MLB
ENGINEERING
Professional Civil Engineer and Land Surveyor

CEQA Drainage Study

for

TPM 21086, Env. Log # 07-0082924

Prepared for:

Gicanov Family Trust

1210 North Howard Street

Glendale, CA 91207

760-724-4355

Project Site Address

Via Salvador E/o Mac Tan Rd., Valley Center, CA

Prepared by:

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Date:

July 21, 2008

JN 06-sd090

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Section 1.
Certification

Declaration of Responsible Charge

I hereby declare that I a m the engineer of work for this 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 prject drawing 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 responsibilities for project design.

Michael L Benesh, RCE 37893 Date
Reg. Expires 3/31/09

Section 2. Discussion

Section 2.01 Purpose

The purpose of this study is to determine the existing and anticipated 10 and 100-year storm runoff and required size of hydraulic structures to protect the proposed and existing slopes and structures on the site, and to identify existing drainage problems that may be caused, or aggravated, by project development.

This study will also determine the anticipated 85th percentile storm runoff, or water quality treatment runoff, for the proposed project.

Section 3. Project

Section 3.01 Description

The site is located in the Valley Center area of the unincorporated territory of the County of San Diego, CA. TPM 21086 is on the south side of a private road known as Via Salvador approximately 1100 feet easterly of Mac Tan Road.

The project site is a vacant 4.4 acre parcel. The proposed project will subdivide the property into two residential parcels. Construction will include limited street and utility improvements along Via Salvador, as well as on-site grading to create building pads. The amount of anticipated grading is approximately 900 cubic yards.

The site is adjacent to single family homes on minimum 2 acre parcels to the north, east, west & south. There are also groves to the east and west and an agricultural use north of Via Salvador adjoining the property. There is one vacant property adjoining the site on the southwest. The surrounding properties are zoned for residential-agricultural use as is the site.

A detailed vicinity map is included in **Attachment A**.

Section 3.02 Topography and Land Use

The site is currently in an unimproved, natural condition. The surface of the site has an average slope of about 10 percent, down from the north to the south. A well defined natural drainage channel starts near the north end of the site and continues across

the site to the south property line. There are a few scattered trees, but most of the site is covered with sparse low lying brush and grasses. Existing off-site runoff from approximately two acres of land north of the project drain through the site.

Site development will include widening and construction of portions of Via Salvador to serve the proposed parcels. Utilities, individual pads and driveways will have to be constructed to serve the proposed parcels.

The storm water runoff will flow as it does now to the existing natural drainage channel to the south end of the project and from there, via overland natural drainage courses, to the San Luis Rey River and the Pacific Ocean.

Section 4. Methodology

Section 4.01 Rational Method

The Rational Method as described in the San Diego County Hydrology Manual, Section 3, (Revised June 2003) shall be used to determine storm runoff.

The Rational Method formula is expressed as follows:

$$Q = C\ I\ A$$

Where:

Q = peak discharge, in cubic feet per second (cfs)

C = runoff coefficient, proportion of the rainfall that runs off the surface.

The coefficient C has no units and is based on the soil group and the development type for the drainage sub-area. **Attachment F** includes calculations for the runoff coefficient for each drainage sub-area.

I = average rainfall intensity for a duration equal to the Tc for the area, (in/Hr.)

A = drainage area contributing to the design location, in acres

The following values are used in the calculations:

Soil Group C from San Diego County Soils Group Map.	See **Attachment C**.
C (Coefficient of Runoff) from Table 3-1.	See **Attachment D**.
10 year 6 Hr. Rainfall = 2.7”	See **Attachment E**.
10 year 24 Hr. Rainfall =5.2"	“ “ “
100 year 6 Hr. Rainfall = 3.8”	“ “ “
100 year 24 Hr. Rainfall =8.1"	“ “ “

The site is first divided into drainage sub-areas. See the On-Site Hydrology Maps in **Attachment B.** The time of concentration, Tc, for each sub-area along the drainage path is computed based on the initial time of concentration for the initial area and the travel time to reach each succeeding node. Based on the time of concentration, the rainfall intensity is determined using Figure 3-2 (See **Attachment D**). Then applying the rational method equation, the peak runoff is determined at each node along the drainage path. Q’s are tabulated for each sub-area along the drainage path.

The rational method calculations are in **Attachment G**.

Section 5. Summary

Section 5.01 Post Construction Storm Runoff

The proposed project will not alter drainage patterns on the site or the surrounding area. The Storm water discharge points will not divert runoff from existing conditions. The potential polutants generated by the increased runoff from the additional impervious areas will be mitigated by directing the flows from new impervious surfaces on-site through vegetated/rock swales on each of the proposed lots prior to draining onto the existing natural drainage areas.

5.01.1 Storm Runoff Entering the Site

The project is subject to storm run-on from the North. The storm run-on enters the site at approximately the middle of the north boundary of the site. There are 2.05 acres tributary to this concentration point. The results of the rational method calculations for the storm run-on to the site are summarized in Table 5.1 below. This will not change with the construction of the site.

Table 5.1 – Runoff Entering Site @ N'ly P.L.	
Tributary Drainage Basin Area (acres)	2.05
Q10 (CFS)	3.5
Q100 (CFS)	4.9

5.01.2 Storm Runoff Exiting the Site

The amount of impervious area on the site will increase from approximately 0% of the site area at present to 10% of the site area due to the construction of the future residences, driveways and street. This increase in impervious area will cause an increase the storm runoff exiting the site. The runoff increase will have a less than significant impact on the properties downstream of this site. The increase in peak flows will not adversely affect the peak velocity at the discharge point. The increase in peak discharge velocity is varies from about 4 percent for the 10 year storm event to 1 percent for the 100 year storm event. The results of the rational method calculations for the storm run-off from the site are summarized in Table 5.2 below.

Table 5.2 – Runoff Exiting Site @ S'ly P.L.			
	Pre-Construction (A)	Post Construction (B)	Percent Change(1)
Drainage Basin Area (Acres)	6.37	6.37	0.0%
Q10 (CFS) (1)	8.6	9.6	11.6%
Q100 (CFS) (1)	12.2	13.7	12.3%
V10(FPS) (2)	6.8	7.1	4.4%
V100(FPS) (2)	7.6	7.7	1.3%

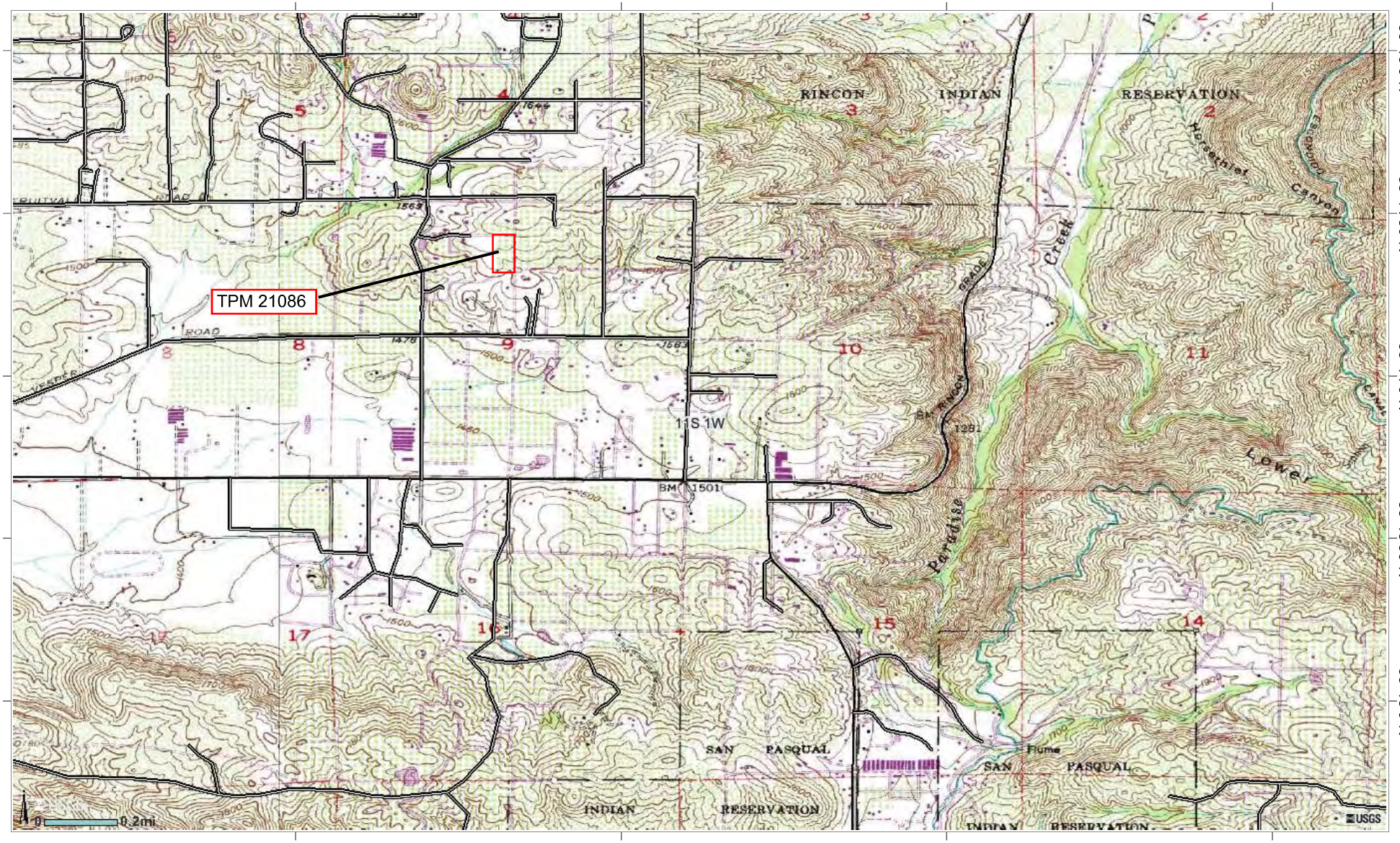
(1)Rational Method Calculations, Attachment G

(2)Plate D-6.1, Attachment D, Channel Slope= 0.075

(3)100*(B-A)/A

Attachment A - Vicinity Map

See map of portion of Rodriguez Mtn. Quadrangle on following page.



USGS
science for a changing world

33°15′7″N
117°0′52″W | Map Extent | 116°56′39″W
33°12′37″N

The National Map
http://nationalmap.gov/

Geographic Coordinate System (WGS84)

Attachment B - On-Site Hydrology Map

See Map in folder.

Attachment C - San Diego County Soils Group Map

See Map in folder.

Attachment D - San Diego County Hydrology Manual Excerpts

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

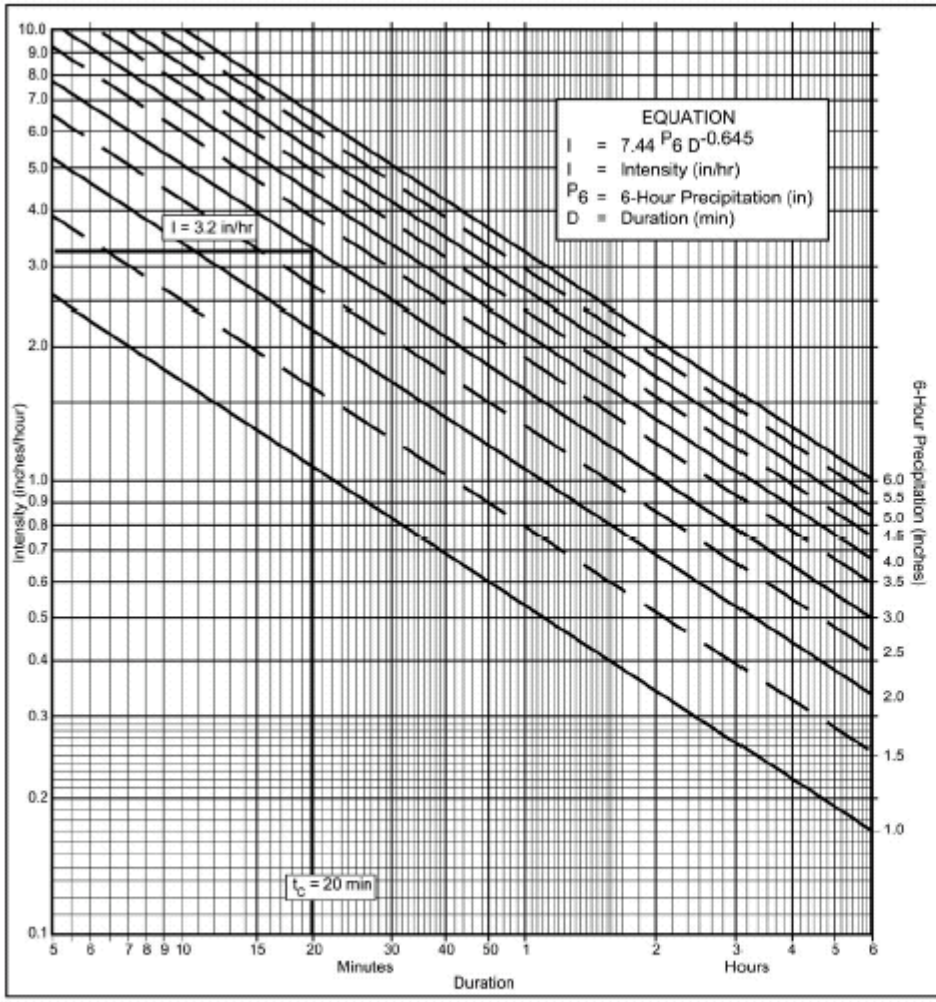
*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area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

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



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 applicaple 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 50 year

(b) P_6 = 3 in., P_{24} = 5.5 , $\frac{P_6}{P_{24}}$ = 54.5 %(2)

(c) Adjusted P_6(2) = 3 in.

(d) t_x = 20 min.

(e) I = 3.2 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	1.65	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 - Example

FIGURE
3-2

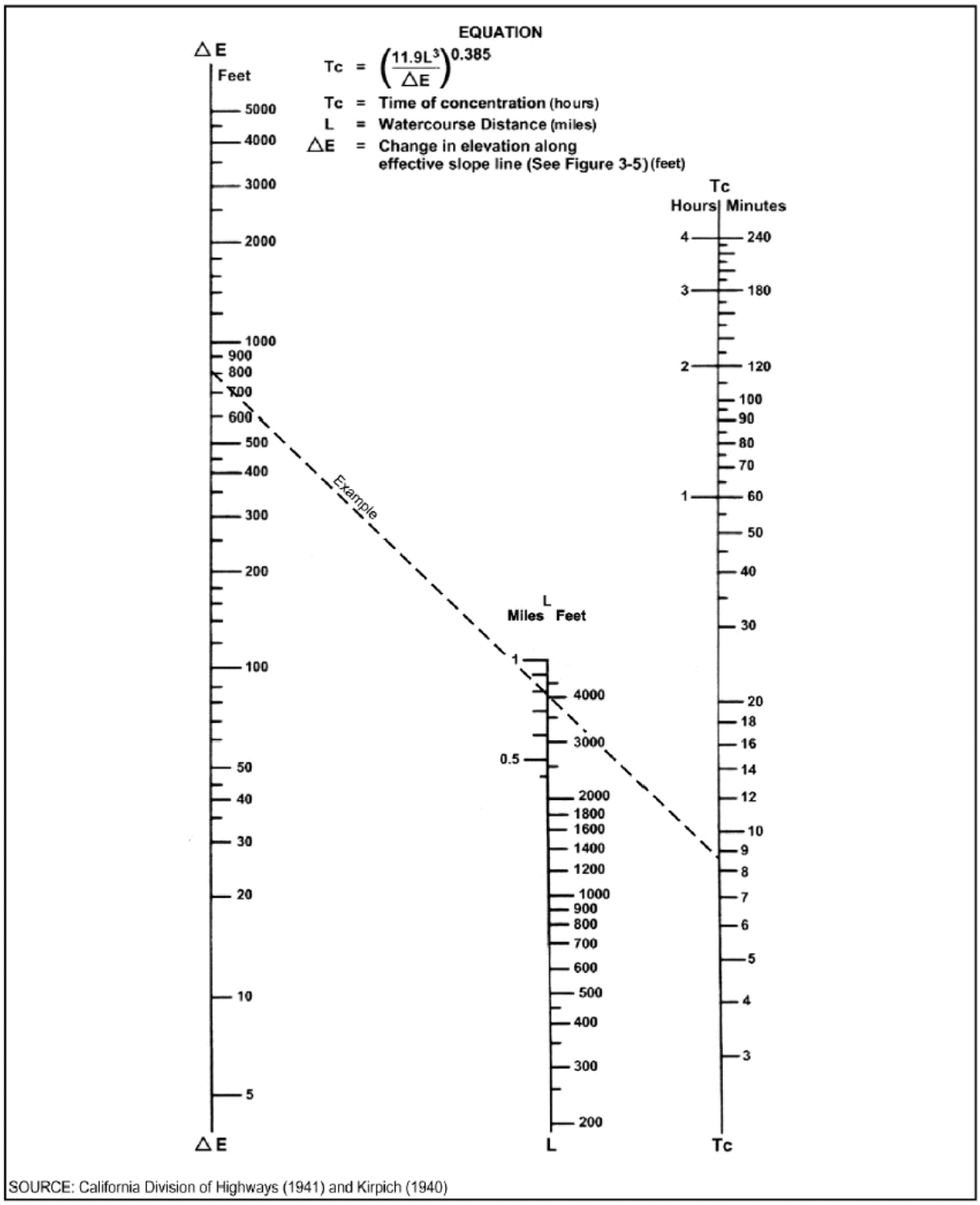


FIGURE 3-4

Nomograph for Determination of Time of Concentration (Tc) or Travel Time (Tt) for Natural Watersheds

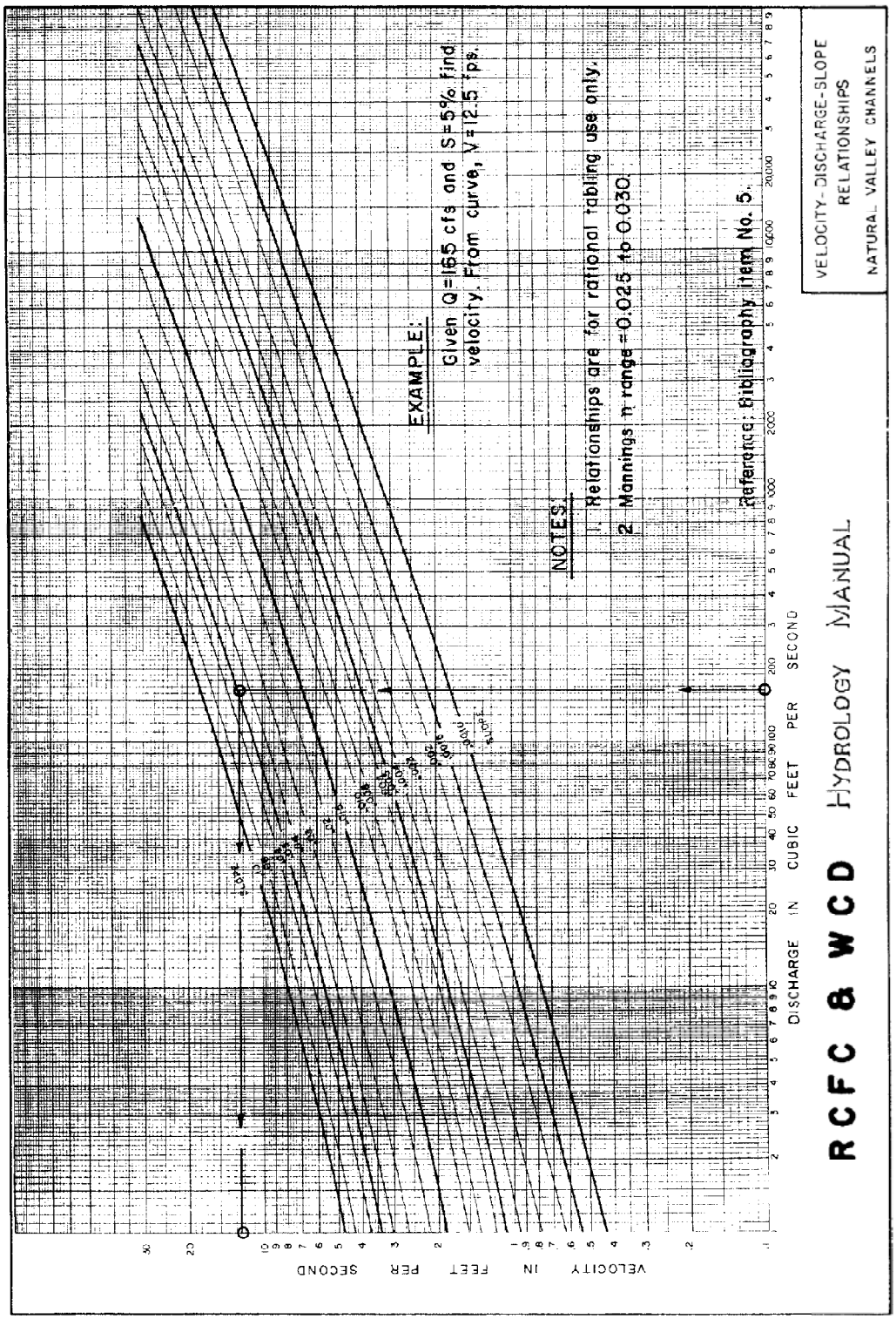
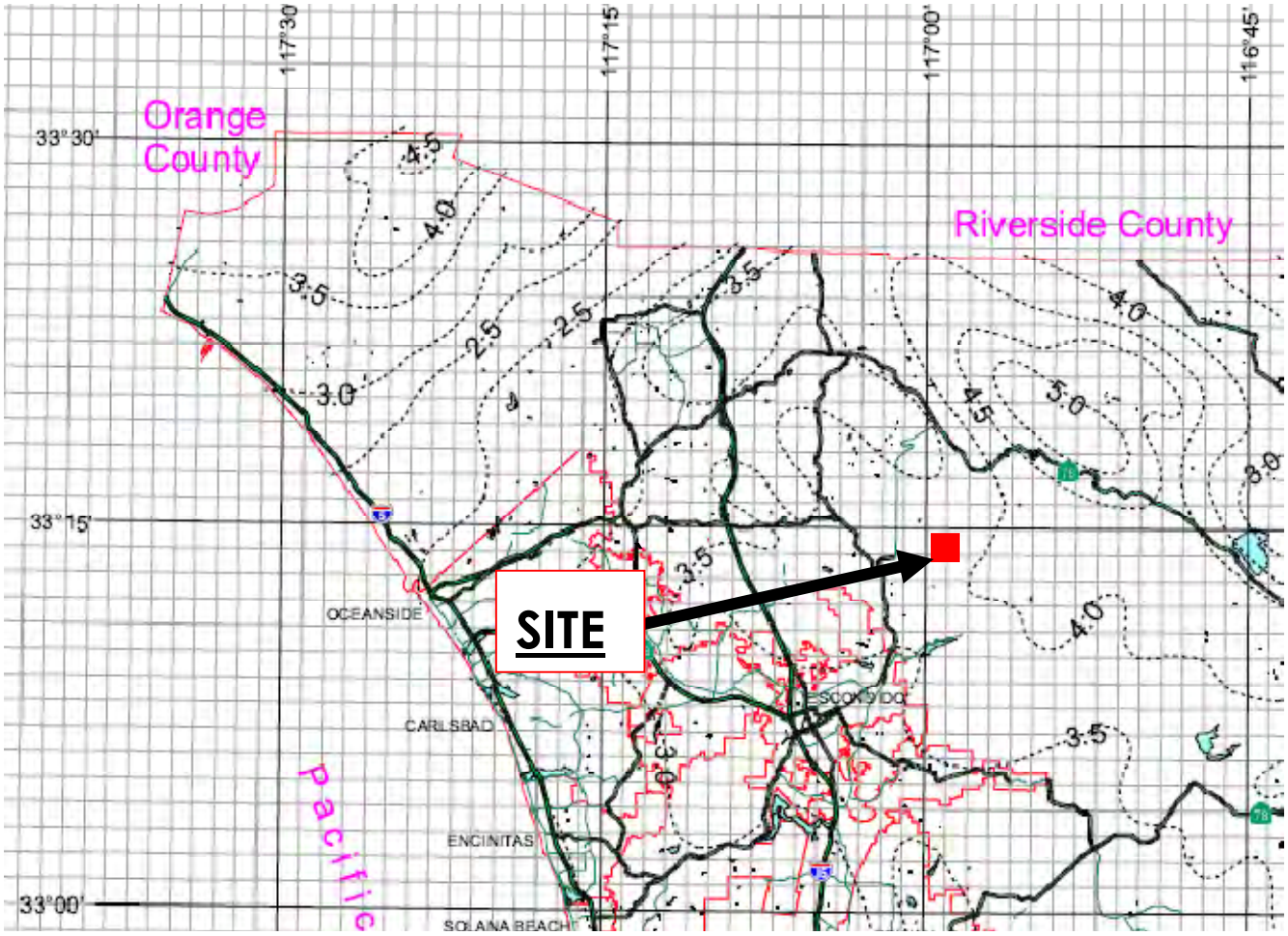
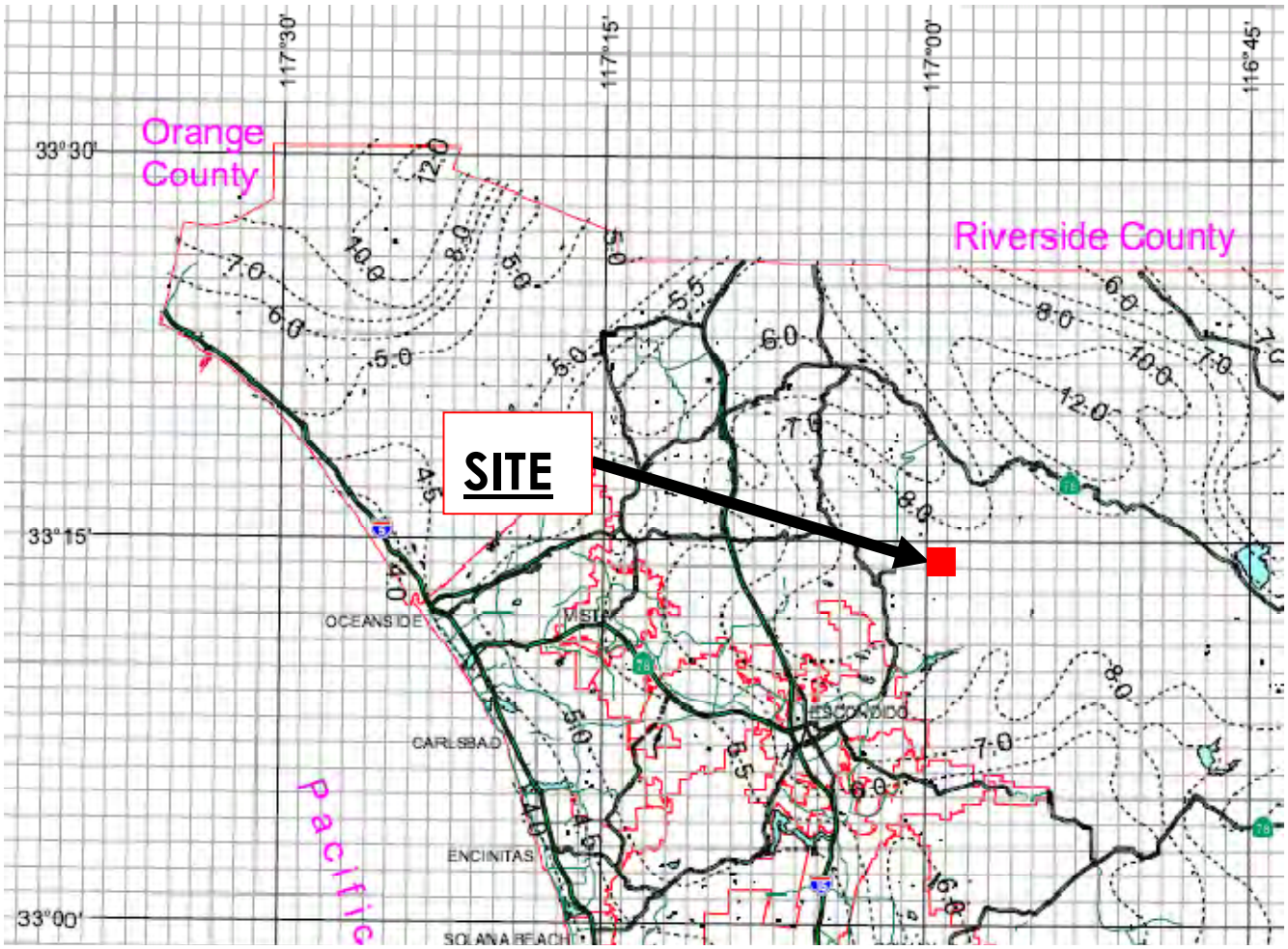

VELOCITY-DISCHARGE-SLOPE
RELATIONSHIPS
NATURAL VALLEY CHANNELS
EXAMPLE:
Given Q=165 cfs and S=5% find velocity. From curve, V=12.5 fps.
NOTES:
1. Relationships are for rational tabling use only.
2. Mannings n range=0.025 to 0.030.
Reference: Bibliography item No. 5.
RCFC & WCD HYDROLOGY MANUAL
DISCHARGE IN CUBIC FEET PER SECOND
VELOCITY IN FEET PER SECOND

PLATE D-6.1

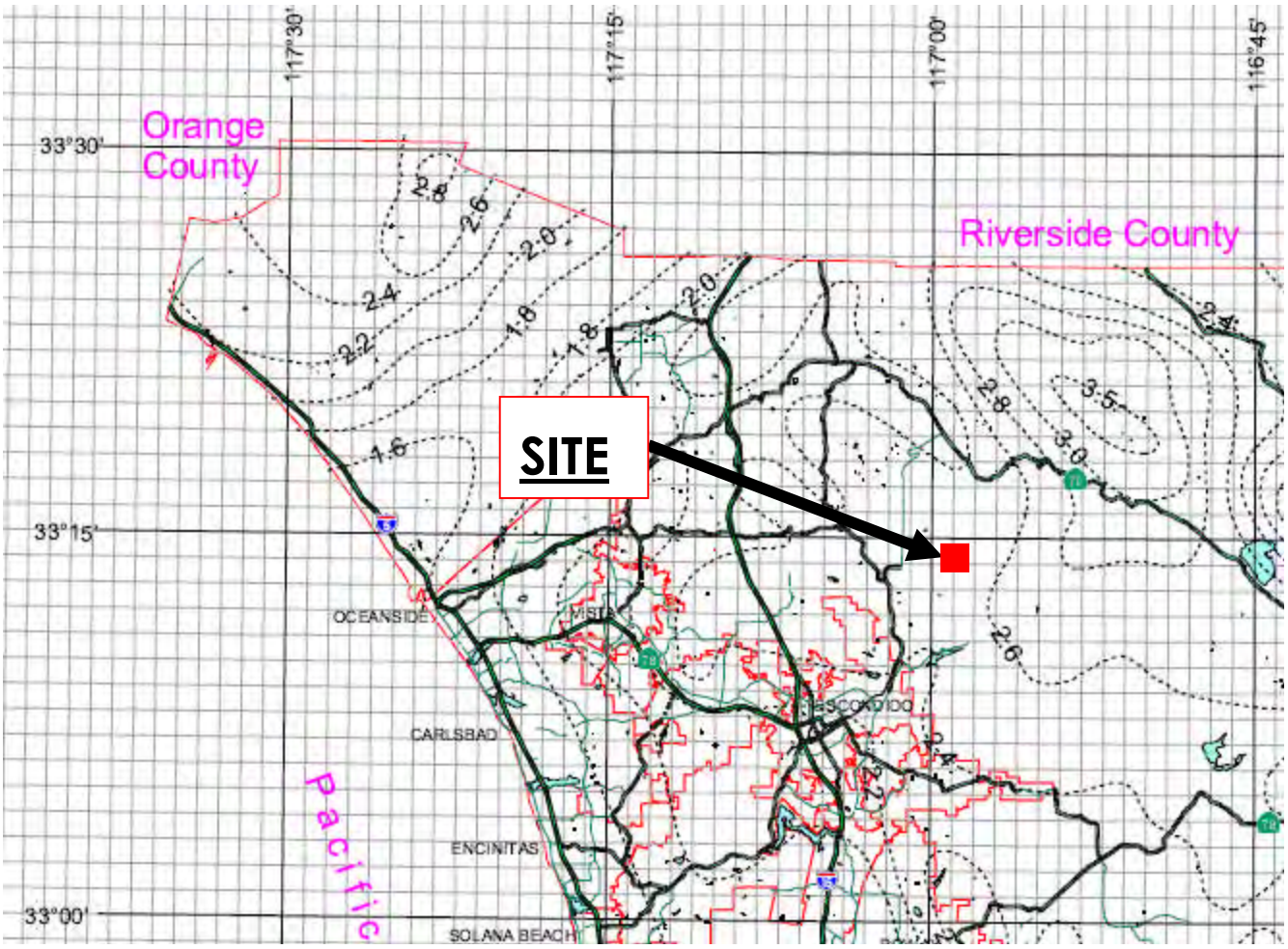
Attachment E - San Diego County Point Rainfall Maps



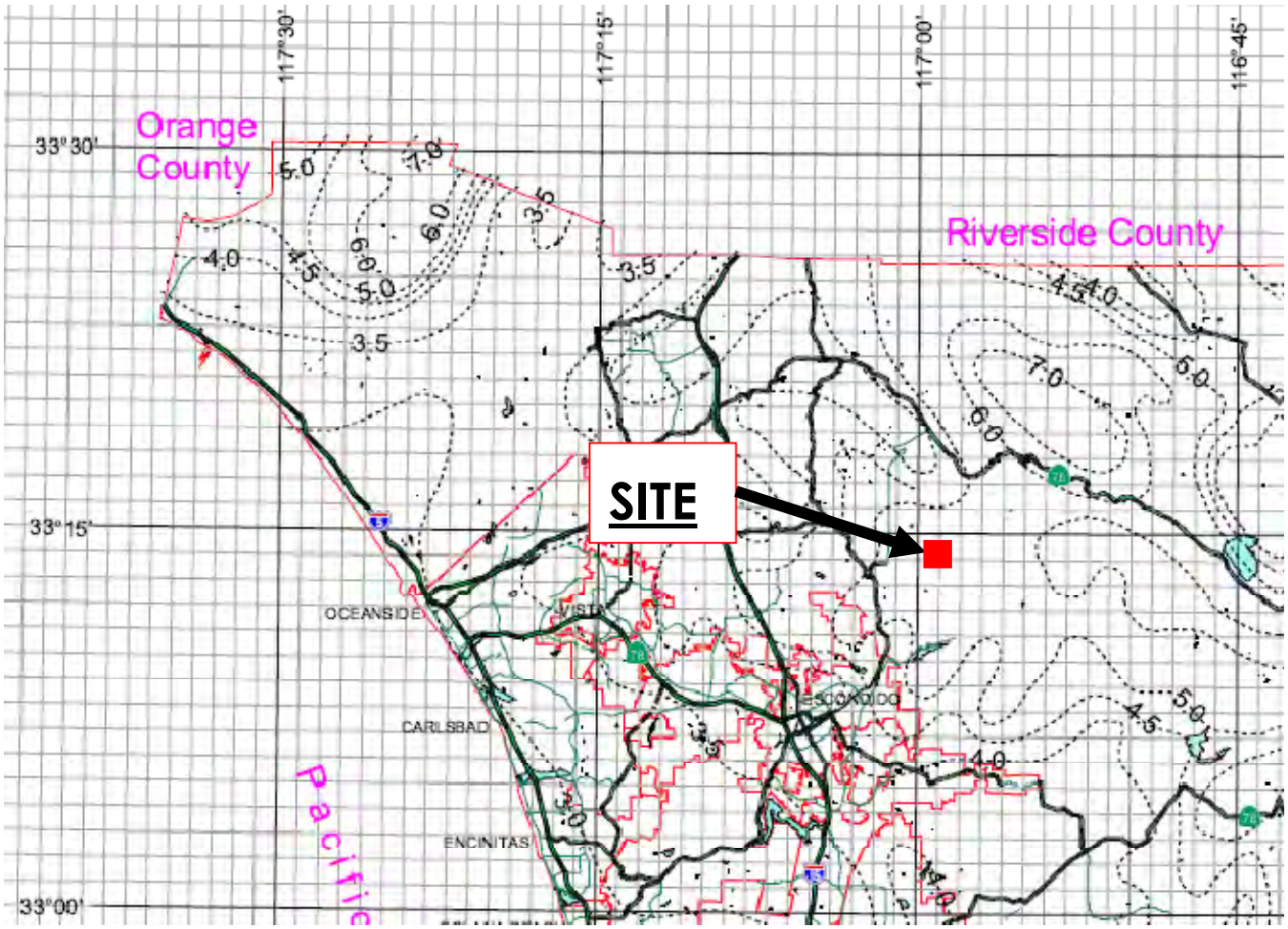
100 Year – 6 Hour Rainfall



100 Year – 24 Hour Rainfall



10 Year – 6 Hour Rainfall



10 Year – 24 Hour Rainfall

Attachment F - Impervious Area and TC Calculations

Node 101-102

Total Area = 2.05 Acres

% Imp = 10% Use LDR 1.0 DU/A

L=420'

Initial Slope 5%

Ti=8.0 Min., Lm=100' Table 3-2

Tt= 1.5 min. Fig. 3-4, L=320', H=36'

Tc=8.0 + 1.5 = 9.5 min.

Node 102-103

Total Area = 4.32 Acres

% Imp = 0% Use Natural – Existing Condition

% Imp = 10% Use LDR 1.0 DU/A – Proposed Condition

Attachment G - Rational Method Calculations

Rational Method Calculation Form
Project: TPM 21086

Frequency 10 Year
Existing Condition
P6=2.7 in./hr.

Calculated by MB
Date: 7/21/08

Drainage Area	Soil & Development	A Acres	C	CA	ΣCA	I In./Hr.	Q CFS	Slope	Section	V '/Sec.	L Ft.	Tt Min.	Tc Min.	Remarks
101-102	C - LDR 1.0	2.05	0.36	0.7	0.7	4.70	3.5	0.075	Nat	6.5	670	1.7	9.5	See Attachment F
102-103	C - Undev	4.32	0.30	1.3	2.0	4.22	8.6						11.2	Plate D-6.1 (avg Q=6)

Rational Method Calculation Form
Project: TPM 21076

Frequency 10 Year
Proposed Condition
P6=2.7 in./hr.

Calculated by MB
Date: 7/21/2008

Drainage Area	Soil & Development	A Acres	C	CA	ΣCA	I In./Hr.	Q CFS	Slope	Section	V '/Sec.	L Ft.	Tt Min.	Tc Min.	Remarks
101-102	C - LDR 1.0	2.05	0.36	0.7	0.7	4.70	3.5	0.075	Nat	6.2	670	1.8	9.5	See Attachment F
102-103	" "	4.32	0.36	1.6	2.3	4.20	9.6						11.3	Plate D-6.1 (avg Q=6.5)

Rational Method Calculation Form
Project: TPM 21086

Frequency 100 Year
Existing Condition
P6=3.8 in./hr.

Calculated by MB
Date: 7/21/08

Drainage Area	Soil & Development	A Acres	C	CA	ΣCA	I In./Hr.	Q CFS	Slope	Section	V '/Sec.	L Ft.	Tt Min.	Tc Min.	Remarks
101-102	C - LDR 1.0	2.05	0.36	0.7	0.7	6.62	4.9	0.075	Nat	7	670	1.6	9.5	See Attachment F
102-103	C - Undev	4.32	0.30	1.3	2.0	5.99	12.2						11.1	Plate D-6.1 (avg Q=8.5)

Rational Method Calculation Form
Project: TPM 21086

Frequency 100 Year
Proposed Condition
P6=3.8 in./hr.

Calculated by MB
Date: 7/21/2008

Drainage Area	Soil & Development	A Acres	C	CA	ΣCA	I In./Hr.	Q CFS	Slope	Section	V '/Sec.	L Ft.	Tt Min.	Tc Min.	Remarks
101-102	C - LDR 1.0	2.05	0.36	0.7	0.7	6.62	4.9	0.075	Nat	7	670	1.6	9.5	See Attachment F
102-103	" "	4.32	0.36	1.6	2.3	5.99	13.7						11.1	Plate D-6.1 (avg Q=9.5)