HYDROLOGY & HYDRAULICS STUDY

4/25/05
(Revised 8/01/06)
(Revised 01/22/07)

FOR

CONCEPTUAL GRADING PLAN

LOCATION:
A.P.N: 127-460-14

OWNERS:

DIA DANG MEDIATION CENTER
6326 CAMINO DEL REY
BONSAL, CA 92003
Ph: (760) 945-5588

BY: SPEAR & ASSOCIATES, INC.
CIVIL ENGINEERING AND LAND SURVEYING
475 Production Street
San Marcos, CA 92078

PHONE: (760) 736-2040

REGISTERED PROFESSIONAL ENGINEER
RICHARD W. HARTLEY
No. 20934
EXP. 9-30-07
CIVIL
STATE OF CALIFORNIA

Date: 01/27/07

Richard W. Hartley, Project Engineer
RCE 20934, Expires 9/30/07

S&A, INC: J. N. 2003-190

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1.0 Project Description

This is project is located north of Camino Del Rey and 1.9± miles east of Highway 76. The site is 8.96± acres in area. The lowest elevation is located at the southwest corner and is 205 feet above sea elevation. The highest elevation is located at the northeast corner and is 410 feet above sea elevation. Therefore the site slopes from northeast to southwest. The average slope is 18%±. The property has three natural drainage courses that channel there stormwater runoff from the property and also for off-site runoff (see Attachment "A" Location Map & Drainage Area Map).

Stormwater runoff from the drainage area flows to Camino Del Rey and then west along the northerly right-of-way for Camino Del Rey 1600± feet to a 6' x 12' box culvert that passes under Camino Del Rey and from there it flows into the Moosa Canyon Creek, thence westerly to the San Luis Rey River and then on to the Pacific Ocean.

The project consists of developing 9.0± acres for a Buddhist Meditation Center for Thirty (30) monks. There will also be Sunday services from 9A.M. until 4P.M. Three new buildings are proposed, there are currently three existing buildings on the site, along with grass courts and parking areas (see Attachment "A" Project Map).

The existing Zoning is A-70 (.5du/ac or .25du/ac based on slope analysis); existing Use is Limited Agricultural or Single Family Residence.

There are no existing upstream or down stream erosion impacts caused by drainage form this site. The development of this property as shown on the grading plan will increase the amount of impervious area and thus result in an increase in runoff flow from the site. Down stream facilities will not be impacted due to the development of on-site detention basins and flow control structures that will control the run-off from the site so that the post-development run-off is equal to or less than the pre-development run-off.

All development on this site, i.e. all buildings and leach fields are out of the flood plain of Moosa Creek. See Moosa Canyon Flood Plain Map.

2. Discussion

We have used the County of San Diego Hydrology Manual (June2003) to develop the runoff flows from this site for 100 year storm event and for the 85th percentile storm event and for a storm that will produce an Intensity of I=0.02in/hr. We have provided summary sheets for each event within the body of this report Table 2.1 below, gives the summary of Post-Construction Water Quality Flow at the points of exist form the site, also the increase of flow (difference Post Development – Pre Development).

At Node P1 we propose to reduce the flow, velocity and energy by the installation of an underground detention pond using 2- 60" diameter pipes and by constructing a concrete energy dissipater per San Diego Regional Standard Drawing (D-41A). At Node N we propose to use an extended dry detention pond. Preliminary calculations for both are given in the Hydraulic and Pond Design Section. The location and design of these detention ponds may change in the final design of the project, but they will maintain the flow off the site such that the post-development flow will be equal to or less than the pre-development flow.

Also the extended dry detention pond will provide treatment for the 2 year storm event for Area "E" with a draw down time of 35 hours.

Table 1 Summary 100Year Storm Event with Detention and Water Quality Flows

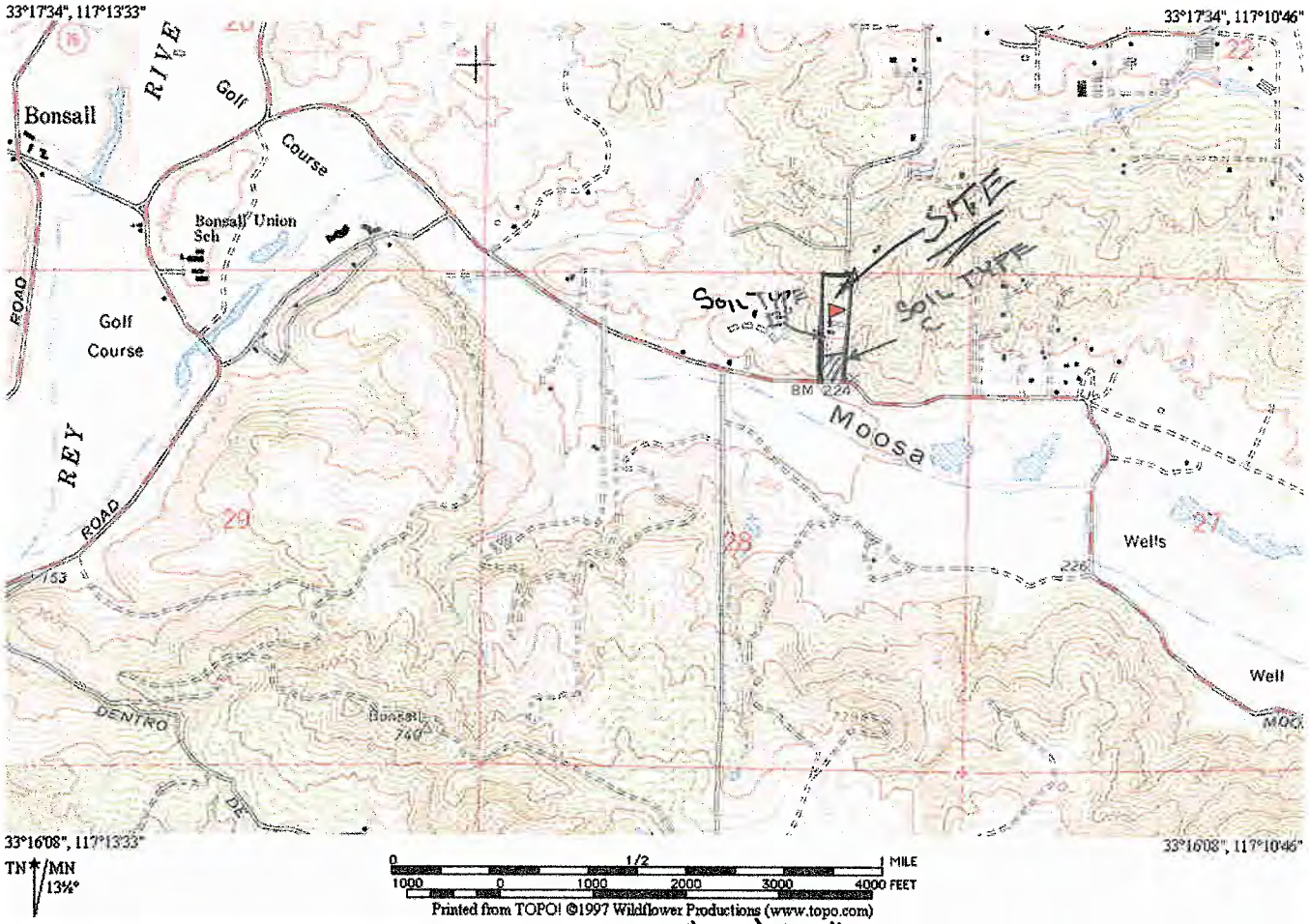
Outfall-Area	Tributary Area (acres)	Q100 (cfs)	Q100 with Detention		Qwq I=0.2in/hr	Vwq (cf) for 85%
Point "P" Post Dev.	2.77	8.65	1.69		0.3	
Point "P" Pre-D.ev	1.99	2.94	<2.94			
Increase	0.78	4.05	-1.25			
Point "M" Post-Dev.	19.4	24.22			N/A	
Point "M Pre-Dev.	19.74	23.77				
Increase	0.2	0.45				
Point "N" Post-Dev.	3.46	11.28	5.02		0.34	2805
Point "N" Pre-Dev.	3.5	9.43	<9.43			
Increase	-0.04	1.85	-4.39			

Note: The total Post-Dev. Q (M+N)=35.5cfs; Total Post-Dev Q (M+N) w/detention=30.15cfs: The Total Pre-Dev QM+N=33.2cfs; Therefore Post-Dev. Q (M+N) is 3.05cfs less.

3. CONCLUSION:

We have taken every pre-caution to design the proposed grading plan, drainage facilities and erosion control comply with the County of San Diego Grading and Erosion Control Ordinances.

The Calculations presented herein are based on standard engineering practices and the County of San Diego "Hydrology Manual (June 2003)" They indicate that the proposed grading plan and drainage facilities are adequate to handle the 100 year storm event and provide Stormwater Quality Management to the maximum extent practical.



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LAT: 33° 16' 57"
LONG: 117° 11' 47"

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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

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

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

Table 3-2

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

Element*	DU/	.5%		1%		2%		3%		5%		10%	
	Acre	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

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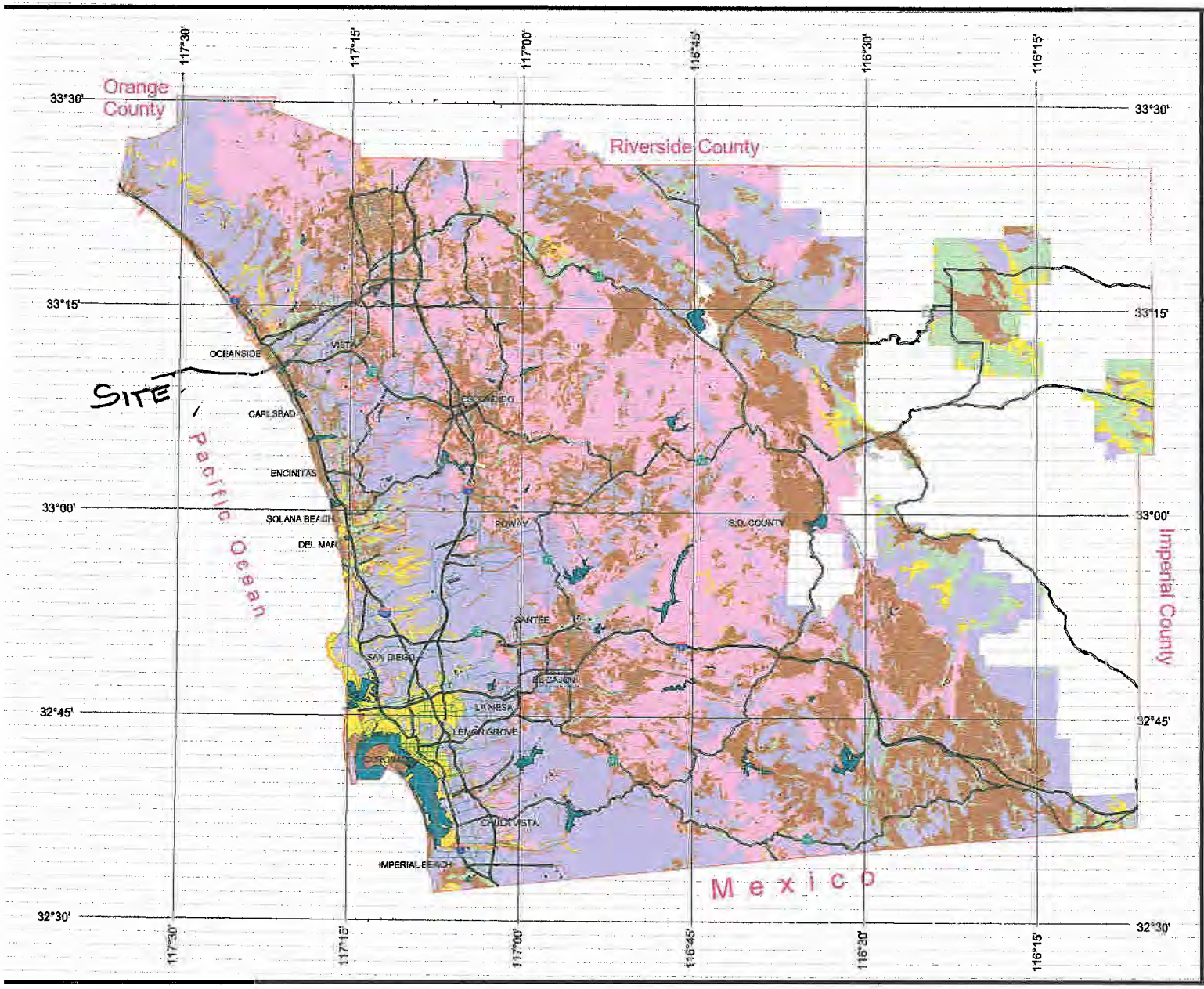

County of San Diego Hydrology Manual

Soil Hydrologic Groups

Legend

Soil Groups

- Group A
- Group B
- Group C
- Group D
- Undetermined
- Data Unavailable

DPW GIS
Department of Public Works Geographic Information Services

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N
W E
S

3 0 3 Miles

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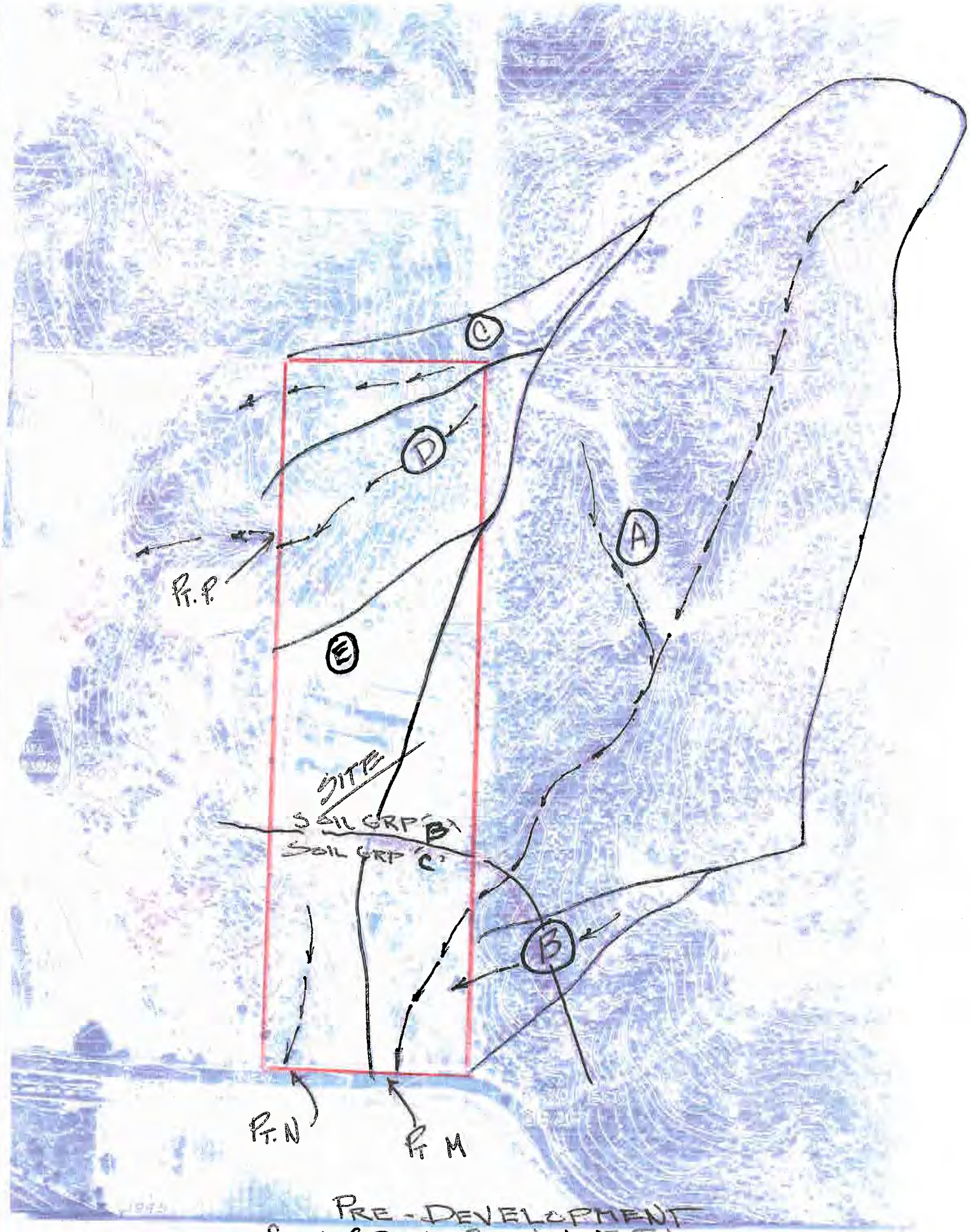
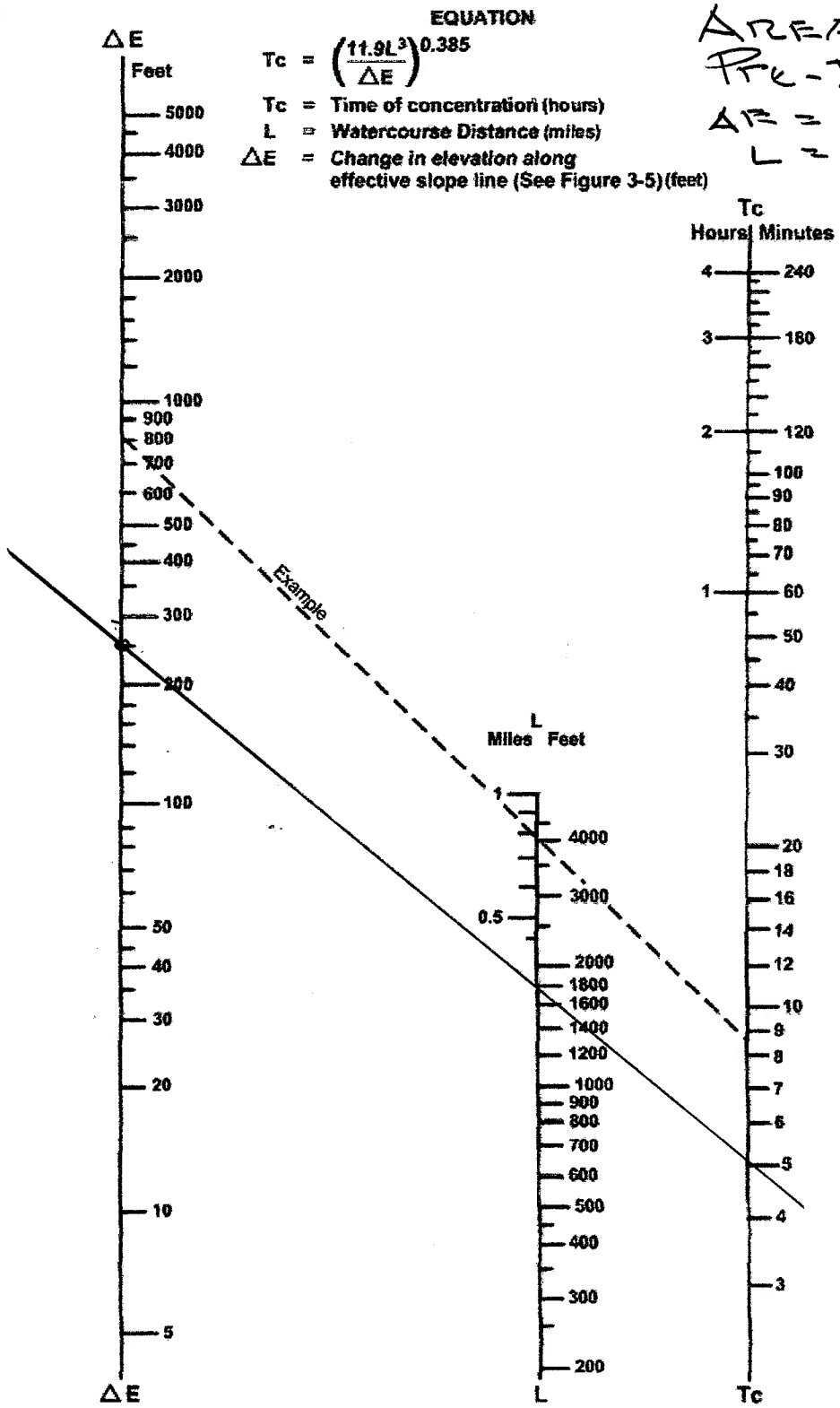


PRE-DEVELOPMENT
SOIL GROUP BREAK LINE TAKEN
FROM S.D. HYDROLOGIC SOIL GROUPS MAP #2

PRE-DEV.

AREA A
PRE-DEV.
ΔE = 250'
L = 1800'



USE 5 MIN
+ 7
12 MIN

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

9

OFF-SITE-PRE-DEV.

AREA B
PRE-DEV
ΔE = 120
L = 420

EQUATION

$$T_c = \left(\frac{11.9L^3}{\Delta E}\right)^{0.385}$$

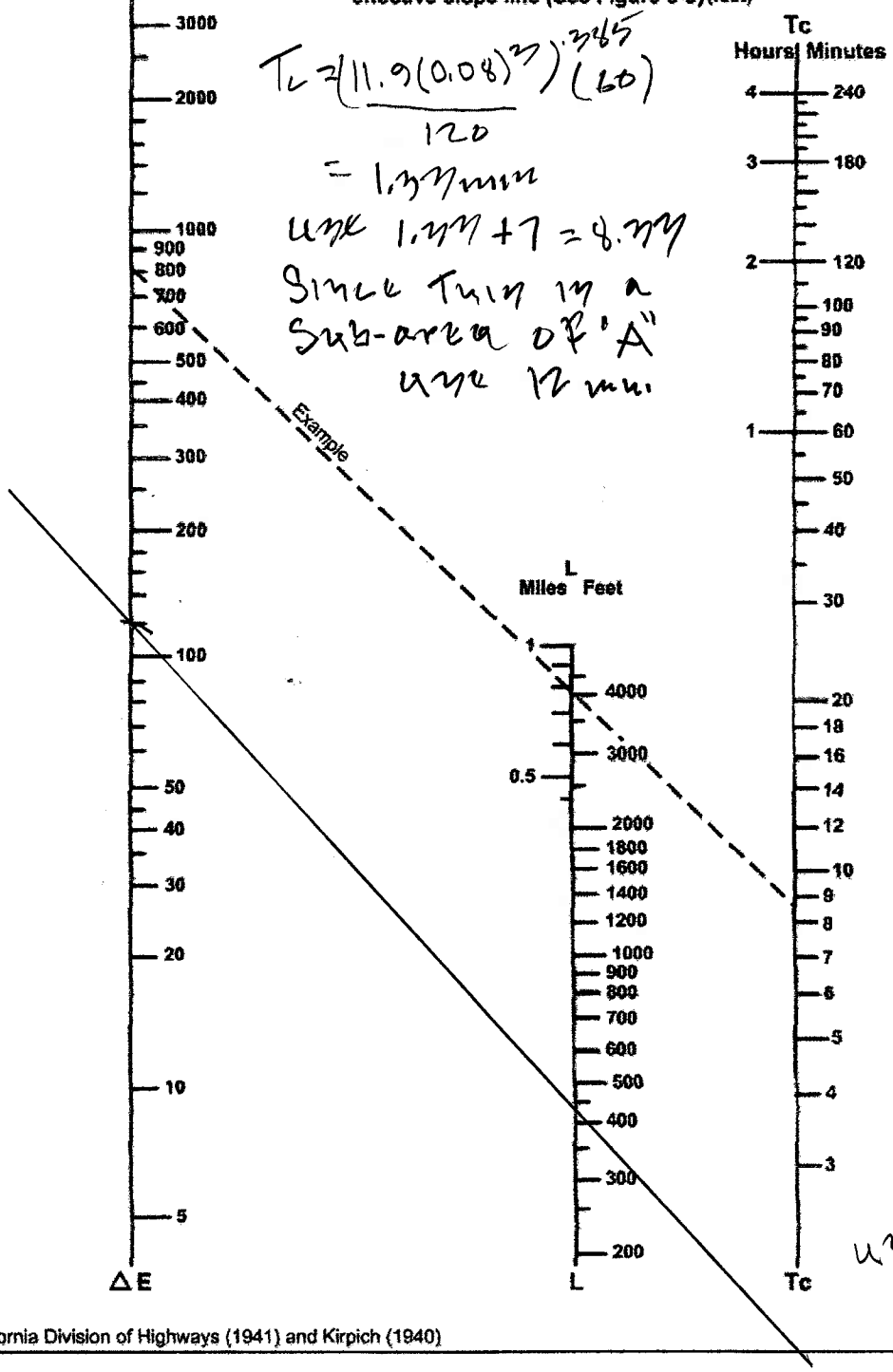
Tc = Time of concentration (hours)
L = Watercourse Distance (miles)
ΔE = Change in elevation along effective slope line (See Figure 3-5) (feet)

$$T_c = \left(\frac{11.9(0.08)^3}{120}\right)^{.385}(60)$$

= 1.37 min

use 1.37 + 7 = 8.37

Since this is a sub-area of "A" use 12 min.



use 2 min.
+ 7
9 min

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

10

PRE-DEV.

AREA C

ΔE = 132

L = 700

EQUATION

$$T_c = \left(\frac{11.9L^3}{\Delta E}\right)^{0.385}$$

T_c = Time of concentration (hours)

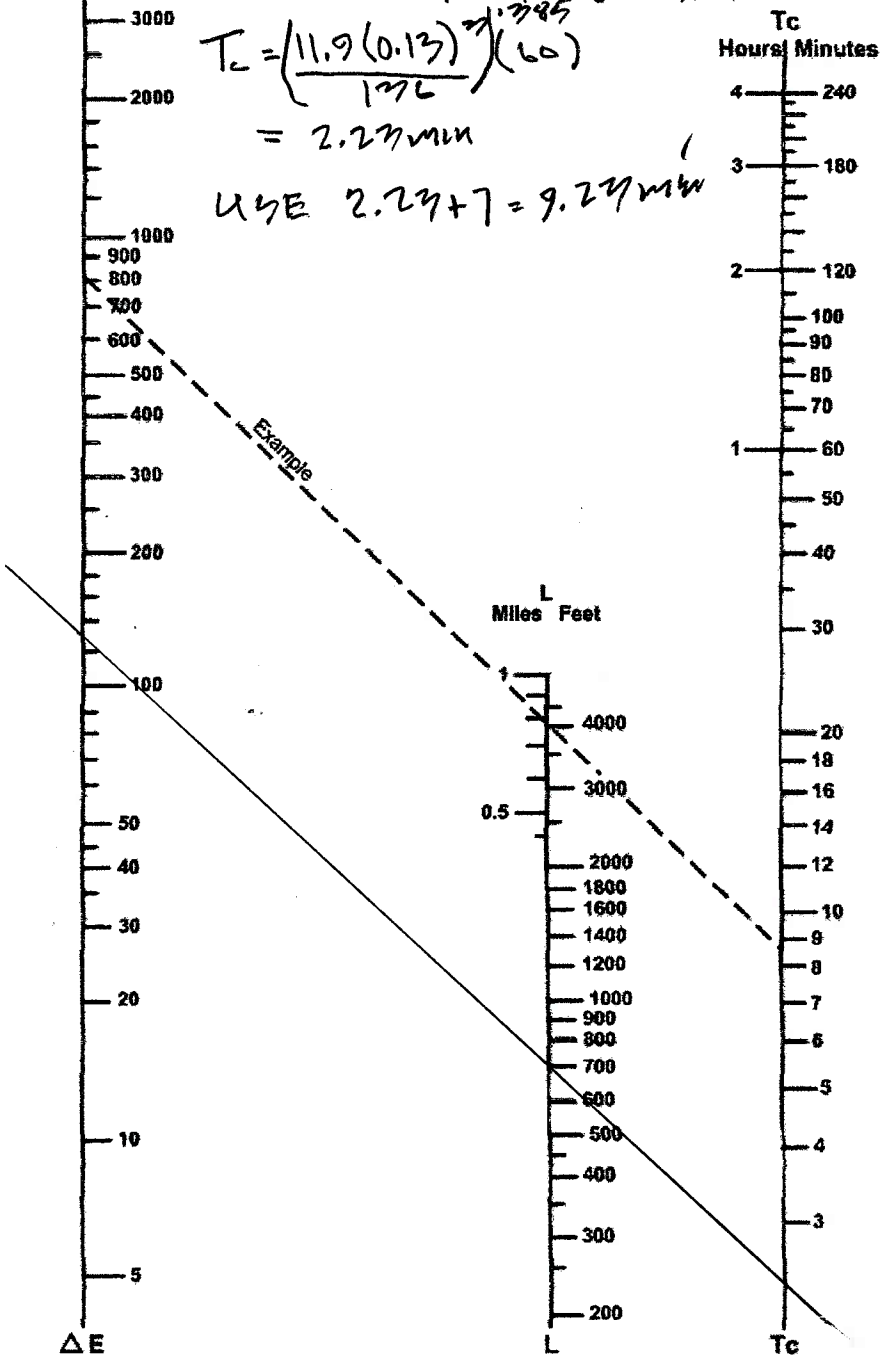
L = Watercourse Distance (miles)

ΔE = Change in elevation along effective slope line (See Figure 3-5) (feet)

$$T_c = \left(\frac{11.9(0.13)^3}{132}\right)^{0.385}(60)$$

= 2.23 min

USE 2.23 + 7 = 9.23 min



USE 2.23 min
+ 7
9.23

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

111

Area "D"
Pre - DEV
ΔE = 125
L = 520

EQUATION

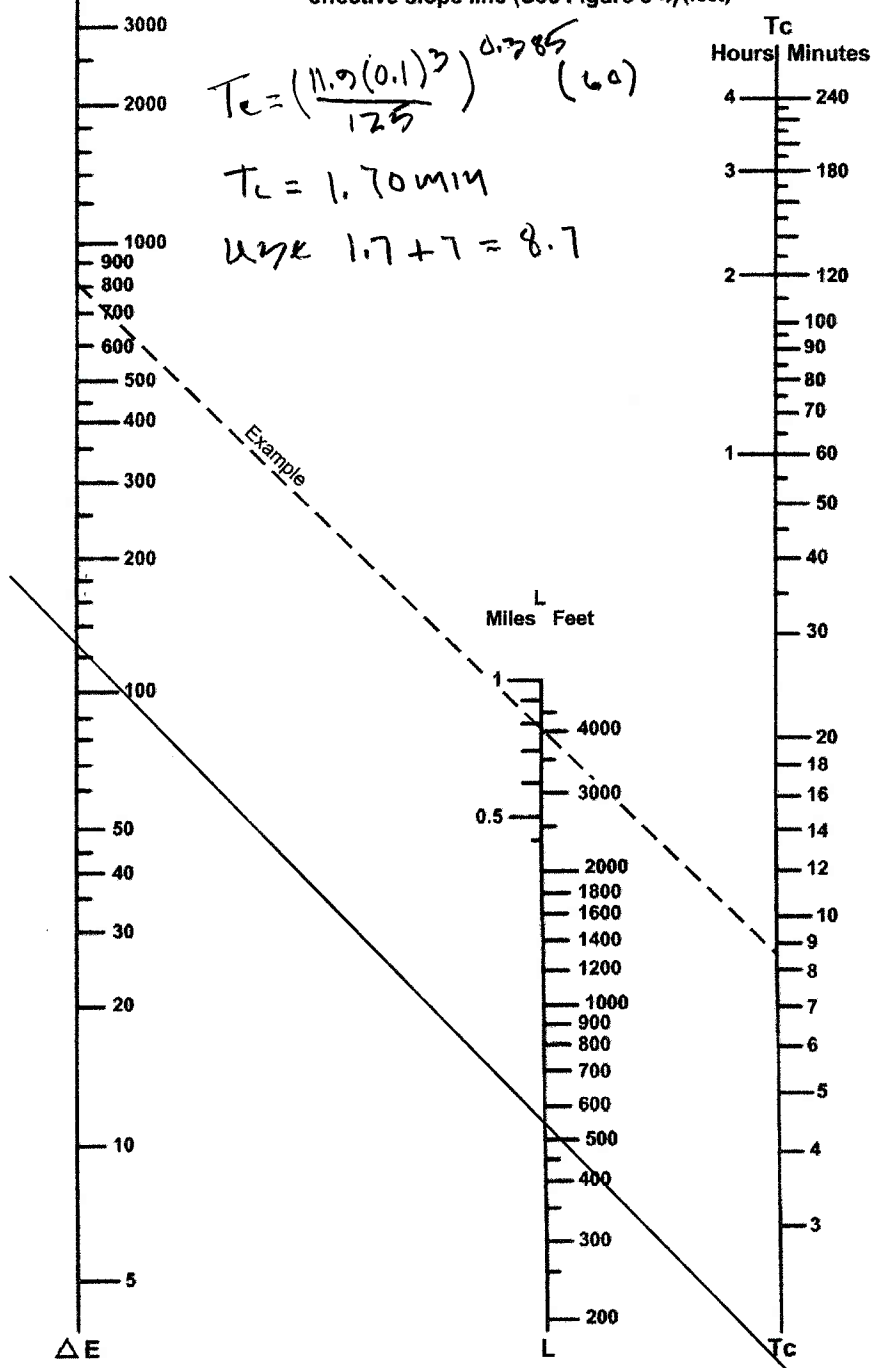
$$T_c = \left(\frac{11.9L^3}{\Delta E}\right)^{0.385}$$

T_c = Time of concentration (hours)
L = Watercourse Distance (miles)
ΔE = Change in elevation along effective slope line (See Figure 3-4) (feet)

$$T_c = \left(\frac{11.9(0.1)^3}{125}\right)^{0.385} (60)$$

T_c = 1.70 min

use 1.7 + 7 = 8.7



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

FIGURE 3-3

Nomograph for Determination of Time of Concentration (Tc) for Natural Watersheds

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JOB NO. 03-190
CLIENT/JOB NAME DAI - DANG
DATE 12/18/03
CREW CHIEF TRUNT
CREW

T_1 Calculations

Area D_1

$H = 5.5$; $L = 40$ $S = 13.75$

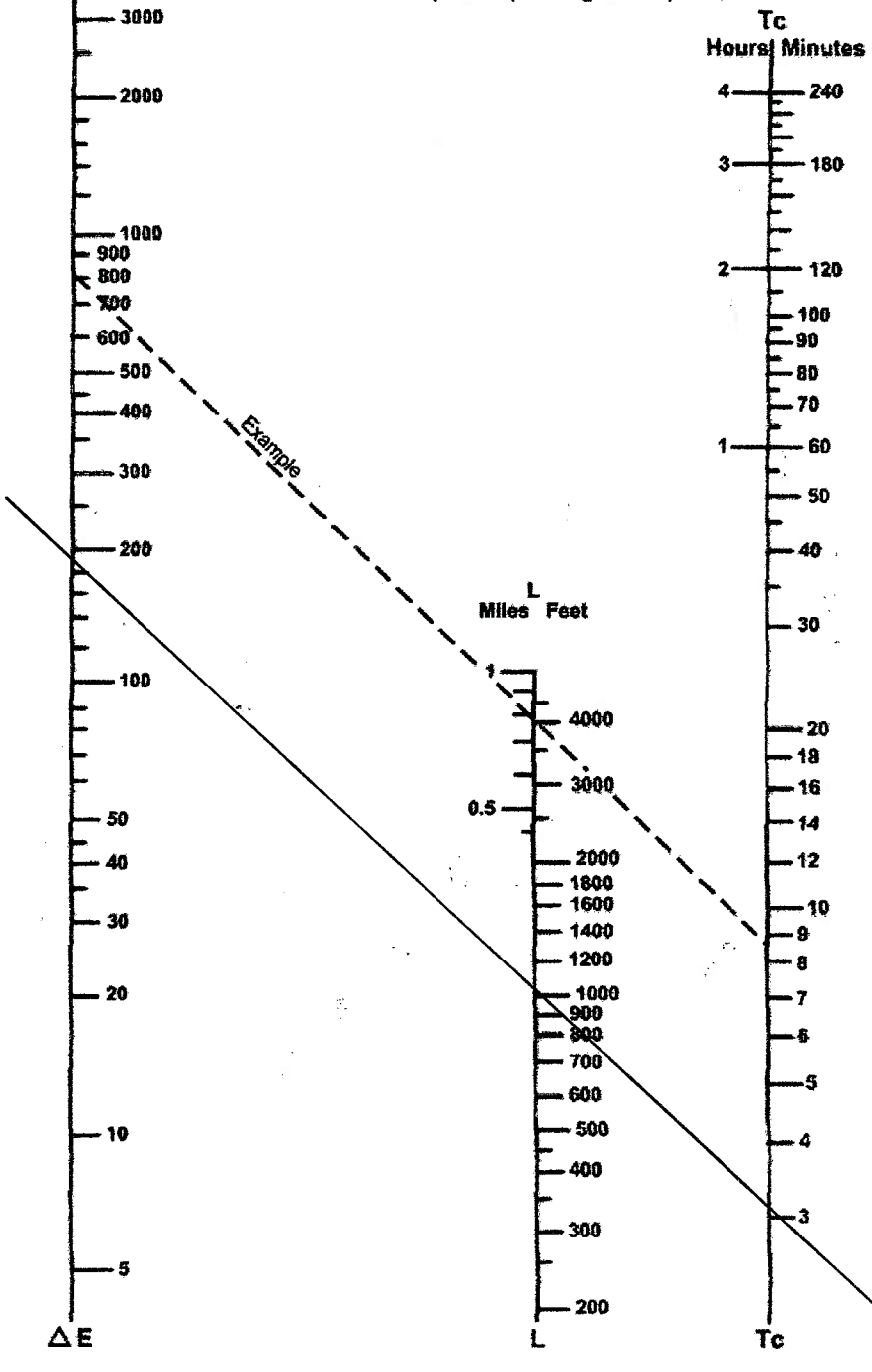
$T_1 = 1.8(1.1 - .95)\sqrt{80} / 3\sqrt{10} = 5.2$ min

AREA E
Pre Dev
ΔE = 194
L = 1000

EQUATION

$$Tc = \left(\frac{11.9L^3}{\Delta E}\right)^{0.385}$$

Tc = Time of concentration (hours)
L = Watercourse Distance (miles)
ΔE = Change in elevation along effective slope line (See Figure 3-5) (feet)



use 7 min
+7
10 min

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

100 YEAR STORM EVENT

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PROJECT No: 03-190
DATE:12/12/03 (Revised 01/22/07
BY: R.W.HARTLEY

TABLE 1-A

Summary 100 Year Storm Event

HYDROLOGY CALCULATIONS

(P6=3.2)

NO	AREA ACRES	ΔE (Ft) or Slope %	L (Ft.)	Tc (Min.)	I (In./Hr.)	C	Q_{100} C.F.S.	DIFF. C.F.S.
		POST DEVELOPMENT						
D1	0.16	see Calculation sheet		6.9	6.85	0.25	0.19	
D2	0.17			7.99	6.23	0.95	1.01	
D3	0.13			8.35	6.05	0.58	0.46	
D4	0.45			8.35	6.05	0.25	0.68	
D5	1.91			9.18	5.7	0.58	6.31	
Total	2.77						8.65	
E1	0.57	see Calculation sheet		5	8.43	0.58	2.79	
E2	0.48			5.71	7.74	0.58	2.15	
E3	0.71	"		6.04	7.46	0.58	3.07	
E4	0.91	"		11.09	5.04	0.48	2.2	
F	0.71	"		11.09	5.04	0.3	1.07	
Total E + F	3.46						11.28	
A	19.2	250	1800	12	4.79	0.25	22.99	
B	0.92	120	420	12	4.79	0.28	1.23	
C	1.04	136	700	9.25	5.67	0.25	1.47	
E+F	3.46						11.28	
Total Post-development offsite+Total Site							45.62	
		PRE DEVELOPMENT						
A	18.82	250	1800	12	4.79	0.25	22.54	
B	0.92	120	420	12	4.79	0.28	1.23	
Total A + B								
C	1.65	136	700	9.25	5.67	0.25	2.34	
D	1.99	125	520	8.7	5.9	0.25	2.93	
E	3.5	194	1000	10	5.39	0.5	9.43	
Total Site + Offsite Pre-Development run-off							38.47	7.15

Lat: 33°17'04" Long: 117°11'47"

$I=7.44(P_6)(T_c)^{-0.645}$

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Sheet No.: 1of 2
Calculated By: RWH Date: 7/31/06 (Revised 01/22/07
J.N. 03-190

HYDROLOGY CALCULATION
RATIONAL METHOD

STORM FREQUENCY: 100 year
P6=3.2

Soil Classification Group = "B" & "C"
Zone: Residential/Agr.
Runoff Coefficient for Soil Grp. B & C; C=0.25 & 0.3 Pre-Dev.
Post-Dev. C=0.58 & 0.60

PROJECT: Dia Dang Meditation Center

Post-Development

Drainage Area Loc. No.	Soil Group & Development Type	Area (Acres)	I (in/hr)	"C"	ΔQ (c.f.s.)	ΣQ (c.f.s.)	Section	Slope % or ΔE (ft)	"V" (fps)	"L" (Ft)	"T" (Min)	ΣTC	Remarks
						0		10%+		100	6.9		I=7.44(P6)(Tc)-0.645
D1	"B" -43du/ac	0.11	6.85	0.25	0.19							6.9	Natural Slope
						0.19	Curb & Gutter	18.00%	4.56	300	1.09		
D2	"	0.17	6.23	0.95	1.01							7.99	"
						1.2	PCC Swale	5.00%	3.75	80	0.36		
D3	"	0.13	6.05	0.58	0.46							8.35	
						1.66	Sheet Flow	20.00%		220			
D4	"	0.45	6.05	0.25	0.68							8.35	Use same Tc
						2.34	Curb & Gutter	5.00%	5.3	265	0.83		
D5	"	1.91	5.7	0.58	6.31							9.18	
Total Area "D"		2.77				8.65							
						0		2.00%		75	5		
E1	"B" - 43du/ac	0.57	8.43	0.58	2.79							5	use 5 minutes as minimum
						2.79	PCC Swale	0.50%	4.64	200	0.71		
E2	"	0.48	7.74	0.58	2.15							5.71	
						4.94	PCC D/W	15.50%	8.18	160	0.33		
E3	"	0.71	7.46	0.58	3.07							6.04	
						8.01	Grass Swale	20.00%	1.65	500	5.05		
E4	"	0.91	5.04	0.48	2.20							11.09	
		2.75				10.21	Sheet Flow						
F	"C" Natural	0.71	5.04	0.3	1.07							11.09	
Total Areas E + F		3.46				11.28							
							Sheet Flow	250'		1800	12		
A	"B" Natural	19.2	4.79	0.25	22.99							12	
						22.99	Sheet Flow						
B	"B" Natural	0.92	4.79	0.28	1.23							12	use same Tc as "A"
						24.22		136'		700	9.25		
C	"B" Natural	1.04	5.67	0.25	1.47							9.25	
						1.47							
Total Post-Dev. Total Site						45.62							

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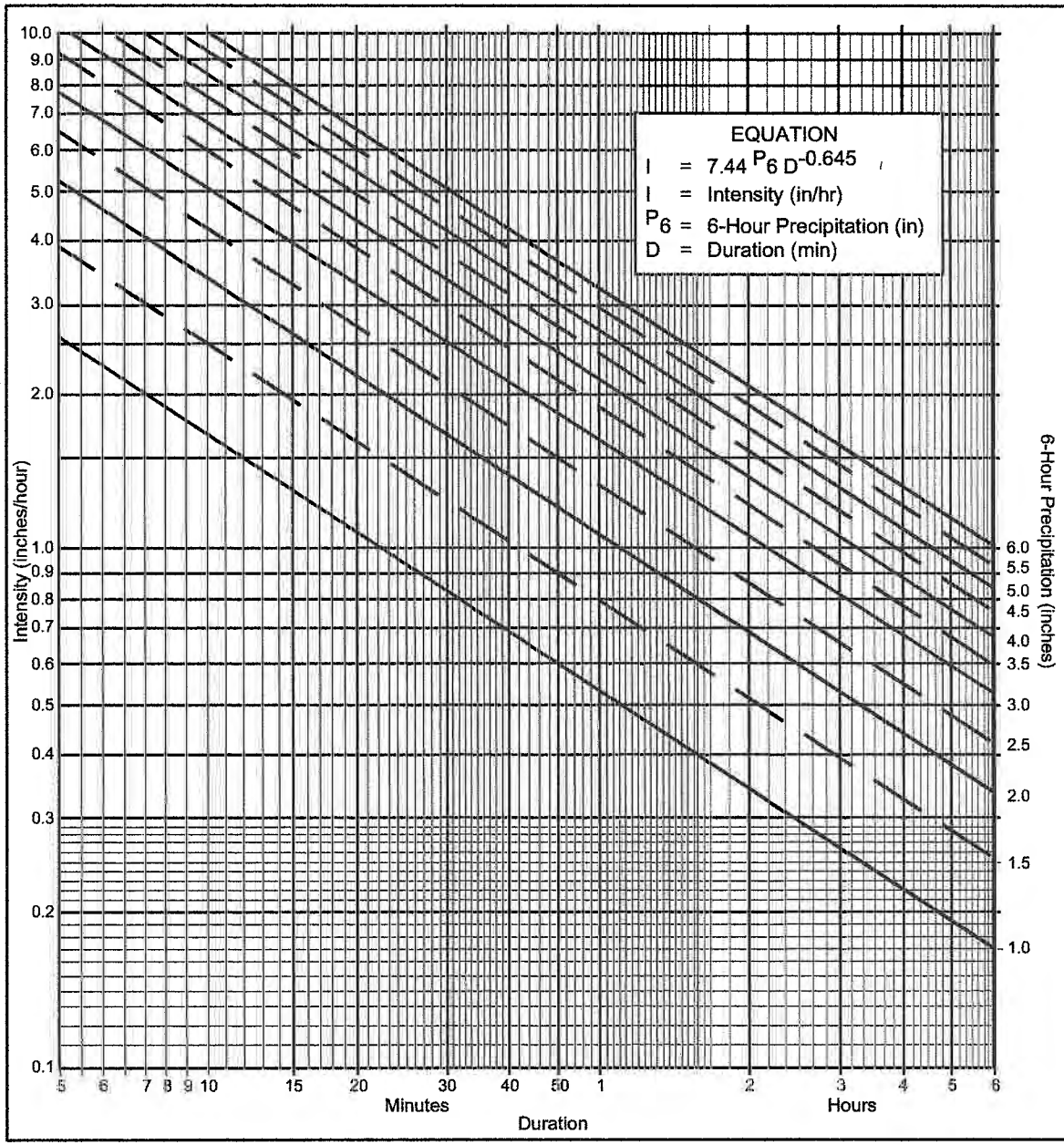
JOB NO. 03-190
CLIENT/JOB NAME
DATE 12/18/03
CREW CHIEF
CREW RWT

E4) Adjusted C values POST-DEVELOPMENT

Imperv. Area = 0.31

% Imprv = 0.27/.91 = 0.3

C = 0.9(.3) + .3(1-0.3) = 0.48



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 = 3.2 in., P_{24} = 5.5 = 58.2%(2)

(c) Adjusted $P_6^{(2)}$ = 3.2 in.

(d) t_x = _____ min.

(e) I = _____ 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

19.

Intensity-Duration Design Chart - Template

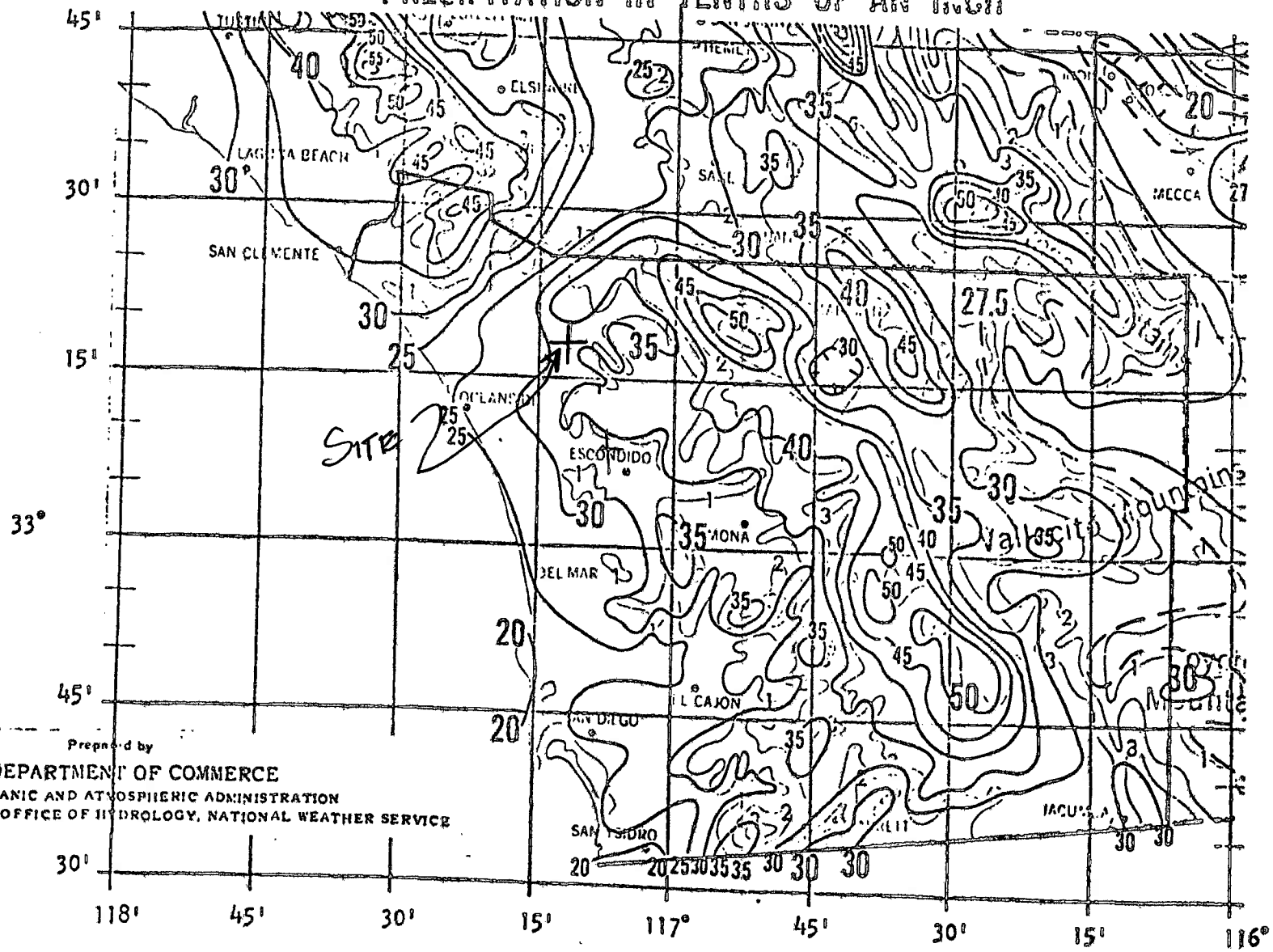
FIGURE

3-1

COUNTY OF SAN DIEGO
DEPARTMENT OF SANITATION &
FLOOD CONTROL

100-YEAR 6-HOUR PRECIPITATION

20 ISOPLUVIALS OF 100-YEAR 6-HOUR PRECIPITATION IN TENTHS OF AN INCH

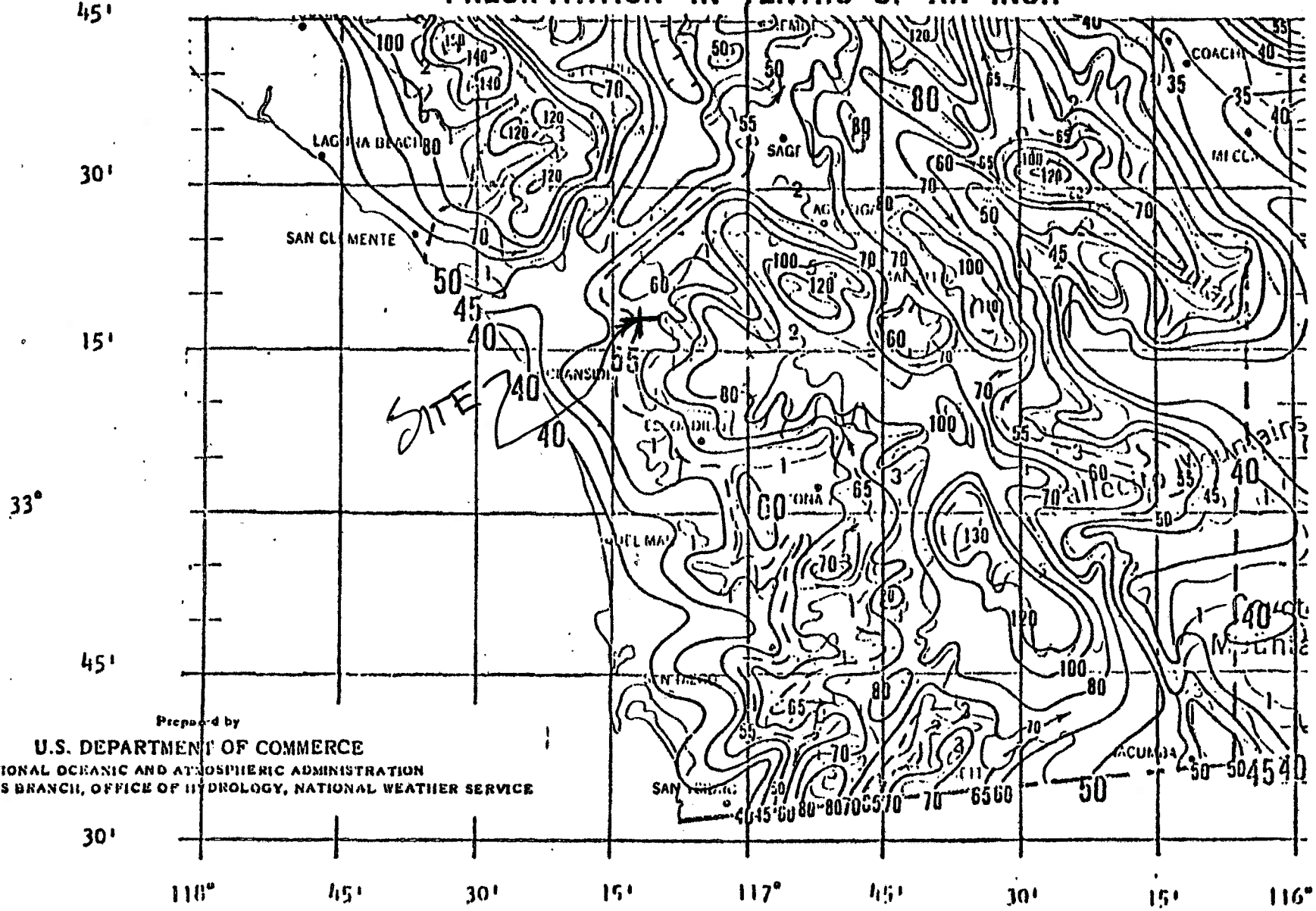


Prepared by
U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
SPECIAL STUDIES BRANCH, OFFICE OF HYDROLOGY, NATIONAL WEATHER SERVICE

COUNTY OF SAN DIEGO
DEPARTMENT OF SANITATION &
FLOOD CONTROL

100-YEAR 24-HOUR PRECIPITATION

20 ISOPLUVIALS OF 100-YEAR 24-HOUR PRECIPITATION IN TENTHS OF AN INCH



Prepared by
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SPECIAL STUDIES BRANCH, OFFICE OF HYDROLOGY, NATIONAL WEATHER SERVICE

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Rating Tables for Typical Channel Sections

Cross Section for Curb & Gutter:S=18%

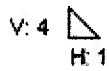
Project Description

Solve For	Spread

Input Data

Channel Slope	0.18000	ft/ft
Discharge	2.00	ft^3/s
Gutter Width	2.00	ft
Gutter Cross Slope	0.03	ft/ft
Road Cross Slope	0.02	ft/ft
Spread	4.88	ft
Roughness Coefficient	0.014	

Cross Section Image



Rating Table for Curb & Gutter:S=18%

Project Description

Solve For	Spread

Input Data

Channel Slope	0.18000	ft/ft
Discharge	2.00	ft³/s
Gutter Width	2.00	ft
Gutter Cross Slope	0.03	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	

Discharge (ft³/s)	Spread (ft)	Velocity (ft/s)
0.00		
0.10	1.31	3.88
0.20	1.70	4.62
0.30	1.98	5.11
0.40	2.30	5.48
0.50	2.59	5.75
0.60	2.83	5.98
0.70	3.05	6.18
0.80	3.25	6.36
0.90	3.44	6.52
1.00	3.61	6.67
1.10	3.76	6.81
1.20	3.91	6.93
1.30	4.05	7.06
1.40	4.19	7.17
1.50	4.31	7.28
1.60	4.44	7.38
1.70	4.55	7.48
1.80	4.66	7.58
1.90	4.77	7.67
2.00	4.88	7.76

Cross Section for Curb & Gutter: S=5.00%

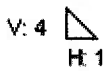
Project Description

Solve For	Spread

Input Data

Channel Slope	0.05000	ft/ft
Discharge	2.50	ft³/s
Gutter Width	2.00	ft
Gutter Cross Slope	0.03	ft/ft
Road Cross Slope	0.02	ft/ft
Spread	6.94	ft
Roughness Coefficient	0.014	

Cross Section Image



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Rating Table for Curb & Gutter: S=5.00%

Project Description

Solve For	Spread

Input Data

Channel Slope	0.05000	ft/ft
Discharge	2.50	ft³/s
Gutter Width	2.00	ft
Gutter Cross Slope	0.03	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	

Discharge (ft³/s)	Spread (ft)	Velocity (ft/s)
0.00		
0.10	1.67	2.40
0.20	2.24	2.85
0.30	2.76	3.12
0.40	3.17	3.31
0.50	3.52	3.48
0.60	3.82	3.61
0.70	4.09	3.74
0.80	4.34	3.85
0.90	4.56	3.95
1.00	4.77	4.04
1.10	4.96	4.13
1.20	5.15	4.21
1.30	5.32	4.29
1.40	5.49	4.36
1.50	5.65	4.43
1.60	5.80	4.49
1.70	5.94	4.56
1.80	6.08	4.62
1.90	6.22	4.67
2.00	6.35	4.73
2.10	6.47	4.78
2.20	6.59	4.84
2.30	6.71	4.89

Rating Table for Curb & Gutter: S=5.00%

Input Data

Discharge (ft^3/s)	Spread (ft)	Velocity (ft/s)
2.40	6.83	4.94
2.50	6.94	4.98

Cross Section for PCC D/W Swale:S =15.5%

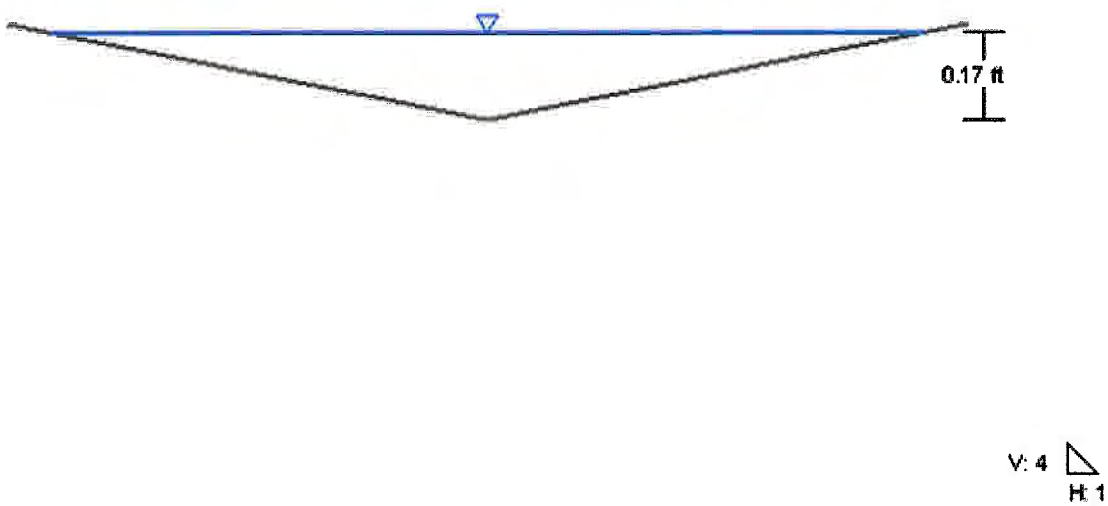
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.014	
Channel Slope	0.15500	ft/ft
Normal Depth	0.17	ft
Left Side Slope	20.00	ft/ft (H:V)
Right Side Slope	20.00	ft/ft (H:V)
Discharge	5.00	ft^3/s

Cross Section Image



Rating Table for PCC D/W Swale:S =15.5%

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.014	
Channel Slope	0.15500	ft/ft
Left Side Slope	20.00	ft/ft (H:V)
Right Side Slope	20.00	ft/ft (H:V)
Discharge	5.00	ft³/s

Discharge (ft³/s)	Normal Depth (ft)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.00					
0.10	0.04	3.13	0.03	1.60	1.60
0.20	0.05	3.67	0.05	2.09	2.09
0.30	0.06	4.07	0.07	2.43	2.43
0.40	0.07	4.38	0.09	2.71	2.70
0.50	0.07	4.63	0.11	2.94	2.94
0.60	0.08	4.84	0.12	3.15	3.15
0.70	0.08	5.02	0.14	3.34	3.34
0.80	0.09	5.19	0.15	3.51	3.51
0.90	0.09	5.32	0.17	3.68	3.68
1.00	0.10	5.50	0.18	3.82	3.81
1.10	0.10	5.63	0.20	3.96	3.96
1.20	0.10	5.75	0.21	4.09	4.09
1.30	0.11	5.86	0.22	4.22	4.21
1.40	0.11	5.97	0.23	4.34	4.33
1.50	0.11	6.07	0.25	4.45	4.45
1.60	0.11	6.16	0.26	4.56	4.56
1.70	0.12	6.25	0.27	4.67	4.66
1.80	0.12	6.34	0.28	4.77	4.77
1.90	0.12	6.43	0.30	4.87	4.86
2.00	0.12	6.51	0.31	4.96	4.96
2.10	0.13	6.59	0.32	5.06	5.05
2.20	0.13	6.67	0.33	5.14	5.14
2.30	0.13	6.76	0.34	5.22	5.22

Rating Table for PCC D/W Swale:S =15.5%

Input Data

Discharge (ft³/s)	Normal Depth (ft)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
2.40	0.13	6.82	0.35	5.31	5.30
2.50	0.13	6.89	0.36	5.40	5.39
2.60	0.14	6.95	0.37	5.48	5.47
2.70	0.14	7.06	0.38	5.54	5.53
2.80	0.14	7.12	0.39	5.62	5.61
2.90	0.14	7.18	0.40	5.69	5.69
3.00	0.14	7.23	0.41	5.77	5.76
3.10	0.15	7.29	0.43	5.84	5.83
3.20	0.15	7.35	0.44	5.91	5.90
3.30	0.15	7.43	0.44	5.97	5.96
3.40	0.15	7.48	0.45	6.04	6.03
3.50	0.15	7.51	0.47	6.11	6.11
3.60	0.15	7.56	0.48	6.18	6.17
3.70	0.16	7.62	0.49	6.24	6.23
3.80	0.16	7.67	0.50	6.31	6.30
3.90	0.16	7.72	0.51	6.37	6.36
4.00	0.16	7.76	0.52	6.43	6.42
4.10	0.16	7.81	0.52	6.49	6.48
4.20	0.16	7.86	0.53	6.55	6.54
4.30	0.16	7.90	0.54	6.61	6.60
4.40	0.17	7.95	0.55	6.66	6.65
4.50	0.17	7.99	0.56	6.72	6.71
4.60	0.17	8.04	0.57	6.78	6.77
4.70	0.17	8.08	0.58	6.83	6.82
4.80	0.17	8.12	0.59	6.88	6.88
4.90	0.17	8.16	0.60	6.94	6.93
5.00	0.17	8.21	0.61	6.99	6.98

Cross Section for PCC Swale: S=0.50%

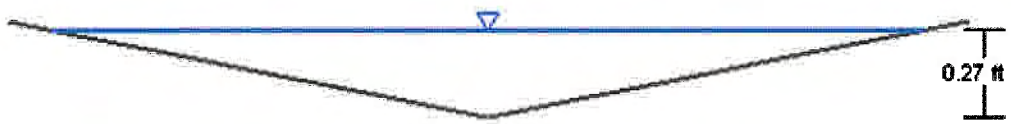
Project Description

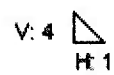
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.014	
Channel Slope	0.00500	ft/ft
Normal Depth	0.27	ft
Left Side Slope	20.00	ft/ft (H:V)
Right Side Slope	20.00	ft/ft (H:V)
Discharge	3.00	ft^3/s

Cross Section Image





Rating Table for PCC Swale: S=0.50%

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.014	
Channel Slope	0.00500	ft/ft
Left Side Slope	20.00	ft/ft (H:V)
Right Side Slope	20.00	ft/ft (H:V)
Discharge	3.00	ft³/s

Discharge (ft³/s)	Normal Depth (ft)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.00					
0.10	0.08	0.85	0.12	3.06	3.06
0.20	0.10	1.01	0.20	3.98	3.98
0.30	0.12	1.12	0.27	4.64	4.63
0.40	0.13	1.20	0.33	5.17	5.16
0.50	0.14	1.28	0.39	5.60	5.60
0.60	0.15	1.33	0.45	6.01	6.00
0.70	0.16	1.39	0.51	6.37	6.36
0.80	0.17	1.43	0.56	6.69	6.69
0.90	0.17	1.47	0.61	7.00	6.99
1.00	0.18	1.52	0.66	7.27	7.26
1.10	0.19	1.55	0.71	7.54	7.53
1.20	0.19	1.59	0.76	7.79	7.78
1.30	0.20	1.62	0.80	8.03	8.02
1.40	0.21	1.65	0.85	8.25	8.24
1.50	0.21	1.68	0.89	8.47	8.46
1.60	0.22	1.70	0.94	8.68	8.67
1.70	0.22	1.73	0.98	8.88	8.87
1.80	0.23	1.75	1.03	9.07	9.06
1.90	0.23	1.78	1.07	9.25	9.24
2.00	0.24	1.80	1.11	9.43	9.42
2.10	0.24	1.82	1.15	9.61	9.60
2.20	0.24	1.85	1.19	9.78	9.77
2.30	0.25	1.86	1.23	9.95	9.94

Rating Table for PCC Swale: S=0.50%

Input Data

Discharge (ft³/s)	Normal Depth (ft)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
2.40	0.25	1.88	1.27	10.11	10.10
2.50	0.26	1.91	1.31	10.26	10.25
2.60	0.26	1.92	1.35	10.41	10.40
2.70	0.26	1.94	1.39	10.56	10.55
2.80	0.27	1.96	1.43	10.70	10.69
2.90	0.27	1.98	1.47	10.85	10.83
3.00	0.27	1.99	1.50	10.99	10.97

Cross Section for PCC Swale: S=5.00%

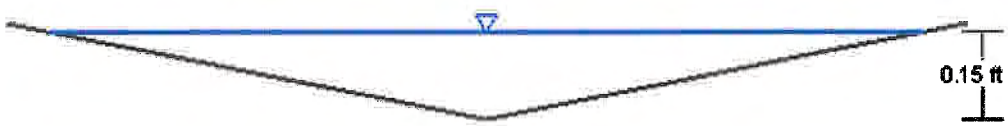
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.014	
Channel Slope	0.05000	ft/ft
Normal Depth	0.15	ft
Left Side Slope	20.00	ft/ft (H:V)
Right Side Slope	20.00	ft/ft (H:V)
Discharge	2.00	ft^3/s

Cross Section Image



V: 4
H: 1

Rating Table for PCC Swale: S=5.00%

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.014	
Channel Slope	0.05000	ft/ft
Left Side Slope	20.00	ft/ft (H:V)
Right Side Slope	20.00	ft/ft (H:V)
Discharge	2.00	ft³/s

Discharge (ft³/s)	Normal Depth (ft)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.00					
0.10	0.05	2.00	0.05	2.00	2.00
0.20	0.06	2.41	0.08	2.58	2.58
0.30	0.08	2.66	0.11	3.00	3.00
0.40	0.08	2.86	0.14	3.35	3.35
0.50	0.09	3.01	0.17	3.65	3.65
0.60	0.10	3.16	0.19	3.90	3.89
0.70	0.10	3.29	0.21	4.13	4.13
0.80	0.11	3.39	0.24	4.35	4.34
0.90	0.11	3.49	0.26	4.55	4.54
1.00	0.12	3.58	0.28	4.73	4.73
1.10	0.12	3.67	0.30	4.90	4.90
1.20	0.13	3.75	0.32	5.07	5.06
1.30	0.13	3.83	0.34	5.21	5.21
1.40	0.13	3.90	0.36	5.37	5.36
1.50	0.14	3.99	0.38	5.49	5.48
1.60	0.14	4.05	0.40	5.63	5.62
1.70	0.14	4.11	0.41	5.76	5.75
1.80	0.15	4.16	0.43	5.89	5.88
1.90	0.15	4.22	0.45	6.01	6.00
2.00	0.15	4.27	0.47	6.13	6.12

Cross Section for Trapezoidal Grass Swale: S=20.00%

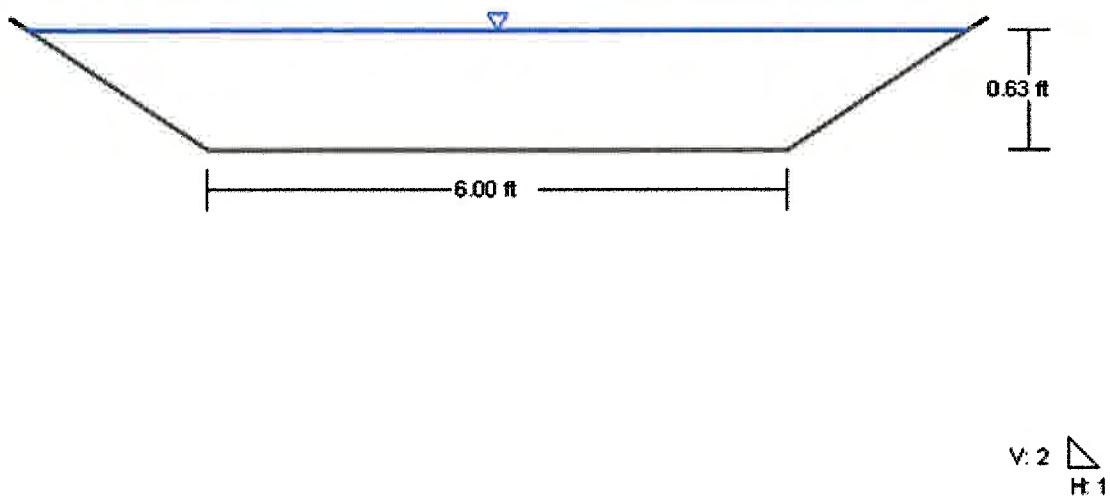
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.250	
Channel Slope	0.20000	ft/ft
Normal Depth	0.63	ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	6.00	ft
Discharge	8.20	ft^3/s

Cross Section Image



Rating Table for Trapezoidal Grass Swale: S=20.00%

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.250	
Channel Slope	0.20000	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	6.00	ft
Discharge	8.20	ft³/s

Discharge (ft³/s)	Normal Depth (ft)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.00					
0.10	0.05	0.34	0.29	6.30	6.28
0.20	0.07	0.45	0.45	6.45	6.43
0.30	0.09	0.52	0.57	6.58	6.55
0.40	0.11	0.58	0.69	6.69	6.65
0.50	0.12	0.63	0.79	6.78	6.74
0.60	0.14	0.68	0.88	6.87	6.83
0.70	0.15	0.72	0.97	6.96	6.91
0.80	0.16	0.75	1.06	7.03	6.98
0.90	0.18	0.79	1.14	7.11	7.05
1.00	0.19	0.82	1.22	7.18	7.12
1.10	0.20	0.84	1.30	7.25	7.19
1.20	0.21	0.87	1.38	7.31	7.25
1.30	0.22	0.90	1.45	7.38	7.31
1.40	0.23	0.92	1.52	7.44	7.36
1.50	0.24	0.94	1.59	7.50	7.42
1.60	0.25	0.97	1.66	7.56	7.48
1.70	0.25	0.99	1.72	7.61	7.53
1.80	0.26	1.01	1.79	7.66	7.58
1.90	0.27	1.03	1.85	7.72	7.63
2.00	0.28	1.04	1.91	7.77	7.68
2.10	0.29	1.06	1.98	7.82	7.73
2.20	0.30	1.08	2.04	7.87	7.78

Rating Table for Trapezoidal Grass Swale: S=20.00%

Input Data

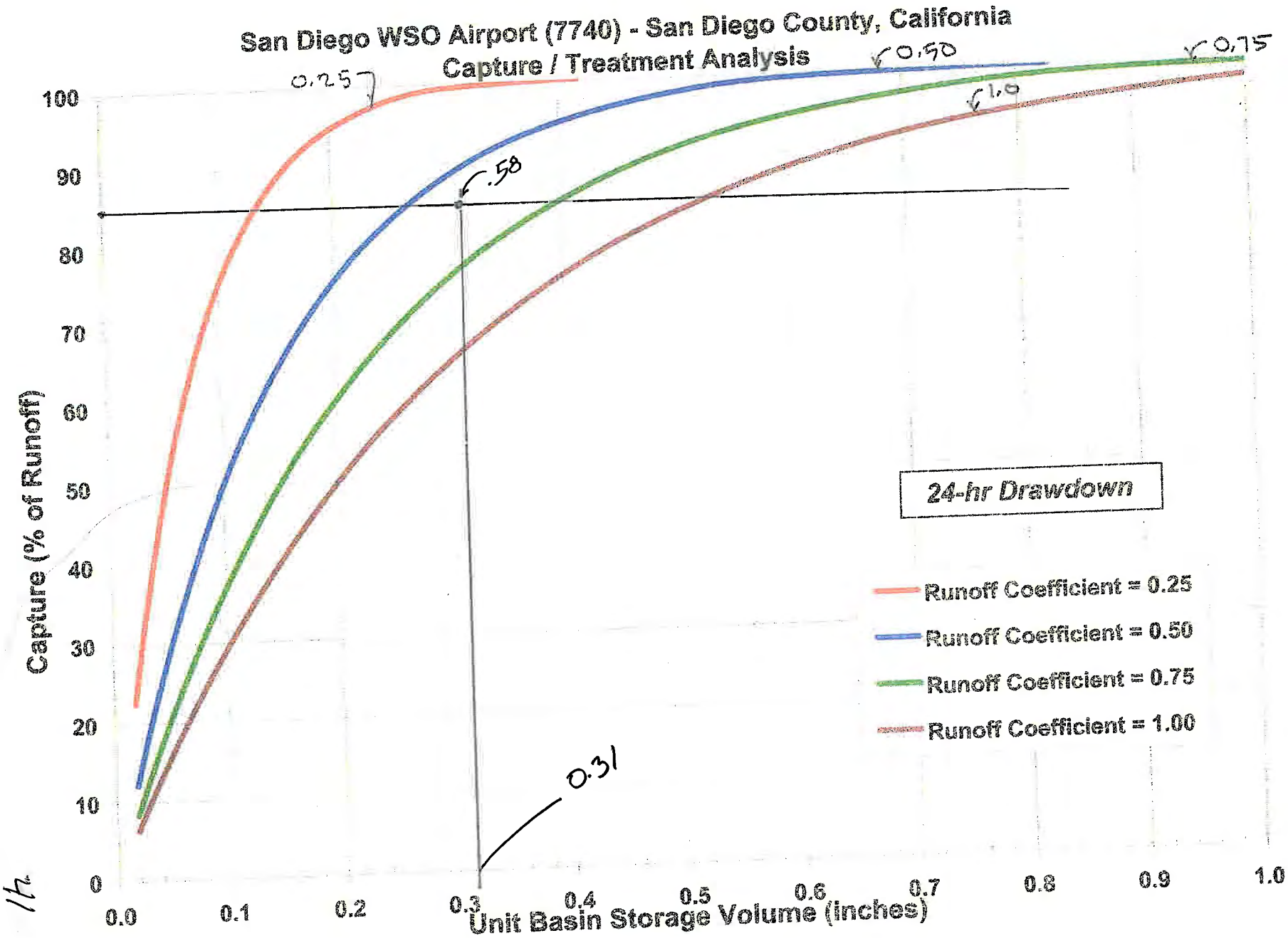
Discharge (ft³/s)	Normal Depth (ft)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
2.30	0.30	1.10	2.10	7.92	7.82
2.40	0.31	1.11	2.16	7.97	7.87
2.50	0.32	1.13	2.22	8.01	7.91
2.60	0.33	1.14	2.27	8.06	7.96
2.70	0.33	1.16	2.33	8.11	8.00
2.80	0.34	1.17	2.39	8.15	8.04
2.90	0.35	1.19	2.44	8.19	8.08
3.00	0.35	1.20	2.50	8.24	8.12
3.10	0.36	1.21	2.56	8.28	8.16
3.20	0.37	1.23	2.61	8.32	8.20
3.30	0.37	1.24	2.66	8.36	8.24
3.40	0.38	1.25	2.72	8.41	8.28
3.50	0.39	1.26	2.77	8.45	8.32
3.60	0.39	1.28	2.82	8.49	8.36
3.70	0.40	1.29	2.87	8.52	8.40
3.80	0.41	1.30	2.92	8.56	8.43
3.90	0.41	1.31	2.98	8.60	8.47
4.00	0.42	1.32	3.03	8.64	8.50
4.10	0.42	1.33	3.08	8.68	8.54
4.20	0.43	1.34	3.13	8.71	8.58
4.30	0.44	1.35	3.18	8.75	8.61
4.40	0.44	1.36	3.23	8.79	8.65
4.50	0.45	1.37	3.28	8.82	8.68
4.60	0.45	1.38	3.32	8.86	8.71
4.70	0.46	1.39	3.38	8.90	8.75
4.80	0.46	1.40	3.42	8.93	8.78
4.90	0.47	1.41	3.47	8.96	8.81
5.00	0.47	1.42	3.52	9.00	8.84
5.10	0.48	1.43	3.57	9.03	8.88
5.20	0.48	1.44	3.61	9.07	8.91
5.30	0.49	1.45	3.66	9.10	8.94
5.40	0.49	1.46	3.70	9.13	8.97
5.50	0.50	1.46	3.75	9.17	9.00
5.60	0.51	1.47	3.80	9.20	9.03
5.70	0.51	1.48	3.85	9.23	9.06
5.80	0.52	1.49	3.89	9.26	9.09
5.90	0.52	1.50	3.94	9.29	9.12

Rating Table for Trapezoidal Grass Swale: S=20.00%

Input Data

Discharge (ft³/s)	Normal Depth (ft)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
6.00	0.53	1.51	3.98	9.32	9.15
6.10	0.53	1.52	4.03	9.35	9.18
6.20	0.54	1.52	4.07	9.39	9.21
6.30	0.54	1.53	4.12	9.42	9.24
6.40	0.54	1.54	4.16	9.44	9.27
6.50	0.55	1.55	4.20	9.48	9.30
6.60	0.55	1.55	4.25	9.51	9.33
6.70	0.56	1.56	4.29	9.54	9.36
6.80	0.56	1.57	4.34	9.57	9.38
6.90	0.57	1.58	4.38	9.59	9.41
7.00	0.57	1.58	4.42	9.62	9.44
7.10	0.58	1.59	4.47	9.65	9.47
7.20	0.58	1.60	4.51	9.68	9.49
7.30	0.59	1.60	4.55	9.71	9.52
7.40	0.59	1.61	4.60	9.74	9.55
7.50	0.60	1.62	4.63	9.76	9.57
7.60	0.60	1.62	4.68	9.79	9.60
7.70	0.60	1.63	4.72	9.82	9.62
7.80	0.61	1.64	4.77	9.85	9.65
7.90	0.61	1.64	4.81	9.88	9.68
8.00	0.62	1.65	4.85	9.90	9.70
8.10	0.62	1.66	4.89	9.93	9.73
8.20	0.63	1.66	4.93	9.96	9.76

85TH PERCENTILE STORM EVENT


San Diego WSO Airport (7740) - San Diego County, California
Capture / Treatment Analysis
Capture (% of Runoff)
Unit Basin Storage Volume (inches)
24-hr Drawdown
Runoff Coefficient = 0.25
Runoff Coefficient = 0.50
Runoff Coefficient = 0.75
Runoff Coefficient = 1.00
0.25
0.50
0.75
1.0
.58
0.31
0
10
20
30
40
50
60
70
80
90
100
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0

4

Adjust Unit Basin Volume for Location

P6 (85th %) @ Project Location = 0.75
P6 (85th %) @ San Diego Airport = 0.55
"C" =058

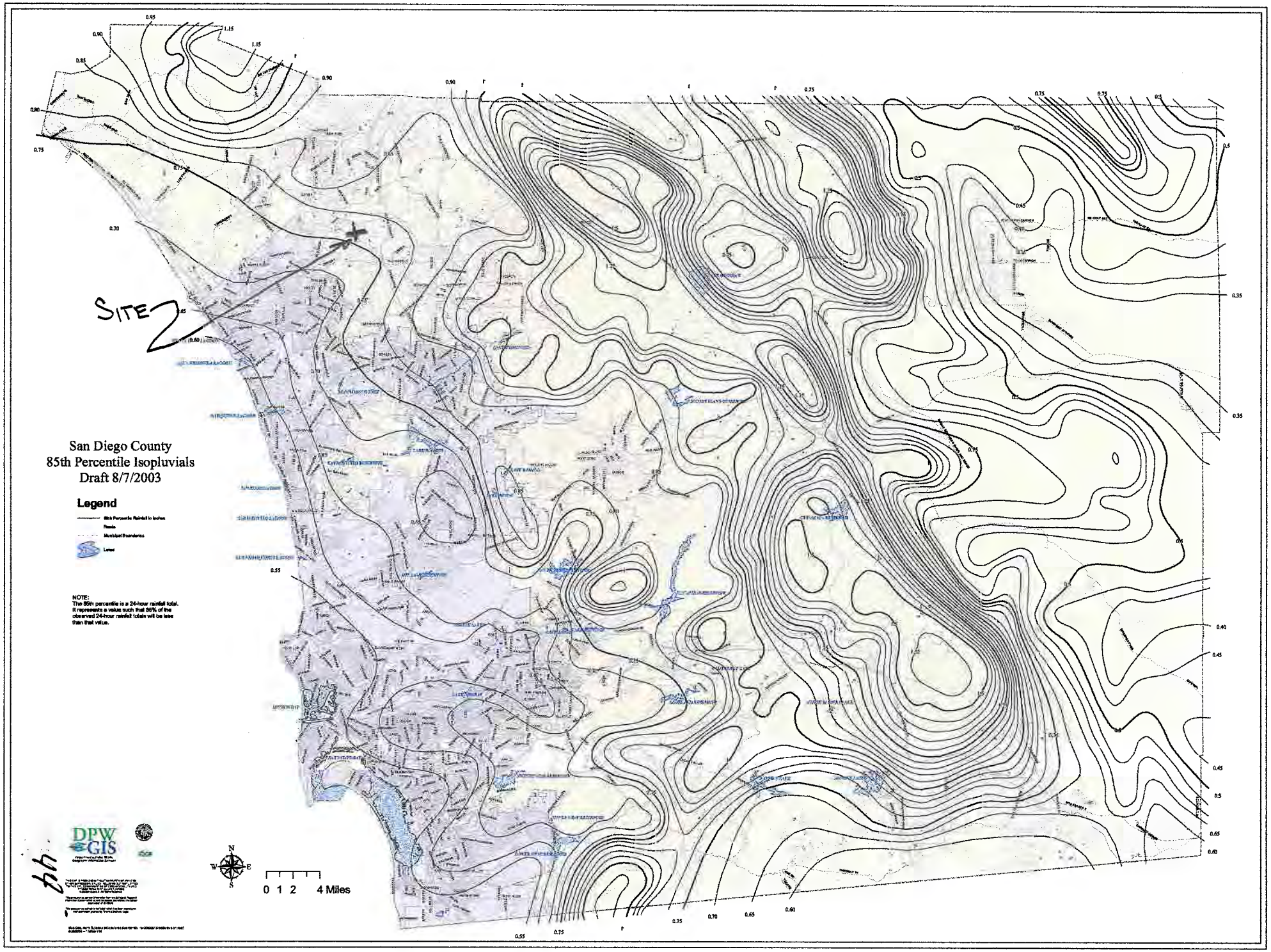
Y =0.31(0.75/0.55) = 0.42in

TABLE 1.2

WATER QUALITY TREATMENT VOLUME

Area Desig.	Area (Ac's)	Unit Basin Volume Y (in)	Vwq (c.f.)
E1 Thru E3	1.84	0.42	2,805.00

Note: Vwq = Water Quality Treatment Volume =(YA)(43560sf)/12"


SITE 2
San Diego County
85th Percentile Isopluvials
Draft 8/7/2003
Legend
85th Percentile Rainfall in Inches
Roads
Municipal Boundaries
Lakes
NOTE:
The 85th percentile is a 24-hour rainfall total.
It represents a value such that 85% of the
observed 24-hour rainfall totals will be less
than that value.
DPW GIS
N
W
E
S
0 1 2 4 Miles

SPEAR & ASSOCIATES, INC.
475 Production Street
San Marcos, CA 92078
Phn: (760) 736-2040

Sheet No.:1of 2
Calculated By:RWH Date: 7/31/06
J.N. 03-190

HYDROLOGY CALCULATION
RATIONAL METHOD

STORM FREQUENCY:I=0.2in/hr Storm

Soil Classification Group = "B" & "C"
Zone: Residential/Agr.
Runoff Coefficient for Soil Grp. B & C; C=0.25 & 0.3 Pre-Dev.
Post-Dev. C=0.58 & 0.60

PROJECT: Dia Dang Meditation Center

Post-Development

Drainage Area Loc. No.	Soil Group & Development Type	Area (Acres)	I (in/hr)	"C"	ΔQ (c.f.s.)	∑Q (c.f.s.)	Section	Slope % or ΔE (ft)	"V" (fps)	"L" (Ft)	"T" (Min)	∑TC	Remarks
						0		10%+		100			
D1	"B" -43du/ac	0.11	0.2	0.25	0.01		Curb &						
						0.1	Gutter	18.00%	4.56	300			
D2	"	0.17	0.2	0.95	0.03		PCC						
						0.04	Swale	5.00%	3.75	80			
D3	"	0.13	0.2	0.58	0.02		Sheet						
						0.06	Flow	20.00%		220			
D4	"	0.45	0.2	0.25	0.02		Curb &						
						0.08	Gutter	5.00%	5.3	265			
D5	"	1.91	0.2	0.58	0.22								
Total Area "D"		2.77				0.3							
								2.00%		75			
E1	"B" - 43du/ac	0.57	0.2	0.58	0.07		PCC						
						0.07	Swale	0.50%	4.64	200			
E2	"	0.48	0.2	0.58	0.06		PCC						
						0.13	D/W	15.50%	8.18	160			
E3	"	0.71	0.2	0.58	0.08		Grass						
						0.21	Swale	20.00%	1.65	500			
E4	"	0.91	0.2	0.48	0.09		Sheet						
						0.3	Flow						
F	"C" Natural	0.71	0.2	0.3	0.04								
Total Areas E + F		3.46				0.34							
Total Post-Dev. Total Site						45.77							

Sh.

HYDRAULIC CALCULATIONS

And

DETENTION POND DESIGNS

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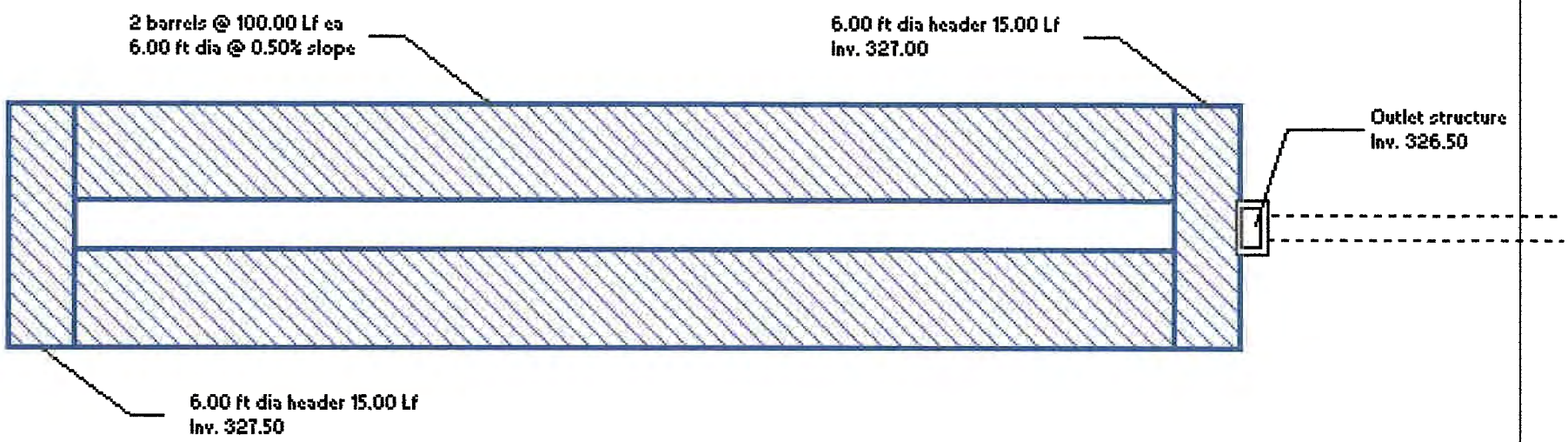
Legend

Hyd.	Origin	Description
1	Rational	Area D Post-Develpment
2	Reservoir	Underground Storage D

New Pond1



Plan View

NTS

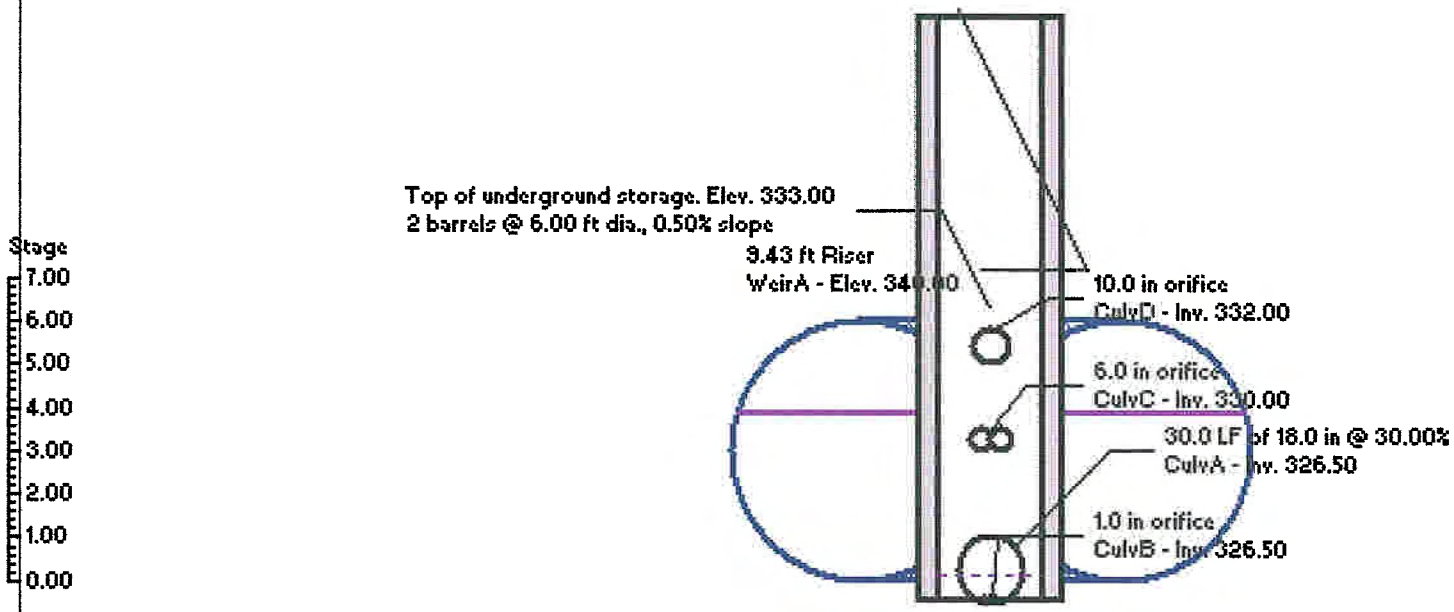
(100 yr)

48

Schematic only. Not for construction.

Hydraflow Hydrographs Pond Draw	Project: SA03-130 Pond D.gpw	Wednesday, Aug 2 2006, 4:01 PM

New Pond1



Front View

NTS - Looking upstream

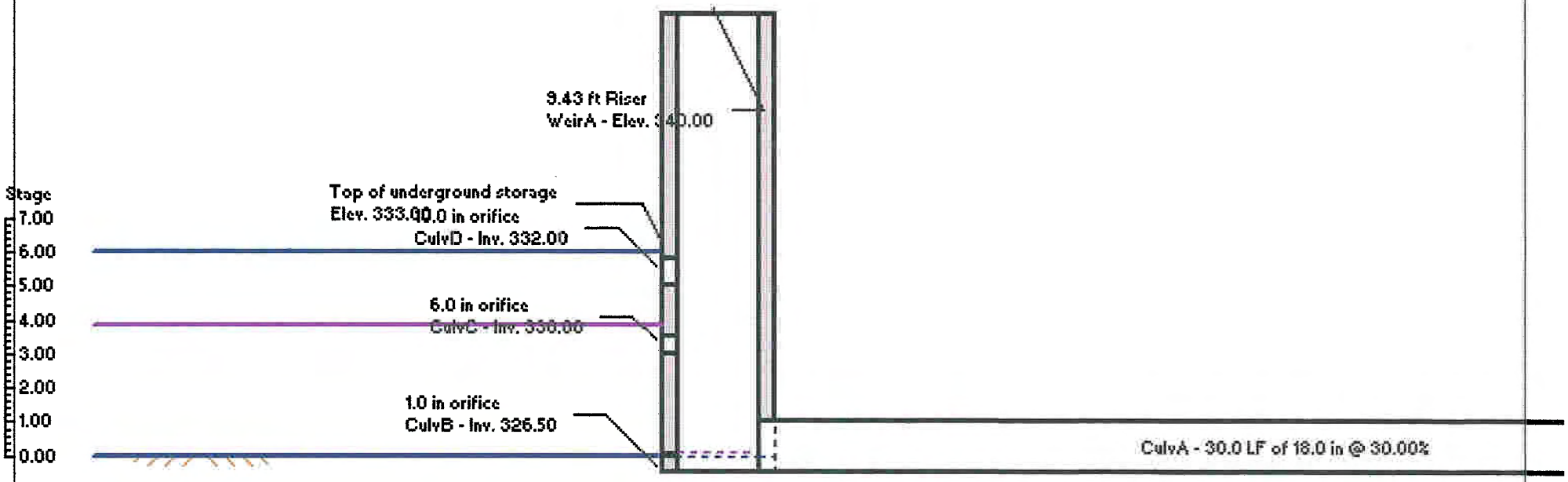
(100 yr)

49

Schematic only. Not for construction.

Hydraflow Hydrographs Pond Draw	Project: SA03-130 Pond D.gpw	Wednesday, Aug 2 2006, 3:57 PM

New Pond1



Section

NTS

(100 yr)

25

Schematic only. Not for construction.

Hydraflow Hydrographs Pond Draw	Project: SA03-130 Pond D.gpw	Wednesday, Aug 2 2006, 3:59 PM

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100 - Year

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Hydrograph No. 2, Reservoir, Underground Storage D 4

Pond Report 5

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow Hyd(s)	Peak Outflow (cfs)								Hydrograph description
			1-Yr	2-Yr	3-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	
1	Rational	-------	-------	-------	-------	-------	0.00	-------	-------	8.70	Area D Post-Develpment
2	Reservoir	1	-------	-------	-------	-------	0.00	-------	-------	1.69	Underground Storage D

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Proj. file: SA03-130 Pond D.gpw | Wednesday, Aug 2 2006, 4:03 PM

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	Rational	8.70	1	9	4,699	----	------	------	Area D Post-Develpment
2	Reservoir	1.69	1	16	4,699	1	330.87	4,098	Underground Storage D

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SA03-130 Pond D.gpw	Return Period: 100 Year	Wednesday, Aug 2 2006, 4:03 PM

Hydrograph Plot

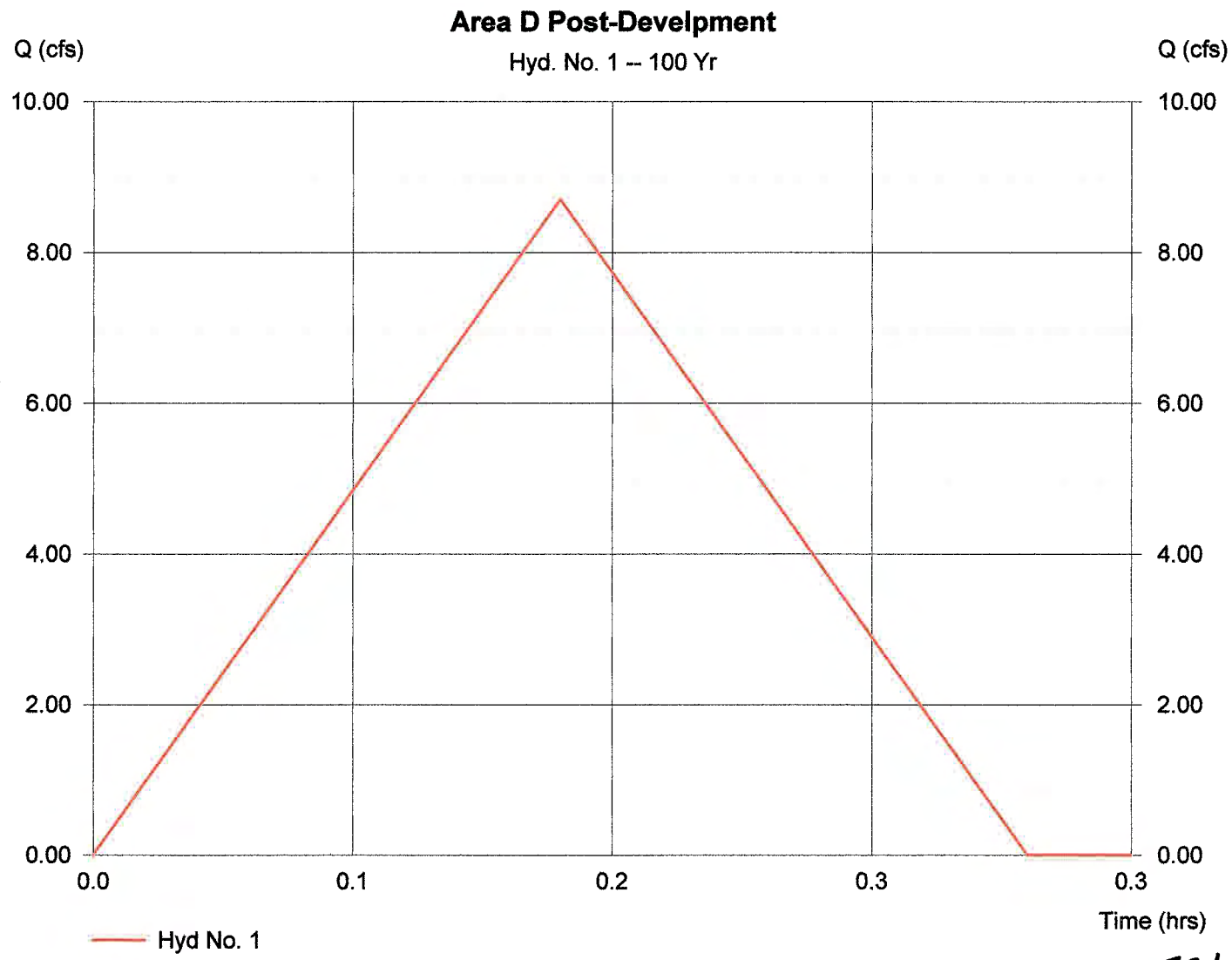
Hydraflow Hydrographs by Intelisolve | Wednesday, Aug 2 2006, 4:3 PM

Hyd. No. 1

Area D Post-Develpment

Hydrograph type	= Rational	Peak discharge	= 8.70 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 2.770 ac	Runoff coeff.	= 0.55
Intensity	= 5.712 in/hr	Tc by User	= 9.00 min
IDF Curve	= SA03-190D.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 4,699 cuft



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Hydrograph Plot

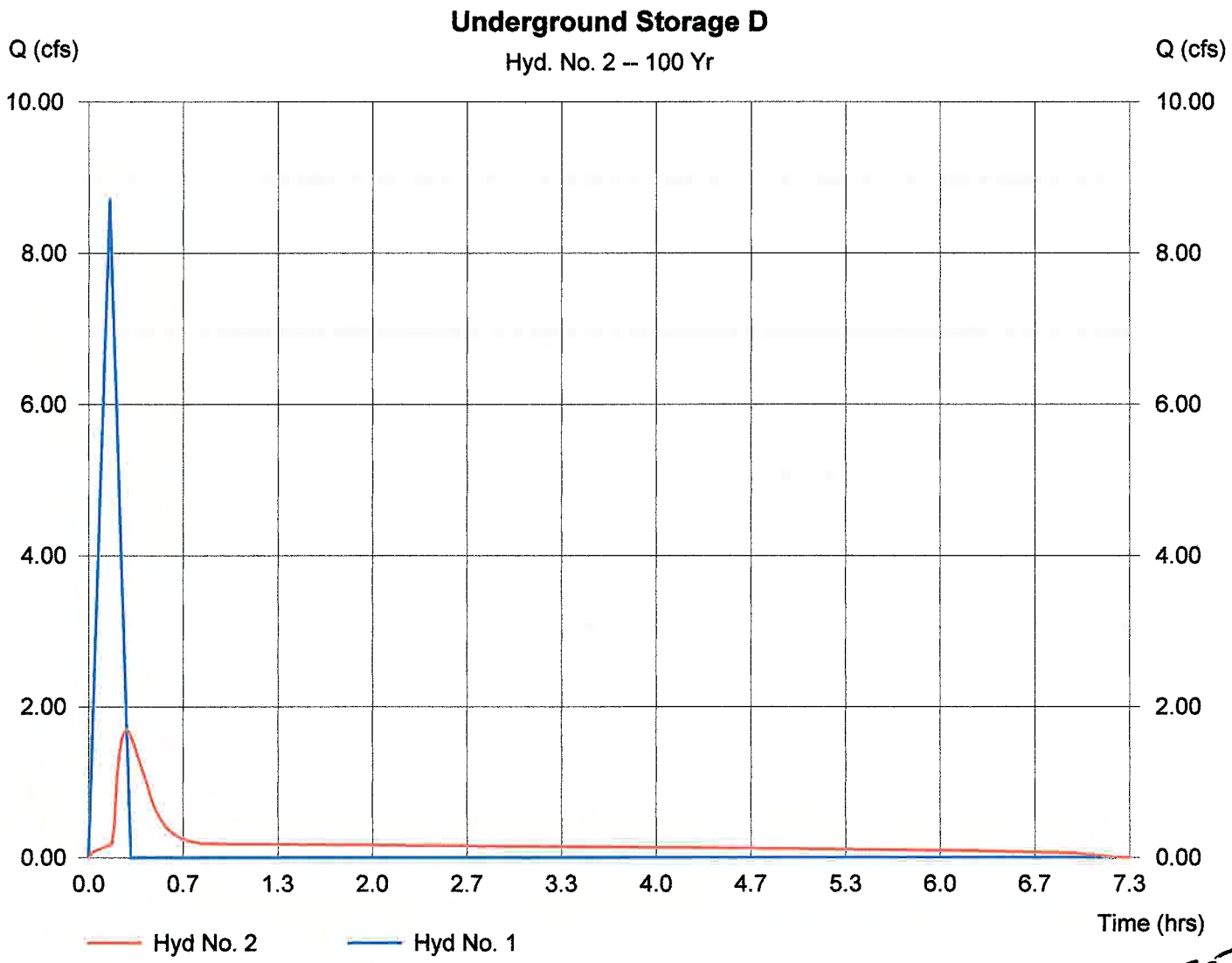
Hydraflow Hydrographs by Intelisolve | Wednesday, Aug 2 2006, 4:3 PM

Hyd. No. 2

Underground Storage D

Hydrograph type	= Reservoir	Peak discharge	= 1.69 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Inflow hyd. No.	= 1	Max. Elevation	= 330.87 ft
Reservoir name	= New Pond1	Max. Storage	= 4,098 cuft

Storage Indication method used. | Hydrograph Volume = 4,699 cuft



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Pond Report

Hydraflow Hydrographs by Intelisolve — Wednesday, Aug 2 2006, 4:3 PM

Pond No. 1 - New Pond1

Pond Data

Pipe dia. = 6.00 ft Pipe length = 100.0 ft No. Barrels = 2.0 Slope = 0.50 % Invert elev. = 327.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	327.00	00	0	0
0.33	327.33	00	38	38
0.65	327.65	00	159	197
0.98	327.98	00	257	454
1.30	328.30	00	316	770
1.63	328.63	00	359	1,129
1.95	328.95	00	391	1,520
2.28	329.28	00	414	1,933
2.60	329.60	00	431	2,364
2.93	329.93	00	442	2,806
3.25	330.25	00	447	3,253
3.58	330.58	00	447	3,700
3.90	330.90	00	442	4,142
4.23	331.23	00	430	4,572
4.55	331.55	00	415	4,987
4.88	331.88	00	390	5,376
5.20	332.20	00	358	5,735
5.53	332.53	00	316	6,051
5.85	332.85	00	256	6,307
6.17	333.18	00	159	6,467
6.50	333.50	00	38	6,504

Culvert / Orifice Structures

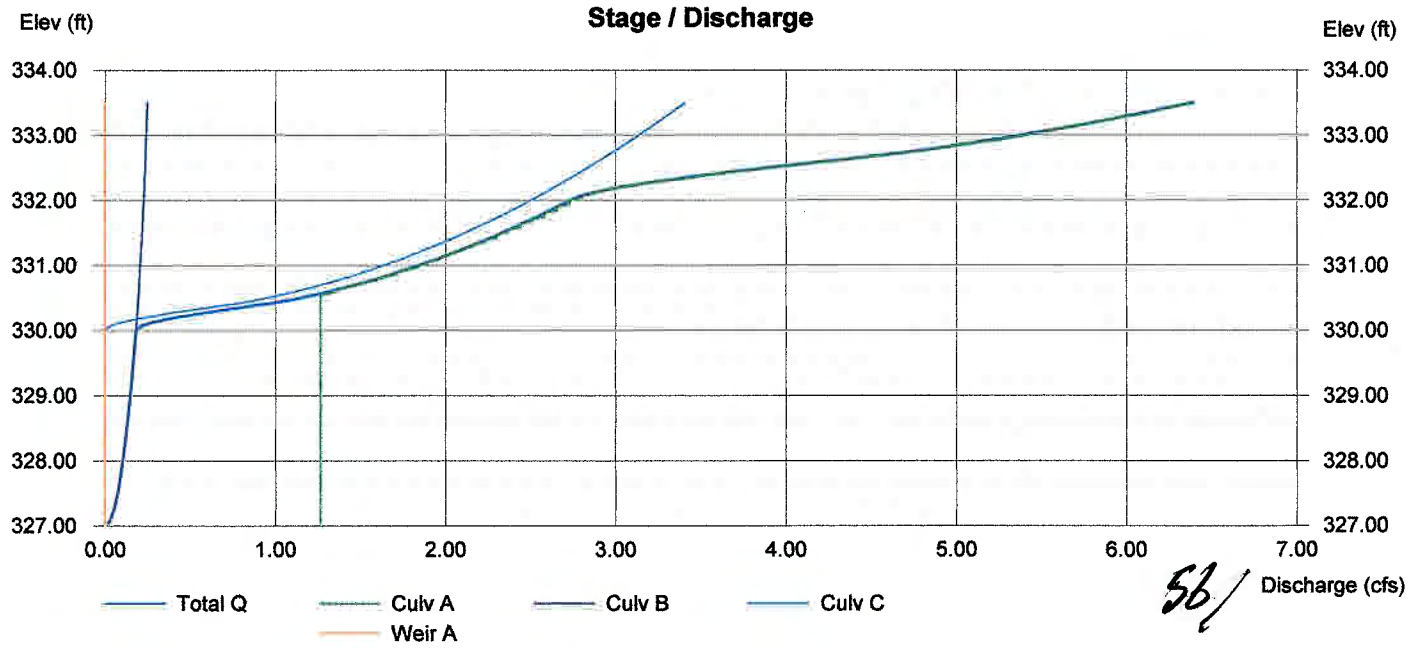
	[A]	[B]	[C]	[D]
Rise (in)	= 18.00	1.00	6.00	10.00
Span (in)	= 18.00	1.00	6.00	10.00
No. Barrels	= 1	4	2	1
Invert El. (ft)	= 326.50	326.50	330.00	332.00
Length (ft)	= 30.00	0.50	0.50	0.00
Slope (%)	= 30.00	0.00	0.00	0.00
N-Value	= .013	.013	.013	.013
Orif. Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	Yes

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 9.43	0.00	0.00	0.00
Crest El. (ft)	= 340.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	0.00	0.00
Weir Type	= Riser	---	---	---
Multi-Stage	= Yes	No	No	No

Exfiltration = 0.000 in/hr (Wet area) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



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Legend

Hyd.	Origin	Description
1	Rational	Area D Post-Develpment
2	Reservoir	Detention Pond Area E

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10 - Year

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Hydrograph No. 2, Reservoir, Detention Pond Area E 8
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100 - Year

Summary Report 10
Hydrograph Reports 11
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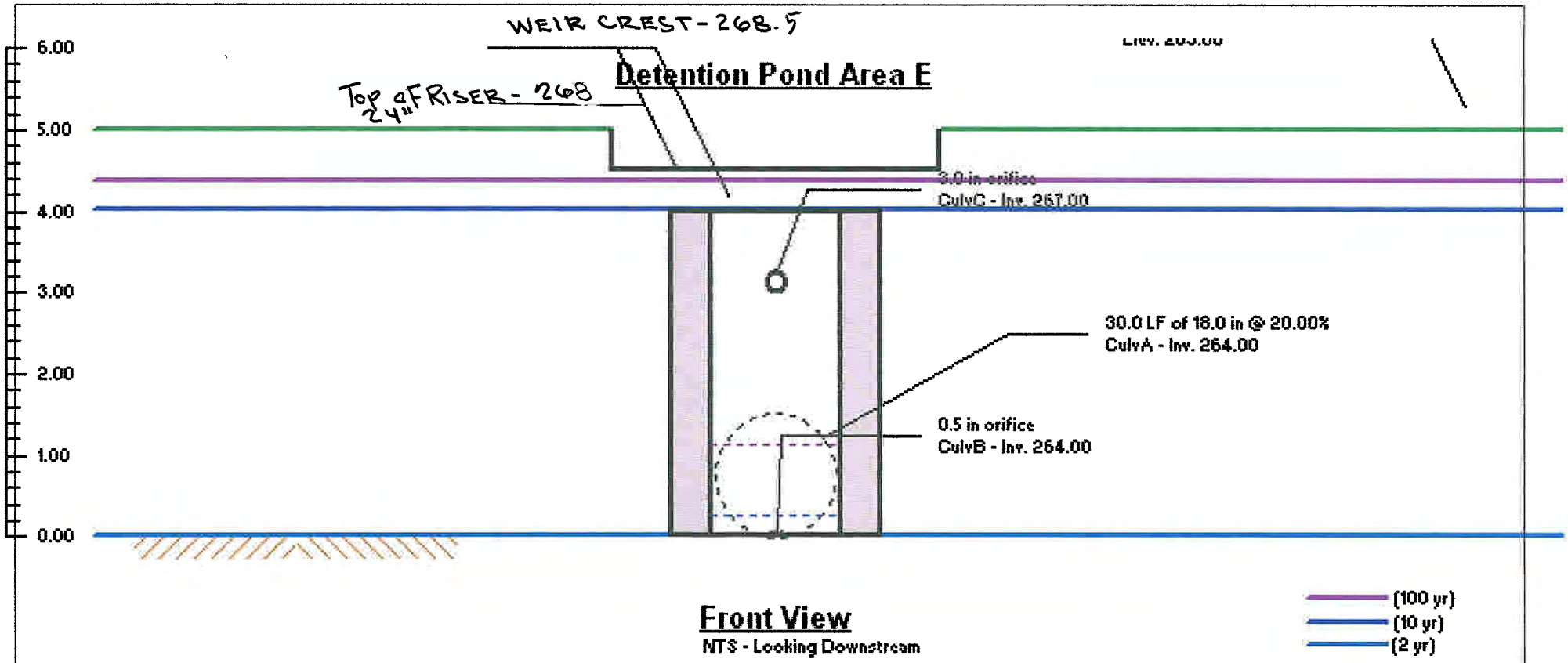
Pond Report 13

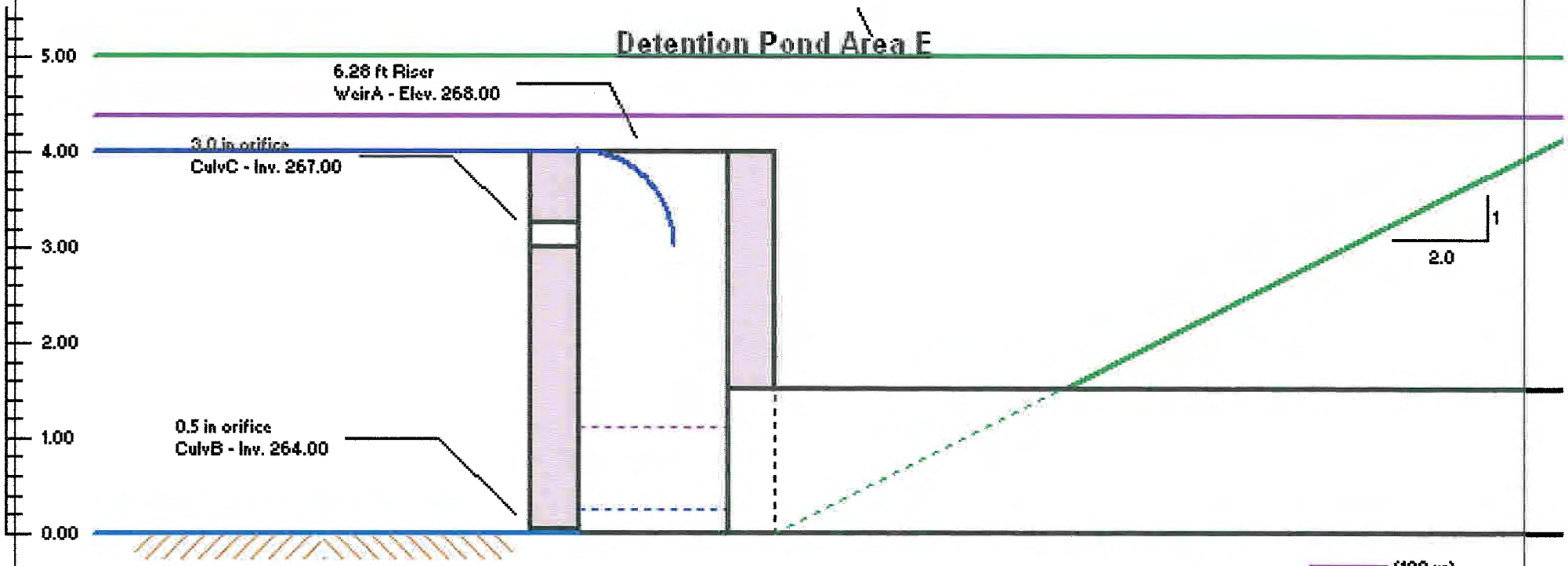


Front View

NTS - Looking Downstream

Schematic only. Not for construction.

Hydraflow Hydrographs Pond Draw	Project: SA03-130 Pond E.gpw	Wednesday, Aug 2 2006, 3:22 PM



Section

NTS

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Schematic only. Not for construction.

Hydraflow Hydrographs Pond Draw	Project: SA03-130 Pond E.gpw	Wednesday, Aug 2 2006, 3:24 PM

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow Hyd(s)	Peak Outflow (cfs)								Hydrograph description
			1-Yr	2-Yr	3-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	
1	Rational	-------	-------	5.31	-------	-------	8.32	-------	-------	11.46	Area D Post-Develpment
2	Reservoir	1	-------	0.04	-------	-------	0.34	-------	-------	5.02	Detention Pond Area E

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Proj. file: SA03-130 Pond E.gpw

Thursday, Aug 3 2006, 3:20 PM

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	Rational	5.31	1	9	2,868	---	-----	------	Area D Post-Develpment
2	Reservoir	0.04	1	18	2,858	1	266.99	2,836	Detention Pond Area E

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SA03-130 Pond E.gpw	Return Period: 2 Year	Thursday, Aug 3 2006, 3:20 PM

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

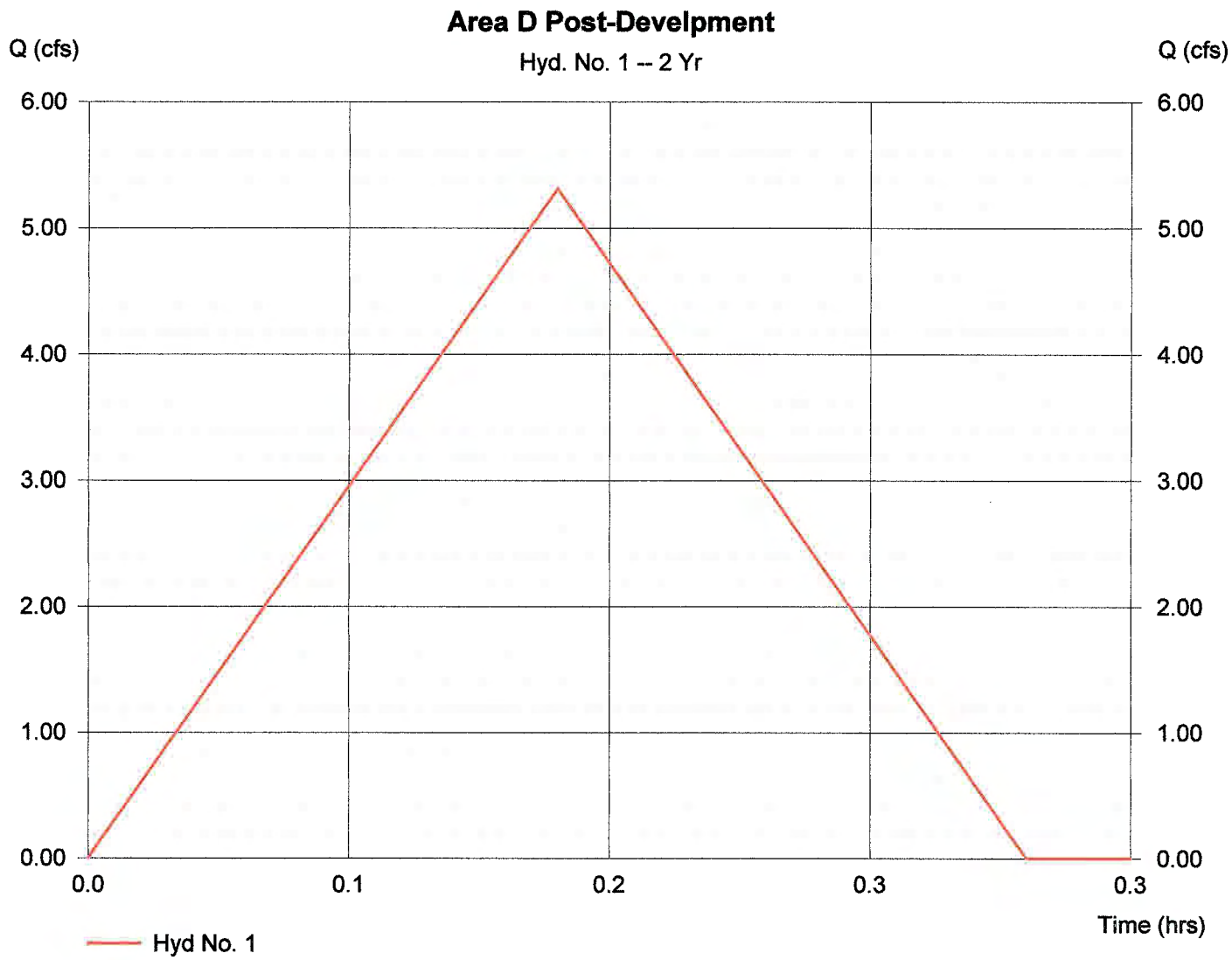
Thursday, Aug 3 2006, 3:20 PM

Hyd. No. 1

Area D Post-Develpment

Hydrograph type	= Rational	Peak discharge	= 5.31 cfs
Storm frequency	= 2 yrs	Time interval	= 1 min
Drainage area	= 3.460 ac	Runoff coeff.	= 0.58
Intensity	= 2.647 in/hr	Tc by User	= 9.00 min
IDF Curve	= SA03-190D.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 2,868 cuft



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Hydrograph Plot

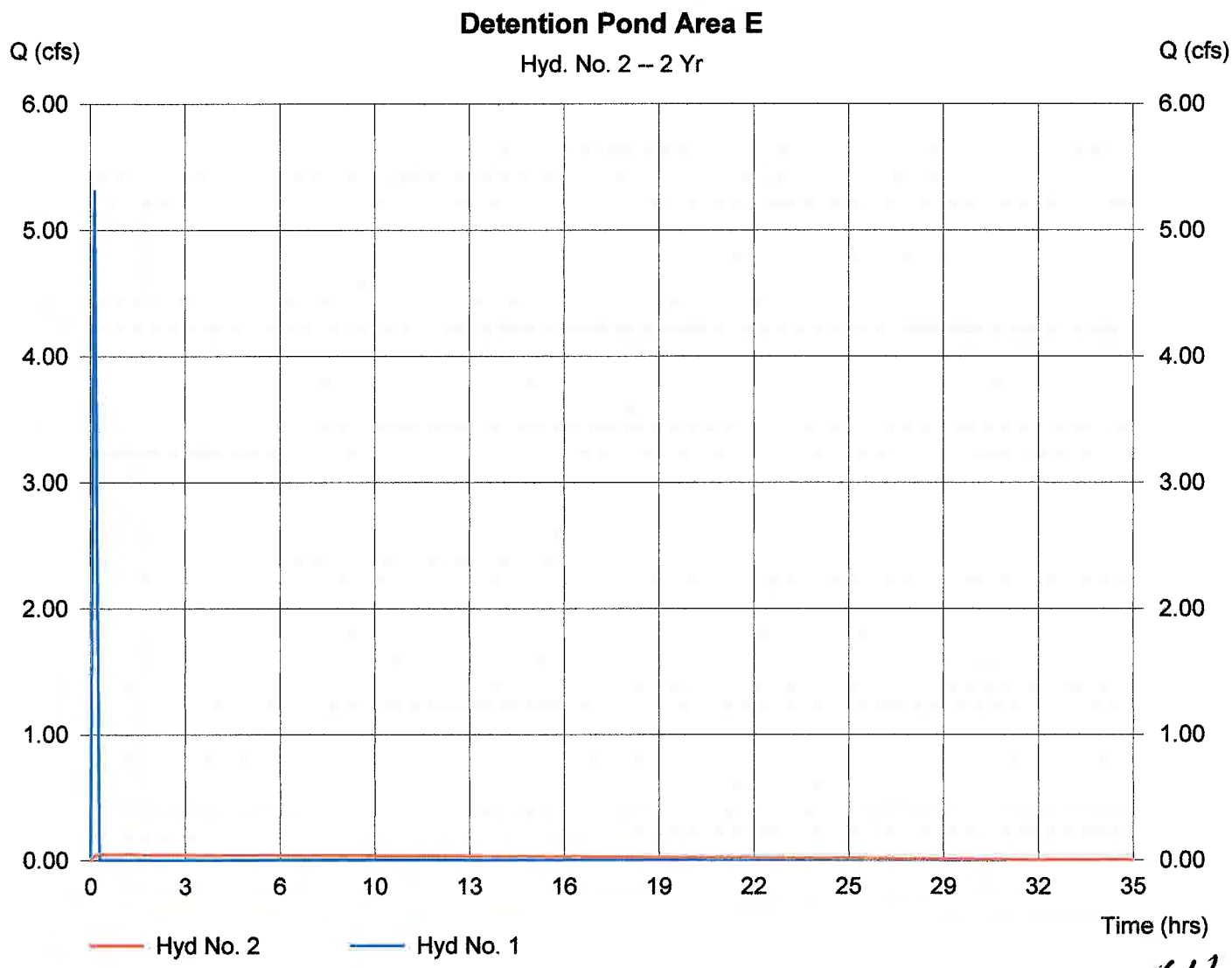
Hydraflow Hydrographs by Intelisolve | Thursday, Aug 3 2006, 3:20 PM

Hyd. No. 2

Detention Pond Area E

Hydrograph type	=	Reservoir	Peak discharge	=	0.04 cfs
Storm frequency	=	2 yrs	Time interval	=	1 min
Inflow hyd. No.	=	1	Max. Elevation	=	266.99 ft
Reservoir name	=	Detention Pond Area E	Max. Storage	=	2,836 cuft

Storage Indication method used. | Hydrograph Volume = 2,858 cuft



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Pond Report

Hydraflow Hydrographs by Intelisolve — Thursday, Aug 3 2006, 3:20 PM

Pond No. 1 - Detention Pond Area E

Pond Data

Bottom LxW = 30.0 x 20.0 ft Side slope = 2.0:1 Bottom elev. = 264.00 ft Depth = 5.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	264.00	600	0	0
0.25	264.25	651	156	156
0.50	264.50	704	169	326
0.75	264.75	759	183	508
1.00	265.00	816	197	705
1.25	265.25	875	211	917
1.50	265.50	936	226	1,143
1.75	265.75	999	242	1,385
2.00	266.00	1,064	258	1,643
2.25	266.25	1,131	274	1,917
2.50	266.50	1,200	291	2,208
2.75	266.75	1,271	309	2,517
3.00	267.00	1,344	327	2,844
3.25	267.25	1,419	345	3,189
3.50	267.50	1,496	364	3,554
3.75	267.75	1,575	384	3,937
4.00	268.00	1,656	404	4,341
4.25	268.25	1,739	424	4,766
4.50	268.50	1,824	445	5,211
4.75	268.75	1,911	467	5,678
5.00	269.00	2,000	489	6,167

Culvert / Orifice Structures

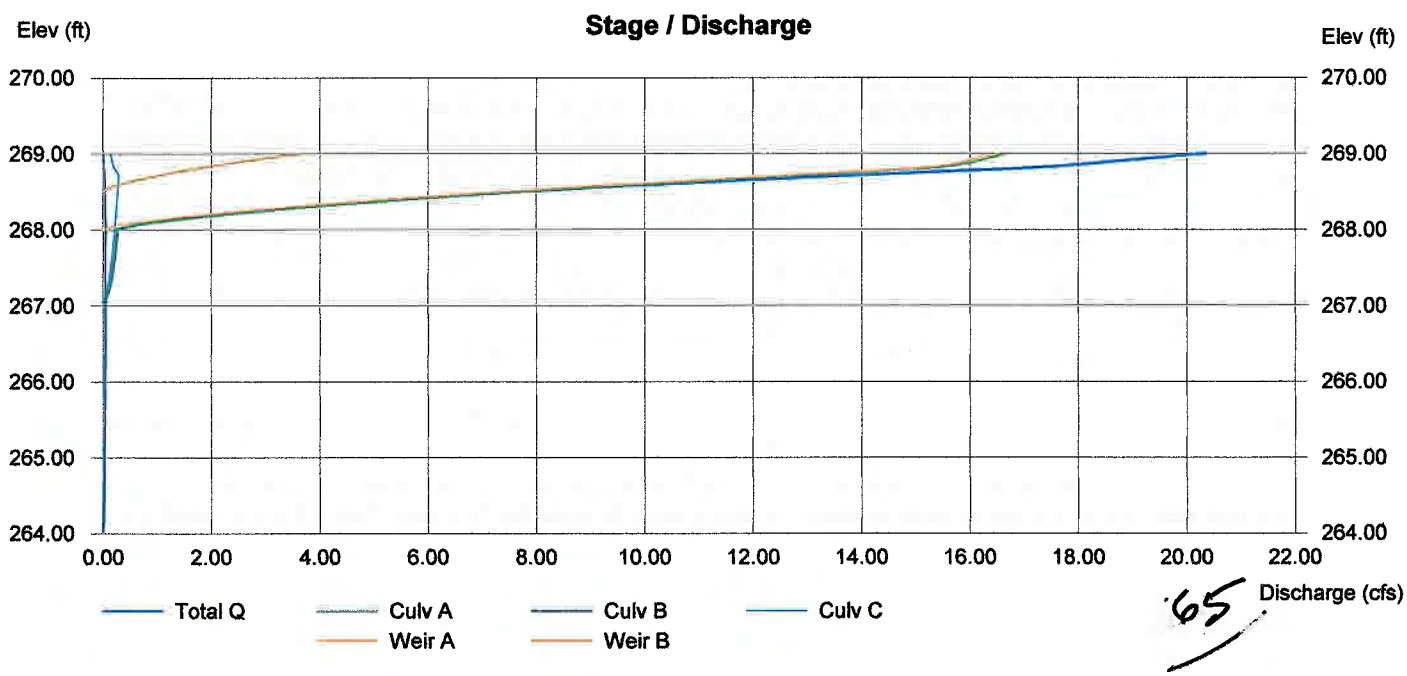
	[A]	[B]	[C]	[D]
Rise (in)	= 18.00	0.50	3.00	0.00
Span (in)	= 18.00	0.50	3.00	0.00
No. Barrels	= 1	4	1	0
Invert El. (ft)	= 264.00	264.00	267.00	0.00
Length (ft)	= 30.00	0.50	0.50	0.00
Slope (%)	= 20.00	0.00	0.00	0.00
N-Value	= .013	.013	.013	.013
Orif. Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.28	4.00	0.00	0.00
Crest El. (ft)	= 268.00	268.50	0.00	0.00
Weir Coeff.	= 3.33	2.60	0.00	0.00
Weir Type	= Riser	Broad	---	---
Multi-Stage	= Yes	No	No	No

Exfiltration = 0.000 in/hr (Wet area) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



.65

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	Rational	8.32	1	9	4,495	---	-----	-----	Area D Post-Develpment
2	Reservoir	0.34	1	18	4,485	1	268.02	4,373	Detention Pond Area E

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SA03-130 Pond E.gpw	Return Period: 10 Year	Thursday, Aug 3 2006, 3:20 PM

Hydrograph Plot

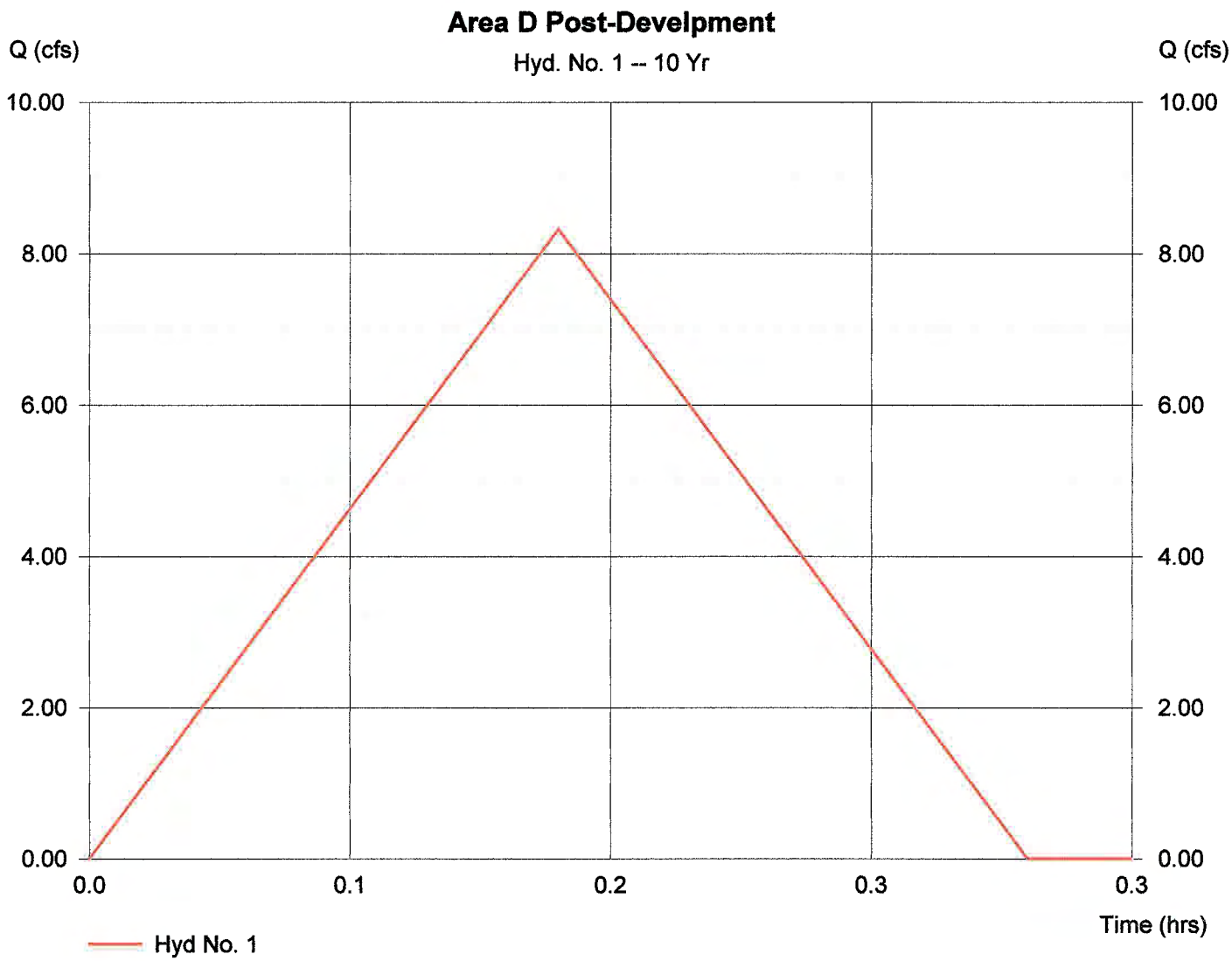
Hydraflow Hydrographs by Intelisolve | Thursday, Aug 3 2006, 3:20 PM

Hyd. No. 1

Area D Post-Develpment

Hydrograph type	= Rational	Peak discharge	= 8.32 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Drainage area	= 3.460 ac	Runoff coeff.	= 0.58
Intensity	= 4.148 in/hr	Tc by User	= 9.00 min
IDF Curve	= SA03-190D.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 4,495 cuft



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Hydrograph Plot

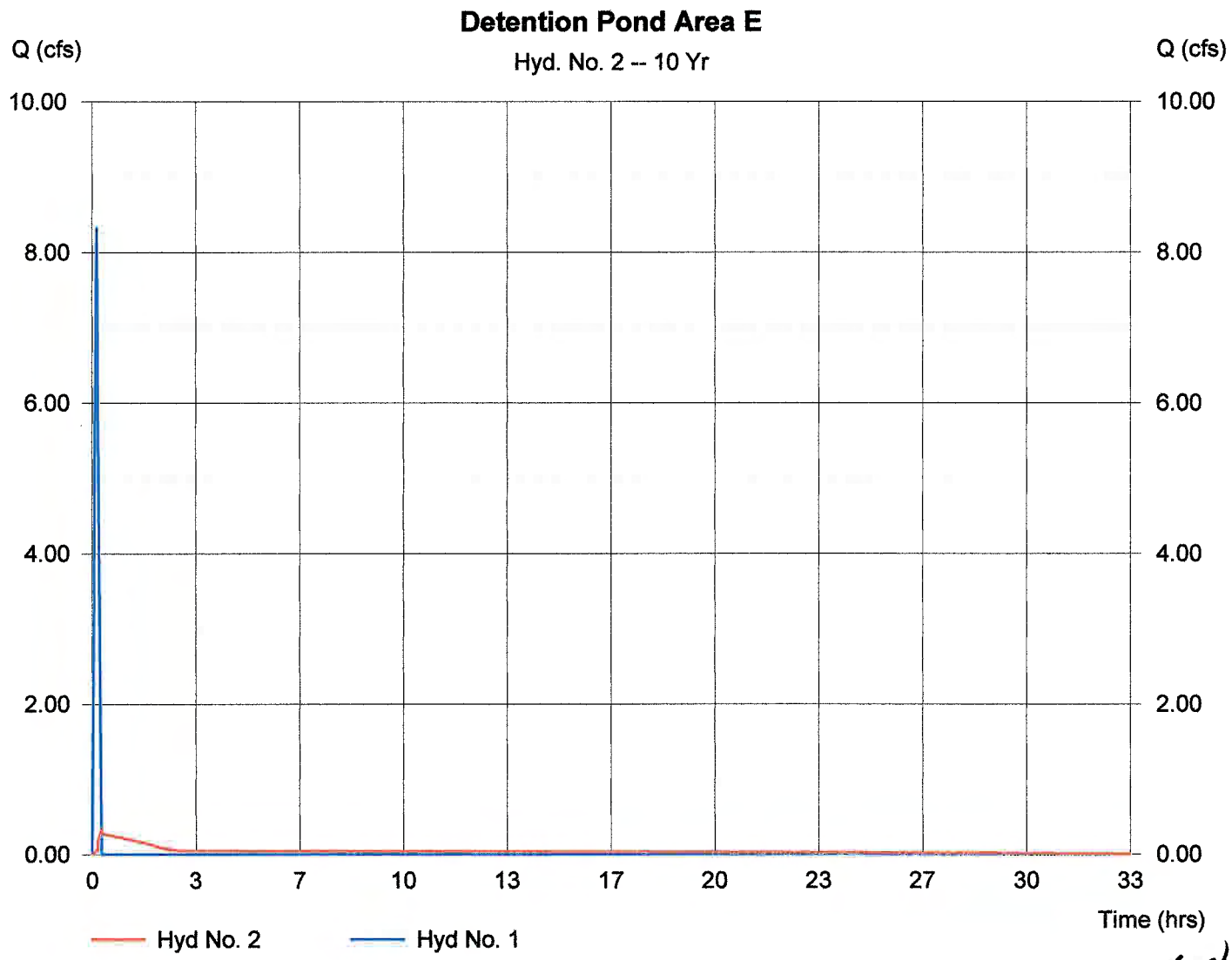
Hydraflow Hydrographs by Intelisolve | Thursday, Aug 3 2006, 3:20 PM

Hyd. No. 2

Detention Pond Area E

Hydrograph type	= Reservoir	Peak discharge	= 0.34 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Inflow hyd. No.	= 1	Max. Elevation	= 268.02 ft
Reservoir name	= Detention Pond Area E	Max. Storage	= 4,373 cuft

Storage Indication method used. | Hydrograph Volume = 4,485 cuft



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Pond Report

Hydraflow Hydrographs by Intelisolve — Thursday, Aug 3 2006, 3:20 PM

Pond No. 1 - Detention Pond Area E

Pond Data

Bottom LxW = 30.0 x 20.0 ft Side slope = 2.0:1 Bottom elev. = 264.00 ft Depth = 5.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	264.00	600	0	0
0.25	264.25	651	156	156
0.50	264.50	704	169	326
0.75	264.75	759	183	508
1.00	265.00	816	197	705
1.25	265.25	875	211	917
1.50	265.50	936	226	1,143
1.75	265.75	999	242	1,385
2.00	266.00	1,064	258	1,643
2.25	266.25	1,131	274	1,917
2.50	266.50	1,200	291	2,208
2.75	266.75	1,271	309	2,517
3.00	267.00	1,344	327	2,844
3.25	267.25	1,419	345	3,189
3.50	267.50	1,496	364	3,554
3.75	267.75	1,575	384	3,937
4.00	268.00	1,656	404	4,341
4.25	268.25	1,739	424	4,766
4.50	268.50	1,824	445	5,211
4.75	268.75	1,911	467	5,678
5.00	269.00	2,000	489	6,167

Culvert / Orifice Structures

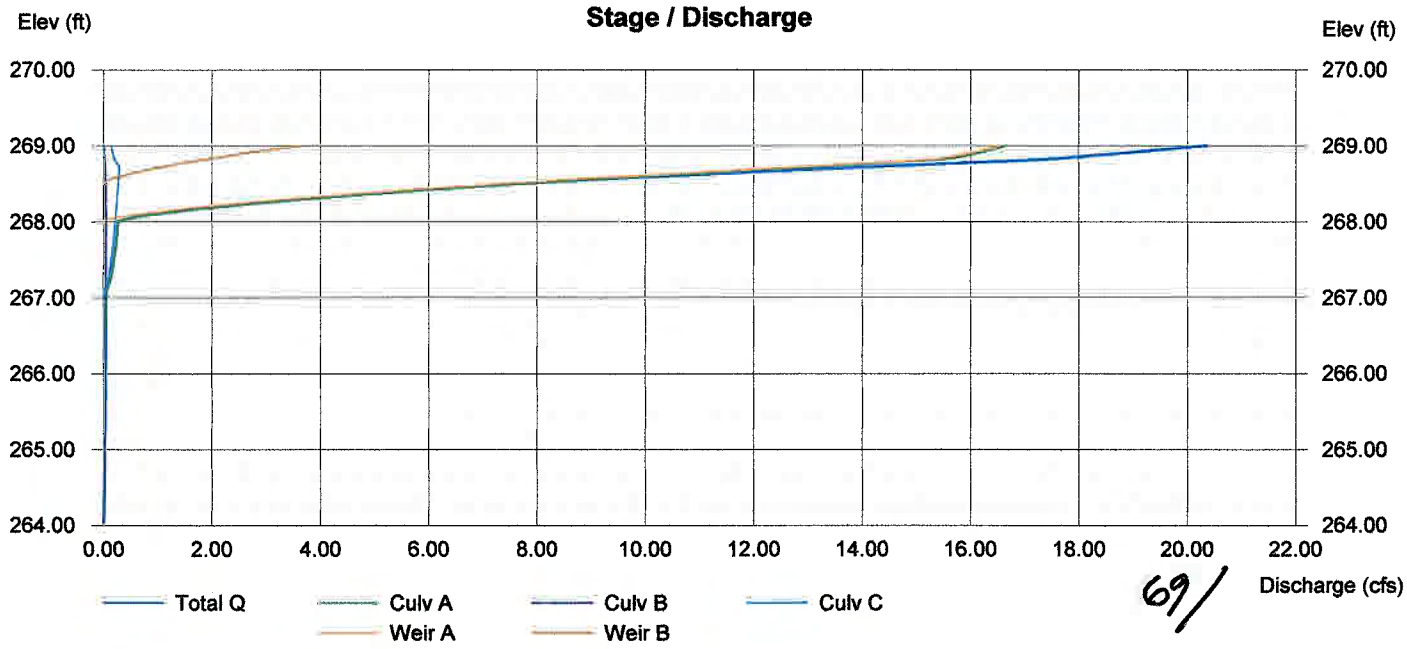
	[A]	[B]	[C]	[D]
Rise (in)	= 18.00	0.50	3.00	0.00
Span (in)	= 18.00	0.50	3.00	0.00
No. Barrels	= 1	4	1	0
Invert El. (ft)	= 264.00	264.00	267.00	0.00
Length (ft)	= 30.00	0.50	0.50	0.00
Slope (%)	= 20.00	0.00	0.00	0.00
N-Value	= .013	.013	.013	.013
Orif. Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.28	4.00	0.00	0.00
Crest El. (ft)	= 268.00	268.50	0.00	0.00
Weir Coeff.	= 3.33	2.60	0.00	0.00
Weir Type	= Riser	Broad	---	---
Multi-Stage	= Yes	No	No	No

Exfiltration = 0.000 in/hr (Wet area) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



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Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	Rational	11.46	1	9	6,190	---	------	------	Area D Post-Develpment
2	Reservoir	5.02	1	14	6,180	1	268.37	4,980	Detention Pond Area E

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SA03-130 Pond E.gpw	Return Period: 100 Year	Thursday, Aug 3 2006, 3:20 PM

Hydrograph Plot

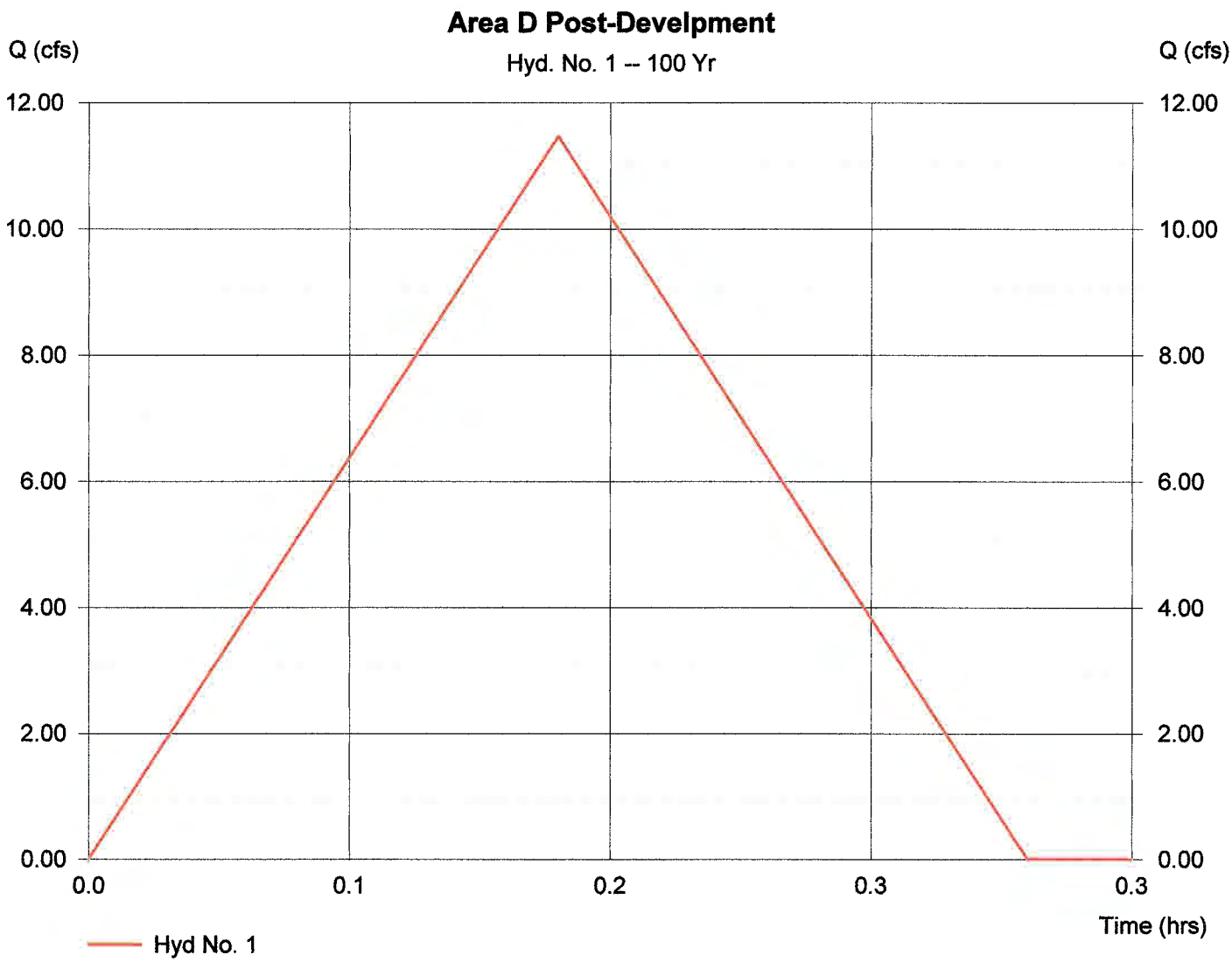
Hydraflow Hydrographs by Intelisolve | Thursday, Aug 3 2006, 3:20 PM

Hyd. No. 1

Area D Post-Develpment

Hydrograph type	= Rational	Peak discharge	= 11.46 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 3.460 ac	Runoff coeff.	= 0.58
Intensity	= 5.712 in/hr	Tc by User	= 9.00 min
IDF Curve	= SA03-190D.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 6,190 cuft



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Hydrograph Plot

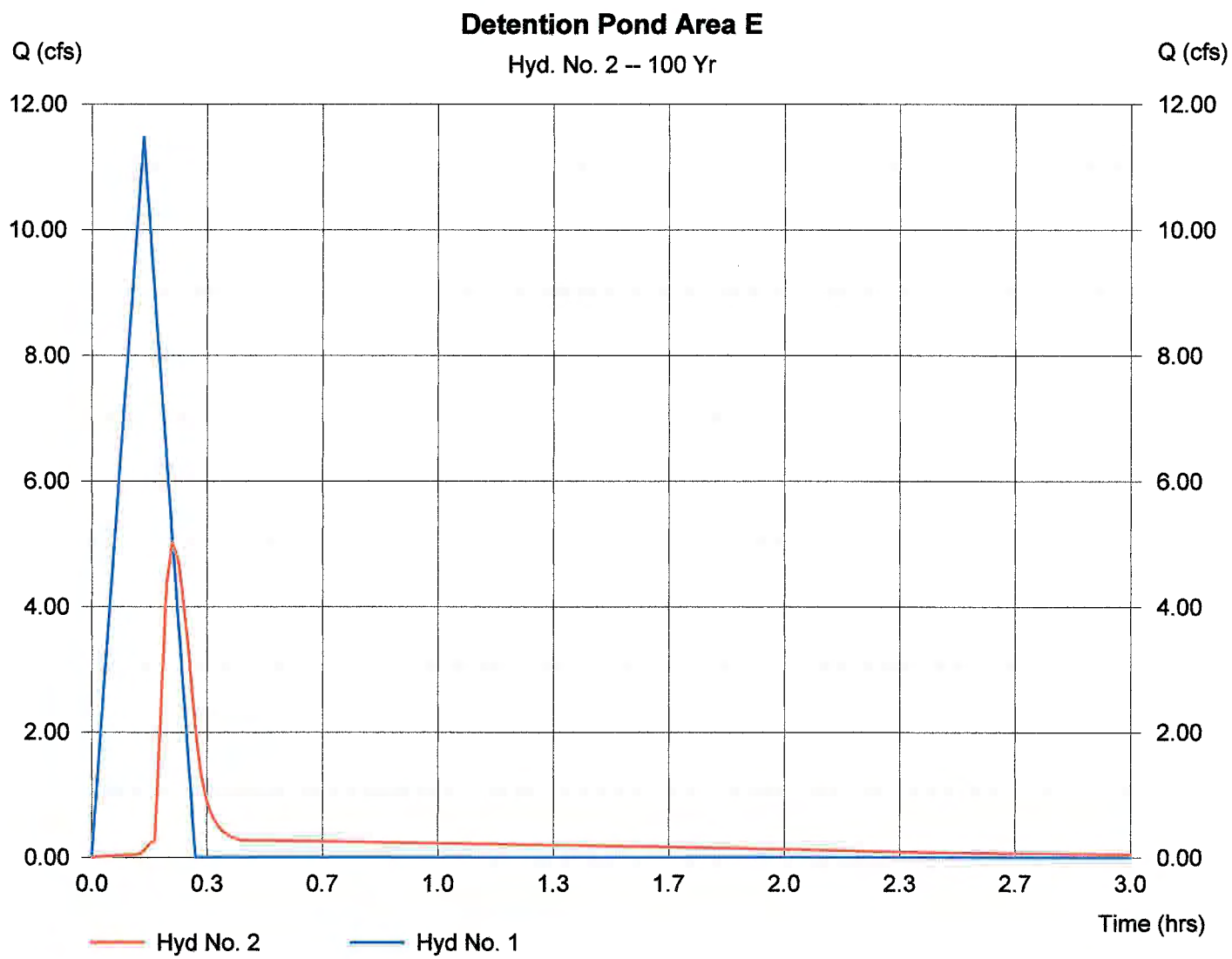
Hydraflow Hydrographs by Intelisolve | Thursday, Aug 3 2006, 3:20 PM

Hyd. No. 2

Detention Pond Area E

Hydrograph type	= Reservoir	Peak discharge	= 5.02 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Inflow hyd. No.	= 1	Max. Elevation	= 268.37 ft
Reservoir name	= Detention Pond Area E	Max. Storage	= 4,980 cuft

Storage Indication method used. | Hydrograph Volume = 6,180 cuft



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Pond Report

Hydraflow Hydrographs by Intelisolve — Thursday, Aug 3 2006, 3:20 PM

Pond No. 1 - Detention Pond Area E

Pond Data

Bottom LxW = 30.0 x 20.0 ft Side slope = 2.0:1 Bottom elev. = 264.00 ft Depth = 5.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	264.00	600	0	0
0.25	264.25	651	156	156
0.50	264.50	704	169	326
0.75	264.75	759	183	508
1.00	265.00	816	197	705
1.25	265.25	875	211	917
1.50	265.50	936	226	1,143
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4.00	268.00	1,656	404	4,341
4.25	268.25	1,739	424	4,766
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4.75	268.75	1,911	467	5,678
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Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
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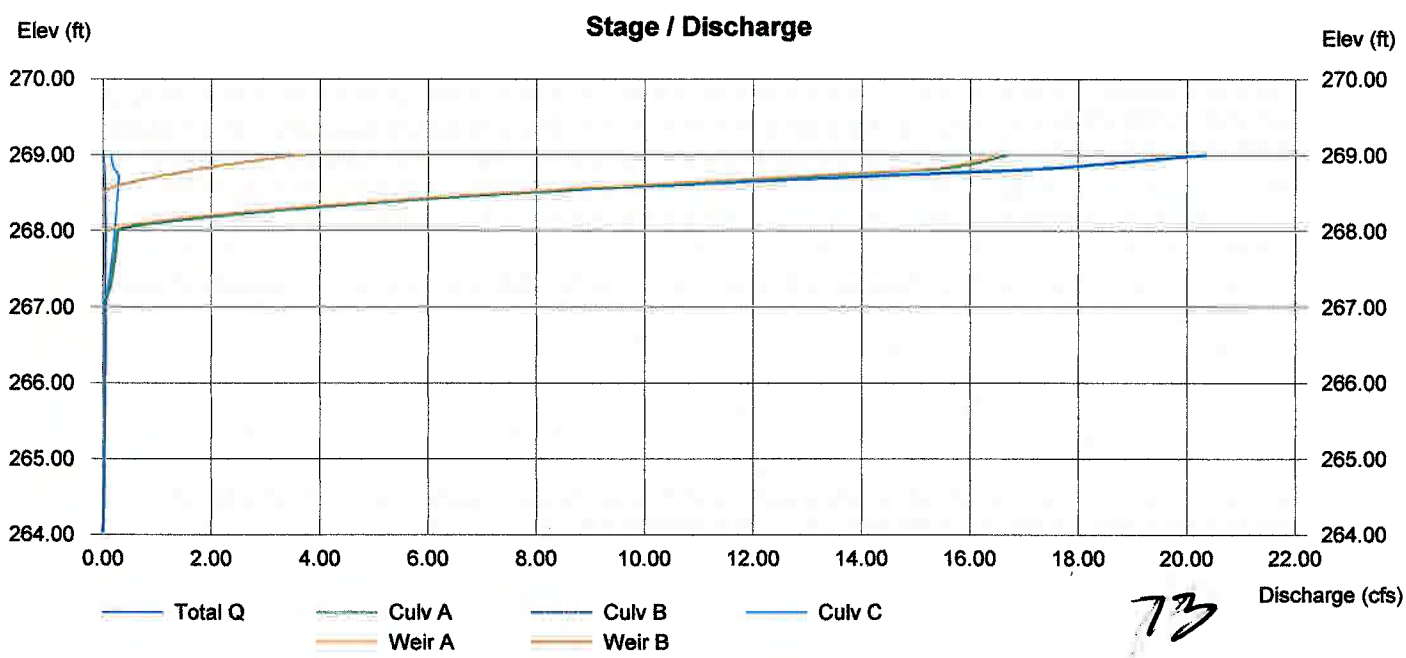
Span (in)	= 18.00	0.50	3.00	0.00
No. Barrels	= 1	4	1	0
Invert El. (ft)	= 264.00	264.00	267.00	0.00
Length (ft)	= 30.00	0.50	0.50	0.00
Slope (%)	= 20.00	0.00	0.00	0.00
N-Value	= .013	.013	.013	.013
Orif. Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.28	4.00	0.00	0.00
Crest El. (ft)	= 268.00	268.50	0.00	0.00
Weir Coeff.	= 3.33	2.60	0.00	0.00
Weir Type	= Riser	Broad	---	---
Multi-Stage	= Yes	No	No	No

Exfiltration = 0.000 in/hr (Wet area) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



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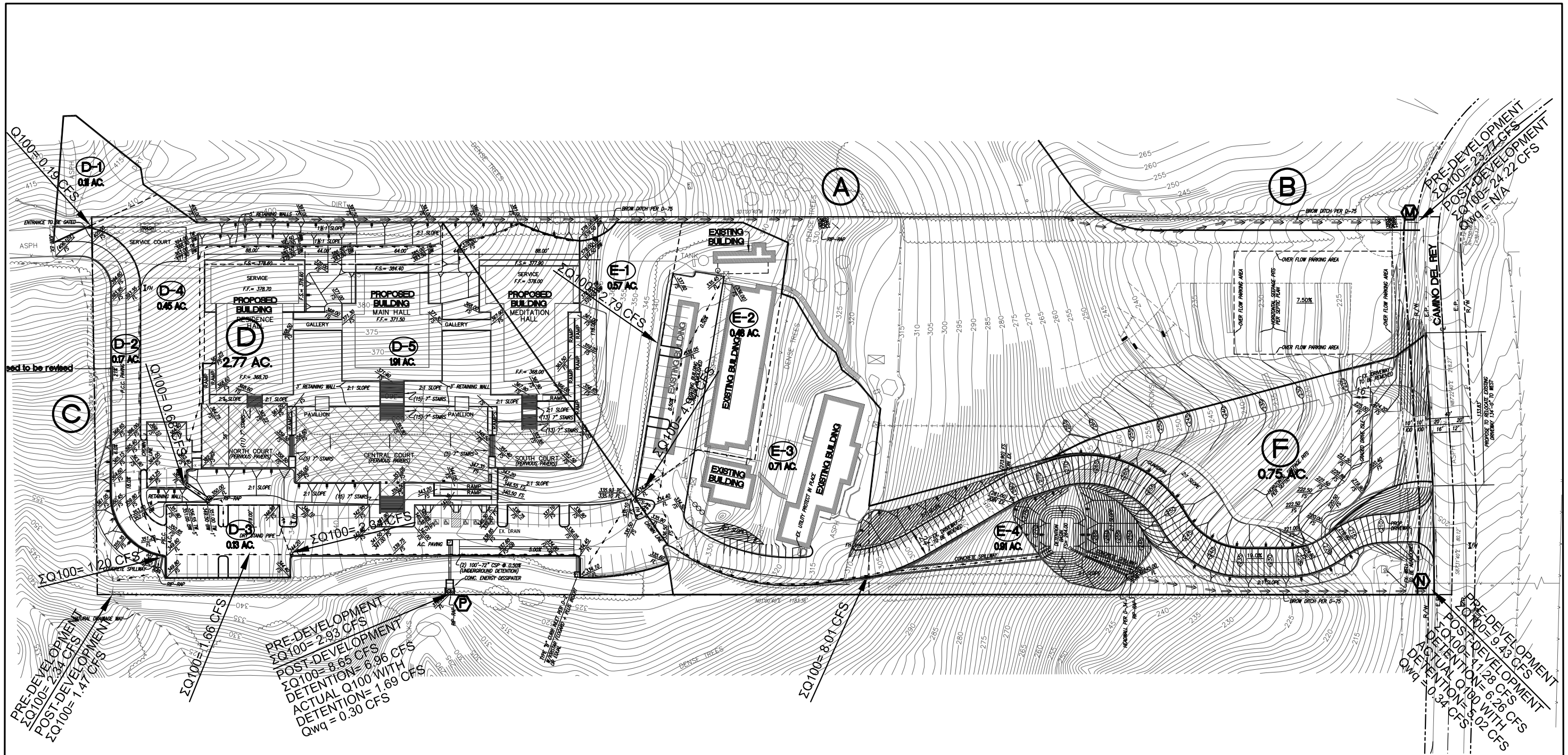
ATTACHMENT "A"

DRAINAGE AREA MAP



APPLICANT/OWNER

DAI DANG MEDITATION CENTER
6326 CAMINO DEL REY
BONSALL, CA 92003
(760) 945-5588

A.P.N. 127-460-14

NOTE:

THIS PLAN IS PROVIDED TO ALLOW FOR FULL AND ADEQUATE DISCRETIONARY REVIEW OF A PROPOSED DEVELOPMENT PROJECT. THE PROPERTY OWNER ACKNOWLEDGES THAT ACCEPTANCE OR APPROVAL OF THIS PLAN DOES NOT CONSTITUTE AN APPROVAL TO PERFORM ANY GRADING SHOWN HEREON, AND AGREES TO OBTAIN VALID GRADING PERMISSIONS BEFORE COMMENCING SUCH ACTIVITY.

COUNTY APPROVED CHANGES			
NO.		Approved by	Date

PERMITS	
REZONE PERMIT NO.	N/A
SPECIAL USE PERMIT NO.	N/A
TENTATIVE MAP NO.	N/A

BENCH MARK

DESCRIPTION:
RECORD FROM:
ELEVATION: DATUM:

PRIVATE CONTRACT

SHEET 1	COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC WORKS	1 SHEETS

DRAINAGE AREA MAP

DAI DANG MEDITATION CENTER

CALIFORNIA COORDINATE INDEX .

Approved DOUGLAS M. ISBELL
COUNTY ENGINEER
BY: DATE

ENGINEER OF WORK:
RICHARD W. HARTLEY R.C.E. 20934 EXP. 9/30/05

GRADING PERMIT NO.

ENGINEER'S NAME: SPEAR & ASSOCIATES, INC
PHONE NO. 1-760-736-2040

SPEAR & ASSOCIATES PROJECT NO. 03-190 DIF/JRZ

DRAINAGE AREA MAP