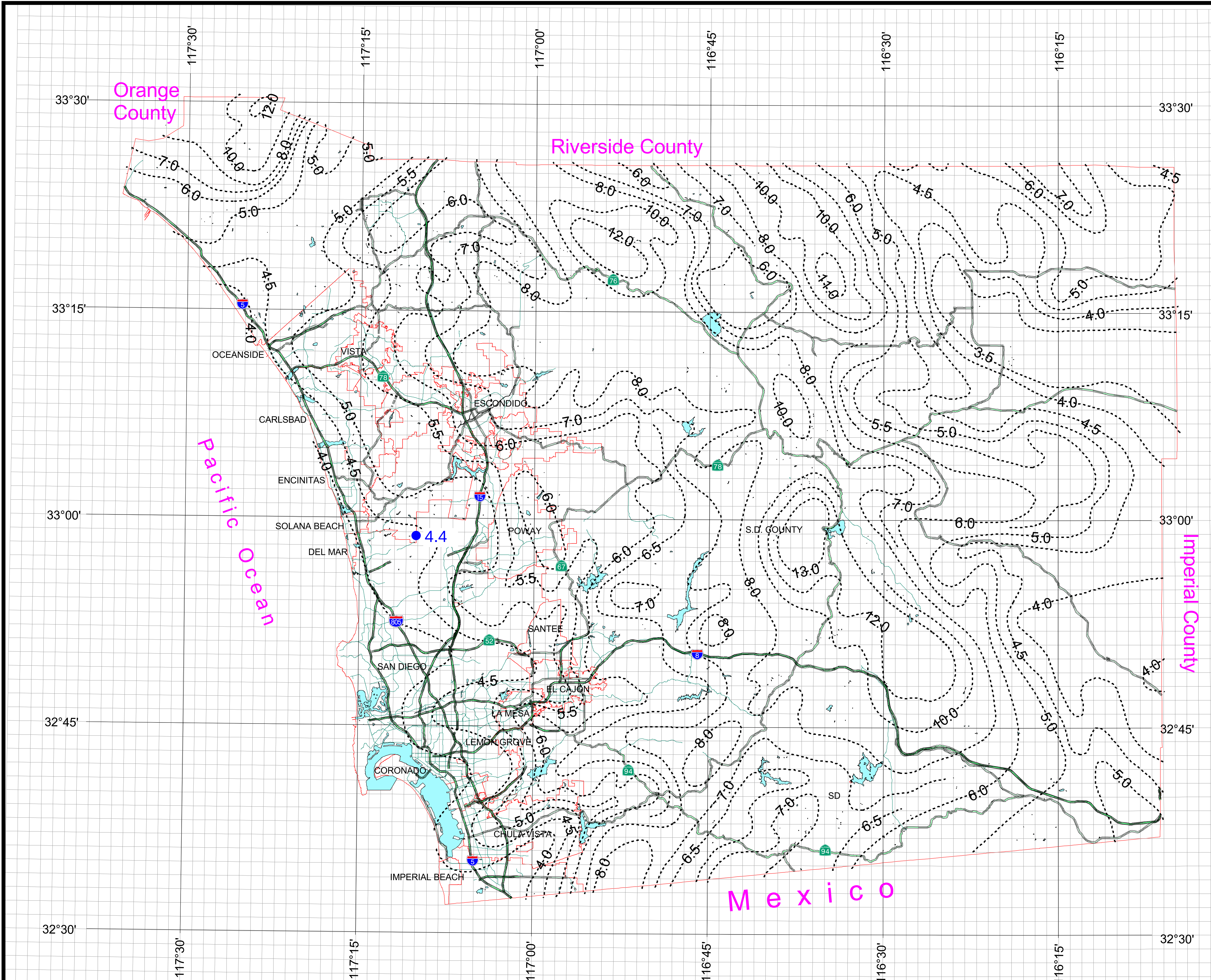
County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)



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ATTACHMENT 6
GEOTECHNICAL AND GROUNDWATER INVESTIGATION REPORT

Attach project's geotechnical and groundwater investigation report. Refer to Appendix C.4 to determine the reporting requirements.

ATTACHMENT 7
REFERENCE DOCUMENTS

GEOTECHNICAL INVESTIGATION

LIGHTHOUSE RIDGE
LIGHTHOUSE WAY
SAN DIEGO, CALIFORNIA

GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

PACIFIC LEGACY HOMES
SAN DIEGO, CALIFORNIA

FEBRUARY 15, 2017
PROJECT NO. G1996-42-01

Project No. G1996-42-01
February 15, 2017

Pacific Legacy Homes
16870 West Bernardo Drive
San Diego, California 92127

Attention: Mr. Michael Graham

Subject: GEOTECHNICAL INVESTIGATION
LIGHTHOUSE RIDGE
LIGHTHOUSE WAY
SAN DIEGO, CALIFORNIA

Dear Mr. Graham:

In accordance with your authorization, we herein submit the results of our geotechnical investigation for the subject project. We performed our investigation to evaluate the underlying soil and geologic conditions and potential geologic hazards and to assist in the design of the proposed project. We also conducted infiltration testing at several locations. The accompanying report presents the results of our study and conclusions and recommendations pertaining to the geotechnical aspects of the proposed project. The site is considered suitable for the proposed project provided the recommendations of 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

Garry W. Cannon
CEG 2201
RCE 56468

Rodney C. Mikesell
GE 2533

GWC:RCM:dmc

(1) Addressee
(3/del) Lattitude 33
Attention: Melissa Krause

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GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the results of our geotechnical investigation for the proposed residential subdivision to be located at northern terminus of Lighthouse Way in San Diego, California (see Vicinity Map, Figure 1). The purpose of this geotechnical investigation is to evaluate the surface and subsurface soil conditions, general site geology, and to identify geotechnical constraints that may impact the planned improvements to the property. In addition, this report provides 2016 CBC seismic design criteria and recommendations for: grading, foundation design; concrete slab-on-grade and flatwork; retaining wall, lateral loading; storm water infiltration; and a discussion regarding the local geologic hazards including faulting and seismic shaking.

This report is limited to the area shown on the Geologic Map, Figure 2.

The scope of this investigation included: a review of readily available published and unpublished geologic literature (see List of References); excavating six exploratory trenches to a maximum depth of about 8 feet below ground surface; soil sampling; laboratory testing; engineering analyses; and preparation of this report. Appendix A presents the exploratory-trench logs and details of the field investigation. Appendix B presents details of the laboratory tests and a summary of the test results.

2. SITE AND PROJECT DESCRIPTION

The approximately 3-acre site is located at the northern terminus of Lighthouse Way, San Diego, California. The site may have been previously graded and is currently vacant. The site is bound on the north and south by residential neighborhoods; on the west by an approximately 35-foot-high slope descending to Winstanley Way; and on the east by open space.

The site is covered with vegetation. There are some debris piles from previous site use. A sound wall has alos been constructed on the property.

We have reviewed the preliminary grading plan and conceptual sute plan. We understand that the project will consist of grading the site to receive 10, residential, building lots. The plan also shows the construction of a cul-de-sac driveway, an approximately 50-foot-high fill slope, a storm water detension basin at the toe of the eastern fill slope, and retaining walls.

The above locations, site descriptions, and proposed development is based on a site reconnaissance, review of published geologic literature, our field investigations, and discussions with you. If development plans differ from those described herein, Geocon Incorporated should be contacted for review of the plans and possible revisions to this report.

3. GENERAL GEOLOGY AND GEOLOGIC SETTING

The San Diego area is located in the Coastal Plain sub-province of the Peninsular Ranges Physiographic Provence. In San Diego County, the coastal plain runs parallel to the coast flanking the Peninsular Range and is characterized by a broad wedge of Tertiary sedimentary deposits that thicken from east to west capped by Pleistocene and Quaternary marine terrace deposits.

Kennedy and Tan (2008) has mapped the site vicinity as Tertiary-age Mission Valley Formation.

4. SOIL AND GEOLOGIC CONDITIONS

Based on our field investigation, the site is underlain by limited areas of undocumented fill and topsoil over the Mission Valley Formation. Figure 2 provides a geologic map. Figures 3 through 5 present geologic cross sections. The trench logs, presented in Appendix A, provide a description of the soils encountered during our field investigation. The geologic units are described below.

4.1 Undifferentiated Undocumented Fill and Topsoil (Qudf-ts)

Undifferentiated undocumented fill and topsoil ranging in thickness from 0.5 to 4.5 feet was observed in all six trenches. This unit consisted of: loose to medium dense, wet to saturated, clayey sand and soft to firm, wet to saturated, sandy clay. The undocumented fill and topsoil are not suitable for the support of settlement-sensitive structures or improvements. We recommend that undocumented fill and topsoil be removed and replaced with properly compacted fill. Remedial grading recommendations are provided in the *Grading* section of this report.

4.2 Mission Valley Formation (Tmv)

Tertiary-age Mission Valley Formation was observed in all exploratory trenches. This unit consisted of very dense, moist to wet, clayey sand and firm to very stiff, moist to saturated, clay. The Mission Valley deposits are suitable for the support of settlement-sensitive structures or improvements.

5. GROUNDWATER

We did not encounter groundwater in any borings during the site investigation. We do not expect groundwater or seepage to be encountered during construction of the proposed project; however, it is not uncommon for seepage conditions to exist within the near surface elevations or develop where none previously existed especially at geologic contacts. Seepage is dependent on seasonal precipitation, irrigation, land use, among other factors, and varies as a result. Proper surface drainage will be important to future performance of the project.

6. GEOLOGIC HAZARDS

6.1 Geologic Hazard Category

The City of San Diego (2008) assigns the site and vicinity Geologic Hazard Category 53 – "Level or sloping terrain, unfavorable geologic structure, Low to moderate risk", and Geologic Hazard Category 23 – "Friars: neutral or favorable geologic structure". It is our opinion, at the compleation of grading, that the site will have favorable geologic conditions.

6.2 Seismicity

We performed a deterministic seismic analysis using Risk Engineering (2011). Eight known active faults were located within a search radius of 50 miles from the property. The 2008 USGS fault database, which provides several models and combinations of fault data, was used to evaluate the fault information. Based on this database, the Newport-Inglewood/Rose Canyon Fault Zone, located approximately 5 miles from the site, is the nearest known active fault zone and is the dominant source of potential ground motion. Earthquakes that might occur on the Newport-Inglewood/Rose Canyon Fault Zone or other faults within the southern California and northern Baja California area are potential generators of significant ground motion at the site. The estimated maximum earthquake magnitude and peak ground acceleration for the Newport-Inglewood/Rose Canyon Fault are 7.5 and 0.38g, respectively. The Table 6.2.1 lists the estimated maximum earthquake magnitude and peak ground acceleration for the most dominant faults in relation to the site location. We calculated peak ground acceleration (PGA) using Boore-Atkinson (2008), Campbell-Bozorgnia (2008), and Chiou-Youngs (2008) acceleration-attenuation relationships.

TABLE 6.2.1
DETERMINISTIC SPECTRA SITE PARAMETERS

Fault Name	Distance from Site (miles)	Maximum Earthquake Magnitude (Mw)	Peak Ground Acceleration		
			Boore-Atkinson 2008 (g)	Campbell-Bozorgnia 2008 (g)	Chiou-Youngs 2008 (g)
Newport-Inglewood/Rose Canyon	5	7.5	0.32	0.30	0.38
Rose Canyon	5	6.9	0.27	0.29	0.32
Coronado Bank	19	7.4	0.16	0.12	0.14
Palos Verdes/Coronado Bank	19	7.7	0.18	0.13	0.17
Elsinore	28	7.85	0.15	0.10	0.13
Earthquake Valley	39	6.8	0.07	0.05	0.04
Palos Verde	46	7.3	0.07	0.06	0.06
San Joaquin Hills	50	7.1	0.06	0.06	0.05

In the event of a major earthquake on the referenced faults or other significant faults in the southern California and northern Baja California area, the site could be subjected to moderate to severe ground shaking. With respect to this hazard, the site is considered comparable to others in the general vicinity.

We performed a probabilistic seismic analysis using Risk Engineering (2011). The program operates under the assumption that the occurrence rate of earthquakes on each mapped Quaternary fault is proportional to the faults slip rate. The program estimates earthquake magnitude as a function of fault rupture length. Site acceleration estimates are made using the earthquake magnitude and distance from the site to the rupture zone. The program also accounts for uncertainty in each of following: (1) earthquake magnitude, (2) rupture length for a given magnitude, (3) location of the rupture zone, (4) maximum possible magnitude of a given earthquake, and (5) acceleration at the site from a given earthquake along each fault. By calculating the expected accelerations from considered earthquake sources, the program calculates the total average annual expected number of occurrences of site acceleration greater than a specified value. We utilized acceleration-attenuation relationships suggested by Boore-Atkinson (2008) NGA USGS, Campbell-Bozorgnia (2008) NGA USGS, and Chiou-Youngs (2007) NGA USGS 2008 in the analysis. Table 6.2.2 presents the site-specific probabilistic seismic hazard parameters including acceleration-attenuation relationships and the probability of exceedence.

TABLE 6.2.2
PROBABILISTIC SEISMIC HAZARD PARAMETERS

Probability of Exceedence	Peak Ground Acceleration		
	Boore-Atkinson, 2008 (g)	Campbell-Bozorgnia, 2008 (g)	Chiou-Youngs, 2007 (g)
2% in a 50 Year Period	0.42	0.42	0.48
5% in a 50 Year Period	0.30	0.30	.032
10% in a 50 Year Period	0.22	0.21	0.22

While listing peak accelerations is useful for comparison of potential effects of fault activity in a region, other considerations are important in seismic design, including the frequency and duration of motion and the soil conditions underlying the site. Seismic design of the structures should be evaluated in accordance with the California Building Code (CBC) guidelines currently adopted by the City of San Diego.

6.3 Ground Rupture

Based on our review of USGS (2016) and City of San Diego (2008) there are no active, potentially active, or inactive faults crossing the subject site; therefore, the risk associated with earthquake ground rupture hazard is low.

6.4 Seiches and Tsunamis

The site is located at an elevation greater than 300 feet above mean sea level (MSL) and is not located adjacent to or downstream from any large body of water; therefore, the risk associated with flooding hazard due to tsunami or seiche events is low.

6.5 Liquefaction

The risk associated with liquefaction and seismically induced settlement hazard at the site soil is low due to the lack of permanent, near-surface ground water and the dense nature and age of the underlying deposits.

6.6 Landslides

The risk associated with landslide hazard is low due to the relatively flat topography of the site and vicinity.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 General

7.1.1 From a geotechnical engineering standpoint, it is our opinion that the site is suitable for development of the proposed project provided the recommendations presented herein are implemented in design and construction of the project.

7.1.2 Provided the recommendations of this report are followed, it is our opinion tht the proposed development will not destabilize or result in settlement of adjacent properties or right-of-way.

7.1.3 With the exception of possible moderate to strong seismic shaking no other significant geologic hazards were observed or are known to exist on the site that would adversely affect the proposed project.

7.1.4 Our field investigation indicates the site is generally underlain by undifferentiated undocumented fill/topsoil and Mission Valley Formation.

7.1.5 Surficial soils (undocumented fill and topsoil) are not suitable for the support of settle-sensitive structures or engineered fill. Surficial soils should be removed to firm native ground and replaced with properly compacted fill. The on-site soils are suitable for use as compacted fill provided they are free of deleterious material.

7.1.6 We did not encounter groundwater or seepage during our field investigation. We do not expect groundwater or seepage to be encountered during construction of the proposed development; however, soil moisture conditions can vary depending on seasonal rainfall, irrigation, and drainage.

7.1.7 Subsurface conditions observed may be extrapolated to reflect general soil/geologic conditions at the site; however, some variations in subsurface conditions between boring locations should be expected.

7.2 Excavation and Soil Conditions

7.2.1 Excavation of the Mission Valley Formation should generally be possible with heavy effort using conventional, heavy-duty equipment. Concretions are common in the Mission Valley Formation, and if encountered, will generate oversize rock tht will require special handling.

7.2.2 The soil encountered in the field investigation is considered to be both "non-expansive" (expansion index [EI] of 20 or less) and "expansive" (EI greater than 20) as defined by 2016 California Building Code (CBC) Section 1803.5.3. Table 8.2 presents soil classifications based on the expansion index.

TABLE 8.2
EXPANSION CLASSIFICATION BASED ON EXPANSION INDEX

Expansion Index (EI)	ASTM D 4829 Expansion Classification	2016 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 We performed laboratory tests on samples of the site materials to evaluate the percentage of water-soluble sulfate content. Appendix B presents the results from the laboratory water-soluble sulfate content tests. The test results indicate that on-site materials at the locations tested possess a "Not Applicable" and "S0" exposure to concrete structures, as defined by 2016 CBC Section 1904 and ACI 318-14 Chapter 19. The presence of water-soluble sulfates is not a visually discernible characteristic. Therefore, other soil samples from the site could yield different concentrations. Additionally, over time landscaping activities (i.e. addition of fertilizers and other soil nutrients) may affect the concentration. We should perform additional laboratory tests to evaluate the soil at existing grade subsequent to the grading operations.

7.2.4 Geocon Incorporated does not practice in the field of corrosion engineering. Therefore, further evaluation by a corrosion engineer may be performed if improvements that could be susceptible to corrosion are planned.

7.3 Slopes

7.3.1 Slope stability analyses were performed utilizing average drained direct shear strength parameters from the laboratory test results. These analyses indicate that the proposed 2:1 fill slope, constructed of on-site materials, should have a calculated factor of safety of at least

1.5 under static conditions for both deep-seated failure and shallow sloughing conditions for the proposed fill slope height. Slope stability calculations are presented on Figures 6 and 7.

7.3.2 The outer 15 feet of fill slopes, measure horizontal to the slope face, should be composed of properly compacted granular "soil" fill to reduce the potential for surface sloughing.

7.3.3 Fill slopes should be compacted by backrolling with a loaded sheepsfoot roller at vertical intervals not to exceed 4 feet and should be track-walked at the completion of each slope such that the fill soils are uniformly compacted to at least 90 percent relative compaction to the face of the finished sloped. Alternatively, the fill slope may be over-built at least 3 feet and cut back to yield a properly compacted slope face.

7.3.4 All slopes should be landscaped with drought-tolerant vegetation, having variable root depths and requiring minimal landscape irrigation. In addition, all slopes should be drained and properly maintained to reduce erosion.

7.3.5 With respect to the proposed BMP basin located at the toe of the proposed fill slope, it is our opinion, that saturation of the soils adjacent at the toe of the slope will not create unstable slope conditions. Infiltration water from the basin is expected to migrate to the east following the natural drainage gradient and not into the fill slope zone.

7.4 Subdrains

7.4.1 Although not expected, a canyon subdrain may be needed within the southeastern portion of the site. Because of existing vegetation, exploratory test pits could not be performed within the southeastern portion of the site and near the toe of the proposed fill slope. The need for canyon subdrians will be determined during grading.

7.5 Grading

7.5.1 Grading should be performed in accordance with the Grading Ordinance of the City of San Diego and the *Recommended Grading Specifications* contained in Appendix D. The recommendations presented in this section take precedence over those presented in Appendix D.

7.5.2 Prior to commencing grading, a pre-construction conference should be held at the site with the project architect, grading contractor, civil engineer, geotechnical engineer, and inspection officials in attendance. Special soil handling requirements can be discussed at that time.

7.5.3 Site preparation should begin with the removal of all deleterious material and vegetation. The depth of removal should be such that material exposed in cut areas or soils to be used as fill are relatively free of organic matter. Material generated during stripping and/or site demolition should be exported from the site.

7.5.4 All compressible deposts, including undocumented fill, topsoil, and alluvium/colluvium (possibly in the eastern and southeastern portion of the property), should be removed to firm natural ground and replaced with properly compacted fill. On site soil, which is free of deleterious material, is suitable for use as compacted fill. Based on exploratory test pits, undocumented fill and topsoil removal depths are on the order of 4 feet or less at the test pit locations. However, test pits could not be performed in the eastern and southeastern portion of the site. Removal depths could be deeper than 4 feet in these areas. Potholes to evaluate removal depths should be performed once the site has been cleared and access provided.

7.5.5. Removals at toes of proposed fill slopes and structural improvements should extend horizontally beyond the edge of fill slope or improvements a distance equal to the depth of removal. Structural setbacks may be required if remedial removals cannot extend to the recommended distance because of existing improvements or property lines. The need for structural setbacks can be determined in the field during grading once removal depths are known.

7.5.6 The surface of areas to receive fill should be scarified to a depth of approximately 8 inches; moisture conditioned to above optimum moisture content or as directed by the geotechnical engineer; and compacted. Fill soils may then be placed and compacted in layers to the design finish grade elevations. The layers should be no thicker than will allow for adequate bonding and compaction. All fill and backfill should be compacted to at least 90 percent of maximum dry density at a moisture content at or slightly above the optimum moisture content as determined by the current version of ASTM D 1557.

7.5.7 Where practical, the upper 3 feet of all building pads (cut or fill) should be comprised of soil with a “very low” to “low” expansion potential. Highly expansive fill soils should be placed in the deeper fill areas. Cobbles, rock fragments, and concretions greater than 6 inches in maximum dimension should not be placed within 3 feet of finish grade in building pad areas.

7.5.8 To reduce the potential for differential settlement, it is recommended that the cut portion of cut/fill transition building pads be undercut at least 3 feet and replaced with properly compacted “very low” to “low” expansive fill soils. The base of undercuts should be sloped towards the front of the lots or deeper fill area.

7.5.9 Oversize material (defined as material greater than 12 inches in nominal dimension) may be generated during ripping of cemented formational materials. Placement of oversize material within fills should be conducted in accordance with the recommendations in Appendix D. Grading operations on the site should be scheduled such that oversize materials are placed in deeper fill areas.

7.5.10 Imported soils should consist of “very low” to “low” expansive (Expansion Index of 50 or less) soils. Prior to importing the material, samples from proposed borrow areas should be obtained and subjected to laboratory testing to determine whether the material conforms to the recommended criteria. At least 3 working days should be allowed for laboratory testing of the soil prior to its importation. Import materials should be free of oversize rock and construction debris.

7.6 Settlement Monitoring

7.6.1 The deepest fill within the building pads is approximatley 40 feet at the east end of the site. Settlement monitoring is not requied.

7.7 Seismic Design Criteria

7.7.1 We used the computer program *U.S. Seismic Design Maps*, provided by the USGS. Table 7.7.1 summarizes site-specific design criteria obtained from the 2016 California Building Code (CBC; Based on the 2015 International Building Code [IBC] and ASCE 7-10), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The short spectral response uses a period of 0.2 seconds. The values presented in Table 7.7.1 are for the risk-targeted maximum considered earthquake (MCE_R). Site Class C should be used for cut lots underlain by bedrock soils or fill lots with less than 15 feet of fill. Site Class D should be used for lots underlain by compacted fill in excess of 15 feet. We evaluated the Site Class based on the discussion in Section 1613.3.2 of the 2016 CBC and Table 20.3-1 of ASCE 7-10.

TABLE 7.7.1
2016 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value		2016 CBC Reference
Site Class	C	D	Section 1613.3.2
Fill Thickness, T (feet)	T<15	T>15	--
Spectral Response – Class B (short), S_S	1.016 g	1.016 g	Figure 1613.3.1(1)
Spectral Response – Class B (1 sec), S_1	0.392 g	0.392 g	Figure 1613.3.1(2)
Site Coefficient, F_a	1.000	1.094	Table 1613.3.3(1)
Site Coefficient, F_v	1.408	1.616	Table 1613.3.3(2)
Maximum Considered Earthquake Spectral Response Acceleration (short), S_{MS}	1.016 g	1.111 g	Section 1613.3.3 (Eqn 16-37)
Maximum Considered Earthquake Spectral Response Acceleration – (1 sec), S_{M1}	0.552 g	0.634 g	Section 1613.3.3 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.677 g	0.741 g	Section 1613.3.4 (Eqn 16-39)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.368 g	0.422 g	Section 1613.3.4 (Eqn 16-40)

7.7.2 Table 7.7.2 presents additional seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-10 for the mapped maximum considered geometric mean (MCE_G).

TABLE 7.7.2
2016 CBC SITE ACCELERATION PARAMETERS

Parameter	Value		ASCE 7-10 Reference
Site Class	C	D	--
Mapped MCE_G Peak Ground Acceleration, PGA	0.408 g	0.408 g	Figure 22-7
Site Coefficient, F_{PGA}	1.000	1.092	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.408g	0.455 g	Section 11.8.3 (Eqn 11.8-1)

7.7.3 Conformance to the criteria for seismic design does not constitute any guarantee or assurance that significant structural damage or ground failure will not occur in the event of a maximum level earthquake. The primary goal of seismic design is to protect life and not to avoid all damage, since such design may be economically prohibitive.

7.8 Foundation and Concrete Slab-On-Grade Recommendations

7.8.1 The foundation recommendations herein are for proposed one- to three-story residential structures. The foundation recommendations have been separated into three categories based on either the maximum and differential fill thickness or Expansion Index. The foundation category criteria are presented in Table 7.8.1.

TABLE 7.8.1
FOUNDATION CATEGORY CRITERIA

Foundation Category	Maximum Fill Thickness, T (Feet)	Differential Fill Thickness, D (Feet)	Expansion Index (EI)
I	$T<20$	--	$EI \leq 50$
II	$20 \leq T<50$	$10 \leq D<20$	$50<EI \leq 90$
III	$T \geq 50$	$D \geq 20$	$90<EI \leq 130$

7.8.2 We will provide final foundation categories for each building or lot after finish pad grades have been achieved and we perform laboratory testing of the subgrade soil.

7.8.3 Table 7.8.2 presents minimum foundation and interior concrete slab design criteria for conventional foundation systems.

TABLE 7.8.2
CONVENTIONAL FOUNDATION RECOMMENDATIONS BY CATEGORY

Foundation Category	Minimum Footing Embedment Depth (inches)	Continuous Footing Reinforcement	Interior Slab Reinforcement
I	12	Two No. 4 bars, one top and one bottom	6 x 6 - 10/10 welded wire mesh at slab mid-point
II	18	Four No. 4 bars, two top and two bottom	No. 3 bars at 24 inches on center, both directions
III	24	Four No. 5 bars, two top and two bottom	No. 3 bars at 18 inches on center, both directions

7.8.4 The embedment depths presented in Table 7.8.2 should be measured from the lowest adjacent pad grade for both interior and exterior footings. The conventional foundations should have a minimum width of 12 inches and 24 inches for continuous and isolated footings, respectively. A typical foundation dimension detail is provided on Figure 8.

7.8.5 The concrete slab-on-grade should be a minimum of 4 inches thick for Foundation Categories I and II and 5 inches thick for Foundation Category III.

7.8.6 Slabs that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials should be underlain by a vapor retarder. 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 used should be specified by the project architect or developer based on the type of floor covering that will be installed and if the structure will possess a humidity controlled environment.

7.8.7 The bedding sand thickness should be determined by the project foundation engineer, architect, and/or developer. However, we should be contacted to provide recommendations if the bedding sand is thicker than 6 inches. It is common to see 3 inches and 4 inches of sand below the concrete slab-on-grade for 5-inch and 4-inch thick slabs, respectively, in the southern California area.

7.8.8 The foundation design engineer should provide appropriate concrete mix design criteria and curing measures to assure proper curing of the slab by reducing the potential for rapid moisture loss and subsequent cracking and/or slab curl. We suggest that the foundation design engineer present the concrete mix design and proper curing methods on the foundation plans. It is critical that the foundation contractor understands and follows the recommendations presented on the foundation plans.

7.8.9 As an alternative to the conventional foundation recommendations, consideration should be given to the use of post-tensioned concrete slab and foundation systems for the support of the proposed structures. The post-tensioned systems should be designed by a structural engineer experienced in post-tensioned slab design and design criteria of the Post-Tensioning Institute (PTI) DC 10.5-12 *Standard Requirements for Design and Analysis of Shallow Post-Tensioned Concrete Foundations on Expansive Soils* or *WRI/CRSI Design of Slab-on-Ground Foundations*, as required by the 2016 California Building Code (CBC Section 1808.6.2). Although this procedure was developed for expansive soil conditions, it can also be used to reduce the potential for foundation distress due to differential fill settlement. The post-tensioned design should incorporate the geotechnical parameters presented in Table 8.11.3 for the particular Foundation Category designated. The parameters presented in Table 8.11.3 are based on the guidelines presented in the PTI DC 10.5 design manual.

TABLE 7.8.3
POST-TENSIONED FOUNDATION SYSTEM DESIGN PARAMETERS

Post-Tensioning Institute (PTI), Third Edition Design Parameters	Foundation Category		
	I	**II**	**III**
Thornthwaite Index	-20	-20	-20
Equilibrium Suction	3.9	3.9	3.9
Edge Lift Moisture Variation Distance, e_M (feet)	5.3	5.1	4.9
Edge Lift, y_M (Inches)	0.61	1.10	1.58
Center Lift Moisture Variation Distance, e_M (feet)	9.0	9.0	9.0
Center Lift, y_M (inches)	0.30	0.47	0.66

7.8.10 The foundations for the post-tensioned slabs should be embedded in accordance with the recommendations of the structural engineer. If a post-tensioned mat foundation system is planned, the slab should possess a thickened edge with a minimum width of 12 inches and extend below the clean sand or crushed rock layer.

7.8.11 If the structural engineer proposes a post-tensioned foundation design method other than PTI DC 10.5:

- The deflection criteria presented in Table 7.8.3 are still applicable.
- Interior stiffener beams should be used for Foundation Categories II and III.
- The width of the perimeter foundations should be at least 12 inches.
- The perimeter footing embedment depths should be at least 12 inches, 18 inches and 24 inches for foundation categories I, II, and III, respectively. The embedment depths should be measured from the lowest adjacent pad grade.

7.8.12 Our experience indicates post-tensioned slabs may be susceptible to excessive edge lift, regardless of the underlying soil conditions. Placing reinforcing steel at the bottom of the perimeter footings and the interior stiffener beams may mitigate this potential. The structural engineer should design the foundation system to reduce the potential of edge lift occurring for the proposed structures.

7.8.13 During the construction of the post-tension foundation system, the concrete should be placed monolithically. Under no circumstances should cold joints form between the footings/grade beams and the slab during the construction of the post-tension foundation system unless designed by the structural engineer.

7.8.14 Category I, II, or III foundations may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot (psf) (dead plus live load). This bearing pressure may be increased by one-third for transient loads due to wind or seismic forces. The estimated maximum total and differential settlement for the planned structures due to foundation loads is 1-inch and ½ inch, respectively.

7.8.15 Isolated footings outside of the slab area, if present, should have the minimum embedment depth and width recommended for conventional foundations for a particular Foundation Category. The use of isolated footings, which are located beyond the perimeter of the building and support structural elements connected to the building, are not recommended for Category III. Where this condition cannot be avoided, the isolated footings should be connected to the building foundation system with grade beams. In addition, consideration should be given to connecting patio slabs, which exceed 5 feet in width, to the building foundation to reduce the potential for future separation to occur.

7.8.16 Interior stiffening beams should be incorporated into the design of the foundation system in accordance with the PTI design procedures.

7.8.17 Special subgrade presaturation is not deemed necessary prior to placing concrete; however, the exposed foundation and slab subgrade soil should be moisture conditioned, as necessary, to maintain a moist condition as would be expected in any such concrete placement.

7.8.18 Where buildings or other improvements are planned near the top of a slope 3:1 (horizontal:vertical) or steeper, special foundation and/or design considerations are recommended due to the tendency for lateral soil movement to occur.

- For fill slopes less than 20 feet high or cut slopes regardless of height, 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.

- When located next to a descending 3:1 (horizontal:vertical) fill slope or steeper, the foundations should be extended to a depth where the minimum horizontal distance is equal to H/3 (where H equals the vertical distance from the top of the fill slope to the base of the fill soil) with a minimum of 7 feet but need not exceed 40 feet. The horizontal distance is measured from the outer, deepest edge of the footing to the face of the slope. A post-tensioned slab and foundation system or mat foundation system can be used to reduce the potential for distress in the structures associated with strain softening and lateral fill extension. Specific design parameters or recommendations for either of these alternatives can be provided once the building location and fill slope geometry have been determined.

- If swimming pools are planned, Geocon Incorporated should be contacted for a review of specific site conditions.

- Swimming pools located within 7 feet of the top of cut or fill slopes are not recommended. Where such a condition cannot be avoided, the portion of the swimming pool wall within 7 feet of the slope face be designed assuming that the adjacent soil provides no lateral support. This recommendation applies to fill slopes up to 30 feet in height, and cut slopes regardless of height. For swimming pools located near the top of fill slopes greater than 30 feet in height, additional recommendations may be required and Geocon Incorporated should be contacted for a review of specific site conditions.

- Although other improvements, which are relatively rigid or brittle, such as concrete flatwork or masonry walls, may experience some distress if located near the top of a slope, it is generally not economical to mitigate this potential. It may be possible, however, to incorporate design measures which would permit some lateral soil movement without causing extensive distress. Geocon Incorporated should be consulted for specific recommendations.

7.8.19 The recommendations of this report are intended to reduce the potential for cracking of slabs and foundations due to expansive soil (if present), differential settlement of fill soil with varying thicknesses. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade placed on such conditions may still exhibit some 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 reduced 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.

7.8.20 Concrete slabs should be provided with adequate crack-control joints, construction joints and/or expansion joints to reduce unsightly shrinkage cracking. The design of joints should consider criteria of the American Concrete Institute (ACI) when establishing crack-control spacing. Additional steel reinforcing, concrete admixtures and/or closer crack control joint spacing should be considered where concrete-exposed finished floors are planned.

7.8.21 Geocon Incorporated should be consulted to provide additional design parameters as required by the structural engineer.

7.9 Retaining Wall and Lateral Load Recommendations

7.9.1 Retaining 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 and having a level backfill surface should be designed for an active soil pressure equivalent to the pressure exerted by a fluid density of 35 pcf. Where the backfill will be inclined at 2:1 (horizontal:vertical), an active soil pressure of 50 pcf is recommended. These soil pressures assume that the backfill materials within an area bounded by the wall and a 1:1 plane extending upward from the base of the wall possess an Expansion Index of less than 50. Select grading will be required to provide suitable soil for wall backfill.

7.9.2 Soil contemplated for use as retaining wall backfill should be identified in the field prior to backfill. At that time, Geocon Incorporated should obtain 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. 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 Incorporated should be consulted to assess the suitability of the on-site soil for use as wall backfill if standard wall designs will be used.

7.9.3 Unrestrained walls will move laterally when backfilled and loading is applied. The amount of lateral deflection is dependent on the wall height, the type of soil used for backfill, and loads acting on the wall. The wall designer should provide appropriate lateral deflection quantities for planned retaining walls structures, if applicable. These lateral values should be considered when planning types of improvements above retaining wall structures.

7.9.4 Where walls are restrained from movement at the top, an additional uniform pressure of 8H psf should be added to the active soil pressure where the wall possesses a height of 8 feet or less and 12H where the wall is greater than 8 feet. For retaining walls subject to vehicular loads within a horizontal distance equal to two-thirds the wall height, a surcharge equivalent to 2 feet of fill soil should be added.

7.9.5 Retaining walls should be provided with a drainage system adequate to prevent the buildup of hydrostatic forces and should be waterproofed as required by the project architect. The use of drainage openings through the base of the wall (weep holes) is not recommended where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall. Figure 9 provides a typical retaining wall drainage detail. The above recommendations assume a properly compacted granular (EI $\leq$ 50) free-draining backfill material with no hydrostatic forces or imposed surcharge load. If conditions different than those described are expected, or if specific drainage details are desired, Geocon Incorporated should be contacted for additional recommendations.

7.9.6 In general, wall foundations having a minimum depth and width of 1 foot may be designed for an allowable soil bearing pressure of 2,000 psf, provided the soil within 3 feet below the base of the wall has an Expansion Index of less than 90. The recommended allowable soil bearing pressures may be increased by 300 psf and 500 psf for each additional foot of foundation width and depth, respectively, up to a maximum allowable soil bearing pressure of 4,000 psf. The proximity of the foundation to the top of a slope steeper than 3:1 could impact the allowable soil bearing pressure. Therefore, Geocon Incorporated should be consulted where such a condition is expected.

7.9.7 The structural engineer should determine the seismic design category for the project in accordance with Section 1613 of the CBC. If the project possesses a 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 18.3.5.12 of the 2016 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. A seismic load of 21H should be used for design. We used the peak ground acceleration adjusted for Site Class effects, PGA_M, of 0.455g calculated from ASCE 7-10 Section 11.8.3 and applied a pseudo-static coefficient of 0.33.

7.9.8 For resistance to lateral loads, an allowable passive earth pressure equivalent to a fluid density of 300 pcf is recommended for footings or shear keys poured neat against properly compacted granular fill soils or undisturbed natural soils. The allowable passive pressure assumes a horizontal surface extending away from the base of the wall at least 5 feet or three times the surface generating the passive pressure, whichever is greater. The upper 12 inches of material not protected by floor slabs or pavement should not be included in the design for lateral resistance. Where walls are planned adjacent to and/or on descending slopes, a passive pressure of 150 pcf should be used in design.

7.9.9 An allowable friction coefficient of 0.4 may be used for resistance to sliding between soil and concrete. This friction coefficient may be combined with the allowable passive earth pressure when determining resistance to lateral loads.

7.9.10 The recommendations presented above are generally applicable to the design of rigid concrete or masonry retaining walls having a maximum height of 10 feet. In the event that walls higher than 8 feet or other types of walls (such as crib or mechanically stabilized earth-type walls) are planned, Geocon Incorporated should be consulted for additional recommendations.

7.10 Storm Water Management

7.10.1 If storm water management devices are not properly designed and constructed, there is a risk for distress to improvements and properties located hydrologically down gradient or adjacent to these devices. Factors such as the amount of water being 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 into the subsurface occurs, downstream improvements 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.

7.10.2 A summary of our study and storm water management recommendations are provided in Appendix C.

7.11 Site Drainage and Moisture Protection

7.11.1 Adequate site drainage is critical to reduce the potential 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 2016 CBC 1804.4 or other applicable standards. 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.

7.11.2 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.

7.11.3 Underground utilities should be leak free. Utility and irrigation lines should be checked periodically for leaks, and detected leaks should be repaired promptly. Detrimental soil movement could occur if water is allowed to infiltrate the soil for prolonged periods of time.

7.11.4 Landscaping planters adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. Area drains to collect excess irrigation water and transmit it to drainage structures or impervious above-grade planter boxes can be used. In addition, where landscaping is planned adjacent to the pavement, construction of 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.

7.12 Slope Maintenance

7.12.1 Slopes that are steeper than 3:1 (horizontal:vertical) may, under conditions that are both difficult to prevent and predict, be susceptible to near-surface (surficial) slope instability. The instability is typically limited to the outer 3 feet of a portion of the slope and usually does not directly impact the improvements on the pad areas above or below the slope. The occurrence of surficial instability is more prevalent on fill slopes and is generally preceded by a period of heavy rainfall, excessive irrigation, or the migration of subsurface seepage. The disturbance and/or loosening of the surficial soils, as might result from root growth, soil expansion, or excavation for irrigation lines and slope planting, may also be a significant contributing factor to surficial instability. It is therefore recommended that, to the maximum extent practical: (a) disturbed/loosened surficial soils be either removed or properly recompacted, (b) irrigation systems be periodically inspected and maintained to eliminate leaks and excessive irrigation, and (c) surface drains on and adjacent to slopes be periodically maintained to preclude ponding or erosion. Although the incorporation of the above recommendations should reduce the potential for surficial slope instability, it will not eliminate the possibility and, therefore, it may be necessary to rebuild or repair a portion of the project's slopes in the future.

7.13 Grading and Foundation Plan Review

7.13.1 Geocon Incorporated should review the final grading and foundation plans prior to finalization to check their compliance with the recommendations of this report and evaluate the need for additional comments, recommendations, and/or analyses.

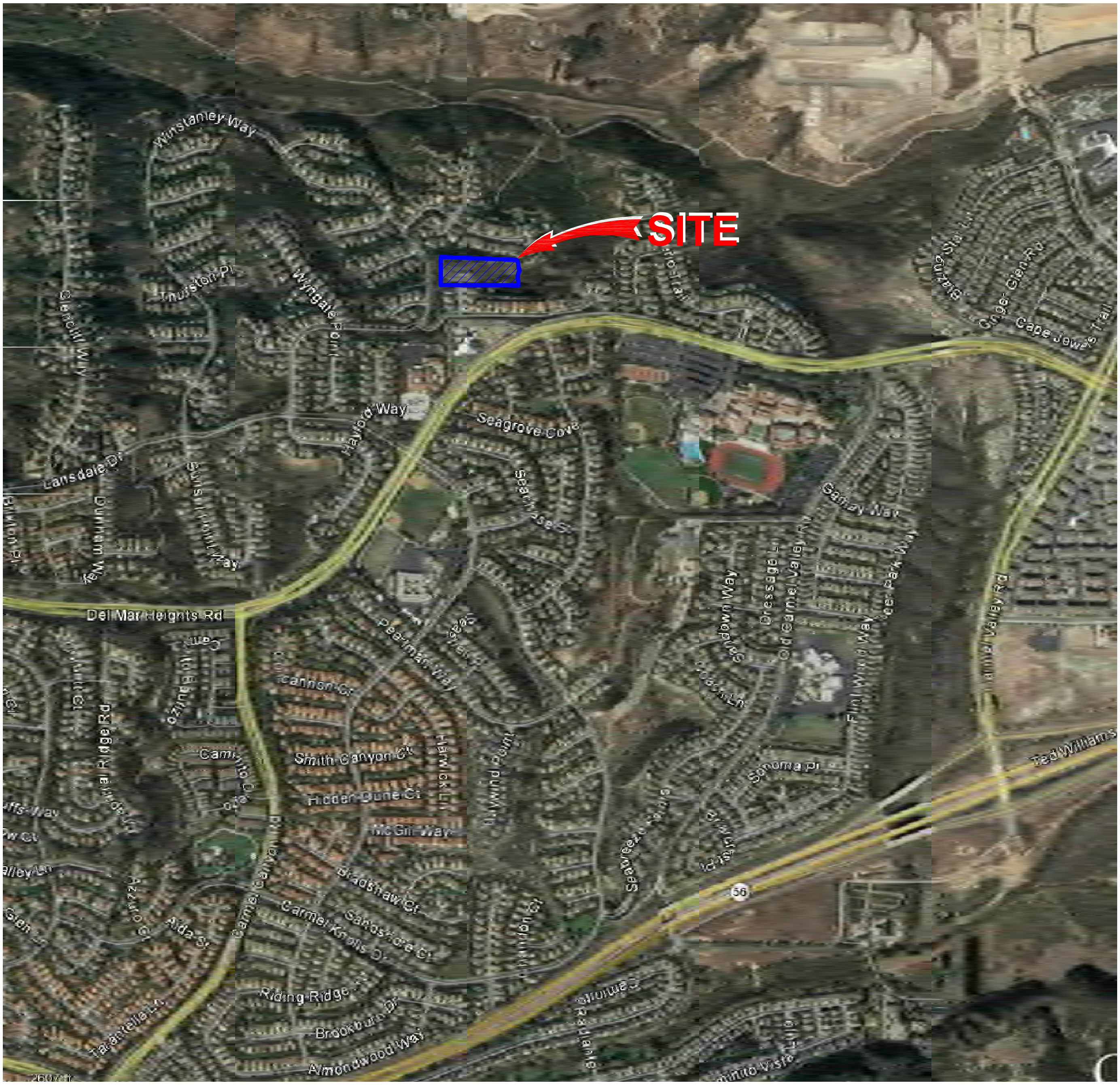
LIMITATIONS AND UNIFORMITY OF CONDITIONS

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.



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NO SCALE

VICINITY MAP

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RM / AML		DSK/GTYPD	DATE 02 - 15 - 2017	PROJECT NO. G1996 - 42 - 01	FIG. 1

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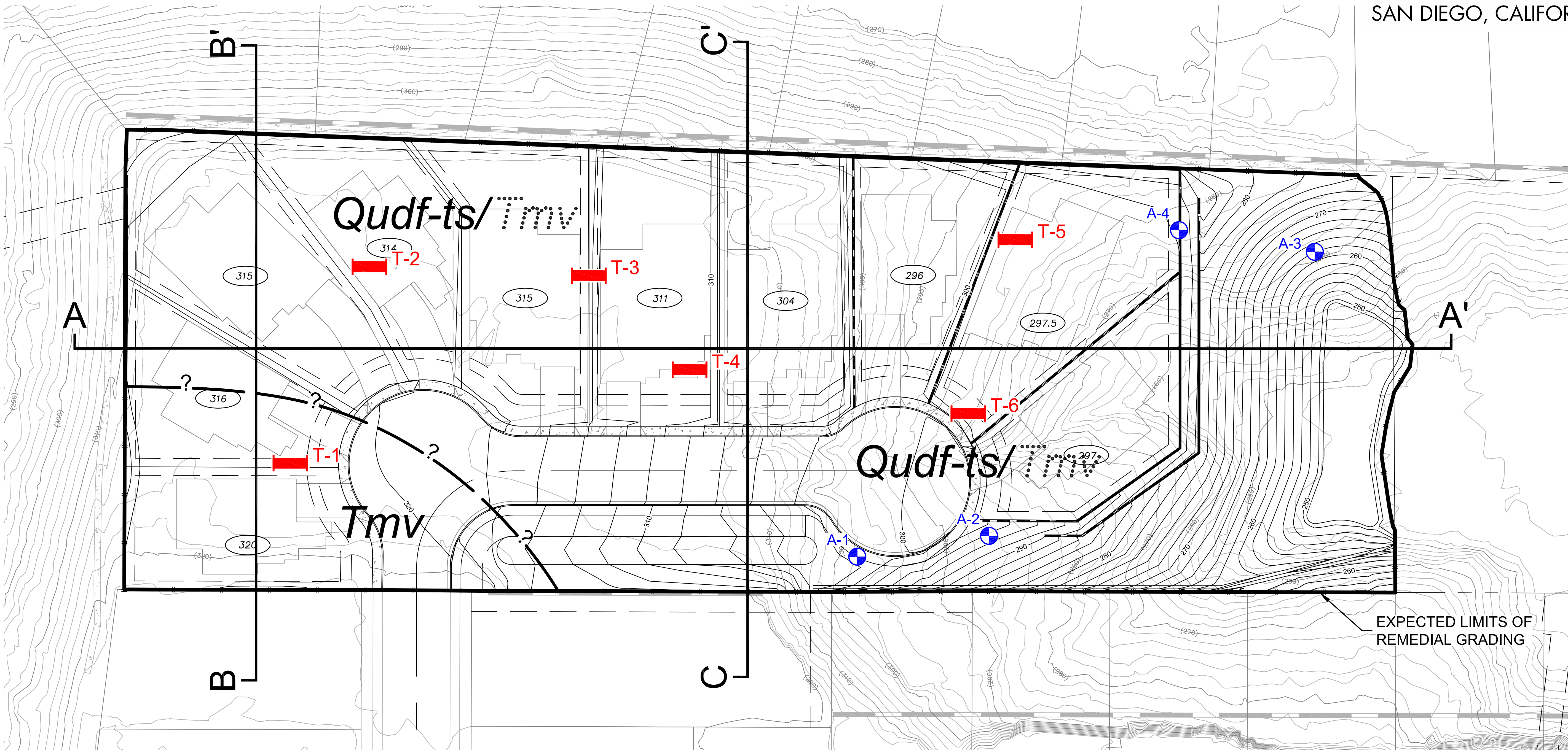

GEOCON LEGEND

Qudf-ts........UNDOCUMENTED FILL AND TOPSOIL (Undifferentiated)

Tmv........MISSION VALLEY FORMATION (Dotted Where Buried)

........APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)

A-4 ....APPROX. LOCATION OF INFILTRATION TEST

T-6 ....APPROX. LOCATION OF EXPLORATORY TRENCH

C C' ....APPROX. LOCATION OF GEOLOGIC CROSS SECTION

0' 25' 50' 75' 100'

SCALE 1"=50'(on 11x17)

GEOLOGIC MAP

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PROJECT NO. G1996 - 42 - 01
FIGURE 2
DATE 02 - 15 - 2017

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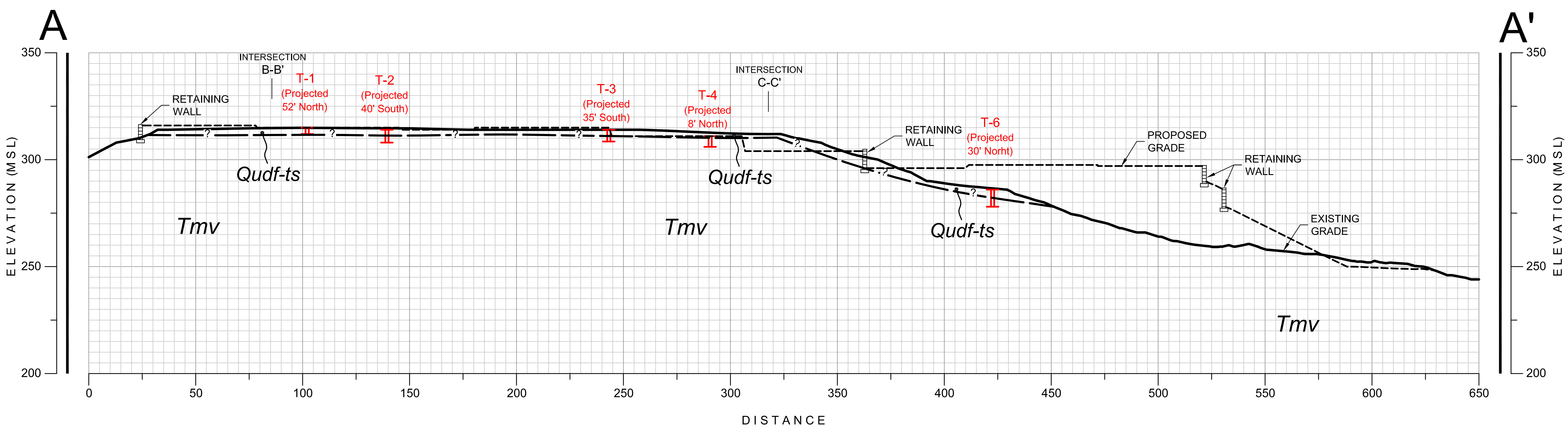
LIGHTHOUSE RIDGE
SAN DIEGO, CALIFORNIA



GEOLOGIC CROSS-SECTION A-A'

SCALE: 1" = 50' (Vert. = Horiz.)

GEOCON LEGEND

Qudf-ts........UNDOCUMENTED FILL AND TOPSOIL (Undifferentiated)

Tmv........MISSION VALLEY FORMATION (Dotted Where Buried)

........APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)

T-6 ....APPROX. LOCATION OF EXPLORATORY TRENCH

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PROJECT NO. G1996 - 42 - 01
FIGURE 3
DATE 02 - 15 - 2017

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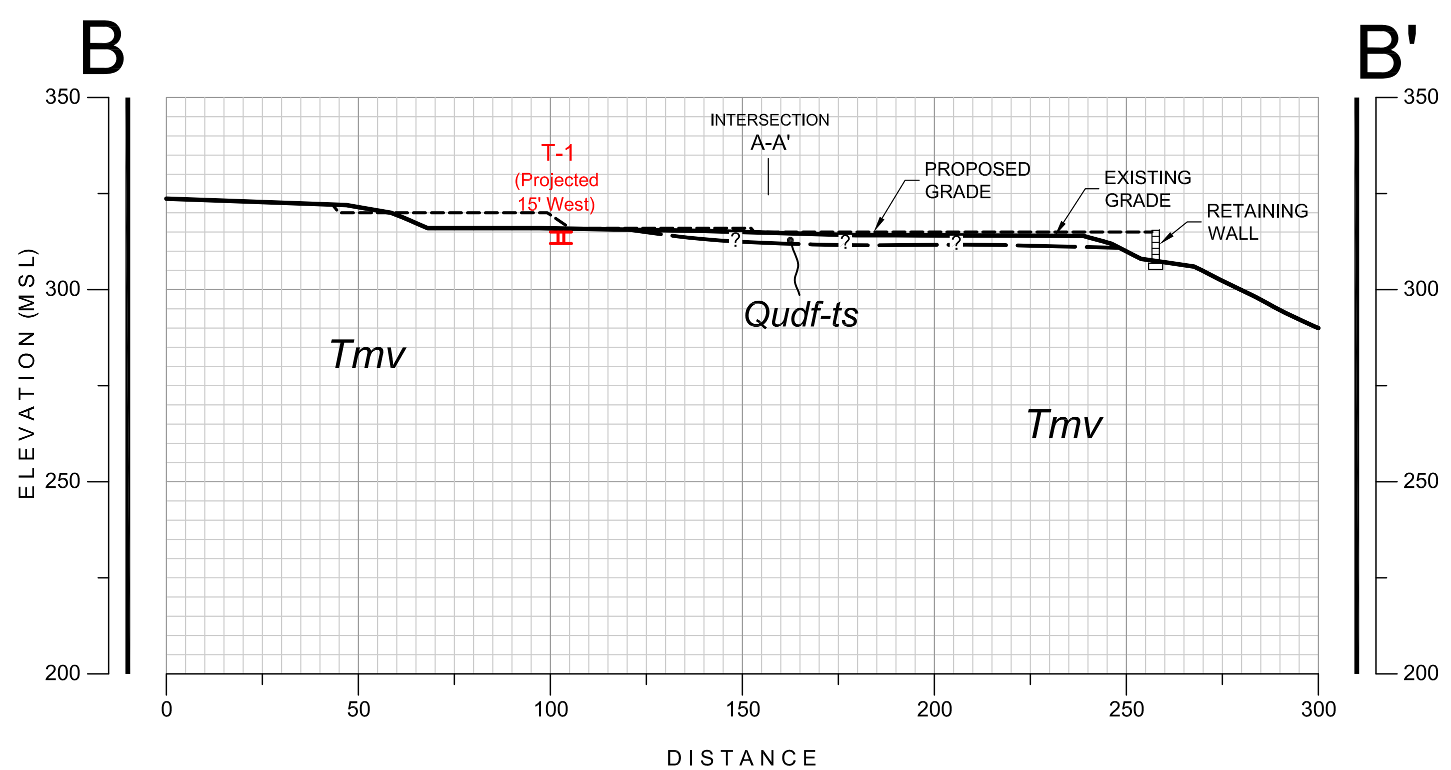

GEOLOGIC CROSS-SECTION B-B'

SCALE: 1" = 50' (Vert. = Horiz.)

GEOCON LEGEND

Qudf-ts........UNDOCUMENTED FILL AND TOPSOIL (Undifferentiated)

Tmv........MISSION VALLEY FORMATION (Dotted Where Buried)

........APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)

T-6 ....APPROX. LOCATION OF EXPLORATORY TRENCH

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PROJECT NO. G1996 - 42 - 01
FIGURE 4
DATE 02 - 15 - 2017

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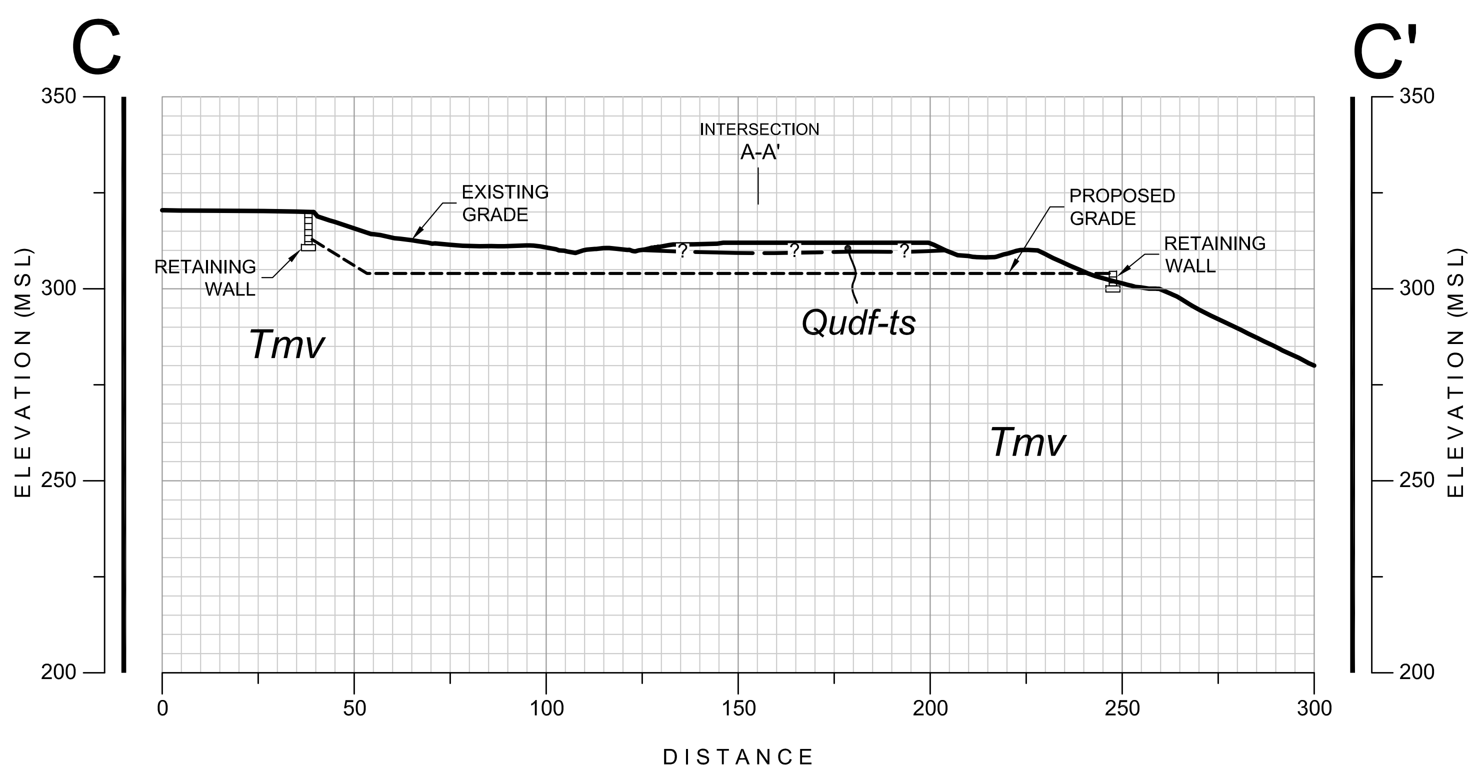

GEOLOGIC CROSS-SECTION C-C'

SCALE: 1" = 50' (Vert. = Horiz.)

GEOCON LEGEND

Qudf-ts........UNDOCUMENTED FILL AND TOPSOIL (Undifferentiated)

Tmv........MISSION VALLEY FORMATION (Dotted Where Buried)

?........APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)

T-6........APPROX. LOCATION OF EXPLORATORY TRENCH

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PROJECT NO. G1996 - 42 - 01
FIGURE 5
DATE 02 - 15 - 2017

ASSUMED CONDITIONS :

SLOPE HEIGHT	H	= 50 feet
SLOPE INCLINATION	2 : 1	(Horizontal : Vertical)
TOTAL UNIT WEIGHT OF SOIL	γ_t	= 125 pounds per cubic foot
ANGLE OF INTERNAL FRICTION	ϕ	= 28 degrees
APPARENT COHESION	C	= 350 pounds per square foot
NO SEEPAGE FORCES		

ANALYSIS :

$\gamma_{c\phi}$	=	$\dfrac{\gamma_t H \tan\phi}{C}$	EQUATION (3-3), REFERENCE 1
FS	=	$\dfrac{N_{cf}C}{\gamma_t H}$	EQUATION (3-2), REFERENCE 1
$\gamma_{c\phi}$	=	9.5	CALCULATED USING EQ. (3-3)
Ncf	=	31	DETERMINED USING FIGURE 10, REFERENCE 2
FS	=	1.74	FACTOR OF SAFETY CALCULATED USING EQ. (3-2)

REFERENCES :

1......Janbu, N., Stability Analysis of Slopes with Dimensionless Parameters, Harvard Soil Mechanics, Series No. 46, 1954

2......Janbu, N., Discussion of J.M. Bell, Dimensionless Parameters for Homogeneous Earth Slopes, Journal of Soil Mechanics and Foundation Design, No. SM6, November 1967.

SLOPE STABILITY ANALYSIS

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ASSUMED CONDITIONS :

SLOPE HEIGHT	H =	Infinite
DEPTH OF SATURATION	Z =	3 feet
SLOPE INCLINATION	2 : 1	(Horizontal : Vertical)
SLOPE ANGLE	i =	26.6 degrees
UNIT WEIGHT OF WATER	γ_w =	62.4 pounds per cubic foot
TOTAL UNIT WEIGHT OF SOIL	γ_t =	125 pounds per cubic foot
ANGLE OF INTERNAL FRICTION	ϕ =	28 degrees
APPARENT COHESION	C =	350 pounds per square foot

SLOPE SATURATED TO VERTICAL DEPTH Z BELOW SLOPE FACE

SEEPAGE FORCES PARALLEL TO SLOPE FACE

ANALYSIS :

$$FS = \frac{C + (\gamma_t - \gamma_w)\ Z\ cos^2\ i\ tan\ \phi}{\gamma_t\ Z\ sin\ i\ cos\ i} = 2.9$$

REFERENCES :

1......Haefeli, R. *The Stability of Slopes Acted Upon by Parallel Seepage*, Proc. Second International Conference, SMFE, Rotterdam, 1948, 1, 57-62

2......Skempton, A. W., and F.A. Delory, *Stability of Natural Slopes in London Clay*, Proc. Fourth International Conference, SMFE, London, 1957, 2, 378-81

SURFICIAL SLOPE STABILITY ANALYSIS

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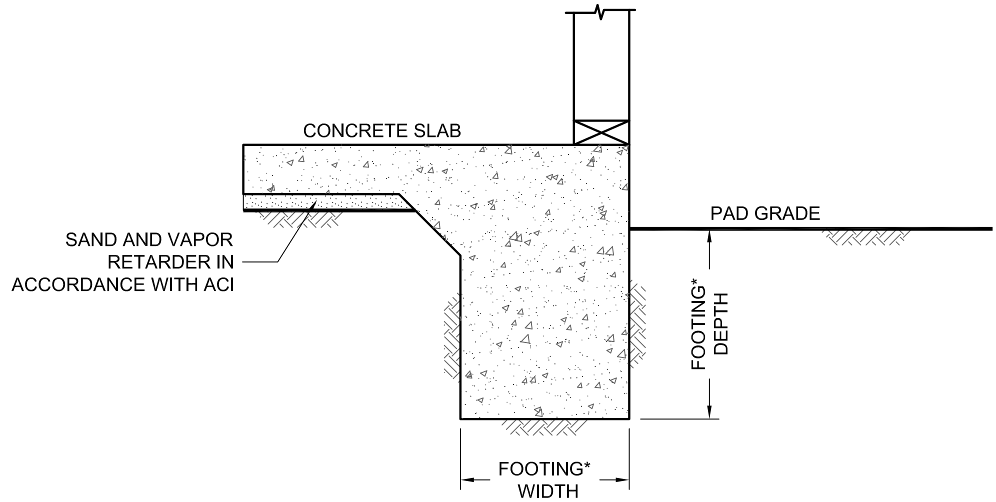
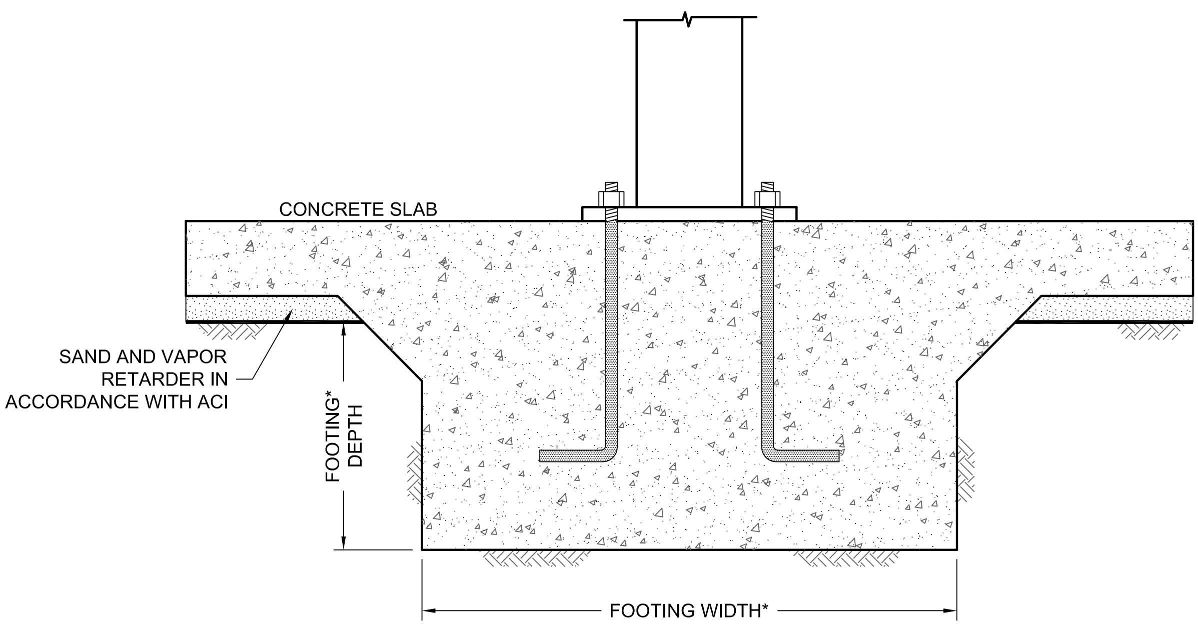
RM / AML		DSK/GTYPD	DATE 02 - 15 - 2017	PROJECT NO. G1996 - 42 - 01	FIG. 7





*....SEE REPORT FOR FOUNDATION WIDTH AND DEPTH RECOMMENDATION

NO SCALE

WALL / COLUMN FOOTING DIMENSION DETAIL

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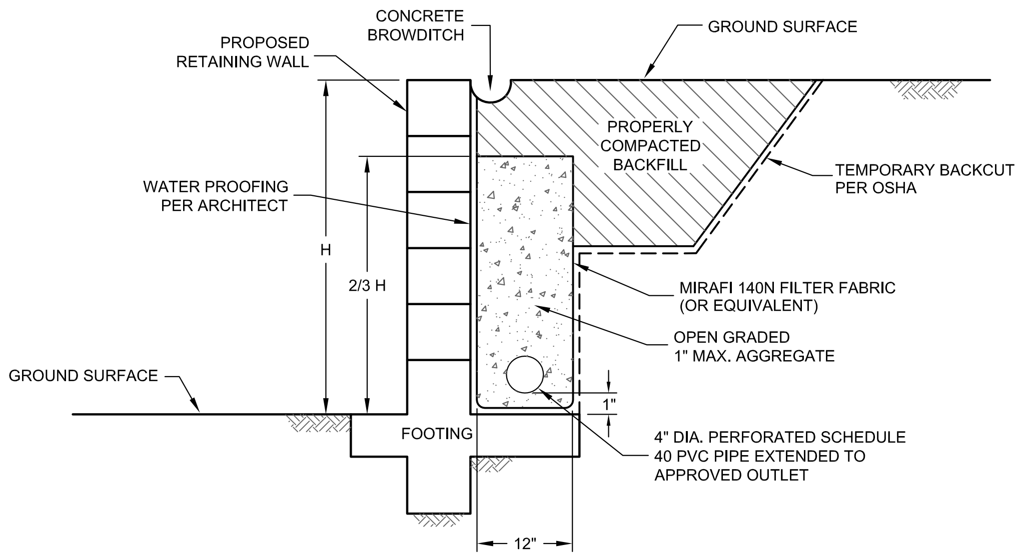
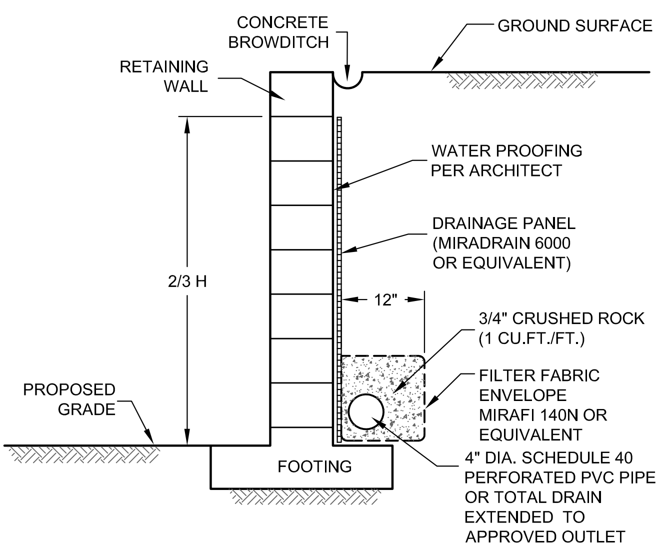
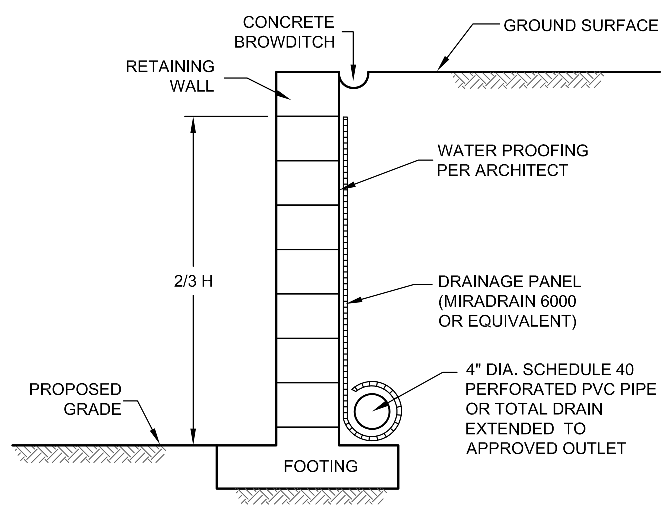
RM / AML		DSK/GTYPD	DATE 02 - 15 - 2017	PROJECT NO. G1996 - 42 - 01	FIG. 8







NOTE :

DRAIN SHOULD BE UNIFORMLY SLOPED TO GRAVITY OUTLET
OR TO A SUMP WHERE WATER CAN BE REMOVED BY PUMPING

NO SCALE

TYPICAL RETAINING WALL DRAIN DETAIL

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APPENDIX A

APPENDIX A

FIELD INVESTIGATION

The field investigation was conducted on February 2, 2017, and consisted of a site reconnaissance and excavating six, shallow exploratory trenches using a rubber-tire backhoe at the approximate locations shown on Figure 2. Bulk soil samples were collected from the trenches.

The soil conditions encountered in the trenches were visually examined, classified, and logged in general accordance with American Society for Testing and Materials (ASTM) practice for Description and Identification of Soils (Visual-Manual Procedure D 2488). Logs of the trenches are presented on Figures A-1 through A-6. The logs depict the soil and geologic conditions encountered and the depth at which samples were obtained.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 1 ELEV. (MSL.) 315' DATE COMPLETED 02-02-2017 EQUIPMENT RUBBER TIRE BACKHOE BY: G. CANNON	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**FILL** Loose, wet to saturated, brown, Clayey, medium SAND			
2	B1-1			SP-SC	**MISSION VALLEY FORMATION** Very dense, moist, light brown, medium SAND; trace clay			
					TRENCH TERMINATED AT 3 FEET Groundwater not encountered			

Figure A-1,
Log of Trench T 1, Page 1 of 1

G1996-42-01.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: 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.

GEOCON

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 2 ELEV. (MSL.) 314' DATE COMPLETED 02-02-2017 EQUIPMENT RUBBER TIRE BACKHOE BY: G. CANNON	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**FILL** Loose, wet-saturated, olive, Clayey, fine SAND; trace gravel, roots			
2	T2-1			SC	**TOPSOIL** Dense, wet to saturated, red brown, Clayey, medium SAND; plastic clay			
4					**MISSION VALLEY FORMATION** Dense to very dense, moist to wet, olive and red brown mottled, Clayey, medium SAND; weathered sandstone			
				SC	Very dense, moist, light brown, Clayey, medium SAND; slightly weathered sandstone			
6					TRENCH TERMINATED AT 6 FEET Groundwater not encountered			

Figure A-2,
Log of Trench T 2, Page 1 of 1

G1996-42-01.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: 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.

GEOCON

PROJECT NO. G1996-42-01

TRENCH T 3

ELEV. (MSL.) **314'** DATE COMPLETED **02-02-2017**

EQUIPMENT **RUBBER TIRE BACKHOE** BY: **G. CANNON**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC	**FILL** Loose, saturated, olive and dark brown, Clayey SAND			
2	T3-1			CL	**TOPSOIL** Soft to firm, saturated, light red brown to olive brown, fine Sandy CLAY; highly plastic			
				CL	Firm, wet to saturated, olive with rust mottling, fine Sandy CLAY; blocky texture			
4	T3-2			SC	**MISSION VALLEY FORMATION** Dense, moist to wet, medium red brown, Clayey, fine SAND; indistinctly laminated			
				CL	Very stiff, moist to wet, light olive, Silty CLAY; blocky, trace gravel			

TRENCH TERMINATED AT 5.5 FEET
Groundwater not encountered

Figure A-3,
Log of Trench T 3, Page 1 of 1

G1996-42-01.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: 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.

GEOCON

TRENCH T 4

ELEV. (MSL.) **311'** DATE COMPLETED **02-02-2017**

EQUIPMENT **RUBBER TIRE BACKHOE** BY: **G. CANNON**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**FILL** Very soft, saturated, light brown, Sandy CLAY			
2				CL	**MISSION VALLEY FORMATION** Soft, saturated, light brown with light red brown, CLAY; horizontal laminated bedding			
	T4-1			CL	Firm, wet to saturated, medium gray, CLAY; horizontal, laminated bedding			
4				CL	Stiff to very stiff, wet, light red brown, Sandy CLAY; interbedded with light olive clay; distinct, horizontal laminated bedding especially in the light olive beds			

TRENCH TERMINATED AT 5 FEET
Groundwater not encountered

Figure A-4,
Log of Trench T 4, Page 1 of 1

G1996-42-01.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: 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.

GEOCON

PROJECT NO. G1996-42-01

TRENCH T 5

ELEV. (MSL.) **286'** DATE COMPLETED **02-02-2017**

EQUIPMENT **RUBBER TIRE BACKHOE** BY: **G. CANNON**

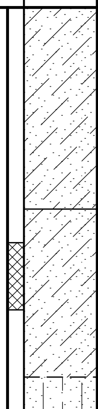
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC	**FILL** Loose, wet to saturated, brown, Clayey, medium SAND			
2								
4	T5-1			SC	**MISSION VALLEY FORMATION** Very dense, moist to wet, light olive, Clayey, fine SAND; interbedded with red brown, clayey sand			
6				SM-SC	Very dense, moist, light olive, Silty, medium SAND			
					TRENCH TERMINATED AT 6 FEET Groundwater not encountered			

Figure A-5,
Log of Trench T 5, Page 1 of 1

G1996-42-01.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: 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.

GEOCON

TRENCH T 6

ELEV. (MSL.) **284'** DATE COMPLETED **02-02-2017**

EQUIPMENT **RUBBER TIRE BACKHOE** BY: **G. CANNON**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	T5-1			SC	**FILL** Loose to medium dense, wet, dark brown, Clayey SAND			
4				SC	**TOPSOIL** Medium dense, moist to wet, Clayey SAND			
6				SC	**MISSION VALLEY FORMATION** Dense, moist to wet, light olive and light red brown, Clayey, medium SAND			
8					TRENCH TERMINATED AT 8 FEET Groundwater not encountered			

Figure A-6,
Log of Trench T 6, Page 1 of 1

G1996-42-01.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: 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 the current, generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. We tested selected samples for maximum dry density and optimum moisture content, expansion index, water-soluble sulfate exposure, and direct shear. The results of our laboratory tests are presented on Tables B-I through B-IV.

TABLE B-I
SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS
ASTM D 1557

Sample No.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
T3-2	Silty, fine to medium SAND	118.2	13.6
T6-1	Fine to medium Sandy SILT	129.3	8.8

TABLE B-II
SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
ASTM D 4829

Sample No.	Moisture Content (%)		Dry Density (pcf)	Expansion Index	Expansion Classification
	Before Test	After Test			
T1-1	10.2	16.6	110.5	1	Very Low
T2-1	10.2	20.5	110.6	57	Medium
T3-2	11.9	28.2	101.0	77	Medium
T6-1	8.6	16.9	114.3	15	Low

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

Sample No.	Water-Soluble Sulfate (%)	Classification
T1-1	0.018	Not Applicable, S0
T3-2	0.057	Not Applicable, S0
T6-1	0.008	Not Applicable, S0

TABLE B-IV
SUMMARY OF LABORATORY DIRECT SHEAR TEST RESULTS
ASTM D 3080

Sample No.	Dry Density (pcf)	Moisture Content (%)		Unit Cohesion (psf)	Angle of Shear Resistance (degrees)
		Initial	Final		
T3-2	106.5	13.2	21.9	280	30
T6-1	11635	9.2	15.3	420	27

APPENDIX C

APPENDIX C

STORM WATER MANAGEMENT

We understand a proposed BMP basin is planned at the eastern end of the site. If not properly constructed, there is a potential for 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.

Underground utilities should not be placed across infiltration systems. Where this condition cannot be avoided, the ingress and egress portions of utility trench crossing the infiltration systems should be provided with cut-off walls to prevent water from entering the utility trenches and impacting down gradient improvements.

Hydrologic Soil Group

The United States Department of Agriculture (USDA), Natural Resources Conservation Services, provides general information regarding soil conditions for areas within the United States. The USDA website also provides the Hydrologic Soil Group. Table C-1 presents the descriptions of the hydrologic soil groups.

TABLE C-1
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 property is underlain by undocumented fill anhd native formational soils of the Mission Valley Formation. Based on the USDA website, the subject site falls within Hydraulic Soil Group D, which has a very slow infiltration rating. Table C-2 presents the information from the USDA website for the property.

TABLE C-2
USDA WEB SOIL SURVEY – HYDROLOGIC SOIL GROUP

Map Unit Name	Map Unit Symbol	Approximate Percentage of Property	Hydrologic Soil Group
Huerhuero loam, 5 to 9 percent slopes, eroded	HrC2	47	D
Terrace escarpments	TeF	53	n/a

We performed 4 saturated hydraulic conductivity tests at depths of approximately 1.5 to 2 feet below the ground surface using a SoilMoisture Inc. Aardvark Downhole Permeameter at the locations shown on Figure 2. The test holes were hand augured to construct a 4-inch diameter test hole. Table C-3 presents the results of the saturated hydraulic conductivity testing. The test data sheets are attached. We used the guidelines presented in the Riverside County Low Impact Development BMP Design Handbook which references the United States Bureau of Reclamation Well Permeameter Test Method (USBR 7300-89). Based on this widely accepted guideline, the saturated hydraulic conductivity (Ksat) is equal to the infiltration rate. Therefore, the Ksat value determined from the Aardvark Permeameter test is the unfactored infiltration rate. The Ksat (infiltration rate) equation provided in the Riverside County Handbook was used to compute the unfactored infiltration rate.

TABLE C-3
UNFACTORED FIELD SATURATED HYDRAULIC CONDUCTIVITY TEST RESULTS USING THE SOILMOISTURE AARDVARK PERMEAMETER

Location	Depth (inches)	Geologic Unit	Fines-Content[1] [Clay Content[2]] (%)	Field Infiltration Rate (inches/hour)
A1	18	Mission Valley Formation	36	0.09
A2	21	Mission Valley Formation	20	0.17
A3	24	Mission Valley Formation	36	0.09
A4	24	Mission Valley Formation	--	0.004

[1] Percent finer than the #200 Sieve.
[2] Percent finer than the 0.002 mm

All of the infiltration tests were performed in the Mission Valley Formation. Although the tests were not performed at the new location of the proposed basin, we opine that the rates indicated from the testing are representative of the Mission Valley Formation and the soil conditions underlying the proposed basin. The average rate from the 4 tests is 0.09 inches/hour.

STORM WATER MANAGEMENT CONCLUSIONS

Soil Types

Mission Valley Formation – The surficial soils on the property are underlain by the Mission Valley Formation. Based on our experience in the area, the Mission Valley Formation is highly variable due to the sedimentary nature of the materials and consists of sandstone and siltstone with occasional sand/gravel conglomerate with cobbles. The formational materials are also cemented and often have concretions that reduces the ability for infiltration. The Mission Valley Formation has a greater propensity for lateral water migration over vertical water migration. Based on the percolation testing on other projects in the Mission Valley Formation, infiltration rates within the Mission Valley Formation are typically very low.

Infiltration Rates

The results of the testing show infiltration rates ranging from approximately 0.004 to 0.17 inches per hour. The rates are not high enough to support full infiltration. Using a factor of safety of 2 for feasibility determination, three of the four tests fall below a rate of 0.05 in/hr. The average rate is 0.09 in/hr, therefore, partial infiltration is also considered infeasible.

Existing Improvements

Existing single family residences border the north and south sides of the property. The natural ground slopes from south to north. Infiltration into the natural soils could result in daylight seepage impacting the down gradient residences to the north. Due to the variable soil conditions and the high potential for lateral water movement, infiltration along the north side of the property is not recommended.

Groundwater

Based on our experience in the area, groundwater is expected to be greater than 50 feet below the existing ground surface on within the area proposed for residential lots.

Existing and New Utilities

There are no known utilities on the property that could be impacted by infiltration. With respect to new utilities that will be constructed for the proposed subdivision, infiltrating near proposed new utilities is not recommended.

Soil or Groundwater Contamination

We are unaware of contaminated soil or groundwater on the property. Therefore, infiltration associated with this risk is considered feasible.

Slopes

Gentle to moderate slopes are present along the perimeter of the property. The slopes along the north and west sides of the property are graded descending slopes that are expected to have heights from 10 feet to 40 feet. Slopes on the south side of the property are gentle slopes that are less than 10 feet tall. The eastern slope is a natural hillside slope extending into open space.

Due to the low infiltration rates and the high potential for lateral water migration, infiltrating into the natural soils is considered infeasible along the north side of the site due to the potential for water migration into the neighboring properties.

The preliminary gradng plan shows the construction of 50-foot-high fill slope on the east side of the property. Infiltrating into compacted fill can cause saturation of the fill.

The proposed BMP basin is located at the toe of the fill slope. It is our opinion that infiltration into the native slopes at the proposed BMP location will not impact the stability of the adjacent proposed fill slope.

Storm Water Management Devices

Liners and subdrains are recommended in 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.

Storm Water Standard Worksheets

The SWS requests the geotechnical engineer complete the *Categorization of Infiltration Feasibility Condition* (Worksheet C.4-1 or I-8) worksheet information to help evaluate the potential for infiltration on the property. The attached Worksheet C.4-1 presents the completed information for the submittal process.

The regional storm water standards also have a worksheet (Worksheet D.5-1 or Form I-9) that helps the project civil engineer estimate the factor of safety based on several factors. Table C-4 describes the suitability assessment input parameters related to the geotechnical engineering aspects for the factor of safety determination.

TABLE C-4
SUITABILITY ASSESSMENT RELATED CONSIDERATIONS FOR INFILTRATION FACILITY SAFETY FACTORS

Consideration	High Concern – 3 Points	Medium Concern – 2 Points	Low Concern – 1 Point
Assessment Methods	Use of soil survey maps or simple texture analysis to estimate short-term infiltration rates. Use of well permeameter or borehole methods without accompanying continuous boring log. Relatively sparse testing with direct infiltration methods	Use of well permeameter or borehole methods with accompanying continuous boring log. Direct measurement of infiltration area with localized infiltration measurement methods (e.g., infiltrometer). Moderate spatial resolution	Direct measurement with localized (i.e. small-scale) infiltration testing methods at relatively high resolution or use of extensive test pit infiltration measurement methods.
Predominant Soil Texture	Silty and clayey soils with significant fines	Loamy soils	Granular to slightly loamy soils
Site Soil Variability	Highly variable soils indicated from site assessment or unknown variability	Soil boring/test pits indicate moderately homogenous soils	Soil boring/test pits indicate relatively homogenous soils
Depth to Groundwater/ Impervious Layer	<5 feet below facility bottom	5-15 feet below facility bottom	>15 feet below facility bottom

Table C-5 presents the estimated factor values for the evaluation of the factor of safety. The factor of safety is determined using the information contained in Table C-4. Table C-5 only presents the suitability assessment safety factor (Part A) of the worksheet. The project civil engineer should evaluate the safety factor for design (Part B of Worksheet D.5-1) and use the combined safety factor for the design infiltration rate.

TABLE C-5
FACTOR OF SAFETY WORKSHEET D.5-1 DESIGN VALUES – PART A[1]

Suitability Assessment Factor Category	Assigned Weight (w)	Factor Value (v)	Product (p = w x v)
Assessment Methods	0.25	3	0.75
Predominant Soil Texture	0.25	2	0.5
Site Soil Variability	0.25	3	0.75
Depth to Groundwater/Impervious Layer	0.25	1	0.25
Suitability Assessment Safety Factor, S_A = □p			2.25

1 The project civil engineer should complete Worksheet D.5-1 or Form I-9 to determine the overall factor of safety.

CONCLUSIONS

Our results indicate the site has highly variable sub-surface conditions and relatively low infiltration characteristics. Because of these site conditions, it is our opinion that there is a high probability for lateral water migration. Considering the presence of nearby existing residences, slopes, and the proposed development, it is our opinion that full and partial infiltration is infeasible on this site. Our evaluation included the soil and geologic conditions, estimated settlement and volume change of the underlying soil, slope stability, utility considerations, groundwater mounding, retaining walls, foundations and existing groundwater elevations. Liners and subdrains should be installed within BMP areas. If water is allowed to infiltrate the soil, water could migrate away from the property into the adjacent apartment complex soils and supporting fill slopes and cause settlement and distress to existing and proposed improvements and structures.

Categorization of Infiltration Feasibility Condition			Worksheet C.4-1
Part 1 - Full Infiltration Feasibility Screening Criteria **Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?**			
Criteria	Screening Question	Yes	No
1	**Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X
Provide basis: We performed 4 infiltration tests in the Mission Valley formation. The results of the infiltration tests show rates ranging from 0.004 to 0.17 inches per hour. This shows the soil has very slow infiltration characteristics. Full infiltration is considered infeasible.			
2	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	X	
Provide basis: Infiltration greater than 0.5 inches per hour can be allowed without increasing the risk of geotechnical hazards at the location of the proposed BMP basin show on Figure 2 of Geocon's February 15, 2017 report.			

<table>
<tr><th colspan="4">Worksheet C.4-1 Page 2 of 4</th></tr>
<tr><th>Criteria</th><th>Screening Question</th><th>Yes</th><th>No</th></tr>
<tr><td>3</td><td>Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:

Groundwater is assumed to be in excess of 50 feet below the proposed basin locations.</td></tr>
<tr><td>4</td><td>Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:

Infiltration is not anticipated to have a negative impact on nearby water balance or discharge of contaminated groundwater to surface waters.</td></tr>
<tr><td>Part 1 Result*</td><td colspan="2">If all answers to rows 1 - 4 are "Yes" a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration

If any answer from row 1-4 is "No", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2</td><td>Full Infiltration not Feasible</td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City to substantiate findings.

Worksheet C.4-1 Page 3 of 4			
Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria **Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?**			
Criteria	Screening Question	**Yes**	**No**
5	**Do soil and geologic conditions allow for infiltration in any appreciable rate or volume?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X
Provide basis: The unfactored infiltration rates from the testing are: A1: 0.09 in/hr (0.045 using a factor of safety of 2.0 for feasibility determination) A2: 0.17 in/hr (0.09 using a factor of safety of 2.0 for feasibility determination) A3: 0.09 in/hr (0.045 using a factor of safety of 2.0 for feasibility determination) A4: 0.004 in/hr (0.002 using a factor of safety of 2.0 for feasibility determination) The average rate is 0.085 in/hr. This value is less than 0.1 inches. The rate using a factor of safety of 2 is less than 0.05 in/hr. Therefore, partial infiltration is considered infeasible.			
6	**Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level**? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	X	
Provide basis: At the proposed basin location shown on Figure 2 of Geocon's February 15, 2017 report, infiltration of an appreciable quantity is not expected to increase the risk of geotechnical hazards.			

Worksheet C.4-1 Page 4 of 4			
Criteria	Screening Question	Yes	No
7	**Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: Groundwater is assumed to be in excess of 50 feet below the proposed basin locations. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
8	**Can infiltration be allowed without violating downstream water rights**? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: Infiltration is not anticipated to have a negative impact on nearby water balance or discharge of contaminated groundwater to surface waters. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative			
Part 2 Result*	If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is **Partial Infiltration.** If any answer from row 5-8 is no, then infiltration of any volume is considered to be **infeasible** within the drainage area. The feasibility screening category is **No Infiltration.**	No Infiltration	

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City to substantiate findings.

G1996-42-01
Lighthouse Way
6/14/2016
JTL

A1

Dia_{hole}	4	inches
$Depth_{hole}$	18	inches
$Depth_{inst}$	18	inches
Ht_{res}	30	inches
$Depth_{valve}$	10.75	inches

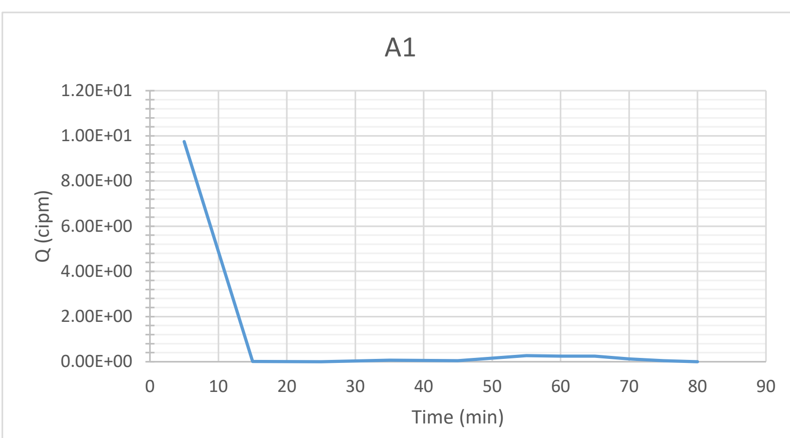
Wt_0 23.6676 lbs

D = 40.75 inches
h = 3.64 inches

t (min)	Δt (min)	Wt (lbs)	ΔWt (lbs)	Δvol (ft^3)	Δvol (in^3)	Q (cipm)
5	5	21.91	1.76	2.82E-02	4.87E+01	9.75E+00
15	10	21.90	0.00	7.05E-05	1.22E-01	1.22E-02
25	10	21.90	0.00	0.00E+00	0.00E+00	0.00E+00
35	10	21.88	0.03	4.23E-04	7.31E-01	7.31E-02
45	10	21.86	0.02	2.82E-04	4.87E-01	4.87E-02
55	10	21.76	0.10	1.55E-03	2.68E+00	2.68E-01
60	5	21.72	0.04	7.05E-04	1.22E+00	2.44E-01
65	5	21.67	0.04	7.05E-04	1.22E+00	2.44E-01
70	5	21.65	0.02	3.53E-04	6.09E-01	1.22E-01
75	5	21.64	0.01	1.41E-04	2.44E-01	4.87E-02
80	5	21.64	0.00	0.00E+00	0.00E+00	0.00E+00
85	5	21.64	0.00	0.00E+00	0.00E+00	0.00E+00

Q (cipm)	h/r	$(h/r)^2$	$((h/r)^2+1)^{0.5}$
1.57E-01	1.82E+00	3.31E+00	2.08E+00

K_f	8.68E-02 **iph**



G1996-42-01
Lighthouse Way
6/14/2016
JL

A2

Dia_{hole}	4	inches
$Depth_{hole}$	21	inches
$Depth_{inst}$	19	inches
Ht_{res}	25.8	inches
$Depth_{valve}$	11.75	inches

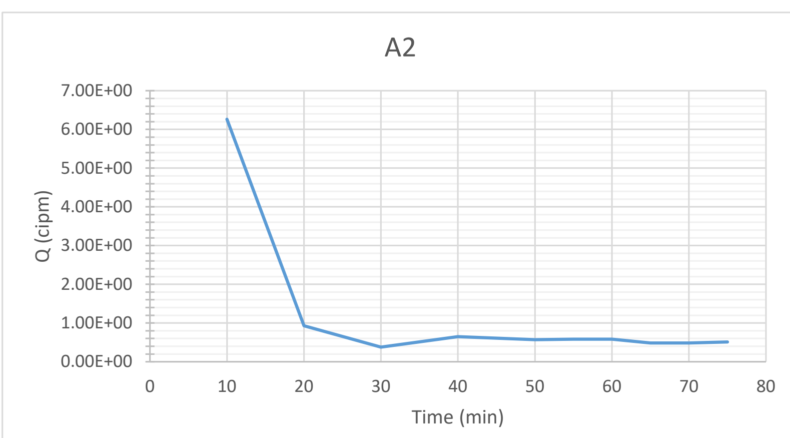
Wt_0 19.8396 lbs

D = 37.55 inches
h = 5.63 inches

t (min)	Δt (min)	Wt (lbs)	ΔWt (lbs)	Δvol (ft^3)	Δvol (in^3)	Q (cipm)
10	10	17.58	2.26	3.62E-02	6.26E+01	6.26E+00
20	10	17.24	0.33	5.36E-03	9.26E+00	9.26E-01
30	10	17.11	0.14	2.19E-03	3.78E+00	3.78E-01
40	10	16.87	0.23	3.74E-03	6.46E+00	6.46E-01
50	10	16.67	0.21	3.31E-03	5.73E+00	5.73E-01
55	5	16.56	0.11	1.69E-03	2.92E+00	5.85E-01
60	5	16.46	0.11	1.69E-03	2.92E+00	5.85E-01
65	5	16.37	0.09	1.41E-03	2.44E+00	4.87E-01
70	5	16.28	0.09	1.41E-03	2.44E+00	4.87E-01
75	5	16.19	0.09	1.48E-03	2.56E+00	5.12E-01

Q (cipm)	h/r	$(h/r)^2$	$((h/r)^2+1)^{0.5}$
5.29E-01	2.82E+00	7.92E+00	2.99E+00

K_f	1.68E-01 **iph**



G1996-42-01
Lighthouse Way
6/14/2016
JTL

A3

Dia_{hole}	4	inches
$Depth_{hole}$	24	inches
$Depth_{inst}$	22.5	inches
Ht_{res}	30	inches
$Depth_{valve}$	15.25	inches

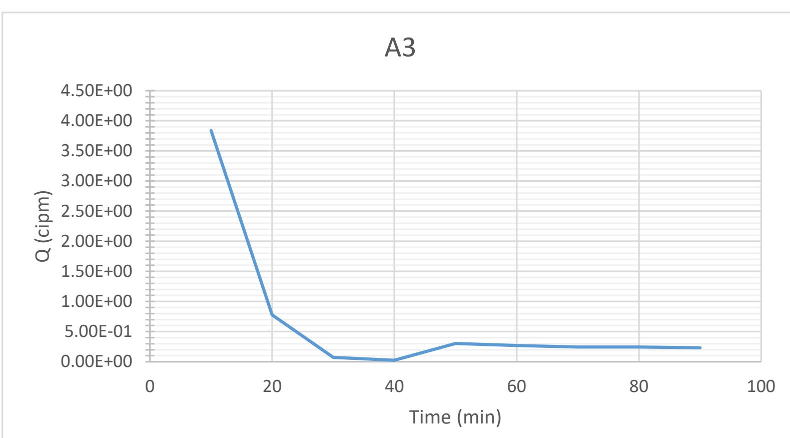
Wt_0	18.1896	lbs

D = 45.25 inches
h = 5.15 inches

t (min)	Δt (min)	Wt (lbs)	ΔWt (lbs)	Δvol (ft^3)	Δvol (in^3)	Q (cipm)
10	10	16.80	1.39	2.22E-02	3.84E+01	3.84E+00
20	10	16.52	0.28	4.51E-03	7.80E+00	7.80E-01
30	10	16.50	0.03	4.23E-04	7.31E-01	7.31E-02
40	10	16.49	0.01	1.41E-04	2.44E-01	2.44E-02
50	10	16.38	0.11	1.76E-03	3.05E+00	3.05E-01
60	10	16.28	0.10	1.55E-03	2.68E+00	2.68E-01
70	10	16.19	0.09	1.41E-03	2.44E+00	2.44E-01
80	10	16.10	0.09	1.41E-03	2.44E+00	2.44E-01
90	10	16.02	0.08	1.34E-03	2.32E+00	2.32E-01

Q (cipm)	h/r	$(h/r)^2$	$((h/r)^2+1)^{0.5}$
2.46E-01	2.58E+00	6.63E+00	2.76E+00

K_f	8.79E-02 **iph**



G1996-42-01
Lighthouse Way
6/14/2016
JTL

A4

Dia_{hole}	4	inches
$Depth_{hole}$	24	inches
$Depth_{inst}$	22	inches
Ht_{res}	30	inches
$Depth_{valve}$	14.75	inches

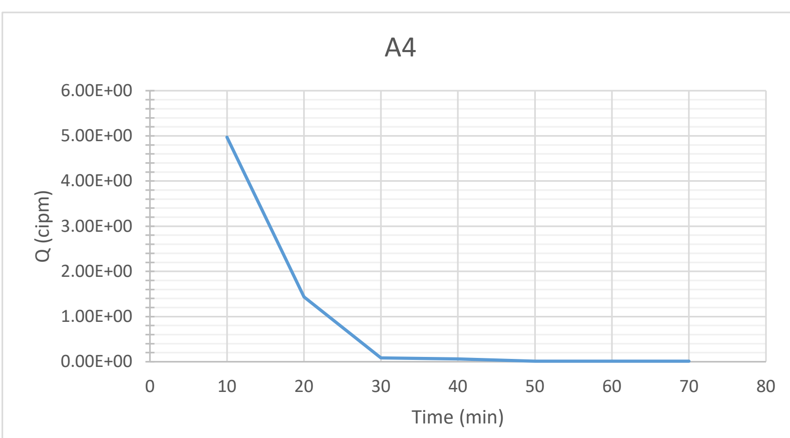
Wt_0	20.8208	lbs

D =	44.75	inches
h =	5.65	inches

t (min)	Δt (min)	Wt (lbs)	ΔWt (lbs)	Δvol (ft^3)	Δvol (in^3)	Q (cipm)
10	10	19.03	1.80	2.88E-02	4.97E+01	4.97E+00
20	10	18.51	0.52	8.32E-03	1.44E+01	1.44E+00
30	10	18.48	0.03	4.94E-04	8.53E-01	8.53E-02
40	10	18.45	0.02	3.53E-04	6.09E-01	6.09E-02
50	10	18.45	0.00	7.05E-05	1.22E-01	1.22E-02
60	10	18.44	0.00	7.05E-05	1.22E-01	1.22E-02
70	10	18.44	0.00	7.05E-05	1.22E-01	1.22E-02

Q (cipm)	h/r	$(h/r)^2$	$((h/r)^2+1)^{0.5}$
1.22E-02	2.83E+00	7.98E+00	3.00E+00

K_f	3.84E-03 **iph**



APPENDIX D

APPENDIX D

RECOMMENDED GRADING SPECIFICATIONS

FOR

LIGHTHOUSE RIDGE
LIGHTHOUSE WAY
SAN DIEGO, CALIFORNIA

PROJECT NO. G1996-42-01

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 ¾ 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 ¾ 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

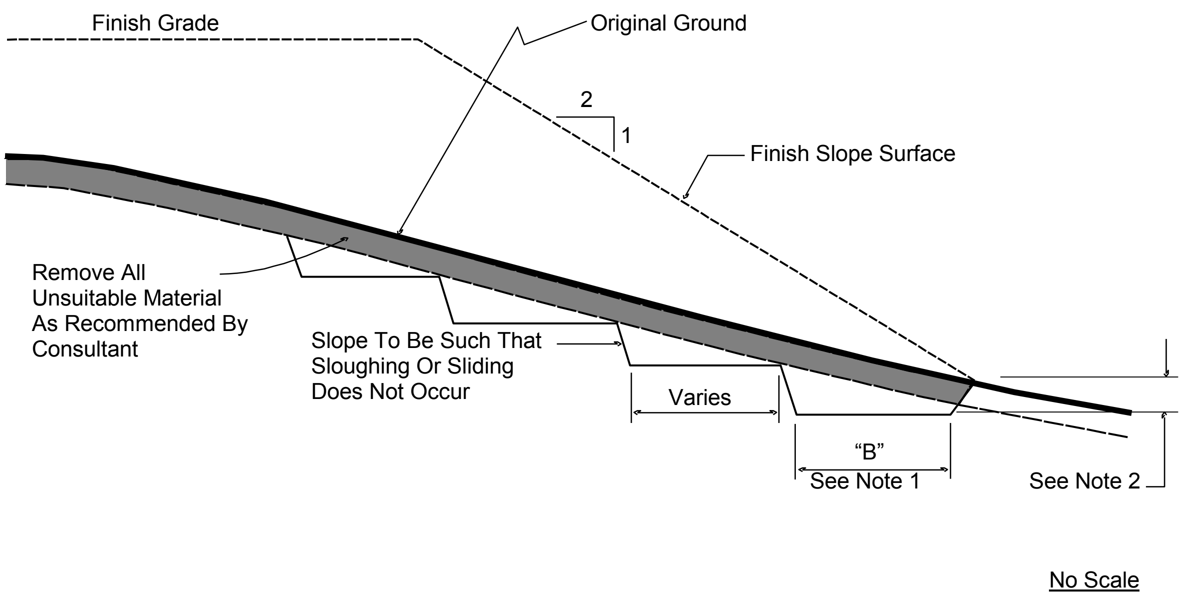
4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material 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.

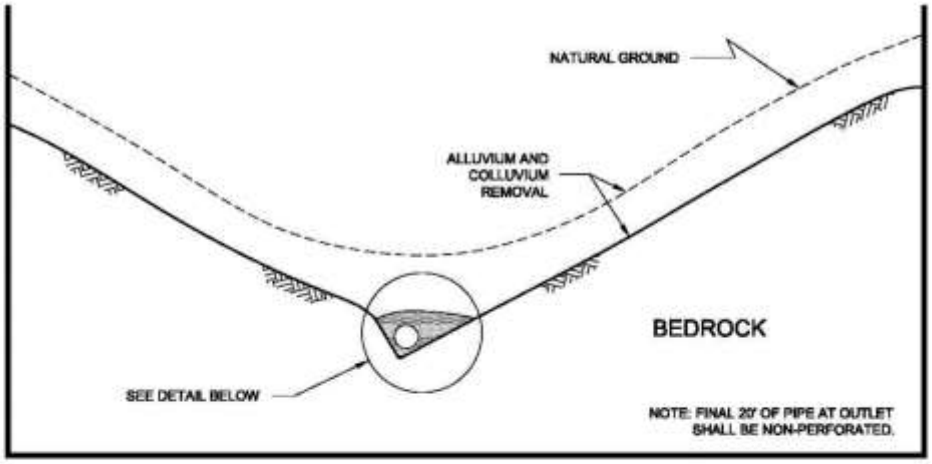
6.3.6 To reduce the potential for “piping” of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant 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.

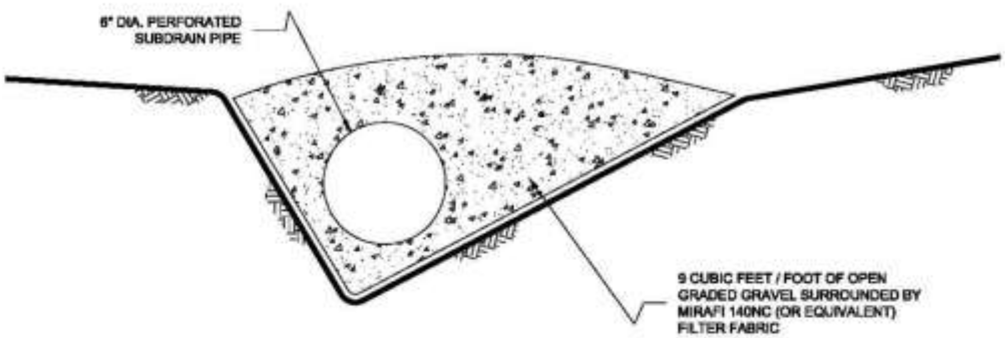
6.3.7 *Rock* fill placement should be continuously observed during placement by the Consultant.

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:

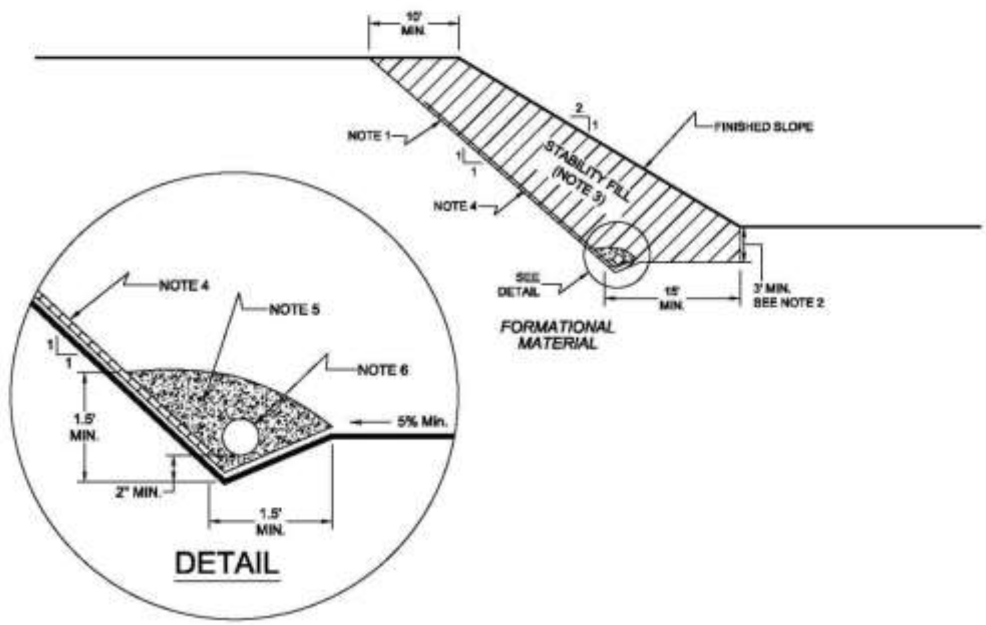
1......6-INCH DIAMETER, SCHEDULE 80 PVC PERFORATED PIPE FOR FILLS IN EXCESS OF 100-FEET IN DEPTH OR A PIPE LENGTH OF LONGER THAN 500 FEET.

2......6-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 lager) 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

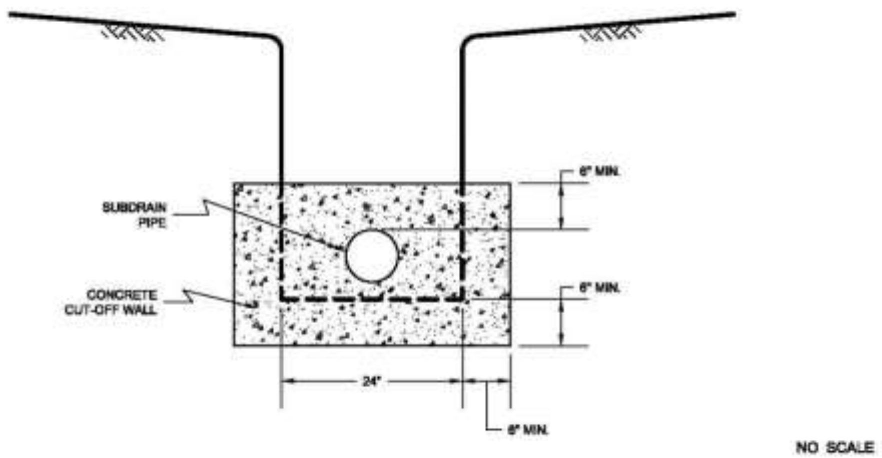
7.3 The actual subdrain locations will be evaluated in the field during the remedial grading operations. Additional drains may be necessary depending on the conditions observed and the requirements of the local regulatory agencies. Appropriate subdrain outlets should be evaluated prior to finalizing 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.

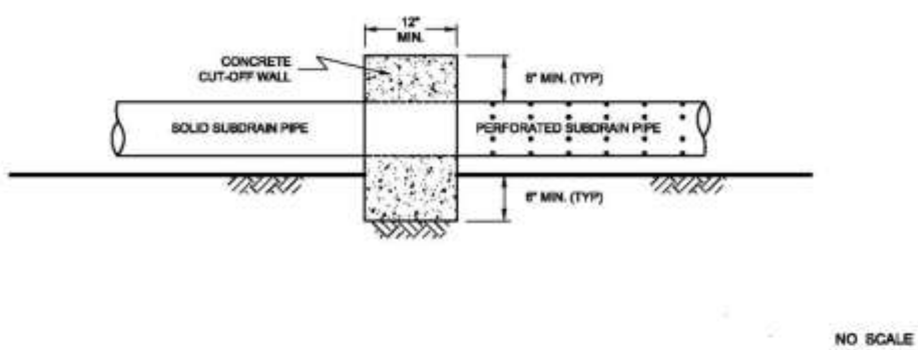
7.5 Prior to outletting, the final 20-foot segment of a subdrain that will not be extended during future development should consist of non-perforated drainpipe. At the non-perforated/ perforated interface, a seepage cutoff wall should be constructed on the downslope side of the pipe.

TYPICAL CUT OFF WALL DETAIL

FRONT VIEW

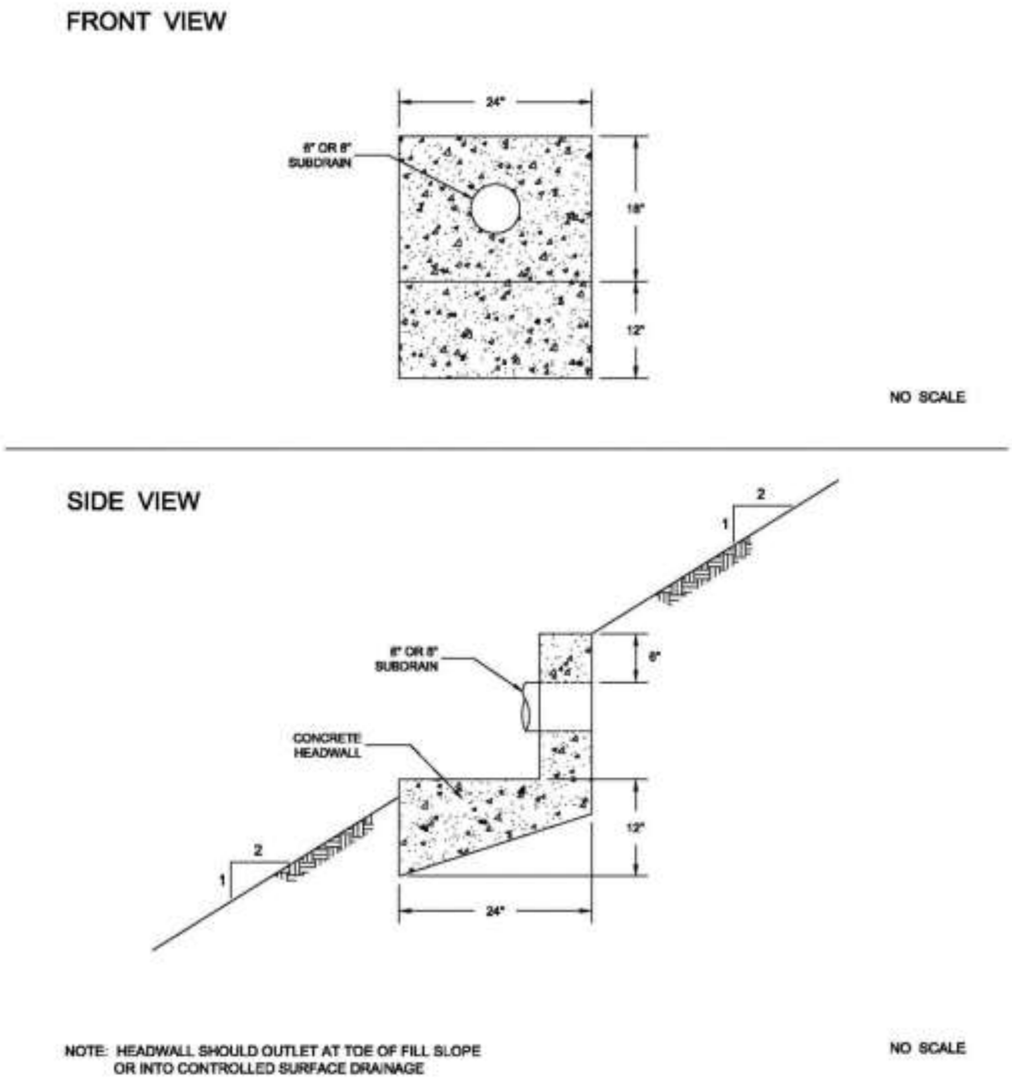


SIDE VIEW



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



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

City of San Diego (2008), *Seismic Safety Study, Geologic Hazards and Faults*, Grid Tiles 42 & 38, City of San Diego Development Services Department;

Risk Engineering (2011), *EZ-FRISK (version 7.62)*, software package used to perform site-specific earthquake hazard analyses. Accessed February 14, 2017;

Kennedy, M. P., and Tan, S. S. (2008), *Geologic Map of the San Diego 30'x60' Quadrangle, California*, California Geological Survey, 1:100,000 Scale;

USGS (2014), *U.S. Seismic Design Maps Web Application (version 3.1.0)*, http://earthquake.usgs.gov/designmaps/us/application.php. Accessed February 8, 2017;

USGS (2016), *Quaternary Fault and Fold Database of the United States:* U.S. Geological Survey website, http://earthquakes,usgs.gov/hazards/qfaults, accessed February 14, 2017.

GEOTECHNICAL INVESTIGATION

LIGHTHOUSE RIDGE
LIGHTHOUSE WAY
SAN DIEGO, CALIFORNIA

GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

PACIFIC LEGACY HOMES
SAN DIEGO, CALIFORNIA

FEBRUARY 15, 2017
PROJECT NO. G1996-42-01

GEOCON
INCORPORATED

GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. G1996-42-01
February 15, 2017

Pacific Legacy Homes
16870 West Bernardo Drive
San Diego, California 92127

Attention: Mr. Michael Graham

Subject: GEOTECHNICAL INVESTIGATION
LIGHTHOUSE RIDGE
LIGHTHOUSE WAY
SAN DIEGO, CALIFORNIA

Dear Mr. Graham:

In accordance with your authorization, we herein submit the results of our geotechnical investigation for the subject project. We performed our investigation to evaluate the underlying soil and geologic conditions and potential geologic hazards and to assist in the design of the proposed project. We also conducted infiltration testing at several locations. The accompanying report presents the results of our study and conclusions and recommendations pertaining to the geotechnical aspects of the proposed project. The site is considered suitable for the proposed project provided the recommendations of 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

Garry W. Cannon
CEG 2201
RCE 56468

Rodney C. Mikesell
GE 2533

GWC:RCM:dmc

(1) Addressee
(3/del) Lattitude 33
Attention: Melissa Krause

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GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the results of our geotechnical investigation for the proposed residential subdivision to be located at northern terminus of Lighthouse Way in San Diego, California (see Vicinity Map, Figure 1). The purpose of this geotechnical investigation is to evaluate the surface and subsurface soil conditions, general site geology, and to identify geotechnical constraints that may impact the planned improvements to the property. In addition, this report provides 2016 CBC seismic design criteria and recommendations for: grading, foundation design; concrete slab-on-grade and flatwork; retaining wall, lateral loading; storm water infiltration; and a discussion regarding the local geologic hazards including faulting and seismic shaking.

This report is limited to the area shown on the Geologic Map, Figure 2.

The scope of this investigation included: a review of readily available published and unpublished geologic literature (see List of References); excavating six exploratory trenches to a maximum depth of about 8 feet below ground surface; soil sampling; laboratory testing; engineering analyses; and preparation of this report. Appendix A presents the exploratory-trench logs and details of the field investigation. Appendix B presents details of the laboratory tests and a summary of the test results.

2. SITE AND PROJECT DESCRIPTION

The approximately 3-acre site is located at the northern terminus of Lighthouse Way, San Diego, California. The site may have been previously graded and is currently vacant. The site is bound on the north and south by residential neighborhoods; on the west by an approximately 35-foot-high slope descending to Winstanley Way; and on the east by open space.

The site is covered with vegetation. There are some debris piles from previous site use. A sound wall has alos been constructed on the property.

We have reviewed the preliminary grading plan and conceptual sute plan. We understand that the project will consist of grading the site to receive 10, residential, building lots. The plan also shows the construction of a cul-de-sac driveway, an approximately 50-foot-high fill slope, a storm water detension basin at the toe of the eastern fill slope, and retaining walls.

The above locations, site descriptions, and proposed development is based on a site reconnaissance, review of published geologic literature, our field investigations, and discussions with you. If development plans differ from those described herein, Geocon Incorporated should be contacted for review of the plans and possible revisions to this report.

3. GENERAL GEOLOGY AND GEOLOGIC SETTING

The San Diego area is located in the Coastal Plain sub-province of the Peninsular Ranges Physiographic Provence. In San Diego County, the coastal plain runs parallel to the coast flanking the Peninsular Range and is characterized by a broad wedge of Tertiary sedimentary deposits that thicken from east to west capped by Pleistocene and Quaternary marine terrace deposits.

Kennedy and Tan (2008) has mapped the site vicinity as Tertiary-age Mission Valley Formation.

4. SOIL AND GEOLOGIC CONDITIONS

Based on our field investigation, the site is underlain by limited areas of undocumented fill and topsoil over the Mission Valley Formation. Figure 2 provides a geologic map. Figures 3 through 5 present geologic cross sections. The trench logs, presented in Appendix A, provide a description of the soils encountered during our field investigation. The geologic units are described below.

4.1 Undifferentiated Undocumented Fill and Topsoil (Qudf-ts)

Undifferentiated undocumented fill and topsoil ranging in thickness from 0.5 to 4.5 feet was observed in all six trenches. This unit consisted of: loose to medium dense, wet to saturated, clayey sand and soft to firm, wet to saturated, sandy clay. The undocumented fill and topsoil are not suitable for the support of settlement-sensitive structures or improvements. We recommend that undocumented fill and topsoil be removed and replaced with properly compacted fill. Remedial grading recommendations are provided in the *Grading* section of this report.

4.2 Mission Valley Formation (Tmv)

Tertiary-age Mission Valley Formation was observed in all exploratory trenches. This unit consisted of very dense, moist to wet, clayey sand and firm to very stiff, moist to saturated, clay. The Mission Valley deposits are suitable for the support of settlement-sensitive structures or improvements.

5. GROUNDWATER

We did not encounter groundwater in any borings during the site investigation. We do not expect groundwater or seepage to be encountered during construction of the proposed project; however, it is not uncommon for seepage conditions to exist within the near surface elevations or develop where none previously existed especially at geologic contacts. Seepage is dependent on seasonal precipitation, irrigation, land use, among other factors, and varies as a result. Proper surface drainage will be important to future performance of the project.

6. GEOLOGIC HAZARDS

6.1 Geologic Hazard Category

The City of San Diego (2008) assigns the site and vicinity Geologic Hazard Category 53 – "Level or sloping terrain, unfavorable geologic structure, Low to moderate risk", and Geologic Hazard Category 23 – "Friars: neutral or favorable geologic structure". It is our opinion, at the compleation of grading, that the site will have favorable geologic conditions.

6.2 Seismicity

We performed a deterministic seismic analysis using Risk Engineering (2011). Eight known active faults were located within a search radius of 50 miles from the property. The 2008 USGS fault database, which provides several models and combinations of fault data, was used to evaluate the fault information. Based on this database, the Newport-Inglewood/Rose Canyon Fault Zone, located approximately 5 miles from the site, is the nearest known active fault zone and is the dominant source of potential ground motion. Earthquakes that might occur on the Newport-Inglewood/Rose Canyon Fault Zone or other faults within the southern California and northern Baja California area are potential generators of significant ground motion at the site. The estimated maximum earthquake magnitude and peak ground acceleration for the Newport-Inglewood/Rose Canyon Fault are 7.5 and 0.38g, respectively. The Table 6.2.1 lists the estimated maximum earthquake magnitude and peak ground acceleration for the most dominant faults in relation to the site location. We calculated peak ground acceleration (PGA) using Boore-Atkinson (2008), Campbell-Bozorgnia (2008), and Chiou-Youngs (2008) acceleration-attenuation relationships.

TABLE 6.2.1
DETERMINISTIC SPECTRA SITE PARAMETERS

Fault Name	Distance from Site (miles)	Maximum Earthquake Magnitude (Mw)	Peak Ground Acceleration		
			Boore-Atkinson 2008 (g)	Campbell-Bozorgnia 2008 (g)	Chiou-Youngs 2008 (g)
Newport-Inglewood/Rose Canyon	5	7.5	0.32	0.30	0.38
Rose Canyon	5	6.9	0.27	0.29	0.32
Coronado Bank	19	7.4	0.16	0.12	0.14
Palos Verdes/Coronado Bank	19	7.7	0.18	0.13	0.17
Elsinore	28	7.85	0.15	0.10	0.13
Earthquake Valley	39	6.8	0.07	0.05	0.04
Palos Verde	46	7.3	0.07	0.06	0.06
San Joaquin Hills	50	7.1	0.06	0.06	0.05

In the event of a major earthquake on the referenced faults or other significant faults in the southern California and northern Baja California area, the site could be subjected to moderate to severe ground shaking. With respect to this hazard, the site is considered comparable to others in the general vicinity.

We performed a probabilistic seismic analysis using Risk Engineering (2011). The program operates under the assumption that the occurrence rate of earthquakes on each mapped Quaternary fault is proportional to the faults slip rate. The program estimates earthquake magnitude as a function of fault rupture length. Site acceleration estimates are made using the earthquake magnitude and distance from the site to the rupture zone. The program also accounts for uncertainty in each of following: (1) earthquake magnitude, (2) rupture length for a given magnitude, (3) location of the rupture zone, (4) maximum possible magnitude of a given earthquake, and (5) acceleration at the site from a given earthquake along each fault. By calculating the expected accelerations from considered earthquake sources, the program calculates the total average annual expected number of occurrences of site acceleration greater than a specified value. We utilized acceleration-attenuation relationships suggested by Boore-Atkinson (2008) NGA USGS, Campbell-Bozorgnia (2008) NGA USGS, and Chiou-Youngs (2007) NGA USGS 2008 in the analysis. Table 6.2.2 presents the site-specific probabilistic seismic hazard parameters including acceleration-attenuation relationships and the probability of exceedence.

TABLE 6.2.2
PROBABILISTIC SEISMIC HAZARD PARAMETERS

Probability of Exceedence	Peak Ground Acceleration		
	Boore-Atkinson, 2008 (g)	Campbell-Bozorgnia, 2008 (g)	Chiou-Youngs, 2007 (g)
2% in a 50 Year Period	0.42	0.42	0.48
5% in a 50 Year Period	0.30	0.30	.032
10% in a 50 Year Period	0.22	0.21	0.22

While listing peak accelerations is useful for comparison of potential effects of fault activity in a region, other considerations are important in seismic design, including the frequency and duration of motion and the soil conditions underlying the site. Seismic design of the structures should be evaluated in accordance with the California Building Code (CBC) guidelines currently adopted by the City of San Diego.

6.3 Ground Rupture

Based on our review of USGS (2016) and City of San Diego (2008) there are no active, potentially active, or inactive faults crossing the subject site; therefore, the risk associated with earthquake ground rupture hazard is low.

6.4 Seiches and Tsunamis

The site is located at an elevation greater than 300 feet above mean sea level (MSL) and is not located adjacent to or downstream from any large body of water; therefore, the risk associated with flooding hazard due to tsunami or seiche events is low.

6.5 Liquefaction

The risk associated with liquefaction and seismically induced settlement hazard at the site soil is low due to the lack of permanent, near-surface ground water and the dense nature and age of the underlying deposits.

6.6 Landslides

The risk associated with landslide hazard is low due to the relatively flat topography of the site and vicinity.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 General

7.1.1 From a geotechnical engineering standpoint, it is our opinion that the site is suitable for development of the proposed project provided the recommendations presented herein are implemented in design and construction of the project.

7.1.2 Provided the recommendations of this report are followed, it is our opinion tht the proposed development will not destabilize or result in settlement of adjacent properties or right-of-way.

7.1.3 With the exception of possible moderate to strong seismic shaking no other significant geologic hazards were observed or are known to exist on the site that would adversely affect the proposed project.

7.1.4 Our field investigation indicates the site is generally underlain by undifferentiated undocumented fill/topsoil and Mission Valley Formation.

7.1.5 Surficial soils (undocumented fill and topsoil) are not suitable for the support of settle-sensitive structures or engineered fill. Surficial soils should be removed to firm native ground and replaced with properly compacted fill. The on-site soils are suitable for use as compacted fill provided they are free of deleterious material.

7.1.6 We did not encounter groundwater or seepage during our field investigation. We do not expect groundwater or seepage to be encountered during construction of the proposed development; however, soil moisture conditions can vary depending on seasonal rainfall, irrigation, and drainage.

7.1.7 Subsurface conditions observed may be extrapolated to reflect general soil/geologic conditions at the site; however, some variations in subsurface conditions between boring locations should be expected.

7.2 Excavation and Soil Conditions

7.2.1 Excavation of the Mission Valley Formation should generally be possible with heavy effort using conventional, heavy-duty equipment. Concretions are common in the Mission Valley Formation, and if encountered, will generate oversize rock tht will require special handling.

7.2.2 The soil encountered in the field investigation is considered to be both “non-expansive” (expansion index [EI] of 20 or less) and “expansive” (EI greater than 20) as defined by 2016 California Building Code (CBC) Section 1803.5.3. Table 8.2 presents soil classifications based on the expansion index.

TABLE 8.2
EXPANSION CLASSIFICATION BASED ON EXPANSION INDEX

Expansion Index (EI)	ASTM D 4829 Expansion Classification	2016 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 We performed laboratory tests on samples of the site materials to evaluate the percentage of water-soluble sulfate content. Appendix B presents the results from the laboratory water-soluble sulfate content tests. The test results indicate that on-site materials at the locations tested possess a “Not Applicable” and “S0” exposure to concrete structures, as defined by 2016 CBC Section 1904 and ACI 318-14 Chapter 19. The presence of water-soluble sulfates is not a visually discernible characteristic. Therefore, other soil samples from the site could yield different concentrations. Additionally, over time landscaping activities (i.e. addition of fertilizers and other soil nutrients) may affect the concentration. We should perform additional laboratory tests to evaluate the soil at existing grade subsequent to the grading operations.

7.2.4 Geocon Incorporated does not practice in the field of corrosion engineering. Therefore, further evaluation by a corrosion engineer may be performed if improvements that could be susceptible to corrosion are planned.

7.3 Slopes

7.3.1 Slope stability analyses were performed utilizing average drained direct shear strength parameters from the laboratory test results. These analyses indicate that the proposed 2:1 fill slope, constructed of on-site materials, should have a calculated factor of safety of at least

1.5 under static conditions for both deep-seated failure and shallow sloughing conditions for the proposed fill slope height. Slope stability calculations are presented on Figures 6 and 7.

7.3.2 The outer 15 feet of fill slopes, measure horizontal to the slope face, should be composed of properly compacted granular “soil” fill to reduce the potential for surface sloughing.

7.3.3 Fill slopes should be compacted by backrolling with a loaded sheepsfoot roller at vertical intervals not to exceed 4 feet and should be track-walked at the completion of each slope such that the fill soils are uniformly compacted to at least 90 percent relative compaction to the face of the finished sloped. Alternatively, the fill slope may be over-built at least 3 feet and cut back to yield a properly compacted slope face.

7.3.4 All slopes should be landscaped with drought-tolerant vegetation, having variable root depths and requiring minimal landscape irrigation. In addition, all slopes should be drained and properly maintained to reduce erosion.

7.3.5 With respect to the proposed BMP basin located at the toe of the proposed fill slope, it is our opinion, that saturation of the soils adjacent at the toe of the slope will not create unstable slope conditions. Infiltration water from the basin is expected to migrate to the east following the natural drainage gradient and not into the fill slope zone.

7.4 Subdrains

7.4.1 Although not expected, a canyon subdrain may be needed within the southeastern portion of the site. Because of existing vegetation, exploratory test pits could not be performed within the southeastern portion of the site and near the toe of the proposed fill slope. The need for canyon subdrians will be determined during grading.

7.5 Grading

7.5.1 Grading should be performed in accordance with the Grading Ordinance of the City of San Diego and the *Recommended Grading Specifications* contained in Appendix D. The recommendations presented in this section take precedence over those presented in Appendix D.

7.5.2 Prior to commencing grading, a pre-construction conference should be held at the site with the project architect, grading contractor, civil engineer, geotechnical engineer, and inspection officials in attendance. Special soil handling requirements can be discussed at that time.

7.5.3 Site preparation should begin with the removal of all deleterious material and vegetation. The depth of removal should be such that material exposed in cut areas or soils to be used as fill are relatively free of organic matter. Material generated during stripping and/or site demolition should be exported from the site.

7.5.4 All compressible deposts, including undocumented fill, topsoil, and alluvium/colluvium (possibly in the eastern and southeastern portion of the property), should be removed to firm natural ground and replaced with properly compacted fill. On site soil, which is free of deleterious material, is suitable for use as compacted fill. Based on exploratory test pits, undocumented fill and topsoil removal depths are on the order of 4 feet or less at the test pit locations. However, test pits could not be performed in the eastern and southeastern portion of the site. Removal depths could be deeper than 4 feet in these areas. Potholes to evaluate removal depths should be performed once the site has been cleared and access provided.

7.5.5. Removals at toes of proposed fill slopes and structural improvements should extend horizontally beyond the edge of fill slope or improvements a distance equal to the depth of removal. Structural setbacks may be required if remedial removals cannot extend to the recommended distance because of existing improvements or property lines. The need for structural setbacks can be determined in the field during grading once removal depths are known.

7.5.6 The surface of areas to receive fill should be scarified to a depth of approximately 8 inches; moisture conditioned to above optimum moisture content or as directed by the geotechnical engineer; and compacted. Fill soils may then be placed and compacted in layers to the design finish grade elevations. The layers should be no thicker than will allow for adequate bonding and compaction. All fill and backfill should be compacted to at least 90 percent of maximum dry density at a moisture content at or slightly above the optimum moisture content as determined by the current version of ASTM D 1557.

7.5.7 Where practical, the upper 3 feet of all building pads (cut or fill) should be comprised of soil with a “very low” to “low” expansion potential. Highly expansive fill soils should be placed in the deeper fill areas. Cobbles, rock fragments, and concretions greater than 6 inches in maximum dimension should not be placed within 3 feet of finish grade in building pad areas.

7.5.8 To reduce the potential for differential settlement, it is recommended that the cut portion of cut/fill transition building pads be undercut at least 3 feet and replaced with properly compacted “very low” to “low” expansive fill soils. The base of undercuts should be sloped towards the front of the lots or deeper fill area.

7.5.9 Oversize material (defined as material greater than 12 inches in nominal dimension) may be generated during ripping of cemented formational materials. Placement of oversize material within fills should be conducted in accordance with the recommendations in Appendix D. Grading operations on the site should be scheduled such that oversize materials are placed in deeper fill areas.

7.5.10 Imported soils should consist of "very low" to "low" expansive (Expansion Index of 50 or less) soils. Prior to importing the material, samples from proposed borrow areas should be obtained and subjected to laboratory testing to determine whether the material conforms to the recommended criteria. At least 3 working days should be allowed for laboratory testing of the soil prior to its importation. Import materials should be free of oversize rock and construction debris.

7.6 Settlement Monitoring

7.6.1 The deepest fill within the building pads is approximatley 40 feet at the east end of the site. Settlement monitoring is not requied.

7.7 Seismic Design Criteria

7.7.1 We used the computer program *U.S. Seismic Design Maps*, provided by the USGS. Table 7.7.1 summarizes site-specific design criteria obtained from the 2016 California Building Code (CBC; Based on the 2015 International Building Code [IBC] and ASCE 7-10), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The short spectral response uses a period of 0.2 seconds. The values presented in Table 7.7.1 are for the risk-targeted maximum considered earthquake (MCE_R). Site Class C should be used for cut lots underlain by bedrock soils or fill lots with less than 15 feet of fill. Site Class D should be used for lots underlain by compacted fill in excess of 15 feet. We evaluated the Site Class based on the discussion in Section 1613.3.2 of the 2016 CBC and Table 20.3-1 of ASCE 7-10.

TABLE 7.7.1
2016 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value		2016 CBC Reference
Site Class	C	D	Section 1613.3.2
Fill Thickness, T (feet)	T<15	T>15	--
Spectral Response – Class B (short), S_S	1.016 g	1.016 g	Figure 1613.3.1(1)
Spectral Response – Class B (1 sec), S_1	0.392 g	0.392 g	Figure 1613.3.1(2)
Site Coefficient, F_a	1.000	1.094	Table 1613.3.3(1)
Site Coefficient, F_v	1.408	1.616	Table 1613.3.3(2)
Maximum Considered Earthquake Spectral Response Acceleration (short), S_{MS}	1.016 g	1.111 g	Section 1613.3.3 (Eqn 16-37)
Maximum Considered Earthquake Spectral Response Acceleration – (1 sec), S_{M1}	0.552 g	0.634 g	Section 1613.3.3 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.677 g	0.741 g	Section 1613.3.4 (Eqn 16-39)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.368 g	0.422 g	Section 1613.3.4 (Eqn 16-40)

7.7.2 Table 7.7.2 presents additional seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-10 for the mapped maximum considered geometric mean (MCE_G).

TABLE 7.7.2
2016 CBC SITE ACCELERATION PARAMETERS

Parameter	Value		ASCE 7-10 Reference
Site Class	C	D	--
Mapped MCE_G Peak Ground Acceleration, PGA	0.408 g	0.408 g	Figure 22-7
Site Coefficient, F_{PGA}	1.000	1.092	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.408g	0.455 g	Section 11.8.3 (Eqn 11.8-1)

7.7.3 Conformance to the criteria for seismic design does not constitute any guarantee or assurance that significant structural damage or ground failure will not occur in the event of a maximum level earthquake. The primary goal of seismic design is to protect life and not to avoid all damage, since such design may be economically prohibitive.

7.8 Foundation and Concrete Slab-On-Grade Recommendations

7.8.1 The foundation recommendations herein are for proposed one- to three-story residential structures. The foundation recommendations have been separated into three categories based on either the maximum and differential fill thickness or Expansion Index. The foundation category criteria are presented in Table 7.8.1.

TABLE 7.8.1
FOUNDATION CATEGORY CRITERIA

Foundation Category	Maximum Fill Thickness, T (Feet)	Differential Fill Thickness, D (Feet)	Expansion Index (EI)
I	$T<20$	--	$EI \leq 50$
II	$20 \leq T<50$	$10 \leq D<20$	$50<EI \leq 90$
III	$T \geq 50$	$D \geq 20$	$90<EI \leq 130$

7.8.2 We will provide final foundation categories for each building or lot after finish pad grades have been achieved and we perform laboratory testing of the subgrade soil.

7.8.3 Table 7.8.2 presents minimum foundation and interior concrete slab design criteria for conventional foundation systems.

TABLE 7.8.2
CONVENTIONAL FOUNDATION RECOMMENDATIONS BY CATEGORY

Foundation Category	Minimum Footing Embedment Depth (inches)	Continuous Footing Reinforcement	Interior Slab Reinforcement
I	12	Two No. 4 bars, one top and one bottom	6 x 6 - 10/10 welded wire mesh at slab mid-point
II	18	Four No. 4 bars, two top and two bottom	No. 3 bars at 24 inches on center, both directions
III	24	Four No. 5 bars, two top and two bottom	No. 3 bars at 18 inches on center, both directions

7.8.4 The embedment depths presented in Table 7.8.2 should be measured from the lowest adjacent pad grade for both interior and exterior footings. The conventional foundations should have a minimum width of 12 inches and 24 inches for continuous and isolated footings, respectively. A typical foundation dimension detail is provided on Figure 8.

7.8.5 The concrete slab-on-grade should be a minimum of 4 inches thick for Foundation Categories I and II and 5 inches thick for Foundation Category III.

7.8.6 Slabs that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials should be underlain by a vapor retarder. 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 used should be specified by the project architect or developer based on the type of floor covering that will be installed and if the structure will possess a humidity controlled environment.

7.8.7 The bedding sand thickness should be determined by the project foundation engineer, architect, and/or developer. However, we should be contacted to provide recommendations if the bedding sand is thicker than 6 inches. It is common to see 3 inches and 4 inches of sand below the concrete slab-on-grade for 5-inch and 4-inch thick slabs, respectively, in the southern California area.

7.8.8 The foundation design engineer should provide appropriate concrete mix design criteria and curing measures to assure proper curing of the slab by reducing the potential for rapid moisture loss and subsequent cracking and/or slab curl. We suggest that the foundation design engineer present the concrete mix design and proper curing methods on the foundation plans. It is critical that the foundation contractor understands and follows the recommendations presented on the foundation plans.

7.8.9 As an alternative to the conventional foundation recommendations, consideration should be given to the use of post-tensioned concrete slab and foundation systems for the support of the proposed structures. The post-tensioned systems should be designed by a structural engineer experienced in post-tensioned slab design and design criteria of the Post-Tensioning Institute (PTI) DC 10.5-12 *Standard Requirements for Design and Analysis of Shallow Post-Tensioned Concrete Foundations on Expansive Soils* or *WRI/CRSI Design of Slab-on-Ground Foundations*, as required by the 2016 California Building Code (CBC Section 1808.6.2). Although this procedure was developed for expansive soil conditions, it can also be used to reduce the potential for foundation distress due to differential fill settlement. The post-tensioned design should incorporate the geotechnical parameters presented in Table 8.11.3 for the particular Foundation Category designated. The parameters presented in Table 8.11.3 are based on the guidelines presented in the PTI DC 10.5 design manual.

TABLE 7.8.3
POST-TENSIONED FOUNDATION SYSTEM DESIGN PARAMETERS

Post-Tensioning Institute (PTI), Third Edition Design Parameters	Foundation Category		
	I	II	III
Thornthwaite Index	-20	-20	-20
Equilibrium Suction	3.9	3.9	3.9
Edge Lift Moisture Variation Distance, e_M (feet)	5.3	5.1	4.9
Edge Lift, y_M (Inches)	0.61	1.10	1.58
Center Lift Moisture Variation Distance, e_M (feet)	9.0	9.0	9.0
Center Lift, y_M (inches)	0.30	0.47	0.66

7.8.10 The foundations for the post-tensioned slabs should be embedded in accordance with the recommendations of the structural engineer. If a post-tensioned mat foundation system is planned, the slab should possess a thickened edge with a minimum width of 12 inches and extend below the clean sand or crushed rock layer.

7.8.11 If the structural engineer proposes a post-tensioned foundation design method other than PTI DC 10.5:

- The deflection criteria presented in Table 7.8.3 are still applicable.
- Interior stiffener beams should be used for Foundation Categories II and III.
- The width of the perimeter foundations should be at least 12 inches.
- The perimeter footing embedment depths should be at least 12 inches, 18 inches and 24 inches for foundation categories I, II, and III, respectively. The embedment depths should be measured from the lowest adjacent pad grade.

7.8.12 Our experience indicates post-tensioned slabs may be susceptible to excessive edge lift, regardless of the underlying soil conditions. Placing reinforcing steel at the bottom of the perimeter footings and the interior stiffener beams may mitigate this potential. The structural engineer should design the foundation system to reduce the potential of edge lift occurring for the proposed structures.

7.8.13 During the construction of the post-tension foundation system, the concrete should be placed monolithically. Under no circumstances should cold joints form between the footings/grade beams and the slab during the construction of the post-tension foundation system unless designed by the structural engineer.

7.8.14 Category I, II, or III foundations may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot (psf) (dead plus live load). This bearing pressure may be increased by one-third for transient loads due to wind or seismic forces. The estimated maximum total and differential settlement for the planned structures due to foundation loads is 1-inch and ½ inch, respectively.

7.8.15 Isolated footings outside of the slab area, if present, should have the minimum embedment depth and width recommended for conventional foundations for a particular Foundation Category. The use of isolated footings, which are located beyond the perimeter of the building and support structural elements connected to the building, are not recommended for Category III. Where this condition cannot be avoided, the isolated footings should be connected to the building foundation system with grade beams. In addition, consideration should be given to connecting patio slabs, which exceed 5 feet in width, to the building foundation to reduce the potential for future separation to occur.

7.8.16 Interior stiffening beams should be incorporated into the design of the foundation system in accordance with the PTI design procedures.

7.8.17 Special subgrade presaturation is not deemed necessary prior to placing concrete; however, the exposed foundation and slab subgrade soil should be moisture conditioned, as necessary, to maintain a moist condition as would be expected in any such concrete placement.

7.8.18 Where buildings or other improvements are planned near the top of a slope 3:1 (horizontal:vertical) or steeper, special foundation and/or design considerations are recommended due to the tendency for lateral soil movement to occur.

- For fill slopes less than 20 feet high or cut slopes regardless of height, 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.

- When located next to a descending 3:1 (horizontal:vertical) fill slope or steeper, the foundations should be extended to a depth where the minimum horizontal distance is equal to H/3 (where H equals the vertical distance from the top of the fill slope to the base of the fill soil) with a minimum of 7 feet but need not exceed 40 feet. The horizontal distance is measured from the outer, deepest edge of the footing to the face of the slope. A post-tensioned slab and foundation system or mat foundation system can be used to reduce the potential for distress in the structures associated with strain softening and lateral fill extension. Specific design parameters or recommendations for either of these alternatives can be provided once the building location and fill slope geometry have been determined.

- If swimming pools are planned, Geocon Incorporated should be contacted for a review of specific site conditions.

- Swimming pools located within 7 feet of the top of cut or fill slopes are not recommended. Where such a condition cannot be avoided, the portion of the swimming pool wall within 7 feet of the slope face be designed assuming that the adjacent soil provides no lateral support. This recommendation applies to fill slopes up to 30 feet in height, and cut slopes regardless of height. For swimming pools located near the top of fill slopes greater than 30 feet in height, additional recommendations may be required and Geocon Incorporated should be contacted for a review of specific site conditions.

- Although other improvements, which are relatively rigid or brittle, such as concrete flatwork or masonry walls, may experience some distress if located near the top of a slope, it is generally not economical to mitigate this potential. It may be possible, however, to incorporate design measures which would permit some lateral soil movement without causing extensive distress. Geocon Incorporated should be consulted for specific recommendations.

7.8.19 The recommendations of this report are intended to reduce the potential for cracking of slabs and foundations due to expansive soil (if present), differential settlement of fill soil with varying thicknesses. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade placed on such conditions may still exhibit some 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 reduced 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.

7.8.20 Concrete slabs should be provided with adequate crack-control joints, construction joints and/or expansion joints to reduce unsightly shrinkage cracking. The design of joints should consider criteria of the American Concrete Institute (ACI) when establishing crack-control spacing. Additional steel reinforcing, concrete admixtures and/or closer crack control joint spacing should be considered where concrete-exposed finished floors are planned.

7.8.21 Geocon Incorporated should be consulted to provide additional design parameters as required by the structural engineer.

7.9 Retaining Wall and Lateral Load Recommendations

7.9.1 Retaining 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 and having a level backfill surface should be designed for an active soil pressure equivalent to the pressure exerted by a fluid density of 35 pcf. Where the backfill will be inclined at 2:1 (horizontal:vertical), an active soil pressure of 50 pcf is recommended. These soil pressures assume that the backfill materials within an area bounded by the wall and a 1:1 plane extending upward from the base of the wall possess an Expansion Index of less than 50. Select grading will be required to provide suitable soil for wall backfill.

7.9.2 Soil contemplated for use as retaining wall backfill should be identified in the field prior to backfill. At that time, Geocon Incorporated should obtain 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. 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 Incorporated should be consulted to assess the suitability of the on-site soil for use as wall backfill if standard wall designs will be used.

7.9.3 Unrestrained walls will move laterally when backfilled and loading is applied. The amount of lateral deflection is dependent on the wall height, the type of soil used for backfill, and loads acting on the wall. The wall designer should provide appropriate lateral deflection quantities for planned retaining walls structures, if applicable. These lateral values should be considered when planning types of improvements above retaining wall structures.

7.9.4 Where walls are restrained from movement at the top, an additional uniform pressure of 8H psf should be added to the active soil pressure where the wall possesses a height of 8 feet or less and 12H where the wall is greater than 8 feet. For retaining walls subject to vehicular loads within a horizontal distance equal to two-thirds the wall height, a surcharge equivalent to 2 feet of fill soil should be added.

7.9.5 Retaining walls should be provided with a drainage system adequate to prevent the buildup of hydrostatic forces and should be waterproofed as required by the project architect. The use of drainage openings through the base of the wall (weep holes) is not recommended where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall. Figure 9 provides a typical retaining wall drainage detail. The above recommendations assume a properly compacted granular (EI $\leq$ 50) free-draining backfill material with no hydrostatic forces or imposed surcharge load. If conditions different than those described are expected, or if specific drainage details are desired, Geocon Incorporated should be contacted for additional recommendations.

7.9.6 In general, wall foundations having a minimum depth and width of 1 foot may be designed for an allowable soil bearing pressure of 2,000 psf, provided the soil within 3 feet below the base of the wall has an Expansion Index of less than 90. The recommended allowable soil bearing pressures may be increased by 300 psf and 500 psf for each additional foot of foundation width and depth, respectively, up to a maximum allowable soil bearing pressure of 4,000 psf. The proximity of the foundation to the top of a slope steeper than 3:1 could impact the allowable soil bearing pressure. Therefore, Geocon Incorporated should be consulted where such a condition is expected.

7.9.7 The structural engineer should determine the seismic design category for the project in accordance with Section 1613 of the CBC. If the project possesses a 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 18.3.5.12 of the 2016 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. A seismic load of 21H should be used for design. We used the peak ground acceleration adjusted for Site Class effects, PGA_M, of 0.455g calculated from ASCE 7-10 Section 11.8.3 and applied a pseudo-static coefficient of 0.33.

7.9.8 For resistance to lateral loads, an allowable passive earth pressure equivalent to a fluid density of 300 pcf is recommended for footings or shear keys poured neat against properly compacted granular fill soils or undisturbed natural soils. The allowable passive pressure assumes a horizontal surface extending away from the base of the wall at least 5 feet or three times the surface generating the passive pressure, whichever is greater. The upper 12 inches of material not protected by floor slabs or pavement should not be included in the design for lateral resistance. Where walls are planned adjacent to and/or on descending slopes, a passive pressure of 150 pcf should be used in design.

7.9.9 An allowable friction coefficient of 0.4 may be used for resistance to sliding between soil and concrete. This friction coefficient may be combined with the allowable passive earth pressure when determining resistance to lateral loads.

7.9.10 The recommendations presented above are generally applicable to the design of rigid concrete or masonry retaining walls having a maximum height of 10 feet. In the event that walls higher than 8 feet or other types of walls (such as crib or mechanically stabilized earth-type walls) are planned, Geocon Incorporated should be consulted for additional recommendations.

7.10 Storm Water Management

7.10.1 If storm water management devices are not properly designed and constructed, there is a risk for distress to improvements and properties located hydrologically down gradient or adjacent to these devices. Factors such as the amount of water being 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 into the subsurface occurs, downstream improvements 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.

7.10.2 A summary of our study and storm water management recommendations are provided in Appendix C.

7.11 Site Drainage and Moisture Protection

7.11.1 Adequate site drainage is critical to reduce the potential 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 2016 CBC 1804.4 or other applicable standards. 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.

7.11.2 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.

7.11.3 Underground utilities should be leak free. Utility and irrigation lines should be checked periodically for leaks, and detected leaks should be repaired promptly. Detrimental soil movement could occur if water is allowed to infiltrate the soil for prolonged periods of time.

7.11.4 Landscaping planters adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. Area drains to collect excess irrigation water and transmit it to drainage structures or impervious above-grade planter boxes can be used. In addition, where landscaping is planned adjacent to the pavement, construction of 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.

7.12 Slope Maintenance

7.12.1 Slopes that are steeper than 3:1 (horizontal:vertical) may, under conditions that are both difficult to prevent and predict, be susceptible to near-surface (surficial) slope instability. The instability is typically limited to the outer 3 feet of a portion of the slope and usually does not directly impact the improvements on the pad areas above or below the slope. The occurrence of surficial instability is more prevalent on fill slopes and is generally preceded by a period of heavy rainfall, excessive irrigation, or the migration of subsurface seepage. The disturbance and/or loosening of the surficial soils, as might result from root growth, soil expansion, or excavation for irrigation lines and slope planting, may also be a significant contributing factor to surficial instability. It is therefore recommended that, to the maximum extent practical: (a) disturbed/loosened surficial soils be either removed or properly recompacted, (b) irrigation systems be periodically inspected and maintained to eliminate leaks and excessive irrigation, and (c) surface drains on and adjacent to slopes be periodically maintained to preclude ponding or erosion. Although the incorporation of the above recommendations should reduce the potential for surficial slope instability, it will not eliminate the possibility and, therefore, it may be necessary to rebuild or repair a portion of the project's slopes in the future.

7.13 Grading and Foundation Plan Review

7.13.1 Geocon Incorporated should review the final grading and foundation plans prior to finalization to check their compliance with the recommendations of this report and evaluate the need for additional comments, recommendations, and/or analyses.

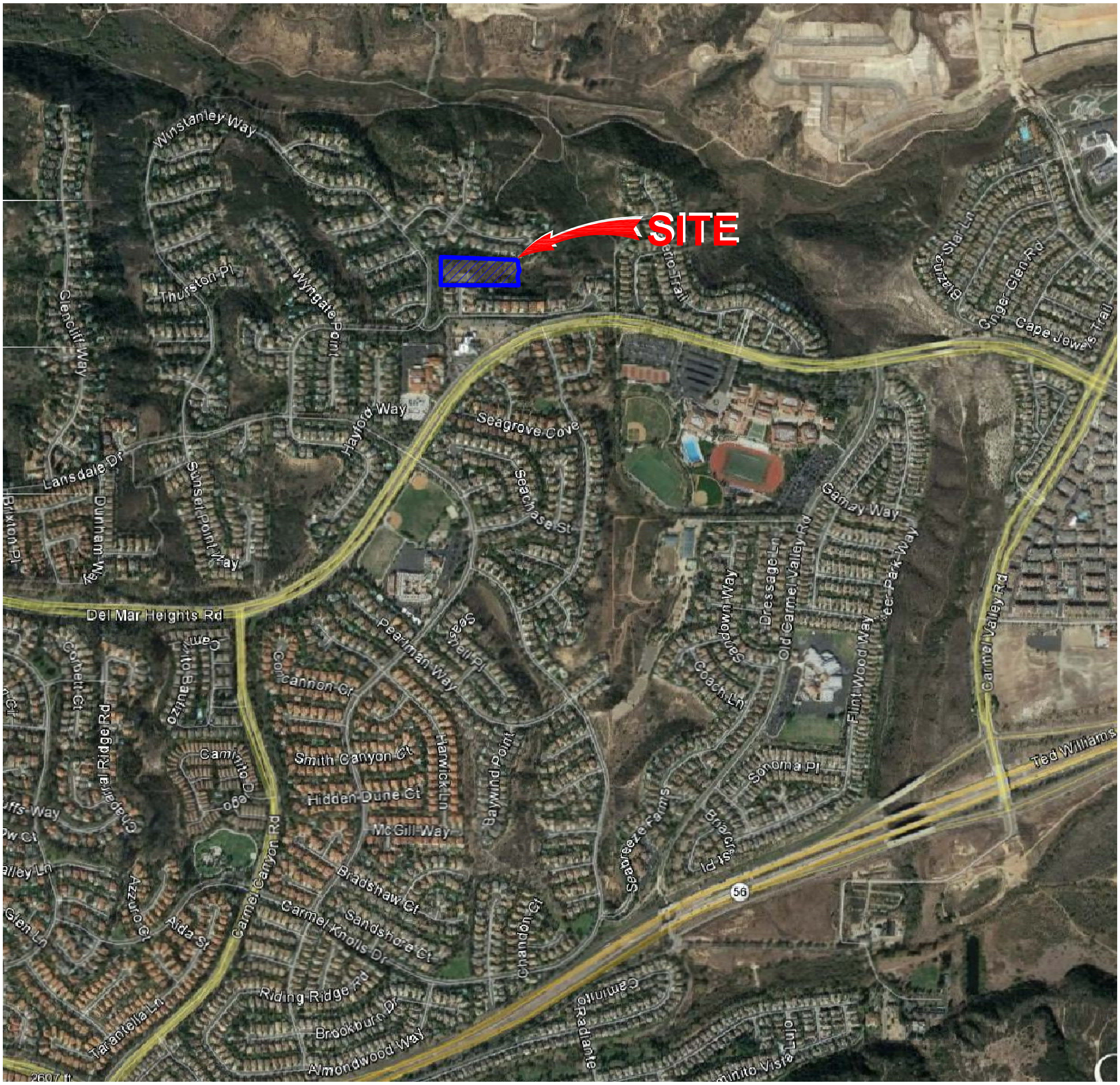
LIMITATIONS AND UNIFORMITY OF CONDITIONS

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.



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NO SCALE

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RM / AML		DSK/GTYPD	DATE 02 - 15 - 2017	PROJECT NO. G1996 - 42 - 01	FIG. 1

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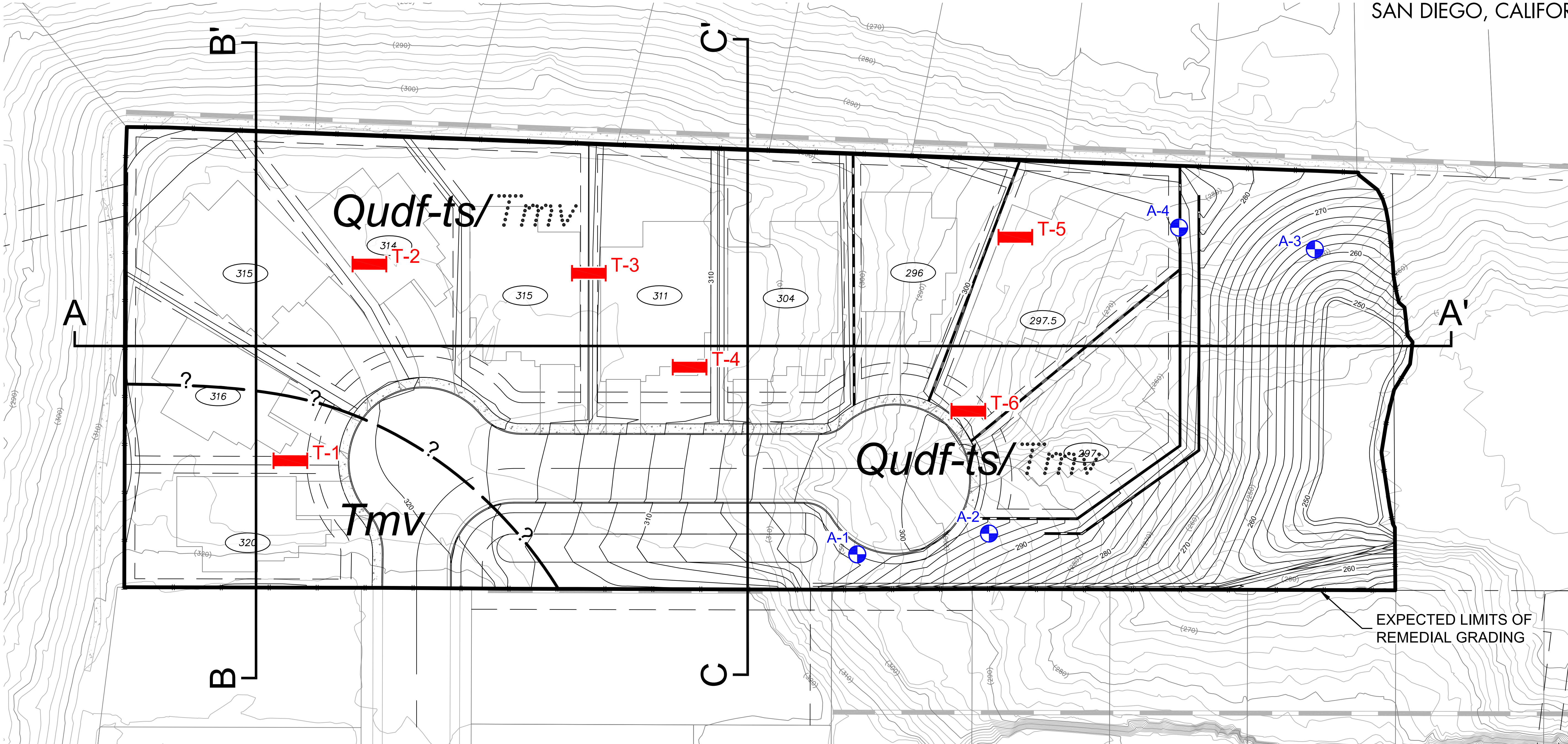

GEOCON LEGEND

Qudf-ts........UNDOCUMENTED FILL AND TOPSOIL (Undifferentiated)

Tmv........MISSION VALLEY FORMATION (Dotted Where Buried)

........APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)

A-4 ....APPROX. LOCATION OF INFILTRATION TEST

T-6 ....APPROX. LOCATION OF EXPLORATORY TRENCH

C C' ....APPROX. LOCATION OF GEOLOGIC CROSS SECTION

0' 25' 50' 75' 100'

SCALE 1"=50'(on 11x17)

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GEOLOGIC MAP

PROJECT NO. G1996 - 42 - 01
FIGURE 2
DATE 02 - 15 - 2017

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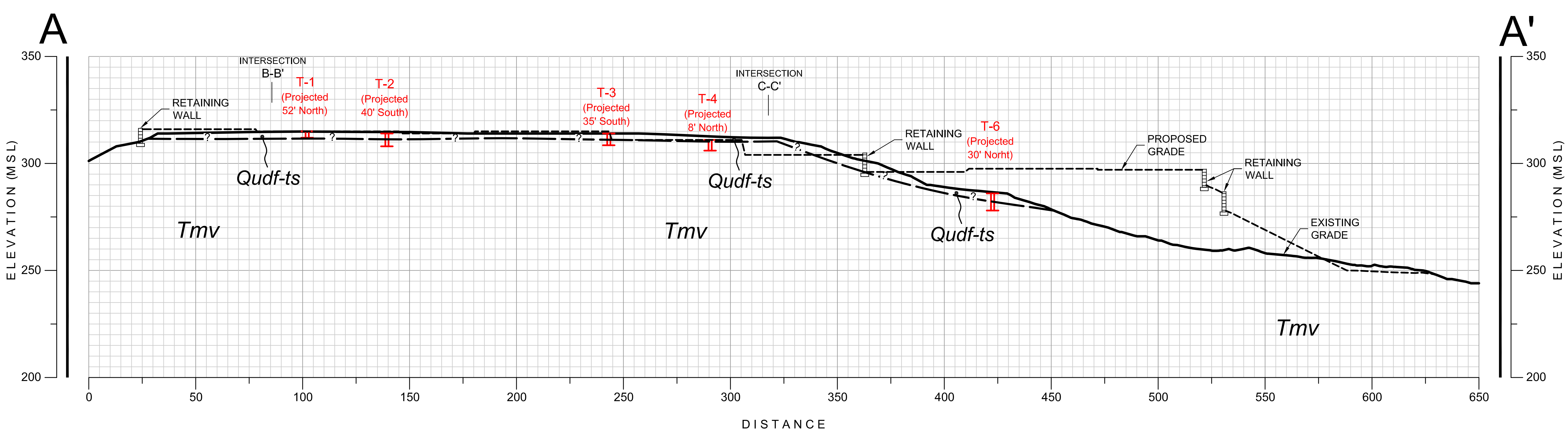

GEOLOGIC CROSS-SECTION A-A'

SCALE: 1" = 50' (Vert. = Horiz.)

GEOCON LEGEND

Qudf-ts........UNDOCUMENTED FILL AND TOPSOIL (Undifferentiated)

Tmv........MISSION VALLEY FORMATION (Dotted Where Buried)

?........APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)

T-6........APPROX. LOCATION OF EXPLORATORY TRENCH

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FIGURE 3
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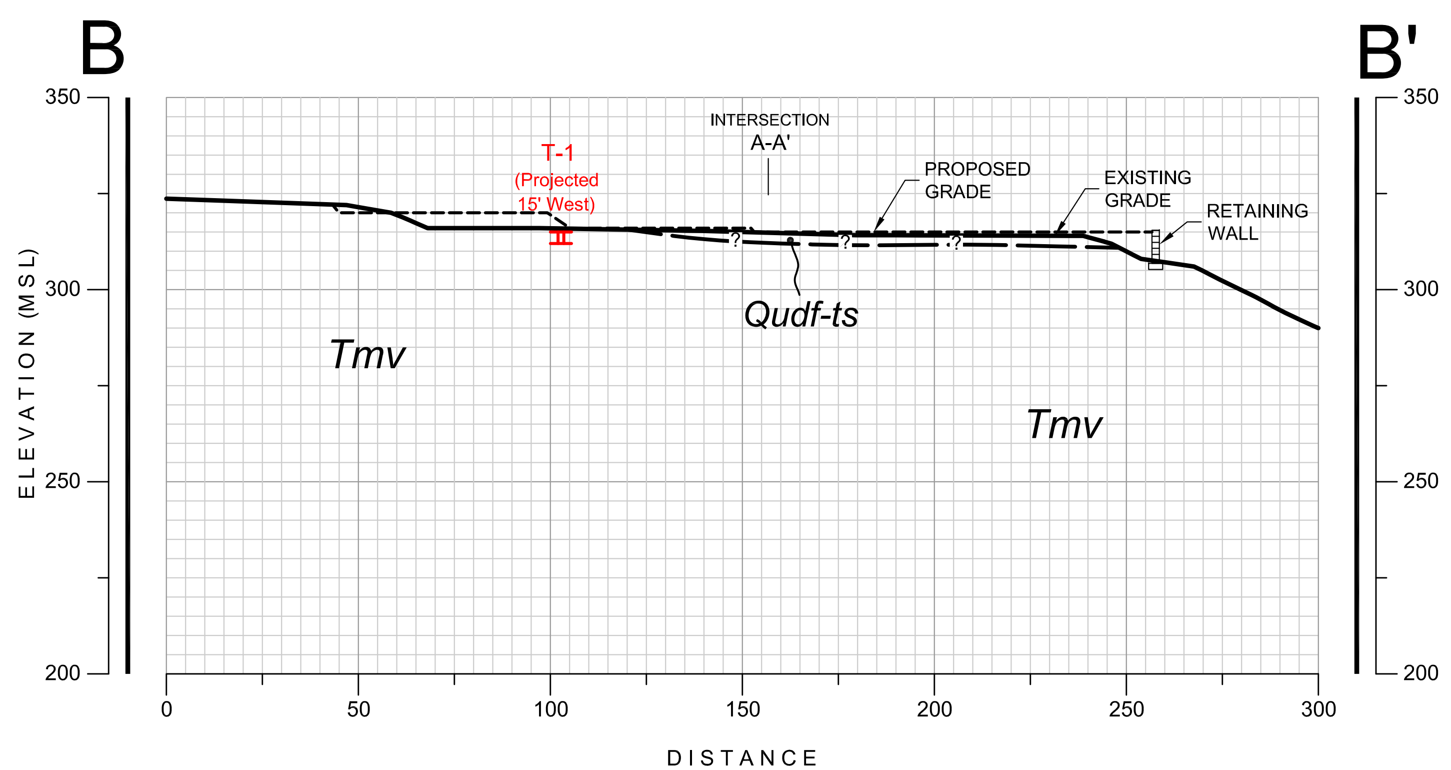

GEOLOGIC CROSS-SECTION B-B'

SCALE: 1" = 50' (Vert. = Horiz.)

GEOCON LEGEND

Qudf-ts........UNDOCUMENTED FILL AND TOPSOIL (Undifferentiated)

Tmv........MISSION VALLEY FORMATION (Dotted Where Buried)

?........APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)

T-6........APPROX. LOCATION OF EXPLORATORY TRENCH

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PROJECT NO. G1996 - 42 - 01
FIGURE 4
DATE 02 - 15 - 2017

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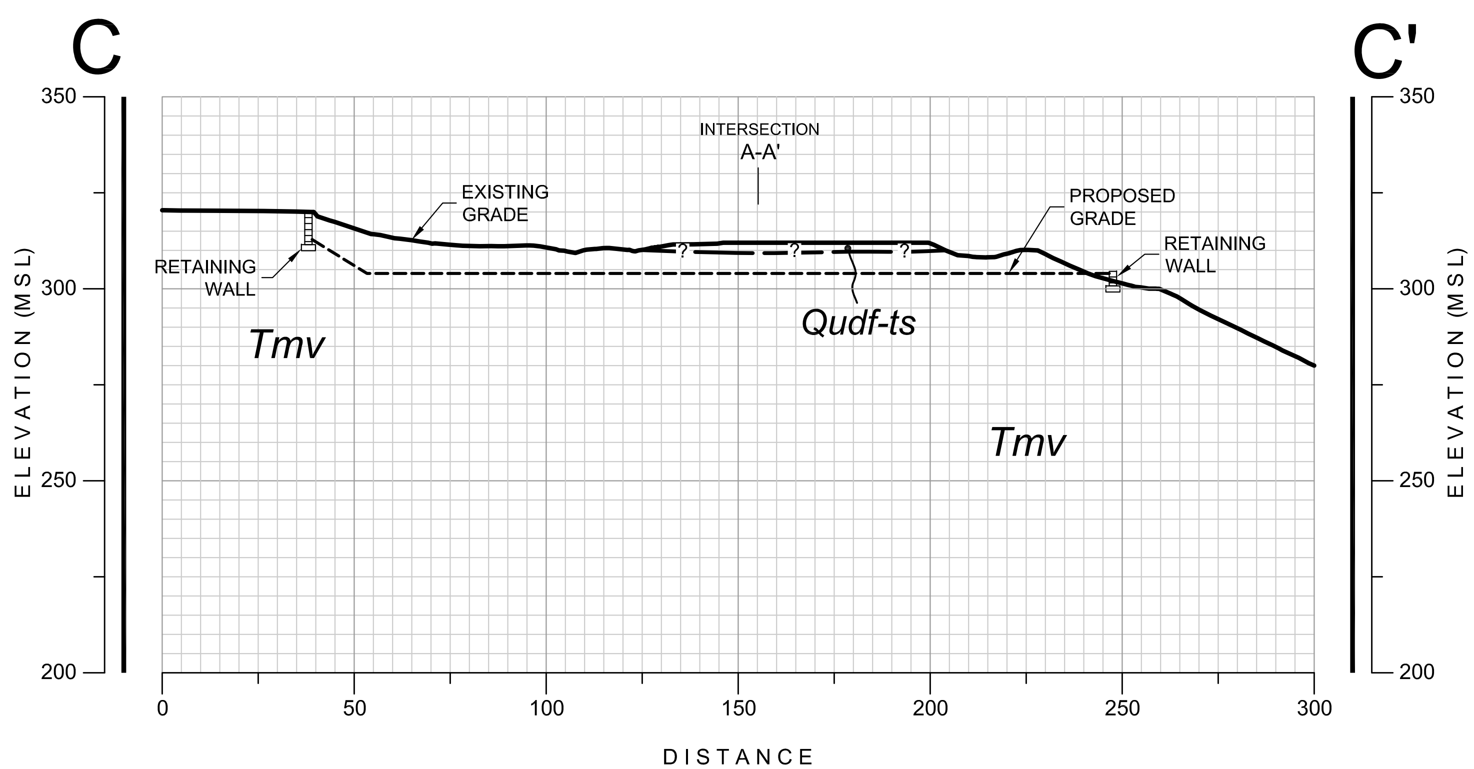

GEOLOGIC CROSS-SECTION C-C'

SCALE: 1" = 50' (Vert. = Horiz.)

GEOCON LEGEND

Qudf-ts........UNDOCUMENTED FILL AND TOPSOIL (Undifferentiated)

Tmv........MISSION VALLEY FORMATION (Dotted Where Buried)

?........APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)

T-6........APPROX. LOCATION OF EXPLORATORY TRENCH

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PROJECT NO. G1996 - 42 - 01
FIGURE 5
DATE 02 - 15 - 2017

ASSUMED CONDITIONS :

SLOPE HEIGHT	H	= 50 feet
SLOPE INCLINATION	2 : 1	(Horizontal : Vertical)
TOTAL UNIT WEIGHT OF SOIL	γ_t	= 125 pounds per cubic foot
ANGLE OF INTERNAL FRICTION	ϕ	= 28 degrees
APPARENT COHESION	C	= 350 pounds per square foot
NO SEEPAGE FORCES		

ANALYSIS :

$\gamma_{c\phi}$	=	$\dfrac{\gamma_t H \tan\phi}{C}$	EQUATION (3-3), REFERENCE 1
FS	=	$\dfrac{N_{cf} C}{\gamma_t H}$	EQUATION (3-2), REFERENCE 1
$\gamma_{c\phi}$	=	9.5	CALCULATED USING EQ. (3-3)
Ncf	=	31	DETERMINED USING FIGURE 10, REFERENCE 2
FS	=	1.74	FACTOR OF SAFETY CALCULATED USING EQ. (3-2)

REFERENCES :

1......Janbu, N., Stability Analysis of Slopes with Dimensionless Parameters, Harvard Soil Mechanics, Series No. 46, 1954

2......Janbu, N., Discussion of J.M. Bell, Dimensionless Parameters for Homogeneous Earth Slopes, Journal of Soil Mechanics and Foundation Design, No. SM6, November 1967.

SLOPE STABILITY ANALYSIS

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ASSUMED CONDITIONS :

SLOPE HEIGHT	H	= Infinite
DEPTH OF SATURATION	Z	= 3 feet
SLOPE INCLINATION	2 : 1	(Horizontal : Vertical)
SLOPE ANGLE	i	= 26.6 degrees
UNIT WEIGHT OF WATER	γ_w	= 62.4 pounds per cubic foot
TOTAL UNIT WEIGHT OF SOIL	γ_t	= 125 pounds per cubic foot
ANGLE OF INTERNAL FRICTION	ϕ	= 28 degrees
APPARENT COHESION	C	= 350 pounds per square foot

SLOPE SATURATED TO VERTICAL DEPTH Z BELOW SLOPE FACE

SEEPAGE FORCES PARALLEL TO SLOPE FACE

ANALYSIS :

$$\mathrm{FS} = \frac{C + (\gamma_t - \gamma_w)\ Z \cos^2 i \tan \phi}{\gamma_t\ Z \sin i \cos i} = 2.9$$

REFERENCES :

1......Haefeli, R. *The Stability of Slopes Acted Upon by Parallel Seepage*, Proc. Second International Conference, SMFE, Rotterdam, 1948, 1, 57-62

2......Skempton, A. W., and F.A. Delory, *Stability of Natural Slopes in London Clay*, Proc. Fourth International Conference, SMFE, London, 1957, 2, 378-81

SURFICIAL SLOPE STABILITY ANALYSIS

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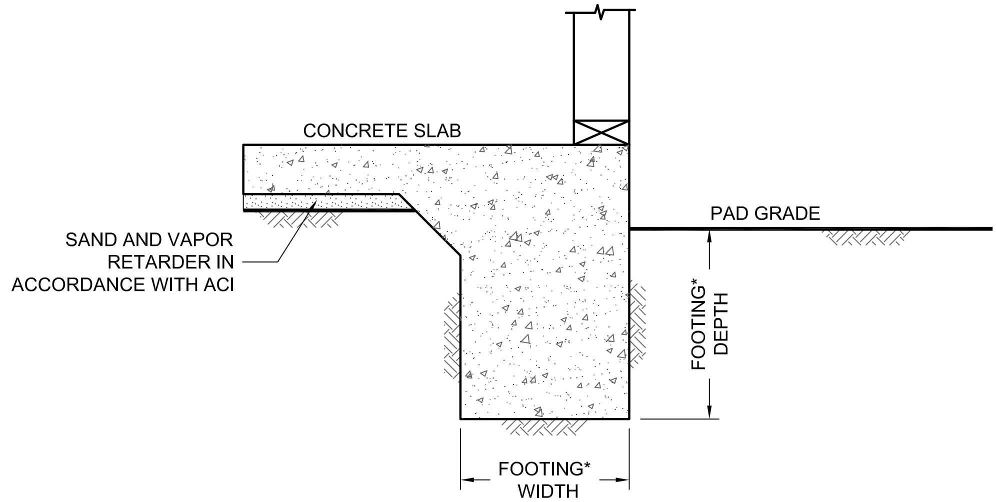

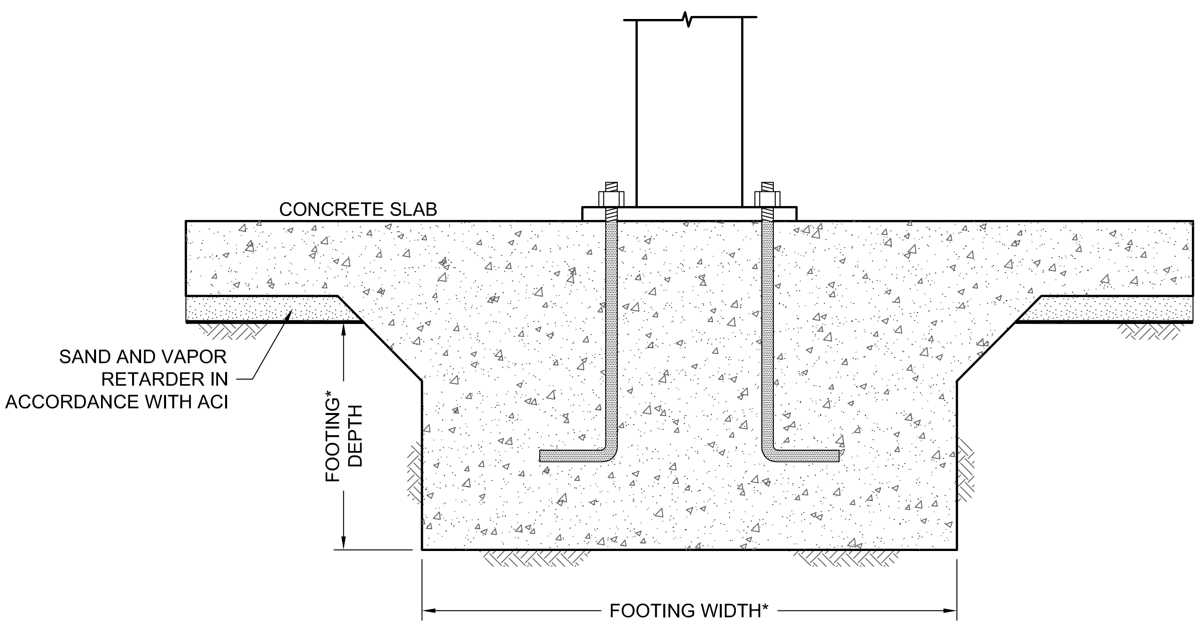

*....SEE REPORT FOR FOUNDATION WIDTH AND DEPTH RECOMMENDATION

NO SCALE

WALL / COLUMN FOOTING DIMENSION DETAIL

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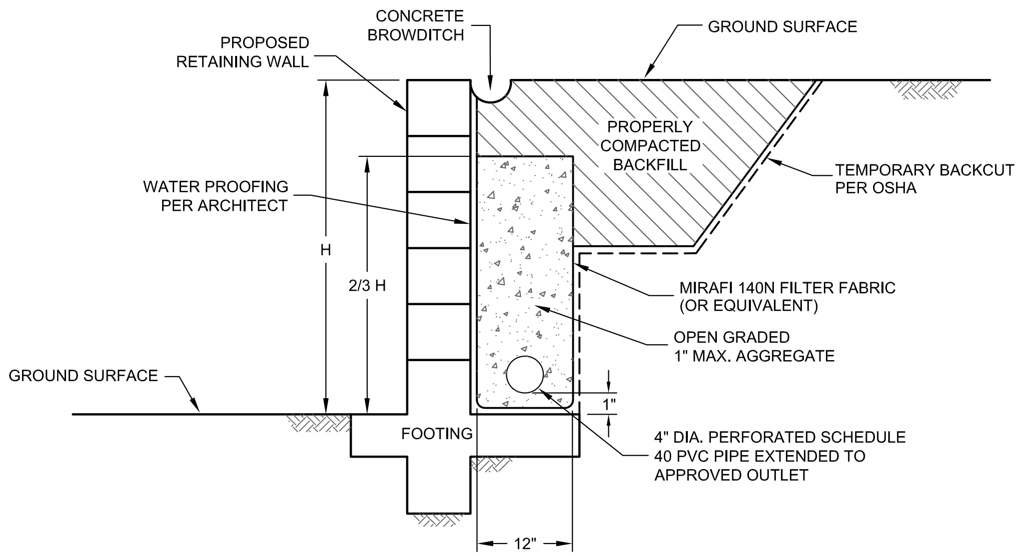
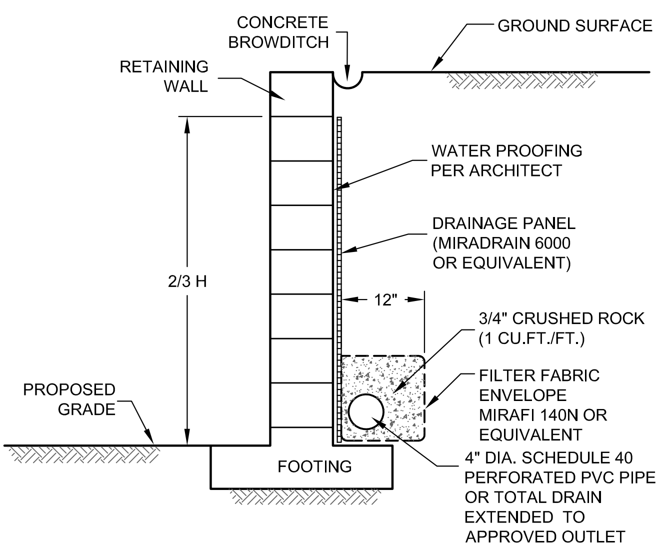
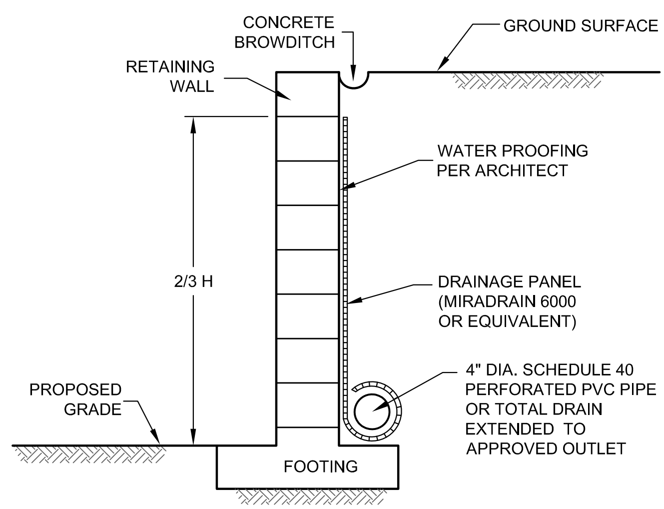
RM / AML		DSK/GTYPD	DATE 02 - 15 - 2017	PROJECT NO. G1996 - 42 - 01	FIG. 8







NOTE :

DRAIN SHOULD BE UNIFORMLY SLOPED TO GRAVITY OUTLET
OR TO A SUMP WHERE WATER CAN BE REMOVED BY PUMPING

NO SCALE

TYPICAL RETAINING WALL DRAIN DETAIL

GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

LIGHTHOUSE RIDGE
SAN DIEGO, CALIFORNIA

RM / AML		DSK/GTYPD	DATE 02 - 15 - 2017	PROJECT NO. G1996 - 42 - 01	FIG. 9

Plotted:02/16/2017 7:20AM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\G1996-42-01 (Lighthouse Ridge)\DETAILS\Typical Retaining Wall Drainage Detail (RWDD7A).dwg

APPENDIX A

APPENDIX A

FIELD INVESTIGATION

The field investigation was conducted on February 2, 2017, and consisted of a site reconnaissance and excavating six, shallow exploratory trenches using a rubber-tire backhoe at the approximate locations shown on Figure 2. Bulk soil samples were collected from the trenches.

The soil conditions encountered in the trenches were visually examined, classified, and logged in general accordance with American Society for Testing and Materials (ASTM) practice for Description and Identification of Soils (Visual-Manual Procedure D 2488). Logs of the trenches are presented on Figures A-1 through A-6. The logs depict the soil and geologic conditions encountered and the depth at which samples were obtained.

TRENCH T 1

ELEV. (MSL.) **315'** DATE COMPLETED **02-02-2017**

EQUIPMENT **RUBBER TIRE BACKHOE** BY: **G. CANNON**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC	**FILL** Loose, wet to saturated, brown, Clayey, medium SAND			
	B1-1			SP-SC	**MISSION VALLEY FORMATION** Very dense, moist, light brown, medium SAND; trace clay			
2								
					TRENCH TERMINATED AT 3 FEET Groundwater not encountered			

Figure A-1,
Log of Trench T 1, Page 1 of 1

G1996-42-01.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: 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.

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TRENCH T 2

ELEV. (MSL.) **314'** DATE COMPLETED **02-02-2017**

EQUIPMENT **RUBBER TIRE BACKHOE** BY: **G. CANNON**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC	**FILL** Loose, wet-saturated, olive, Clayey, fine SAND; trace gravel, roots			
2	T2-1			SC	**TOPSOIL** Dense, wet to saturated, red brown, Clayey, medium SAND; plastic clay			
4					**MISSION VALLEY FORMATION** Dense to very dense, moist to wet, olive and red brown mottled, Clayey, medium SAND; weathered sandstone			
				SC	Very dense, moist, light brown, Clayey, medium SAND; slightly weathered sandstone			
6					TRENCH TERMINATED AT 6 FEET Groundwater not encountered			

Figure A-2,
Log of Trench T 2, Page 1 of 1

G1996-42-01.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: 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.

GEOCON

PROJECT NO. G1996-42-01

TRENCH T 3

ELEV. (MSL.) **314'** DATE COMPLETED **02-02-2017**

EQUIPMENT **RUBBER TIRE BACKHOE** BY: **G. CANNON**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC	**FILL** Loose, saturated, olive and dark brown, Clayey SAND			
2	T3-1			CL	**TOPSOIL** Soft to firm, saturated, light red brown to olive brown, fine Sandy CLAY; highly plastic			
				CL	Firm, wet to saturated, olive with rust mottling, fine Sandy CLAY; blocky texture			
				SC				
4	T3-2			CL	**MISSION VALLEY FORMATION** Dense, moist to wet, medium red brown, Clayey, fine SAND; indistinctly laminated			
					Very stiff, moist to wet, light olive, Silty CLAY; blocky, trace gravel			

TRENCH TERMINATED AT 5.5 FEET
Groundwater not encountered

Figure A-3,
Log of Trench T 3, Page 1 of 1

G1996-42-01.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: 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.

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TRENCH T 4

ELEV. (MSL.) **311'** DATE COMPLETED **02-02-2017**

EQUIPMENT **RUBBER TIRE BACKHOE** BY: **G. CANNON**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**FILL** Very soft, saturated, light brown, Sandy CLAY			
2				CL	**MISSION VALLEY FORMATION** Soft, saturated, light brown with light red brown, CLAY; horizontal laminated bedding			
	T4-1			CL	Firm, wet to saturated, medium gray, CLAY; horizontal, laminated bedding			
4				CL	Stiff to very stiff, wet, light red brown, Sandy CLAY; interbedded with light olive clay; distinct, horizontal laminated bedding especially in the light olive beds			

TRENCH TERMINATED AT 5 FEET
Groundwater not encountered

Figure A-4,
Log of Trench T 4, Page 1 of 1

G1996-42-01.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: 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.

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DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 5 ELEV. (MSL.) 286' DATE COMPLETED 02-02-2017 EQUIPMENT RUBBER TIRE BACKHOE BY: G. CANNON	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**FILL** Loose, wet to saturated, brown, Clayey, medium SAND			
2								
4	T5-1			SC	**MISSION VALLEY FORMATION** Very dense, moist to wet, light olive, Clayey, fine SAND; interbedded with red brown, clayey sand			
				SM-SC	Very dense, moist, light olive, Silty, medium SAND			
6					TRENCH TERMINATED AT 6 FEET Groundwater not encountered			

Figure A-5,
Log of Trench T 5, Page 1 of 1

G1996-42-01.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: 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.

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TRENCH T 6

ELEV. (MSL.) **284'** DATE COMPLETED **02-02-2017**

EQUIPMENT **RUBBER TIRE BACKHOE** BY: **G. CANNON**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	T5-1			SC	**FILL** Loose to medium dense, wet, dark brown, Clayey SAND			
2								
4				SC	**TOPSOIL** Medium dense, moist to wet, Clayey SAND			
				SC	**MISSION VALLEY FORMATION** Dense, moist to wet, light olive and light red brown, Clayey, medium SAND			
6								
8					TRENCH TERMINATED AT 8 FEET Groundwater not encountered			

Figure A-6,
Log of Trench T 6, Page 1 of 1

G1996-42-01.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: 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.

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APPENDIX B

APPENDIX B

LABORATORY TESTING

We performed laboratory tests in accordance with the current, generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. We tested selected samples for maximum dry density and optimum moisture content, expansion index, water-soluble sulfate exposure, and direct shear. The results of our laboratory tests are presented on Tables B-I through B-IV.

TABLE B-I
SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS
ASTM D 1557

Sample No.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
T3-2	Silty, fine to medium SAND	118.2	13.6
T6-1	Fine to medium Sandy SILT	129.3	8.8

TABLE B-II
SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
ASTM D 4829

Sample No.	Moisture Content (%)		Dry Density (pcf)	Expansion Index	Expansion Classification
	Before Test	After Test			
T1-1	10.2	16.6	110.5	1	Very Low
T2-1	10.2	20.5	110.6	57	Medium
T3-2	11.9	28.2	101.0	77	Medium
T6-1	8.6	16.9	114.3	15	Low

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

Sample No.	Water-Soluble Sulfate (%)	Classification
T1-1	0.018	Not Applicable, S0
T3-2	0.057	Not Applicable, S0
T6-1	0.008	Not Applicable, S0

TABLE B-IV
SUMMARY OF LABORATORY DIRECT SHEAR TEST RESULTS
ASTM D 3080

Sample No.	Dry Density (pcf)	Moisture Content (%)		Unit Cohesion (psf)	Angle of Shear Resistance (degrees)
		Initial	Final		
T3-2	106.5	13.2	21.9	280	30
T6-1	11635	9.2	15.3	420	27

APPENDIX C

APPENDIX C

STORM WATER MANAGEMENT

We understand a proposed BMP basin is planned at the eastern end of the site. If not properly constructed, there is a potential for 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.

Underground utilities should not be placed across infiltration systems. Where this condition cannot be avoided, the ingress and egress portions of utility trench crossing the infiltration systems should be provided with cut-off walls to prevent water from entering the utility trenches and impacting down gradient improvements.

Hydrologic Soil Group

The United States Department of Agriculture (USDA), Natural Resources Conservation Services, provides general information regarding soil conditions for areas within the United States. The USDA website also provides the Hydrologic Soil Group. Table C-1 presents the descriptions of the hydrologic soil groups.

TABLE C-1
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 property is underlain by undocumented fill anhd native formational soils of the Mission Valley Formation. Based on the USDA website, the subject site falls within Hydraulic Soil Group D, which has a very slow infiltration rating. Table C-2 presents the information from the USDA website for the property.

TABLE C-2
USDA WEB SOIL SURVEY – HYDROLOGIC SOIL GROUP

Map Unit Name	Map Unit Symbol	Approximate Percentage of Property	Hydrologic Soil Group
Huerhuero loam, 5 to 9 percent slopes, eroded	HrC2	47	D
Terrace escarpments	TeF	53	n/a

We performed 4 saturated hydraulic conductivity tests at depths of approximately 1.5 to 2 feet below the ground surface using a SoilMoisture Inc. Aardvark Downhole Permeameter at the locations shown on Figure 2. The test holes were hand augured to construct a 4-inch diameter test hole. Table C-3 presents the results of the saturated hydraulic conductivity testing. The test data sheets are attached. We used the guidelines presented in the Riverside County Low Impact Development BMP Design Handbook which references the United States Bureau of Reclamation Well Permeameter Test Method (USBR 7300-89). Based on this widely accepted guideline, the saturated hydraulic conductivity (Ksat) is equal to the infiltration rate. Therefore, the Ksat value determined from the Aardvark Permeameter test is the unfactored infiltration rate. The Ksat (infiltration rate) equation provided in the Riverside County Handbook was used to compute the unfactored infiltration rate.

TABLE C-3
UNFACTORED FIELD SATURATED HYDRAULIC CONDUCTIVITY TEST RESULTS USING THE SOILMOISTURE AARDVARK PERMEAMETER

Location	Depth (inches)	Geologic Unit	Fines-Content[1] [Clay Content[2]] (%)	Field Infiltration Rate (inches/hour)
A1	18	Mission Valley Formation	36	0.09
A2	21	Mission Valley Formation	20	0.17
A3	24	Mission Valley Formation	36	0.09
A4	24	Mission Valley Formation	--	0.004

[1] Percent finer than the #200 Sieve.
[2] Percent finer than the 0.002 mm

All of the infiltration tests were performed in the Mission Valley Formation. Although the tests were not performed at the new location of the proposed basin, we opine that the rates indicated from the testing are representative of the Mission Valley Formation and the soil conditions underlying the proposed basin. The average rate from the 4 tests is 0.09 inches/hour.

STORM WATER MANAGEMENT CONCLUSIONS

Soil Types

Mission Valley Formation – The surficial soils on the property are underlain by the Mission Valley Formation. Based on our experience in the area, the Mission Valley Formation is highly variable due to the sedimentary nature of the materials and consists of sandstone and siltstone with occasional sand/gravel conglomerate with cobbles. The formational materials are also cemented and often have concretions that reduces the ability for infiltration. The Mission Valley Formation has a greater propensity for lateral water migration over vertical water migration. Based on the percolation testing on other projects in the Mission Valley Formation, infiltration rates within the Mission Valley Formation are typically very low.

Infiltration Rates

The results of the testing show infiltration rates ranging from approximately 0.004 to 0.17 inches per hour. The rates are not high enough to support full infiltration. Using a factor of safety of 2 for feasibility determination, three of the four tests fall below a rate of 0.05 in/hr. The average rate is 0.09 in/hr, therefore, partial infiltration is also considered infeasible.

Existing Improvements

Existing single family residences border the north and south sides of the property. The natural ground slopes from south to north. Infiltration into the natural soils could result in daylight seepage impacting the down gradient residences to the north. Due to the variable soil conditions and the high potential for lateral water movement, infiltration along the north side of the property is not recommended.

Groundwater

Based on our experience in the area, groundwater is expected to be greater than 50 feet below the existing ground surface on within the area proposed for residential lots.

Existing and New Utilities

There are no known utilities on the property that could be impacted by infiltration. With respect to new utilities that will be constructed for the proposed subdivision, infiltrating near proposed new utilities is not recommended.

Soil or Groundwater Contamination

We are unaware of contaminated soil or groundwater on the property. Therefore, infiltration associated with this risk is considered feasible.

Slopes

Gentle to moderate slopes are present along the perimeter of the property. The slopes along the north and west sides of the property are graded descending slopes that are expected to have heights from 10 feet to 40 feet. Slopes on the south side of the property are gentle slopes that are less than 10 feet tall. The eastern slope is a natural hillside slope extending into open space.

Due to the low infiltration rates and the high potential for lateral water migration, infiltrating into the natural soils is considered infeasible along the north side of the site due to the potential for water migration into the neighboring properties.

The preliminary gradng plan shows the construction of 50-foot-high fill slope on the east side of the property. Infiltrating into compacted fill can cause saturation of the fill.

The proposed BMP basin is located at the toe of the fill slope. It is our opinion that infiltration into the native slopes at the proposed BMP location will not impact the stability of the adjacent proposed fill slope.

Storm Water Management Devices

Liners and subdrains are recommended in 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.

Storm Water Standard Worksheets

The SWS requests the geotechnical engineer complete the *Categorization of Infiltration Feasibility Condition* (Worksheet C.4-1 or I-8) worksheet information to help evaluate the potential for infiltration on the property. The attached Worksheet C.4-1 presents the completed information for the submittal process.

The regional storm water standards also have a worksheet (Worksheet D.5-1 or Form I-9) that helps the project civil engineer estimate the factor of safety based on several factors. Table C-4 describes the suitability assessment input parameters related to the geotechnical engineering aspects for the factor of safety determination.

TABLE C-4
SUITABILITY ASSESSMENT RELATED CONSIDERATIONS FOR INFILTRATION FACILITY SAFETY FACTORS

Consideration	High Concern – 3 Points	Medium Concern – 2 Points	Low Concern – 1 Point
Assessment Methods	Use of soil survey maps or simple texture analysis to estimate short-term infiltration rates. Use of well permeameter or borehole methods without accompanying continuous boring log. Relatively sparse testing with direct infiltration methods	Use of well permeameter or borehole methods with accompanying continuous boring log. Direct measurement of infiltration area with localized infiltration measurement methods (e.g., infiltrometer). Moderate spatial resolution	Direct measurement with localized (i.e. small-scale) infiltration testing methods at relatively high resolution or use of extensive test pit infiltration measurement methods.
Predominant Soil Texture	Silty and clayey soils with significant fines	Loamy soils	Granular to slightly loamy soils
Site Soil Variability	Highly variable soils indicated from site assessment or unknown variability	Soil boring/test pits indicate moderately homogenous soils	Soil boring/test pits indicate relatively homogenous soils
Depth to Groundwater/ Impervious Layer	<5 feet below facility bottom	5-15 feet below facility bottom	>15 feet below facility bottom

Table C-5 presents the estimated factor values for the evaluation of the factor of safety. The factor of safety is determined using the information contained in Table C-4. Table C-5 only presents the suitability assessment safety factor (Part A) of the worksheet. The project civil engineer should evaluate the safety factor for design (Part B of Worksheet D.5-1) and use the combined safety factor for the design infiltration rate.

TABLE C-5
FACTOR OF SAFETY WORKSHEET D.5-1 DESIGN VALUES – PART A[1]

Suitability Assessment Factor Category	Assigned Weight (w)	Factor Value (v)	Product (p = w x v)
Assessment Methods	0.25	3	0.75
Predominant Soil Texture	0.25	2	0.5
Site Soil Variability	0.25	3	0.75
Depth to Groundwater/Impervious Layer	0.25	1	0.25
Suitability Assessment Safety Factor, S_A = □p			2.25

1 The project civil engineer should complete Worksheet D.5-1 or Form I-9 to determine the overall factor of safety.

CONCLUSIONS

Our results indicate the site has highly variable sub-surface conditions and relatively low infiltration characteristics. Because of these site conditions, it is our opinion that there is a high probability for lateral water migration. Considering the presence of nearby existing residences, slopes, and the proposed development, it is our opinion that full and partial infiltration is infeasible on this site. Our evaluation included the soil and geologic conditions, estimated settlement and volume change of the underlying soil, slope stability, utility considerations, groundwater mounding, retaining walls, foundations and existing groundwater elevations. Liners and subdrains should be installed within BMP areas. If water is allowed to infiltrate the soil, water could migrate away from the property into the adjacent apartment complex soils and supporting fill slopes and cause settlement and distress to existing and proposed improvements and structures.

Categorization of Infiltration Feasibility Condition			Worksheet C.4-1
Part 1 - Full Infiltration Feasibility Screening Criteria **Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?**			
Criteria	Screening Question	Yes	No
1	**Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X
Provide basis: We performed 4 infiltration tests in the Mission Valley formation. The results of the infiltration tests show rates ranging from 0.004 to 0.17 inches per hour. This shows the soil has very slow infiltration characteristics. Full infiltration is considered infeasible.			
2	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	X	
Provide basis: Infiltration greater than 0.5 inches per hour can be allowed without increasing the risk of geotechnical hazards at the location of the proposed BMP basin show on Figure 2 of Geocon's February 15, 2017 report.			

Worksheet C.4-1 Page 2 of 4			
Criteria	Screening Question	**Yes**	**No**
3	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: Groundwater is assumed to be in excess of 50 feet below the proposed basin locations.			
4	**Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: Infiltration is not anticipated to have a negative impact on nearby water balance or discharge of contaminated groundwater to surface waters.			
Part 1 Result*	If all answers to rows 1 - 4 are "**Yes**" a full infiltration design is potentially feasible. The feasibility screening category is **Full Infiltration** If any answer from row 1-4 is "**No**", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2		Full Infiltration not Feasible

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City to substantiate findings.

Worksheet C.4-1 Page 3 of 4

Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria

Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
5	**Do soil and geologic conditions allow for infiltration in any appreciable rate or volume?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X

Provide basis:

The unfactored infiltration rates from the testing are:

A1: 0.09 in/hr (0.045 using a factor of safety of 2.0 for feasibility determination)
A2: 0.17 in/hr (0.09 using a factor of safety of 2.0 for feasibility determination)
A3: 0.09 in/hr (0.045 using a factor of safety of 2.0 for feasibility determination)
A4: 0.004 in/hr (0.002 using a factor of safety of 2.0 for feasibility determination)

The average rate is 0.085 in/hr. This value is less than 0.1 inches. The rate using a factor of safety of 2 is less than 0.05 in/hr. Therefore, partial infiltration is considered infeasible.

Criteria	Screening Question	Yes	No
6	**Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	X	

Provide basis:

At the proposed basin location shown on Figure 2 of Geocon’s February 15, 2017 report, infiltration of an appreciable quantity is not expected to increase the risk of geotechnical hazards.

Worksheet C.4-1 Page 4 of 4			
Criteria	Screening Question	**Yes**	**No**
7	**Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: Groundwater is assumed to be in excess of 50 feet below the proposed basin locations. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
8	**Can infiltration be allowed without violating downstream water rights**? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: Infiltration is not anticipated to have a negative impact on nearby water balance or discharge of contaminated groundwater to surface waters. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative			
Part 2 Result*	If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is **Partial Infiltration.** If any answer from row 5-8 is no, then infiltration of any volume is considered to be **infeasible** within the drainage area. The feasibility screening category is **No Infiltration.**	No Infiltration	

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City to substantiate findings.

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Lighthouse Way
6/14/2016
JTL

A1

Dia_{hole}	4	inches
$Depth_{hole}$	18	inches
$Depth_{inst}$	18	inches
Ht_{res}	30	inches
$Depth_{valve}$	10.75	inches

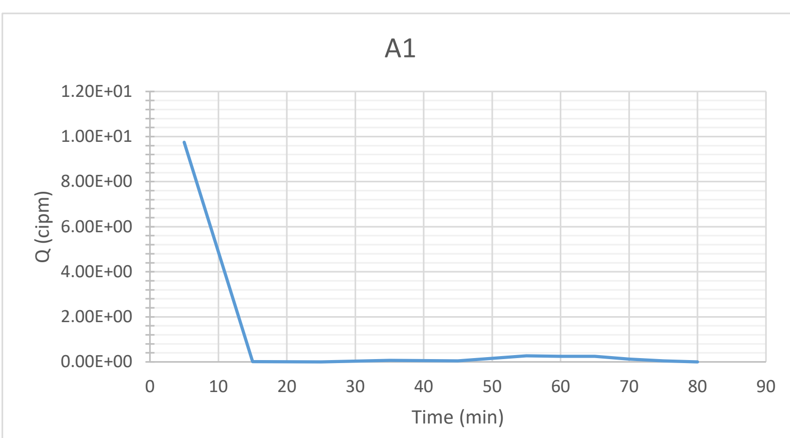
Wt_0	23.6676	lbs

D = 40.75 inches
h = 3.64 inches

t (min)	Δt (min)	Wt (lbs)	ΔWt (lbs)	Δvol (ft^3)	Δvol (in^3)	Q (cipm)
5	5	21.91	1.76	2.82E-02	4.87E+01	9.75E+00
15	10	21.90	0.00	7.05E-05	1.22E-01	1.22E-02
25	10	21.90	0.00	0.00E+00	0.00E+00	0.00E+00
35	10	21.88	0.03	4.23E-04	7.31E-01	7.31E-02
45	10	21.86	0.02	2.82E-04	4.87E-01	4.87E-02
55	10	21.76	0.10	1.55E-03	2.68E+00	2.68E-01
60	5	21.72	0.04	7.05E-04	1.22E+00	2.44E-01
65	5	21.67	0.04	7.05E-04	1.22E+00	2.44E-01
70	5	21.65	0.02	3.53E-04	6.09E-01	1.22E-01
75	5	21.64	0.01	1.41E-04	2.44E-01	4.87E-02
80	5	21.64	0.00	0.00E+00	0.00E+00	0.00E+00
85	5	21.64	0.00	0.00E+00	0.00E+00	0.00E+00

Q (cipm)	h/r	$(h/r)^2$	$((h/r)^2+1)^{0.5}$
1.57E-01	1.82E+00	3.31E+00	2.08E+00

K_f	8.68E-02 iph



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A2

Dia_{hole}	4	inches
$Depth_{hole}$	21	inches
$Depth_{inst}$	19	inches
Ht_{res}	25.8	inches
$Depth_{valve}$	11.75	inches

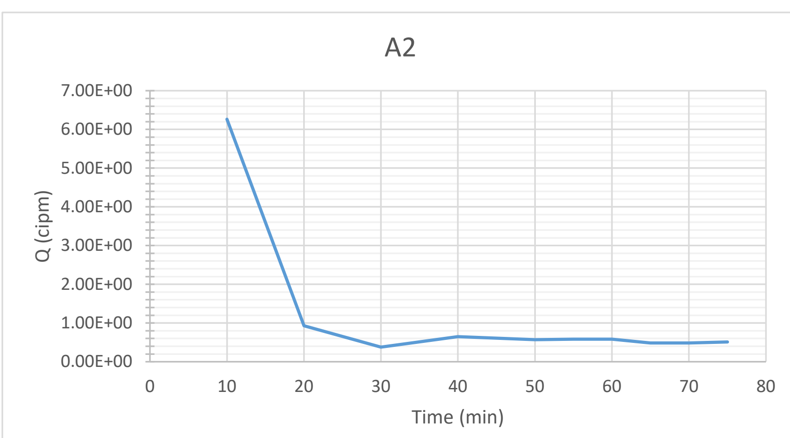
Wt_0 19.8396 lbs

D = 37.55 inches
h = 5.63 inches

t (min)	Δt (min)	Wt (lbs)	ΔWt (lbs)	Δvol (ft^3)	Δvol (in^3)	Q (cipm)
10	10	17.58	2.26	3.62E-02	6.26E+01	6.26E+00
20	10	17.24	0.33	5.36E-03	9.26E+00	9.26E-01
30	10	17.11	0.14	2.19E-03	3.78E+00	3.78E-01
40	10	16.87	0.23	3.74E-03	6.46E+00	6.46E-01
50	10	16.67	0.21	3.31E-03	5.73E+00	5.73E-01
55	5	16.56	0.11	1.69E-03	2.92E+00	5.85E-01
60	5	16.46	0.11	1.69E-03	2.92E+00	5.85E-01
65	5	16.37	0.09	1.41E-03	2.44E+00	4.87E-01
70	5	16.28	0.09	1.41E-03	2.44E+00	4.87E-01
75	5	16.19	0.09	1.48E-03	2.56E+00	5.12E-01

Q (cipm)	h/r	$(h/r)^2$	$((h/r)^2+1)^{0.5}$
5.29E-01	2.82E+00	7.92E+00	2.99E+00

K_f	1.68E-01 iph



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6/14/2016
JTL

A3

Dia_{hole}	4	inches
$Depth_{hole}$	24	inches
$Depth_{inst}$	22.5	inches
Ht_{res}	30	inches
$Depth_{valve}$	15.25	inches

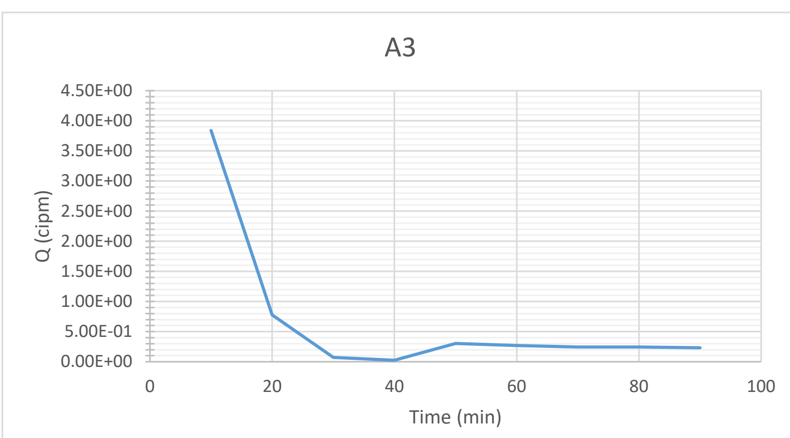
Wt_0 18.1896 lbs

D = 45.25 inches
h = 5.15 inches

t (min)	Δt (min)	Wt (lbs)	ΔWt (lbs)	Δvol (ft^3)	Δvol (in^3)	Q (cipm)
10	10	16.80	1.39	2.22E-02	3.84E+01	3.84E+00
20	10	16.52	0.28	4.51E-03	7.80E+00	7.80E-01
30	10	16.50	0.03	4.23E-04	7.31E-01	7.31E-02
40	10	16.49	0.01	1.41E-04	2.44E-01	2.44E-02
50	10	16.38	0.11	1.76E-03	3.05E+00	3.05E-01
60	10	16.28	0.10	1.55E-03	2.68E+00	2.68E-01
70	10	16.19	0.09	1.41E-03	2.44E+00	2.44E-01
80	10	16.10	0.09	1.41E-03	2.44E+00	2.44E-01
90	10	16.02	0.08	1.34E-03	2.32E+00	2.32E-01

Q (cipm)	h/r	$(h/r)^2$	$((h/r)^2+1)^{0.5}$
2.46E-01	2.58E+00	6.63E+00	2.76E+00

K_f	8.79E-02 iph



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Lighthouse Way
6/14/2016
JTL

A4

Dia_{hole}	4	inches
$Depth_{hole}$	24	inches
$Depth_{inst}$	22	inches
Ht_{res}	30	inches
$Depth_{valve}$	14.75	inches

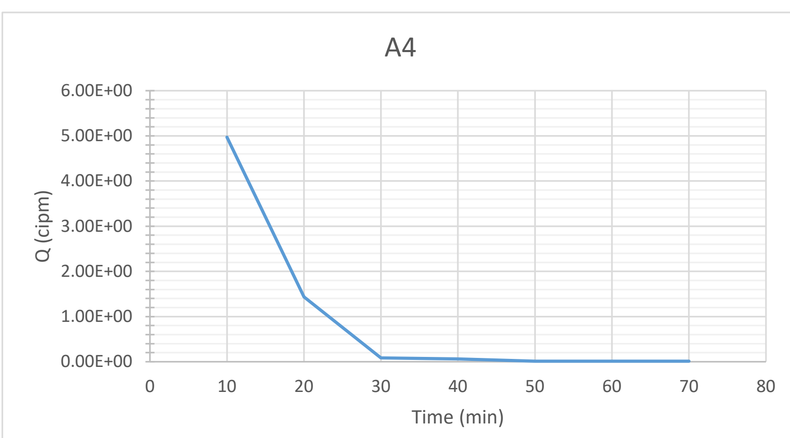
Wt_0	20.8208	lbs

D = 44.75 inches
h = 5.65 inches

t (min)	Δt (min)	Wt (lbs)	ΔWt (lbs)	Δvol (ft^3)	Δvol (in^3)	Q (cipm)
10	10	19.03	1.80	2.88E-02	4.97E+01	4.97E+00
20	10	18.51	0.52	8.32E-03	1.44E+01	1.44E+00
30	10	18.48	0.03	4.94E-04	8.53E-01	8.53E-02
40	10	18.45	0.02	3.53E-04	6.09E-01	6.09E-02
50	10	18.45	0.00	7.05E-05	1.22E-01	1.22E-02
60	10	18.44	0.00	7.05E-05	1.22E-01	1.22E-02
70	10	18.44	0.00	7.05E-05	1.22E-01	1.22E-02

Q (cipm)	h/r	$(h/r)^2$	$((h/r)^2+1)^{0.5}$
1.22E-02	2.83E+00	7.98E+00	3.00E+00

K_f	3.84E-03 **iph**



APPENDIX D

APPENDIX D

RECOMMENDED GRADING SPECIFICATIONS

FOR

LIGHTHOUSE RIDGE
LIGHTHOUSE WAY
SAN DIEGO, CALIFORNIA

PROJECT NO. G1996-42-01

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 ¾ 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 ¾ 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

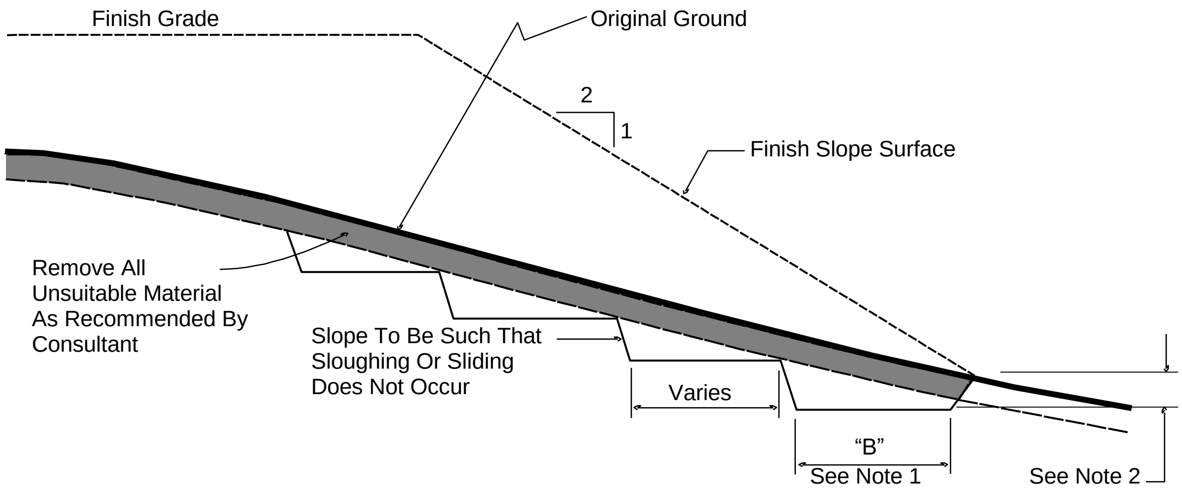
4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material 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



No Scale

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.

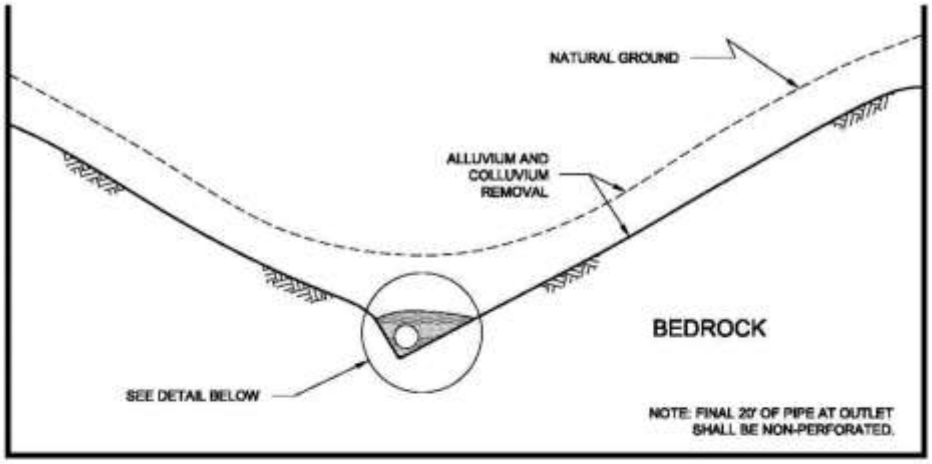
6.3.6 To reduce the potential for "piping" of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant 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.

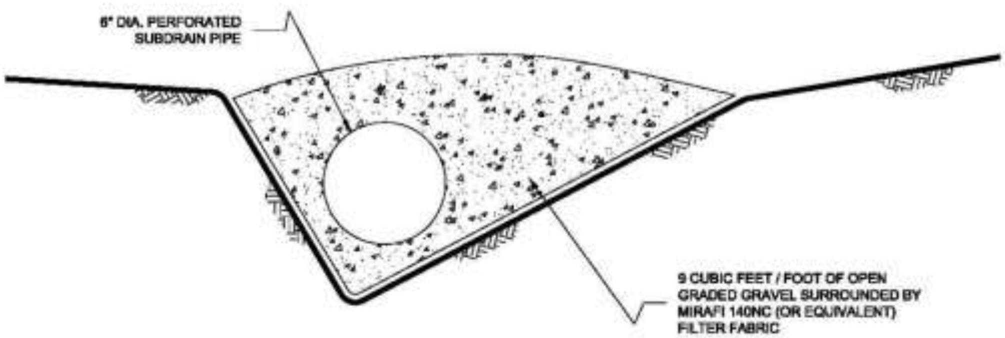
6.3.7 *Rock* fill placement should be continuously observed during placement by the Consultant.

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:

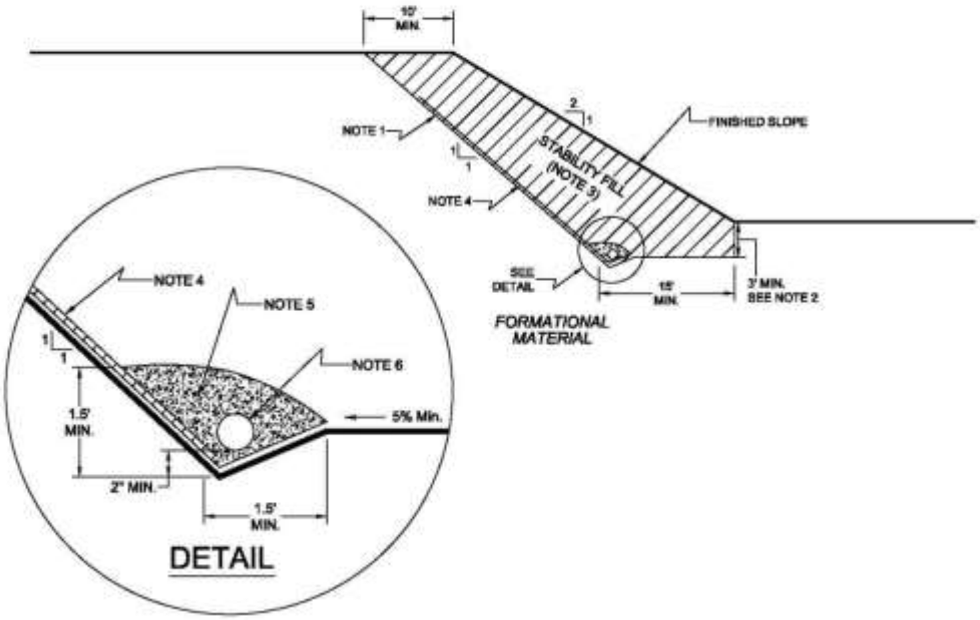
1......6-INCH DIAMETER, SCHEDULE 80 PVC PERFORATED PIPE FOR FILLS IN EXCESS OF 100-FEET IN DEPTH OR A PIPE LENGTH OF LONGER THAN 500 FEET.

2......6-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 lager) 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.

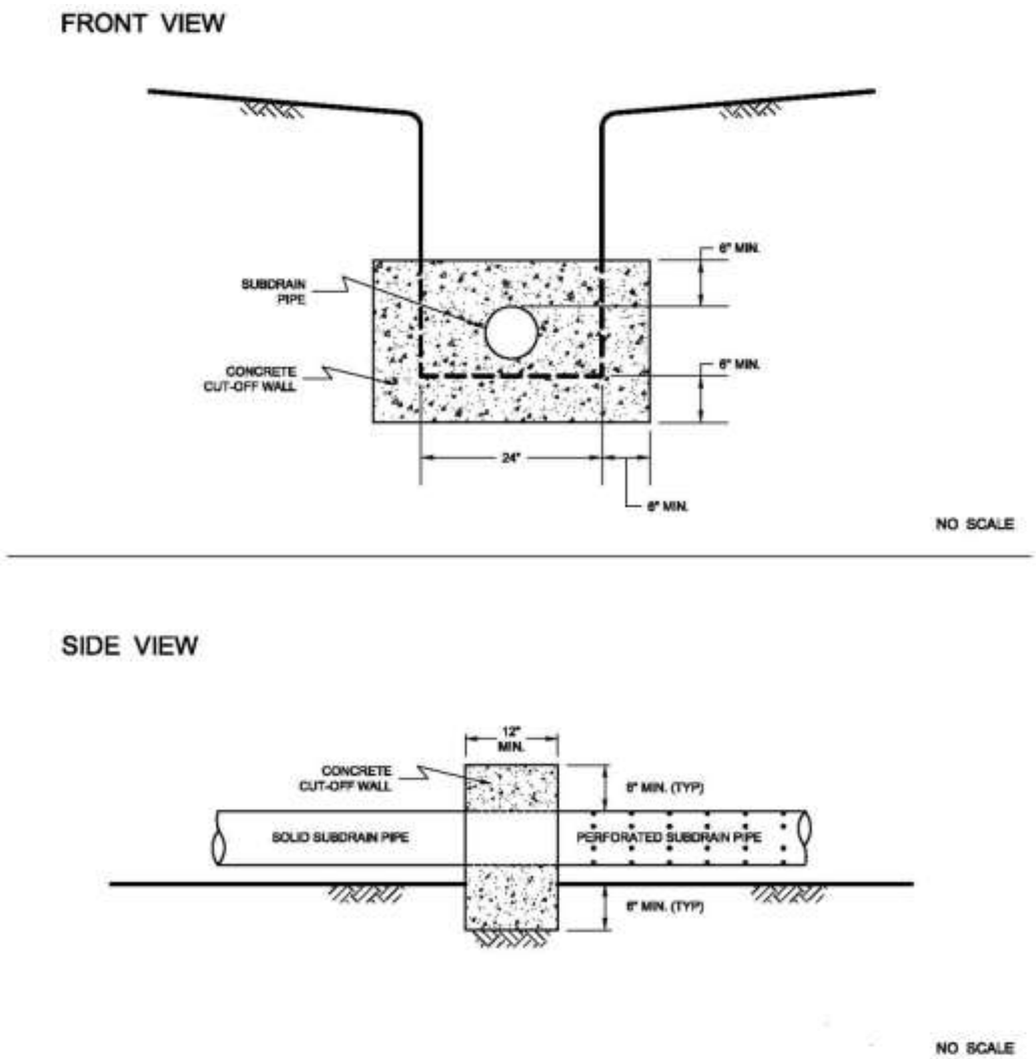
NO SCALE

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.

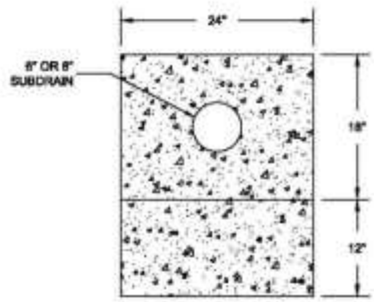
TYPICAL CUT OFF WALL DETAIL



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

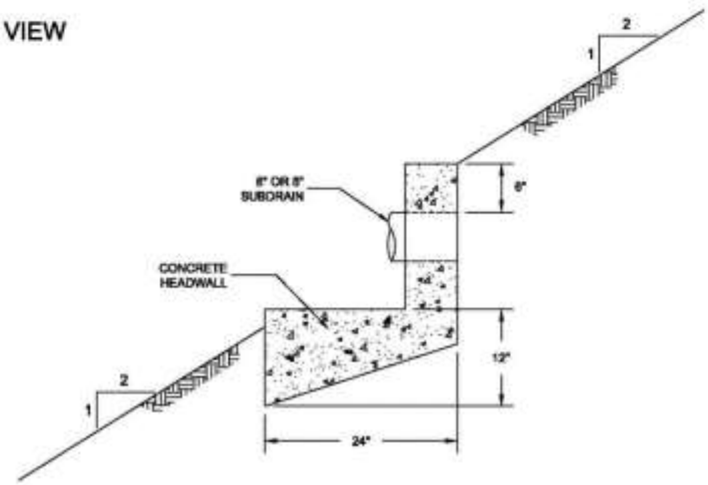
TYPICAL HEADWALL DETAIL

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

City of San Diego (2008), *Seismic Safety Study, Geologic Hazards and Faults*, Grid Tiles 42 & 38, City of San Diego Development Services Department;

Risk Engineering (2011), *EZ-FRISK (version 7.62)*, software package used to perform site-specific earthquake hazard analyses. Accessed February 14, 2017;

Kennedy, M. P., and Tan, S. S. (2008), *Geologic Map of the San Diego 30'x60' Quadrangle, California*, California Geological Survey, 1:100,000 Scale;

USGS (2014), *U.S. Seismic Design Maps Web Application (version 3.1.0)*, http://earthquake.usgs.gov/designmaps/us/application.php. Accessed February 8, 2017;

USGS (2016), *Quaternary Fault and Fold Database of the United States:* U.S. Geological Survey website, http://earthquakes,usgs.gov/hazards/qfaults, accessed February 14, 2017.

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October 25, 2017 PLH-02

Mr. Michael Graham
Pacific Legacy Homes
16870 W. Bernardo Drive, Suite 400
San Diego, CA 92127

Subject: Revised Biological Resources Letter Report for the Lighthouse Ridge Project

Dear Mr. Graham:

At the request of Pacific Legacy Homes (Applicant) and the City of San Diego (City), HELIX Environmental Planning, Inc. (HELIX) has completed this biological resources letter report for the Lighthouse Ridge Project (project), which is proposed in the City of San Diego, San Diego County, California. The project would construct a 10-lot residential subdivision on a 4.8-acre parcel.

The purpose of this report is to document the existing biological conditions within the project site and provide an analysis of potential impacts to sensitive biological resources with respect to local, state, and federal policy. This report provides the biological resources technical documentation necessary for review under the California Environmental Quality Act (CEQA) by the City and other responsible agencies for the project.

Figures and other supporting information are provided as enclosures attached to this letter report.

INTRODUCTION

Project Location

The approximately 4.8-acre project site is located in the City of San Diego, east of Interstate 5 and north of Del Mar Heights Road (Figure 1). The site is located within Section 17, Township 14 South, Range 3 West of the U.S. Geological Survey 7.5-minute Del Mar topographic quadrangle (Figure 2), east of Winstanley Way, at the northern terminus of Lighthouse Way

(Figure 3). As evidenced in historic aerial photos, the project site was completely disturbed in the late 1980s (Figure 4).

Project Description

The project would include 10 residential lots accessed by an extension of Lighthouse Way. A bio-retention swale on the south side of the proposed road would treat storm water, which would then flow through a created stream channel into the existing jurisdictional streambed and California Department of Fish and Wildlife (CDFW)/City wetland. Another bio-retention basin at the base of the proposed fill slope will treat the remainder of the storm water. The wetland area, a 30- to 60-foot buffer, and native habitat to the east of the wetland will be retained in biological open space.

METHODS

Literature Review

Prior to conducting biological field surveys, HELIX conducted a search of aerial imagery, soil survey data, U.S. Geological Survey topographic maps, U.S. Fish and Wildlife Service (USFWS) critical habitat maps, City of San Diego Multiple Species Conservation Program Subarea Plan (MSCP) designations, and sensitive species information from CDFW's California Natural Diversity Database (CNDDB) and USFWS database records.

General Biological and Rare Plant Surveys

HELIX biologist Stacy Nigro conducted a biological constraints assessment survey of the site on January 20, 2016 in order to map existing vegetation communities; evaluate the potential for sensitive plant and animal species to occur; and identify other sensitive biological resources constraints associated with the project site and immediate vicinity, such as potential waterways and wetlands (Table 1). Vegetation was mapped on a 1"=75' scale aerial photograph. A spring rare plant survey of the project site was conducted by HELIX biologist Talaya Rachels on May 27, 2016. Rare plant locations were recorded using a handheld GPS unit. The site was surveyed on foot with the aid of binoculars. Animal identifications were made in the field by direct, visual observation, or indirectly by detection of calls, burrows, tracks, or scat. Plant identifications were made in the field or in the lab through comparison with voucher specimens or photographs. Plant and animal species observed or otherwise detected during the survey were recorded (Attachments A and B). However, the lists of species identified are not necessarily comprehensive accounts of all species that occur on the site, as species that are nocturnal, secretive, or seasonally restricted may not have been observed.

Table 1
HELIX SURVEY INFORMATION

SURVEY DATE	PERSONNEL	PURPOSE	SURVEY TIMES	WEATHER CONDITIONS
1/20/2016	Stacy Nigro	General biological survey	0900-1500	Mostly Cloudy
4/26/2016	Stacy Nigro	Jurisdictional delineation	0900-1300	Partly Cloudy
5/12/2016	Ben Rosenbaum	Least Bell's vireo	0900-1000	Cloudy
5/23/2016	Ben Rosenbaum	Least Bell's vireo	0900-1000	Partly Cloudy
5/27/2016	Talaya Rachels	Rare plant survey	0900-1500	Cloudy
6/3/2016	Ben Rosenbaum	Least Bell's vireo	0900-1000	Cloudy
6/8/2016	Jason Kurnow	Gnatcatcher	0830-1000	Cloudy
6/13/2016	Laura Moreton	Least Bell's vireo	0845-0945	Cloudy
6/15/2016	Erica Harris	Gnatcatcher	1030-1130	Sunny
6/21/2016	Talaya Rachels	Rare plant survey	0835-1310	Partly Cloudy
6/22/2016	Erica Harris	Gnatcatcher	1040-1140	Sunny
6/23/2016	Ben Rosenbaum	Least Bell's vireo	0850-0940	Mostly Sunny
7/6/2016	Ben Rosenbaum	Least Bell's vireo	0900-1000	Partly Cloudy
7/19/2016	Ben Rosenbaum	Least Bell's vireo	0805-0905	Sunny
7/29/2016	Laura Moreton	Least Bell's vireo	0900-0940	Mostly Sunny

Jurisdictional Wetland Delineation

A jurisdictional delineation of the project site and adjacent lands was conducted by HELIX biologist Stacy Nigro on April 26, 2016. Prior to beginning fieldwork, aerial photographs (1"=80' scale), topographic maps (1"=80' scale), and National Wetlands Inventory (NWI) maps were reviewed to assist in determining the presence or absence of potential jurisdictional areas in the project site. The delineation included two soil pits, one within the southern willow scrub and one within the mule fat scrub. The delineation was conducted to identify and map any water and wetland resources potentially subject to U.S. Army Corps of Engineers (USACE) jurisdiction pursuant to Section 404 of the Clean Water Act (CWA; 33 USC 1344), Regional Water Quality Control Board (RWQCB) jurisdiction pursuant to Section 401 of the CWA and State Porter-Cologne Water Quality Control Act, and streambed and riparian habitat potentially subject to CDFW jurisdiction pursuant to Sections 1600 *et seq.* of the California Fish and Game Code (CFG Code). The delineation was also conducted to determine the presence or absence of City Environmentally Sensitive Lands (ESL) Regulations wetlands or vernal pools. Areas generally characterized by depressions, drainage features, and riparian and wetland vegetation were evaluated.

Waters of the U.S./Waters of the State

Potential USACE wetland boundaries were determined using the three criteria (vegetation, hydrology, and soils) established for wetland delineations, as described within the Wetlands Delineation Manual (Environmental Laboratory 1987) and Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (USACE 2008).

Areas were determined to be non-wetland waters of the U.S. if there was evidence of regular surface flow (e.g., bed and bank) but either the vegetation or soils criterion was not met. Jurisdictional limits for these areas were defined by the ordinary high water mark, which is defined in 33 CFR Section 329.11 as "that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank; shelving; changes in the character of the soil; destruction of terrestrial vegetation; the presence of litter or debris; or other appropriate means that consider the characteristics of the surrounding areas."

Streambed and Riparian Habitat

Potential CDFW jurisdictional boundaries were determined based on the presence of riparian vegetation or regular surface flow. Streambeds within CDFW jurisdiction were delineated based on the definition of streambed as "a body of water that flows at least periodically or intermittently through a bed or channel having banks and supporting fish or other aquatic life. This includes watercourses having a surface or subsurface flow that supports riparian vegetation" (Title 14, Section 1.72). Riparian habitat is not defined in Title 14, but the section refers to vegetation and habitat associated with a stream. The CDFW jurisdictional habitat includes all riparian shrub or tree canopy that may extend beyond the banks of a stream.

City Wetlands

According to City of San Diego Municipal Code, Chapter 11, Section 113.0103:

"Wetlands are defined as areas which are characterized by any of the following conditions:

"1. All areas persistently or periodically containing naturally occurring wetland vegetation communities characteristically dominated by hydrophytic vegetation, including but not limited to salt marsh, brackish marsh, freshwater marsh, riparian forest, oak riparian forest, riparian woodlands, riparian scrub, and vernal pools;

"2. Areas that have hydric soils or wetland hydrology and lack naturally occurring wetland vegetation communities because human activities have removed the historic wetland vegetation or catastrophic or recurring natural events or processes have acted to preclude the establishment of wetland vegetation as in the case of salt pannes and mudflats;

“3. Areas lacking wetland vegetation communities, hydric soils, and wetland hydrology due to non-permitted filling of previously existing wetlands;

“4. Areas mapped as wetlands on Map C-713 as shown in Chapter 13, Article 2, Division 6 (Sensitive Coastal Overlay Zone).

“It is intended for this definition to differentiate for the purposes of delineating wetlands, between naturally occurring wetlands and wetlands intentionally created by human actions, from areas with wetlands characteristics unintentionally resulting from human activities in historically non-wetland areas. With the exception of wetlands created for the purpose of providing wetland habitat or resulting from human actions to create open waters or from the alteration of natural stream courses, areas demonstrating wetland characteristics, which are artificially created are not considered wetlands by this definition. Taking into account regional precipitation cycles, all adopted scientific, regulator, and technological information available from the State and Federal resource agencies shall be used for guidance on the identification of hydrophytic vegetation, hydric soils and wetland hydrology.”

The City’s Land Development Code Biology Guidelines (City 2012) describe wetlands as follows:

“Wetlands support many of the species included in the MSCP (i.e., Covered Species). The definition of wetlands in ESL is intended to differentiate uplands (terrestrial areas) from wetlands, and furthermore to differentiate naturally occurring wetland areas from those created by human activities. Except for areas created for the purposes of wetland habitat or resulting from human actions to create open waters or from the alteration of natural stream courses, it is not the intent of the City to regulate artificially created wetlands in historically non-wetland areas unless they have been delineated as wetlands by the Army Corps of Engineers, and/or the California Department of Fish and Game. For the purposes of the ESL, artificially created lakes such as Lake Hodges, artificially channeled floodways such as the Carmel Valley Restoration and Enhancement Project (CVREP), and previously dredged tidal areas such as Mission Bay should be considered wetlands under ESL. The following provides guidance for defining wetlands regulated by the City of San Diego under the Land Development Code.

“Naturally occurring wetland vegetation communities are typically characteristic of wetland areas. Examples of wetland vegetation communities include saltmarsh, brackish marsh, freshwater marsh, riparian forest, oak riparian forest, riparian woodland, riparian scrub, and vernal pools. Common to all wetland vegetation communities is the predominance of hydrophytic plant species (plants adapted for life in anaerobic soils). Many references are available to help identify and classify wetland vegetation communities; Holland (1986), revised Holland (Oberbauer 2005 and 2008), Cowardin et al. (1979), Sawyer and Keeler-Wolf (1996), and Zedler (1987). The U.S. Army Corps of Engineers Wetland Delineation Manual (1987) provides technical information on hydrophytic species.

"Problem areas can occur when delineating wetlands due to previous human activities or naturally occurring events. Areas lacking naturally occurring wetland vegetation communities are still considered wetlands if hydric soil or wetland hydrology is present and past human activities have occurred to remove the historic vegetation (e.g., agricultural grading in floodways, dirt roads bisecting vernal pools, channelized streambeds), or catastrophic or recurring natural events preclude the establishment of wetland vegetation (e.g., areas of scour within streambeds, coastal mudflats and salt pannes that are unvegetated due to tidal duration). The U.S. Army Corps of Engineers Wetland Delineation Manual (1987) provides technical information on hydric soils and wetland hydrology.

"Seasonal drainage patterns that are sufficient enough to etch the landscape (i.e., ephemeral/ intermittent drainages) may not be sufficient enough to support wetland dependent vegetation. These types of drainages would not satisfy the City's wetland definition unless wetland dependent vegetation is either present in the drainage or lacking due to past human activities. Seasonal drainage patterns may constitute 'waters of the United States' which are regulated by the Army Corps of Engineers and/or the California Department of Fish and Game.

"Areas lacking wetland vegetation communities, hydric soils and wetland hydrology due to non-permitted filling of previously existing wetlands will be considered a wetland under the ESL and regulated accordingly. The removal of the fill and restoration of the wetland may be required as a condition of project approval.

"Areas that contain wetland vegetation, soils, or hydrology created by human activities in historically non-wetland areas do not qualify as wetlands under this definition unless they have been delineated as wetlands by the Army Corps of Engineers, and/or the California Department of Fish and Game. Artificially created wetlands consist of the following: wetland vegetation growing in brow ditches and similar drainage structures outside of natural drainage courses, wastewater treatment ponds, stock watering, desiltation and retention basins, water ponding on landfill surfaces, road ruts created by vehicles and artificially irrigated areas which would revert to uplands if the irrigation ceased. Areas of historic wetlands can be assessed using historic aerial photographs, existing environmental reports (EIRs, biology surveys, etc.), and other collateral material such as soil surveys.

"Some coastal wetlands, vernal pools and riparian areas have been previously mapped. The maps, labeled C-713 and C-740 are available to aid in the identification of wetlands. Additionally, the 1":2000' scale MSCP vegetation maps may also be used as a general reference, as well as the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory maps. These maps, available for viewing at the Development Services Department, should not replace site-specific field mapping."

Least Bell's Vireo and Coastal California Gnatcatcher Surveys

Protocol least Bell's vireo (*Vireo bellii pusillus*) and coastal California gnatcatcher (*Polioptila californica californica*) surveys were conducted, and both surveys were negative. The project site is considered unoccupied by least Bell's vireo. The coastal California gnatcatcher was incidentally identified during the least Bell's vireo survey.

Survey Limitations

Noted animal species were identified by direct observation, vocalizations, or the observance of scat, tracks, or other signs. However, the lists of species identified are not necessarily comprehensive accounts of all species that utilize the project site as species that are nocturnal, secretive, or seasonally restricted may not have been observed. Those species that are of special status and have potential to occur in the project site are addressed in Attachments C and D to this report.

Nomenclature

Nomenclature follows Baldwin et al. (2012) for plants; Collins and Taggart (2006) for reptiles, American Ornithologists' Union (2016) for birds, Baker et al. (2003) for mammals, and Holland (1986) and Oberbauer (2008) for vegetation communities. Plant species status is taken from the California Native Plant Society (CNPS; 2016). Animal species status is from CDFW (2016a and b). Soils information was taken from the Natural Resources Conservation Service (NRCS; 2016).

RESULTS

Regional Context

The site is within the boundary of the City's MSCP Subarea Plan, but is not within the Multi-habitat Planning Area (MHPA). However, MHPA lands occur off site to the northeast, thus the site would be considered by the City to be adjacent to the MHPA (Figure 3). The site is located outside the Coastal Overlay Zone, and is not within any lands identified as critical habitat by the USFWS.

General Land Uses

Surrounding land uses include high-density residential immediately to the north, south, and west, and undeveloped land immediately east, transitioning to high-density residential further east. Undeveloped lands connecting to the eastern portion of the site extend north to conserved open space lands in Gonzalez Canyon and further north to the San Dieguito River valley.

Disturbance

It appears from historic aerial photos that the entire project site was subject to extensive disturbance in the late 1980s (Figure 4). The western half of the site is mostly flat and was graded and used for construction staging during development of the surrounding residential community in the mid-1990s. The past disturbance of the site was confirmed by the project's geotechnical report (GEOCON 2017) and by an on-site meeting with City staff on June 8, 2017. The western half of the site remains substantially disturbed and dominated by non-native species, while native habitat has recovered on the eastern half of the site, which is characterized primarily by native scrub communities, including wetland and upland habitat types.

Portions of the site along the northern boundary have been disturbed by adjacent landowners, who have placed a swing set, raised bed garden boxes, irrigation, tools, and other items on the property. These areas do not currently appear to be in active use.

Topography and Soils

Elevations in the project site range from approximately 300 feet above mean sea level (amsl) on the west side to 220 feet amsl on the east side. Two soil types have been mapped within the project site: Huerhuero loam, 5 to 9 percent slopes, eroded; and Terrace escarpments (NRCS 2016).

Vegetation Communities/Habitat Types

A total of 10 vegetation communities or land use types occur on the project site: southern willow scrub, mule fat scrub, southern maritime chaparral, Diegan coastal sage scrub (including disturbed), baccharis scrub, coastal sage-chaparral scrub, non-native grassland, eucalyptus woodland, disturbed land, and developed lands (Table 2; Figure 5). Seven of these are considered sensitive habitats requiring mitigation for impacts (southern willow scrub, mule fat scrub, southern maritime chaparral, Diegan coastal sage scrub [including disturbed], baccharis scrub, coastal sage-chaparral scrub, and non-native grassland). Four vegetation communities/ habitat types occur in the project site, as presented in Table 2 and shown on Figure 5. The communities/habitat types are presented in Table 2 in order by MSCP Tier.

Table 2 EXISTING VEGETATION COMMUNITIES/LAND USE TYPES		
MULTIPLE SPECIES CONSERVATION PROGRAM (MSCP) TIER[1]	VEGETATION COMMUNITY/ LAND USE TYPE	ACREAGE[2]
Wetlands		
--	Southern Willow Scrub	0.27
--	Mule Fat Scrub	0.07
	Wetlands Subtotal	**0.34**
Uplands		
II	Diegan Coastal Sage Scrub (including disturbed)	1.3
II	Baccharis Scrub	0.3
II	Coastal Sage-Chaparral Scrub	0.4
IIIA	Southern Mixed Chaparral	0.1
IIIB	Non-native Grassland	0.2
IV	Eucalyptus Woodland	0.1
IV	Disturbed Land	2.0
IV	Developed Land	<0.1
	Uplands Subtotal	**4.4**
	TOTAL	**4.8**

[1]Tiers refer to City MSCP Subarea Plan habitat classification system.
[2]Habitat rounded to the nearest 0.1 acre for uplands and 0.01 acre for wetlands; total reflects rounding.

Southern Willow Scrub

Southern willow scrub consists of dense, broadleaved, winter-deciduous stands of trees dominated by shrubby willows (*Salix* sp.) in association with mule fat (*Baccharis salicifolia*), and with scattered emergent cottonwood (*Populus fremontii*) and western sycamores (*Platanus racemosa*). This vegetation community occurs on loose, sandy or fine gravelly alluvium deposited near stream channels during flood flows. Approximately 0.27 acre of southern willow scrub occurs in the central-eastern portion of the site (Figure 5). On site, this habitat is dominated by arroyo willow (*Salix lasiolepis*), along with mule fat and pampas grass (*Cortaderia selloana*).

Mule Fat Scrub

Mule fat scrub is a depauperate, shrubby riparian scrub community dominated by mule fat and interspersed with small willows. This vegetation community occurs along intermittent stream channels with a fairly coarse substrate and moderate depth to the water table. Approximately 0.07 acre of southern willow scrub occurs on the channel slopes north of the southern willow scrub area (Figure 5). On site, this habitat is dominated by mule fat.

Southern Mixed Chaparral

Southern mixed chaparral is composed of broad-leaved sclerophyllous shrubs that can reach six to 10 feet in height and form dense often nearly impenetrable stands with poorly developed understories. In this mixed chaparral, the shrubs are generally tall and deep rooted, with a well-developed soil litter layer, high canopy coverage, low light levels within the canopy, and lower soil temperatures (Keeley and Keeley 1988). This vegetation community occurs on dry, rocky, often steep north-facing slopes with little soil. As conditions become more mesic, broad-leaved sclerophyllous shrubs that resprout from underground root crowns become dominant. Depending upon relative proximity to the coast, southern mixed chaparral is dominated by chamise (*Adenostoma fasciculatum)*, mission manzanita (*Xylococcus bicolor*), wart-stemmed ceanothus (*Ceanothus verrucosus*), Ramona lilac (*Ceanothus tomentosus*), white-stem wild-lilac (*Ceanothus leucodermis*), big-berry manzanita (*Arctostaphylos glauca*), and Nuttall's scrub oak (*Quercus dumosa*).

When classifying the chaparral that occurs on site, southern maritime chaparral was also considered as a potential vegetation classification. Southern maritime chaparral is restricted to the weathered sands within the coastal fog belt in San Diego County from La Jolla to Carlsbad with some scattered patches to the south (Holland 1986, Oberbauer 2008). This low, fairly open chaparral is typically dominated by wart-stemmed ceanothus and thick-leaved Eastwood's manzanita (*Arctostaphylos glandulosa* ssp.). Additional species include mission manzanita, chamise, Del Mar manzanita (*Arctostaphylos glandulosa* ssp. *crassifolia*), and summer holly (*Comarostaphylis diversifolia* ssp. *diversifolia*). The Biology Guidelines also list Orcutt's spineflower (*Chorizanthe orcuttiana*), sea dahlia (*Leptosyne maritima*), California aster (*Corethrogyne filaginifolia*), short-leaved dudleya (*Dudleya blochmaniae* ssp. *brevifolia*), Torrey pine (Pinus torreyana), Nuttall's scrub oak, and Encinitas baccharis (*Baccharis vanessae*) as indicator species (City 2012).

After considering both alternatives, the chaparral on site was determined to be southern mixed chaparral for the following reasons:

- It is tall, densely vegetated chaparral on a north-facing slope rather than a low- to medium-height relatively open chaparral growing on sandstone soils;

- It is dominated by a mix of characteristic southern mixed chaparral species, including chamise, lemonadeberry (*Rhus integrifolia*), bush monkeyflower (*Mimulus aurantiacus*), toyon (*Heteromeles arbutifolia*), black sage (*Salvia mellifera*), and mission manzanita.

- A single individual of summer-holly was the only maritime chaparral indicator species present, and this species is also found in mixed chaparral and sage scrub habitats. No other maritime chaparral indicator species are present in this area (e.g., Del Mar manzanita, bushrue (*Cneoridium dumosum*), wart-stemmed ceanothus, Nuttall's scrub oak, sea dahlia, Encinitas baccharis, etc.).

- The site is 3.5 miles from the ocean, near the outer limit of influence of the coastal fog belt, and the habitat composition of the chaparral is not indicative of fog-influenced maritime chaparral. Southern maritime chaparral is characterized by several endemic shrubs that are not present in the chaparral on site.

Approximately 0.1 acre of southern mixed chaparral occurs along the southern edge of the site (Figure 5).

Diegan Coastal Sage Scrub

Diegan coastal sage scrub is the widespread coastal sage scrub in coastal southern California, typically occupying xeric sites characterized by shallow soils. Approximately 1.3 acres of Diegan coastal sage scrub occurs in the central and eastern portions of the site, including disturbed Diegan coastal sage scrub toward the central-western part of the site (Figure 5). On site, this habitat is dominated by California sagebrush (*Artemisia californica*), lemonadeberry, and black sage. The disturbed areas have patchy shrub cover with the herb layer dominated by onion weed (*Asphodelus fistulosus*).

Baccharis Scrub

Baccharis scrub is an upland community recognized by resource agencies as a subtype of coastal sage scrub that develops under a variety of circumstances following Diegan coastal sage scrub disturbance. Approximately 0.3 acre of baccharis scrub occurs in the central-eastern portion of the site (Figure 5). On site, this habitat is dominated by broom baccharis (*Baccharis sarothroides*), along with mule fat and black sage.

Coastal Sage-Chaparral Scrub

Coastal sage-chaparral scrub is a mixture of sclerophyllous chaparral shrubs and drought-deciduous sage scrub species regarded as an ecotone (transition) between two vegetation communities. This community varies in species composition but always contains coastal sage and chaparral species. Approximately 0.4 acre of coastal sage-chaparral scrub occurs in the central and southeastern portions of the site (Figure 5). On site, this habitat is dominated by California sagebrush and chamise.

Non-native Grassland

Non-native grassland is characterized by a sparse to dense cover of annual grasses and is often associated with numerous species of showy-flowered, native, annual forbs. Approximately 0.2 acre of non-native grassland occurs in the eastern portion of the project site (Figure 5). On site, this habitat is dominated by foxtail chess (*Bromus madritensis*) and fascicled tarplant (*Deinandra fasciculata*).

Eucalyptus Woodland

Eucalyptus woodland is dominated by eucalyptus (*Eucalyptus* sp.), an introduced tree that has often been planted purposely for wind blocking, ornamental, and hardwood production purposes. The understory within well-established groves is usually very sparse due to the closed canopy and allelopathic nature of the abundant leaf and bark litter. Approximately 0.1 acre of eucalyptus woodland occurs in the northwestern corner of the project site (Figure 5). On site, this habitat is dominated by eucalyptus with a mixture of native and non-native plants in the understory.

Disturbed Land

Disturbed land is either unvegetated or is dominated by non-native, weedy species that are adapted to a regime of frequent disturbance (ruderal). Approximately 2.0 acres of disturbed land occur in the western and central portions of the project site (Figure 5). On site, this habitat is dominated by Russian thistle (*Salsola tragus*), redstem filaree (*Erodium cicutarium*), and onion weed.

Developed

Developed land on site consists of Lighthouse Way, which is less than 0.1 acre in the southwestern portion of the project site (Figure 5).

Flora

HELIX identified a total of 106 plant species in the project site, of which 55 (52 percent) are non-native species (Attachment A).

Fauna

A total of 48 animal species were observed or otherwise detected in the project site during the biological surveys conducted on site, including seven invertebrate, three reptile, 34 bird, and four mammal species (Attachment B).

Sensitive Vegetation Communities/Habitat Types

Sensitive vegetation communities/habitat types are defined as land that supports unique vegetation communities or the habitats of rare or endangered species or subspecies of animals or plants as defined by Section 15380 of the State CEQA Guidelines. The City's ESL and Biology Guidelines (City 2012) define sensitive biological resources as: lands included in the MHPA; wetlands; Tier IIIB and higher vegetation types; and habitat for rare, endangered, threatened, or narrow endemic species. Impacts to sensitive habitat types require compensatory mitigation at the ratios specified in Table 5.

<u>Special Status Species</u>

Special Status Plant Species

Special status plant species have been afforded special status and/or recognition by the USFWS, CDFW, and/or the City (e.g., MSCP narrow endemic species) and may also be included in the CNPS Inventory of Rare and Endangered Plants. Their status is often based on one or more of three distributional attributes: geographic range, habitat specificity, and/or population size. A species that exhibits a small or restricted geographic range (such as those endemic to the region) is geographically rare. A species may be more or less abundant but occur only in very specific habitats. Lastly, a species may be widespread but exists naturally in small populations.
Three special status plant species were observed on the project site: California adolphia (*Adolphia californica*), summer holly, and Nuttall's scrub oak.

California adolphia (*Adolphia californica*)
Listing: --/--; CRPR 2B.1
Distribution: Below 1,000 feet in elevation in western San Diego County and northwestern Baja California, Mexico
Habitat: Most often found in sage scrub but occasionally occurs in peripheral chaparral habitats, particularly hillsides near creeks. Usually associated with xeric locales where shrub canopy reaches four or five feet.
Status on site: Three individuals were observed within Diegan coastal sage scrub on a south-facing slope in the eastern portion of the site.

Summer-holly (*Comarostaphylis diversifolia* ssp. *diversifolia*)
Listing: --/--; CRPR 1B.2
Distribution: Orange, Riverside, and San Diego counties south into Baja California, Mexico
Habitat: Mesic north-facing slopes in southern mixed chaparral are the preferred habitat of this large, showy shrub. Rugged steep drainages seem to be a preferred location for isolated shrubs.
Status on site: Two individuals were observed on north-facing slopes in the southeastern portion of the site: one in southern maritime chaparral and one in coastal sage-chaparral scrub.

Nuttall's scrub oak (*Quercus dumosa*)
Listing: --/--; CRPR 1B.1
Distribution: San Diego, Orange, and Santa Barbara counties; Baja California, Mexico
Habitat: Chaparral with a relatively open canopy cover is the preferred habitat in flat terrain (also found in coastal scrub). On north-facing slopes, may grow in dense monotypic stands. Prefers sandy or clay loam soils.
Status on site: One individual was observed in Diegan coastal sage scrub in the northeastern corner of the site.

A total of 30 special status plant species known from within two miles of the site or included on the City's MSCP Narrow Endemic list were analyzed for their potential to occur within the project site (Attachment C). Aside from the three species observed on site, no special status plant species have a high potential to occur due to lack of appropriate habitat or suitable conditions.

Special Status Animal Species

Special status animal species include those that have been afforded special status and/or recognition by the USFWS, CDFW, and/or the City. In general, the principal reason an individual taxon (species or subspecies) is given such recognition is the documented or perceived decline or limitations of its population size or geographical extent and/or distribution, resulting in most cases from habitat loss.

Five special status species were observed on site in surveys to date: Belding's orange-throated whiptail (*Aspidoscelis hyperythrus beldingi*), yellow-breasted chat (*Icteria virens*), Nuttall's woodpecker (*Picoides nuttallii*), Allen's hummingbird (*Selasphorus sasin*), and coastal California gnatcatcher.

Belding's orange-throated whiptail (*Aspidoscelis hyperythrus beldingi*)
Status: --/SSC; MSCP Covered
Distribution: Southern Orange County and southern San Bernardino County, south through Baja California
Habitat(s): Coastal sage scrub, chaparral, edges of riparian woodlands, and washes. Also found in weedy, disturbed areas adjacent to these habitats. Important habitat requirements include open, sunny areas, shaded areas, and abundant insect prey base, particularly termites (*Reticulitermes* sp.).
Status on site: Observed on site during a least Bell's vireo survey conducted on July 6 on disturbed land in the middle of the site.

Yellow-breasted chat (*Icteria virens*)
Status: --/SSC
Distribution: Occurs throughout San Diego County's coastal lowlands in the breeding season.
Habitat(s): Mature riparian woodland
Status on site: Observed on site in willow scrub during the June rare plant survey.

Nuttall's woodpecker (*Picoides nuttallii*)
Status: BCC/--
Distribution: Widespread resident species in San Diego County
Habitat(s): Riparian, oak, and coniferous woodland, as well as urban landscaping
Status on site: Observed in eucalyptus trees on site.

Coastal California gnatcatcher (*Polioptila californica californica*)
Status: FT/SSC; MSCP Covered
Distribution: In San Diego County, occurs throughout coastal lowlands
Habitat(s): Coastal sage scrub

Status on site: Protocol surveys conducted during the breeding season were negative. The species was incidentally identified by call during the least Bell's vireo surveys conducted on July 19 and July 29, in baccharis scrub proposed for preservation in the eastern-central portion of the site. The potential for breeding on site is low because the habitat is likely too patchy and disturbed for this species, and the sage scrub is mostly dominated by lemonade berry and laurel sumac. California sagebrush, California buckwheat, and black sage are very limited on site. The site is considered unoccupied by breeding gnatcatchers based on the negative protocol survey; however, gnatcatchers appear to be using the project site for foraging.

Allen's hummingbird (*Selasphorus sasin*)
Status: BCC/--
Distribution: In San Diego County, most commonly observed in migration, but some do breed here.
Habitat(s): Willow scrub, ornamental vegetation, chaparral, scrub
Status on site: Observed in southern willow scrub on site during a least Bell's vireo survey conducted on July 6. The date observed is within the fall migration period for this species.

A total of 13 special status animal species known from within two miles of the site were analyzed for their potential to occur within the study area (Attachment D). No other special status animal species have a high potential to occur due to overall lack of suitable conditions.

Nesting Birds

Trees and shrubs both within and adjacent to the project site could provide suitable nesting habitat for several bird species known to the region.

Raptor Foraging

No raptors were observed or detected near the project site during the biological surveys. Raptor species that have shown the ability to adapt to suburban environments may use the site for foraging and could use on-site trees for nesting. These include red-shouldered hawk (*Buteo lineatus*; not listed or MSCP-covered) and Cooper's hawk (*Accipiter cooperi*; State Watch List and MSCP-Covered). However, the area of potential foraging habitat for raptors is very limited on site. The habitat within the study area does not provide high-quality raptor foraging habitat due to disturbance and proximity to human activity.

<u>Jurisdictional Waters and Wetlands</u>

The site supports three potential jurisdictional areas that may be regulated by the USACE, CDFW, RWQCB, and/or City. These areas include southern willow scrub and mule fat scrub habitats occurring in the eastern portion of the site within the canyon bottom, and an ephemeral stream channel in the central portion of the site (Figure 4). The stream channel originates as two smaller channels at the edge of the previously graded pad, joining into one channel approximately 75 feet down slope (east) of the graded pad.

Federal Jurisdiction

Neither of the two riparian habitat areas on site, southern willow scrub and mule fat scrub, meet the criteria to be considered USACE wetlands. As detailed in Attachment E, neither of the sampling points met the criteria for hydrophytic vegetation, hydric soils, or hydrology; however, the project site does support non-wetland waters of the U.S. Federal jurisdictional areas on the project site total 0.02 acre and 659 linear feet (Figure 5; Table 3).

Table 3
JURISDICTIONAL WATERS

JURISDICTIONAL AREAS	ACRES	LINEAR FEET
USACE		
Non-wetland Waters of the U.S.	0.02	659
USACE Total:	**0.02**	**659**
CDFW		
Non-vegetated Streambed	0.02	464
Southern Willow Scrub	0.27	31
Mule Fat Scrub	0.07	164
CDFW Total:	**0.36**	**659**

State Jurisdiction

The CDFW jurisdictional areas on site include 0.34 acre of wetland and 0.02 acre of non-vegetated streambed (Figure 5; Table 3). The length of CDFW jurisdictional areas on site totals 659 linear feet. Areas determined to be potential non-wetland waters of the U.S. under the jurisdiction of the USACE and CDFW were also determined to be potential waters of the State under the jurisdiction of the RWQCB. No isolated waters of the State were found on the site.

City ESL Wetlands

City jurisdictional wetlands on site are coterminous with CDFW jurisdictional wetlands, and include 0.34 acre of wetland (Figure 5; Table 3). The non-vegetated streambeds are not considered City wetlands because they naturally lack hydrophytic vegetation. Review of aerial photographs shows that the non-vegetated streambeds occur within historic uplands (Figure 6). Prior to development of the surrounding lots, it appears that the natural drainage course, if any, flowed from the southwest, off site, not from the on-site uplands. The non-vegetated streambeds were not visible in their present location in aerial photos from 1953 through 1981, nor was any wetland vegetation visible in that location. The watershed above the project site was and is quite limited, which likely explains the lack of visible wetland vegetation in the 1981 aerial photo. There is a drainage easement south of the site today and it is likely that the City wetland on site today is partly fed by drainage from the off-site developed area, rather than the on-site non-vegetated streambeds. It appears that they formed by erosion through disturbed land after the site was graded in the late 1980s and 1990s. The drainages connect with a City-defined wetland downstream; however, the drainages themselves formed as a result of human disturbance and have never supported hydrophytic vegetation.

No vernal pools, road pools, or seasonal ponding was observed or detected on site. The nearest known vernal pool, according to the City's Draft Vernal Pool Habitat Conservation Plan Interactive Map, is located at least 1.5 miles away, south of State Route 56.

Habitat Connectivity and Wildlife Corridors

Wildlife corridors connect otherwise isolated pieces of habitat and allow movement or dispersal of plants and animals. Local wildlife corridors allow access to resources such as food, water, and shelter within the framework of their daily routine. Regional corridors provide these functions over a larger scale and link two or more large habitat areas, allowing the dispersal of organisms and the consequent mixing of genes between populations. A corridor is a specific route that is used for the movement and migration of species, and may be different from a linkage in that it represents a smaller or narrower avenue for movement. A linkage is an area of land that supports or contributes to the long-term movement of animals and genetic exchange by providing live-in habitat that connects to other habitat areas. Many linkages occur as stepping-stone linkages that are made up of a fragmented archipelago arrangement of habitat over a linear distance.

The project site does not occur within any known corridors or linkages. The site is located at the end of a side canyon that connects north to Gonzalez Canyon. Gonzalez Canyon is designated as a MHPA by the City's MSCP and is expected to support east-west wildlife movement through the area. North-south wildlife movement would likely follow the strip of MHPA designated further to the east, along Carmel Valley Road (Figure 3). The project site itself is surrounded by homes on three sides, and the western portion of the site provides minimal resources or cover for wildlife because of past disturbance. Therefore, no corridor or linkages occur.

APPLICABLE REGULATIONS

This section provides a summary of applicable regulations to the proposed project.

Federal Government

Federal Endangered Species Act

Administered by the USFWS, the Federal Endangered Species Act (FESA) provides the legal framework for the listing and protection of species (and their habitats) that are identified as being endangered or threatened with extinction. Actions that jeopardize endangered or threatened species and the habitats upon which they rely are considered a 'take' under the FESA. Section 9(a) of the FESA defines take as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct." "Harm" and "harass" are further defined in federal regulations and case law to include actions that adversely impair or disrupt a listed species' behavioral patterns.

The USFWS designates critical habitat for endangered and threatened species. Critical habitat is defined as areas of land that are considered necessary for endangered or threatened species to recover. The ultimate goal is to restore healthy populations of listed species within their native habitats so they can be removed from the list of threatened or endangered species. Once an area is designated as critical habitat pursuant to the FESA, federal agencies must consult with the USFWS to ensure that any action they authorize, fund, or carry out is not likely to result in destruction or adverse modification of the critical habitat.

Sections 7 and 10(a) of the FESA regulate actions that could jeopardize endangered or threatened species. Section 7 generally describes a process of federal interagency consultation and issuance of a biological opinion and incidental take statement when federal actions may adversely affect listed species. Section 10(a) generally describes a process for preparation of a Habitat Conservation Plan and issuance of an incidental take permit. Pursuant to Section 10(a), the City was issued a take permit for their adopted MSCP Subarea Plan.

Migratory Bird Treaty Act

All migratory bird species that are native to the United States or its territories are protected under the federal Migratory Bird Treaty Act (MBTA), as amended under the Migratory Bird Treaty Reform Act of 2004 (FR Doc. 05-5127). The MBTA is generally protective of migratory birds but does not actually stipulate the type of protection required. In common practice, the MBTA is now used to place restrictions on disturbance of active bird nests during the nesting season; however, the City does not treat compliance with the MBTA as a mitigation measure under CEQA unless sensitive species are present. In addition, the USFWS commonly places restrictions on disturbances allowed near active raptor nests.

<u>State of California</u>

California Environmental Quality Act

Primary environmental legislation in California is found in CEQA and its implementing guidelines (State CEQA Guidelines), which require that projects with potential adverse effects (or impacts) on the environment undergo environmental review. Adverse environmental impacts are typically mitigated as a result of the environmental review process in accordance with existing laws and regulations.

California Endangered Species Act

The California Endangered Species Act (CESA) established that it is State policy to conserve, protect, restore, and enhance State endangered species and their habitats. Under State law, plant and animal species may be formally designated rare, threatened, or endangered by official listing by the California Fish and Game Commission. The CESA authorizes that private entities may "take" plant or wildlife species listed as endangered or threatened under the FESA and CESA, pursuant to a federal Incidental Take Permit if the CDFW certifies that the incidental take is consistent with CESA (CFG Code Section 2080.1[a]). For State-only listed species, Section 2081 of CFG Code authorizes the CDFW to issue an Incidental Take Permit for State listed threatened and endangered species if specific criteria are met. The City was issued a take permit for their adopted MSCP Subarea Plan pursuant to Section 2081.

California Fish and Game Code

The CFG Code provides specific protection and listing for several types of biological resources. Pursuant to CFG Code Section 3503, it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, except as otherwise provided by this code or any regulation made pursuant thereto. Raptors and owls and their active nests are protected by CFG Code Section 3503.5, which states that it is unlawful to take, possess, or destroy any birds of prey or to take, possess, or destroy the nest or eggs of any such bird unless authorized by the CDFW. Section 3513 states that it is unlawful to take or possess any migratory non-game bird as designated in the MBTA. These regulations could require that construction activities (particularly vegetation removal or construction near nests) be reduced or eliminated during critical phases of the nesting cycle unless surveys by a qualified biologist demonstrate that nests, eggs, or nesting birds will not be disturbed, subject to approval by CDFW and/or USFWS.

City of San Diego

Environmentally Sensitive Lands

Impacts to biological resources in the City must comply with the City's ESL Regulations. The purpose of the regulations is to "protect, preserve, and, where damaged restore, the environmentally sensitive lands of San Diego and the viability of the species supported by those lands." Environmentally sensitive lands (ESL) are defined to include sensitive biological resources, steep hillsides, coastal beaches, sensitive coastal bluffs, and 100-year floodplains.

The ESL regulations require impacts to wetlands be avoided unless the activities meet specific exemption criteria established in the ordinance. Impacts to City-defined wetlands require approval of deviation findings as required by ESL regulations. Impacts to wetlands must be mitigated in accordance with Section III(B)(1)(a) of the Biology Guidelines (City 2012). The ESL regulations also require that buffers be maintained around all wetlands (as appropriate) to protect their functions and values. Buffer widths may either be increased or decreased as determined on a case-by-case basis, taking into consideration the size and type of project proposed, sensitivity of the wetland resource to detrimental edge effects, topography, specific functions and values of the wetland, as well as the need for transitional upland habitat (City 2012).

In addition to restricting impacts to wetland habitats, the ESL regulations also restrict development within the MHPA, including impact avoidance areas around raptor nesting locations (specifically, Cooper's hawk, northern harrier [*Circus cyaneus*], golden eagle [*Aquila chrysaetos*], and burrowing owl [*Athene cunicularia*]) and known locations of southern pond turtle (*Clemmys marmorata pallida*), and also requires seasonal restrictions on grading where development may impact the following bird species: western snowy plover (*Charadrius alexandrinus nivosus*), southwestern willow flycatcher (*Empidonax traillii extimus*), least tern (*Sternula antillarum browni*), San Diego cactus wren (*Campylorhynchus brunneicapillus sandiegensis*), least Bell's vireo, tricolored blackbird (*Agelaius tricolor*), and coastal California gnatcatcher.

Multiple Species Conservation Program

In July 1997, the USFWS, CDFW, and City adopted the Implementing Agreement for the MSCP. This program allows the incidental take of threatened and endangered species as well as regionally-sensitive species that are conserved by it (covered species). The MSCP designates regional preserves that are intended to be mostly void of development activities, while allowing development of other areas subject to the requirements of the program. Impacts to biological resources are regulated by the City's ESL regulations.

The City's MSCP Subarea Plan has been prepared to meet the requirements of the California Natural Communities Conservation Planning Act of 1992. This Subarea Plan describes how the City's portion of the MSCP Preserve, the MHPA, will be implemented.

ANALYSIS OF PROJECT EFFECTS

An analysis of project effects is presented below in accordance with the City's CEQA Significance Determination Thresholds (City 2011).

ISSUE 1 – SPECIAL STATUS SPECIES

Would the project have a substantial adverse impact, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in the MSCP or other local or regional plans, policies or regulations, or by CDFW or USFWS?

Issue 1 Impact Analysis

No federally or state listed endangered or threatened plant or animal species are known to breed within the project site, and none are expected to be impacted by the project. A protocol survey conducted in 2016 was negative and the site is considered unoccupied by least Bell's vireo. Any noise impacts to breeding coastal California gnatcatchers located in the offsite MHPA would be considered potentially significant.

Project development has been intentionally planned for the more disturbed western portion of the site, and avoids impacts to summer holly and Nuttall's scrub oak; however, the project would impact one plant species listed as sensitive by the CNPS: California adolphia. The project would impact one individual California adolphia plant, which has a Rare Plant Rank of 2B.1. This species is known to occur at multiple locations in the area, including within MHPA. Because the species occurs within preserved lands nearby, the impact to one individual plant will not have a substantial adverse impact on the species, and is not considered significant. No other special status plant species have a high potential to occur on site due to lack of suitable habitat; none are expected to be impacted by the project.

Nuttall's woodpecker, a Bird of Conservation Concern, was observed on site in eucalyptus woodland. According to the San Diego County Bird Atlas, this species is San Diego County's most widespread woodpecker, a common permanent resident in riparian, oak, and coniferous woodland, as well as urban landscaping (Unitt 2004). The proposed impacts to habitat supporting Nuttall's woodpecker will not have a substantial adverse impact on the species, and are not considered significant.

Allen's hummingbird, a Bird of Conservation Concern, was observed on site in the southern willow scrub. According to the San Diego County Bird Atlas, this species is most commonly observed in migration in San Diego County, although it has been observed breeding in San Diego County since 2001 (Unitt 2004). This species migrates early, and the individual observed in July was likely on its fall migration. The area where the species was observed will be preserved in open space, and the project will not have a substantial adverse impact on the species.

In addition, one species listed as a State Species of Special Concern was observed on site during a rare plant survey conducted on June 21: yellow-breasted chat. The observation occurred during the breeding season; however, this species was not observed in subsequent gnatcatcher or vireo surveys, and is presumed not to be nesting on site. The yellow-breasted chat occurs widely in San Diego County's coastal lowland wherever there is substantial riparian woodland, particularly in the northwestern part of the County. The proposed impacts to habitat supporting yellow-breasted chat will not have a substantial adverse impact on the species, and are not considered significant.

The federally threatened Coastal California gnatcatcher was incidentally identified by call during the least Bell's vireo surveys conducted on July 19 and July 29, 2016; however, protocol surveys conducted during the breeding season were negative, meaning the site was not occupied by breeding coastal California gnatcatcher. The gnatcatcher identified during the vireo survey was likely a young individual dispersing through the area. The species was heard in baccharis scrub proposed for preservation in the eastern-central portion of the site. The potential for breeding on site is low because the habitat is likely too patchy and disturbed for this species, and the sage scrub is mostly dominated by lemonade berry and laurel sumac. The area where the species was observed is located outside the MHPA and it will be preserved in open space; however, indirect impacts could occur to breeding gnatcatchers in the MHPA if construction occurred during the breeding season. Because the site is located adjacent to the MHPA, implementation of Mitigation

Measure **BIO-2** would ensure that no indirect impacts occur to breeding coastal California gnatcatchers within the off-site MHPA during project construction.

The Belding's orange-throated whiptail, a State Species of Special Concern, was observed on site within the proposed impact area during the least Bell's vireo survey conducted on July 6, 2016. This species is considered adequately conserved by the MSCP because 59 percent of its potential habitat and 62 percent of known point occurrences will be conserved through implementation of the MSCP. Impacts to the orange-throated whiptail and other sensitive animal species with potential to occur would be considered less than significant with the implementation of the habitat-based mitigation described in Issue 2.

Conclusions

Less Than Significant with Mitigation. Project implementation could result in potentially significant indirect impacts to nesting coastal California gnatcatchers if they occur in the MHPA within 500 feet of the site. Potentially significant impacts could result from construction noise. Implementation of mitigation measure **BIO-2** would reduce impacts to less than significant.

ISSUE 2 – RIPARIAN HABITAT AND SENSITIVE NATURAL COMMUNITIES

Would the project have a substantial adverse impact on any Tier I Habitats, Tier II Habitats, Tier IIIA Habitats, or Tier IIIB Habitats as identified in the Biology Guidelines of the Land Development manual or other sensitive natural community identified in local or regional plans, policies, regulations, or by the CDFW or USFWS?

Issue 2 Impact Analysis

The project would result in a total of 0.1 acre of permanent, direct impacts to Southern Mixed Chaparral, a Tier IIIA habitat, outside of the MHPA (Figure 7; Table 4). Impacts are considered significant and must be mitigated at a 0.5:1 ratio if the mitigation occurs within the MHPA or a 1:1 ratio if the mitigation occurs outside of the MHPA. Implementation of mitigation measure **BIO-1** would reduce the impact on Tier IIIA habitat to a less than significant level.

Table 4
HABITAT IMPACTS

VEGETATION COMMUNITY	TIER	IMPACTS (ac)
Southern Willow Scrub	wetland	0
Mule Fat Scrub		0
Diegan Coastal Sage Scrub (including disturbed)	II	0.5
Baccharis Scrub		0.1
Coastal Sage-Chaparral Scrub		0.1
Southern Mixed Chaparral	IIIA	0.1
Eucalyptus Woodland	IV	0.1
Disturbed Land		2.0
Developed Land		<0.1
	TOTAL	**2.9**

The project would result in a total of 0.7 acre of permanent, direct impacts to Tier II habitat outside of MHPA (Figure 7; Table 4). Impacts are significant and must be mitigated at a 1:1 ratio if the mitigation occurs within the MHPA or a 1.5:1 ratio if the mitigation occurs outside of the MHPA. Implementation of mitigation measure **BIO-1** would reduce the impact to Tier II habitat to a less than significant level.

Conclusion

Less Than Significant with Mitigation. The project would result in significant impacts to Tier II and Tier IIIA habitat; however, mitigation measures to fully compensate the loss of habitat would reduce impacts to below a level of significance. Mitigation is proposed at ratios consistent with those required by the City and Wildlife Agencies. With the implementation of mitigation measure **BIO-1**, impacts on Tier II and Tier IIIA habitats would be reduced to less than significant.

ISSUE 3 – JURISDICTIONAL WETLANDS AND WATERWAYS

Would the project have a substantial adverse impact on wetlands (including, but not limited to, marsh, vernal pool, riparian, etc.) through direct removal, filling, hydrological interruption, or other means?

Issue 3 Impact Analysis

The project would not result in direct impacts to federally-, state-, or City-protected wetlands or vernal pools since the impact footprint completely avoids southern willow scrub and mule fat scrub and no vernal pools occur on site. The project would provide a minimum 125-foot buffer between the wetlands and the edge of the nearest residential pad. The 30-60 feet closest to the wetland would be made up of existing native habitat, avoided by the project and preserved by a dedicated biological open space easement. The remaining 60-110 feet includes a bio-retention basin and a proposed 2:1 slope, which would be planted with coastal sage scrub and other non-invasive species. The entire slope would be irrigated per Brush Management Zone (BMZ) 1 requirements and the central portion of the slope would be maintained per BMZ 1 requirements by the Homeowner's Association (HOA).

The native and non-invasive planting in the buffer will provide adjacent upland habitat that helps support wildlife foraging by species that utilize the riparian area. The residential pads will be grade-separated and located above the drainage area where the riparian habitat is rooted. The proposed landscape planting will provide screening between the homes and the riparian area. This will provide transitional habitat and deter people from accessing the wetland. The slope will incorporate erosion control best management practices per the City's standards to prevent erosion into the wetland. Runoff from the residential pads will be directed into a bio-retention basin for treatment before flowing into the existing channel, thus maintaining the water supply to the wetland and improving its quality. Runoff from the proposed cul-de-sac will the directed into a bio-retention swale for treatment, then the clean water will flow through a created stream channel into the existing channel. The proposed wetland buffer meets the City's requirement to protect the functions and values of the avoided wetland.

It is noted that although jurisdictional wetlands have been avoided, the project would impact 381 linear feet of CDFW- and USACE-jurisdictional non-vegetated streambed. Because the width of CDFW jurisdiction is wider than USACE jurisdiction, the project would impact 0.01 acre of non-wetland waters of the U.S. and 0.02 acre of CDFW non-vegetated streambed (Table 4, Figure 7). A Streambed Alteration Agreement would be required for impacts to 0.02 acre of CDFW jurisdictional waters pursuant to Section 1600 *et seq.* of the California Fish and Game Code. The project would require a Section 404 permit from the USACE and a Section 401 Certification from the RWQCB for impacts to 0.01 acre of USACE jurisdiction.

The project proposes to create a stream channel on site to meet anticipated RWQCB mitigation requirements. The created channel will flow down the graded slope from the project's bio-retention swale into the existing non-vegetated channel at the edge of the biological open space. The final details of mitigation for jurisdictional impacts will be determined in consultation with the regulatory agencies as part of regulatory permitting prior to issuance of permits by the City.

Conclusion

Less Than Significant. The project would not result in impacts to federally-, state-, or City-protected wetlands, an adequate buffer would be provided, and no mitigation for wetlands is required.

ISSUE 4 – WILDLIFE MOVEMENT AND NURSERY SITES

Would the project interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, including linkages identified in the MSCP Plan, or impede the use of native wildlife nursery sites?

Issue 4 Impact Analysis

Less Than Significant. The project would not impede the movement of any native, resident, or migratory fish or wildlife species or interfere with established native, resident, or migratory wildlife corridors. In addition, the project would not interfere with linkages identified in the MSCP Plan or use of native wildlife nursery sites. The project is surrounded on three sides by residential development. Impacts are considered less than significant and no mitigation is required.

ISSUE 5 – ADOPTED PLANS

Would the project conflict with the provisions of an adopted Habitat Conservation Plan, Natural Conservation Community Plan, or other approved local, regional, or state habitat conservation plan, either within the MSCP plan area or in the surrounding region?

Issue 5 Impact Analysis

As stated above, the project would result in potential significant impacts to special status species and significant impacts to Tier II and Tier IIIA habitat. The project is located within the adopted City MSCP Subarea Plan, outside of MHPA. Implementation of mitigation measures **BIO-1** through **BIO-3** would ensure project consistency with the adopted City MSCP Subarea Plan. No other adopted Habitat Conservation Plan, Resource Management Plan, Special Area Management Plan, Watershed Plan, or other regional planning efforts are applicable to the project. The MSCP Subarea Plan also includes Area Specific Management Directives for the two MSCP covered species observed on site: Belding's orange-throated whiptail and coastal California gnatcatcher. For the orange-throated whiptail, "Area specific management directives must address edge effects." For the coastal California gnatcatcher, "Area specific management directives must include measures to reduce edge effects and minimize disturbance during the nesting period, fire protection measures to reduce the potential for habitat degradation due to unplanned fire, and management measures to maintain or improve habitat quality including vegetation structure. No clearing of occupied habitat within the cities' MHPAs and within the County's Biological Resource Core Areas may occur between March 1 and August 15."

The project design minimizes edge effects as detailed in the Land Use Adjacency analysis below. The project includes Brush Management Zones as required by the City for fire protection. Implementation of mitigation measure **BIO-2** will also minimize disturbance during the nesting period and ensure that occupied habitat within the MHPA is not cleared during the gnatcatcher breeding season. The planting of the slope adjacent to the on-site open space will improve habitat quality on site, and the habitat preserved according to mitigation measure **BIO-1** will receive ongoing management and monitoring by the City according to the City's MSCP Framework Management Plan and area specific management directives. Finally, the on-site open space will be permanently protected by easement recordation per mitigation measure **BIO-3**. Therefore, the MSCP covered species observed on site will be conserved in conformance with the MSCP.

Conclusion

Less Than Significant with Mitigation. The project would result in potentially significant impacts to special status species and significant impacts to Tier II and Tier IIIA habitat; however, mitigation measures to fully compensate the loss of habitat and conserve covered species in accordance with the City's MSCP requirements would reduce impacts to below a level of significance. Mitigation is proposed at ratios consistent with those required by the City. With the implementation of mitigation measures **BIO-1** through **BIO-3**, the project would be consistent with the adopted City MSCP Subarea Plan.

ISSUE 6 – LAND USE ADJACENCY

Would the project introduce land use within an area adjacent to the MHPA that would result in adverse edge effects?

Issue 6 Impact Analysis

The northeast corner of the project is located approximately 30 feet from the MHPA, and, therefore, the project is subject to MHPA Land Use Adjacency Guidelines designed to minimize indirect impacts to sensitive resources contained in the MHPA and thus maintain the value of the preserve. By conforming to the Land Use Adjacency Guidelines, the project addresses edge effects as required by the Area Specific Management Directives for the MSCP covered species observed on site. The adjacency guidelines related to potential indirect impacts are listed below, along with a response as to how the proposed project conforms to each guideline:

Drainage

All new and proposed development adjacent to the MHPA must not drain directly into the preserve, and must prevent the release of toxins, chemicals, petroleum products, exotic plant materials, and other elements that might degrade or harm the natural environment or ecosystem processes within the MHPA.

Implementation of best management practices during construction, as well as compliance with City landscape regulations in the landscape design, would prevent drainage from the project directly into the MHPA. The proposed project includes bio-retention basins to prevent discharges of untreated storm water into the on-site channel that flows into the MHPA.

Toxins

Land uses such as recreation and agriculture that use chemicals or generate byproducts that are potentially toxic or harmful to wildlife, habitat, or water quality must incorporate measures to reduce the impact of application or drainage of such materials into the MHPA.

The proposed land use is residential, and the nearest landscaped area is approximately 300 feet from the MHPA. The landscaped slopes would be maintained by the HOA, and any chemicals would be applied following applicable laws and requirements to reduce their potential impact on the proposed biological open space or drainage into the MHPA.

Lighting

Lighting must be directed away from the MHPA and if necessary adequately shielded to protect the MHPA and sensitive species from night lighting.

Residential development is not a land use that is expected to produce excessive light spill. In addition, the nearest residential pad that would include lighting is approximately 500 feet from the MHPA, and there are existing homes closer to the MHPA already. Therefore, the project would not introduce night lighting to the MHPA.

Noise

Uses adjacent to the MHPA must be designed to minimize noise that might impact or interfere with wildlife utilization of the MHPA.

The off-site MHPA within 500 feet of the impact area has marginal potential to support breeding coastal California gnatcatchers. Potential impacts of construction noise on gnatcatchers would be avoided by implementation of mitigation measure **BIO-2**. The nearest residential pad that could generate noise is approximately 500 feet from the MHPA, and there are existing homes closer to the MHPA already. Noise generated by residential use of backyards is not expected to have a significant impact because human voices do not appreciably increase noise levels. Therefore, the project would not have construction-phase or operational noise impacts that would impact or interfere with wildlife utilization of the MHPA.

Barriers to Incursion

New development adjacent to the preserve may be required to provide barriers along MHPA boundaries to redirect public access to appropriate locations and reduce domestic animal predation in the preserve.

The MHPA boundary is located beyond the limits of the project site; however, the residential pad edges adjacent to the open space will be fenced to restrict access and reduce domestic animal predation in the preserve. To the east of the fence there will be a fill slope planted with coastal sage scrub species to serve as a buffer between the proposed development and the open space. The proposed 2:1 slope and retaining walls will provide 40 feet of vertical separation and 65-150 feet of horizontal separation between the residential backyards and the open space, minimizing the amount of light and noise entering the open space, and discouraging residents and domestic animals from entering the open space.

Invasive Species

No invasive plant species shall be introduced into areas adjacent to the MHPA.

The part of the site adjacent to the MHPA will be preserved in biological open space, and no planting or landscaping will occur in that area. In addition, the graded slopes adjacent to the biological open space will be planted with native and non-invasive species, and will not include invasive plant species.

Brush Management

New residential development located adjacent to and topographically above the MHPA must be set back from slope edges to incorporate Zone 1 brush management areas on the development pad and outside of the MHPA. Zone 2 may be located in the MHPA upon granting of an easement to the City (or other acceptable agency) except where narrow wildlife corridors require it to be located outside of the MHPA.

Brush management Zone 1 would be included in the proposed development area of the project, and would not extend into the biological open space or the MHPA.

Grading/Land Development

Manufactured slopes associated with project development must be included in the project footprint.

No manufactured slopes associated with the proposed project would extend into the MHPA. All manufactured slopes are included in the impact calculations.

Conclusion

Less Than Significant. The project is consistent with the MHPA Land Use Adjacency Guidelines and would not result in significant impacts related to MHPA adjacency.

ISSUE 7 – LOCAL POLICIES OR ORDINANCES

Would the project conflict with any local policies or ordinances protecting biological resources?

Issue 7 Impact Analysis

As described above, the project has been specifically designed to minimize impacts to biological resources addressed in the City's MSCP Subarea Plan and Land Development Code. Mitigation measures **BIO-1** through **BIO-3** would ensure that the project is consistent with the MSCP and that impacts to species and habitats are mitigated in accordance with Land Development Code and City Biology Guidelines requirements. Implementation of mitigation measures **BIO-1** through **BIO-3** would ensure project consistency with the MSCP and Land Development Code pertaining to biological resources.

Conclusion

Less Than Significant with Mitigation. The project could result in significant impacts to species and habitats addressed in the City's MSCP Subarea Plan and Land Development Code. Implementation of mitigation measures **BIO-1** through **BIO-3** would reduce impacts to less than significant.

ISSUE 8 – INVASIVE SPECIES

Would the project result in an introduction of invasive species of plants into a natural open space area?

Issue 8 Impact Analysis

The project would not result in the introduction of invasive species of plants into a natural open space area. The project area is surrounded by urban development and non-native plant species are prevalent on adjacent lands. Furthermore, any landscaping associated with the project would not include plant species identified as invasive by the California Invasive Plant Council. The landscaping on the graded slope adjacent to the open space will include native species that are allowed by fire code regulations.

Conclusion

Less Than Significant. The project would not result in the introduction of invasive species of plants into a natural open space area, thus no significant impact would occur.

MITIGATION AND MONITORING REQUIREMENTS

The following Mitigation Measures shall be implemented in order to reduce potential impacts from the Lighthouse Ridge project to below the level of significance.

Mitigation for Impacts to Sensitive Upland Habitats

Implementation of Mitigation Measure **BIO-1** would reduce the impacts to Tier II and Tier IIIA habitat to below the level of significance (Table 5).

BIO-1 Compensatory Mitigation: The project applicant shall provide payment into the City of San Diego Habitat Acquisition Fund (HAF) at a 1:1 mitigation ratio for impacts to 0.7 acre of Tier II habitat and at a 0.5:1 mitigation ratio for impacts to 0.1 acre of Tier IIIA habitat, for a total of 0.75 acre of HAF credit.

Table 5
SENSITIVE HABITAT IMPACTS AND MITIGATION

VEGETATION COMMUNITY	TIER	IMPACTS (ac)	MITIGATION RATIO†	PROPOSED MITIGATION (ac)
Diegan Coastal Sage Scrub (including disturbed)	II	0.5	1:1	0.5
Baccharis Scrub		0.1		0.1
Coastal Sage-Chaparral Scrub		0.1		0.1
Southern Mixed Chaparral	IIIA	0.1	0.5:1	0.05
TOTAL		**0.8**		**0.75**

†Mitigation ratios assume that mitigation occurs off site through the HAF program (inside MHPA).

According to the Guidelines, the HAF is intended to be used only for the mitigation of impacts to small, isolated sites with lower long-term conservation value (City 2012). Payment into the HAF is acceptable as mitigation approach for the impacted Tier II and Tier IIIA habitat because the site is less than five acres in size, which qualifies as small under the guidelines. The site is isolated because it is surrounded by development on three sides, except for a narrow strip of open space on the southeast side of the site. The site is separated from MHPA by approximately 30 feet at the closest point, the northeast corner. Although the on-site open space has a tenuous connection to conserved open space lands in Gonzalez Canyon and further north to the San Dieguito River valley, the connection is narrow and the site is located at the very upper end of the canyon with no connectivity to the southwest. The small size and isolation of the site means that it has lower long-term conservation value compared to mitigation within the HAF, which preserves MHPA lands selected for their sensitivity and connectivity.

Biological Resource Protection During Construction

Implementation of Mitigation Measure **BIO-2** would reduce potential impacts from construction to below the level of significance.

BIO-2 Prior to the issuance of any grading permit, the City Manager (or appointed designee) shall verify that the following project requirements are shown on the construction plans:

I. Prior to Construction

A. **Biologist Verification** – The owner/permittee shall provide a letter to the City's Mitigation Monitoring Coordination (MMC) section stating that a Project Biologist (Qualified Biologist), as defined in the City of San Diego's Biological Guidelines (2012), has been retained to implement the project's biological monitoring program. The letter shall include the names and contact information of all persons involved in the biological monitoring of the project.

B. **Preconstruction Meeting** – The Qualified Biologist shall attend the preconstruction meeting, discuss the project's biological monitoring program, and arrange to perform any follow up mitigation measures and reporting including site-specific monitoring, restoration, or revegetation, and additional fauna/flora surveys/salvage.

C. **Biological Documents** – The Qualified Biologist shall submit all required documentation to MMC verifying that any special mitigation reports including but not limited to, maps, plans, surveys, survey timelines, or buffers are completed or scheduled per City Biology Guidelines, MSCP, ESL Ordinance, project permit conditions, CEQA, endangered species acts, and/or other local, state, or federal requirements.

D. **Biological Construction Mitigation/Monitoring Exhibit** – The Qualified Biologist shall present a Biological Construction Mitigation/Monitoring Exhibit (BCME), which includes the biological documents in C above. In addition, it includes: restoration/revegetation plans, plant salvage/relocation requirements (e.g., coastal cactus wren plant salvage, burrowing owl exclusions, etc.), avian or other wildlife surveys/survey schedules (including general avian nesting and USFWS protocol), timing of surveys, wetland buffers, avian construction avoidance areas/noise buffers/barriers, other impact avoidance areas, and any subsequent requirements determined by the Qualified Biologist and the City ADD/MMC. The BCME shall include a site plan, written and graphic depiction of the project's biological mitigation/monitoring program, and a schedule. The BCME shall be approved by MMC and referenced in the construction documents.

E. **Coastal California Gnatcatcher Protection Requirement** – No clearing, grubbing, grading, or other construction activities shall occur between March 1 and August 15, the breeding season of the coastal California gnatcatcher, until the following requirements have been met to the satisfaction of the City Manager:

A Qualified Biologist (possessing a valid Endangered Species Act Section 10(a)(1)(A) Recovery Permit) shall survey those habitat areas within the MHPA that would be subject to construction noise levels exceeding 60 decibels [dB(A)] hourly average for the presence of the coastal California gnatcatcher. Surveys for the coastal California gnatcatcher shall be conducted pursuant to the protocol survey guidelines established by the USFWS within the breeding season prior to the commencement of any construction. If gnatcatchers are present, then the following conditions must be met:

I. Between March 1 and August 15, no clearing, grubbing, or grading of occupied gnatcatcher habitat shall be permitted. Areas restricted from such activities shall be staked or fenced under the supervision of a Qualified Biologist; and

II. Between March 1 and August 15, no construction activities shall occur within any portion of the site where construction activities would result in noise levels exceeding 60 dB(A) hourly average at the edge of occupied gnatcatcher habitat. An analysis showing that noise generated by construction activities would not exceed 60 dB(A) hourly average at the edge of occupied habitat must be completed by a qualified acoustician (possessing current noise engineer license or registration with monitoring noise level experience with listed animal species) and approved by the City Manager at least two weeks prior to the commencement of construction activities. Prior to the commencement of construction activities during the breeding season, areas restricted from such activities shall be staked or fenced under the supervision of a Qualified Biologist; or

III. At least two weeks prior to the commencement of construction activities, under the direction of a qualified acoustician, noise attenuation measures (e.g., berms, walls) shall be implemented to ensure that noise levels resulting from construction activities will not exceed 60 dB(A) hourly average at the edge of habitat occupied by the coastal California gnatcatcher. Concurrent with the commencement of construction activities and the construction of necessary noise attenuation facilities, noise monitoring* shall be conducted at the edge of the occupied habitat area to ensure that noise levels do not exceed 60 dB(A) hourly average. If the noise attenuation techniques implemented are determined to be inadequate by the qualified acoustician or biologist, then the associated construction activities shall cease until such time that adequate noise attenuation is achieved or until the end of the breeding season (September 16).

** Construction noise monitoring shall continue to be monitored at least twice weekly on varying days, or more frequently depending on the construction activity, to verify that noise levels at the edge of occupied habitat are maintained below 60 dB(A) hourly average or to the ambient noise level if it already exceeds 60 dB(A) hourly average. If not, other measures shall be implemented in consultation with the biologist and the City Manager, as necessary, to reduce noise levels to below 60 dB(A) hourly average or to the ambient noise level if it already exceeds 60 dB(A) hourly average. Such measures may include, but are not limited to, limitations on the placement of construction equipment and the simultaneous use of equipment.*

If coastal California gnatcatchers are not detected during the protocol survey, the Qualified Biologist shall submit substantial evidence to the City Manager and applicable Resource Agencies that demonstrates whether or not mitigation measures, such as noise walls, are necessary between March 1 and August 15 as follows:

I. If this evidence indicates the potential is high for coastal California gnatcatcher to be present based on historical records or site conditions, then condition III shall be adhered to as specified above.

II. If this evidence concludes that no impacts to this species are anticipated, no mitigation measures would be necessary.

F. **Resource Delineation** – Prior to construction activities, the Qualified Biologist shall supervise the placement of orange construction fencing or equivalent along the limits of disturbance adjacent to sensitive biological habitats and verify compliance with any other project conditions as shown on the BCME. This phase shall include flagging plant specimens and delimiting buffers to protect sensitive biological resources (e.g., habitats/flora and fauna species, including nesting birds) during construction. Appropriate steps/care should be taken to minimize attraction of nest predators to the site.

G. **Education** – Prior to commencement of construction activities, the Qualified Biologist shall meet with the owner/permittee or designee and the construction crew and conduct an on-site educational session regarding the need to avoid impacts outside of the approved construction area and to protect sensitive flora and fauna (e.g., explain the avian and wetland buffers, flag system for removal of invasive species or retention of sensitive plants, and clarify acceptable access routes/methods and staging areas, etc.).

II. During Construction

A. **Monitoring** – All construction (including access/staging areas) shall be restricted to areas previously identified, proposed for development/staging, or previously disturbed as shown on "Exhibit A" and/or the BCME. The Qualified Biologist shall monitor construction activities as needed to ensure that construction activities do not encroach into biologically sensitive areas, or cause other similar damage, and that the work plan has been amended to accommodate any sensitive species located during the pre-construction surveys. In addition, the Qualified Biologist shall document field activity via the Consultant Site Visit Record (CSVR). The CSVR shall be e-mailed to MMC on the first day of monitoring, the first week of each month, the last day of monitoring, and immediately in the case of any undocumented condition or discovery.

B. **Subsequent Resource Identification** – The Qualified Biologist shall note/act to prevent any new disturbances to habitat, flora, and/or fauna on site (e.g., flag plant specimens for avoidance during access, etc.). If active nests or other previously unknown sensitive resources are detected, all project activities that directly impact the resource shall be delayed until species specific local, state, or federal regulations have been determined and applied by the Qualified Biologist.

III. Post Construction Measures

A. In the event that impacts exceed previously allowed amounts, additional impacts shall be mitigated in accordance with City Biology Guidelines, ESL and MSCP, State CEQA, and other applicable local, state, and federal law. The Qualified Biologist shall submit a final BCME/report to the satisfaction of the City ADD/MMC within 30 days of construction completion.

Implementation of Mitigation Measure **BIO-3** would ensure long-term protection of sensitive habitats on site.

BIO-3 Covenant of Easement: The project applicant shall preserve 1.8 acres of habitat on site as shown on the Tentative Map, including 1.2 acres of Tier II, 0.34 acre of wetlands, and 0.2 acre of Tier IIIB habitat. Preserved lands on the Lighthouse Ridge project site would be protected by placement of a covenant of easement to ensure long term protection. This would ensure protection in perpetuity of those lands outside of the development area of the property.

Please do not hesitate to contact me or Tom Huffman at (619) 462-1515 if you have any questions or require further assistance.

Sincerely,

Beth Ehsan

Beth Ehsan
Biology Project Manager

Enclosures:

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Figure 2	Project Vicinity (USGS Topography)
Figure 3	Project Vicinity (Aerial Photograph)
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Attachment B	Animal Species Observed or Detected
Attachment C	Sensitive Plant Species with Potential to Occur
Attachment D	Sensitive Animal Species with Potential to Occur
Attachment E	Jurisdictional Delineation Data Sheets

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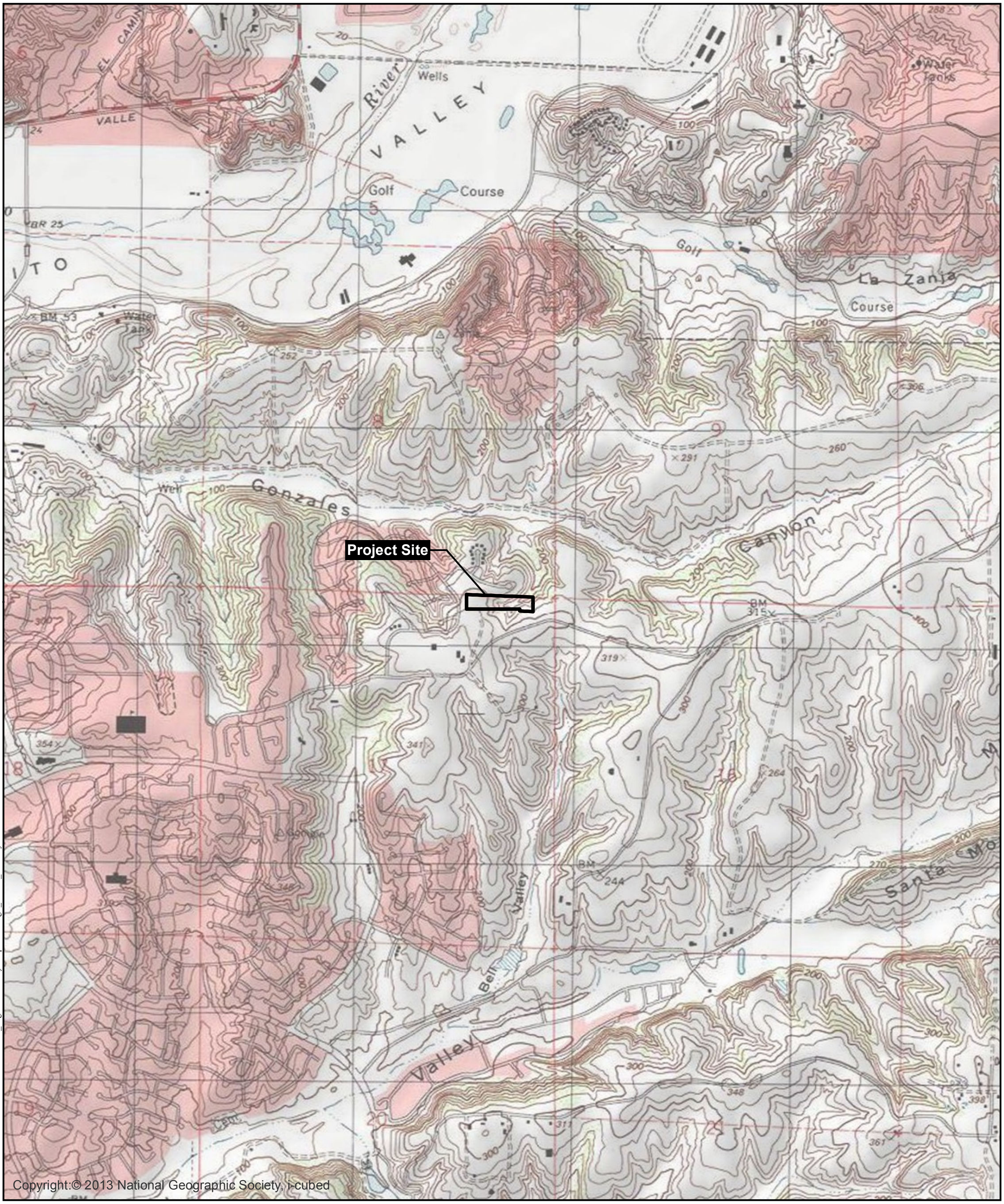
Regional Location Map

LIGHTHOUSE RIDGE

HELIX Environmental Planning

N 0 8 Miles

Figure 1



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Project Vicinity (USGS Topography)

LIGHTHOUSE RIDGE

HELIX Environmental Planning

0 2,000 Feet

Figure 2

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Project Vicinity (Aerial Photograph)

LIGHTHOUSE RIDGE

HELIX Environmental Planning

0 2,000 Feet

Figure 3

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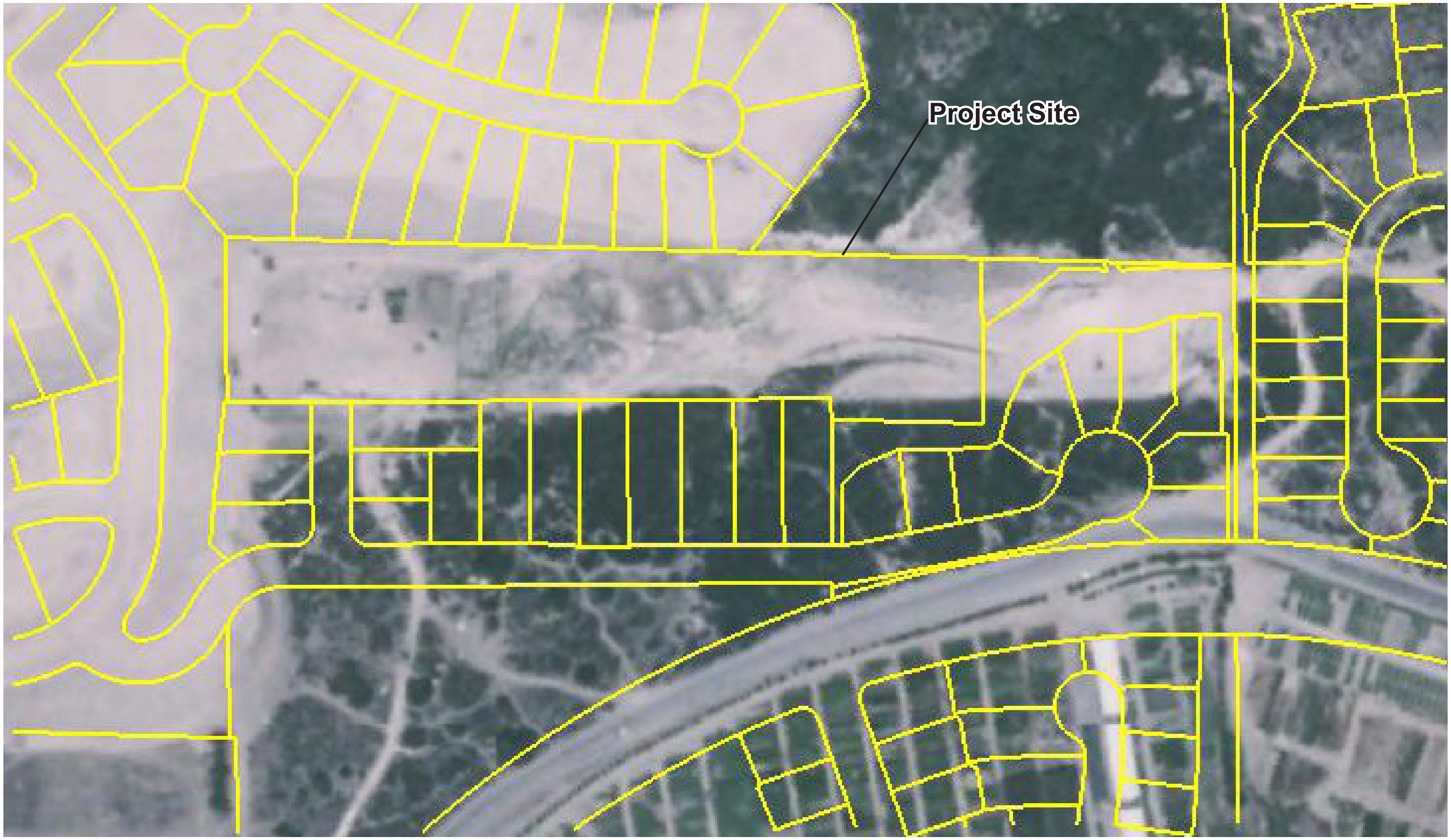


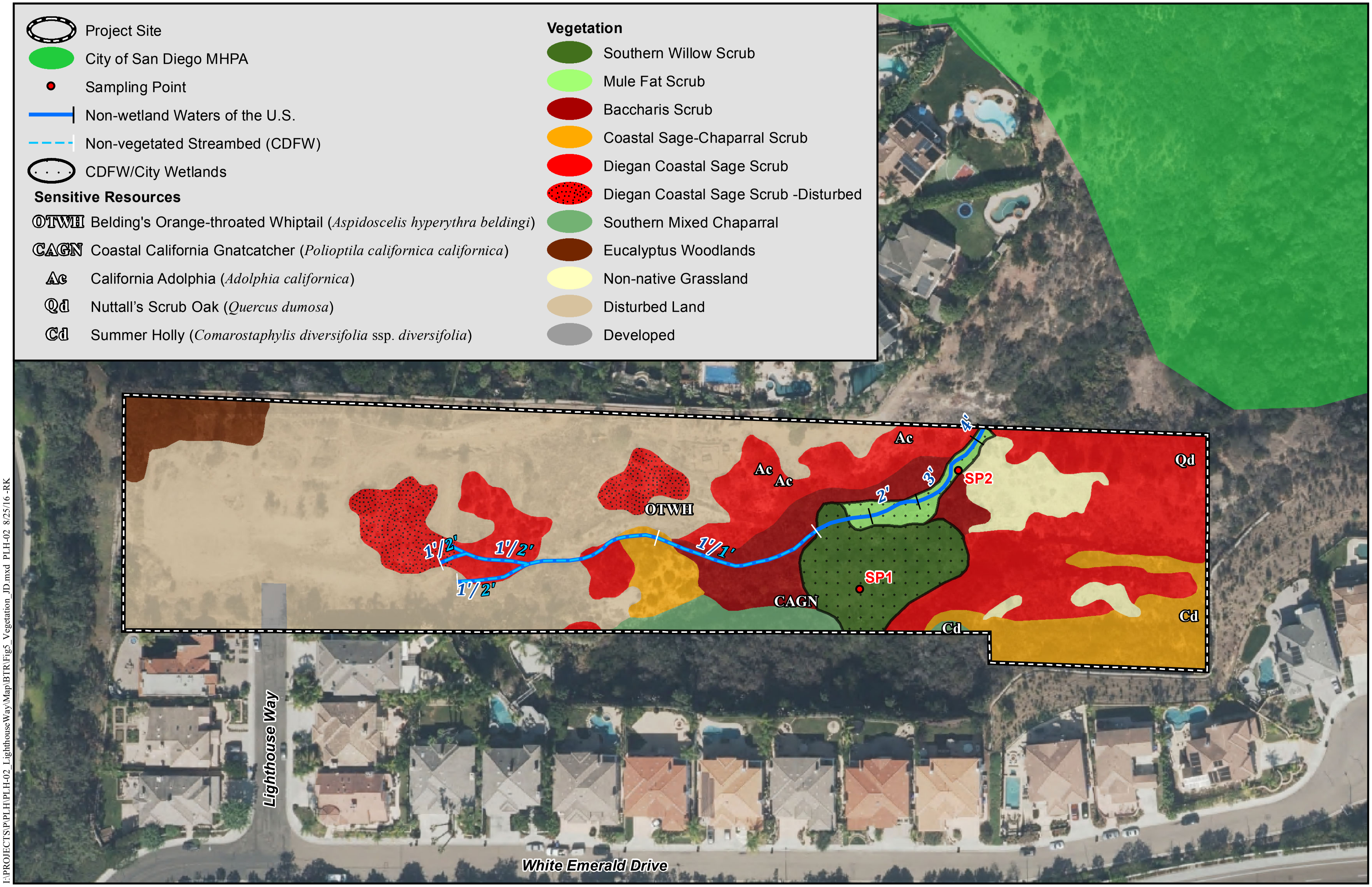
Source: HistoricAerials.com and Latitude 33

1989 Aerial Photo

LIGHTHOUSE RIDGE

HELIX
Environmental Planning

Figure 4



Vegetation and Jurisdictional Features

LIGHTHOUSE RIDGE

HELIX Environmental Planning

Figure 5

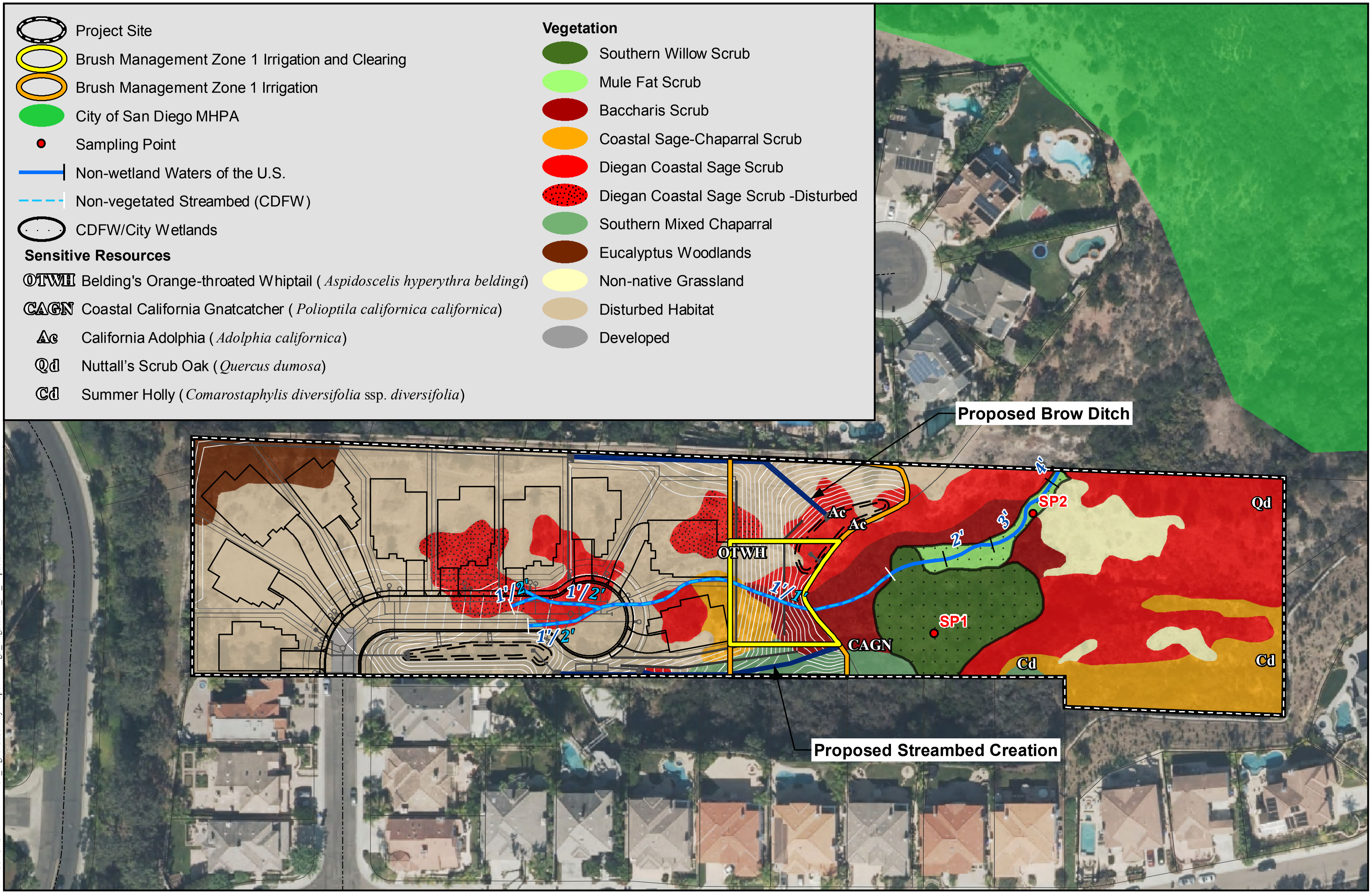
Source: HistoricAerials.com and Latitude 33

1981 Aerial Photo

LIGHTHOUSE RIDGE

Figure 6

HELIX
Environmental Planning



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Vegetation and Jurisdictional Features/Impacts

LIGHTHOUSE RIDGE

HELIX Environmental Planning

N 0 125 Feet

Figure 7

Attachment A
PLANT SPECIES OBSERVED

FAMILY	SCIENTIFIC NAME	COMMON NAME
Adoxaceae	*Sambucus nigra* ssp. *canadensis*	black elderberry
Agavaceae	*Chlorogalum parviflorum*	small-flower soap-plant
	Hesperoyucca whipplei	Our Lord's candle
Aizoaceae	*Carpobrotus edulis**	hottentot-fig
	*Mesembryanthemum crystallinum**	crystalline iceplant
Anacardiaceae	*Malosma laurina*	laurel sumac
	Rhus integrifolia	lemonadeberry
Apiaceae	*Foeniculum vulgare**	fennel
Apocynaceae	*Nerium oleander**	oleander
Arecaceae	*Phoenix canariensis**	Canary Island date palm
	*Washingtonia robusta**	Mexican fan palm
Asparagaceae	*Yucca elephantipes**	giant yucca
	*Asphodelus fistulosus**	onion weed
Asteraceae	*Ambrosia psilostachya*	western ragweed
	Artemisia californica	California sagebrush
	Baccharis pilularis	coyote brush
	Baccharis salicifolia	mule fat
	Baccharis sarothroides	broom baccharis
	*Centaurea melitensis**	tocalote
	*Cirsium vulgare**	bull thistle
	Deinandra fasciculata	fascicled tarplant
	Encelia californica	California encelia
	*Erigeron bonariensis**	flax-leaf fleabane
	Erigeron canadensis	horseweed
	*Helminthotheca echioides**	bristly ox-tongue
	Heterotheca grandiflora	telegraph weed
	Isocoma menziesii var. *menziesii*	San Diego goldenbush
	*Lactuca serriola**	wild lettuce
	*Logfia gallica**	narrow-leaf filago
	Pseudognaphalium beneolens	fragrant everlasting
	Pseudognaphalium biolettii	bicolor cudweed
	Pseudognaphalium californicum	California everlasting
	*Sonchus asper**	prickly sow thistle
	*Sonchus oleraceus**	common sow thistle
	Stephanomeria sp.	wreath-plant

Attachment A (cont.)
PLANT SPECIES OBSERVED

FAMILY	SCIENTIFIC NAME	COMMON NAME
Boraginaceae	*Echium candicans**	pride-of-Madeira
	Phacelia sp.	phacelia
	*Brassica nigra**	black mustard
	*Hirschfeldia incana**	short-pod mustard
	*Sisymbrium irio**	London rocket
Cactaceae	*Cylindropuntia prolifera*	coastal cholla
	Opuntia littoralis	coastal prickly pear
Caprifoliaceae	*Lonicera subspicata* var. *denudata*	San Diego honeysuckle
Chenopodiaceae	*Chenopodium murale**	nettle-leaf goosefoot
	*Salsola tragus**	Russian thistle
Crassulaceae	*Dudleya edulis*	ladies-fingers
Cucurbitaceae	*Marah macrocarpa*	wild cucumber
Ericaceae	*Comarostaphylis diversifolia* ssp. *diversifolia*†	summer holly
	Xylococcus bicolor	mission manzanita
Euphorbiaceae	*Euphorbia peplus**	petty spurge
	*Euphorbia virgata**	leafy spurge
Fabaceae	*Acacia* sp.*	acacia
	Acmispon glaber	deerweed
	*Medicago polymorpha**	burclover
	*Melilotus indicus**	Indian sweet clover
Fagaceae	*Quercus agrifolia* var. *agrifolia*	coast live oak
	Quercus berberidifolia	scrub oak
	Quercus dumosa†	Nuttall's scrub oak
Geraniaceae	*Erodium cicutarium**	redstem filaree
	*Erodium moschatum**	green-stem filaree
Grossulariaceae	*Ribes speciosum*	fuschia-flowered gooseberry
Iridaceae	*Sisyrinchium bellum*	blue-eyed grass
Lamiaceae	*Salvia apiana*	white sage
	Salvia mellifera	black sage
Malvaceae	*Malacothamnus fasciculatus*	chaparral mallow
	*Malva parviflora**	cheeseweed
Myoporaceae	*Myoporum parvifolium**	creeping myoporum
Myrsinaceae	*Anagallis arvensis**	scarlet pimpernel
	*Lysimachia arvensis**	scarlet pimpernel

Attachment A (cont.)
PLANT SPECIES OBSERVED

FAMILY	SCIENTIFIC NAME	COMMON NAME
Myrtaceae	*Eucalyptus* sp.*	eucalyptus
	Melaleuca sp.*	paperbark
Nyctaginaceae	*Mirabilis laevis* ssp. *crassifolia*	wishbone bush
Oxalidaceae	*Oxalis pes-caprae**	Bermuda buttercup
Phrymaceae	*Mimulus aurantiacus*	monkey-flower
Plantaginaceae	*Antirrhinum nuttallianum*	nuttall snapdragon
Plumbaginaceae	*Limonium perezii**	statice
	*Limonium sinuatum**	sea-lavender
	*Plumbago auriculata**	cape leadwort
Poaceae	*Avena fatua**	wild oats
	*Bromus diandrus**	common ripgut grass
	*Bromus hordeaceus**	soft brome
	*Bromus madritensis**	foxtail chess
	*Cortaderia selloana**	white pampasgrass
	Cortaderia sp.*	pampas grass
	*Cynodon dactylon**	Bermuda grass
	*Festuca myuros**	fescue
	*Pennisetum setaceum**	purple fountain grass
	*Polypogon monspeliensis**	annual beardgrass
	*Schismus barbatus**	Mediterranean grass
	Stipa sp.	needlegrass
Polygonaceae	*Eriogonum fasciculatum*	buckwheat
	*Rumex crispus**	curly dock
Rhamnaceae	*Adolphia californica*†	spineshrub
	Rhamnus crocea	spiny redberry
Rosaceae	*Adenostoma fasciculatum*	chamise
	Heteromeles arbutifolia	toyon
Salicaceae	*Salix gooddingii*	Goodding's black willow
	Salix lasiolepis	arroyo willow
Solanaceae	*Nicotiana glauca**	tree tobacco
	Solanum americanum	white nightshade
	Solanum parishii	Parish's nightshade
Tamaricaceae	*Tamarix* sp.*	tamarisk

*Non-native species
†Listed or sensitive species

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Attachment B
ANIMAL SPECIES OBSERVED OR DETECTED

FAMILY	SCIENTIFIC NAME	COMMON NAME
INVERTEBRATES		
Papilionidae	*Papilio cresphontes*	giant swallowtail
Pieridae	*Anthocharis sara sara*	Pacific Sara orangetip
		White sp.
Lycaenidae	*Icaricia acmon acmon*	acmon blue
	Leptotes marina	marine blue
Nymphalidae	*Junonia coenia grisea*	common buckeye
	Nymphalis antiopa	mourning cloak
VERTEBRATES		
Reptiles		
Phrynosomatidae	*Sceloporus occidentalis longipes*	Great Basin fence lizard
	Uta stansburiana	common side-blotched lizard
Teiidae	*Aspidoscelis hyperythra*†	Orange-throated whiptail
Birds		
Aegithalidae	*Psaltriparus minimus*	bushtit
Columbidae	*Zenaida macroura*	mourning dove
Corvidae	*Aphelocoma californica*	Western scrub-jay
	Corvus brachyrhynchos	American crow
	Corvus corax	common raven
Emberizidae	*Melospiza melodia*	song sparrow
	Melozone crissalis	California towhee
	Pipilo maculatus	spotted towhee
	Zonotrichia leucophrys	white-crowned sparrow
Estrildidae	*Lonchura punctulata*	scaly-breasted munia
Fringillidae	*Haemorhous mexicanus*	house finch
	Spinus psaltria	lesser goldfinch
Hirundinidae	*Petrochelidon pyrrhonota*	cliff swallow
	Stelgidopteryx serripennis	Northern Rough-winged Swallow
Icteridae	*Icterus cucullatus*	hooded oriole
	Molothrus ater	brown-headed cowbird
Mimidae	*Mimus polyglottos*	Northern mockingbird

Attachment B (cont.)
ANIMAL SPECIES OBSERVED OR DETECTED

FAMILY	SCIENTIFIC NAME	COMMON NAME
VERTEBRATES (cont.)		
Birds (cont.)		
Parulidae	*Geothlypis trichas*	common yellowthroat
	Icteria virens†	yellow-breasted chat
	Oreothlypis celata	orange-crowned warbler
	Setophaga coronata	yellow-rumped warbler
Passeridae	*Passer domesticus*	house sparrow
Picidae	*Melanerpes formicivorus*	acorn woodpecker
	Picoides nuttallii†	Nuttall's woodpecker
	Picoides pubescens	Downy woodpecker
Polioptilidae	*Polioptila californica*†	California gnatcatcher
Sylviidae	*Chamaea fasciata*	wrentit
Trochilidae	*Archilochus alexandri*	black-chinned hummingbird
	Calypte anna	Anna's hummingbird
	Selasphorus sasin†	Allen's hummingbird
Troglodytidae	*Thryomanes bewickii*	Bewick's wren
Tyrannidae	*Empidonax difficilis*	Pacific-slope flycatcher
	Sayornis nigricans	black phoebe
	Tyrannus vociferans	Cassin's kingbird
Mammals		
Cervidae	*Odocoileus hemionus*	mule deer
Leporidae	*Sylvilagus audubonii*	desert cottontail
Muridae	*Neotoma sp.*	woodrat sp.
Sciuridae	*Spermophilus beecheyi*	California ground squirrel

†Listed or sensitive species

Attachment C SENSITIVE PLANT SPECIES OBSERVED OR WITH POTENTIAL TO OCCUR		
SPECIES	**LISTING OR SENSITIVITY***	**POTENTIAL TO OCCUR**
San Diego thorn-mint (*Acanthomintha ilicifolia*)	FT/SE CNPS Rank 1B.1 City Narrow Endemic (NE) MSCP Covered	**Not Likely to Occur**. Found in grassy openings in chaparral or sage scrub, or near vernal pools, with friable or broken clay soils. No vernal pools are present on site, and species was not observed during survey. Blooming period is April through June.
California adolphia (*Adolphia californica*)	--/-- CNPS Rank 2B.1	**Species Present**. Two plants observed in coastal sage scrub near the middle of the site.
Shaw's agave (*Agave shawii*)	--/-- CNPS Rank 2B.1 City NE MCSP Covered	**Not Likely to Occur**. Occurs in coastal bluff scrub and coastal sage scrub. Conspicuous species that would have been observed if present.
San Diego ambrosia (*Ambrosia pumila*)	FE/-- CNPS Rank 1B.1 City NE MSCP Covered	**Not Likely to Occur**. Found in a variety of habitats, including sage scrub, grasslands, wetlands, disturbed habitat, and sloped areas. Conspicuous species that would have been observed if present. Blooming period is April through October.
Aphanisma (*Aphanisma blitoides*)	--/-- CNPS Rank 1B.2 City NE MCSP Covered	**Not Likely to Occur**. Occurs in coastal bluff scrub, coastal dunes, and sandy coastal scrub. Suitable habitat does not occur on site.
Del Mar manzanita (*Arctostaphylos glandulosa* ssp. *crassifolia*)	FE/-- CNPS Rank 1B.1 MSCP Covered	**Low Potential to Occur**. Occurs in relatively open, coastal chaparral. At occasional inland sites it occurs in denser mixed chaparral vegetation. Although this species has been observed within one mile of the site, this conspicuous species would have been observed if present on site. Blooming period is December through February.
Coastal dunes milk-vetch (*Astragalus tener* var. *titi*)	FE/SE CNPS Rank 1B.1 City NE MCSP Covered	**Not Likely to Occur**. Occurs in coastal dunes and sandy places along the coast. Suitable habitat does not occur on site.

Attachment C (cont.) **SENSITIVE PLANT SPECIES OBSERVED** **OR WITH POTENTIAL TO OCCUR**		
SPECIES	**LISTING OR SENSITIVITY***	**POTENTIAL TO OCCUR**
Encinitas baccharis (*Baccharis vanessae*)	FT/SE CNPS Rank 1B.1 City NE MSCP Covered	**Not Likely to Occur**. Mature but relatively low-growing chaparral is primary habitat; also found in southern maritime and southern mixed chaparrals. Perennial shrub that would have been observed if present. Blooming period is August through November.
Wart-stemmed ceanothus (*Ceanothus verrucosus*)	--/-- CNPS Rank 2B.2 MSCP Covered	**Low Potential to Occur**. Coastal chaparral intermixed with chamise and mission manzanita is the preferred habitat for this species. Although this species has been observed within one mile of the site, this conspicuous species would have been observed if present on site. Blooming period is December through April.
Southern tarplant (*Centromadia parryi* ssp. *australis*)	--/-- CNPS Rank 1B.1	**Low Potential to Occur**. Seasonally moist (saline) grasslands. Mesic areas in valley and foothill grasslands, alkaline locales, and peripheral salt marsh are utilized. Although this species has been observed within two miles of the site, it would have been observed if present on site. Blooming period is June through October.
Orcutt's pincussion (*Chaenactis glabriuscula* var. *orcuttiana*)	--/-- CNPS Rank 1B.1	**Low Potential to Occur**. Occurs in open Diegan coastal sage scrub, typically in proximity to moist ocean breezes. Although this species has been observed within two miles of the site, it would have been observed if present on site. Blooming period is January through August.
Long-spined spineflower (*Chorizanthe polygonoides* var. *longispina*)	--/-- CNPS Rank 1B.2	**Not Likely to Occur**. Typically found on clay lenses largely devoid of shrubs. Can be occasionally seen on vernal pool and even montane meadows peripheries near vernal seeps. Although this species has been observed within two miles of the site, it would have been observed if present on site. Blooming period is April through June.
Summer-holly (*Comarostaphylis diversifolia* ssp. *diversifolia*)	--/-- CNPS Rank 1B.2	**Species Present**. Two plants observed on site: one in southern maritime chaparral along the southern boundary and one in coastal sage-chaparral scrub along the eastern boundary.

Attachment C (cont.)
SENSITIVE PLANT SPECIES OBSERVED
OR WITH POTENTIAL TO OCCUR

SPECIES	LISTING OR SENSITIVITY*	POTENTIAL TO OCCUR
Del Mar Mesa sand aster (*Corethrogyne filaginifolia* var. *linifolia*)	--/-- CNPS Rank 1B.2	**Moderate Potential to Occur**. Occurs on sandy soils in coastal bluff scrub, openings in maritime chaparral, and coastal sage scrub. Species has been observed within one mile and could occur in the eastern portion of the site, but is less likely to occur in the impact area in the disturbed western portion of the site. Blooming period is July through November.
Snake cholla (*Cylindropuntia californica* var. *californica*)	--/-- CNPS Rank 1B.1 City NE MSCP Covered	**Not Likely to Occur**. Occurs in chaparral and Diegan coastal sage scrub. Conspicuous species that would have been observed if present.
Otay tarplant (*Deinandra conjugens*)	FT/SE CNPS Rank 1B.1 City NE MSCP Covered	**Not Likely to Occur**. Occurs in coastal sage scrub and grassland habitats in southern San Diego County. Suitable habitat does not occur on site.
Short-leaved dudleya (*Dudleya brevifolia*)	--/SE CNPS Rank 1B.1 City NE MSCP Covered	**Not Likely to Occur**. Occurs in open areas and sandstone bluffs in chamise chaparral or Torrey pine forest. Suitable habitat does not occur on site.
Variegated dudleya (*Dudleya variegata*)	--/-- CNPS Rank 1B.2 City NE MSCP Covered	**Not Likely to Occur**. Occurs in chaparral, cismontane woodland, coastal sage scrub, valley and foothill grassland, and vernal pools. Would have been observable during rare plant survey. Blooming period is May through June.
Palmer's goldenbush (*Ericameria palmeri* ssp. *palmeri*)	--/-- CNPS Rank 1B.1 MSCP Covered	**Not Likely to Occur**. This sizeable shrub grows along coastal drainages, in mesic chaparral sites, or rarely in Diegan coastal sage scrub. Occasionally occurs as a hillside element (usually at higher elevations inland on north-facing slopes). Although this species has been observed within two miles of the site, it would have been observed if present on site. Blooming period is July through November.
San Diego button-celery (*Eryngium aristulatum* var. *parishii*)	FE/SE CNPS Rank 1B.1 City NE MSCP Covered	**Not Likely to Occur**. Occurs within vernal pools. No vernal pools are present within the study area, and species was not observed during survey. Blooming period is April through June.

Attachment C (cont.)
SENSITIVE PLANT SPECIES OBSERVED OR WITH POTENTIAL TO OCCUR

SPECIES	LISTING OR SENSITIVITY*	POTENTIAL TO OCCUR
Cliff spurge (*Euphorbia misera*)	--/-- CNPS Rank 2B.2	**Not Likely to Occur**. Sea bluffs in maritime sage scrub. Although this species has been observed within two miles of the site, this conspicuous shrub would have been observed if present on site. Blooming period is December through October.
San Diego barrel cactus (*Ferocactus viridescens*)	--/-- CNPS Rank 2B.1 MSCP Covered	**Not Likely to Occur**. Occurs in chaparral, coastal sage scrub, valley and foothill grassland, and vernal pools. Although this species has been observed within two miles of the site, this conspicuous species would have been observed if present on site. Blooming period is May through June.
Decumbent goldenbush (*Isocoma menziesii* var. *decumbens*)	--/-- CNPS Rank 1B.2	**Not Likely to Occur**. Occurs in chaparral and sandy coastal sage scrub, often in disturbed areas. Although this species has been observed within two miles of the site, this perennial shrub would have been observed if present on site. Blooming period is July through November.
San Diego marsh-elder (*Iva hayesiana*)	--/-- CNPS Rank 2B.2	**Low Potential to Occur**. Occurs in marshes, swamps, and playas. Although this species has been observed within one mile of the site, this species would have been observed if present on site. Blooming period is March through September.
Sea dahlia (*Leptosyne maritima*)	FE/SE CNPS Rank 2B.2	**Not Likely to Occur**. Sandstone cliffs and coastal bluffs. Although this species has been observed within two miles of the site, the site does not include sandstone cliffs or coastal bluffs, and this species would have been observed if present on site. Blooming period is March through May.
Spreading navarretia (*Navarretia fossalis*)	FT/-- CNPS Rank 1B.1 City NE MSCP Covered	**Not Likely to Occur**. Occurs within vernal pools. No vernal pools are present within the study area. Blooming period is April through June.
California Orcutt grass (*Orcuttia californica*)	FE/SE CNPS Rank 1B.1 City NE MSCP Covered	**Not Likely to Occur**. Uncommon plant that occurs within vernal pools. Known from fewer than 20 occurrences. Suitable habitat does not occur on site.

Attachment C (cont.) **SENSITIVE PLANT SPECIES OBSERVED** **OR WITH POTENTIAL TO OCCUR**		
SPECIES	**LISTING OR SENSITIVITY***	**POTENTIAL TO OCCUR**
San Diego mesa mint (*Pogogyne abramsii*)	FE/SE CNPS Rank 1B.1 City NE MSCP Covered	**Not Likely to Occur**. This small annual is restricted to vernal pools in grasslands, chamise chaparral, and coastal sage scrub on mesas. No vernal pools are present within the study area. Blooming period is April through July.
Otay mesa mint (*Pogogyne nudiuscula*)	FE/SE CNPS Rank 1B.1 City NE MSCP Covered	**Not Likely to Occur**. Occurs within vernal pools. Suitable habitat does not occur on site.
Nuttall's scrub oak (*Quercus dumosa*)	--/-- CNPS Rank 1B.1	**Species Present**. One plant observed in coastal sage scrub in the northeastern corner of the site.

*Refer to Appendix C for an explanation of listing and sensitivity codes.

Potential to Occur:

Not Likely to Occur – There are no present or historical records of the species occurring on or in the immediate vicinity, (within 1 mile) of the site and the diagnostic habitats strongly associated with the species do not occur on or in the immediate vicinity of the survey area.

Low Potential to Occur – There is a historical record of the species in the vicinity of the survey area and potentially suitable habitat on the site, but existing conditions, such as density of cover, prevalence of non-native species, evidence of disturbance, limited habitat area, isolation, substantially reduce the possibility that the species may occur. The survey area is above or below the recognized elevation limits for this species.

Moderate Potential to Occur – The diagnostic habitats associated with the species occur on or in the immediate vicinity of the site, but there is not a recorded occurrence of the species within the immediate vicinity (within 1 mile). Some species that have extremely limited distributions may be considered moderate, even if there is a recorded occurrence in the immediate vicinity.

High Potential to Occur – There is both suitable habitat associated with the species and a historical record of the species on or in the immediate vicinity of the site (within 1 mile).

Species Present – The species was observed on site at the time of the survey or during a previous biological survey.

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Attachment D
SENSITIVE ANIMAL SPECIES KNOWN TO OCCUR OR WITH POTENTIAL TO OCCUR IN THE STUDY AREA

SPECIES	LISTING OR SENSITIVITY	POTENTIAL/HABITAT
VERTEBRATES		
Reptiles and Amphibians		
Orange-throated whiptail (*Aspidoscelis hyperytha*)	--/SSC MSCP Covered	**Species Present.** Typically occurs in sage scrub and grassland areas. Observed on site in disturbed land in the middle of the site.
Coast horned lizard (*Phrynosoma blainvillii*)	--/SSC MSCP Covered	**Moderate Potential to Occur.** Coastal sage scrub and open areas in chaparral, oak woodlands, and coniferous forests with sufficient basking sites, adequate scrub cover, and areas of loose soil; require native ants, especially harvester ants (*Pogonomyrmex* sp.), and are generally excluded from areas invaded by Argentine ants (*Linepithema humile*). Suitable habitat on site; however, there are no historical accounts within one mile of the project.
Western spadefoot (*Spea hammondii*)	--/SSC	**Not Likely to Occur.** Occurs in open coastal sage scrub, chaparral, and grassland, along sandy or gravelly washes, floodplains, alluvial fans, or playas; require temporary pools for breeding and friable soils for burrowing; generally excluded from areas with bullfrogs (*Rana catesbiana*) or crayfish (*Procambarus* sp). The site does not support vernal pools and there are no historical accounts within one mile of the project.
Birds		
Southern California rufous-crowned sparrow (*Aimophila ruficeps canescens*)	--/WL MSCP Covered	**Moderate Potential to Occur.** Occurs in sage scrub and grassland areas. Suitable habitat on site; however, there are no historical accounts within one mile of the project.
Bell's sage sparrow (*Artemisiospiza belli belli*)	--/WL	**Moderate Potential to Occur.** Occurs in coastal sagebrush, chaparral, and other open, scrubby habitats. Suitable habitat on site; however, there are no historical accounts within one mile of the project.

Attachment D (cont.)
SENSITIVE ANIMAL SPECIES KNOWN TO OCCUR
OR WITH POTENTIAL TO OCCUR IN THE STUDY AREA

SPECIES	LISTING OR SENSITIVITY	POTENTIAL/HABITAT
VERTEBRATES (cont.)		
Birds (cont.)		
Burrowing owl (*Athene cunicularia*)	BCC/SSC MSCP Covered	**Low Potential to Occur.** Species typically found in grassland or open scrub habitats supporting ground squirrel (*Spermophilis beecheyi*) burrows or other burrows or places for nesting (e.g. in piles of riprap or debris). Little suitable habitat is present, and the site is small and adjacent to dense residential development on three sides. No California ground squirrels or burrows were observed on site, and there are no historical accounts within one mile of the project.
Nuttall's woodpecker (*Dryobates nuttallii*)	BCC/--	**Species Present.** Primarily found in oak woodlands and riparian forests. Observed on site in the eucalyptus trees at the western end of the site.
Coastal California gnatcatcher (*Polioptila californica californica*)	FT/SSC MSCP Covered	**Species Observed Onsite.** Habitat consists of sage scrub communities. Coastal sage scrub habitat occurs on site and there are several historical accounts of individuals within one mile of the project, which would typically indicate high potential. However, the habitat on this site is likely too patchy and disturbed for this species to breed on site, and the sage scrub is mostly dominated by lemonade berry and laurel sumac. California sagebrush, California buckwheat, and black sage are very limited on site. The adjacent MHPA has marginal potential due to small patch size and species composition, with the area dominated by chaparral and chamise. Protocol surveys conducted during the breeding season (June 2016) were negative. Although the species was heard calling during two of the eight least Bell's vireo surveys, in baccharis scrub proposed for preservation in the eastern-central portion of the site, the site is considered unoccupied by breeding gnatcatcher based on the negative protocol survey.

Attachment D (cont.)
SENSITIVE ANIMAL SPECIES KNOWN TO OCCUR OR WITH POTENTIAL TO OCCUR IN THE STUDY AREA

SPECIES	LISTING OR SENSITIVITY	POTENTIAL/HABITAT
VERTEBRATES (cont.)		
Birds (cont.)		
Ridgway's rail (*Rallus obsoletus*)	FE/SE MSCP Covered	**Not Likely to Occur.** Occurs in coastal marshes, lagoons and maritime environments with dense vegetation and shallow waters. No suitable habitat on site or within surrounding area.
Least Bell's vireo (*Vireo bellii pusillus*)	FE/SE MSCP Covered	**Protocol Survey Negative.** Occurs in dense riparian thickets with canopy and shrub layers. Some suitable habitat on site; however, there are no historical accounts within one mile of the project. Protocol survey results were negative.
Mammals		
Northwestern San Diego pocket mouse (*Chaetodipus fallax fallax*)	--/SSC	**Moderate Potential to Occur.** Occurs in shrublands that vary from sparse desert scrub and dense coastal sage scrub. Suitable habitat on site; however, there are no historical accounts within one mile of the project.
San Diego black-tailed jackrabbit (*Lepus californicus bennettii*)	--/SSC	**Moderate Potential to Occur.** Found primarily in open habitats including coastal sage scrub, chaparral, grasslands, croplands, and open, disturbed areas if there is at least some shrub cover present. Suitable habitat on site; however, there are no historical accounts within one mile of the project.
San Diego desert woodrat (*Neotoma lepida intermedia*)	--/SSC	**Moderate Potential to Occur.** Occurs in open chaparral and coastal sage scrub, often building large, stick nests in rock outcrops or around clumps of cactus or yucca. A woodrat nest was observed on site, which could indicate either dusky-footed woodrat (Neotoma fuscipes) or San Diego desert woodrat. The nest was located in the proposed open space area, in the eastern half of the site. The species cannot be determined without trapping, which is not warranted in this case given that the project design and mitigation requirements would not change based on the presence of this species.

Attachment D (cont.)
SENSITIVE ANIMAL SPECIES KNOWN TO OCCUR OR WITH POTENTIAL TO OCCUR IN THE STUDY AREA

Federal:		**State:**	
FE	Federal Endangered	SSC	California Species of Concern
FT	Federal Threatened	WL	Watch List
BCC	Bird of Conservation Concern		

Potential to Occur:

Not Likely to Occur - There are no present or historical records of the species occurring on or in the immediate vicinity, (within 1 mile) of the survey area and the diagnostic habitats strongly associated with the species do not occur on or in the immediate vicinity of the survey area.

Low Potential to Occur - There is a historical record of the species in the vicinity of the survey area and potentially suitable habitat on the survey area, but existing conditions, such as density of cover, prevalence of non-native species, evidence of disturbance, limited habitat area, isolation, substantially reduce the possibility that the species may occur.

Moderate Potential to Occur - The diagnostic habitats associated with the species occur on or in the immediate vicinity of the survey area, but there is not a recorded occurrence of the species within the immediate vicinity (within 1 mile). Some species that contain extremely limited distributions may be considered moderate, even if there is a recorded occurrence in the immediate vicinity.

High Potential to Occur - There is both suitable habitat associated with the species and a historical record of the species on or in the immediate vicinity of the survey area (within 1 mile).

Species Present - The species was observed on the survey area at the time of the survey or during a previous biological survey.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Lighthouse Property; HELIX JO# PLH-02 City/County: San Diego/San Diego Sampling Date: 4/26/16

Applicant/Owner: ______ State: CA Sampling Point: 1

Investigator(s): S. Nigro Section, Township, Range: Sec 17/T 14S/R 03W Del Mar quadrangle

Landform (hillslope, terrace, etc.): canyon/valley bottom Local relief (concave, convex, none): flat Slope (%): ______

Subregion (LRR): C Lat: 32.962814 Long: -117.206421 Datum: ______

Soil Map Unit Name: Terrace Escarpments NWI classification: not on NWI map

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ______ (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		✓
Hydric Soil Present?		✓
Wetland Hydrology Present?		✓

Is the Sampled Area within a Wetland? Yes ______ No ✓

Remarks:

USACE wetland criteria not met. Sampling point is within CDFW and City wetland (southern willow scrub).

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: r=20')			
1. Salix lasiolepis	50	X	FACW
2.			
3.			
4.			
	50 = Total Cover		
Sapling/Shrub Stratum (Plot size: r=20')			
1. Salix lasiolepis	3	X	FACW
2. Baccharis pilularis	2	X	UPL
3.			
4.			
5.			
	5 = Total Cover		
Herb Stratum (Plot size: r=20')			
1. Cortaderia sp.	10	X	FACU
2. Erigeron canadensis	1		FACU
3. Euphorbia peplus	1		UPL
4. Medicago polymorpha	1		FACU
5. Anagallis arvensis	1		UPL
6.			
7.			
8.			
	14 = Total Cover		
Woody Vine Stratum (Plot size: r=20')			
1. N/A			
2.			
	0 = Total Cover		

% Bare Ground in Herb Stratum 5 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	53	x 2 = 106
FAC species	0	x 3 = 0
FACU species	12	x 4 = 48
UPL species	4	x 5 = 20
Column Totals:	69 (A)	174 (B)

Prevalence Index = B/A = 2.5

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ______ No ✓

Remarks:

USACE hydrophytic vegetation criterion not met due to dominance of FACU and UPL species in the herb and shrub strata, however, these two strata have low cover overall as compared to the tree stratum. The tree stratum provides the majority of plant cover and is dominated by arroyo willow, thus, the habitat is categorized as southern willow scrub. Prevalence index does not apply since hydric soil and wetland hydrology indicators are not met (see back of form).

SOIL

Sampling Point: 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 3/2	100	-	-	-	-	clay loam	
3-8	10YR 4/3	100	-	-	-	-	sandy lm	
8-12	10YR 4/3	95	10YR 4/6	5	C	M	sandy lm	
12-16	10YR 4/3	100	-	-	-	-	sandy lm	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes ___ No ✓

Remarks:

Hydric soil criterion not met. Sampling point soil profile does not correspond to any hydric soil indicator.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ___
Water Table Present? Yes ___ No ✓ Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ___

Wetland Hydrology Present? Yes ___ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland hydrology criterion not met, no indicators observed, although area does receive runoff from residential development on adjacent slopes. Runoff from these nearby homes seeps from a high retaining wall located south of the project site in association with homes on White Emerald Drive, then seeps into the ground in the lowest area and provides a source of moisture for establishment of willows. Surface indicators of runoff where not observed. FAC-neutral test not met (2:2)

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Lighthouse Property; HELIX JO# PLH-02 City/County: San Diego/San Diego Sampling Date: 4/26/16

Applicant/Owner: ______ State: CA Sampling Point: 2

Investigator(s): S. Nigro Section, Township, Range: Sec 17/T 14S/R 03W Del Mar quadrangle

Landform (hillslope, terrace, etc.): channel slope Local relief (concave, convex, none): concave Slope (%): ______

Subregion (LRR): C Lat: 32.963118 Long: -117.206127 Datum: ______

Soil Map Unit Name: Terrace Escarpments NWI classification: not on NWI map

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ______ (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		✓
Hydric Soil Present?		✓
Wetland Hydrology Present?		✓
Is the Sampled Area within a Wetland?		✓

Remarks:

Does not meet USACE wetland criteria. Soil pit excavated in mule fat scrub on side slope of a channel, about 1 foot above non-vegetated channel bottom. Channel is non-wetland waters of the U.S. MFS is CDFW and City wetland.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 10'x20')			
1. N/A	0		
2.			
3.			
4.			
= Total Cover	0		
Sapling/Shrub Stratum (Plot size: 10'x20')			
1. Baccharis salicifolia	40	X	FAC
2. Baccharis pilularis	2		UPL
3. Rhus integrifolia	2		UPL
4.			
5.			
= Total Cover	44		
Herb Stratum (Plot size: 10'x20')			
1. Bromus madritensis	5	X	UPL
2. Brassica nigra	1		UPL
3. Euphorbia peplus	2		UPL
4. Helminthotheca echioides	2		FACU
5.			
6.			
7.			
8.			
= Total Cover	10		
Woody Vine Stratum (Plot size: 10'x20')			
1. N/A			
2.			
= Total Cover	0		

% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	0	x 2 = 0
FAC species	40	x 3 = 120
FACU species	2	x 4 = 8
UPL species	12	x 5 = 60
Column Totals:	54 (A)	188 (B)

Prevalence Index = B/A = 3.5

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ______ No ✓

Remarks:

USACE hydrophytic vegetation criterion not met, however, mule fat dominates this habitat and it is considered mule fat scrub.

SOIL

Sampling Point: 2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 4/3	100	-	-	-	-	sdy cly lm	
2-10	10YR 4/3	100	-	-	-	-	sandy lm	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes ______ No ✓

Remarks:

Hydric soil criterion not met.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ______	No ✓	Depth (inches): ______
Water Table Present?	Yes ______	No ✓	Depth (inches): ______
Saturation Present? (includes capillary fringe)	Yes ______	No ✓	Depth (inches): ______

Wetland Hydrology Present? Yes ______ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland hydrology criterion not met.

FAC-neutral test not met (0:1)

Lighthouse Ridge Project

Project No. 438585

Cultural Resources Survey

August 2017

Mary Robbins-Wade
Director of Cultural Resources

Kristina Davison
Staff Archaeologist

Prepared for:
Pacific Legacy Homes
16870 W. Bernardo Drive, Suite 400
San Diego, CA 92127

Submitted to:
City of San Diego Development Services
1222 First Avenue
San Diego, CA 92101

Prepared by:
HELIX Environmental Planning, Inc.
7578 El Cajon Boulevard
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This report form shall be used when a site-specific survey for historical resources was completed and no archaeological resources were identified within the project area (APE). This form may be used, rather than completion of an Archaeological Resource Management Report, when archaeological resources were identified and, based on an evaluation, were determined to be non-significant or are potentially significant but will not be directly impacted by the proposed development project. Completion of the required site-specific survey and this report form must conform to the Historical Resources Guidelines of the Land Development Manual.

I. PROJECT DESCRIPTION AND LOCATION

(Include the geographic limits of the study area and a description of the proposed development project).

The Lighthouse Ridge project (Project No. 438585; project) is located in the Carmel Valley (North City West) community in the northwestern part of the City of San Diego (City), in western San Diego County (Figure 1, *Regional Location Map*). The project area is located east of Interstate 5, north of Del Mar Heights Road, and south of the San Dieguito River Valley (Figure 2, *Project Vicinity [USGS Topography]*); the northern terminus of Lighthouse Way is located at the project's southern border, roughly 130 feet east of the project's western boundary (Figure 3, *Aerial Photograph*). The project area is within Township 14 South, Range 3 West, Section 17, on the US Geological Survey (USGS) 7.5-minute Del Mar quadrangle (Figure 2).

The project proposes to construct a 10-lot residential subdivision on the 4.8-acre parcel. The project site would be cleared of vegetation, graded, and utilities installed for residential use. The drainage flow would be restructured to capture runoff along the project's southern border and direct the runoff into the existing drainage that runs into Gonzalez Canyon. The project area is generally surrounded by residential development.

A cultural resources survey was conducted by HELIX Environmental Planning, Inc. (HELIX) and Red Tail Monitoring and Research in September 2016.

II. SETTING

Natural Environment (Past and Present)

The project area is in the coastal plains of San Diego County, where the climate is characterized as "semi-arid, cool" (Griner and Pryde 1976:Figure 3.4). Average January minimum daily temperatures in the project area are about 44ºF, while average July maximum daily temperatures are about 75ºF (Griner and Pryde 1976). The project is located less than one mile south of the San Dieguito River Valley, and roughly 3.5 miles east of the open coast. Gonzalez Canyon is less than .25 mile to the north of the project area; the project's northeastern corner is actually within a south-trending finger of the canyon. The project area is underlain by the Quaternary Baypoint formation and Tertiary (Eocene) Mission Valley formation on the ridge top, with Eocene Friars formation and

Stadium Conglomerate in the canyon (Kennedy 1975). Cobbles from these formations were used for stone tool manufacture. The soil types mapped for the project area are terrace escarpments and Huerhuero loam, 5 to 9 percent slopes, eroded (Bowman 1973). Each soil type composes roughly 50 percent of the project's acreage; terrace escarpments are mapped within the low-lying drainage that terminates at Gonzalez Canyon, and Huerhuero loam composes the project's western half and southeastern corner (Web Soil Survey, accessed 2016).

Water would have been available in numerous seasonal drainages in the area, including the nearby Gonzalez Canyon, located a short distance to the north of the project site, as well as other large canyons in the vicinity (Figure 2). The soils in the project area and immediate vicinity generally support annual grasses and forbs, with some shrubs and scattered oaks (Bowman 1973). Vegetation types mapped within the project area include southern willow scrub, mule fat scrub, baccharis scrub, coastal sage-chaparral scrub, Diegan coastal sage scrub, southern maritime chaparral, and non-native grassland (HELIX 2016). Non-native grassland is often found in areas that had previously supported native grasses. These plant communities would have provided an array of plant and animal species used by the native people for food, medicine, tools, shelter, ceremonial and other uses (see Christenson 1990; Hedges and Beresford 1986). In addition, the proximity to both open coast and lagoon environments would have provided access to shellfish, fin fish, water fowl, salt, and other resources.

Ethnography/History

Several summaries discuss the prehistory of San Diego County and provide a background for understanding the archaeology of the general area surrounding the project. Moratto's (1984) review of the archaeology of California contains important discussions of Southern California, including the San Diego area, as does a relatively recent book by Neusius and Gross (2007). Bull (1983, 1987), Carrico (1987), Gallegos (1987), and Warren (1985, 1987) provide summaries of archaeological studies and interpretations, and another paper (Arnold et al. 2004) discusses advances since 1984. A culture history of the region is included as Attachment D.

The project area is within lands that have traditionally been inhabited by the Kumeyaay people, also known as Diegueño or Ipai/Tipai (Luomala 1978). The project site is just south of the San Dieguito River Valley, which is rich in cultural resources. Most of the sites in the river valley have been described as habitation or temporary habitation sites with ground stone implements, flaked stone artifacts, shell, and fire-affected rock or a combination of these elements. Ceramics were noted at a few of the sites. Many of the sites in the valley were used/occupied for thousands of years. The Carmel Valley area also supports numerous pre-contact Native American and historic period resources.

III. AREA OF POTENTIAL EFFECT (APE)

(Describe the nature and extent of anticipated direct, indirect, and cumulative impacts).

The Area of Potential Effect (APE) is defined as the entire project area, as shown in Figures 2 and 3 and described above under Project Description.

IV. STUDY METHODS

(Include a description of the specific methods used in the identification and evaluation of archaeological resources for this study).

HELIX obtained a records search from the South Coastal Information Center (SCIC) in October 2016 for the project site and a one-mile radius (Confidential Appendix A). Historic maps and aerial photographs were reviewed to assess the potential for historic archaeological resources.

The Native American Heritage Commission (NAHC) was contacted on September 1, 2016 for a Sacred Lands File search, and letters regarding the project were sent on September 20, 2016 to the Native American contacts listed by the NAHC (Confidential Appendix C).

HELIX archaeologist Kristina Davison and Nate Curo of Red Tail Monitoring and Research (Native American Monitor) surveyed the project area on September 13, 2016. To the extent feasible, Ms. Davison and Mr. Curo traversed the project area and inspected all observable areas for evidence of cultural material.

V. RESULTS OF STUDY

Background Research

As previously noted, HELIX obtained a records search from SCIC to supplement in-house records search data obtained from SCIC and the San Diego Museum of Man for other projects in the vicinity. The records search maps are include as Confidential Appendix A. SCIC has a record of 88 reports for the records search radius, including overview studies, surveys, testing, data recovery projects, and monitoring.

A total of 67 resources have been recorded within the search radius. The majority of these are prehistoric sites, with three habitation sites, 11 temporary habitation or campsites, 18 lithic scatters, four lithic and shell scatters, five shell scatters, and 20 isolates. One site is recorded as multicomponent, containing both prehistoric and historic elements. Five historic sites have been recorded within the search radius, including one homestead with an existing adobe wall and dam, one orange grove, and three refuse scatters.

The project site is within a larger project area that was surveyed for cultural resources in 1984. Archaeological sites recorded during that survey were tested to assess significance (Cardenas and Winterrowd 1985). This report is not on file at SCIC; however, it is on file at HELIX. One archaeological site recorded as a result of this survey is located within the Lighthouse Ridge project area: CA-SDI-10036.

CA-SDI-10036 was originally recorded in 1979 as an isolated find, consisting of two flakes and a flaked stone tool. During the fieldwork conducted in 1984 the site was described as a light density lithic scatter on the mesa top, overlooking a tributary drainage to Gonzalez Canyon. A cobble lens was noted just east of the site. Surface collection and the excavation of three test units resulted in the recovery of ground stone implements, flaked stone tools, a hammer, cores, flakes, burned animal bone, and burned shell. Subsurface cultural material was recovered to a depth of 30 cm in the test units (Cardenas and Winterrowd 1985).

Based on the artifact assemblage recovered at CA-SDI-10036, Cardenas and Winterrowd suggested that heavy, medium, and light processing activities were undertaken. “Heavy processing activities include the procurement, preparation, and processing of wood, plant, and animal materials” (Cardenas and Winterrowd 1985:57). “Medium processing activities include the preparation of subsistence goods for consumption or storage, the processing of raw materials and the production of finished items” (Cardenas and Winterrowd 1985:57). Activities classified as light processing include the procurement and preparation of subsistence goods and some processing of plant material (Cardenas and Winterrowd 1985:57). The ratio of debitage representing primary tool manufacture to flakes indicative of secondary tool manufacture, finishing and resharpening is 1:1 at CA-SDI-10036, as opposed to a ratio of 2:1 or greater at other nearby sites. This indicates that tool finishing and resharpening took place at the site, while primary tool manufacture occurred at other sites in the vicinity (Cardenas and Winterrowd 1985:58).

Burned shell (3.1 grams [g] of *Tivela stultorum*) was recovered from the test units at CA-SDI-10036, as was 0.8 g of burned rabbit bone (*Sylvilagus* sp.). Based on the range of artifact types and presence of faunal remains, Cardenas and Winterrowd (1985) interpreted CA-SDI-10036 as a temporary habitation site. While they noted that the portion of the site within Pardee Company ownership did not contain significant deposits, “Potentially significant and/or unique subsurface midden deposits were found outside the Pardee ownership” (Cardenas and Winterrowd 1985:63). Therefore, the potential for significant impacts to cultural resources was noted as possible. “Subsequent to the testing of SDi-10036, that portion of the site that remained potentially significant was partially or wholly destroyed through grading by the property owner” (Cardenas and Winterrowd 1985:63). Unfortunately, the report does not include ownership maps or other figures showing which portion of CA-SDI-10036 was thought to have been destroyed by grading. No aerial photographs were available between the years 1981 and 1989; by 1989 the entire area surrounding the archaeological site appears to have been graded. Given that the surrounding parcels have been developed in planned residential developments, it is reasonable to assume that the portion of CA-SDI-10036 that was destroyed through grading without further archaeological study is the part of the site within the current project area.

Historic maps and aerial photographs were reviewed to assess the potential for historic archaeological resources. Tax factor aerial photographs taken in 1928 show what is now Del Mar Heights Road and a dirt road running generally north-south through the project site, but no structures are visible in the project area or its vicinity. To the south of the property, immediately north of Del Mar Heights Road was a rectangular area that had been cleared of brush and was delineated by lines of trees; it was apparently used for agricultural or ranching uses. USGS topographic maps (7.5-minute Del Mar quadrangle) from 1943 and 1953 also showed Del Mar Heights Road and the dirt road through the project area but no buildings or structures in the vicinity. This same condition, undeveloped but with a dirt road running through the property, is visible in aerial photographs from 1953, 1964, 1966, 1967, and 1981 (NETR Online 2016). By 1989 the property has been graded, and a 1994 aerial photograph seems to show trailers on the site (NETR Online 2016), possibly construction trailers for development just to the south. The project area seems to be in its current condition in aerial photographs from 2002, 2005, 2009, 2010, and 2012 (NETR Online 2016). These data indicate a low potential for historic archaeological material to be encountered.

The Sacred Lands File search, received on September 9, 2016, indicated “negative results.” Letters were sent on September 20, 2016 to the tribal contacts listed by the NAHC. To date no responses have been received. When responses are received, they will be forwarded to the applicant and to City staff. Native American correspondence is included as Confidential Appendix B.

Field Reconnaissance

Ground visibility was quite poor during the current survey, due to dense vegetation and the presence of crushed decomposed granite (DG) atop the non-vegetated surfaces. Vegetation obscured the ground surface throughout most of the eastern half of the project area. The western third of the project area (extending to roughly 300 feet east of the western boundary) has been graded and covered in a thin layer of crushed DG. Ground visibility in the graded portion of the project area ranged from 0 to 75 percent; in areas where vegetation (Russian thistle, grasses and forbs) and leaf litter (eucalyptus grove) were not a hindrance to ground visibility, crushed DG was present and was effectively obscuring the actual ground surface. A manufactured berm, or possibly spoils from grading, is located in the northeast corner of the graded area, and appears to be near where the graded dirt road on the property had been located.

The eastern two-thirds of the project area consists of a gentle slope into the valley, which trends northeast at the project’s eastern boundary. Areas within this portion that were not filled with dense vegetation were traversed; parallel transects were not feasible, due to the density of vegetation cover. Thistle, grasses, scattered oaks, shrubs, and cacti were found throughout this eastern portion of the project site. The flow areas of the drainage were the most heavily vegetated, as well as the southern boundary and a sizeable area near the center of the project. Ground visibility was, at best, 25 percent in areas in which grasses and thistle were the primary vegetation; in other areas, ground visibility was no more than 0 to 5 percent.

Non-cultural fossilized shell (*Chione, Ostrea)* was observed along the eastern border of the graded pad to roughly 300 feet to the east, where ground visibility was extremely low (0 to 5 percent). This particular area of the project exhibited a moderate to high degree of erosion, exposing an underlying metavolcanic cobble lens in several areas.

One cobble with battering present on the proximal and distal ends was observed within a spoils pile near the project's southwestern corner. This artifact, which was not collected, is probably associated with CA-SDI-10036, but its original provenience is unknown, due to the level of disturbance in the area. No other cultural material was observed during the survey.

Evaluation

No historic or archaeological material was observed during the field survey. However, as addressed under Background Research, one archaeological site (CA-SDI-10036) was previously recorded as partially within the project area. The site was noted as a significant resource; however, unauthorized grading had destroyed the significant portion of the resource subsequent to the testing/assessment but before any further research could be undertaken (Cardenas and Winterrowd 1985). The portion of the site within the project area has been either completely destroyed or highly disturbed by grading activity, possibly the same grading noted by Cardenas and Winterrowd (1985). Based on this, the project is expected to have no significant impacts to cultural resources; the significant cultural resources previously recorded within the project area appear to have been destroyed. Despite the disturbed nature of the project site, there remains a potential for cultural material that could not be seen during the field survey, due to the limited ground visibility in most areas. At other recent projects (e.g., Worsch Way 11/Mayfair [Robbins-Wade 2014]), cultural material was encountered in highly disturbed contexts where the ground surface was obscured at the time of the cultural resources survey.

VI. RECOMMENDATIONS

(Include recommendations for mitigation of significant indirect and cumulative impacts and monitoring, as appropriate).

Although no significant impacts to cultural resources are anticipated, there is a potential for encountering cultural material during vegetation clearing, grading, and other ground-disturbing activity within the project site, despite the high degree of past disturbance. Therefore, an archaeologist and a Kumeyaay Native American monitor should be present to observe initial ground-disturbing activity. If cultural material is encountered, both the archaeologist and the Native American monitor will have the authority to temporarily halt the work while the material is evaluated to assess its significance and determine if there is a need for further mitigation measures to be developed and implemented.

VII. SOURCES CONSULTED

SOURCES CONSULTED	DATE	
■ National Register of Historic Places	Month and Year:	October 2016
■ California Register of Historical Resources	Month and Year:	October 2016
Archaeological/Historical Site Records:		
■ South Coastal Information Center	Month and Year:	October 2016
Other Sources Consulted:		
■ Native American Heritage Commission Sacred Land Files	Month and Year:	September 2016

VIII. CERTIFICATION

Preparer: Mary Robbins-Wade Title: Director of Cultural Resources

Signature: Mary Robbins-Wade Date: August 23, 2017

Preparer: Kristina Davison Title: Staff Archaeologist

Signature: Kristina K Davison Date: August 23, 2017

IX. ATTACHMENTS

A National Archaeological Data Base Information
B Bibliography
C Maps/Figures
- ■ Figure 1 Regional Location Map
- ■ Figure 2 Project Vicinity (USGS Topography)
- ■ Figure 3 Aerial Photograph

D Culture History

Confidential Appendices
A Records Search Maps
B Native American Correspondence

Attachment A

NATIONAL ARCHAEOLOGICAL DATABASE INFORMATION

NATIONAL ARCHAEOLOGICAL DATA BASE INFORMATION

Authors:	Mary Robbins-Wade and Kristina Davison
Consulting Firm:	HELIX Environmental Planning, Inc., 7578 El Cajon Blvd., La Mesa, CA 91942, (619) 462-1515
Report Date:	November 2016
Report Title:	Archaeological Report Form: Lighthouse Ridge Project, San Diego, CA. Project No. 438585
Submitted to:	City of San Diego, Development Services, 1222 First Avenue, San Diego, CA 92101
Prepared for:	Pacific Legacy Homes, 16870 W. Bernardo Drive, Suite 400, San Diego, CA 92127
Contract Number:	HELIX Project No. PLH-02
USGS Quadrangles:	Del Mar (7.5' series)
Acreage:	4.8 acres
Keywords:	Negative archaeological survey; City of San Diego, San Diego County, Carmel Valley, Gonzalez Canyon,; Township 14 South, Range 3 West, Section 17; CA-SDI-10036 (site has been destroyed through past grading)

Attachment B

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Attachment C

MAPS/FIGURES

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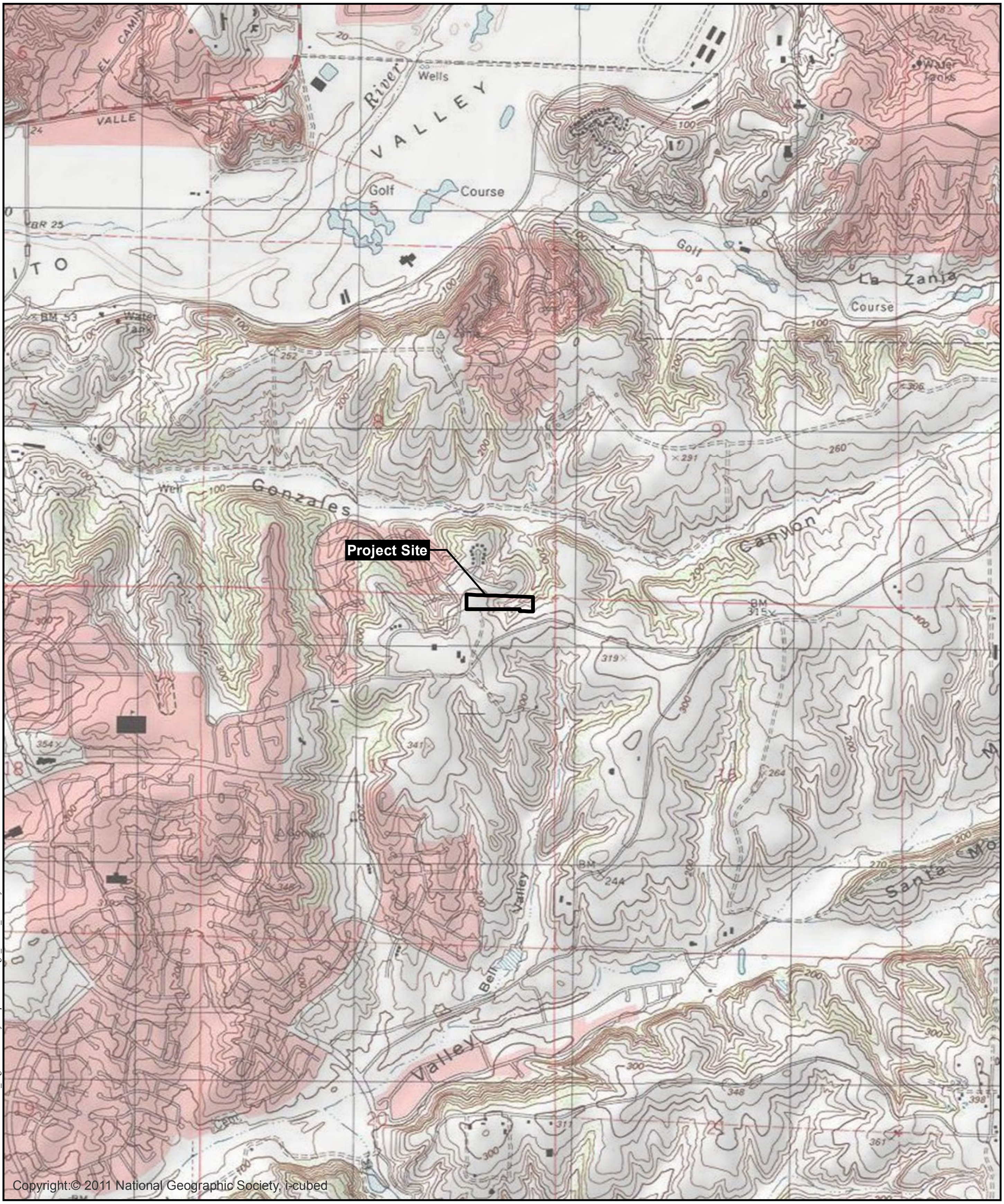
Regional Location Map

LIGHTHOUSE RIDGE

HELIX Environmental Planning

Figure 1



Project Vicinity (USGS Topography)

LIGHTHOUSE RIDGE

Figure 2

N 0 2,000 Feet

HELIX Environmental Planning

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Aerial Photograph

LIGHTHOUSE RIDGE

HELIX Environmental Planning

N 0 450 Feet

Figure 3

Attachment D

GENERAL CULTURE HISTORY

GENERAL CULTURE HISTORY

Several summaries discuss the prehistory of San Diego County and provide a background for understanding the archaeology of the general area surrounding the project. Moratto's (1984) review of the archaeology of California contains important discussions of Southern California, including the San Diego area, as does a relatively recent book by Neusius and Gross (2007). Bull (1983, 1987), Carrico (1987), Gallegos (1987), and Warren (1985, 1987) provide summaries of archaeological studies and interpretations, and another paper (Arnold et al. 2004) discusses advances since 1984. The following is a brief discussion of the culture history of the San Diego region.

Carter (1957, 1978, 1980), Minshall (1976) and others (e.g., Childers 1974; Davis 1968, 1973) have long argued for the presence of Pleistocene humans in California, including the San Diego area. The sites identified as "early man" are all controversial. Carter and Minshall are best known for their discoveries at Texas Street and Buchanan Canyon. The material from these sites is generally considered nonartifactual, and the investigative methodology is often questioned (Moratto 1984).

The earliest accepted archaeological manifestation of Native Americans in the San Diego area is the San Dieguito complex, dating to approximately 10,000 years ago (Warren 1967). The San Dieguito complex was originally defined by Rogers (1939), and Warren published a clear synthesis of the complex in 1967. The material culture of the San Dieguito complex consists primarily of scrapers, scraper planes, choppers, large blades, and large projectile points. Rogers considered crescentic stones to be characteristic of the San Dieguito complex as well. Tools and debitage made of fine-grained green metavolcanic material, locally known as felsite, were found at many sites which Rogers identified as San Dieguito. Often these artifacts were heavily patinated. Felsite tools, especially patinated felsite, came to be seen as an indicator of the San Dieguito complex. Many archaeologists felt that the San Dieguito culture lacked milling technology and saw this as an important difference between the San Dieguito and La Jolla complexes. Sleeping circles, trail shrines, and rock alignments have also been associated with early San Dieguito sites. The San Dieguito complex is chronologically equivalent to other Paleoindian complexes across North America, and sites are sometimes called "Paleoindian" rather than "San Dieguito." San Dieguito material underlies La Jolla complex strata at the C.W. Harris site in San Dieguito Valley (Warren, ed. 1966).

The traditional view of San Diego prehistory has the San Dieguito complex followed by the La Jolla complex at least 7000 years ago, possibly as long as 9000 years ago (Rogers 1966). The La Jolla complex is part of the Encinitas tradition and equates with Wallace's (1955) Millingstone Horizon. The Encinitas tradition is generally "recognized by millingstone assemblages in shell middens, often near sloughs and lagoons" (Moratto 1984:147). "Crude" cobble tools, especially choppers and scrapers, characterize the La Jolla complex (Moriarty 1966). Basin metates, manos, discoidals, a small number of Pinto series and Elko series points, and flexed burials are also characteristic.

Warren et al. (1961) proposed that the La Jolla complex developed with the arrival of a desert people on the coast who quickly adapted to their new environment. Moriarty (1966) and Kaldenberg (1976) have suggested an in situ development of the La Jolla people from the San Dieguito. Moriarty has since proposed a Pleistocene migration of an ancestral stage of the La Jolla people to the San Diego coast. He suggested this Pre-La Jolla complex is represented at Texas Street, Buchanan Canyon, and the Brown site (Moriarty 1987).

Since the 1980s, archaeologists in the region have begun to question the traditional definition of San Dieguito people simply as makers of finely crafted felsite projectile points, domed scrapers, and discoidal cores, who lacked milling technology. The traditional defining criteria for La Jolla sites (manos, metates, “crude” cobble tools, and reliance on lagoonal resources) have also been questioned (Bull 1987; Cárdenas and Robbins-Wade 1985; Robbins-Wade 1986). There is speculation that differences between artifact assemblages of “San Dieguito” and “La Jolla” sites reflect functional differences rather than temporal or cultural variability (Bull 1987; Gallegos 1987). Gallegos (1987) has proposed that the San Dieguito, La Jolla, and Pauma complexes are manifestations of the same culture, with differing site types “explained by site location, resources exploited, influence, innovation and adaptation to a rich coastal region over a long period of time” (Gallegos 1987:30). The classic “La Jolla” assemblage is one adapted to life on the coast and appears to continue through time (Robbins-Wade 1986; Winterrowd and Cárdenas 1987). Inland sites adapted to hunting contain a different tool kit, regardless of temporal period (Cárdenas and Van Wormer 1984).

Several archaeologists in San Diego, however, do not subscribe to the Early Prehistoric/ Late Prehistoric chronology (see Cook 1985; Gross and Hildebrand 1998; Gross and Robbins-Wade 1989; Shackley 1988; Warren 1998). They feel that an apparent overlap among assemblages identified as “La Jolla,” “Pauma,” or “San Dieguito” does not preclude the existence of an Early Milling period culture in the San Diego region separate from an earlier culture. One perceived problem is that many site reports in the San Diego region present conclusions based on interpretations of stratigraphic profiles from sites at which stratigraphy cannot validly be used to address chronology or changes through time. Archaeology emphasizes stratigraphy as a tool, but many of the sites known in the San Diego region are not in depositional situations. In contexts where natural sources of sediment or anthropogenic sources of debris to bury archaeological materials are lacking, other factors must be responsible for the subsurface occurrence of cultural materials. The subsurface deposits at numerous sites are the result of such agencies as rodent burrowing and insect activity. Studies have emphasized the importance of bioturbative factors in producing the stratigraphic profiles observed at archaeological sites (see Gross 1992). Different classes of artifacts move through the soil in different ways (Bocek 1986; Erlandson 1984; Johnson 1989), creating vertical patterning (Johnson 1989) that is not culturally relevant. Many sites that have been used to help define the culture sequence of the San Diego region are the result of just such nondepositional stratigraphy.

The Late Prehistoric period is represented by the Cuyamaca complex in the southern portion of San Diego County and the San Luis Rey complex in the northern portion of the county. The Cuyamaca complex is the archaeological manifestation of the Yuman forebears of the Kumeyaay people. The San Luis Rey complex represents the Shoshonean predecessors of the ethnohistoric Luiseño. The name Luiseño derives from Mission San Luis Rey de Francia and has been used to refer to the Native people associated with that mission, while the Kumeyaay people are also known as Ipai, Tipai, or Diegueño (named for Mission San Diego de Alcala). Agua Hedionda Creek is often described as the division between the territories of the Luiseño and the Kumeyaay people (Bean and Shipek 1978; White 1963), although various researchers use slightly different ethnographic territory boundaries. Traditional stories and songs of the Native people also describe the extent of traditional use areas.

Elements of the Cuyamaca and San Luis Rey complexes include small, pressure-flaked projectile points (e.g., Cottonwood and Desert Side-notched series); milling implements, including mortars and pestles; Olivella shell beads; ceramic vessels; and pictographs (True 1970; True et al. 1974). Of these elements, mortars and pestles, ceramics, and pictographs are not associated with earlier sites. True noted a greater number of quartz projectile points at San Luis Rey sites than at Cuyamaca complex sites, which he interpreted as a cultural preference for quartz (True 1966). He considered ceramics to be a late development among the Luiseño, probably learned from the Diegueño.

Both the San Luis Rey and Cuyamaca complexes were defined on the basis of village sites in the foothills and mountains. Coastal manifestations of both Luiseño and Kumeyaay differ from their inland counterparts. Fewer projectile points are found on the coast, and there tends to be a greater number of scrapers and scraper planes at coastal sites (Robbins-Wade 1986, 1988). Cobble-based tools, originally defined as “La Jolla,” are characteristic of coastal sites of the Late Prehistoric period, as well (Cárdenas and Robbins-Wade 1985:117; Winterrowd and Cárdenas 1987:56).

PROJECT VICINITY

The project area is within lands that have traditionally been inhabited by the Kumeyaay people, also known as Diegueño or Ipai/Tipai (Luomala 1978). The project is south of the San Dieguito River Valley, which is rich in cultural resources. Most of these sites have been described as habitation or temporary habitation sites with ground stone implements, flaked stone artifacts, shell, and fire-affected rock or a combination of these elements. Ceramics were noted at a few of the sites. Historic foundations and historic debris have been recorded at several sites as well. The Carmel Valley area is also rich in historic and Native American cultural resources; almost 70 resources have been recorded within a one-mile radius of the project area.

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October 25, 2017 PLH-02

Mr. Michael Graham
Pacific Legacy Homes
16870 W. Bernardo Drive, Suite 400
San Diego, CA 92127

Subject: City of San Diego Climate Action Plan (CAP) Checklist Consistency for the Lighthouse Ridge Project

Dear Mr. Graham:

HELIX Environmental Planning, Inc. (HELIX) has reviewed the Lighthouse Ridge Project (project) for consistency with the City of San Diego (City) Climate Action Plan's (CAP's) Consistency Checklist (Checklist) to determine the proposed project's impacts on greenhouse gas (GHG) emissions. This memorandum summarizes the findings.

Site Information

The approximately 4.8-acre project site is located in the City, east of Interstate 5 and north of Del Mar Heights Road. The site is located within Section 17, Township 14 South, Range 3 West of the U.S. Geological Survey 7.5-minute Del Mar topographic quadrangle, east of Winstanley Way, at the northern terminus of Lighthouse Way. The property is within the Carmel Valley Community Plan, which designates the site's land use as Very Low Density Residential. The General Plan land use designation is Residential. The zoning for the project site is Carmel Valley Planned District – Single Family 1 (CVPD-SF1).

Project Description

The project would include a Vesting Tentative Subdivision Map and Site Development Permit for 10 residential lots accessed by an extension of Lighthouse Way. The project would include four "Plan 1" houses that would be 3,756 square feet (SF) each and six "Plan 2" houses that would be 4,515 SF each. A bio-retention swale and two bio-retention basins would treat storm water, which would then flow through created stream channels into the existing jurisdictional streambed and adjacent wetland area. The wetland area, a 30-foot buffer, and native habitat to the east of the wetland would be retained in biological open space.

CAP and Checklist Overview

In December 2015, the City adopted the CAP that outlines the actions the City will undertake to achieve its proportional share of State GHG emission reductions. The purpose of the Checklist is to, in conjunction with the CAP, provide a streamlined review process for proposed new development projects that are subject to discretionary review and trigger environmental review pursuant to the California Environmental Quality Act (CEQA).

The Checklist contains measures that are required to be implemented on a project-by-project basis to ensure that the specified emissions targets identified in the CAP are achieved. Implementation of the measures would ensure that new development is consistent with CAP strategies toward achieving the identified GHG reduction targets. Projects that are consistent with the CAP, as determined through the use of the Checklist, may rely on the CAP for the cumulative impacts analysis of GHG emissions. Projects that are not consistent with the CAP must prepare a comprehensive project-specific analysis of GHG emissions, including quantification of existing and projected GHG emissions and incorporation of the measures in the Checklist to the extent feasible. Cumulative GHG impacts would be significant for any project that is not consistent with the CAP.

Project Consistency with Checklist

<u>Step 1: Land Use Consistency</u>

The proposed project was analyzed for consistency with the CAP's Checklist (see Attachment A for the Checklist). Step 1 of the Checklist is to determine land use consistency of a project. A project would have a consistent land use if it is:

- Consistent with the existing General Plan and Community Plan land use and zoning designations (Checklist Item A of Step 1); or

- If not consistent with Item A, a project would be land use consistent if it is located in a Transit Priority Area (TPA) and implements CAP Strategy 3 actions (Checklist Item B of Step 1); or

- If not consistent with Item A or B, a project would be consistent if it would be an equivalent or less GHG-intensive project than the existing designations (Checklist Item C of Step 1).

The project is proposing 10 residential units on a 4.8-acre site, or approximately two units per acre. The project would be consistent with the Community Plan's land use and development intensity for Very Low Density Residential, which is one to five dwelling units per acre. In addition, the single-family residential development would be consistent with the General Plan's land use designation of Residential. The project would be consistent with the CVPD-SF1 zone requirements provided in Chapter 15, Article 3, Division 3 of the City Municipal Code. Therefore, the project would be consistent with the General Plan and Community Plan land use and zoning designations and Checklist Item 1 of Step 1 would apply to the project.

Step 2: CAP Strategies Consistency

After determining consistency with Step 1, Step 2 of the Checklist determines a project's consistency with the applicable strategies and actions of the CAP. The project's conformance with each CAP measure is described below.

Strategy 1: Energy and Water Efficient Buildings

1. *Cool/Green Roofs*

The project would include cool roofs that have a minimum 3-year aged solar reflection and thermal emittance or solar reflection index equal to or greater than the values specified in the voluntary measures under the California Green Building Standards Code.

2. *Plumbing Fixtures and Fittings*

The project would be provided with plumbing fixtures and fittings that meet the standards listed in the checklist for residential buildings.

Strategy 3: Bicycling, Walking, Transit and Land Use

3. *Electric Vehicle Charging*

The project is a single-family residential project and would not be subject to the requirements under this strategy..

4. *Bicycle Parking Spaces*

The project is residential and, therefore, the requirement for bicycle parking spaces does not apply.

5. *Shower Facilities*

The project would not include nonresidential development and would not have employees. Shower facility provisions would not be applicable to the project.

6. *Designated Parking Spaces*

The project is residential and does not include an employment use in a TPA. Therefore, the requirement for designated parking spaces does not apply.

7. *Transportation Demand Management Program*

This measure is not applicable to the proposed project, as the project does not meet the over 50 employee threshold for the Transportation Demand Management Program.

Step 3: Project CAP Conformance Evaluation (if applicable)

The third step of the CAP consistency review only applies if Step 1 is answered in the affirmative under Item B. As detailed previously, Step 1 was answered in the affirmative under Item A. As such, Step 3 does not apply to the project.

Conclusion

As described above, the project would be consistent with the Community Plan and General Plan's land use and development intensity. Furthermore, the project would implement and be consistent with two of the seven CAP measures identified in Step 2; the remaining five would not be applicable to the project. Given the aforementioned, the proposed project would be consistent with the Checklist and, therefore, the CAP, and the project's incremental contribution to a cumulative GHG emissions effect would not to be cumulatively considerable. Impacts to GHG emissions from the project would be less than significant.

Sincerely,

Bill Vosti
Air Quality Specialist

Victor Ortiz
Senior Air Quality Specialist

Attachment A: Climate Action Plan Consistency Checklist

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City of San Diego

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CLIMATE ACTION PLAN CONSISTENCY CHECKLIST INTRODUCTION

In December 2015, the City adopted a Climate Action Plan (CAP) that outlines the actions that City will undertake to achieve its proportional share of State greenhouse gas (GHG) emission reductions. The purpose of the Climate Action Plan Consistency Checklist (Checklist) is to, in conjunction with the CAP, provide a streamlined review process for proposed new development projects that are subject to discretionary review and trigger environmental review pursuant to the California Environmental Quality Act (CEQA).[1]

Analysis of GHG emissions and potential climate change impacts from new development is required under CEQA. The CAP is a plan for the reduction of GHG emissions in accordance with CEQA Guidelines Section 15183.5. Pursuant to CEQA Guidelines Sections 15064(h)(3), 15130(d), and 15183(b), a project's incremental contribution to a cumulative GHG emissions effect may be determined not to be cumulatively considerable if it complies with the requirements of the CAP.

This Checklist is part of the CAP and contains measures that are required to be implemented on a project-by-project basis to ensure that the specified emissions targets identified in the CAP are achieved. Implementation of these measures would ensure that new development is consistent with the CAP's assumptions for relevant CAP strategies toward achieving the identified GHG reduction targets. Projects that are consistent with the CAP as determined through the use of this Checklist may rely on the CAP for the cumulative impacts analysis of GHG emissions. Projects that are not consistent with the CAP must prepare a comprehensive project-specific analysis of GHG emissions, including quantification of existing and projected GHG emissions and incorporation of the measures in this Checklist to the extent feasible. Cumulative GHG impacts would be significant for any project that is not consistent with the CAP.

The Checklist may be updated to incorporate new GHG reduction techniques or to comply with later amendments to the CAP or local, State, or federal law.

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[1] Certain projects seeking ministerial approval may be required to complete the Checklist. For example, projects in a Community Plan Implementation Overlay Zone may be required to use the Checklist to qualify for ministerial level review. See Supplemental Development Regulations in the project's community plan to determine applicability.

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CAP CONSISTENCY CHECKLIST SUBMITTAL APPLICATION

- The Checklist is required only for projects subject to CEQA review.[2]
- If required, the Checklist must be included in the project submittal package. Application submittal procedures can be found in Chapter 11: Land Development Procedures of the City's Municipal Code.
- The requirements in the Checklist will be included in the project's conditions of approval.
- The applicant must provide an explanation of how the proposed project will implement the requirements described herein to the satisfaction of the Planning Department.

Application Information

Contact Information

Project No./Name: Lighthouse Ridge

Property Address: Lighthouse Way

Applicant Name/Co.: Pacific Legacy Homes

Contact Phone: (858) 756 – 1191 Contact Email: Mgraham@pacificlegacyhomes.com

Was a consultant retained to complete this checklist? ■ Yes ☐ No If Yes, complete the following

Consultant Name: Victor Ortiz Contact Phone: (619) 462-1515

Company Name: HELIX Environmental Planning, Inc. Contact Email: VictorO@helixepi.com

Project Information

1. What is the size of the project (acres)? 4.8 acre
2. Identify all applicable proposed land uses:
   - ■ Residential (indicate # of single-family units): 10
   - ☐ Residential (indicate # of multi-family units):
   - ☐ Commercial (total square footage):
   - ☐ Industrial (total square footage):
   - ☐ Other (describe):
3. Is the project or a portion of the project located in a Transit Priority Area? ☐ Yes ■ No
4. Provide a brief description of the project proposed:

The project would include a Vesting Tentative Subdivision Map and Site Development Permit for 10 residential lots accessed by an extension of Lighthouse Way. The project would include 4 "Plan 1" houses that would be 3,756 square foot (SF) each and 6 "Plan 2" houses that would be 4,515 SF each.

[2] Certain projects seeking ministerial approval may be required to complete the Checklist. For example, projects in a Community Plan Implementation Overlay Zone may be required to use the Checklist to qualify for ministerial level review. See Supplemental Development Regulations in the project's community plan to determine applicability.

CAP CONSISTENCY CHECKLIST QUESTIONS

Step 1: Land Use Consistency

The first step in determining CAP consistency for discretionary development projects is to assess the project's consistency with the growth projections used in the development of the CAP. This section allows the City to determine a project's consistency with the land use assumptions used in the CAP.

Step 1: Land Use Consistency		
Checklist Item (Check the appropriate box and provide explanation and supporting documentation for your answer)	Yes	No
A. Is the proposed project consistent with the existing General Plan and Community Plan land use and zoning designations?;[3] OR, B. If the proposed project is not consistent with the existing land use plan and zoning designations, and includes a land use plan and/or zoning designation amendment, would the proposed amendment result in an increased density within a Transit Priority Area (TPA)[4] and implement CAP Strategy 3 actions, as determined in Step 3 to the satisfaction of the Development Services Department?; OR, C. If the proposed project is not consistent with the existing land use plan and zoning designations, does the project include a land use plan and/or zoning designation amendment that would result in an equivalent or less GHG-intensive project when compared to the existing designations?	☑	☐

If "***Yes***," proceed to Step 2 of the Checklist. For question B above, complete Step 3. For question C above, provide estimated project emissions under both existing and proposed designation(s) for comparison. Compare the maximum buildout of the existing designation and the maximum buildout of the proposed designation.

If "***No***," in accordance with the City's Significance Determination Thresholds, the project's GHG impact is significant. The project must nonetheless incorporate each of the measures identified in Step 2 to mitigate cumulative GHG emissions impacts unless the decision maker finds that a measure is infeasible in accordance with CEQA Guidelines Section 15091. Proceed and complete Step 2 of the Checklist.

The project is proposing 10 residential units on a 4.8-acre site, or approximately two units per acre. The project would be consistent with the Community Plan's land use and development intensity for Very Low Density Residential, which is one to five dwelling units per acre. In addition, the single-family residential development would be consistent with the General Plan's land use designation of Residential. The project would be consistent with the CVPD-SF1 zone requirements provided in Chapter 15, Article 3, Division 3 of the City Municipal Code. Therefore, the project would be consistent with the General Plan and Community Plan land use and zoning designations and Checklist Item 1 of Step 1 would apply to the project.

[3] This question may also be answered in the affirmative if the project is consistent with SANDAG Series 12 growth projections, which were used to determine the CAP projections, as determined by the Planning Department.

[4] This category applies to all projects that answered in the affirmative to question 3 on the previous page: Is the project or a portion of the project located in a transit priority area.

Step 2: CAP Strategies Consistency

The second step of the CAP consistency review is to review and evaluate a project's consistency with the applicable strategies and actions of the CAP.   Step 2 only applies to development projects that involve permits that would require a certificate of occupancy from the Building Official or projects comprised of one and two family dwellings or townhouses as defined in the California Residential Code and their accessory structures.[5] All other development projects that would not require a certificate of occupancy from the Building Official shall implement Best Management Practices for construction activities as set forth in the Greenbook (for public projects).

Step 2: CAP Strategies Consistency			
Checklist Item (Check the appropriate box and provide explanation for your answer)	Yes	No	N/A
Strategy 1: Energy & Water Efficient Buildings			
1. *Cool/Green Roofs*. • Would the project include roofing materials with a minimum 3-year aged solar reflection and thermal emittance or solar reflection index equal to or greater than the values specified in the voluntary measures under California Green Building Standards Code (Attachment A)?; OR • Would the project roof construction have a thermal mass over the roof membrane, including areas of vegetated (green) roofs, weighing at least 25 pounds per square foot as specified in the voluntary measures under California Green Building Standards Code?; OR • Would the project include a combination of the above two options? Check "N/A" only if the project does not include a roof component. The project would include cool roofs that have a minimum 3-year aged solar reflection and thermal emittance or solar reflection index equal to or greater than the values specified in the voluntary measures under the California Green Building Standards Code.	☑	☐	☐

[5] Actions that are not subject to Step 2 would include, for example: 1) discretionary map actions that do not propose specific development, 2) permits allowing wireless communication facilities, 3) special events permits, 4) use permits or other permits that do not result in the expansion or enlargement of a building (e.g., decks, garages, etc.), and 5) non-building infrastructure projects such as roads and pipelines. Because such actions would not result in new occupancy buildings from which GHG emissions reductions could be achieved, the items contained in Step 2 would not be applicable.

2. *Plumbing fixtures and fittings* With respect to plumbing fixtures or fittings provided as part of the project, would those low-flow fixtures/appliances be consistent with each of the following: Residential buildings: • Kitchen faucets: maximum flow rate not to exceed 1.5 gallons per minute at 60 psi; • Standard dishwashers: 4.25 gallons per cycle; • Compact dishwashers: 3.5 gallons per cycle; and • Clothes washers: water factor of 6 gallons per cubic feet of drum capacity? Nonresidential buildings: • Plumbing fixtures and fittings that do not exceed the maximum flow rate specified in Table A5.303.2.3.1 (voluntary measures) of the California Green Building Standards Code (See Attachment A); and • Appliances and fixtures for commercial applications that meet the provisions of Section A5.303.3 (voluntary measures) of the California Green Building Standards Code (See Attachment A)? Check "N/A" only if the project does not include any plumbing fixtures or fittings. The project would be provided with plumbing fixtures and fittings that meet the standards listed in the checklist for residential buildings.	☑	☐	☐

Strategy 3: Bicycling, Walking, Transit & Land Use			
3. *Electric Vehicle Charging* • <u>Multiple-family projects of 17 dwelling units or less</u>: Would 3% of the total parking spaces required, or a minimum of one space, whichever is greater, be provided with a listed cabinet, box or enclosure connected to a conduit linking the parking spaces with the electrical service, in a manner approved by the building and safety official, to allow for the future installation of electric vehicle supply equipment to provide electric vehicle charging stations at such time as it is needed for use by residents? • <u>Multiple-family projects of more than 17 dwelling units</u>: Of the total required listed cabinets, boxes or enclosures, would 50% have the necessary electric vehicle supply equipment installed to provide active electric vehicle charging stations ready for use by residents? • <u>Non-residential projects</u>: Of the total required listed cabinets, boxes or enclosures, would 50% have the necessary electric vehicle supply equipment installed to provide active electric vehicle charging stations ready for use? Check "N/A" only if the project is a single-family project or would not require the provision of listed cabinets, boxes, or enclosures connected to a conduit linking the parking spaces with electrical service, e.g., projects requiring fewer than 10 parking spaces. The project is a single-family residential project and would not be subject to the requirements under this strategy.	☐	☐	☑

Strategy 3: Bicycling, Walking, Transit & Land Use (Complete this section if project includes non-residential or mixed uses)			
4. *Bicycle Parking Spaces* Would the project provide more short- and long-term bicycle parking spaces than required in the City's Municipal Code (Chapter 14, Article 2, Division 5)?[6] Check "N/A" only if the project is a residential project. The project is residential and, therefore, the requirement for bicycle parking spaces does not apply.	☐	☐	☑

[6] Non-portable bicycle corrals within 600 feet of project frontage can be counted towards the project's bicycle parking requirements.

5. *Shower facilities*

If the project includes nonresidential development that would accommodate over 10 tenant occupants (employees), would the project include changing/shower facilities in accordance with the voluntary measures under the California Green Building Standards Code as shown in the table below?

Number of Tenant Occupants (Employees)	Shower/Changing Facilities Required	Two-Tier (12" X 15" X 72") Personal Effects Lockers Required
0-10	0	0
11-50	1 shower stall	2
51-100	1 shower stall	3
101-200	1 shower stall	4
Over 200	1 shower stall plus 1 additional shower stall for each 200 additional tenant-occupants	1 two-tier locker plus 1 two-tier locker for each 50 additional tenant-occupants

☐ ☐ ☑

Check "N/A" only if the project is a residential project, or if it does not include nonresidential development that would accommodate over 10 tenant occupants (employees).

The project would not include nonresidential development and would not have employees. Shower facility provisions would not be applicable to the project.

6. *Designated Parking Spaces*

If the project includes a nonresidential use in a TPA, would the project provide designated parking for a combination of low-emitting, fuel-efficient, and carpool/vanpool vehicles in accordance with the following table?

Number of Required Parking Spaces	Number of Designated Parking Spaces
0-9	0
10-25	2
26-50	4
51-75	6
76-100	9
101-150	11
151-200	18
201 and over	At least 10% of total

This measure does not cover electric vehicles. See Question 4 for electric vehicle parking requirements.

Note: Vehicles bearing Clean Air Vehicle stickers from expired HOV lane programs may be considered eligible for designated parking spaces. The required designated parking spaces are to be provided within the overall minimum parking requirement, not in addition to it.

Check "N/A" only if the project is a residential project, or if it does not include nonresidential use in a TPA.

☐ ☐ ☑

The project is residential and does not include an employment use in a TPA. Therefore, the requirement for designated parking spaces does not apply.

7. *Transportation Demand Management Program* If the project would accommodate over 50 tenant-occupants (employees), would it include a transportation demand management program that would be applicable to existing tenants and future tenants that includes: At least one of the following components: • Parking cash out program • Parking management plan that includes charging employees market-rate for single-occupancy vehicle parking and providing reserved, discounted, or free spaces for registered carpools or vanpools • Unbundled parking whereby parking spaces would be leased or sold separately from the rental or purchase fees for the development for the life of the development And at least three of the following components: • Commitment to maintaining an employer network in the SANDAG iCommute program and promoting its RideMatcher service to tenants/employees • On-site carsharing vehicle(s) or bikesharing • Flexible or alternative work hours • Telework program • Transit, carpool, and vanpool subsidies • Pre-tax deduction for transit or vanpool fares and bicycle commute costs • Access to services that reduce the need to drive, such as cafes, commercial stores, banks, post offices, restaurants, gyms, or childcare, either onsite or within 1,320 feet (1/4 mile) of the structure/use? Check "N/A" only if the project is a residential project or if it would not accommodate over 50 tenant-occupants (employees). This measure is not applicable to the proposed project, as the project does not meet the over 50 employee threshold for the Transportation Demand Management Program.	☐	☐	☑

Step 3: Project CAP Conformance Evaluation (if applicable)

The third step of the CAP consistency review only applies if Step 1 is answered in the affirmative under option B. The purpose of this step is to determine whether a project that is located in a TPA but that includes a land use plan and/or zoning designation amendment is nevertheless consistent with the assumptions in the CAP because it would implement CAP Strategy 3 actions. In general, a project that would result in a reduction in density inside a TPA would not be consistent with Strategy 3.The following questions must each be answered in the affirmative and fully explained.

1. **Would the proposed project implement the General Plan's City of Villages strategy in an identified Transit Priority Area (TPA) that will result in an increase in the capacity for transit-supportive residential and/or employment densities?**

   Considerations for this question:
   - Does the proposed land use and zoning designation associated with the project provide capacity for transit-supportive residential densities within the TPA?
   - Is the project site suitable to accommodate mixed-use village development, as defined in the General Plan, within the TPA?
   - Does the land use and zoning associated with the project increase the capacity for transit-supportive employment intensities within the TPA?

2. **Would the proposed project implement the General Plan's Mobility Element in Transit Priority Areas to increase the use of transit?**

   Considerations for this question:
   - Does the proposed project support/incorporate identified transit routes and stops/stations?
   - Does the project include transit priority measures?

3. **Would the proposed project implement pedestrian improvements in Transit Priority Areas to increase walking opportunities?**

   Considerations for this question:
   - Does the proposed project circulation system provide multiple and direct pedestrian connections and accessibility to local activity centers (such as transit stations, schools, shopping centers, and libraries)?
   - Does the proposed project urban design include features for walkability to promote a transit supportive environment?

4. **Would the proposed project implement the City of San Diego's Bicycle Master Plan to increase bicycling opportunities?**

   Considerations for this question:
   - Does the proposed project circulation system include bicycle improvements consistent with the Bicycle Master Plan?
   - Does the overall project circulation system provide a balanced, multimodal, "complete streets" approach to accommodate mobility needs of all users?

5. **Would the proposed project incorporate implementation mechanisms that support Transit Oriented Development?**

   Considerations for this question:
   - Does the proposed project include new or expanded urban public spaces such as plazas, pocket parks, or urban greens in the TPA?
   - Does the land use and zoning associated with the proposed project increase the potential for jobs within the TPA?
   - Do the zoning/implementing regulations associated with the proposed project support the efficient use of parking through mechanisms such as: shared parking, parking districts, unbundled parking, reduced parking, paid or time-limited parking, etc.?

6. **Would the proposed project implement the Urban Forest Management Plan to increase urban tree canopy coverage?**

   Considerations for this question:
   - Does the proposed project provide at least three different species for the primary, secondary and accent trees in order to accommodate varying parkway widths?
   - Does the proposed project include policies or strategies for preserving existing trees?
   - Does the proposed project incorporate tree planting that will contribute to the City's 20% urban canopy tree coverage goal?

Lighthouse Ridge Project

Waste Management Plan

August 2017

Prepared for:

Pacific Legacy Homes

16870 W. Bernardo Drive, Suite 400

San Diego, CA 92127

Prepared by:

HELIX Environmental Planning, Inc.

7578 El Cajon Boulevard

La Mesa, CA 91942

Lighthouse Ridge Project

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August 2017

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ACRONYMS AND ABBREVIATIONS

AB	Assembly Bill
C&D	Construction and Demolition
CalRecycle	California Department of Resources Recycling and Recovery
CEQA	California Environmental Quality Act
CIWMA	California Integrated Waste Management Act of 1989
CVPD-SF1	Carmel Valley Planned District – Single Family 1
CY	cubic yard(s)
DSD	Development Services Department (City of San Diego)
ESD	Environmental Services Department (City of San Diego)
IWMP	Integrated Waste Management Plan
lbs	pounds
LEED	Leadership in Energy and Environmental Design
SDMC	San Diego Municipal Code
SF	square foot/feet
SRRE	Source Reduction and Recycling Element
SWMC	Solid Waste Management Coordinator
WDM	Waste Diversion Measures
WMP	Waste Management Plan
USGBC	U.S. Green Building Council

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1.0 INTRODUCTION

1.1 PURPOSE OF THE REPORT

The purpose of this Waste Management Plan (WMP) is to identify the quantity of solid waste that would be generated by the Lighthouse Ridge Project (project) throughout construction and operation, and to identify measures to reduce the potential impacts associated with management of such waste.

Proper separation and diversion of recyclable waste materials is required in order to divert each material type to a recycling/reuse facility with the highest possible diversion rate. As discussed further in Section 2.0, *Regulatory Framework*, to comply with the City of San Diego's (City's) waste reduction ordinances and the waste diversion goals established in State Assembly Bill (AB) 341, the project must achieve a 75 percent diversion rate during demolition and construction. The City's California Environmental Quality Act (CEQA) Significance Thresholds for solid waste identify a threshold of 1,500 tons of waste or more during construction and demolition (C&D) for direct solid waste impacts, and 60 tons of waste or more during C&D for potentially significant cumulative solid waste impacts. The City Environmental Services Department's (ESD) 2017 Certified Construction & Demolition Recycling Facility Directory (City 2017) provides guidance on identifying recycling/reuse facility locations, accepted materials, recycling/reuse rates, and associated disposal fees and/or the value of the materials accepted for recycling/reuse.

This WMP has been prepared consistent with applicable federal, State, and local laws, regulations, and standards pertinent to the project. Its goal is to implement an approach for managing waste that conserves landfill space, preserves environmental quality, conserves natural resources, and reduces disposal costs. Responsibility for ensuring ongoing WMP compliance would be under the direction of the Project Solid Waste Management Coordinator (SWMC), as assigned by Pacific Legacy Homes (Applicant).

1.2 PROJECT LOCATION

The approximately 4.8-acre project site is located in the City of San Diego, east of Interstate 5 and north of Del Mar Heights Road (Figure 1, *Regional Location Map*). The site is located within Section 17, Township 14 South, Range 3 West of the U.S. Geological Survey 7.5-minute Del Mar topographic quadrangle, east of Winstanley Way, at the northern terminus of Lighthouse Way (Figure 2, *Project Vicinity*). The property is within the Carmel Valley Community Plan, which designates the site's land use as Very Low Density Residential. The General Plan land use designation is Residential. The zoning for the project site is Carmel Valley Planned District – Single Family 1 (CVPD-SF1).

1.3 PROJECT DESCRIPTION

The project would include a Vesting Tentative Subdivision Map and Site Development Permit for 10 residential lots accessed by an extension of Lighthouse Way. The project would include four "Plan 1" houses that would be 3,756 square feet (SF) each and six "Plan 2" houses that would be 4,515 SF each. A bio-retention swale and two bio-retention basins would treat storm water, which would then flow through created stream channels into the existing jurisdictional streambed and adjacent wetland area. The wetland area, a 30-foot buffer, and native habitat to the east of the wetland would be retained in biological open space.

Proposed underground utilities within the project site would connect to existing facilities in Lighthouse Way. Paved areas would cover approximately 21,180 SF, with 1,947 SF of sidewalks, 13,633 SF of roadways, and 5,600 SF of driveways (pers. comm. Isabel Stonehouse, Latitude 33 Planning and Engineering 2017). Site grading would require no export of soil and an estimated 20,000 cubic yards (CY) of fill.

2.0 REGULATORY FRAMEWORK

2.1 STATE OF CALIFORNIA

The State of California (State) Integrated Waste Management Act (CIWMA) of 1989 (AB 939), which is administered by the California Department of Resources Recycling and Recovery (CalRecycle), requires counties to develop an Integrated Waste Management Plan (IWMP) that describes local waste diversion and disposal conditions, and lays out realistic programs to achieve the waste diversion goals. IWMPs compile Source Reduction and Recycling Elements (SRREs) that are required to be prepared by each local government, including cities. SRREs analyze the local waste stream to determine where to focus diversion efforts, and provide a framework to meet waste reduction mandates. The goal of the solid waste management efforts is not to increase recycling, but to decrease the amount of waste entering landfills. AB 939 required all cities and counties to divert a minimum 50 percent of all solid waste from landfill disposal.

In 2011, the State legislature enacted AB 341 (California Public Resource Code Section 42649.2), increasing the diversion target to 75 percent statewide. AB 341 also requires the provision of recycling service to commercial and residential facilities that generate 4 CY or more of solid waste per week.

2.2 CITY OF SAN DIEGO

The City has enacted codes and policies directed at the achievement of State-required diversion levels, including the Refuse and Recyclable Materials Storage Regulations (City 1997; Municipal Code Chapter 14, Article 2 Division 8), Recycling Ordinance (City 2007; Municipal Code Chapter 6, Article 6, Division 7), and the Construction and Demolition Debris Deposit Ordinance (City 2008; Municipal Code Chapter 6, Article 6, Division 6). As stated in the City Development Services Department (DSD) CEQA Significance Determination Thresholds (City 2016a), implementation of these regulations and ordinances alone is not projected to achieve a 50 percent diversion rate, far below the current 75 percent diversion level targeted by the State. The City's ESD estimates that compliance with existing City ordinances and regulations alone achieves only an approximate 40 percent diversion rate (City 2013).

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Regional Location Map

LIGHTHOUSE RIDGE

HELIX Environmental Planning

Figure 1

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Project Vicinity

LIGHTHOUSE RIDGE

HELIX
Environmental Planning

N 0 450 Feet

Figure 2

The City's Zero Waste Plan, a component of the City's Climate Action Plan, was approved and adopted by City Council on July 13, 2015. The Climate Action Plan was approved in December 2015. The Zero Waste Plan identifies goals and strategies to achieve 75 percent diversion by 2020, 90 percent diversion by 2035, and "zero" waste by 2040 (City 2015).

Given the aforementioned, discretionary projects must undertake additional measures to comply with existing regulations. The City's Miramar Landfill is currently projected to close in 2025, further emphasizing the need to preserve landfill space.

City of San Diego CEQA Significance Determination Thresholds

The City's CEQA Significance Determination Thresholds establish solid waste generation thresholds for discretionary projects. Proposed projects that involve construction, demolition, and/or renovation that meet or exceed the thresholds described below are considered to have potentially significant solid waste impacts and require the preparation of a WMP.

Direct Impacts

Projects that include the construction, demolition, or renovation of 1,000,000 SF or more of building space may generate approximately 1,500 tons of waste or more during construction and demolition, and are considered to have direct impacts on solid waste services.

- Direct impacts result from the generation of large amounts of waste, which brings facilities closer to daily throughput limits, shortens facility lifespans, requires increased numbers of trucks and other equipment, and makes it difficult for the City to achieve required waste reduction levels. Waste management planning is based on a steady rate of waste generation and does not assume increased waste generation due to growth.

- While all projects are required to comply with the City's waste management ordinances, direct and cumulative impacts are mitigated by the implementation of project-specific WMPs, which may reduce solid waste impacts to below a level of significance.

- For projects over 1,000,000 SF, a significant direct and cumulative solid waste impact would result if the compliance with the City's ordinances and the WMP fail to reduce the impacts of such projects to below a level of significance and/or if a WMP for the project is not prepared and conceptually approved by the ESD prior to distribution of the draft environmental document for public review.

Cumulative Impacts

Projects that include the construction, demolition, and/or renovation of 40,000 SF or more of building space may generate approximately 60 tons of waste or more, and are considered to have cumulative impacts on solid waste services.

While all projects are required to comply with the City's waste management ordinances, cumulative impacts are mitigated by the implementation of a project-specific WMP that reduces solid waste impacts to below a level of significance.

LEED Projects Exceeding the Significance Thresholds

Projects that intend certification as U.S. Green Building Council (USGBC) Leadership in Energy and Environmental Design (LEED) Silver or better would include LEED measures as part of their WMP. This would demonstrate implementation of sustainability measures intended to assure a minimal project “environmental footprint,” including mitigating the types of impacts caused by waste generation.

At the preliminary planning stage, the project does not propose LEED certification, although it would incorporate sustainable and waste reduction elements consistent with LEED principles (as discussed further in Section 7.2 of this report). The project proposes construction of more than 40,000 SF, thereby exceeding the City’s threshold for cumulative solid waste impacts without implementation of solid waste diversion measures. Because implementation of the project without waste diversion measures would exceed cumulative solid waste thresholds, preparation of this WMP is required under CEQA to ensure that the project contribution to the overall waste produced within the City would be reduced sufficiently to allow the City to comply with the waste reduction targets established in the Public Resources Code and State statutes.

City of San Diego Refuse and Recyclable Materials Storage Ordinance

San Diego Municipal Code (SDMC) Section 142.0801 et seq. contains the language of the City Refuse and Recyclable Materials Storage Ordinance (Storage Ordinance), an ordinance that is required by State law. Table 1, *Required Minimum Storage Areas for Residential Development*, (SDMC Table 142-08B) provides information on minimum exterior refuse and recyclable material storage areas for residential development.

Table 1
REQUIRED MINIMUM STORAGE AREAS FOR RESIDENTIAL DEVELOPMENT

Number of Dwelling Units	Minimum Refuse Storage Area (SF)	Minimum Recyclable Material Storage Area (SF)	Total Minimum Storage Area (SF)
2-6	12	12	24
7-15	24	24	48
16-25	48	48	96
26-50	96	96	192
51-75	144	144	288
76-100	192	192	348
101-125	240	240	480
126-150	288	288	676
151-175	336	336	672
176-200	384	384	768
200+	384 + 48 for every 25 dwelling units above 201	384 + 48 for every 25 dwelling units above 201	768 + 96 for every 25 dwelling units above 201

SF = square feet

City of San Diego Recycling Ordinance

The City's Recycling Ordinance, found in SDMC Section 66.0701 et seq., was adopted in November 2007 (City 2007). The Recycling Ordinance requires the provision of recycling service for all commercial facilities, all single-family residences, and multi-family residences with more than 49 units. The Ordinance also provides an exemption for land uses that generate less than six CY of waste per week. However, as noted above, AB 341, which was chaptered after the City enacted this ordinance, has imposed a requirement that "captures" any uses being served with four CY or more of refuse capacity. This State requirement makes the provision of recycling service a virtually universal requirement. In addition, the Recycling Ordinance also requires development of educational materials to ensure occupants are informed about the City's ordinance and recycling services, including information on types of recyclable materials accepted.

City of San Diego Construction and Demolition Debris Deposit Ordinance

On July 1, 2008, the City's C&D Debris Deposit Ordinance became effective (City 2008). An amendment to the ordinance and revisions to the associated C&D deposit schedule were approved by the City Council on December 10, 2013 (effective January 1, 2014) and on April 19, 2016 (effective June 22, 2016). The C&D Debris Deposit Ordinance is designed to keep C&D materials out of local landfills and ensure that materials are diverted from disposal. The ordinance creates an economic incentive to recycle C&D debris through the collection of fully refundable deposits that are returned, in whole or in part, upon proof of the amount of C&D debris the project applicant diverted from landfill disposal. The ordinance requires that the majority of construction, demolition and remodeling projects requiring building or demolition/ removal permits pay a refundable C&D Debris Recycling Deposit and divert at least 65 percent of their debris by recycling, reusing, or donating usable materials. The deposit is held until the applicant provides receipts demonstrating that a minimum 65 percent of the material generated has been diverted from disposal in landfills.

The C&D Ordinance stipulates that projects will be required to divert 75 percent of their wastes when mixed debris facilities with a permitted daily tonnage capacity of at least 1,000 tons maintain a 75 percent diversion rate for three consecutive calendar year quarters. Greater than 75 percent diversion also may be required for a project if a higher goal is specified during discretionary permitting. Mixed debris recyclers in San Diego County currently achieve between 67 and 88 percent diversion rates at their facilities (refer to Appendix B). This is because not everything that comes through the door is usable or marketable. While there is one facility that achieves a diversion rate greater than 75 percent, the others have a diversion rate of between 67 and 69 percent. For a project that would dispose of mixed debris at one of the facilities that achieve a 67 or 69 percent diversion rate, virtually all clean C&D waste from a project must be source separated and sent to a material-specific recycling facility, such as aggregate and metal recyclers, in order to achieve an overall diversion rate of 75 percent. Higher diversion rates can also be accomplished by salvage and/or on-site reuse of C&D materials. The City's C&D thresholds and deposit amounts are shown below in Table 2, *City C&D Deposit Schedule*.

Table 2 CITY C&D DEPOSIT SCHEDULE				
Building Category	**Deposit per SF[1]**	**Minimum SF Subject to Ordinance**	**Maximum SF Subject to Ordinance**	**Range of Deposits**
Residential New Construction, Non-residential Alterations, Demolition	$0.40	1,000	100,000	$400-$40,000
Non-residential New Construction	$0.20	1,000	50,000	$200-$10,000
Flat Rate				
Residential Alterations	$1,000	1,000	6,999	$1,000

Source: City 2016b

[1] Deposit amounts are applied to the entire area(s) where work will be performed, and are calculated based on square footage.

SF = square feet

3.0 SITE PREPARATION WASTE GENERATION AND DIVERSION: DEMOLITION, CLEARING/GRUBBING, AND GRADING

All C&D-generated waste would be subject to compliance with the source separation and diversion requirements contained in this WMP to divert, recycle, and/or re-use these materials to the maximum degree possible. As identified in the City's 2017 Certified Construction & Demolition Recycling Facility Directory (Appendix B), "Mixed C&D Debris" recyclers attain diversion rates between 67 to 88 percent diversion rate, whereas "source separated" material recyclers can attain nearly 100 percent diversion rates (City 2017). As a result, to achieve the highest level of waste diversion from landfills, and highest dollar value for the quality of materials, the project would source separate (segregate) clean recyclable materials on the site by material type, to the maximum extent practicable, and divert them for recycling or reuse at City-certified facilities specializing in each material type. As of the 2017 C&D directory, no source separated recyclers are available for drywall, and in the future drywall would be sent to a mixed recycler with a 67 percent diversion rate.

3.1 DEMOLITION

Prior to initiation of the project's construction activities, site preparation would require the demolition of existing asphalt concrete pavement. This pavement currently extends into the project site from where Lighthouse Way ends. Demolition estimates for the existing on-site pavement and concrete was estimated to total approximately 20 CY (pers. comm. Michael Graham, Pacific Legacy Homes 2017). Based on the City's C&D Debris Conversion Rate Table, which identifies a weight of 1.3 tons/CY of concrete (City 2016c; Appendix C), the weight of demolition materials is anticipated to be approximately 26 tons.

Salvage

The demolished asphalt pavement may be salvaged for use during project fill operations.

Recycling

Quantities of asphalt concrete pavement demolition materials are estimated to total approximately 26 tons.

3.2 CLEARING AND GRUBBING

The Applicant has indicated that the project is anticipated to require net export of approximately 100 CY of removed vegetation and other cleared materials during the clearing and grubbing process (pers. comm. Michael Graham, Pacific Legacy Homes 2017). Based on the City's C&D Debris Conversion Rate Table, which identifies a weight of 0.15 tons/CY of vegetation (City 2016c; Appendix C), the net export of removed vegetation and other cleared materials during the clearing and grubbing process is anticipated to be approximately 15 tons.

Salvage

No salvage of materials is proposed for the areas of the project site to be cleared.

Recycling

Vegetation would be processed and recycled at a target rate of 100 percent diversion at Miramar Greenery, a City-certified green waste recycling facility. The City's 2017 Certified Construction & Demolition Recycling Facility Directory (Appendix B) states the diversion rate for clean source-separated materials is 100 percent. Other waste materials associated with the clearing and grubbing are anticipated to include negligible amounts of waste generated by contractors working on the site during the clearing and grubbing process.

3.3 GRADING

Site grading would require no export of soil, and therefore no waste diversion. Other waste materials associated with grading are anticipated to include negligible amounts of waste generated by contractors working on site during the grading process.

3.4 SUMMARY OF SITE PREPARATION DEMOLITION, CLEARING AND GRUBBING, AND GRADING WASTE GENERATION AND DIVERSION

As discussed above, the waste materials to be generated during demolition and clearing and grubbing for project implementation would be source separated for recycling or reuse at City-certified facilities specializing in each material type, as applicable. No soil waste materials from grading would be exported off-site. A summary of anticipated waste generation volumes and diversion rates for site preparation activities is provided in Table 3, *Site Preparation Demolition and Clearing/Grubbing Solid Waste Generation, Diversion Rates, and Facilities*. As shown in the table, during site preparation the project would generate and divert 41 tons.

Salvage

The demolished asphalt pavement may be salvaged for use during project fill operations. However, as no specific inventory of reusable items has been conducted at this preliminary stage and no salvage plan has been prepared, no salvage is calculated.

Recycling

Materials generated during site preparation demolition and clearing and grubbing that are designated for recycling would be source separated on site during these activities. The City's 2017 Certified Construction & Demolition Recycling Facility Directory, updated quarterly, states that the diversion rate for these materials shall be 100 percent, except mixed C&D debris which achieves a maximum 88 percent diversion rate at the EDCO CDI Recycling and Buy Back Center (City 2017).

Table 3
SITE PREPARATION DEMOLITION AND CLEARING/GRUBBING
SOLID WASTE GENERATION, DIVERSION RATES, AND FACILITIES

Source of Material	Material	Volume (CY)	Tons/Unit Conversion Factor	Tons	Diversion Rate (Percent)	Facility/ Destination of Materials	Tons Diverted	Tons Disposed
Pavement	Asphalt/Concrete	20	1.3	26	100%	A	26	0
Clearing/Grubbing	Landscape Debris	100	0.15	15	100%	B	15	0
			TOTAL	**41**	**100%**	**--**	**41**	**0**

Sources: City's 2017 Certified Construction & Demolition Recycling Facility Directory (City 2017; Appendix B), City's C&D Debris Conversion Rate Table (City 2016c; Appendix C)
Facility/Destination Key:
A. Appropriate facility on City's 2017 Certified Construction & Demolition Recycling Facility Directory
B. Miramar Greenery, 5180 Convoy Street, San Diego, CA 92111
Notes:
- Table information subject to field verification during site preparation.
- The Applicant would contract with source separating recycling facilities listed in the City's 2017 Certified Construction & Demolition Recycling Facility Directory (City 2017) with an equal or greater diversion rate to ensure diversion rates meet those estimated in this table.
- Total diversion rate based on the percentage of total tons of waste diverted over the total tons of waste generated.

CY = cubic yards

4.0 CONSTRUCTION WASTE GENERATION AND DIVERSION

In estimating the quantity of waste generated during construction, City ESD staff recommends assuming each material type (carpet, ceiling tiles, etc.) would approximately equal the square footage of each structure. This square footage can then be multiplied by the weight of the material, and divided by ten (percent) to account for waste generated during the construction process. A 10 percent construction waste generation rate is a very conservative figure, used here for analysis of the "worst-case" scenario based on the following reasoning:

- The cost of purchasing construction materials in excess of the quantity required is prohibitive.
- Many materials, such as metal studs, come prefabricated in specific sizes, such that the contractor can accurately predict and purchase the specific quantity that would be required.
- Contractors can return unused and unneeded items (such as metal studs, appliances, fixtures, etc.) and/or utilize materials (such as brick or drywall) on other projects.
- Not all materials would be utilized throughout project square footage, so generation rates based on the total square footage are bound to be overestimated.

The project would include 4 "Plan 1" houses that would be 3,756 SF and 6 "Plan 2" houses that would be 4,515 SF, for a combined square footage of 42,114 SF. No specific construction materials or quantities are available at this preliminary planning level. The project proposes Type V construction for all structures. These construction types typically consist of wood-frame structures that include concrete components. Floor coverings are anticipated to consist of carpeting and ceramic tiling. Based on the proposed structures, the following building materials which may generate waste are likely to be used during construction:

- Metals
- Concrete/Asphalt
- Wood
- Drywall
- Carpet
- Carpet padding
- Ceramic tile
- Ceiling tile
- Roofing materials

Other waste generated would consist of packaging materials from construction material, appliances, windows, etc., including the following:

- Corrugated cardboard (packaging)
- Industrial plastics (plastic wrap, fasteners, etc.)
- Styrofoam (appliance packaging, not peanuts)

4.1 ESTIMATED CONSTRUCTION WASTE GENERATION AND DIVERSION

The City uses a rule of thumb of 3 lbs/SF of waste materials generated during construction (3 lbs = 0.0015 tons). Material quantities are based on City guidance as follows:

- Total project SF x each material type = Total quantity of construction materials required
- Total construction material required x 10 percent = Anticipated quantity of construction waste generated

Anticipated project construction waste generation is shown in Table 4, *Construction Solid Waste Generation, Diversion Rates, and Facilities*.

Table 4
CONSTRUCTION SOLID WASTE GENERATION, DIVERSION RATES, AND FACILITIES

Source of Material	New Gross SF	Material	Diversion Rate (Percent)[1]	Tons Diverted[2]	Tons Disposed
Single-family Residential (10 units)	42,114	Metals	100%	6.3	0.0
		Concrete/Asphalt	100%	6.3	0.0
		Wood	100%	6.3	0.0
		Drywall	67%	4.2	2.1
		Carpet	67%	4.2	2.1
		Carpet Padding	67%	4.2	2.1
		Mixed Debris	67%	4.2	2.1
		Trash	0%	0.0	6.3
Common Areas	12,176	Concrete/Asphalt	100%	3.2	0
		TOTAL	**74%**	**42**	**15**

[1] Trash would be taken to the Miramar Landfill (5180 Convoy Street, San Diego, CA 92111) at a zero percent diversion rate. All other construction debris would be taken to an appropriate facility listed on the City's 2017 Certified Construction & Demolition Recycling Facility Directory. Facilities that process metals, concrete/asphalt, and wood all achieve a 100 percent diversion rate for these materials. Drywall facilities achieve a 67 percent diversion rate. Facilities that process mixed debris achieve a minimum 67 percent diversion rate, which was conservatively assumed for this project. Although the facility directory indicates that carpet, and carpet padding would achieve a 100 percent diversion rate, City staff have indicated that applicable facilities to handle these types of construction debris may not be available and these materials should be assumed to be sent to a mixed debris facility with a 67 percent diversion rate (City 2016d).

[2] For each material type, construction waste quantities are calculated based on:
Three lbs of waste per building SF (e.g., 42,114 SF x 3 lbs/SF = 126,342 lbs, or 63 tons)
Total construction material required x 10 percent = anticipated quantity of construction waste generated (6.3 tons)

lbs = pounds; SF = square feet

4.2 PROPOSED POST-CONSUMER CONTENT CONSTRUCTION MATERIALS

In order to further minimize waste, the project would utilize recycled content construction materials, where possible. Given the preliminary nature of the project plans, an overall target of five percent is anticipated, with verification of purchase of materials equating to this target to be provided prior to or during the pre-construction meeting. See Section 6.1 for the construction waste management, coordination, and oversight measures that would be implemented pursuant to this WMP.

5.0 OCCUPANCY WASTE GENERATION AND DIVERSION

The project would be managed under the Applicant or its designee(s). The City's Storage Ordinance (Municipal Code Section 142.0801 et. seq.) requires the provision of separate bins for recyclable waste products to be separated from non-recyclable solid waste. Recycling containers would be provided in compliance with the Storage Ordinance, meeting or exceeding the minimums shown in Table 1 (see Appendix A, *Architectural Site Plans*).

The City's ESD provides a list of waste generation factors for the occupancy phase of development (City 2012; included as Appendix D of this report). The estimated waste generation and diversion for the proposed project is shown in Table 5, *Estimated Annual Solid Waste Generation and Diversion Rates.*

Table 5
ESTIMATED ANNUAL SOLID WASTE GENERATION AND DIVERSION RATES

Source of Material	Square Footage/Units	Waste Generation Factor[1]	Tons Generated (per year)	Expected Percent Diverted from Source-Separated Recycling[2,3]	Tons Diverted (per year)	Tons Disposed (per year)
Single-family Residential	10	1.6 tons per year per unit	16	40%	6.4	9.6
Common Areas	N/A	N/A	N/A	N/A	N/A	N/A
		TOTAL	**16**	**40%**	**6.4**	**9.6**

1 Waste generation factors provided in Appendix D to this WMP.
2 Reflects compliance with existing City Storage Ordinance and City Recycling Ordinance.
3 The Applicant would contract with City-approved recycling haulers and disposal facilities.

As shown in the table, it is anticipated that approximately 9.6 tons of waste are anticipated to be disposed of annually, and approximately 6.4 tons are estimated to be diverted. These estimates are based on the City's current waste generation factors, which do not take into consideration additional sustainability measures and recycling programs that may be implemented at the project and exceed the overall 40 percent diversion estimated by the City for occupancy. Based on this consideration, the actual waste generation may be lower than the estimated waste generation rates.

6.0 WASTE REDUCTION, RECYCLING, AND DIVERSION MEASURES

The Applicant is committed to waste reduction during all aspects of project grading, construction, and operation, and would incorporate the Waste Diversion Measures (WDM) described below to ensure compliance with applicable solid waste disposal and waste reduction regulations and ordinances. Mandatory compliance with these measures shall be included in all project contractor agreements, clearly reflected on project plans, and verifiable by City ESD staff through written submittals and/or site inspections as described below.

6.1 CONSTRUCTION WASTE MANAGEMENT, COORDINATION, AND OVERSIGHT

a. Contractor Agreements and City Coordination

All WDM described herein shall be included as part of contractor agreements and clearly reflected on project plans identifying activities required to be undertaken during clearing, grading, and construction. These measures shall also be provided in checklist format to City ESD staff prior to the initiation of any activities identified in the WMP. ESD staff shall be allowed access to the project site, project plans, and contractor education program meetings and materials (described below) to verify conformance with these measures.

b. Designation of a Solid Waste Management Coordinator

Prior to initiation of any construction, clearing, grading, or grubbing activities on site, the Applicant shall designate a SWMC for the property with the authority to provide guidelines and procedures for contractor(s) and staff to implement waste reduction and recycling efforts. These responsibilities shall include, but are not limited to, the following:

- Prepare a Contractor Education Program on the waste separation and diversion/disposal procedures specified in this WMP. The Contractor Education Program shall contain, at a minimum, the following information:
    - Written and visual description of each waste type required to be source separated
    - Written and graphic description of how each waste type must be treated prior to and during source separation
    - Direction on which waste types go to mixed-debris facilities
    - Direction on which waste types go to Miramar Landfill
    - Direction on materials requiring special handling, such as hazardous materials
    - Contact for designated contractor in case of questions or emergency
    - Contact at City ESD in case of questions or emergency
    - Phone number, address, and telephone contact information for each contracted hauler and disposal/diversion facility to be utilized
- Ensure the correct number and signage of bins, as specified in this WMP.

- Ensure a maximum five percent contamination by different waste types/non-recyclable materials by weight in the bins.

- Ensure no overtopping of bins occurs.

- Work with contractor(s) to refine estimated quantities of each type of material that would be recycled, reused, or disposed of as waste, then assist contractor(s) with documentation of that waste through receipts at each recycling and landfill facility identified in this WMP, or as otherwise agreed to by ESD staff.

- Issue stop work orders if procedures and standards specified in this WMP are not being followed/met.

- Coordinate with ESD and/or Mitigation Monitoring staff, including regular communication and invitations to the work site, and ensure appropriate staff members are involved at every stage.

- Ensure ESD staff attendance at the contractor education meeting and pre-construction meetings of each phase of the development.

c. Contractor Waste Management Training

The project's SWMC or an ESD-approved contractor designee shall carry out Contractor Education Program presentations ensuring all project personnel are trained regarding content and requirements of this WMP. Prior to beginning work on any portion of the project, each member of the team, including all workers, subcontractors, and suppliers, shall be provided with a copy of the WMP, and undergo training on proper waste management procedures applicable to the project.

- The project's SMWC, or ESD-approved Contractor-designee shall carry out contractor waste management training presentations for each new group or individual hired, contracted, or assigned to work on the project.

- The SMWC and/or Contractor-designee shall ensure that each person working on the project has completed the waste management training by maintaining a written log to be signed and dated by each trainee upon completion of the training program. Copies of this written log, along with a list of all applicable personnel, shall be provided to City ESD staff for verification during each phase of project activities.

d. Daily Site Inspections by Contractor(s)

The project contractor(s) shall conduct daily inspections of the construction site to ensure compliance with the requirements of this WMP and with all other applicable laws and ordinances. Daily inspections shall include verifying the availability and number of dumpsters based on amount of debris being generated, verifying trash and recycled materials dumpsters are correctly labeled, ensuring proper sorting and segregation of materials, and ensuring excess materials are properly salvaged. The project contractor(s) shall report the results of the daily site inspections to the SWMC.

e. Regular Removal of Waste Materials

The project contractor(s) shall ensure removal of construction waste materials in sufficient frequency to prevent over-topping of bins. The accumulation and burning of on-site grading/ land-clearing and construction waste materials shall be prohibited.

f. City Verification

The Applicant shall ensure a representative of the City's ESD attends pre-construction meetings prior to clearing, grading, and construction to ensure that the following items are verified:

- Material segregation, recycling, and reuse is occurring per the WMP;
- Soil is being transported to an appropriate facility for reuse;
- Grubbed materials are sent to a suitable green waste recycling facility;
- Contract documents have appropriate estimates and constraints to avoid "overbuying" construction materials;
- Contract documents specify methods to achieve five percent post-consumer content goal;
- Contamination levels (i.e., different waste types/non-recyclable materials) do not exceed five percent by weight;
- An appropriate diversion rate (as specified in this WMP) has been included on the deposit form;
- Contract documents specify agreements for each recyclable/reusable material type to be taken to an appropriate recycling/reuse facility, as specified in this WMP; and
- Minimum exterior refuse and recyclable material storage areas have been incorporated into project plans, as a requirement of the City of San Diego Storage Ordinance (Municipal Code Section 142.0801 et. seq.).

6.2 CONSTRUCTION WASTE REDUCTION, DIVERSION COMPLIANCE, AND VERIFICATION

a. Identification, Separation, and Diversion of Recyclable/Reusable Materials

The Applicant shall ensure that:

- Throughout project activities, waste materials shall be source separated on site into the appropriate bin based on materials type, according to the categories in this WMP.

Materials generated during clearing, grading, and construction that would be source separated and recycled are listed below:

- Mixed C&D (wood, dirt, concrete, drywall, brick, metals, rock, asphalt, tile, cardboard)
- Metals
- Concrete/Asphalt
- Wood
- Drywall
- Carpet
- Carpet padding
- Clean fill dirt
- Green waste

- A separate bin for each clean waste material type to be generated during each phase of clearing, grading, and construction activity shall be provided on the site, subject to the following requirements:
    - Containers shall be clearly labeled, with a list of acceptable and unacceptable materials. The list of acceptable materials must be the same as the materials recycled at the receiving material recovery facility or recycling processor.
    - The collection containers for recyclable grading/land-clearing and construction waste shall contain no more than five percent non-recyclable materials, by weight.
    - Regular visual inspections of dumpsters and recycling bins shall be conducted to remove contaminants.
    - Recycling areas shall be clearly identified with large signs. Lists of acceptable and unacceptable materials shall be posted on recycling bins and throughout the project site and all recycled material signage shall be visible on at least two sides of haul containers.
    - Recycling bins shall be placed in areas that would be readily accessible and would minimize misuse or contamination. The SWMC shall be responsible for these efforts and they shall be reviewed at pre-construction meetings and/or during contractor education meetings, if conducted separately.
    - Recyclable and/or reusable waste materials collected in source-separated bins shall be diverted to recycling/reuse facilities as designated in Tables 3 and 4 of this WMP, or to another facility listed on the City's 2017 Certified Construction & Demolition Recycling Facility Directory, should the designated facilities not be available.

b. Source Reduction Measures

Project contractors and subcontractors, in cooperation with the project's SWMC and ESD staff, as applicable, shall coordinate to minimize the over-purchasing of construction materials to lower the amount of materials taken to recycling and disposal facilities. The project shall minimize over-purchasing through purchase of pre-cut materials, whenever feasible. The following steps shall be undertaken:

- Detailed material estimates shall be used to reduce risk of unplanned and potentially wasteful material cuts.

- Contractor and subcontractor material purchasing agreements shall include a waste reduction provision requesting that: materials and equipment be delivered in packaging made of recyclable material; vendors reduce the amount of packaging; packaging be taken back by vendors for reuse or recycling; and vendors take back all unused product. Contracts containing this language shall be made available to ESD staff during ESD site visits for inspection.

- Post-consumer content products shall be employed in the design and construction of the new facilities with the goal of achieving five percent post-consumer content materials. Efforts to use post-consumer content may include using products manufactured with post-consumer content materials (i.e., products that were bought, used, and recycled by consumers), such as natural textiles, aggregate, or concrete. Receipts demonstrating post-consumer content shall be provided to ESD staff at or prior to the pre-construction meetings.

- Prior to submittal, final project plans shall indicate the anticipated source and quantity of materials to be reused on site, and the source, quantity, and percentage of post-consumer content waste products anticipated to be utilized for project construction.

- Contractors shall include the anticipated source and quantity of post-consumer content products proposed for reuse or purchase in their project bid.

- Final project plans inclusive of the information above shall be provided to ESD for verification.

6.3 Operational Waste Management and Diversion Measures

The Applicant shall undertake and/or shall specify in contract language and/or sales/lease agreements with any tenant, operator, and/or future owner, a list of recycling requirements with which the Applicant or future tenants, operators, and/or owners shall be obligated to comply, including, but not limited to, the following:

- Recycling areas shall be clearly identified with large signs.

- Lists of acceptable and unacceptable materials shall be posted on recycling bins.

- All recycled material signage shall be visible on at least two sides of recycling containers.

- Recycling bins shall be placed in areas that would be readily accessible and would minimize misuse or contamination.

- Prepare and distribute recycling educational materials for inspection by ESD prior to certificate of occupancy.

- After materials are approved, distribute to all project site owners/occupants.

- Green waste generated by ongoing landscaping and landscape maintenance activities shall be source separated by the landscaping contractor, and diverted to Miramar Greenery.

Prior to issuance of any certificate of occupancy/tentative certificate of occupancy, the Applicant shall invite a representative of the City ESD to:

- Inspect and approve storage areas that have been provided consistent with the City's Storage Ordinance;

- Ensure that a hauler has been retained to provide recyclable materials collection, and, if applicable, landscape waste collection; and

- Inspect and approve education materials for building tenants/owners that are required pursuant to the City's Recycling Ordinance.

For specialized product purchasing (e.g., with recycled content) to be used during occupancy, the Applicant shall provide for inspection by ESD the documentation that would be used to carry out this requirement.

7.0 CONCLUSION

As discussed under Regulatory Framework, a project may result in a significant direct impact under City CEQA Significance Thresholds if it generates more than 1,500 tons of solid waste materials during construction and demolition. Projects that include the construction, demolition, and/or renovation of 40,000 SF or more of building space or generate approximately 60 tons of waste or more are considered to have potentially significant cumulative impacts on solid waste services. Further, AB 341 requires the diversion of 75 percent of solid waste and mandatory provision of recycling collection service during occupancy.

7.1 SUMMARY OF WASTE GENERATION AND DIVERSION

During site preparation demolition, clearing/grubbing, and grading, the project would produce 42 tons of green waste, asphalt/concrete, and other C&D waste, and divert these 42 tons from the landfill, as identified in Table 3. Therefore, the overall site preparation diversion rate would be 100 percent.

During construction, the project would produce 57 tons of solid waste (metal, concrete, concrete/ asphalt, wood, drywall, carpet, carpet padding, mixed debris, and trash), and divert 42 tons of solid waste materials from the landfill, as identified in Table 4. The diverted material would consist of clean, source-separated (segregated) recyclable and/or reusable material, as well as mixed debris, to be deposited at the recycling/reuse facilities identified in the City's 2017 Certified Construction & Demolition Recycling Facility Directory (Appendix B; City 2017). Approximately 15 tons of solid waste material generated during construction is anticipated to be disposed of as non-recyclable/non-reusable waste at Miramar Landfill, for an overall diversion rate during construction of approximately 74 percent.

With the combined site preparation and construction phases, the project would produce 98 tons of solid waste and would divert 83 tons. This would be an overall diversion rate during site preparation and construction of 87 percent.

During occupancy, it has been estimated that the project would generate 16 tons of waste per year, and would divert 6.4 tons per year to recycling/reuse facilities, resulting in an estimated 40 percent diversion of waste from the landfill, as identified in Table 5. These materials would consist of clean, recyclable materials, gathered in on-site recycling bins. Approximately 9.6 tons per year, or 60 percent of occupancy material generated, are estimated to be disposed of as non-recyclable/non-reusable waste at Miramar Landfill.

7.2 COMPLIANCE WITH CITY AND STATE REGULATIONS

Project compliance with City and State regulations is addressed below.

State of California

Based on the quantified waste generation and diversion rates discussed above, the project would exceed the 75 percent solid waste diversion rate for waste produced during construction. The project would fail to meet the 75 percent waste reduction target annually once the buildings are occupied. This shortcoming is overcome by the following factors:

- The segregation proposed during site preparation and construction would achieve an overall 87 percent diversion rate, exceeding the 75 percent target.
- The project would incorporate mandatory waste reduction, recycling, and diversion measures as identified in Sections 6.1 and 6.2 of this WMP during site preparation and construction, to further reduce solid waste impacts.
- To minimize generation of waste materials, the project would incorporate recycled, post-consumer content materials in interiors and exteriors, to the extent practicable.

In addition to these measures implemented during site preparation and construction activities, the Applicant would commit to the recycling requirements identified in Section 6.3 of this WMP, to further reduce solid waste impacts during occupancy.

City of San Diego

The project would be below the City's CEQA Significance Determination Threshold (generation of more than 1,500 tons of solid waste materials) for direct impacts to solid waste facilities during demolition and construction, with 15 tons being sent to Miramar Landfill.

The project would exceed the City's threshold for cumulative impacts to solid waste facilities, as the project proposes greater than 40,000 SF of building space and the project would generate more than 60 tons of waste during C&D. In addition, during occupancy, the project would achieve an average 40 percent diversion of waste via source-separated recycling and would dispose of approximately 16 tons of waste per year once the buildings are occupied.

As mitigation, the City requires implementation of this document, a project-specific WMP, to identify measures for waste reduction. These waste exceedances would be overcome by the waste reduction achieved during construction through measures described in Sections 6.1 and 6.2 of this WMP. Through the quantified waste generation and diversion rates discussed in this document, the project would exceed the 75 percent solid waste diversion rate for waste produced during construction by achieving an overall 87 percent diversion rates. In addition, the measures specified for operation in Section 6.3 of this WMP would provide adequate waste management. Regarding trash and recycling storage space during operation, the project would provide at least 48 SF of trash and recycling storage space, per the City Storage Ordinance (Table 1). The project would comply with the City Recycling Ordinance by providing adequate space, bins, and educational materials for recycling during occupancy.

Through compliance with waste diversion measures included in this WMP, plus implementation of sustainability and efficiency features, the project's contribution to a cumulative solid waste generation would be reduced to a level that is less than cumulatively considerable.

8.0 REFERENCES

City of San Diego (City)

2017 2017 Certified Construction & Demolition Recycling Facility Directory. Environmental Services Department. January 10. Available at: https://www.sandiego.gov/sites/default/files/2017_certified_cd_facility_directory_010917.pdf

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2016d Personal communication between Lisa Wood of City of San Diego and Bill Vosti of HELIX. Via phone, August 26.

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2007 Recycling Ordinance (Municipal Code Chapter 6, Article 6, Division 7). November.

1997 Refuse and Recyclable Materials Storage Regulations (Municipal Code Chapter 14, Article 2 Division 8). December 9.

Latitude 33 Planning and Engineering

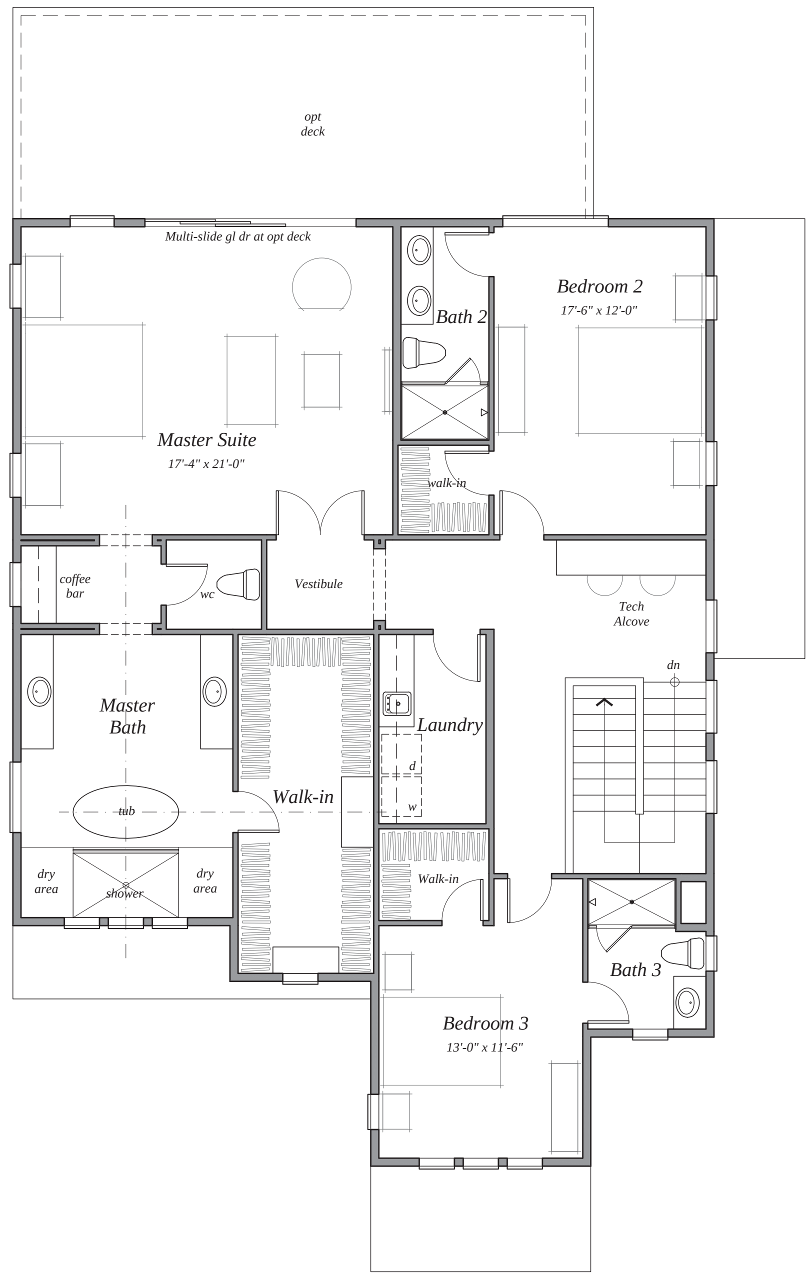
2017 Personal communication between Isabel Stonehouse of Latitude 33 and Beth Ehsan of HELIX. February 6.

Pacific Legacy Homes
2017 Personal communication between Michael Graham of Pacific Legacy Homes and Beth Ehsan of HELIX. January 13.

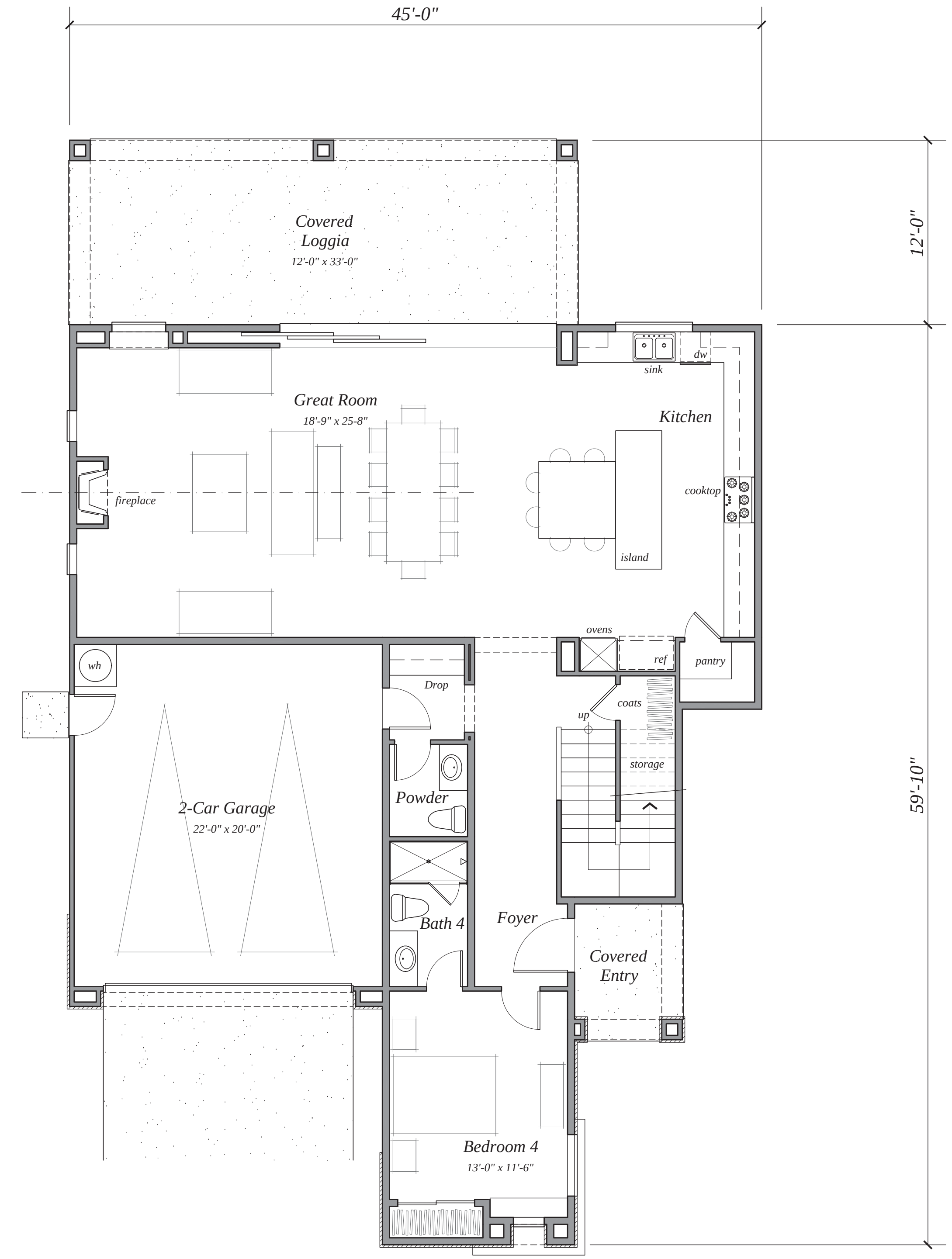
State of California (State)
1989 California Integrated Waste Management Act of 1989. State of California Assembly Bill 939.

Appendix A

ARCHITECTURAL SITE PLANS



Upper Level
1,788 S.F.



Entry Level
1,510 S.F.

RESIDENCE ONE - PRELIMINARY FLOOR PLANS / 3,298 S.F. / 3,756 S.F. (INCL. GARAGE)

SCALE: 1/4" = 1'-0"

LIGHTHOUSE RIDGE

PACIFIC LEGACY HOMES

eA

edingerArchitects

09/08/16

eA16016
PLAN 1 / 1-FLOORS / 9/8/16

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Project Address:
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Project Name:
LIGHTHOUSE RIDGE

Sheet Title:
VTM/SDP
Residence One - Preliminary Floor Plans

Revision 14:
Revision 13:
Revision 12:
Revision 11:
Revision 10:
Revision 9:
Revision 8:
Revision 7:
Revision 6:
Revision 5:
Revision 4:
Revision 3:
Revision 2:
Revision 1:

Original Date: 09/13/16

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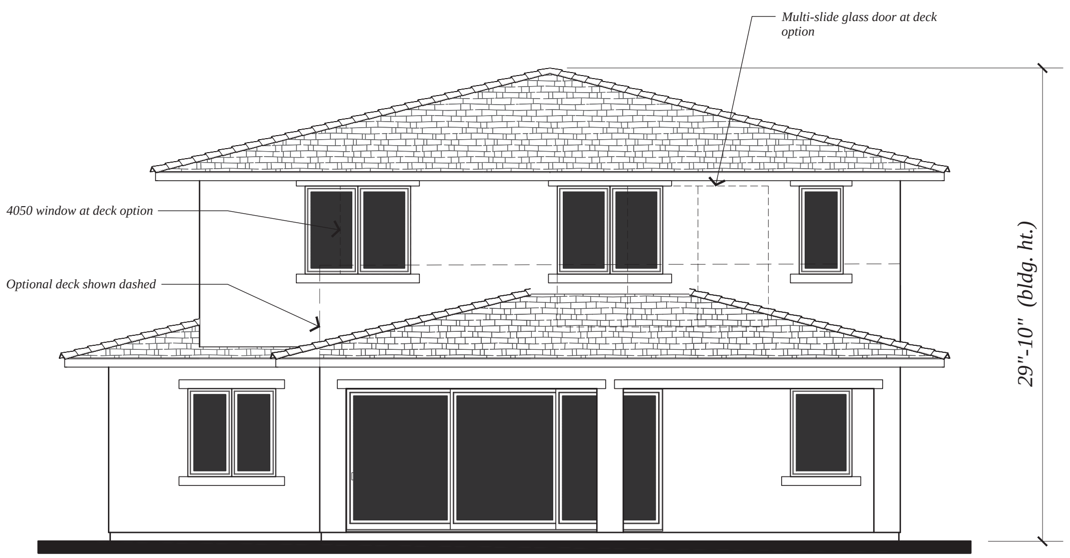
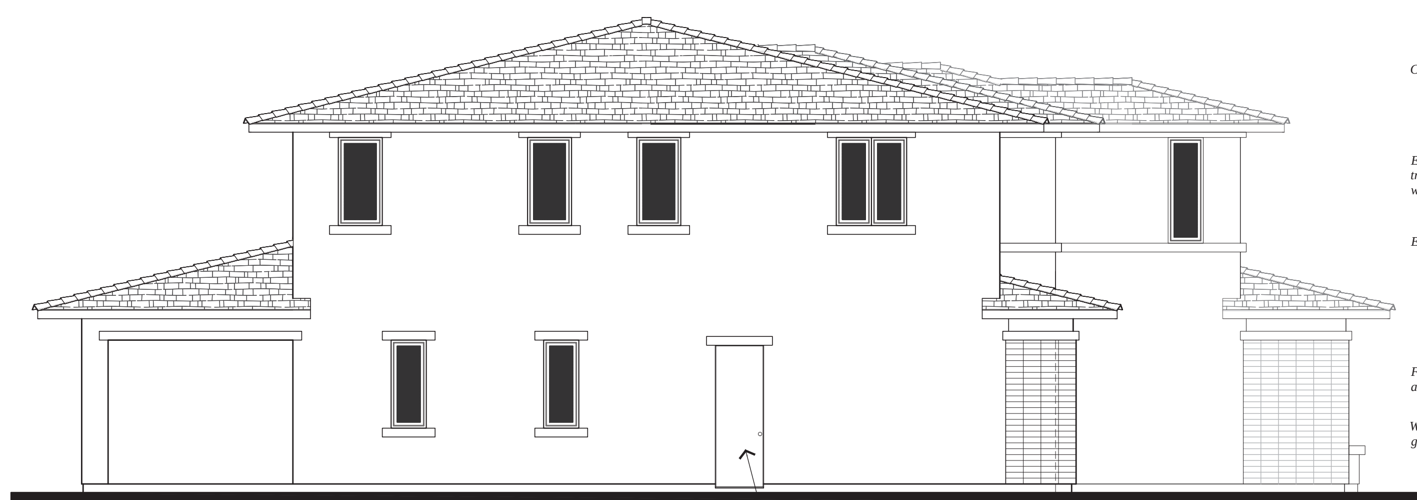
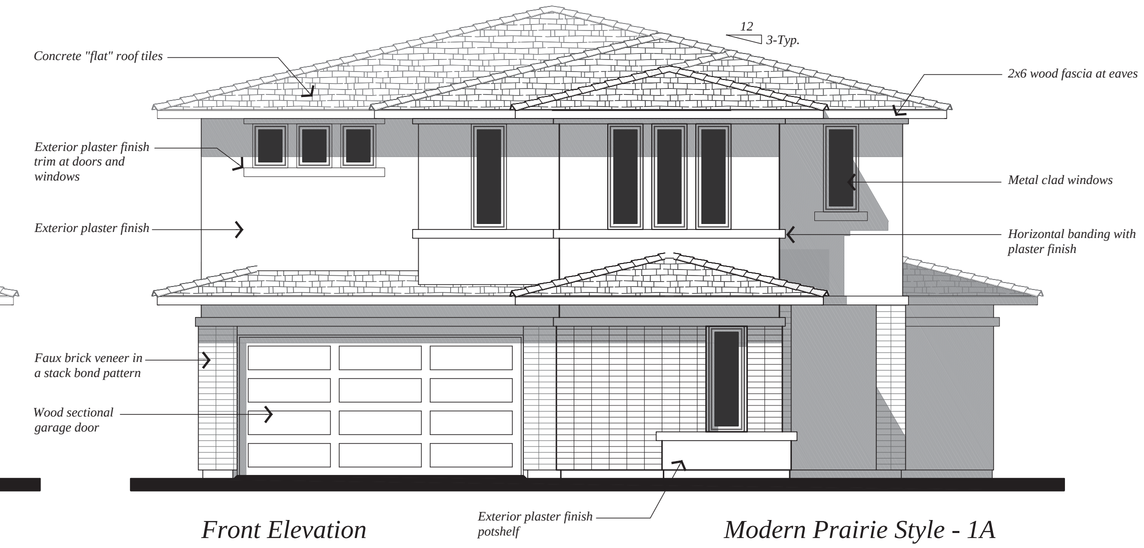
Right Side Elevation



Rear Elevation



Left Side Elevation



Front Elevation

Modern Prairie Style - 1A

RESIDENCE ONE - PRELIMINARY EXTERIOR ELEVATIONS "A"

SCALE: 1/4" = 1'-0"

LIGHTHOUSE RIDGE

PACIFIC LEGACY HOMES

eA

edingerArchitects

09/08/16

eA16016
PLAN 1 / 2A / 9/8/16

Prepared By:
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Address: 444 S. Cedros Avenue, Ste 215
Solana Beach, CA 92075
Phone #: (858) 704-4004
Fax #:

Project Address:
LIGHTHOUSE WAY, SAN DIEGO, CALIFORNIA, 92130

Project Name:
LIGHTHOUSE RIDGE

Sheet Title:
VTM/SDP

Residence One - Preliminary Exterior elevations "A"

Revision 14:
Revision 13:
Revision 12:
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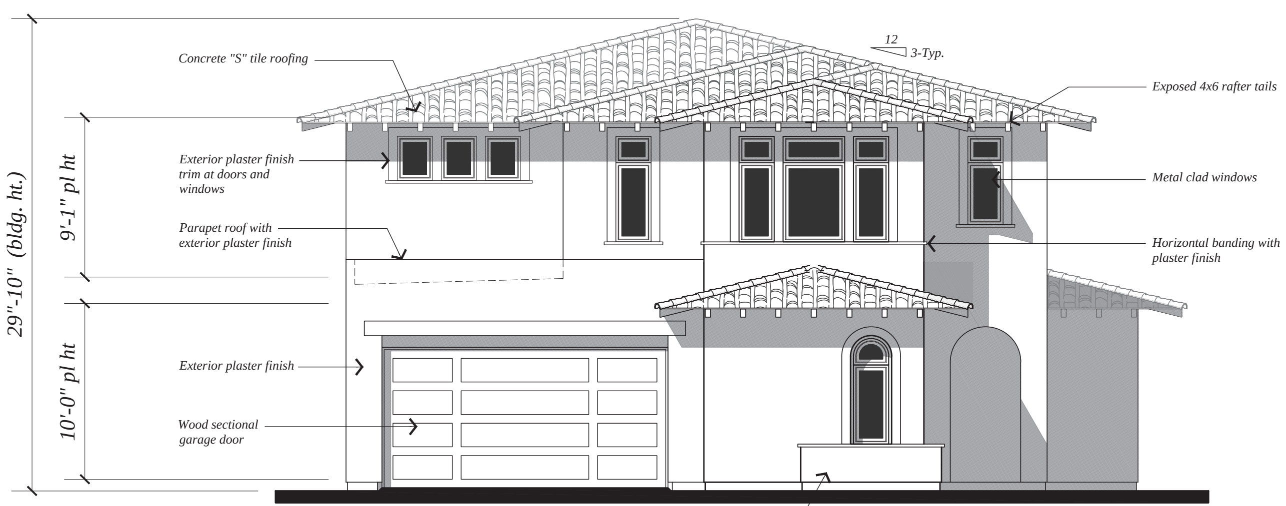

Front Elevation

Modern Mission Style - 1B

Front Elevation

Modern Craftsman Style - 1C

RESIDENCE ONE - PRELIMINARY FRONT EXTERIOR ELEVATIONS "B" & "C"

SCALE: 1/4" = 1'-0"

LIGHTHOUSE RIDGE

PACIFIC LEGACY HOMES

eA

edingerArchitects

09/08/16

eA16016
PLAN 1 / 3-B_C / 9/8/16

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Project Name:
LIGHTHOUSE RIDGE

Sheet Title:
VTM/SDP
Residence One - Preliminary Front Exterior Elevations
"B" and "C"

Revision 14:
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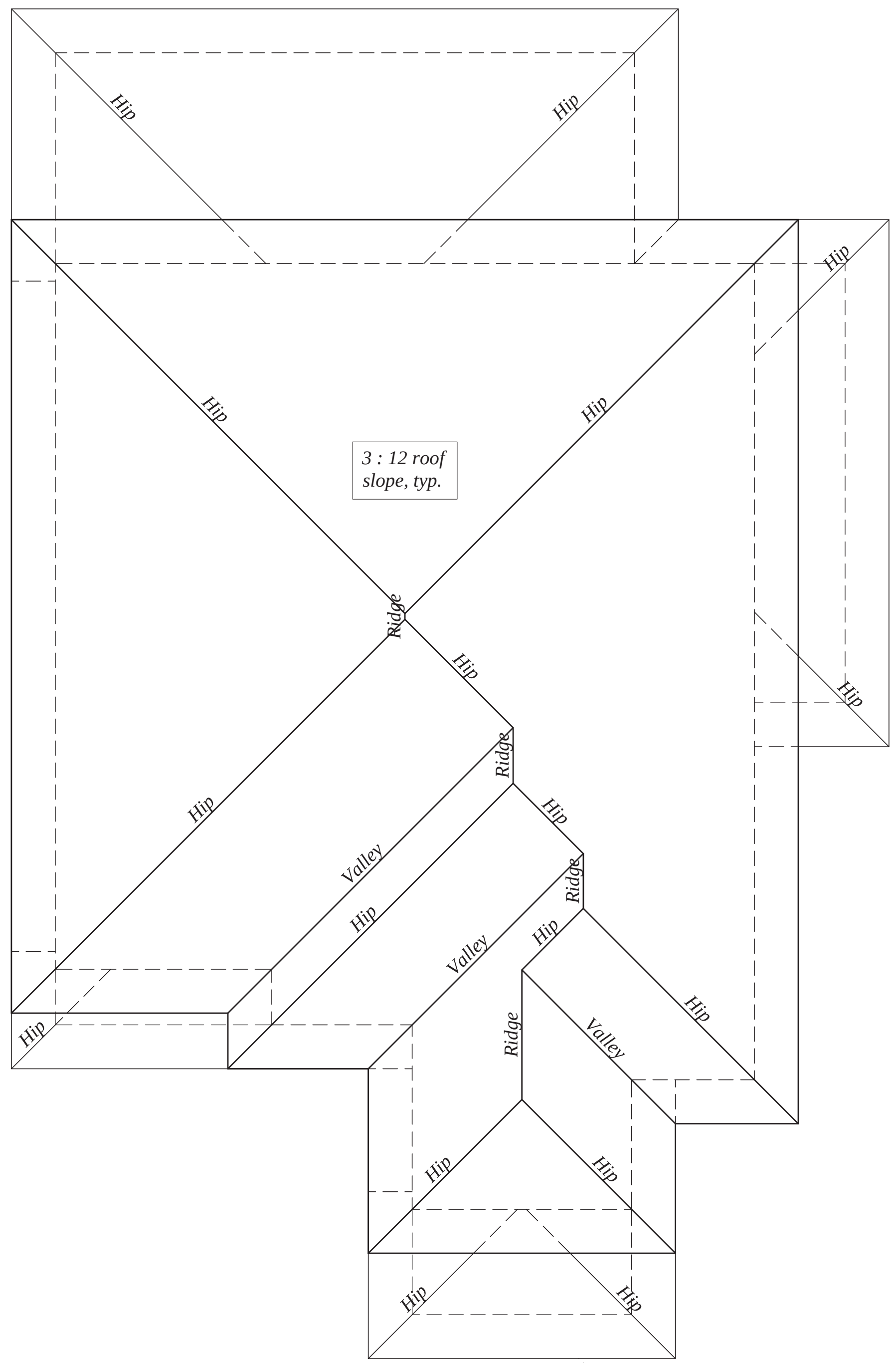
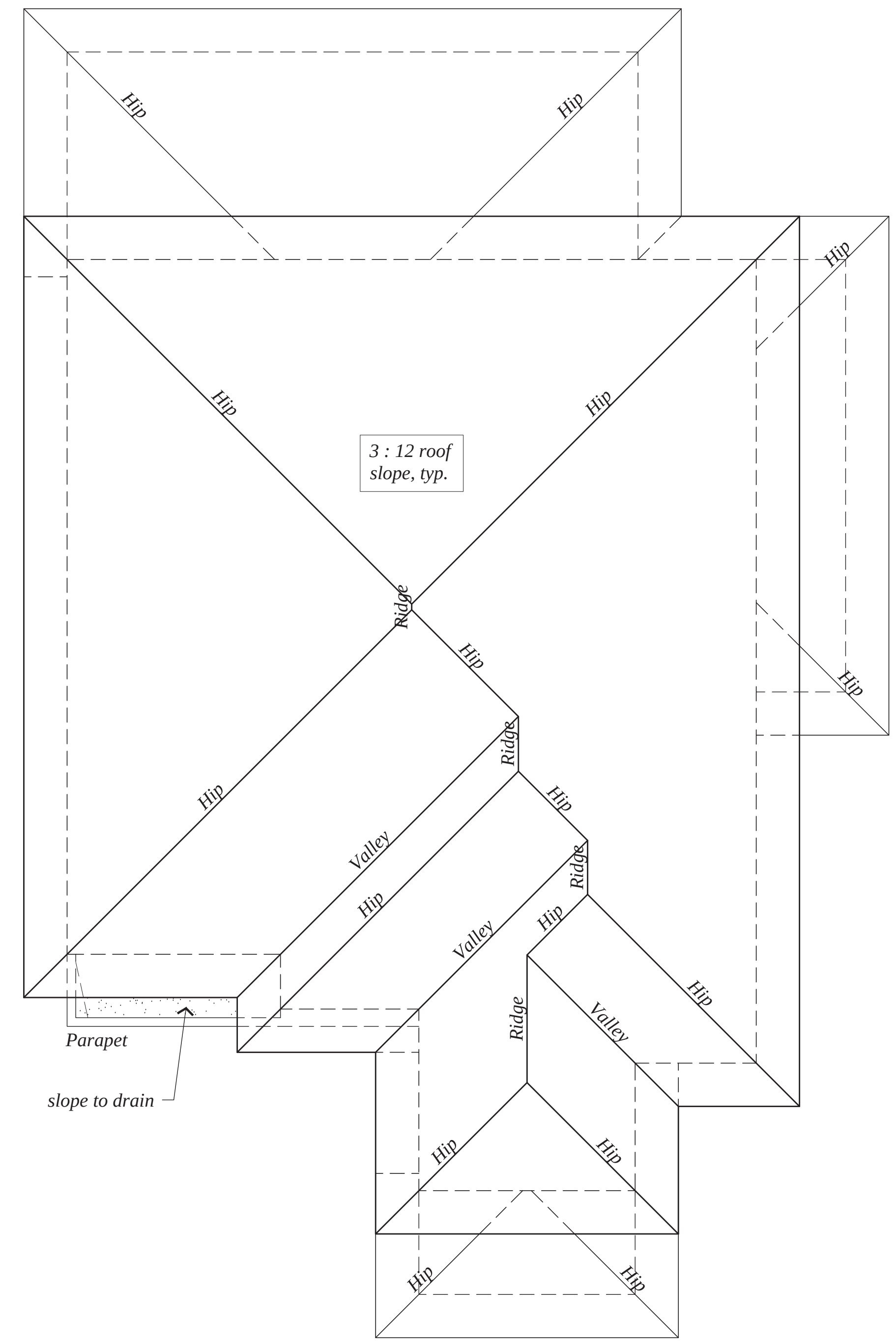


Roof Plan A and C



Roof Plan B

RESIDENCE ONE - PRELIMINARY ROOF PLANS

SCALE: 1/4" = 1'-0"

LIGHTHOUSE RIDGE

PACIFIC LEGACY HOMES

eA

e d i n g e r A r c h i t e c t s

09/08/16

eA16016
PLAN 1 / 4-ROOFS / 9/8/16

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Fax #:

Project Address:
LIGHTHOUSE WAY, SAN DIEGO, CALIFORNIA, 92130

Project Name:
LIGHTHOUSE RIDGE

Sheet Title:
VTM/SDP
Residence One - Preliminary Roof Plans

Revision 14:
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Original Date: 09/13/16

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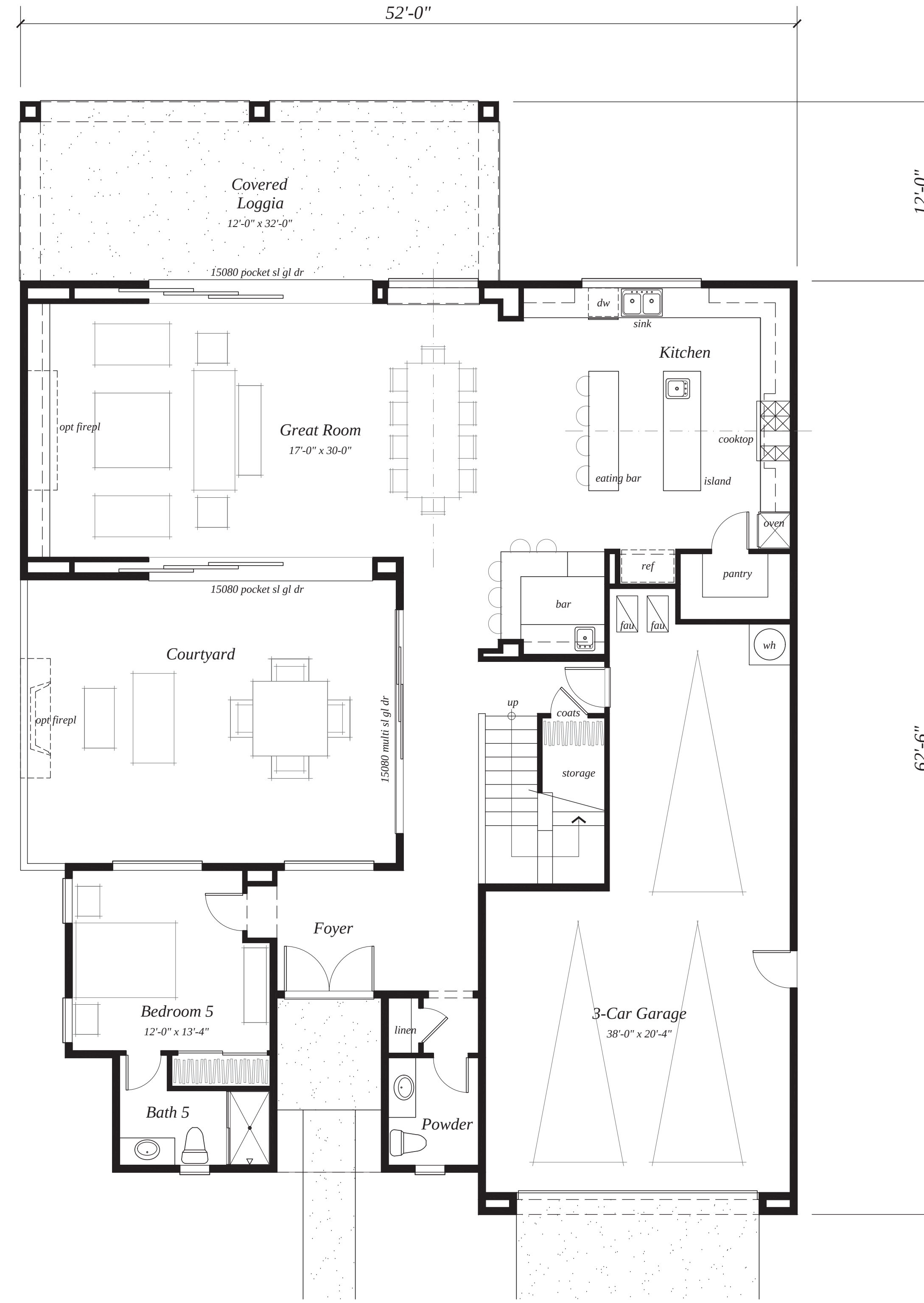
Upper Level
2,020 S.F.



Entry Level
1,828 S.F.

RESIDENCE TWO - PRELIMINARY FLOOR PLANS / 3,848 S.F. / 4,515 S.F. (INCL. GARAGE)
SCALE: 1/4" = 1'-0"

LIGHTHOUSE RIDGE

PACIFIC LEGACY HOMES

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09/08/16

eA16016
PLAN 2 / 5-FLOORS / 9/8/16

Prepared By:
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Project Address:
LIGHTHOUSE WAY, SAN DIEGO, CALIFORNIA, 92130

Project Name:
LIGHTHOUSE RIDGE

Sheet Title:
VTM/SDP
Residence Two - Preliminary Floor Plans

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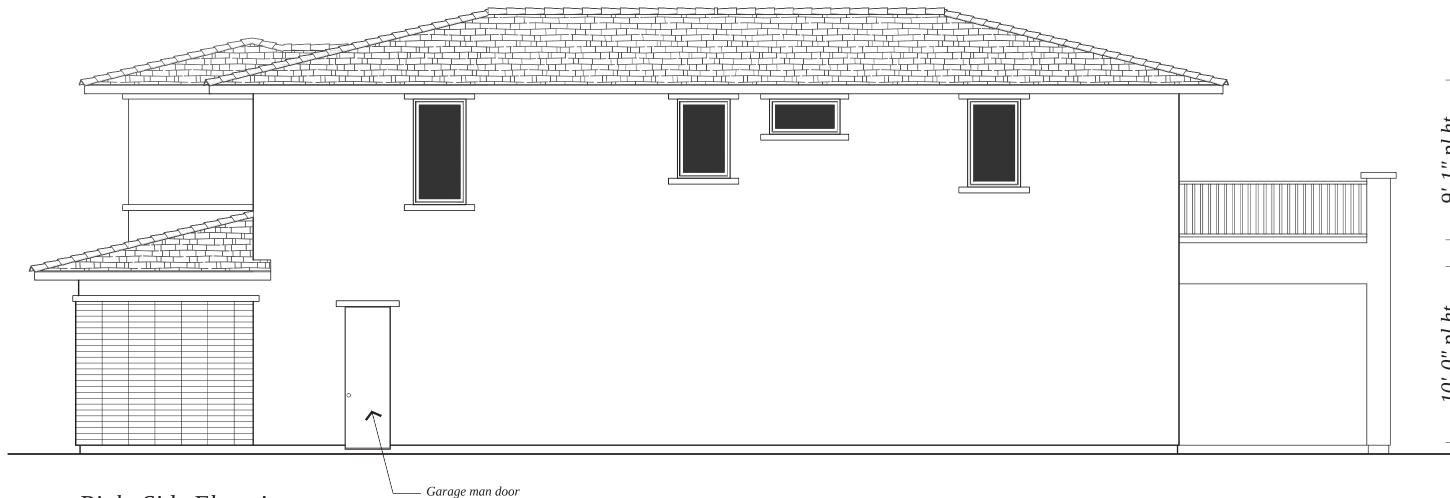
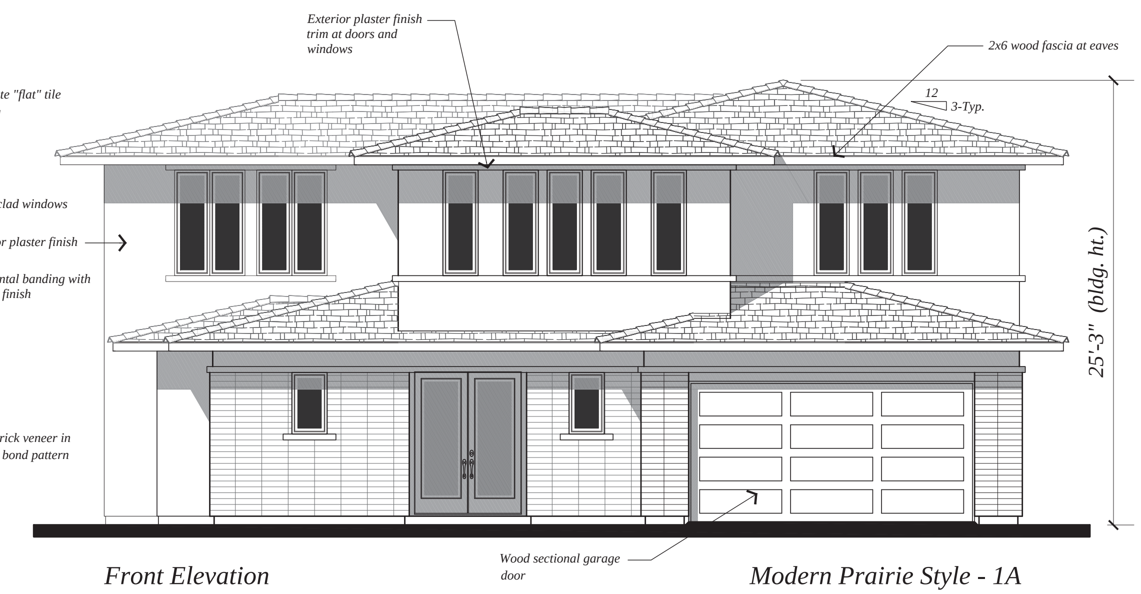


Right Side Elevation

Rear Elevation

Left Side Elevation



Front Elevation

Modern Prairie Style - 1A

RESIDENCE TWO - PRELIMINARY EXTERIOR ELEVATIONS "A"

SCALE: 1/4" = 1'-0"

LIGHTHOUSE RIDGE

PACIFIC LEGACY HOMES

eA

e d i n g e r A r c h i t e c t s

09/08/16

eA16016
PLAN 2 / 6-A / 9/8/16

Prepared By:
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Project Address: LIGHTHOUSE WAY, SAN DIEGO, CALIFORNIA, 92130

Project Name: LIGHTHOUSE RIDGE

Sheet Title: VTM/SDP

Residence Two - Preliminary Exterior Elevations "A"

Revision 14:
Revision 13:
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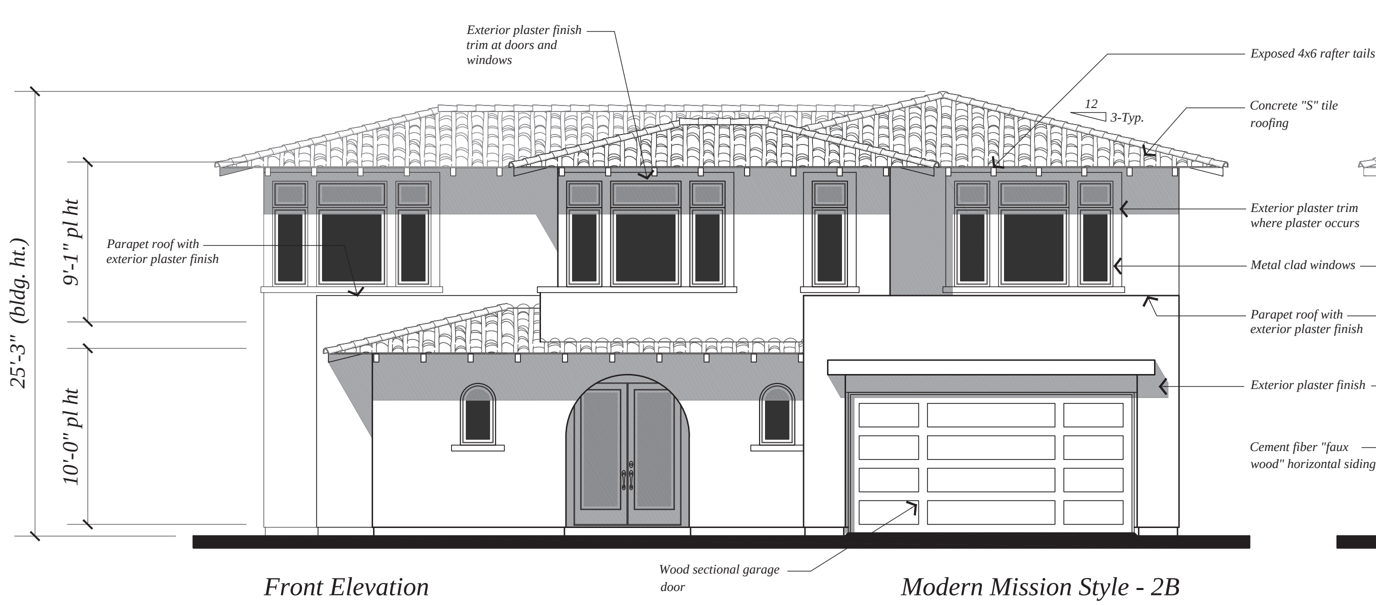
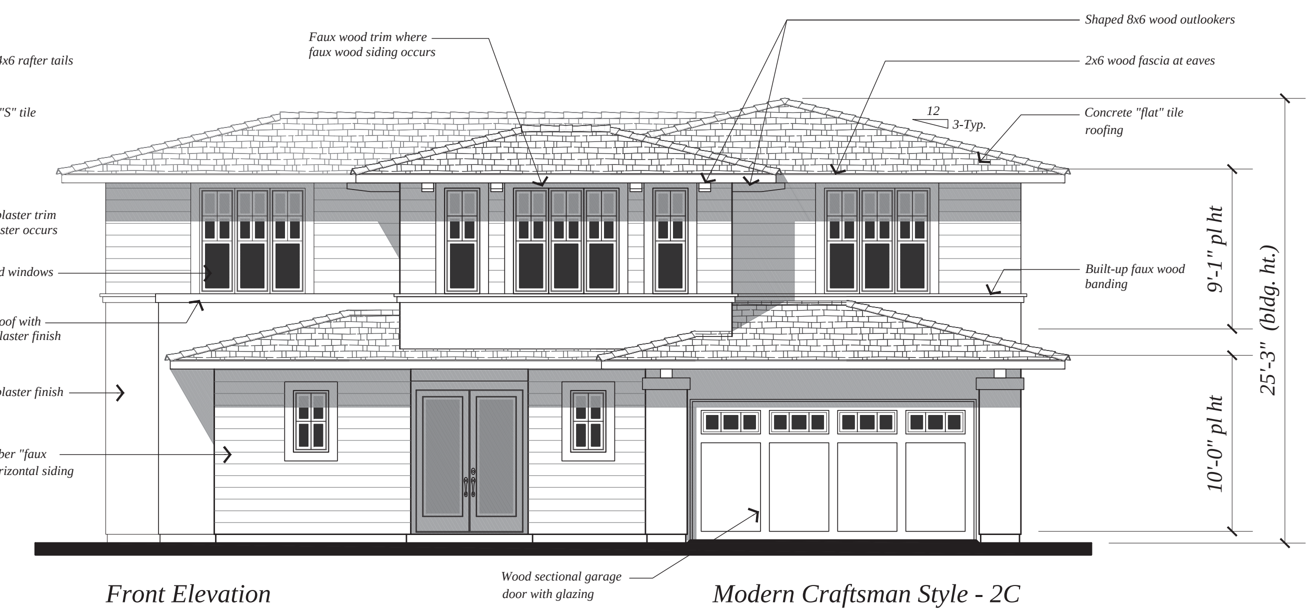


Front Elevation — Modern Mission Style - 2B



Front Elevation — Modern Craftsman Style - 2C

RESIDENCE TWO - PRELIMINARY FRONT EXTERIOR ELEVATIONS "B" & "C"

SCALE: 1/4" = 1'-0"

LIGHTHOUSE RIDGE

PACIFIC LEGACY HOMES

eA

edingerArchitects

09/08/16

eA16016
PLAN 2 / 7-B_C / 9/8/16

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Project Name:	LIGHTHOUSE RIDGE
Sheet Title:	VTM/SDP Residence Two - Preliminary Front Exterior Elevations "B" and "C"

Revision 14:	
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Revision 11:	
Revision 10:	
Revision 9:	
Revision 8:	
Revision 7:	
Revision 6:	
Revision 5:	
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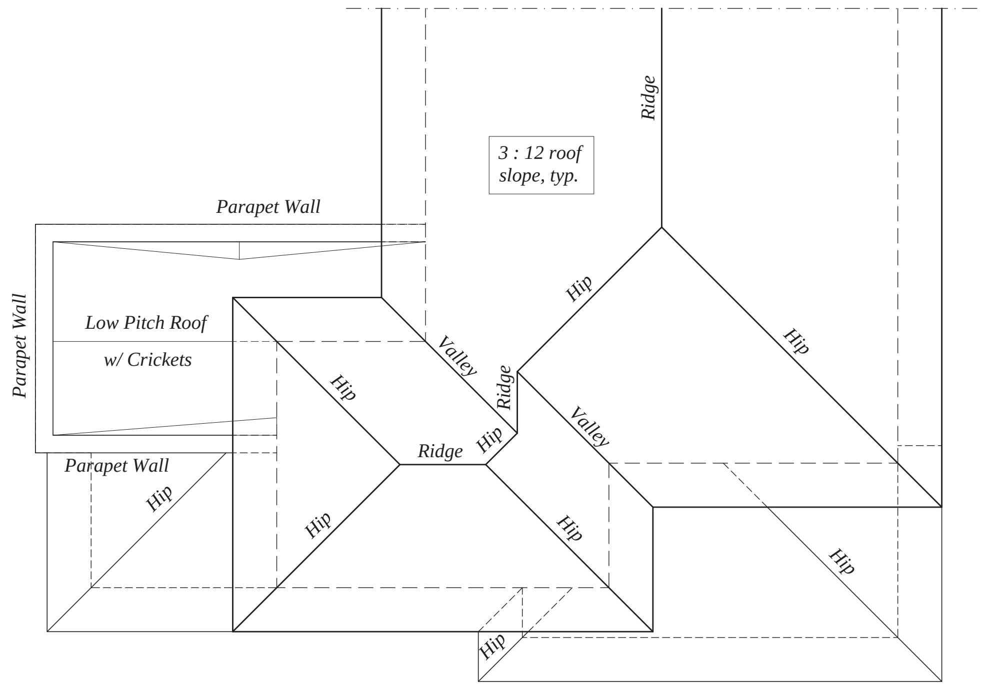
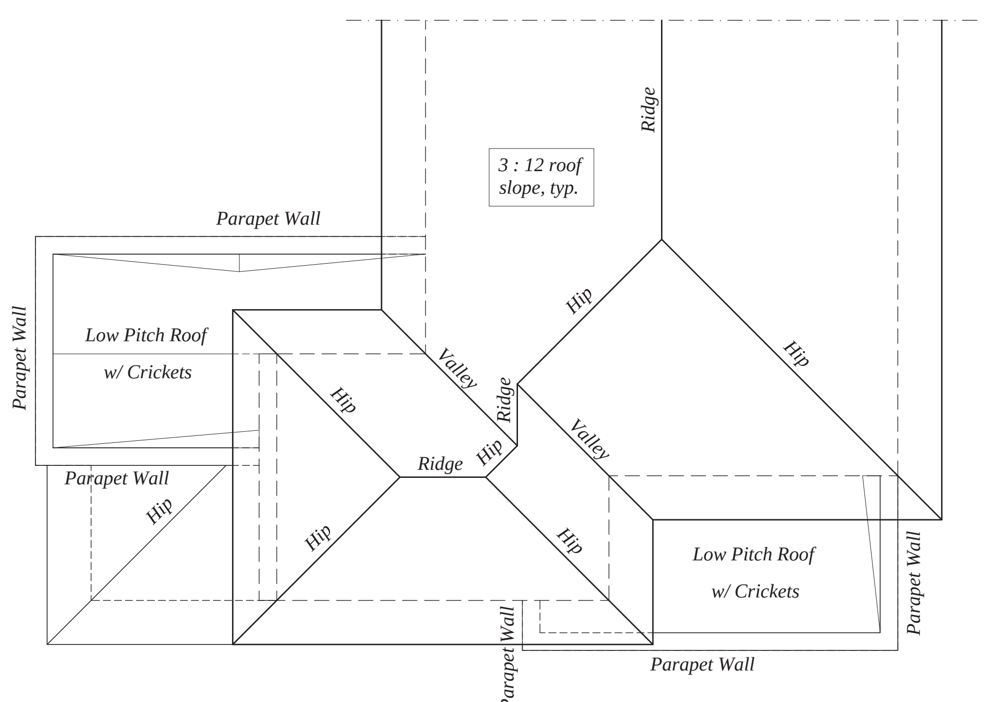
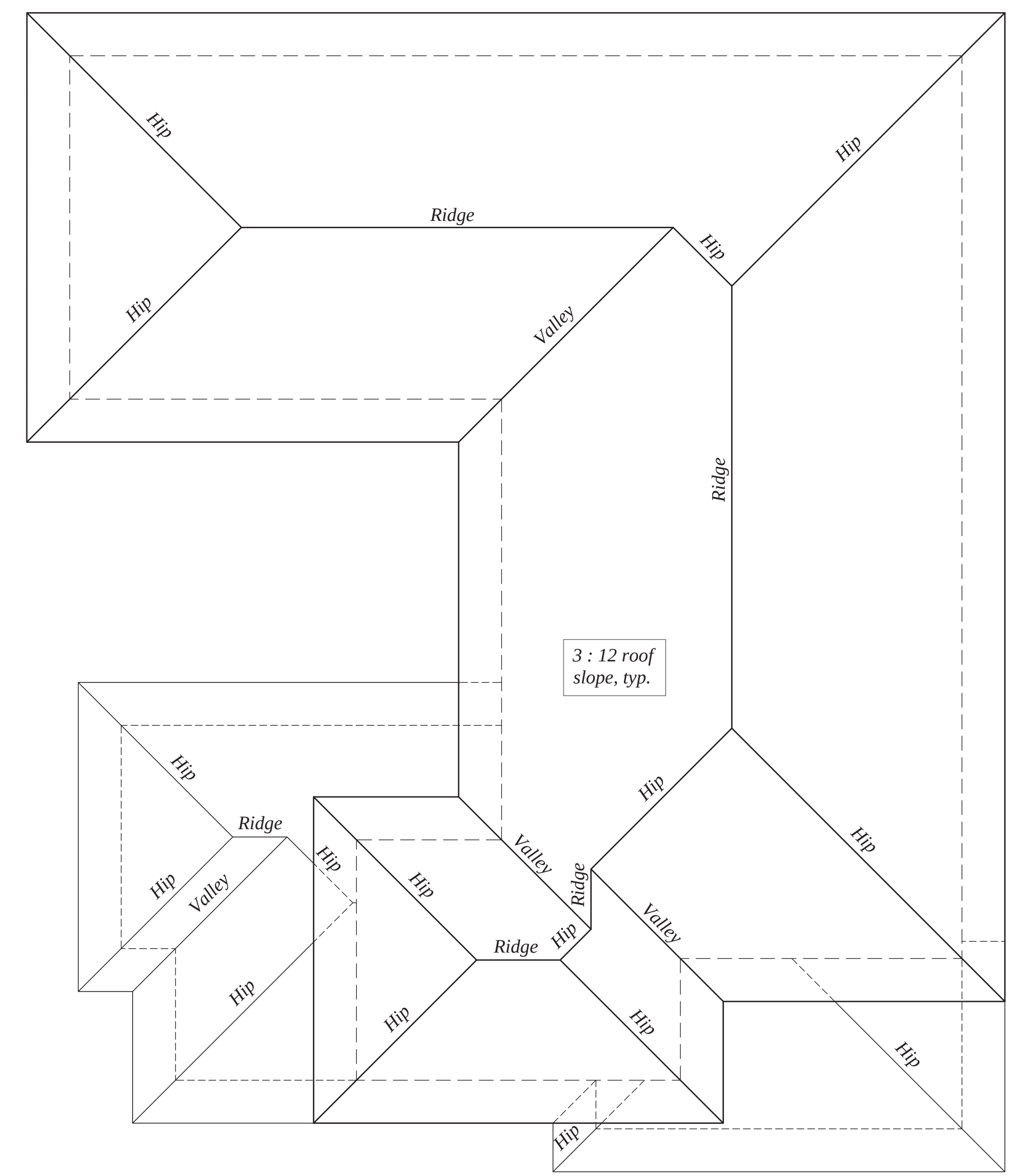


Roof Plan C



Roof Plan B



Roof Plan A

RESIDENCE TWO - PRELIMINARY ROOF PLANS

SCALE: 1/4" = 1'-0"

LIGHTHOUSE RIDGE

PACIFIC LEGACY HOMES

eA

e d i n g e r A r c h i t e c t s

09/08/16

Prepared By:
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Fax #:

Project Address: LIGHTHOUSE WAY, SAN DIEGO, CALIFORNIA, 92130

Project Name: LIGHTHOUSE RIDGE

Sheet Title: VTM/SDP

Residence Two - Preliminary Roof Plans

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eA16016
PLAN 2 / 8-ROOFS / 9/8/16

Appendix B

2017 CERTIFIED CONSTRUCTION & DEMOLITION RECYCLING FACILITY DIRECTORY

2017 Certified Construction & Demolition Recycling Facility Directory

These facilities are certified by the City of San Diego to accept materials listed in each category. Hazardous materials are not accepted. The diversion rate for these materials shall be considered 100%, except mixed C&D debris which updates quarterly. The City is not responsible for changes in facility information. Please call ahead to confirm details such as accepted materials, days and hours of operation, limitations on vehicle types, and cost. For more information visit: www.recyclingworks.com.

Please note: In order to receive recycling credit, Mixed C&D Facility and transfer station receipts must: *-be coded as construction & demolition (C&D) debris* *-have project address or permit number on receipt* **Make sure to notify weighmaster that your load is subject to the City of San Diego C&D Ordinance.* *Note about landfills: Miramar Landfill and other landfills do not recycle mixed C&D debris.*	Mixed C&D Debris	Asphalt/Concrete	Brick/Block/Rock	Building Materials for Reuse	Cardboard	Carpet	Carpet Padding	Ceiling Tile	Ceramic Tile/Porcelain	Clean Fill Dirt	Clean Wood/Green Waste	Drywall	Industrial Plastics	Lamps/Light Fixtures	Metal	Mixed Inerts	Styrofoam Blocks
EDCO Recovery & Transfer 3660 Dalbergia St, San Diego, CA 92113 619-234-7774 | www.edcodisposal.com/public-disposal	67%											•					
EDCO Station Transfer Station & Buy Back Center 8184 Commercial St, La Mesa, CA 91942 619-466-3355 | www.edcodisposal.com/public-disposal	67%				•							•			•		
EDCO CDI Recycling & Buy Back Center 224 S. Las Posas Rd, San Marcos, CA 92078 760-744-2700 | www.edcodisposal.com/public-disposal	88%				•										•		
Escondido Resource Recovery 1044 W. Washington Ave, Escondido 760-745-3203 | www.edcodisposal.com/public-disposal	67%																
Fallbrook Transfer Station & Buy Back Center 550 W. Aviation Rd, Fallbrook, CA 92028 760-728-6114 | www.edcodisposal.com/public-disposal	67%				•										•		
Otay C&D/Inert Debris Processing Facility 1700 Maxwell Rd, Chula Vista, CA 91913 619-421-3773 | www.sd.disposal.com	69%																
Ramona Transfer Station & Buy Back Center 324 Maple St, Ramona, CA 92065 760-789-0516 | www.edcodisposal.com/public-disposal	67%				•										•		
SANCO Resource Recovery & Buy Back Center 6750 Federal Blvd, Lemon Grove, CA 91945 619-287-5696 | www.edcodisposal.com/public-disposal	67%				•										•		
All American Recycling 10805 Kenney St, Santee, CA 92071 619-508-1155 (Must call for appointment)						•											
Allan Company 6733 Consolidated Wy, San Diego, CA 92121 858-578-9300 | www.allancompany.com/facilities.htm					•										•		
Allan Company Miramar Recycling 5165 Convoy St, San Diego, CA 92111 858-268-8971 | www.allancompany.com/facilities.htm					•										•		
AMS 4674 Cardin St, San Diego, CA 92111 858-541-1977 | www.a-m-s.com								•									

	Mixed C&D Debris	Asphalt/Concrete	Brick/Block/Rock	Building Materials for Reuse	Cardboard	Carpet	Carpet Padding	Ceiling Tile	Ceramic Tile/Porcelain	Clean Fill Dirt	Clean Wood/Green Waste	Drywall	Industrial Plastics	Lamps/Light Fixtures	Metal	Mixed Inerts	Styrofoam Blocks
Armstrong World Industries, Inc. 300 S. Myrida St, Pensacola, FL 32505 877-276-7876 (Press 1, Then 8) www.armstrong.com/commceilingsna								•									
Cactus Recycling 8710 Avenida De La Fuente, San Diego, CA 92154 619-661-1283 | www.cactusrecycling.com					•								•		•		•
DFS Flooring 10178 Willow Creek Road, San Diego, CA 92131 858-630-5200 | www.dfsflooring.com						•	•										
Duco Metals 220 Bingham Drive Suite 100, San Marcos, CA 92069 760-747-6330 | www.ducometals.com															•		
Enniss Incorporated 12421 Vigilante Rd, Lakeside, CA 92040 619-443-9024 | www.ennissinc.com		•	•						•	•							
Escondido Sand and Gravel 500 N. Tulip St, Escondido, CA 92025 760-432-4690 | www.weirasphalt.com/esg		•															
Habitat for Humanity ReStore 10222 San Diego Mission Rd, San Diego, CA 92108 619-516-5267 | www.sdhfh.org/restore.php				•													
Hanson Aggregates West – Lakeside Plant 12560 Highway 67, Lakeside, CA 92040 858-547-2141		•															
Hanson Aggregates West – Miramar 9229 Harris Plant Rd, San Diego, CA 92126 858-974-3849		•								•							
HVAC Exchange 2675 Faivre St, Chula Vista, CA 91911 619-423-1855 | www.thehvacexchange.com															•		
IMS Recycling Services 2740 Boston Ave, San Diego, CA 92113 619-423-1564 | www.imsrecyclingservices.com					•								•				
IMS Recycling Services 2697 Main St, San Diego, CA 92113 619-231-2521 | www.imsrecyclingservices.com													•		•		
Inland Pacific Resource Recovery 12650 Slaughterhouse Canyon Rd, Lakeside, CA 92040 619-390-1418											•						
Lamp Disposal Solutions 1405 30th Street, San Diego, CA 92154 858-569-1807 | www.lampdisposalsolutions.com														•			
Los Angeles Fiber Company 4920 S. Boyle Ave, Vernon, CA 90058 323-589-5637 | www.lafiber.com						•	•										

	Mixed C&D Debris	Asphalt/Concrete	Brick/Block/Rock	Building Materials for Reuse	Cardboard	Carpet	Carpet Padding	Ceiling Tile	Ceramic Tile/Porcelain	Clean Fill Dirt	Clean Wood/Green Waste	Drywall	Industrial Plastics	Lamps/Light Fixtures	Metal	Mixed Inerts	Styrofoam Blocks
Miramar Greenery, City of San Diego 5180 Convoy St, San Diego, CA 92111 858-694-7000 | www.sandiego.gov/environmental-services/miramar/greenery.shtml											•						
Moody's 3210 Oceanside Blvd., Oceanside, CA 92056 760-433-3316		•								•						•	
Otay Valley Rock, LLC 2041 Heritage Rd, Chula Vista, CA 91913 619-591-4717 | www.otayrock.com		•															
Reclaimed Aggregates Chula Vista 855 Energy Wy, Chula Vista, CA 91913 619-656-1836		•														•	
Reconstruction Warehouse 3650 Hancock St., San Diego, CA 92110 619-795-7326 | www.recowarehouse.com				•													
Robertson's Ready Mix 2094 Willow Glen Dr, El Cajon, CA 92019 619-593-1856		•								•						•	
Romero General Construction Corp. 8354 Nelson Wy, Escondido, CA 92026 760-749-9312 | www.romerogc.com/crushing/nelsonway.htm		•															
SA Recycling 3055 Commercial St., San Diego, CA 92113 619-238-6740 | www.sarecycling.com															•		
SA Recycling 1211 S. 32nd St., San Diego, CA 92113 619-234-6691 | www.sarecycling.com															•		
Universal Waste Disposal 8051 Wing Avenue, El Cajon, CA 92020 619-438-1093 | www.universalwastedisposal.com														•			
Vulcan Carol Canyon Landfill and Recycle Site 10051 Black Mountain Rd, San Diego, CA 92126 858-530-9465 | www.vulcanmaterials.com		•	•							•						•	
Vulcan Otay Asphalt Recycle Center 7522 Paseo de la Fuente, San Diego, CA 92154 619-571-1945 | www.vulcanmaterials.com		•															

Appendix C

2016 CITY OF SAN DIEGO C&D DEBRIS CONVERSION RATE TABLE

CITY OF SAN DIEGO
Construction & Demolition (C&D) Debris
Conversion Rate Table

This worksheet lists materials typically generated from a constructionor demolition project and provides formulas for converting common units (i.e. cubic yards, square feet, and board feet) to tons. It is a tool that should be used for preparing your Waste Mangement Form - Part I, which requires that quantities be provided in tons.
Note: Weigh receipts are required for your refund request.

Step 1: Enter the estimated quantity for each applicable material in Column I, based on units
Step 2: Multiply by Tons/Unit figure listed in Column II. Enter the result for each material in Column III.
If using Excel version, column III will automatically calculate tons.
Step 3: Enter quantities for each separated material from Column III on this worksheet into the corresponding section of your Waste Management Form - Part I.

		Column I			Column II		Column III
Category	**Material**	**Volume**	**Unit**		**Tons/Unit**		**Tons**
Asphalt/Concrete	Asphalt (broken)		cy	x	0.70	=	
	Concrete (broken)		cy	x	1.20	=	
	Concrete (solid slab)		cy	x	1.30	=	
Brick/Masonry/Tile	Brick (broken)		cy	x	0.70	=	
	Brick (whole, palletized)		cy	x	1.51	=	
	Masonry Brick (broken)		cy	x	0.60	=	
	Tile		sq ft	x	0.00175	=	
Building Materials (doors, windows, cabinets, etc.)			cy	x	0.15	=	
Cardboard (flat)			cy	x	0.05	=	
Carpet	By square foot		sq ft	x	0.0005	=	
	By cubic yard		cy	x	0.30	=	
Carpet Padding/Foam			sq ft	x	0.000125	=	
Ceiling Tiles	Whole (palletized)		sq ft	x	0.0003	=	
	Loose		cy	x	0.09	=	
Drywall (new or used)	1/2" (by square foot)		sq ft	x	0.0008	=	
	5/8" (by square foot)		sq ft	x	0.00105	=	
	Demo/used (by cubic yd)		cy	x	0.25	=	
Earth	Loose/Dry		cy	x	1.20	=	
	Excavated/Wet		cy	x	1.30	=	
	Sand (loose)		cy	x	1.20	=	
Landscape Debris (brush, trees, etc)			cy	x	0.15	=	
Mixed Debris	Construction		cy	x	0.18	=	
	Demolition		cy	x	1.19	=	
Scrap metal			cy	x	0.51	=	
Shingles, asphalt			cy	x	0.22	=	
Stone (crushed)			cy	x	2.35	=	
Unpainted Wood & Pallets	By board foot		bd ft	x	0.001375	=	
	By cubic yard		cy	x	0.15	=	
Garbage/Trash			cy	x	0.18	=	
Other (estimated weight)			cy	x	estimate	=	
			cy	x	estimate	=	
			cy	x	estimate	=	
					Total All		

Appendix D

CITY OF SAN DIEGO WASTE GENERATION FACTORS – OCCUPANCY PHASE

Waste Generation Factors – Occupancy Phase

The following factors are used by the City of San Diego Environmental Services Department to estimate the expected waste generation in a new residential or commercial development.

Residential Uses
Residential Unit = 1.6 tons/year/unit
Multi-family Unit = 1.2 tons/year/unit

Example: To calculate the amount of waste that will be generated from a project with 100 new homes, multiply the number of homes by the generation factor.

100 single family homes x 1.6 = 160 tons/year
100 multi-family units x 1.2 = 120 tons/year

Commercial/Industrial Uses

General Retail	0.0028
Restaurants & Bars	0.0122
Hotels/Motels	0.0045
Food Stores	0.0073
Auto/Service/Repair	0.0051
Medical Offices	0.0033
Hospitals	0.0055
Office	0.0017
Transp/Utilities	0.0085
Manufacturing	0.0059
Education	0.0013
Unclassified Services	0.0042

Example: To calculate the amount of waste that could be generated from a new building with 10,000 square feet for offices and 10,000 square feet for manufacturing, multiply the square footage for each use by the generation factor.

10,000 square feet x 0.0017 = 17 tons/year
10,000 square feet x 0.0059 = 59 tons per year

Total estimated waste generation for building = 76 tons/year