

**HYDROLOGY/HYDRAULIC ANALYSIS**

*For*

**TABERNA VISTA WAY GRADING  
(PDS2016-LDGRMJ-30079)**

***County of San Diego***

*Applicant/Developer:*

Thomas C. Dyke  
PO Box 352  
Alpine, CA 91903  
(619) 403-8260

*Prepared By:*

***Snipes-Dye Associates***  
***civil engineers and land surveyors***

8348 Center Drive, Suite G  
La Mesa, CA 91942-2910  
(619) 697-9234, Fax (619) 460-2033  
AL1722

*Dated: May 19, 2016*

*Revised: September 6, 2016*

*Revised: May 20, 2021*

*Revised: September 16, 2021*

## **DECLARATION OF RESPONSIBLE CHARGE**

*I, HEREBY DECLARE THAT I AM THE CIVIL 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 COUNTY OF SAN DIEGO IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITY FOR PROJECT DESIGN.*

  
SON P. NGUYEN  
R.C.E. 86249  
EXP. 03-31-23

9-16-2021  
Date



# *Project Information*

HYDROLOGY/HYDRAULIC ANALYSIS  
FOR  
TABERNA VISTA WAY GRADING

**EXISTING SITE CONDITIONS:** The project site is located 1115 Tavern Road, Alpine, California, at the end of Taberna Vista Way. The site was illegally graded. There is no existing structure on subject site. The hydrologic soil group of the project site is Group D.

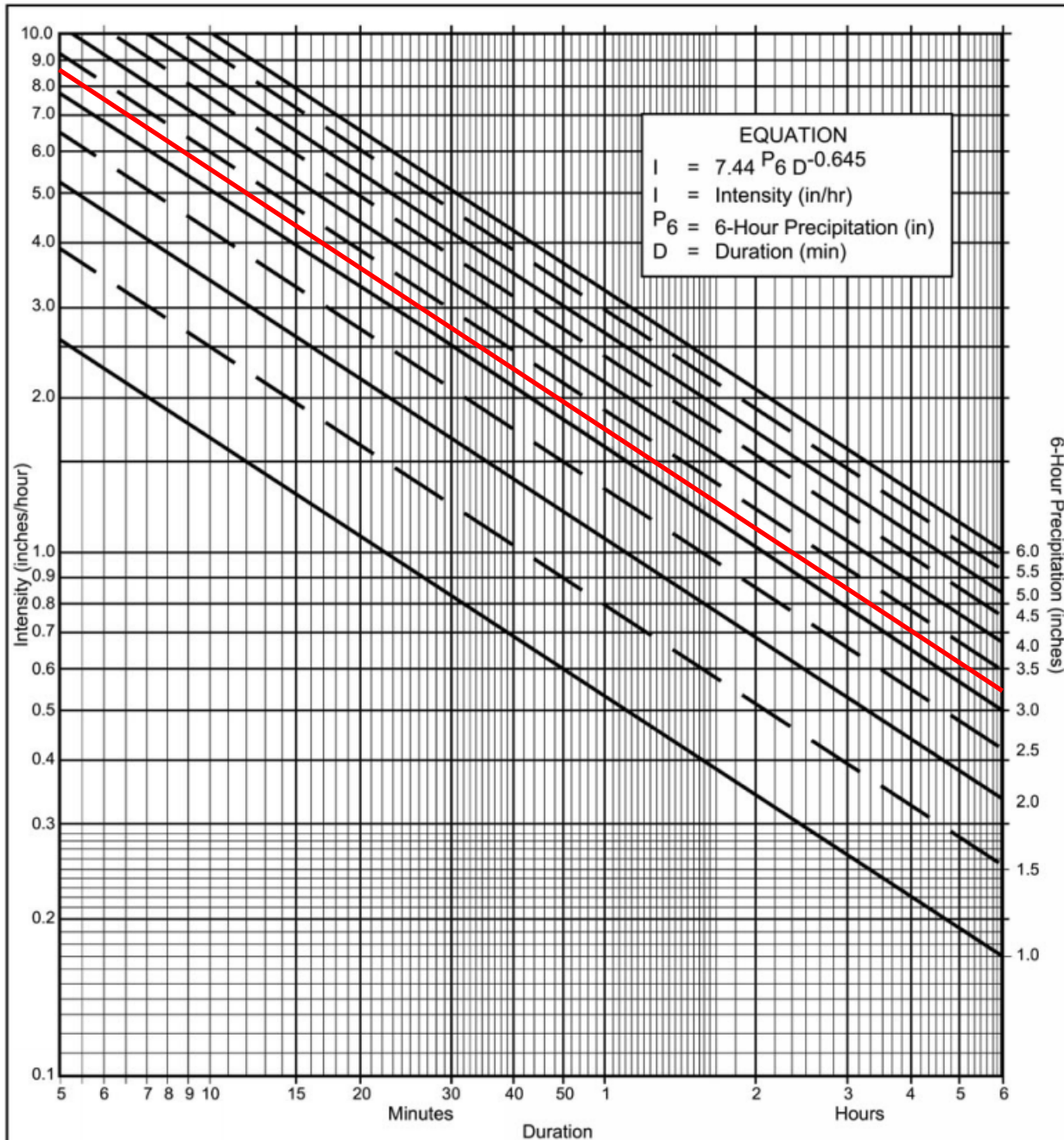
**PROPOSED SITE CONDITIONS:** The project proposes to re-grade the site to create a flat pad (non-developable) and to construct erosion control facilities to control and correct the flows of the current conditions due to illegal grading operations. No impervious surfaces are proposed for this project.

**EXISTING DRAINAGE CONDITIONS:** Based on the County 200-scale Topo Map 246-1833, the existing site runoff divides into three sub-drainage basins, the easterly, center and the westerly sub-basins. The easterly sub-basin consists of approximate 2.53 acres of drainage area along Taberna Vista Way and discharges downstream at the Outfall No. 1, as shown on the enclosed drainage map. The center sub-basin consists of approximate 3.44 acres of onsite & offsite drainage area. Its discharge to the downstream is at the Outfall No. 2. The westerly sub-basin consists of 0.32 acre of drainage basin discharging southwesterly along the westerly boundary.

**PROPOSED DRAINAGE CONDITIONS:** The proposed grading was designed to maintain the similar drainage patterns of the existing site conditions. The outfalls to the downstream from the project site will be at the same locations. Due to the grading of the site, flow lengths have been extended hence increasing the time of concentration. As a result the discharges to the downstream in the proposed conditions will be equal or less than discharges in the existing conditions at all three outfalls. See the drainage summary table below.

	<b>Q<sub>100</sub></b>		<b>Q<sub>100</sub></b>	
	<b>Existing Site Conditions</b>		<b>Proposed Site Conditions</b>	
	<b>Basin Area (acres)</b>	<b>Q<sub>100</sub> Flow (cfs)</b>	<b>Basin Area (acres)</b>	<b>Q<sub>100</sub> Flow (cfs)</b>
<b>Outfall No. 1</b>	2.53 acres	5.24 cfs	2.75 acre	5.70 cfs
<b>Outfall No. 2</b>	3.44 acres	7.13 cfs	3.22 acres	6.67 cfs
<b>Outfall No. 3</b>	0.32 acre	0.71 cfs	0.32 acre	0.71 cfs
<b>Total</b>	6.29 acres	13.08 cfs	6.29 acres	13.08 cfs





**Directions for Application:**

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

**Application Form:**

- (a) Selected frequency 100 year
- (b)  $P_6 = \underline{3.2}$  in.,  $P_{24} = \underline{7.0}$  in.,  $\frac{P_6}{P_{24}} = \underline{45.7} \%^{(2)}$
- (c) Adjusted  $P_6^{(2)} = \underline{3.2}$  in.
- (d)  $t_x = \underline{\hspace{2cm}}$  min.
- (e)  $I = \underline{\hspace{2cm}}$  in./hr.

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

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

Intensity-Duration Design Chart - Template

FIGURE

3-1

# County of San Diego Hydrology Manual

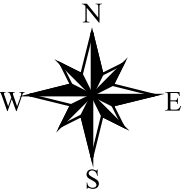
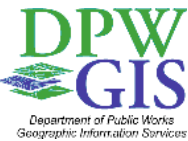


## Rainfall Isophuvials

### 100 Year Rainfall Event - 6 Hours

3.2 Isopluvial (inches)

### Taberna Vista Way GP

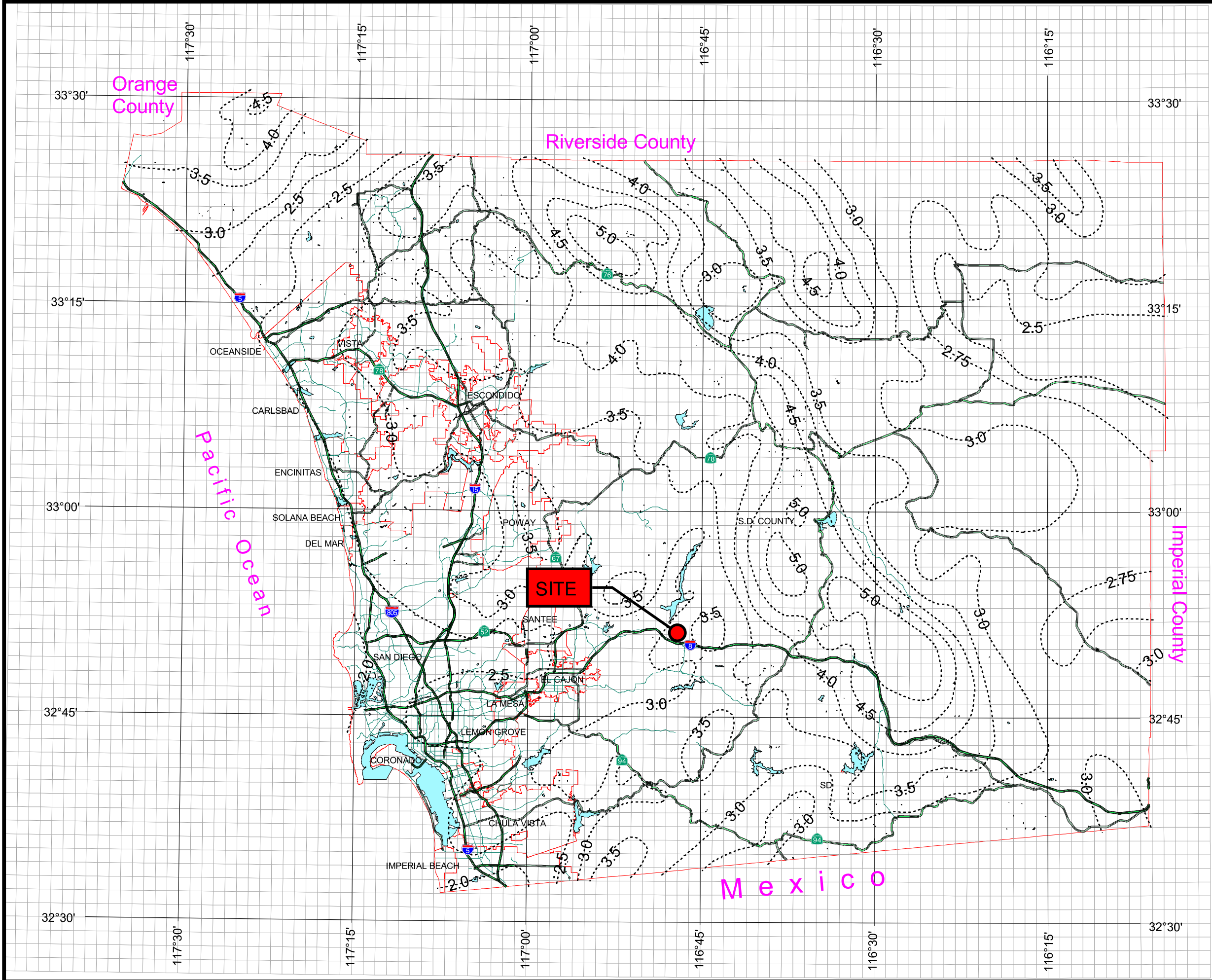


3 0 3 Miles

THIS MAP IS PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Copyright SanGIS. All Rights Reserved.

This products may contain information from the SANDAG Regional Information System which cannot be reproduced without the written permission of SANDAG.

This product may contain information which has been reproduced with permission granted by Thomas Brothers Maps.



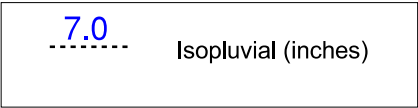


# County of San Diego Hydrology Manual

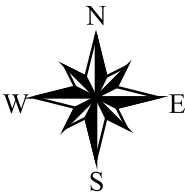
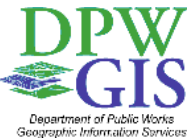


## Rainfall Isophluvials

### 100 Year Rainfall Event - 24 Hours



### Taberna Vista Way GP

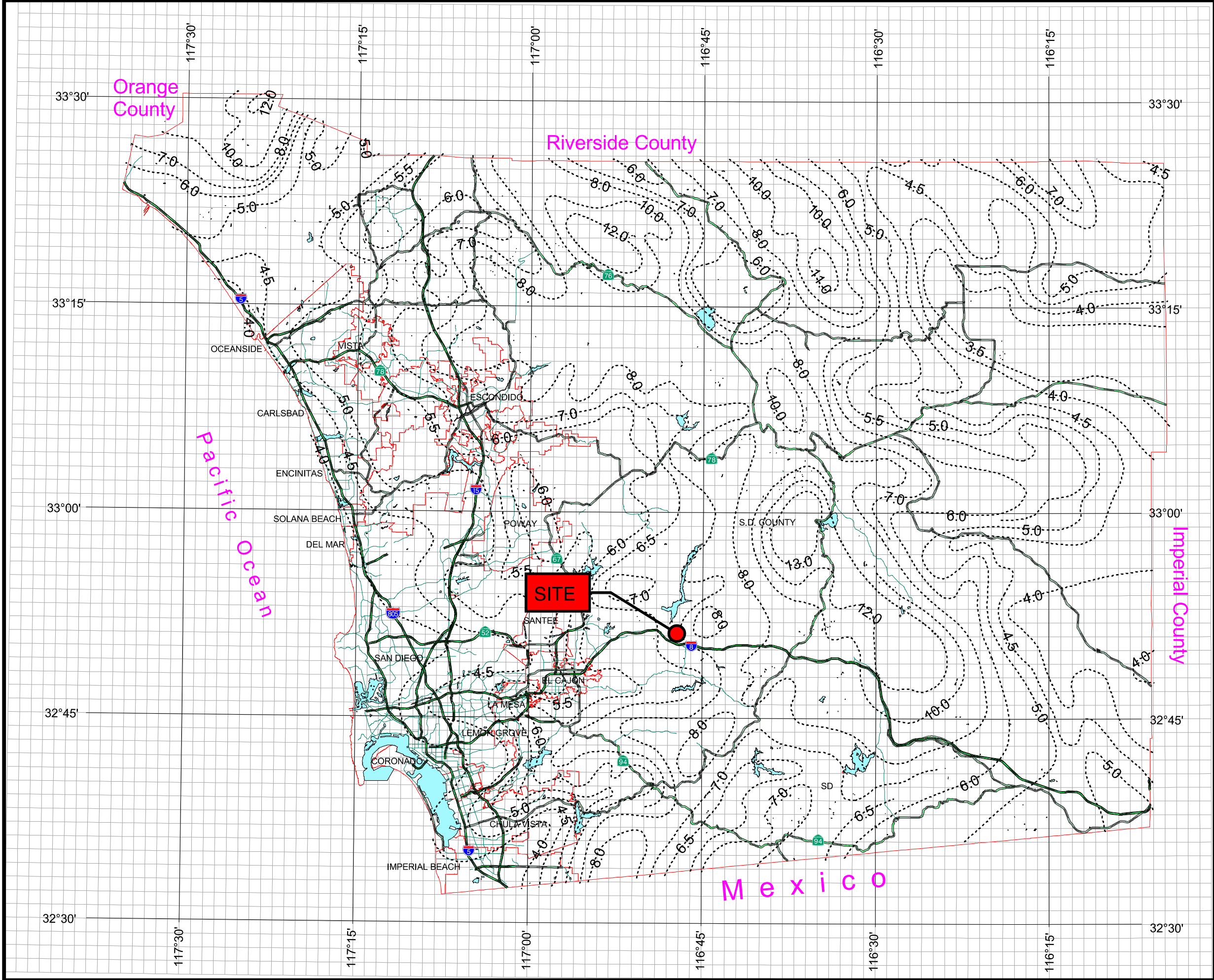


3 0 3 Miles

THIS MAP IS PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Copyright SanGIS. All Rights Reserved.

This products may contain information from the SANDAG Regional Information System which cannot be reproduced without the written permission of SANDAG.

This product may contain information which has been reproduced with permission granted by Thomas Brothers Maps.



## TABERNA VISTA WAY GP

San Diego County Hydrology Manual  
Date: June 2003

Section: 3  
Page: 6 of 26

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

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

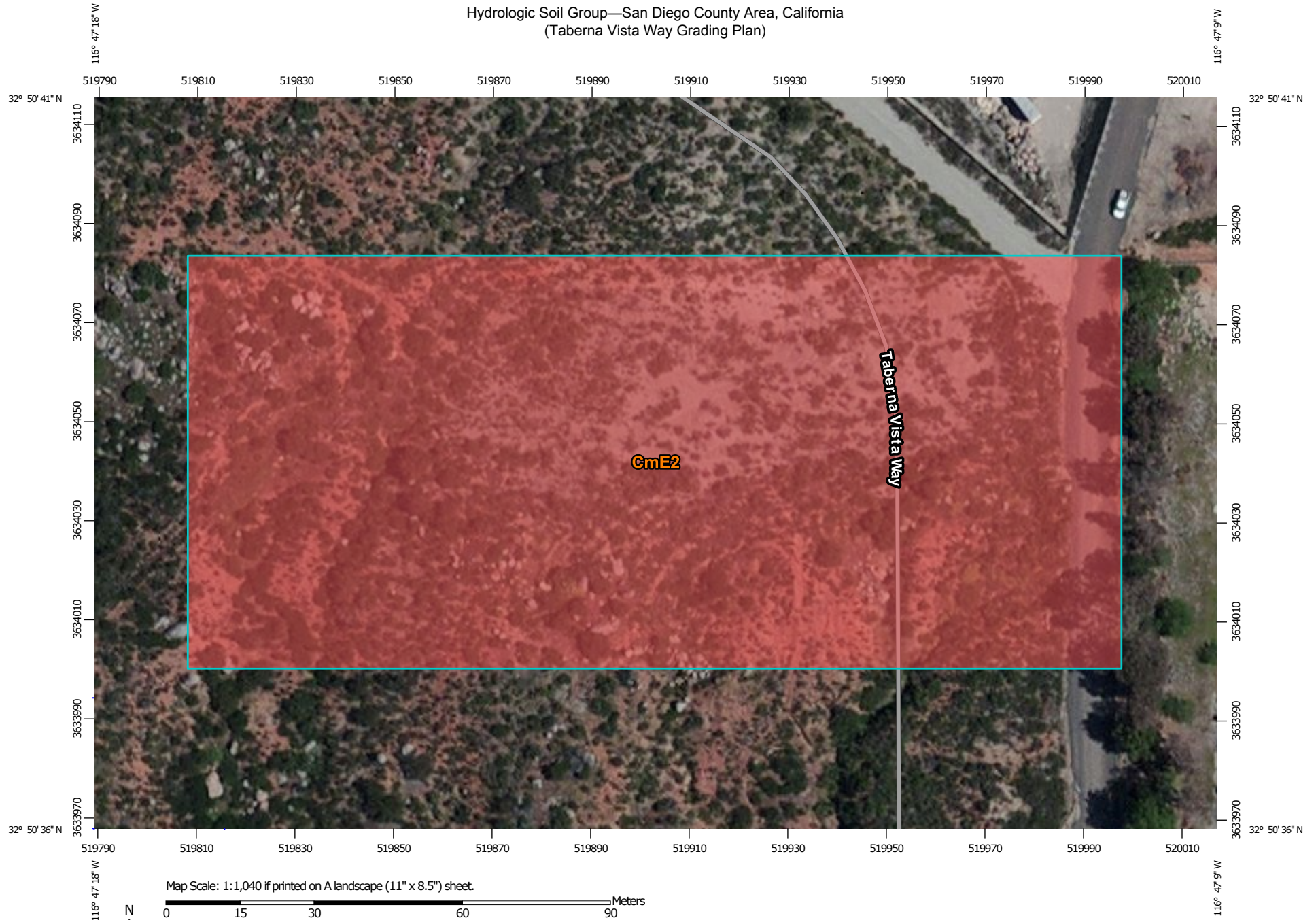
\*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient,  $C_p$ , for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the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

DU/A = dwelling units per acre

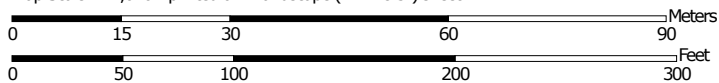
NRCS = National Resources Conservation Service



# Hydrologic Soil Group—San Diego County Area, California (Taberna Vista Way Grading Plan)



Map Scale: 1:1,040 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84




**Natural Resources  
Conservation Service**

Web Soil Survey  
National Cooperative Soil Survey

5/13/2016  
Page 1 of 4

## MAP LEGEND

### Area of Interest (AOI)









 Area of Interest (AOI)

### Soils

#### Soil Rating Polygons





 A  
 A/D  
 B  
 B/D  
 C  
 C/D  
 D  
 Not rated or not available

#### Soil Rating Lines

 A  
 A/D  
 B  
 B/D  
 C  
 C/D  
 D  
 Not rated or not available

#### Soil Rating Points






 A  
 A/D  
 B  
 B/D

 C  
 C/D  
 D  
 Not rated or not available

### Water Features

 Streams and Canals

### Transportation

 Rails  
 Interstate Highways  
 US Routes  
 Major Roads  
 Local Roads

### Background

 Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service  
 Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>  
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California  
 Survey Area Data: Version 9, Sep 17, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Data not available.

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — San Diego County Area, California (CA638)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CmE2	Cieneba rocky coarse sandy loam, 9 to 30 percent slopes , eroded	D	3.9	100.0%
<b>Totals for Area of Interest</b>			<b>3.9</b>	<b>100.0%</b>

## Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group 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.

Group 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.

Group 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.

Group 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.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

## Rating Options

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff: None Specified*

*Tie-break Rule: Higher*



Table 3-2

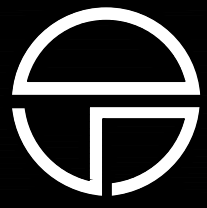
**MAXIMUM OVERLAND FLOW LENGTH ( $L_M$ )  
& INITIAL TIME OF CONCENTRATION ( $T_i$ )**

Element*	DU/ Acre	.5%		1%		2%		3%		5%		10%	
		$L_M$	$T_i$	$L_M$	$T_i$	$L_M$	$T_i$	$L_M$	$T_i$	$L_M$	$T_i$	$L_M$	$T_i$
Natural		50	13.2	70	12.5	85	10.9	100	10.3	100	8.7	100	6.9
LDR	1	50	12.2	70	11.5	85	10.0	100	9.5	100	8.0	100	6.4
LDR	2	50	11.3	70	10.5	85	9.2	100	8.8	100	7.4	100	5.8
LDR	2.9	50	10.7	70	10.0	85	8.8	95	8.1	100	7.0	100	5.6
MDR	4.3	50	10.2	70	9.6	80	8.1	95	7.8	100	6.7	100	5.3
MDR	7.3	50	9.2	65	8.4	80	7.4	95	7.0	100	6.0	100	4.8
MDR	10.9	50	8.7	65	7.9	80	6.9	90	6.4	100	5.7	100	4.5
MDR	14.5	50	8.2	65	7.4	80	6.5	90	6.0	100	5.4	100	4.3
HDR	24	50	6.7	65	6.1	75	5.1	90	4.9	95	4.3	100	3.5
HDR	43	50	5.3	65	4.7	75	4.0	85	3.8	95	3.4	100	2.7
N. Com		50	5.3	60	4.5	75	4.0	85	3.8	95	3.4	100	2.7
G. Com		50	4.7	60	4.1	75	3.6	85	3.4	90	2.9	100	2.4
O.P./Com		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
Limited I.		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
General I.		50	3.7	60	3.2	70	2.7	80	2.6	90	2.3	100	1.9

\*See Table 3-1 for more detailed description

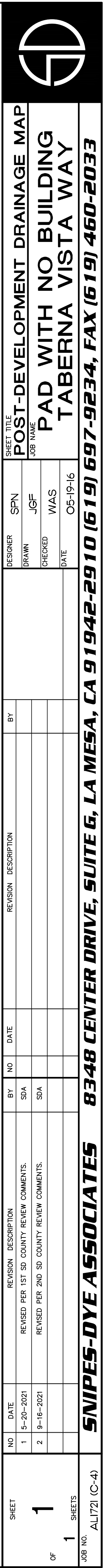
# *Drainage Maps*





SHEET		NO		DATE		REVISION		DESCRIPTION		BY		NO		DATE		REVISION		DESCRIPTION		DESIGNER		SPN		SHEET TITLE	
1		1		5-20-2021		REVISED PER 1ST SD COUNTY REVIEW COMMENTS.		SDA												DRAWN		JGF		PRE-DEVELOPMENT DRAINAGE MAP	
OF		1		9-16-2021		REVISED PER 2ND SD COUNTY REVIEW COMMENTS.		SDA												CHECKED		WAS		PAD WITH NO BUILDING	
1		1																		DATE		05-19-16		TABERNA VISTA WAY	
JOB NO.		AL172 (C-4)																						SNIPES-DYE ASSOCIATES 8348 CENTER DRIVE, SUITE G, LA MESA, CA 91942-2910 (619) 697-9234 FAX (619) 460-2033	





# *Time of Concentration Calculations*

## TIME OF CONCENTRATION ( $T_c$ ) - PRE-DEV. OUTFALL 1

### DETERMINE THE INITIAL TIME OF CONCENTRATION ( $T_i$ )

See Table 3-2 of the San Diego County Hydrology Manual

<b>Node ID</b>	11	Elev.=	1,819	Feet
<b>Node ID</b>	12	Elev.=	1,806.5	Feet
<b>Initial Length</b>		Lin =	100	Feet
		Calculated Slope=	12.5%	
		Land Use Element =	Natural	
		Utilize Slope =	10%	

**Initial Time of Concentration**       $T_i = 6.9$       Minutes

### DETERMINE THE TRAVEL TIME OF CONCENTRATION ( $T_t$ )

$\Delta E$  = change in elevation along effective slope line (Feet)

L = Watercourse Distance (Miles)

$T_t$  = Travel Time of Concentration (Hours)

**Travel Time of Concentration**       $T_t = (11.9L^3/\Delta E)^{0.385}$

		L =	457	Feet =	
<b>Node ID</b>	12	Elev.=	1,806.5	Feet	
<b>Node ID</b>	13	Elev.=	1,735	Feet	
<b>Elevation Difference</b>		$\Delta E =$	72		

$T_t = 0.030$       Hours =      1.8 Minutes

$$T_c = T_i + T_t$$

<b><math>T_c = 8.7</math>      Minutes</b>
--

## TIME OF CONCENTRATION ( $T_c$ ) - PRE-DEV. OUTFALL 2

### DETERMINE THE INITIAL TIME OF CONCENTRATION ( $T_i$ )

See Table 3-2 of the San Diego County Hydrology Manual

<b>Node ID</b>	11	Elev.=	1,819	Feet
<b>Node ID</b>	22	Elev.=	1,795	Feet
<b>Initial Length</b>		Lin =	100	Feet
		Calculated Slope=	24.0%	
		Land Use Element =	Natural	
		Utilize Slope =	10%	

**Initial Time of Concentration**       $T_i = 6.9$       Minutes

### DETERMINE THE TRAVEL TIME OF CONCENTRATION ( $T_t$ )

$\Delta E$  = change in elevation along effective slope line (Feet)

L = Watercourse Distance (Miles)

$T_t$  = Travel Time of Concentration (Hours)

**Travel Time of Concentration**       $T_t = (11.9L^3/\Delta E)^{0.385}$

		L =	553	Feet =	
<b>Node ID</b>	22	Elev.=	1,795	Feet	
<b>Node ID</b>	23	Elev.=	1,724.5	Feet	
<b>Elevation Difference</b>		$\Delta E =$	71		

$T_t = 0.037$       Hours =      2.2 Minutes

$$T_c = T_i + T_t$$

<b><math>T_c = 9.1</math>      Minutes</b>
--

## TIME OF CONCENTRATION ( $T_c$ ) - PRE-DEV. OUTFALL 3

### DETERMINE THE INITIAL TIME OF CONCENTRATION ( $T_i$ )

See Table 3-2 of the San Diego County Hydrology Manual

**Node ID**    31    Elev.=    1,790.3    Feet  
**Node ID**    32    Elev.=    1,772    Feet  
**Initial Length**     $L_{in}$  =    100    Feet  
                          Calculated Slope=    18.3%  
                          Land Use Element = Natural  
                          Utilize Slope = 10%

**Initial Time of Concentration**     $T_i$  =    6.9    Minutes

### DETERMINE THE TRAVEL TIME OF CONCENTRATION ( $T_t$ )

$\Delta E$  = change in elevation along effective slope line (Feet)

$L$  = Watercourse Distance (Miles)

$T_t$  = Travel Time of Concentration (Hours)

**Travel Time of Concentration**     $T_t = (11.9L^3/\Delta E)^{0.385}$

$L$  =    155    Feet =    0.029 Miles  
**Node ID**    32    Elev.=    1,772    Feet  
**Node ID**    33    Elev.=    1,747    Feet  
**Elevation Difference**     $\Delta E$  =    25

$T_t$  =    0.013    Hours =    0.8 Minutes

$$T_c = T_i + T_t$$

<b><math>T_c</math> =    7.7    Minutes</b>
---



## TIME OF CONCENTRATION ( $T_c$ ) - POST-DEV. OUTFALL 1

### DETERMINE THE INITIAL TIME OF CONCENTRATION ( $T_i$ )

See Table 3-2 of the San Diego County Hydrology Manual

<b>Node ID</b>	11	Elev.=	1,819	Feet
<b>Node ID</b>	12	Elev.=	1,806.5	Feet
<b>Initial Length</b>		$L_{in}$ =	100	Feet
		Calculated Slope=	12.5%	
		Land Use Element =	Natural	
		Utilize Slope =	10%	

**Initial Time of Concentration**       $T_i$  =      6.9      Minutes

### DETERMINE THE TRAVEL TIME OF CONCENTRATION ( $T_t$ )

$\Delta E$  = change in elevation along effective slope line (Feet)

$L$  = Watercourse Distance (Miles)

$T_t$  = Travel Time of Concentration (Hours)

**Travel Time of Concentration**       $T_t = (11.9L^3/\Delta E)^{0.385}$

		$L$ =	463	Feet =	
<b>Node ID</b>	12	Elev.=	1,806.5	Feet	
<b>Node ID</b>	13	Elev.=	1,735	Feet	
<b>Elevation Difference</b>		$\Delta E$ =	72		

$T_t$  =      0.030      Hours =      1.8 Minutes

$$T_c = T_i + T_t$$

<b><math>T_c</math> =      8.7      Minutes</b>
---

## Post-Dev Outfall 2

### TIME OF CONCENTRATION ( $T_c$ ) - POST-DEV. OUTFALL 2

#### DETERMINE THE INITIAL TIME OF CONCENTRATION ( $T_i$ )

See Table 3-2 of the San Diego County Hydrology Manual

**Node ID** 21 Elev.= 1,819 Feet  
**Node ID** 22 Elev.= 1,795 Feet  
**Initial Length**  $L_{in}$  = 100 Feet  
ed Calculated Slope= 24.0%  
Land Use Element = Natural  
Utilize Slope = 10%

**Initial Time of Concentration**  $T_i$  = 6.9 Minutes

#### DETERMINE THE TRAVEL TIME OF CONCENTRATION ( $T_t$ )

$\Delta E$  = change in elevation along effective slope line (Feet)

$L$  = Watercourse Distance (Miles)

$T_t$  = Travel Time of Concentration (Hours)

**Travel Time of Concentration**  $T_t = (11.9L^3/\Delta E)^{0.385}$

$L$  = 535 Feet = 0.101 Miles  
**Node ID** 22 Elev.= 1,795 Feet  
**Node ID** 23 Elev.= 1,724.5 Feet  
**Elevation Difference**  $\Delta E$  = 70.5

$T_t$  = 0.036 Hours = 2.1 Minutes

$$T_c = T_i + T_t$$

<b><math>T_c</math> = 9.0 Minutes</b>
---------------------------------------

## Post-Dev Outfall 3

### TIME OF CONCENTRATION ( $T_c$ ) - POST-DEV. OUTFALL 3

#### DETERMINE THE INITIAL TIME OF CONCENTRATION ( $T_i$ )

See Table 3-2 of the San Diego County Hydrology Manual

**Node ID** 31 Elev.= 1,790.3 Feet

**Node ID** 32 Elev.= 1,772 Feet

**Initial Length**  $L_{in}$  = 100 Feet

Calculated Slope= 18.3%

Land Use Element = Natural

Utilize Slope = 10%

**Initial Time of Concentration**  $T_i$  = 6.9 Minutes

#### DETERMINE THE TRAVEL TIME OF CONCENTRATION ( $T_t$ )

$\Delta E$  = change in elevation along effective slope line (Feet)

$L$  = Watercourse Distance (Miles)

$T_t$  = Travel Time of Concentration (Hours)

**Travel Time of Concentration**  $T_t = (11.9L^3/\Delta E)^{0.385}$

$L$  = 155 Feet = 0.029 Miles

**Node ID** 32 Elev.= 1,772 Feet

**Node ID** 33 Elev.= 1,747 Feet

**Elevation Difference**  $\Delta E$  = 25

$T_t$  = 0.013 Hours = 0.8 Minutes

$$T_c = T_i + T_t$$

<b><math>T_c</math> = 7.7 Minutes</b>
---------------------------------------

# *Pre-Development Calculations*

# Hydrograph Report

Page 1

Hydraflow Hydrographs by Intelisolve

## Hyd. No. 4

### Pre-development OUTFALL 1

Hydrograph type	= Rational	Peak discharge	= 5.24 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 2.5 ac	Runoff coeff.	= 0.35
Intensity	= 5.920 in/hr	Time of conc. (Tc)	= 9 min
IDF Curve	= Taberna Vista Way.idf	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 2,831 cuft

## Hydrograph Discharge Table

### Time -- Outflow (min cfs)

1	0.58
2	1.17
3	1.75
4	2.33
5	2.91
6	3.50
7	4.08
8	4.66
9	5.24 <<
10	4.66
11	4.08
12	3.50
13	2.91
14	2.33
15	1.75
16	1.17
17	0.58

...End

# Hydrograph Report

Page 1

Hydraflow Hydrographs by Intelisolve

## Hyd. No. 5

### Pre-development OUTFALL 2

Hydrograph type	= Rational	Peak discharge	= 7.13 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 3.4 ac	Runoff coeff.	= 0.35
Intensity	= 5.920 in/hr	Time of conc. (Tc)	= 9 min
IDF Curve	= Taberna Vista Way.idf	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 3,849 cuft

## Hydrograph Discharge Table

### Time -- Outflow (min cfs)

1	0.79
2	1.58
3	2.38
4	3.17
5	3.96
6	4.75
7	5.54
8	6.34
9	7.13 <<
10	6.34
11	5.54
12	4.75
13	3.96
14	3.17
15	2.38
16	1.58
17	0.79

...End

# Hydrograph Report

## Hyd. No. 6

### Pre-development OUTFALL 3

Hydrograph type	= Rational	Peak discharge	= 0.71 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 0.3 ac	Runoff coeff.	= 0.35
Intensity	= 6.367 in/hr	Time of conc. (Tc)	= 8 min
IDF Curve	= Taberna Vista Way.idf	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 342 cuft

## Hydrograph Discharge Table

### Time -- Outflow (min cfs)

1	0.09
2	0.18
3	0.27
4	0.36
5	0.45
6	0.53
7	0.62
8	0.71 <<
9	0.62
10	0.53
11	0.45
12	0.36
13	0.27
14	0.18
15	0.09

...End

# *Post-Development Calculations*



# Hydrograph Report

## Hyd. No. 3

### Post-development OUTFALL 1

Hydrograph type	= Rational	Peak discharge	= 5.70 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 2.8 ac	Runoff coeff.	= 0.35
Intensity	= 5.920 in/hr	Time of conc. (Tc)	= 9 min
IDF Curve	= Taberna Vista Way.idf	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 3,077 cuft

## Hydrograph Discharge Table

### Time -- Outflow (min cfs)

1	0.63
2	1.27
3	1.90
4	2.53
5	3.17
6	3.80
7	4.43
8	5.07
9	5.70 <<
10	5.07
11	4.43
12	3.80
13	3.17
14	2.53
15	1.90
16	1.27
17	0.63

...End

# Hydrograph Report

Page 1

Hydraflow Hydrographs by Intelisolve

## Hyd. No. 2

### Post-development OUTFALL 2

Hydrograph type = Rational  
Storm frequency = 100 yrs  
Drainage area = 3.2 ac  
Intensity = 5.920 in/hr  
IDF Curve = Taberna Vista Way.idf

Peak discharge = 6.67 cfs  
Time interval = 1 min  
Runoff coeff. = 0.35  
Time of conc. (Tc) = 9 min  
Asc/Rec limb fact = 1/1

Hydrograph Volume = 3,603 cuft

## Hydrograph Discharge Table

### Time -- Outflow (min cfs)

1	0.74
2	1.48
3	2.22
4	2.97
5	3.71
6	4.45
7	5.19
8	5.93
9	6.67 <<
10	5.93
11	5.19
12	4.45
13	3.71
14	2.97
15	2.22
16	1.48
17	0.74

...End

# Hydrograph Report

Page 1

Hydraflow Hydrographs by Intelisolve

## Hyd. No. 1

### Post-development OUTFALL 3

Hydrograph type	= Rational	Peak discharge	= 0.71 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 0.3 ac	Runoff coeff.	= 0.35
Intensity	= 6.367 in/hr	Time of conc. (Tc)	= 8 min
IDF Curve	= Taberna Vista Way.idf	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 342 cuft

## Hydrograph Discharge Table

### Time -- Outflow (min cfs)

1	0.09
2	0.18
3	0.27
4	0.36
5	0.45
6	0.53
7	0.62
8	0.71 <<
9	0.62
10	0.53
11	0.45
12	0.36
13	0.27
14	0.18
15	0.09

...End