CEQA LEVEL
DRAINAGE STUDY

PROJECT:

LEHMAN TPM
PDS2020-TPM-21278
PDS2020-ER-02-002
4-lot Subdivision
3600 Linda Vista Drive
Fallbrook, CA 92028
APN 123-261-14

PREPARED FOR:

Tad Lehman
1494 Meredith Road
Fallbrook, CA 92028

PREPARED BY:

Kristin L. Greene, P.E.
dk GREENE CONSULTING, INC.
P.O. Box 143
Bonsall, CA 92003
J.N. 19-107

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.

EXPIRES: JUNE 30, 2024

dk Greene Consulting, Inc.

Kristin L. Greene, P.E. C57860

May 31, 2022
Date

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0.0 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 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 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 responsibilities for project design.

5/31/22

Kristin L. Greene, PE C57860 Date

EXPIRES: JUNE 30, 2024

1.0 Project Information

1.1 Introduction to Site and Project Description

This 12.9-acre parcel is located on Linda Vista Drive, west of Linda Vista Terrace in Fallbrook. The site has an existing single-family residence located near the northern property line, but the majority of the parcel is undeveloped.

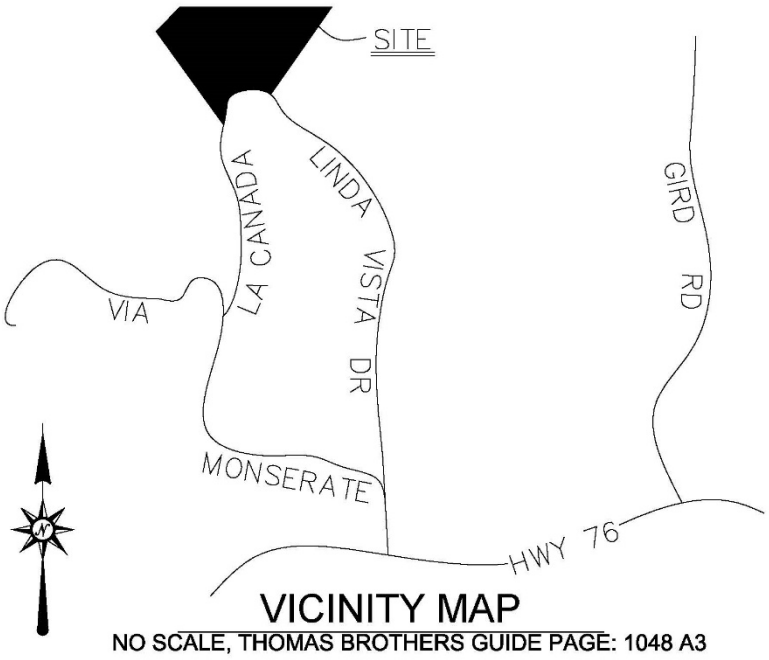


Figure 1-1. Vicinity Map.

The lot is surrounded by a variety of residences of similar size and undeveloped agricultural areas.

The owner intends to prepare a tentative parcel map to subdivide this rural area parcel into four lots and sell separately. The project consists of grading three level pads to prepare the lots for the future development into single-family residences (Parcels 1, 2, and 3). The existing residence will be undisturbed (Parcel 4).

The access road, Linda Vista Drive, will provide access to the three new residences for Parcels 1, 2, and 3. Linda Vista Drive will be widened per County requirements.

Access to the existing residence on Parcel 4 will remain from the private road, Linda Vista Terrace, north of the lot.

This report will focus on the hydrology in response to the grading and improvements associated with the development. In the pre-development condition, the site has one basin with one outlet (outfall) point. In the post-development condition, the site will have four sub-basins with one outlet (outfall) point.

1.2 Existing Site Topography and Drainage Condition

Topography of the site was provided by Patrick Harrison, P.E., and is based on a previous aerial topography and updated in April 2022. Generally, the entire project drains toward the southwest corner of the property. In the existing condition, there is one drainage basin (with one outlet point) at the southwest corner to the existing drainage swale. The runoff then drains southerly beyond Linda Vista Drive in the drainage swale.

Figure 1-2. Google Earth Plan View Looking Northerly.

The site has an existing single-family residence located near the northern property line, but the majority of the parcel consists of natural vegetation. Access to the existing residence is provided from a private road north of the property, Linda Terrace Drive. Access to the remainder of the parcel is provided from Linda Vista Drive.

The high point of the site is located near the northeast corner of the property line. There is a potential for offsite drainage ("run-on") at the northeast corner of the site, which is the lot containing the existing residence (Parcel 4 of the proposed TPM). This area will follow the historical drainage pattern and be self-mitigating. There is no additional run-on to the area being developed (Parcels 1, 2, and 3) as the northern property line represents the high point and a "ridge" in the existing topography. The flow along this "ridge" is directly westerly and does not flow on-site. See Appendix A, Existing Hydrology Map.

1.3 Proposed Topography and Drainage Condition

The proposed drainage pattern for this site will be generally the same as the existing, historical drainage pattern, to the maximum extent practicable. The high point will continue to be located near the northeast corner of the property line and the outlet point will continue to be at the southwest corner of the property.

The proposed project will not alter the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site. Biofiltration basins will detain runoff; rip-rap will decrease erosive velocities; and brow ditches will safely convey runoff in the historical drainage pattern.

There is an existing 30" x 24" CMP culvert at the south east intersection of the private road easement and Linda Vista Drive. This culvert is upstream of the proposed development and therefore no drainage from the proposed improvements will affect this culvert.

The project will not propose housing within the 100-year flood hazard area, as mapped on federal Flood Hazard Boundary of Flood Insurance Rate Map or other flood hazard delineation map. All proposed house pads are more than 25 feet in elevation above the floodplain. The proposed project will not expose people or structures to a significant risk of loss, injury or death involving flooding as a result of the failure of a levee or dam as there are no dams or levees in the area.

The future development will not limit flow of offsite drainage. Drainage improvements, as listed above, will convey runoff through the site

This project proposes to create three new pads with cut and fill slopes (cut 8,000 C.Y., fill 8,000 C.Y., Import/Export 0 C.Y.) for the proposed single-family residences. Since the lots will be sold without constructing any residences, a preliminary rough design for the residences has been prepared showing compliant lot drainage for the future development, as shown below:

- Each pad will drain to a biofiltration basin on the south of each pad. Each proposed driveway will drain to an additional biofiltration basin. Each of the basins will outlet in the historical drainage pattern, and eventually to the existing creek along the westerly border of the site.
- The landscape and undisturbed areas will be self-mitigating and drain via sheet flow to the creek or to Linda Vista Drive, and eventually flow south and then west to exit at the southwest corner of the property toward the creek.
- The County will require small areas of road widening of Linda Vista Drive to be compliant with Private Road Standards.

The above drainage plan will provide safe conveyance runoff from the site in the historical drainage pattern. For more information, see Appendix A, Proposed Hydrology Map.

Because there is also no actual design for the impervious surface at this stage of the project, the impervious surfaces have also been projected. They range from 2,882 sq. ft. to 4,848 sq. ft. per lot. Details and calculations are included in the PDP SWQMP for this project.

2.0 Hydrology and Hydraulic Calculations

2.1 Method of Calculation

The methodology used for the hydrologic analysis for this project is the Rational Method according to the San Diego County Hydrology Manual, June 2003. The 100-year storm events are used in the calculations. A spreadsheet located in Section 2.2 will show the calculated Q(100) for the project.

No soil report has been prepared for this project. The site soil is classified as Soil Group C and D according to the Soils Map from the NRCS Websoilsurvey online tool. For purposes of this study, Soil Group D will be used for the existing and proposed soil type, since it is the most conservative. See Appendix B.

EXISTING AND PROPOSED RUNOFF COEFFICIENT FOR EACH PARCEL

The existing condition of the development area (Parcels 1, 2, and 3) is 0% impervious. Parcel 4 is fully developed. See below for impervious surface calculations which will indicate the runoff coefficient for each Parcel.

Each of the projected homes will indicate approximately 30% impervious surface on the pads (C=.52). The proposed driveway runoff was calculated at C=0.85.

UNDISTURBED AREA					
Parcel 4 (existing residence)	19,933	93,218	21%	0.47	0.47

The existing pervious condition “C”, will be based on the natural condition (C_{pre} = 0.35) of the entire parcel, which includes the residence and the natural vegetation. The proposed condition “C” value is based on “Low Density Residential” classification. Detailed “C” values will be calculated during the final engineering phase of this development when the actual development footprints are established.

For detailed calculations of the “C” value, See Appendix B, County of San Diego Hydrologic Tables and Figures, Table 3-1 and the Proposed Runoff Coefficient Spreadsheet.

2.2 Results of Hydrology Study

The 100-year flow rates are shown below indicating there will be a very slight decrease (-0.99 cfs) in flow (Q100) leaving the site as a result of the development, after the mitigation. See the Hydrology Calculation Spreadsheet on the following page. Table 3-2 is used for the initial maximum length and initial Time of Concentration. The remaining length of the subbasin is used to calculate travel time using Kirpich formula, per page 3-14 of the SDCHM.

The creation of the three pads will actually slow the runoff and create longer times of concentration, which translate to a lower overall Q for each of the pad area, which helps to mitigate the increase in impervious area. However, more than 75% of the site is left in it's natural state and much of the area is will be conditioned with restrictions on development due to the biology.

The existing and proposed development calculation are shown above. To mitigate the impervious surfaces created by the project, six biofiltration basins will be constructed for the project (two per each newly created lot) for the purposes of hydromodification and pollutant control compliance. These biofiltration basins will assist in the mitigation of the very small increase in flow generated by the development.

The majority of runoff generated by the new development will flow toward the biofiltration basin and be outlet via pipes with orifice sizes calculated to allow the runoff to flow at lower rate than occurs for the existing condition. Other pervious areas (such as landscaping) are self-mitigating. These pervious areas will allow for appropriate levels of infiltration and will then sheet flow.

In my professional opinion, the proposed project will not substantially alter the existing drainage pattern of the area. The project has been designed to maintain the historical drainage pattern, and the areas of improvements will create flatter slopes that will provide increased times of concentration. With the use of the biofiltration basin and low impact development features, there will be no increase in runoff to off-site parcels, and therefore no downstream flooding will occur due to the development this project.

Maps of the existing and proposed hydrology are provided in Appendix A.

Hydrology Calculation Spreadsheet

PRE-DEVELOPMENT CONDITION SUMMARY - 100 yr.

SYSTEM	AREA (ac.)	C	U/S ELEV. (ft.)	D/S ELEV. (ft.)	LENGTH (ft.)	SLOPE (%)	P_6 (in.)	Figure 3-2	Tc(min.) Fig. 3-4	T(i)+T(t) (min)	I (in./hr.)	Q (cfs)
BASIN A1	2.77	0.35	500.0	446.0	432	12.5	3.4	6.9	1.4	8.3	6.5	6.28
BASIN B1	2.03	0.35	539.0	459.0	596	13.4	3.4	6.9	1.9	8.8	6.2	4.43
BASIN C1	1.98	0.35	547.0	466.0	502	16.1	3.4	6.9	1.5	8.4	6.4	4.45
BASIN D1	0.48	0.47	554.0	552.0	252	0.8	3.4	10.0	2.0	12.0	5.1	1.16
BASIN D2	2.06	0.47	550.0	470.0	629	12.7	3.4	6.9	2.5	9.4	6.0	5.79
TOTAL	9.32								TOTAL OUTFALL 1			22.10

POST-DEVELOPMENT CONDITION SUMMARY - 100 yr.

SYSTEM	AREA (ac.)	C	U/S ELEV. (ft.)	D/S ELEV. (ft.)	LENGTH (ft.)	SLOPE (%)	P_6 (in.)	Figure 3-2	*Tc(min) Fig. 3-4	T(i)+T(t) (min)	I (in./hr.)	Q_{100} (cfs)	Q_{100} Mitigated	**V_{100} (cfs)
BASIN A1	0.84	0.35	516.0	458.0	560	10.4	3.4	6.9	1.9	8.8	6.2	1.82	1.82	4.22
BASIN A21	0.37	0.52	477.0	457.0	340	5.9	3.4	10.0	1.4	11.4	5.3	1.01	0.59	3.03
BASIN A22	0.12	0.85	470.5	458.0	368	3.4	3.4	6.4	1.9	8.3	6.5	0.66	0.59	3.03
BASIN A3	1.44	0.35	462.0	443.0	136	14.0	3.4	6.9	0.2	7.1	7.2	3.61	2.76	4.5
BASIN B1	0.65	0.35	539.0	461.0	590	13.2	3.4	6.9	1.9	8.8	6.2	1.42	1.42	3.83
BASIN B21	0.07	0.52	508.0	504.0	220	1.8	3.4	10.0	1.2	11.2	5.3	0.19	0.19	0.99
BASIN B22	0.32	0.85	508.0	461.0	389	12.1	3.4	6.4	1.2	7.6	6.8	1.85	0.59	3.03
BASIN B3	0.99	0.35	497.0	458.0	351	11.1	3.4	6.9	1.1	8.0	6.6	2.29	2.29	4.37
BASIN C1	0.54	0.35	548.0	470.0	632	12.3	3.4	6.9	2.1	9.0	6.2	1.16	1.16	3.59
BASIN C21	0.25	0.52	523.5	522.0	315	0.5	3.4	10.0	3.7	13.7	4.7	0.61	0.59	3.03
BASIN C22	0.25	0.85	524.0	471.0	454	11.7	3.4	6.4	1.5	7.9	6.7	1.42	0.59	3.03
BASIN C3	0.94	0.35	519.0	465.0	422	12.8	3.4	6.9	1.3	8.2	6.5	2.14	2.14	4.25
BASIN D1	0.48	0.47	554.0	552.0	252	0.8	3.4	10.0	2.0	12.0	5.1	1.16	0.59	3.03
BASIN D2	2.06	0.47	550.0	470.0	629	12.7	3.4	6.9	2.5	9.4	6.0	5.79	5.79	5.33
TOTAL	9.32								TOTAL OUTFALL 1			25.13	21.11	

*Lm has been subtracted from calc of Tc.

**All velocities are under 6 fps so no riprap is required.

PRE VS. POST SUMMARY

Node	Pre-Development Discharge (cfs)	Post-Dev. Discharge (cfs)	Post-Dev w/ Mitig.	Difference
OUTFALL 1 -100 yr.	22.10	25.13	21.11	-0.99

2.3 Summary and Conclusions

This proposed project encompasses subdividing the parcel into four lots so they may be sold separately at a future date.

This proposed development project generates an increase in Q. To provide HMP compliance for this project, the increase in Q will be mitigated by the use of biofiltration basins located near each of the proposed pads, and via biofiltration basins for each proposed driveway. All runoff generated by the impervious surface the site will flow toward this system and be outlet via an orifice calculated and designed to restrict runoff flow at a lower rate than occurs for the existing condition. At each outlet point of the biofiltration basins there will be rip-rap sized to adequately slow velocities and limit any erosion. There will also be rip-rap velocity dissipators at exit points of proposed brow ditches will mitigate any erosive velocities. See Proposed Hydrology Map in Appendix A.

Due to the creation of pads on this moderately-sloping terrain and the mitigation measures proposed by the PDP SWQMP, this proposed project will not increase the runoff, nor create or contribute run-off water which will exceed the capacity of the existing or planned storm water drainage system.

The project has been designed to maintain the historical drainage pattern and the small area of improvements will create flatter areas that will provide increased times of concentration. With the use of biofiltration basins and low-impact development features, there will be no increase in runoff to off-site parcels, and therefore no downstream flooding will occur due to the development this project.

This project will not alter the course of a stream or river or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on or offsite. The construction of biofiltration basins for hydromodification will provide mitigation and limit flow offsite. There will be no alteration of the existing course of a stream in a manner which would result in substantial erosion or siltation onsite or offsite.

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

The proposed project will not place any structures within a 100-year flood hazard area that would impede or re-direct flood flows.

APPENDICES

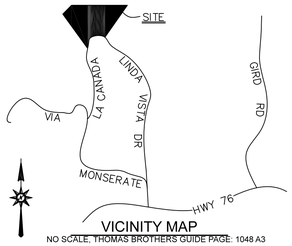
Appendix A

Existing Hydrology Map

Proposed Hydrology Map

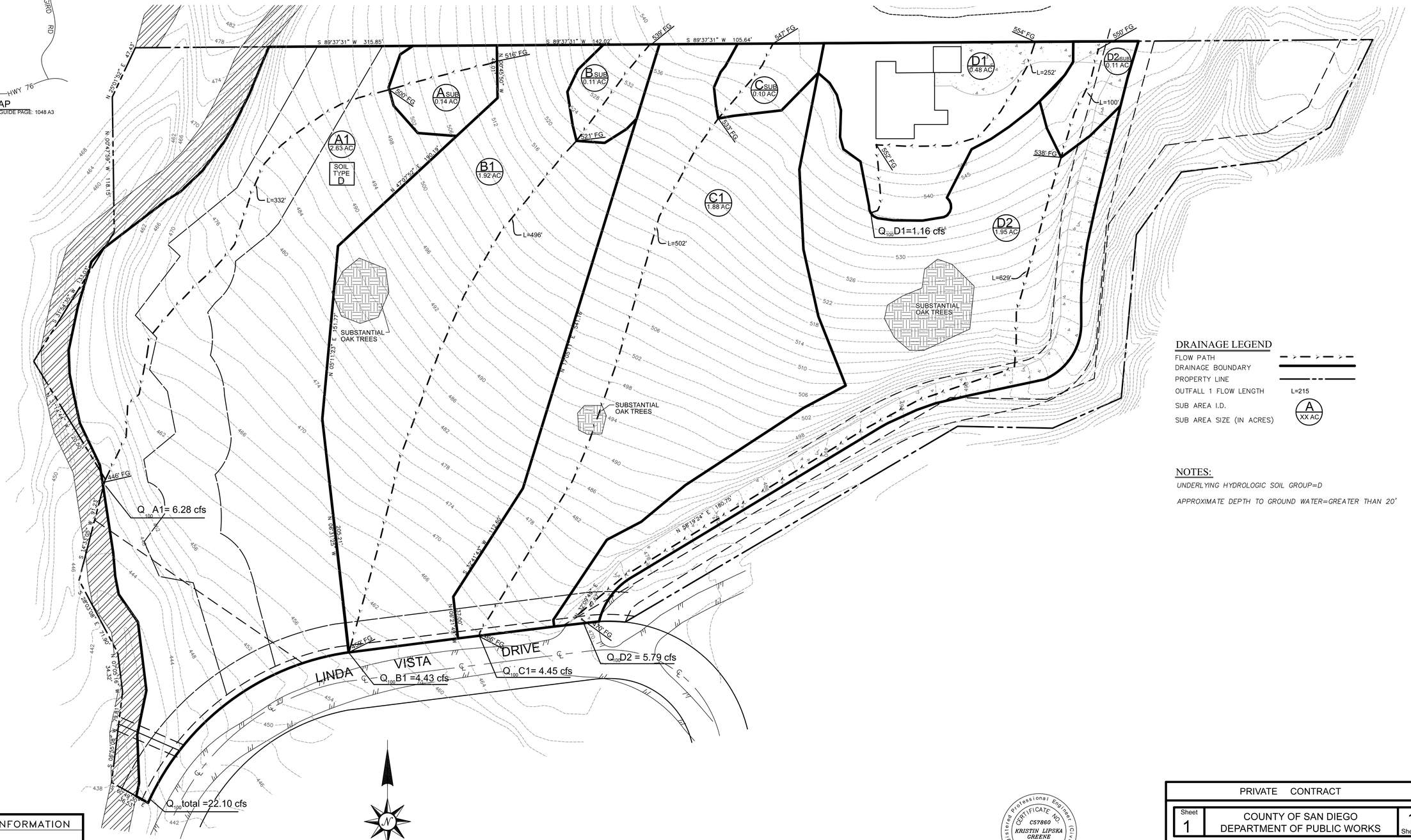
Existing Hydrology Map

EXISTING HYDROLOGY



VICINITY MAP

NO SCALE, THOMAS BROTHERS GUIDE PAGE: 1048 A3



DRAINAGE LEGEND

FLOW PATH	
DRAINAGE BOUNDARY	
PROPERTY LINE	
OUTFALL 1 FLOW LENGTH	L=215
SUB AREA I.D.	A
SUB AREA SIZE (IN ACRES)	XX AC

NOTES:

UNDERLYING HYDROLOGIC SOIL GROUP=D

APPROXIMATE DEPTH TO GROUND WATER=GREATER THAN 20'

SCALE: 1" = 40'

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(760) 525-0264

PROPERTY OWNER INFORMATION

NAME: TAD LEHMAN

ADDRESS: 1494 MEREDITH RD.
FALLBROOK, CA 92028

TELEPHONE NUMBER: XXX
(24 HOUR CONTACT NUMBER)

SITE A.P.N. NUMBER: 123-261-14

SITE ADDRESS: 3600 LINDA VISTA DR
FALLBROOK CA

JOB NO. 19-107

Registered Professional Engineer
CERTIFICATE NO.
C57860
KRISTIN LIPSKA GREENE
EXPIRES 6/30/23
CALIFORNIA
CIVIL

MAY 25, 2022

KRISTIN L. GREENE DATE

PRIVATE CONTRACT

Sheet		
1	COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC WORKS	1 Sheets

EXISTING HYDROLOGY MAP FOR:

LEHMAN TPM
3600 LINDA VISTA DRIVE

CAL. COORD. INDEX:

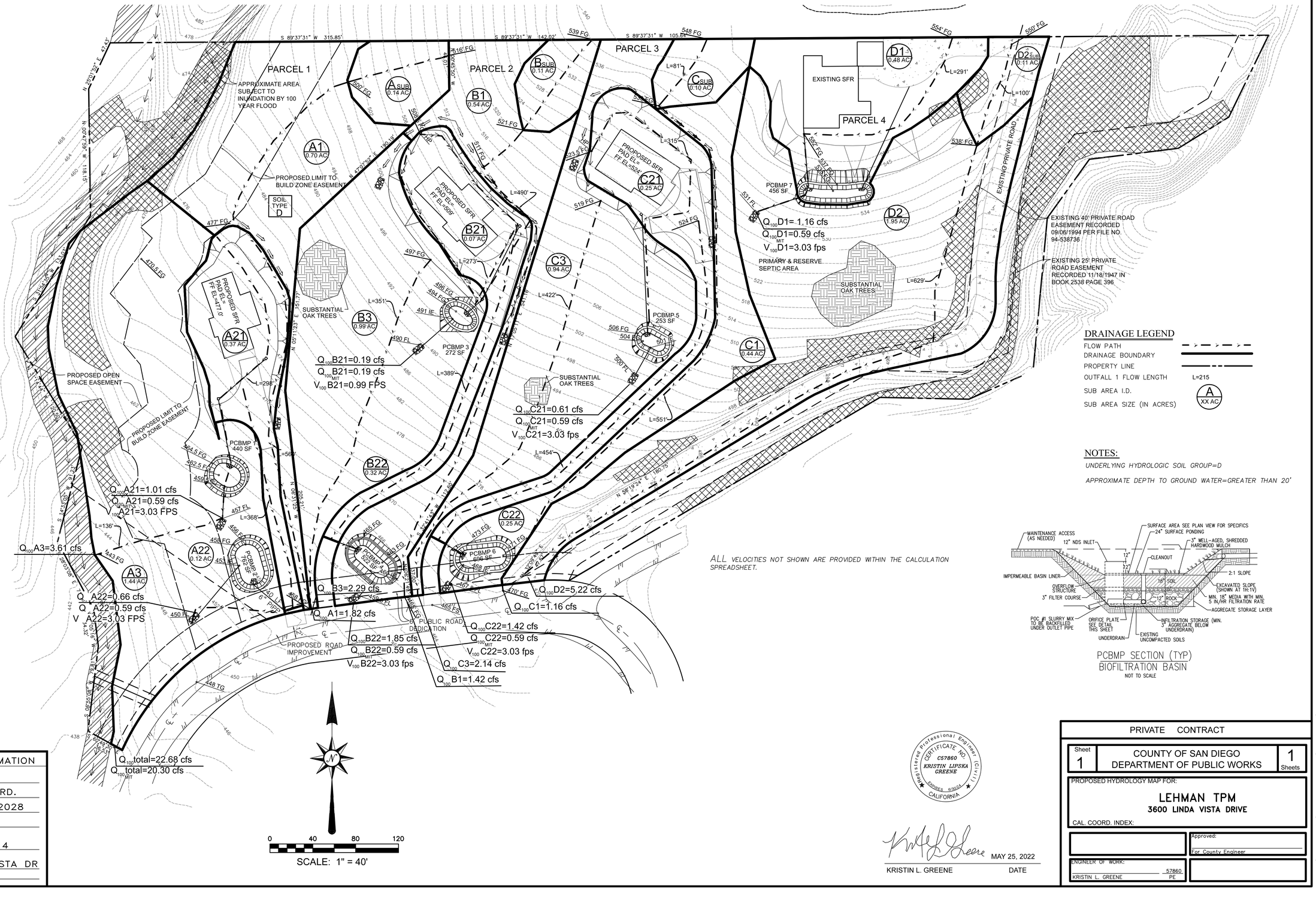
Approved:
For County Engineer

ENGINEER OF WORK:
KRISTIN L. GREENE 57860 PE

ENGINEER'S NAME: dk Greene Consulting, Inc.

Proposed Hydrology Map

PROPOSED HYDROLOGY



NOTES:

UNDERLYING HYDROLOGIC SOIL GROUP=D

APPROXIMATE DEPTH TO GROUND WATER=GREATER THAN 20'

ALL VELOCITIES NOT SHOWN ARE PROVIDED WITHIN THE CALCULATION SPREADSHEET.

PCBMP SECTION (TYP)
BIOFILTRATION BASIN
NOT TO SCALE

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Registered Professional Engineer (Civil) CERTIFICATE NO. C57860 KRISTIN LIPSKA GREENE EXPIRES 6/30/24 CALIFORNIA

KRISTIN L. GREENE MAY 25, 2022
KRISTIN L. GREENE DATE

PRIVATE CONTRACT

Sheet 1	COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC WORKS	1 Sheets

PROPOSED HYDROLOGY MAP FOR:

LEHMAN TPM
3600 LINDA VISTA DRIVE

CAL. COORD. INDEX:

Approved:
For County Engineer

ENGINEER OF WORK:
KRISTIN L. GREENE 57860 PE

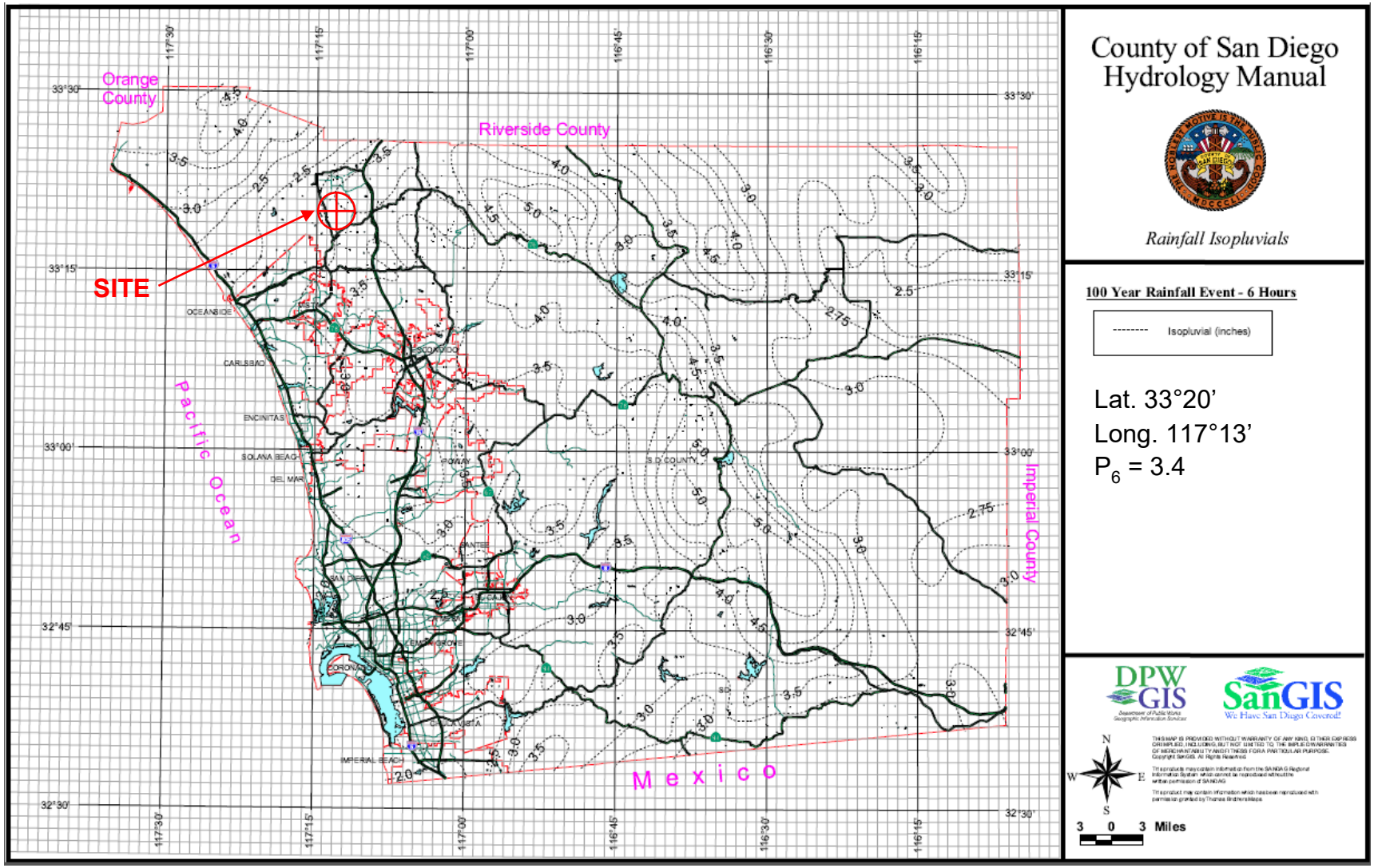
ENGINEER'S NAME: dk Greene Consulting, Inc.

Appendix B

County of San Diego Hydrologic Tables and Figures

Soils Map

County of San Diego Hydrologic Tables and Figures
100 Year Rainfall Event – 6 Hours



County of San Diego
Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

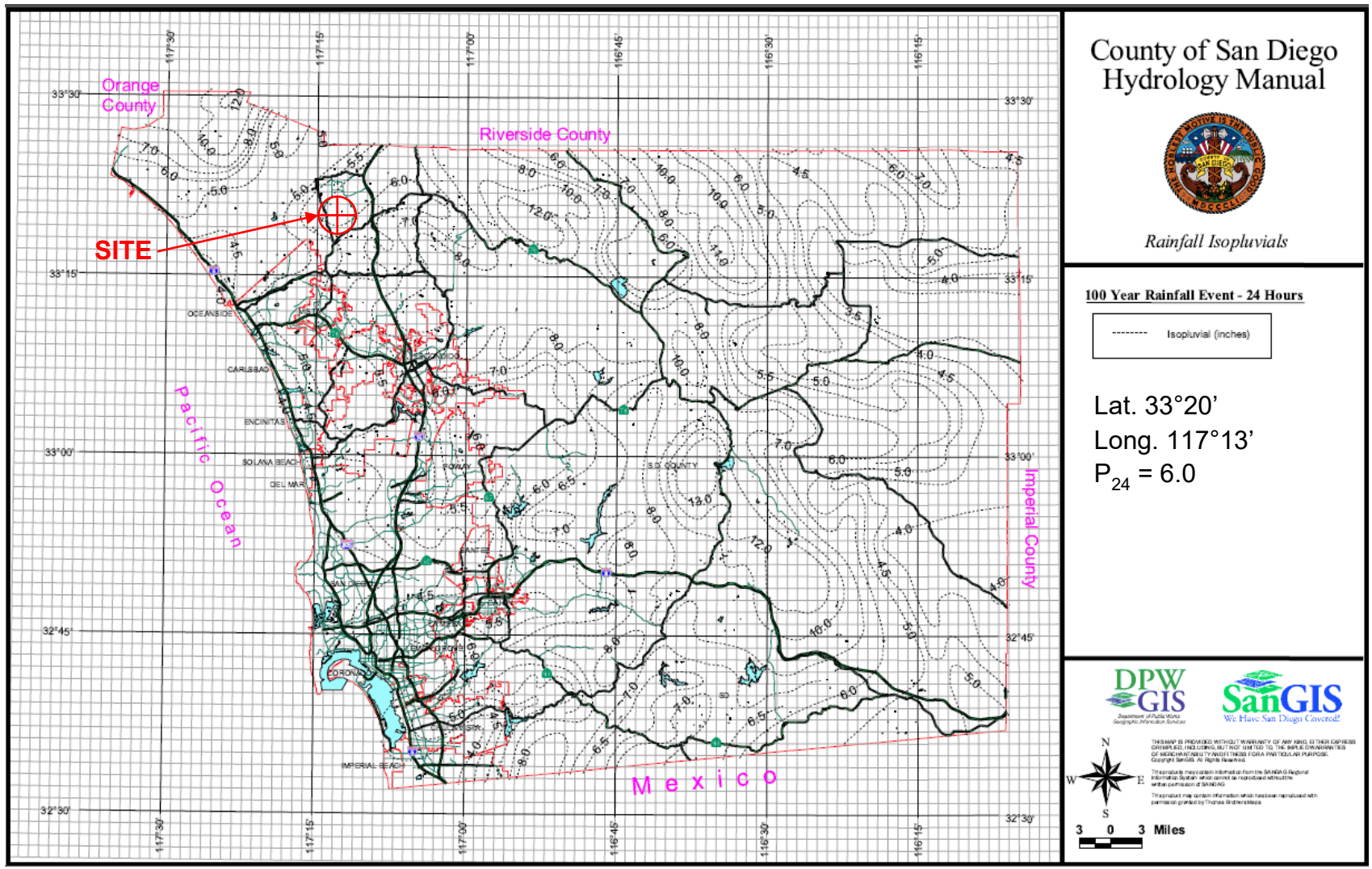
Lat. 33°20'
Long. 117°13'
P_6 = 3.4

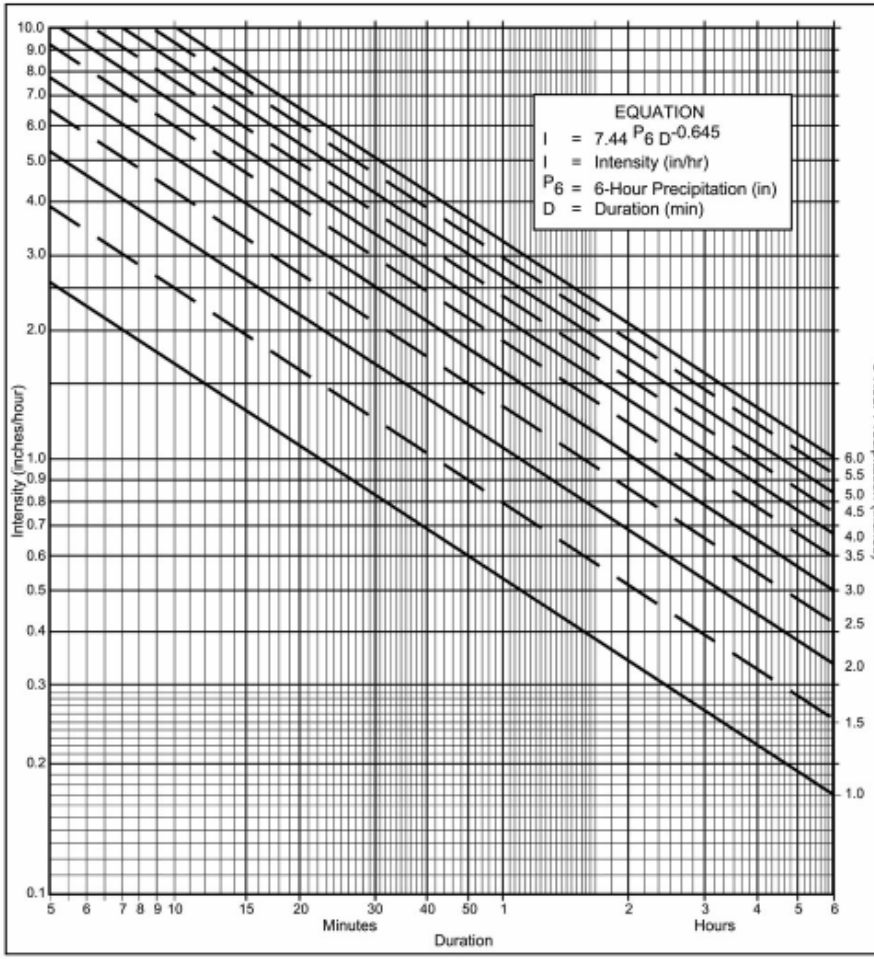
DPW GIS
SanGIS
We Have San Diego Covered!

N W E S

3 0 3 Miles

County of San Diego Hydrologic Tables and Figures
100 Year Rainfall Event – 24 Hours





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 100 year

(b) P_6 = 3.4 in., P_{24} = 6.0, $\frac{P_6}{P_{24}}$ = 57 %[2]

(c) Adjusted P_6[2] = 3.4 in.

(d) t_x = _____ min.

(e) I = _____ in./hr.

See Appendix B, Hydrology Calculation Spreadsheet

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

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	Existing
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	Proposed
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

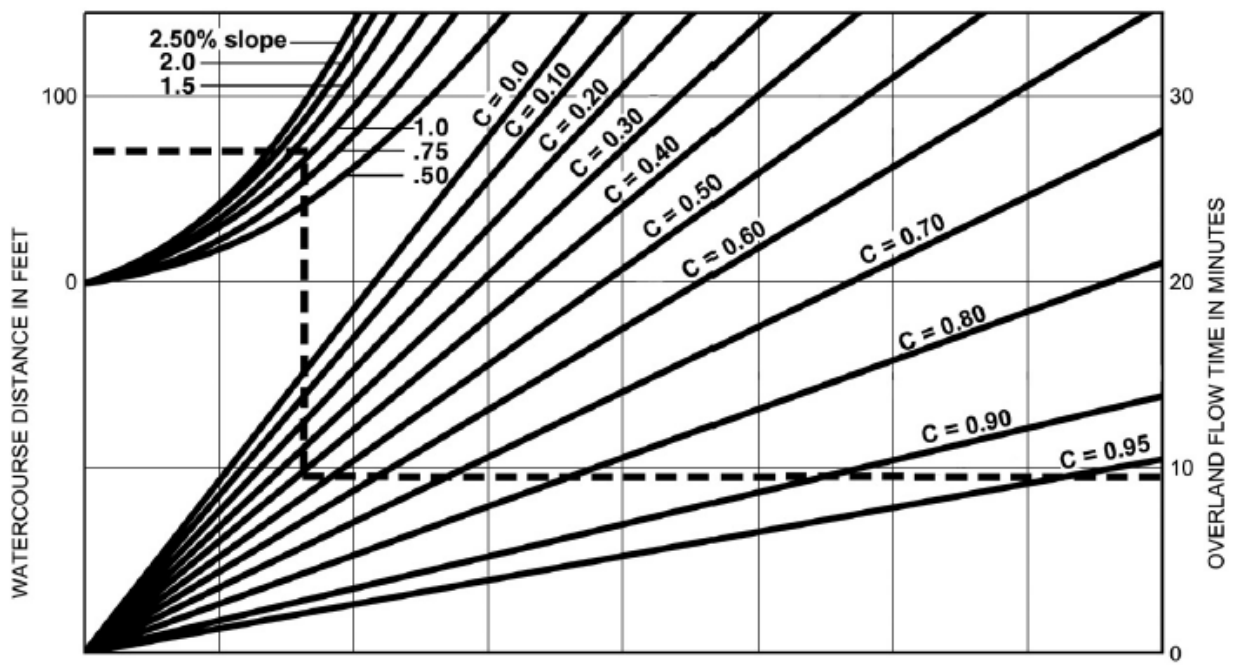
C for driveways was calculated at 0.85.

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



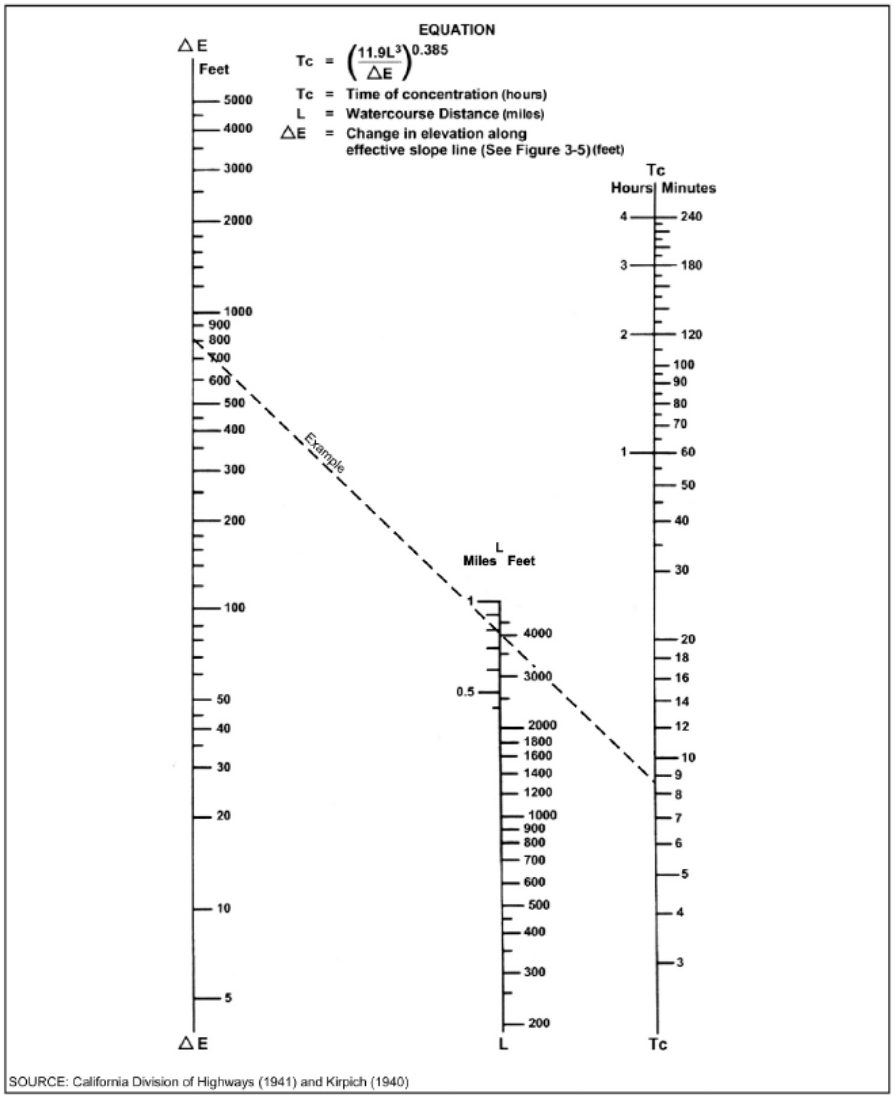
EXAMPLE:
Given: Watercourse Distance (D) = 70 Feet
Slope (s) = 1.3%
Runoff Coefficient (C) = 0.41
Overland Flow Time (T) = 9.5 Minutes

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

SOURCE: Airport Drainage, Federal Aviation Administration, 1965

FIGURE 3-3

Rational Formula - Overland Time of Flow Nomograph



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

FIGURE 3-4

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

Soils Map from NRCS Web Soil Survey

This property was determined to be Hydrologic **Soil Group C and D** per the U.S. Dept. of Agriculture Natural Resources Conservation Service (NRCS) Web Soil Survey online tool.

For the purposes of this study, **Soil Group D** will be used, as it is the most conservative.

Report — Hydrologic Soil Group and Surface Runoff

Absence of an entry indicates that the data were not estimated. The dash indicates no documented presence.

San Diego County Area, California

Map symbol and soil name	Pct. of map unit	Surface Runoff	Hydrologic Soil Group
FaE2—Fallbrook sandy loam, 15 to 30 percent slopes, eroded			
Fallbrook	85	High	C
PeC2—Placentia sandy loam, 5 to 9 percent slopes, eroded			
Placentia	85	Very high	D
StG—Steep gullied land			
Steep gullied land	85	Very high	—