



CEQA PRELIMINARY DRAINAGE STUDY FOR OLDE HIGHWAY 80

Site Plan-Ortega Property

PDS2018-STP-98-031W1

15229 & 15247 Olde Highway 80

El Cajon, CA 92021

(APN 396-111-10 & 17)

Prepared for:

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July 21, 2022

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Declaration of Responsible Charge

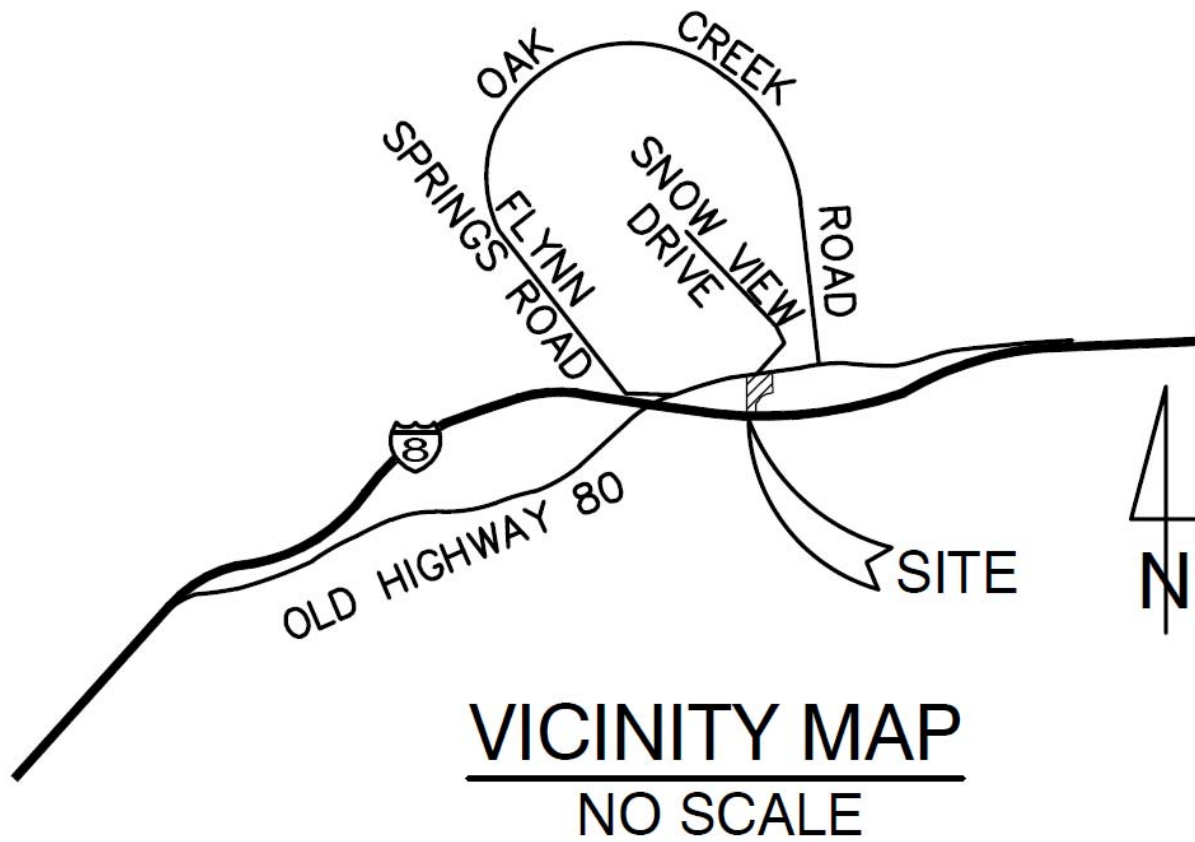
I, declare that I am the Civil Engineer of Work for this Drainage Study, that I have exercised responsible charge over the preparation of said study as defined in section 6703 of the Business and Professions Code, and that the recommendations are consistent with current standards.

I understand the check of this Drainage Study by the County of San Diego is confined to a review only and does not relieve me, as Engineer of Work, of my responsibilities.



Lawrence W. Walsh 7/22/22
LAWRENCE W. WALSH, RCE 46316, EXP. 12-31-22 Date

Vicinity Map



Introduction

The project is located at 15229 and 15247 Olde Highway 80, in the unincorporated portion of El Cajon, CA 92021 within San Diego County. The property consists of two parcels totaling 5.49 acres in size. One parcel is undeveloped while the other consists of an existing building and two portable office trailers. The owner proposes a warehouse, office building and pervious parking lot on the undeveloped parcel. The existing development on the easterly parcel is to remain. The Assessor Parcel Numbers for the site are 396-111-10 & 17. See Preliminary Grading Plan in Section A.

Hydrology Description

Pre-Developed Condition

The pre-developed project site is comprised of one drainage basin. The drainage basin is 2.0 acres in size and encompasses the project site and a small area on the eastern parcel. The drainage basin sheet flows westerly towards the western property line onto the neighboring property. The easterly parcel drains into existing storm drain inlets located throughout the site where runoff then flows south in an existing storm drain system into Los Coches Creek. The point of comparison (POC) for the project drainage basin is the span located across the western property line where runoff naturally sheets across. Los Coches Creek travels across the south side of the property and is inundated by the 100 year storm. The floodway limits can be seen on the Drainage Maps.

Post-Developed Condition

In the proposed condition, there will exist two drainage basins draining to the POC. Basin 1 will comprise of run on from the east, which will be captured in its own storm drain system. This system will bypass Basin 2 and confluence onto a rock layer at the POC. Basin 2 consists of the proposed building and porous parking lot. The proposed building will increase the amount of impervious area on the site and lead to an increase in runoff if left unmitigated. The 1.0 cfs increase in runoff will be mitigated by a stormwater/detention basin. Runoff from the proposed building will drain into the proposed porous pavement section, which will then be captured in a storm drain system and routed into a stormwater/detention basin on the west side of the property. In the basin will contain 2 overflow catch basins which will convey runoff to the POC once the water surface elevation reaches the 100 year water surface. Once the detention basin reaches the 100 year water surface elevation, runoff will enter a pair of overflow catch basins, which will outlet across a 6" layer of 2" rock via a series of 3" pipes evenly spaced

out before sheeting onto the neighboring property to mimic the existing condition. According to the subsequent pages, runoff exiting the site's velocity will be reduced from 2 fps to 0.5 fps due to the proposed rock layer at the west edge of the site. See Drainage Map in Section B. The covered storage area will not affect this project's drainage analysis because prior to its construction exists a layer of AC pavement to remain. Therefore, there is no addition to impervious area and said area will not be analyzed in this report. For stormwater information regarding this project, see associated SWQMP. The volume detained by the detention basin is adequately sized to reduce the peak 100-year flow rate to less than pre-developed levels. The project will remain outside of the 100 year floodway. These limits can be seen in the Drainage Maps and were outlined based on the County flood plain maps. The water surface elevations were converted from the NGVD 29 datum over to the NAVD 88 datum and outlined based on the topography of the existing conditions. The project does not propose any changes to the floodway.

Hydrology Methodology

The hydrologic analysis is done to assess the impact of the proposed building and porous parking lot on the existing drainage patterns and any increase to runoff that will require mitigation. The projects major drainage basins are divided into minor sub basins based on changes in grade, conveyance geometry and run-off coefficients along the drainage paths. The projects estimated storm runoff for the existing and developed condition is analyzed using a computer application of the County of San Diego Flood Control District's Hydrology Manual (2003). This program also includes the necessary retardation/detention basin routines required to analyze the detention basin and mitigate any increase in runoff. The application is offered by CivilDesign® Corporation.

Tabulated Q₁₀₀ Hydrologic Computational Results

100-Year Existing Condition

The below table summarizes the pre-developed runoff at key points. The full computer output files is titled "16921oldehighway80pre" and found in Appendix C.

Nodes	Description	Effective C	Tc (min.)	I (in/hr)	Area (ac)	Velocity (ft/s)	Q _{peak} (cfs)
1.011 to 1.022	Basin 1 to POC	0.363	5.66	7.055	1.95	2	5.0

100-Year Developed Condition

The below table summarizes the post-developed runoff at key points. The full computer output file is titled “16921OldeHighway80Post” and is found in Appendix D.

Unmitigated Developed Condition

Nodes	Description	Effective C	Tc (min.)	I (in/hr)	Area (ac)	Velocity (ft/s)	Q _{peak} (cfs)
1.011 to 1.023	Basin 1	0.85	4.46	7.641	0.25	6	1.6
2.011 to 2.024	Basin 2	0.85	8.83	5.293	1.7	5	6.0
1.023 & 2.024	Confluence at POC	0.85	8.83	5.293	1.95	-	6.0

Detention Analysis

The volume to be detained in order to reduce post-developed flow rates to pre-developed levels is calculated using the “Detention Storage Computation Procedure, Single Hydrograph Form” as outlined in the 2003 County of San Diego Hydrology Manual. It was calculated that 508 cubic feet would need to be detained in the proposed detention basin to match pre-developed levels. This will be the minimum volume of the proposed detention basin. The detention storage calculation and hydrograph for the detention basin can be seen in Section E.

*Mitigated Developed Condition **

Mitigation required (cfs)	Q _{in} (cfs)	Q _{out} (cfs)	Time to peak (min)	Velocity (fps)	V _d (cf)	Q _{peak} (cfs max)
2	6.0	4.9	9.4	7	508	4.9

*See calculation in subsequent pages.

Conclusion

With the increase in impervious surface (building roofs and hardscape) the post-development 100 year peak flowrate of 6.0 cfs has increased compared to the pre-development peak 100 year flowrate of 5.0 cfs. This increase will be mitigated with a detention basin. The detention basin will have 0.1 ac-ft of detention. The peak flowrate at the POC will be reduced from 6.0 cfs to 4.9 cfs which provides 1.1 cfs of mitigation. The 100 year peak flowrate in the post-developed condition is less than the pre-developed condition, providing compliance with the CEQA policy. The project will not alter existing drainage patterns. The proposed building will remain outside of the 100 year floodway and the finished floor will be higher than

one foot above the flood plain. The proposed project will not impede or redirect flood flows during the 100 year storm.

For CEQA purposes, the following information is provided in this study for project review and approval of the Site Plan.

Q: Will the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?

A: No. The overall existing drainage patterns will be maintained, no alterations to streams or rivers will occur and no increase in off-site erosion or siltation will be caused by this project. In addition, the project proposes a rock layer at the west of the property which will provide mitigation.

Q: Will the project substantially alter the existing drainage pattern of the site or area including through the alteration of 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?

A: No. The overall existing drainage patterns will be maintained. No alterations to streams or rivers will occur and the rate or amount of runoff will not increase. Furthermore, a detention basin is proposed to provide mitigation.

Q: Will the project create or contribute runoff water which will exceed the capacity of existing or planned storm water drainage systems?

A: No. The project will not create or contribute runoff water which will exceed the capacity of existing or planned storm water drainage systems. Storm drain facilities are adequately sized to convey the 100-year storm.

Q: Will the project place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map, including County Floodplain Maps?

A: No. The project does not propose to place housing within a 100-year flood hazard area. Storm drain facilities are adequately sized to convey the 100-year storm.

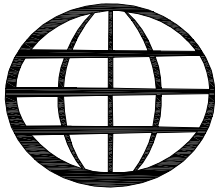
Q: Will the project place within a 100-year flood hazard area structures which would impede or redirect flood flows?

A: No. The proposed project will not place structures within a 100-year flood hazard area that would impede or redirect flood flows.

Q: Will the project expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam on-site or off-site?

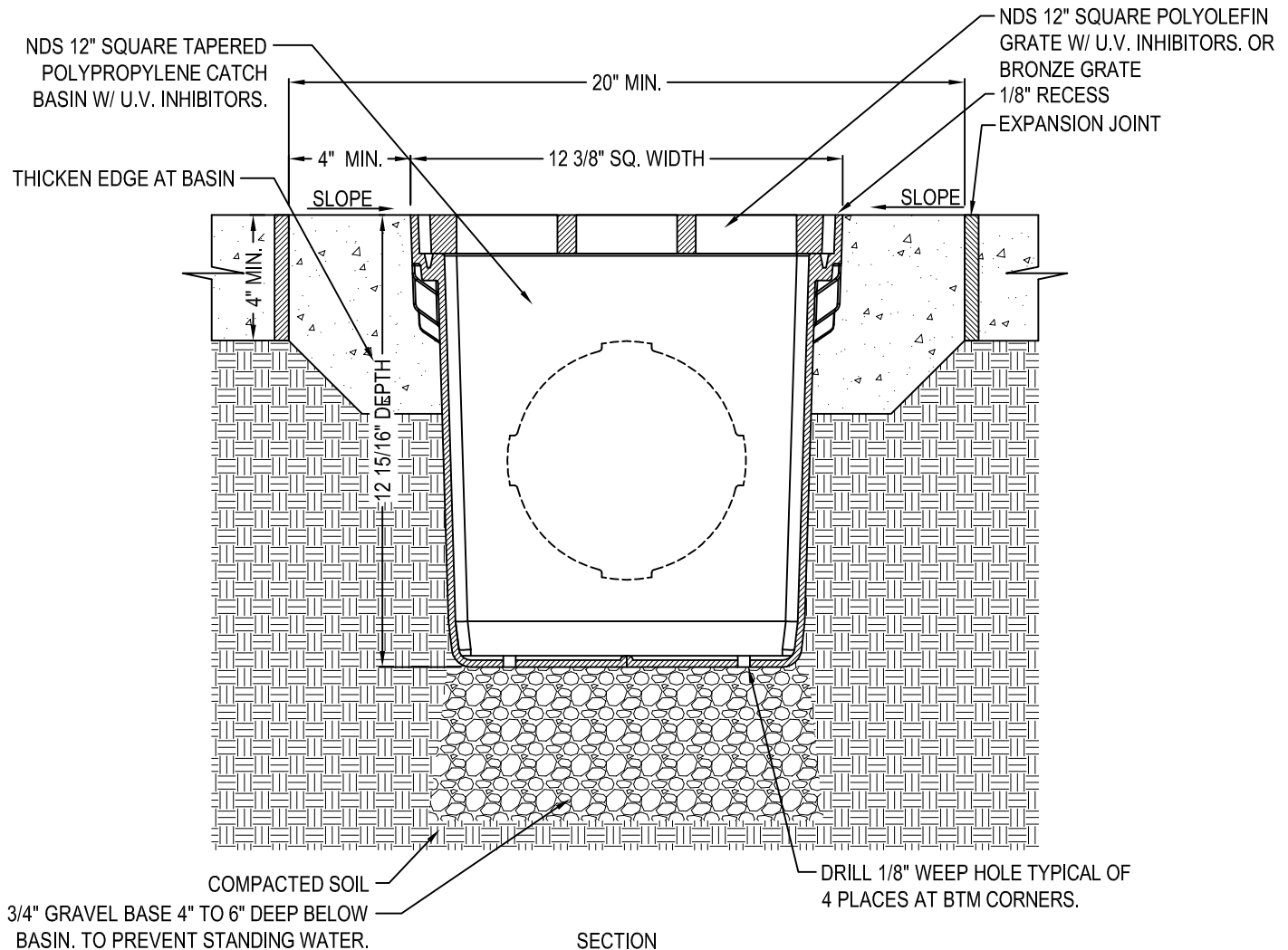
A: No. The project will not expose people or structures to a significant risk of loss, injury or death involving flooding as a result of failure of Dam(s) or levee(s).

Appendix A – Preliminary Grading Plan



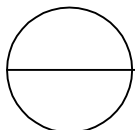
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LINDSAY, CA 93247
TOLL FREE: 1-800-726-1994
PHONE: (559) 562-9888
FAX: (559) 562-4488
www.ndspro.com



NOTES:

1. GRATE TO BE ATTACHED TO CATCH BASIN WITH SCREW PROVIDED AT TIME OF INSTALLATION.
2. BRONZE GRATE TO BE USED IN PEDESTRIAN TRAFFIC APPLICATION ONLY.
3. DO NOT USE OVER 5 RISERS WITH CATCH BASIN.
4. INSTALLATION TO BE COMPLETED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.
5. DO NOT SCALE DRAWING.
6. THIS DRAWING IS INTENDED FOR USE BY ARCHITECTS, ENGINEERS, CONTRACTORS, CONSULTANTS AND DESIGN PROFESSIONALS FOR PLANNING PURPOSES ONLY.
7. ALL INFORMATION CONTAINED HEREIN WAS CURRENT AT THE TIME OF DEVELOPMENT BUT MUST BE REVIEWED AND APPROVED BY THE PRODUCT MANUFACTURER TO BE CONSIDERED ACCURATE.



SQUARE CATCH BASIN

12" SQUARE CATCH BASIN - TYPICAL INSTALLATION FOR PEDESTRIAN & LIGHT VEHICULAR TRAFFIC APPLICATION LOAD CASE A & B



Appendix A – Preliminary Grading Plan

PRELIMINARY GRADING PLAN

EASEMENT NOTES:

EASEMENTS PLOTTED PER PRELIMINARY REPORT PREPARED BY STEWART TITLE COMPANY AS ORDER NO. 18000480408 DATED 03/20/18.

100' HIGHWAY EASEMENT PER DOCUMENT RECORDED 01/29/1932 BOOK 85, PAGE 194 OF OFFICIAL RECORDS.

EASEMENT FOR PUBLIC ROAD PURPOSES PER DOCUMENT RECORDED 01/22/1912 IN BOOK 505, PAGE 373 OF DEEDS - NOT PLOTTABLE.

EASEMENT FOR PUBLIC ROAD PURPOSES PER DOCUMENT RECORDED 02/24/1916 IN BOOK 702, PAGE 373 OF DEEDS - NOT PLOTTABLE.

EASEMENT FOR CABLE TELEVISION PURPOSES DOC. NO. 1984-444187 RECORDED 11/28/1984 - NOT PLOTTABLE.

EASEMENT FOR ELECTRICAL SERVICE PURPOSES PER DOC. NO. 2007-0449585 RECORDED 07/05/2007 - NOT PLOTTABLE.

EASEMENT FOR PUBLIC UTILITIES PER DOCUMENT RECORDED 12/12/1929 IN BOOK 1713 PAGE 366 OF DEEDS - NOT PLOTTABLE.

SDG&E EASEMENT FOR PUBLIC UTILITIES PER DOC. NO. 2011-0221395 RECORDED 04/28/2011 - NOT PLOTTABLE.

GRADING:

CUT= 0 C.Y.
FILL= 10,000 C.Y.
IMPORT= 10,000 C.Y.
EXPORT= 0 C.Y.

LEGEND:

- PROPERTY BOUNDARY
- EXISTING CONTOUR
- EXISTING PCC
- EXISTING AC PAVEMENT
- PROPOSED POROUS PAVEMENT
- PROPOSED PCC
- EXISTING 6" PVC STORM DRAIN PIPE
- EXISTING 2' BY 2' CATCH BASIN
- EXISTING LIGHT
- EXISTING POWER POLE
- PROPOSED STORM DRAIN PIPE
- PROPOSED TYPE G CATCH BASIN PER RSD D-08
- PROPOSED 2' X 2' CATCH BASIN
- PROPOSED ROCK/GRAVEL
- PROPOSED VERTIBLOCK WALL
- PROPOSED RETAINING WALL
- BUILDING SETBACK
- EXISTING OVERHEAD LINE

NOTES:

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 PERMISSION BEFORE COMMENCING SUCH ACTIVITY.

* 100 YEAR WSEL (WATER SURFACE ELEVATION) ADJUSTED 2.1' TO CONVERT FROM THE NGVD 29 DATUM USED ON THE COUNTY OF SAN DIEGO FLOODPLAIN MAP 250-1815 TO THIS PLAN'S TOPOGRAPHY WHICH USES THE NAVD 88 DATUM. 100 YEAR FLOODWAY LIMITS ON THIS PLAN CORRESPOND TO THE EXISTING TOPOGRAPHY.

ASSESSOR PARCEL NUMBERS:

396-111-10 & 17

TOPOGRAPHY:

TOPOGRAPHY PROVIDED BY PHOTOGEODETIC, INC.
DATE FLOWN: 02-15-18.

SITE ADDRESS:

15247 AND 15229 OLDE HIGHWAY 80
EL CAJON, CA 92021

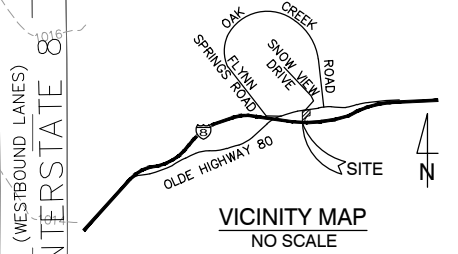
BASIS OF ELEVATIONS:

DESCRIPTION: 3" BRASS DISC IN WELL MONUMENT
STAMPED "RCE 1937"

LOCATION: 300 FEET SOUTHERLY OF CUL-DE-SAC ON MARINA SPRINGS LANE.

ELEVATION: 933.5 (NAVD 88)

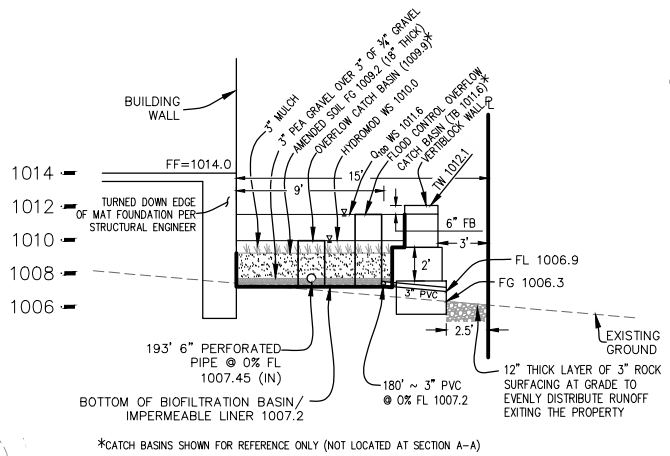
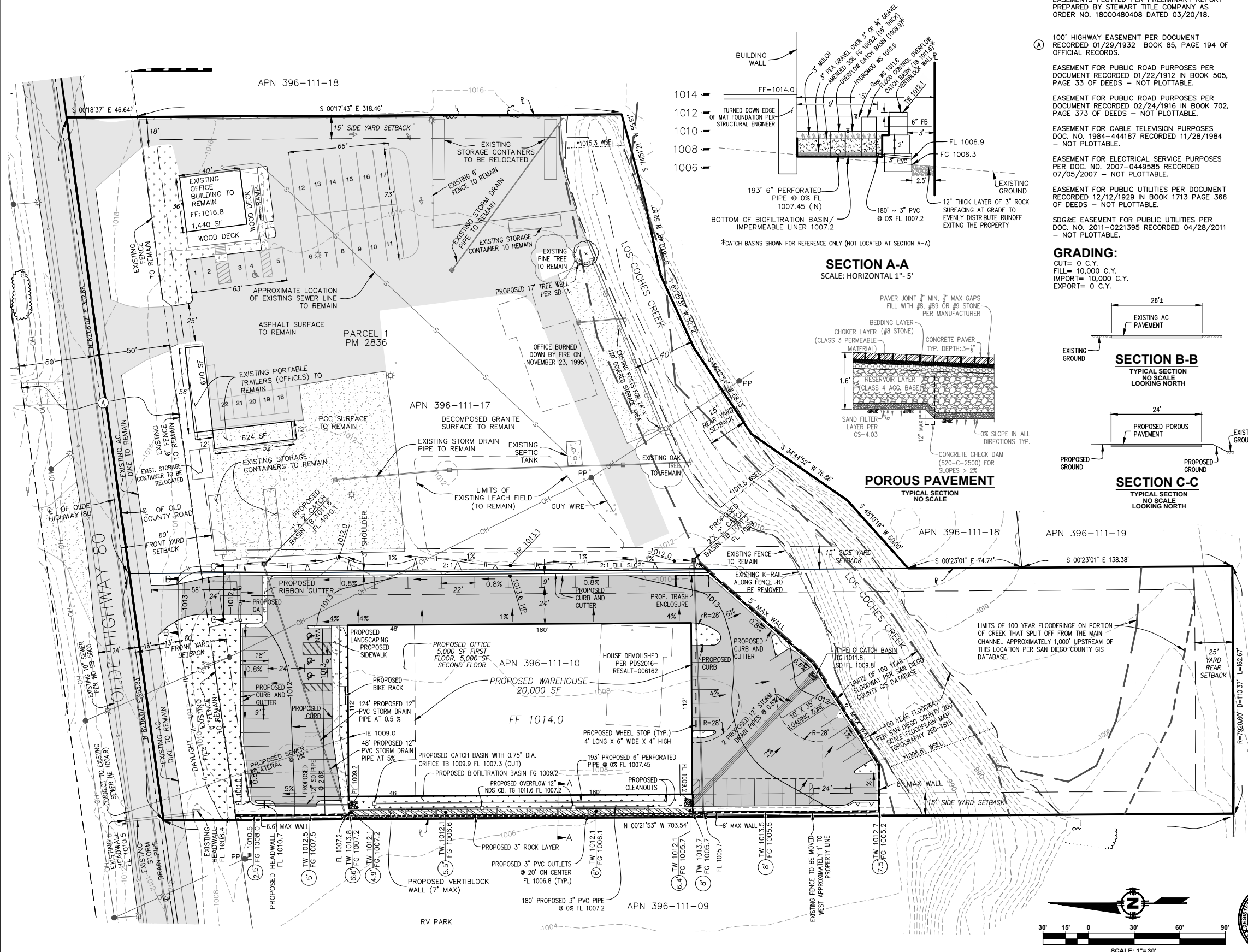
SOURCE: SAN DIEGO COUNTY VERTICAL CONTROL (ROS 17957)



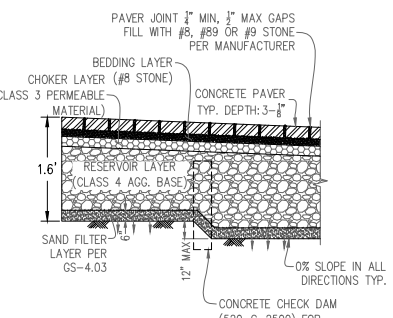
OWNER:

ARCHIE MAURICE ORTEGA DATE
TRUSTEE OF THE ORTEGA FAMILY TRUST DATED MARCH 1, 1988
10125 CHANNEL ROAD
LAKESIDE, CA 92040
(619) 719-8710

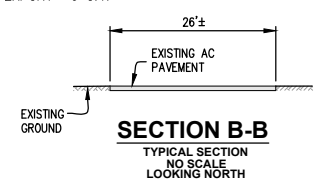
LAWRENCE W. WALSH DATE
Walsh Engineering & Surveying, Inc.
607 Aldwych Road, El Cajon, CA 92020
(619) 588-6747 (619) 792-1232 Fax



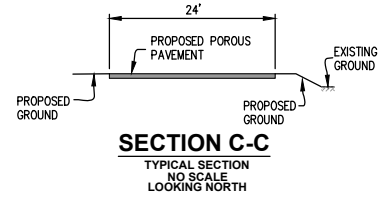
SECTION A-A
SCALE: HORIZONTAL 1"= 5'



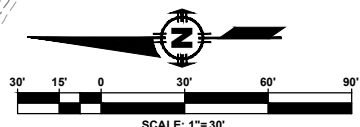
POROUS PAVEMENT
TYPICAL SECTION
NO SCALE



SECTION B-B
TYPICAL SECTION
NO SCALE
LOOKING NORTH



SECTION C-C
TYPICAL SECTION
NO SCALE
LOOKING NORTH



Appendix B – Drainage Maps

OLDE HIGHWAY 80

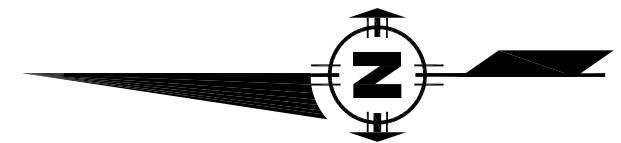
- ✓ **BASIN**
- ✓ **SUB BASIN**
- ✓ **NODE**

NODE 1.022
EL=1006

—**NODE ELEVATION**

LEGEND:

-
-  BASIN BOUNDARY
 SUB-BASIN BOUNDARY
 FLOWPATH (T_c)



A horizontal line representing a 150-foot survey. Above the line, tick marks are labeled 50', 25', 0, 50', 100', and 150'. Below the line, a black rectangular area is shown, starting from the 0 mark and extending to the 100' mark. The width of this black area is 50 feet, as indicated by a dimension line above it.

SCALE: 1"= 50'

AREA SUBJECT TO INUNDATION
BY THE 100 YEAR STORM

100 YEAR FLOODFRINGE
PER SAN DIEGO COUNTY 200-
SCALE FLOOD PLAIN MAP

EXISTING
OFFICE AND
DECK
TO REMAIN

COVERED STORAGE

1.011 /
EL: 1016.8

-SUB-BASIN 1-01
0.05 AC

1.021
EL: 1012.0

BASIN 1
1.95 AC

SUB-BASIN 1-02
1.90 AC

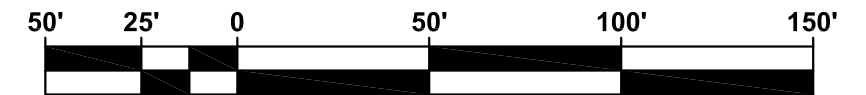
POC
1.022
EL: 1006.5

$Q_{100}=5$ CFS

OLD HIGHWAY 80

OLD HIGHWAY 80

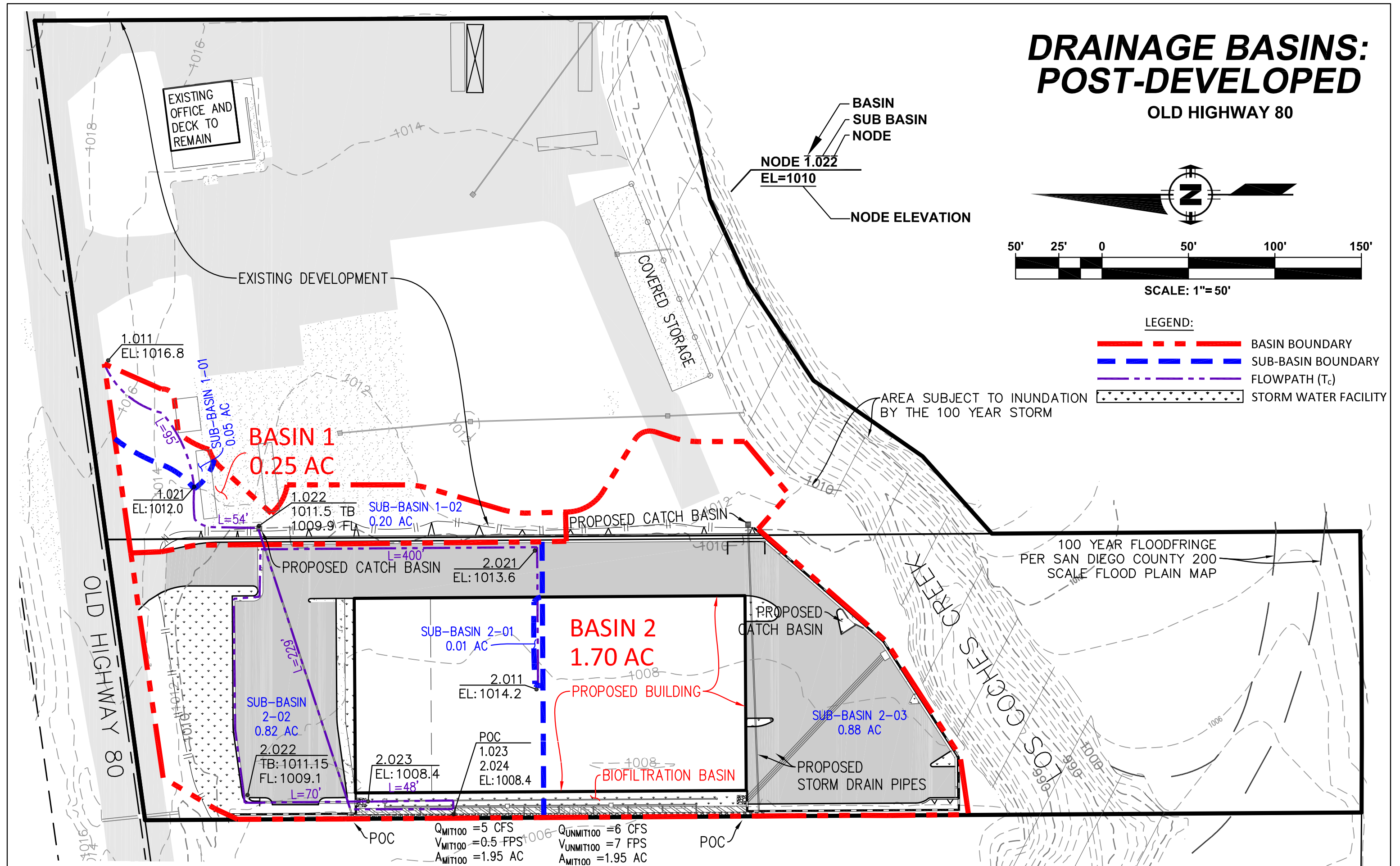
OLD HIGHWAY 80



SCALE: 1"= 50'

LEGEND:

- 



Appendix C – Pre-Developed Calculations

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2012 Version 7.9

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 04/13/21

***** Hydrology Study Control Information *****

Program License Serial Number 6326

Rational hydrology study storm event year is 100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour, precipitation(inches) = 2.900
24 hour precipitation(inches) = 6.300
P6/P24 = 46.0%
San Diego hydrology manual 'C' values used

+++++
Process from Point/Station 1.011 to Point/Station 1.021
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type]
(Limited Industrial)
Impervious value, Ai = 0.900
Sub-Area C Value = 0.850
Initial subarea total flow distance = 95.000(Ft.)
Highest elevation = 1016.800(Ft.)
Lowest elevation = 1012.000(Ft.)
Elevation difference = 4.800(Ft.) Slope = 5.053 %
Top of Initial Area Slope adjusted by User to 5.100 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of 5.10 %, in a development type of

Limited Industrial
 In Accordance With Table 3-2
 Initial Area Time of Concentration = 2.60 minutes
 (for slope value of 5.00 %)
 Calculated TC of 2.600 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
 Rainfall intensity (I) = 7.641(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
 Subarea runoff = 0.325(CFS)
 Total initial stream area = 0.050(Ac.)

+++++
 Process from Point/Station 1.021 to Point/Station 1.022
 ***** IRREGULAR CHANNEL FLOW TRAVEL TIME *****

Estimated mean flow rate at midpoint of channel = 2.702(CFS)
 Depth of flow = 0.200(Ft.), Average velocity = 1.357(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :
 Point number 'X' coordinate 'Y' coordinate
 1 0.00 1.00
 2 50.00 0.00
 3 100.00 1.00
 Manning's 'N' friction factor = 0.035

Sub-Channel flow = 2.703(CFS)
 ' ' flow top width = 19.956(Ft.)
 ' ' velocity = 1.357(Ft/s)
 ' ' area = 1.991(Sq.Ft)
 ' ' Froude number = 0.757

Upstream point elevation = 1012.000(Ft.)
 Downstream point elevation = 1006.500(Ft.)
 Flow length = 249.000(Ft.)
 Travel time = 3.06 min.
 Time of concentration = 5.66 min.
 Depth of flow = 0.200(Ft.)
 Average velocity = 1.357(Ft/s)
 Total irregular channel flow = 2.702(CFS)
 Irregular channel normal depth above invert elev. = 0.200(Ft.)
 Average velocity of channel(s) = 1.357(Ft/s)
 Adding area flow to channel
 Rainfall intensity (I) = 7.055(In/Hr) for a 100.0 year storm
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [UNDISTURBED NATURAL TERRAIN]
 (Permanent Open Space)
 Impervious value, Ai = 0.000
 Sub-Area C Value = 0.350
 Rainfall intensity = 7.055(In/Hr) for a 100.0 year storm

Effective runoff coefficient used for total area
(Q=KCIA) is $C = 0.363$ $CA = 0.707$
Subarea runoff = $4.667(\text{CFS})$ for $1.900(\text{Ac.})$
Total runoff = $4.992(\text{CFS})$ Total area = $1.950(\text{Ac.})$
Depth of flow = $0.251(\text{Ft.})$, Average velocity = $1.582(\text{Ft/s})$
End of computations, total study area = $1.950 (\text{Ac.})$

169210ldeHighway80Post

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2012 Version 7.9

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 04/13/21

Olde Highway 80
Drainage Study
Post-Developed

***** Hydrology Study Control Information *****

Program License Serial Number 6326

Rational hydrology study storm event year is 100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour, precipitation(inches) = 2.900
24 hour precipitation(inches) = 6.300
P6/P24 = 46.0%
San Diego hydrology manual 'C' values used

+++++
Process from Point/Station 1.011 to Point/Station 1.021
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type]
(Limited Industrial)
Impervious value, Ai = 0.900
Sub-Area C Value = 0.850
Initial subarea total flow distance = 95.000(Ft.)
Highest elevation = 1016.800(Ft.)
Lowest elevation = 1012.000(Ft.)
Elevation difference = 4.800(Ft.) Slope = 5.053 %
Top of Initial Area Slope adjusted by User to 5.100 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of 5.10 %, in a development type of
Limited Industrial
In Accordance With Table 3-2
Initial Area Time of Concentration = 2.60 minutes
(for slope value of 5.00 %)
Calculated TC of 2.600 minutes is less than 5 minutes,
resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) = 7.641(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff = 0.325(CFS)
Total initial stream area = 0.050(Ac.)

169210ldeHighway80Post

++++++
 Process from Point/Station 1.021 to Point/Station 1.022
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

 Estimated mean flow rate at midpoint of channel = 0.974(CFS)
 Depth of flow = 0.160(Ft.), Average velocity = 0.759(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :
 Point number 'X' coordinate 'Y' coordinate
 1 0.00 1.00
 2 50.00 0.00
 3 100.00 1.00
 Manning's 'N' friction factor = 0.035

Sub-Channel flow = 0.974(CFS)
 flow top width = 16.021(Ft.)
 velocity = 0.759(Ft/s)
 area = 1.283(Sq.Ft)
 Froude number = 0.473

Upstream point elevation = 1012.000(Ft.)
 Downstream point elevation = 1011.500(Ft.)
 Flow length = 54.000(Ft.)
 Travel time = 1.19 min.
 Time of concentration = 3.79 min.
 Depth of flow = 0.160(Ft.)
 Average velocity = 0.759(Ft/s)
 Total irregular channel flow = 0.974(CFS)
 Irregular channel normal depth above invert elev. = 0.160(Ft.)
 Average velocity of channel(s) = 0.759(Ft/s)
 Adding area flow to channel
 Calculated TC of 3.786 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
 Rainfall intensity (I) = 7.641(In/Hr) for a 100.0 year storm
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [INDUSTRIAL area type]
 (Limited Industrial)
 Impervious value, Ai = 0.900
 Sub-Area C Value = 0.850
 Rainfall intensity = 7.641(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.850 CA = 0.213
 Subarea runoff = 1.299(CFS) for 0.200(Ac.)
 Total runoff = 1.624(CFS) Total area = 0.250(Ac.)
 Depth of flow = 0.194(Ft.), Average velocity = 0.862(Ft/s)

++++++
 Process from Point/Station 1.022 to Point/Station 1.023
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

 Upstream point/station elevation = 1009.900(Ft.)
 Downstream point/station elevation = 1005.400(Ft.)
 Pipe length = 229.00(Ft.) Slope = 0.0197 Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 1.624(CFS)
 Nearest computed pipe diameter = 9.00(In.)
 Calculated individual pipe flow = 1.624(CFS)

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Normal flow depth in pipe = 5.55(In.)
Flow top width inside pipe = 8.75(In.)
Critical Depth = 7.03(In.)
Pipe flow velocity = 5.68(Ft/s)
Travel time through pipe = 0.67 min.
Time of concentration (TC) = 4.46 min.

+++++
Process from Point/Station 1.023 to Point/Station 2.024
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1
Stream flow area = 0.250(Ac.)
Runoff from this stream = 1.624(CFS)
Time of concentration = 4.46 min.
Rainfall intensity = 7.641(In/Hr)
Program is now starting with Main Stream No. 2

+++++
Process from Point/Station 2.011 to Point/Station 2.021
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type]
(Limited Industrial)
Impervious value, Ai = 0.900
Sub-Area C Value = 0.850
Initial subarea total flow distance = 60.000(Ft.)
Highest elevation = 1014.200(Ft.)
Lowest elevation = 1013.600(Ft.)
Elevation difference = 0.600(Ft.) Slope = 1.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 60.00 (Ft)
for the top area slope value of 1.00 %, in a development type of
Limited Industrial
In Accordance With Table 3-2
Initial Area Time of Concentration = 3.70 minutes
(for slope value of 1.00 %)
Calculated TC of 3.700 minutes is less than 5 minutes,
resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) = 7.641(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff = 0.065(CFS)
Total initial stream area = 0.010(Ac.)

+++++
Process from Point/Station 2.021 to Point/Station 2.022
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 1013.600(Ft.)
Downstream point elevation = 1011.650(Ft.)
Channel length thru subarea = 400.000(Ft.)
Channel base width = 0.000(Ft.)
Slope or 'Z' of left channel bank = 1.000
Slope or 'Z' of right channel bank = 100.000
Estimated mean flow rate at midpoint of channel = 1.273(CFS)

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Manning's 'N' = 0.015
 Maximum depth of channel = 0.500(Ft.)
 Flow(q) thru subarea = 1.273(CFS)
 Depth of flow = 0.145(Ft.), Average velocity = 1.199(Ft/s)
 Channel flow top width = 14.642(Ft.)
 Flow Velocity = 1.20(Ft/s)
 Travel time = 5.56 min.
 Time of concentration = 9.26 min.
 Critical depth = 0.132(Ft.)
 Adding area flow to channel
 Rainfall intensity (I) = 5.135(In/Hr) for a 100.0 year storm
 User specified 'C' value of 0.570 given for subarea
 Rainfall intensity = 5.135(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.573 CA = 0.470
 Subarea runoff = 2.349(CFS) for 0.810(Ac.)
 Total runoff = 2.414(CFS) Total area = 0.820(Ac.)
 Depth of flow = 0.184(Ft.), Average velocity = 1.407(Ft/s)
 Critical depth = 0.170(Ft.)

+++++
 Process from Point/Station 2.022 to Point/Station 2.023
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1011.500(Ft.)
 Downstream point/station elevation = 1009.200(Ft.)
 Pipe length = 60.00(Ft.) Slope = 0.0383 Manning's N = 0.015
 No. of pipes = 1 Required pipe flow = 2.414(CFS)
 Nearest computed pipe diameter = 9.00(In.)
 Calculated individual pipe flow = 2.414(CFS)
 Normal flow depth in pipe = 6.43(In.)
 Flow top width inside pipe = 8.13(In.)
 Critical Depth = 8.23(In.)
 Pipe flow velocity = 7.15(Ft/s)
 Travel time through pipe = 0.14 min.
 Time of concentration (TC) = 9.40 min.

+++++
 Process from Point/Station 2.023 to Point/Station 2.023
 **** SUBAREA FLOW ADDITION ****

Rainfall intensity (I) = 5.085(In/Hr) for a 100.0 year storm
 User specified 'C' value of 0.570 given for subarea
 Time of concentration = 9.40 min.
 Rainfall intensity = 5.085(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.572 CA = 0.972
 Subarea runoff = 2.528(CFS) for 0.880(Ac.)
 Total runoff = 4.942(CFS) Total area = 1.700(Ac.)

+++++
 Process from Point/Station 2.024 to Point/Station 2.024
 **** 6 HOUR HYDROGRAPH ****

+++++
 Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003

Time of Concentration = 9.40
 Basin Area = 1.95 Acres

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 6 Hour Rainfall = 2.900 Inches
 Runoff Coefficient = 0.498
 Peak Discharge = 4.94 CFS

Time (Min)	Discharge (CFS)
0	0.000
9	0.166
18	0.171
27	0.174
36	0.180
45	0.184
54	0.191
63	0.195
72	0.203
81	0.208
90	0.218
99	0.223
108	0.235
117	0.242
126	0.257
135	0.266
144	0.285
153	0.296
162	0.322
171	0.337
180	0.373
189	0.396
198	0.454
207	0.492
216	0.602
225	0.685
234	1.006
243	1.418
252	4.942
261	0.807
270	0.540
279	0.423
288	0.354
297	0.308
306	0.275
315	0.249
324	0.229
333	0.213
342	0.199
351	0.187
360	0.177
369	0.168

UNDETAINED
Q100 TO BASIN

+++++
 6 - H O U R S T O R M
 R u n o f f H y d r o g r a p h

 Hydrograph in 1 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	1.2	2.5	3.7	4.9
0+ 0	0.0000	0.00	Q				
0+ 1	0.0000	0.02	Q				
0+ 2	0.0001	0.04	Q				
0+ 3	0.0002	0.06	Q				
0+ 4	0.0003	0.07	Q				
0+ 5	0.0004	0.09	Q				
0+ 6	0.0005	0.11	Q				
0+ 7	0.0007	0.13	VQ				

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0+ 8	0.0009	0.15	VQ
0+ 9	0.0011	0.17	VQ
0+10	0.0014	0.17	VQ
0+11	0.0016	0.17	VQ
0+12	0.0018	0.17	VQ
0+13	0.0021	0.17	VQ
0+14	0.0023	0.17	VQ
0+15	0.0025	0.17	VQ
0+16	0.0028	0.17	VQ
0+17	0.0030	0.17	VQ
0+18	0.0032	0.17	VQ
0+19	0.0035	0.17	VQ
0+20	0.0037	0.17	VQ
0+21	0.0039	0.17	VQ
0+22	0.0042	0.17	VQ
0+23	0.0044	0.17	VQ
0+24	0.0047	0.17	VQ
0+25	0.0049	0.17	VQ
0+26	0.0051	0.17	VQ
0+27	0.0054	0.17	VQ
0+28	0.0056	0.17	VQ
0+29	0.0059	0.18	Q
0+30	0.0061	0.18	Q
0+31	0.0063	0.18	Q
0+32	0.0066	0.18	Q
0+33	0.0068	0.18	Q
0+34	0.0071	0.18	Q
0+35	0.0073	0.18	Q
0+36	0.0076	0.18	Q
0+37	0.0078	0.18	Q
0+38	0.0081	0.18	Q
0+39	0.0083	0.18	Q
0+40	0.0086	0.18	Q
0+41	0.0088	0.18	Q
0+42	0.0091	0.18	Q
0+43	0.0093	0.18	Q
0+44	0.0096	0.18	Q
0+45	0.0098	0.18	Q
0+46	0.0101	0.18	Q
0+47	0.0104	0.19	Q
0+48	0.0106	0.19	Q
0+49	0.0109	0.19	Q
0+50	0.0111	0.19	Q
0+51	0.0114	0.19	Q
0+52	0.0116	0.19	QV
0+53	0.0119	0.19	QV
0+54	0.0122	0.19	QV
0+55	0.0124	0.19	QV
0+56	0.0127	0.19	QV
0+57	0.0130	0.19	QV
0+58	0.0132	0.19	QV
0+59	0.0135	0.19	QV
1+ 0	0.0138	0.19	QV
1+ 1	0.0140	0.19	QV
1+ 2	0.0143	0.19	QV
1+ 3	0.0146	0.19	QV
1+ 4	0.0148	0.20	QV
1+ 5	0.0151	0.20	QV
1+ 6	0.0154	0.20	QV
1+ 7	0.0157	0.20	QV
1+ 8	0.0159	0.20	QV
1+ 9	0.0162	0.20	QV
1+10	0.0165	0.20	QV

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1+11	0.0168	0.20	QV			
1+12	0.0170	0.20	QV			
1+13	0.0173	0.20	QV			
1+14	0.0176	0.20	Q V			
1+15	0.0179	0.20	Q V			
1+16	0.0182	0.21	Q V			
1+17	0.0185	0.21	Q V			
1+18	0.0187	0.21	Q V			
1+19	0.0190	0.21	Q V			
1+20	0.0193	0.21	Q V			
1+21	0.0196	0.21	Q V			
1+22	0.0199	0.21	Q V			
1+23	0.0202	0.21	Q V			
1+24	0.0205	0.21	Q V			
1+25	0.0208	0.21	Q V			
1+26	0.0210	0.21	Q V			
1+27	0.0213	0.21	Q V			
1+28	0.0216	0.22	Q V			
1+29	0.0219	0.22	Q V			
1+30	0.0222	0.22	Q V			
1+31	0.0225	0.22	Q V			
1+32	0.0228	0.22	Q V			
1+33	0.0231	0.22	Q V			
1+34	0.0234	0.22	Q V			
1+35	0.0238	0.22	Q V			
1+36	0.0241	0.22	Q V			
1+37	0.0244	0.22	Q V			
1+38	0.0247	0.22	Q V			
1+39	0.0250	0.22	Q V			
1+40	0.0253	0.22	Q V			
1+41	0.0256	0.23	Q V			
1+42	0.0259	0.23	Q V			
1+43	0.0262	0.23	Q V			
1+44	0.0265	0.23	Q V			
1+45	0.0269	0.23	Q V			
1+46	0.0272	0.23	Q V			
1+47	0.0275	0.23	Q V			
1+48	0.0278	0.24	Q V			
1+49	0.0282	0.24	Q V			
1+50	0.0285	0.24	Q V			
1+51	0.0288	0.24	Q V			
1+52	0.0291	0.24	Q V			
1+53	0.0295	0.24	Q V			
1+54	0.0298	0.24	Q V			
1+55	0.0301	0.24	Q V			
1+56	0.0305	0.24	Q V			
1+57	0.0308	0.24	Q V			
1+58	0.0311	0.24	Q V			
1+59	0.0315	0.25	Q V			
2+ 0	0.0318	0.25	Q V			
2+ 1	0.0322	0.25	Q V			
2+ 2	0.0325	0.25	Q V			
2+ 3	0.0328	0.25	Q V			
2+ 4	0.0332	0.25	Q V			
2+ 5	0.0335	0.26	Q V			
2+ 6	0.0339	0.26	Q V			
2+ 7	0.0343	0.26	Q V			
2+ 8	0.0346	0.26	Q V			
2+ 9	0.0350	0.26	Q V			
2+10	0.0353	0.26	Q V			
2+11	0.0357	0.26	Q V			
2+12	0.0361	0.26	Q V			
2+13	0.0364	0.26	Q V			

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2+14	0.0368	0.26	Q	V			
2+15	0.0371	0.27	Q	V			
2+16	0.0375	0.27	Q	V			
2+17	0.0379	0.27	Q	V			
2+18	0.0383	0.27	Q	V			
2+19	0.0386	0.27	Q	V			
2+20	0.0390	0.28	Q	V			
2+21	0.0394	0.28	Q	V			
2+22	0.0398	0.28	Q	V			
2+23	0.0402	0.28	Q	V			
2+24	0.0406	0.28	Q	V			
2+25	0.0410	0.29	Q	V			
2+26	0.0414	0.29	Q	V			
2+27	0.0418	0.29	Q	V			
2+28	0.0422	0.29	Q	V			
2+29	0.0426	0.29	Q	V			
2+30	0.0430	0.29	Q	V			
2+31	0.0434	0.29	Q	V			
2+32	0.0438	0.29	Q	V			
2+33	0.0442	0.30	Q	V			
2+34	0.0446	0.30	Q	V			
2+35	0.0450	0.30	Q	V			
2+36	0.0454	0.30	Q	V			
2+37	0.0458	0.31	Q	V			
2+38	0.0463	0.31	Q	V			
2+39	0.0467	0.31	Q	V			
2+40	0.0471	0.32	Q	V			
2+41	0.0476	0.32	Q	V			
2+42	0.0480	0.32	Q	V			
2+43	0.0485	0.32	Q	V			
2+44	0.0489	0.32	Q	V			
2+45	0.0494	0.33	Q	V			
2+46	0.0498	0.33	Q	V			
2+47	0.0503	0.33	Q	V			
2+48	0.0507	0.33	Q	V			
2+49	0.0512	0.33	Q	V			
2+50	0.0517	0.34	Q	V			
2+51	0.0521	0.34	Q	V			
2+52	0.0526	0.34	Q	V			
2+53	0.0531	0.34	Q	V			
2+54	0.0535	0.35	Q	V			
2+55	0.0540	0.35	Q	V			
2+56	0.0545	0.36	Q	V			
2+57	0.0550	0.36	Q	V			
2+58	0.0555	0.37	Q	V			
2+59	0.0560	0.37	Q	V			
3+ 0	0.0565	0.37	Q	V			
3+ 1	0.0571	0.38	Q	V			
3+ 2	0.0576	0.38	Q	V			
3+ 3	0.0581	0.38	Q	V			
3+ 4	0.0586	0.38	Q	V			
3+ 5	0.0592	0.39	Q	V			
3+ 6	0.0597	0.39	Q	V			
3+ 7	0.0602	0.39	Q	V			
3+ 8	0.0608	0.39	Q	V			
3+ 9	0.0613	0.40	Q	V			
3+10	0.0619	0.40	Q	V			
3+11	0.0624	0.41	Q	V			
3+12	0.0630	0.42	Q	V			
3+13	0.0636	0.42	Q	V			
3+14	0.0642	0.43	Q	V			
3+15	0.0648	0.43	Q	V			
3+16	0.0654	0.44	Q	V			

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3+17	0.0660	0.45	Q	V				
3+18	0.0666	0.45	Q	V				
3+19	0.0673	0.46	Q	V				
3+20	0.0679	0.46	Q	V				
3+21	0.0686	0.47	Q	V				
3+22	0.0692	0.47	Q	V				
3+23	0.0699	0.48	Q	V				
3+24	0.0705	0.48	Q	V				
3+25	0.0712	0.48	Q	V				
3+26	0.0719	0.49	Q	V				
3+27	0.0725	0.49	Q	V				
3+28	0.0732	0.50	Q	V				
3+29	0.0739	0.52	Q	V				
3+30	0.0747	0.53	Q	V				
3+31	0.0754	0.54	Q	V				
3+32	0.0762	0.55	Q	V				
3+33	0.0770	0.57	Q	V				
3+34	0.0777	0.58	Q	V				
3+35	0.0786	0.59	Q	V				
3+36	0.0794	0.60	Q	V				
3+37	0.0802	0.61	Q	V				
3+38	0.0811	0.62	Q	V				
3+39	0.0820	0.63	Q	V				
3+40	0.0828	0.64	Q	V				
3+41	0.0837	0.65	Q	V				
3+42	0.0846	0.66	Q	V				
3+43	0.0855	0.67	Q	V				
3+44	0.0865	0.68	Q	V				
3+45	0.0874	0.69	Q	V				
3+46	0.0884	0.72	Q	V				
3+47	0.0895	0.76	Q	V				
3+48	0.0905	0.79	Q	V				
3+49	0.0917	0.83	Q	V				
3+50	0.0929	0.86	Q	V				
3+51	0.0941	0.90	Q	V				
3+52	0.0954	0.94	Q	V				
3+53	0.0967	0.97	Q	V				
3+54	0.0981	1.01	Q	V				
3+55	0.0996	1.05	Q	V				
3+56	0.1011	1.10	Q	V				
3+57	0.1027	1.14	Q	V				
3+58	0.1043	1.19	Q	V				
3+59	0.1060	1.23	Q	V				
4+ 0	0.1078	1.28	Q	V				
4+ 1	0.1096	1.33	Q	V				
4+ 2	0.1115	1.37	Q	V				
4+ 3	0.1134	1.42	Q	V				
4+ 4	0.1159	1.81		Q				
4+ 5	0.1190	2.20		Q				
4+ 6	0.1225	2.59		Q				
4+ 7	0.1266	2.98		Q				
4+ 8	0.1313	3.38		Q				
4+ 9	0.1365	3.77		Q				
4+10	0.1422	4.16		Q				
4+11	0.1485	4.55		Q				
4+12	0.1553	4.94		Q				
4+13	0.1615	4.48		Q				
4+14	0.1670	4.02		Q				
4+15	0.1719	3.56		Q				
4+16	0.1762	3.10		Q				
4+17	0.1798	2.64		Q				
4+18	0.1828	2.19		Q				
4+19	0.1852	1.73		Q				

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4+20	0.1870	1.27		Q	V
4+21	0.1881	0.81		Q	V
4+22	0.1891	0.78		Q	V
4+23	0.1902	0.75		Q	V
4+24	0.1912	0.72		Q	V
4+25	0.1921	0.69		Q	V
4+26	0.1930	0.66		Q	V
4+27	0.1939	0.63		Q	V
4+28	0.1947	0.60		Q	V
4+29	0.1955	0.57		Q	V
4+30	0.1962	0.54		Q	V
4+31	0.1970	0.53		Q	V
4+32	0.1977	0.51		Q	V
4+33	0.1984	0.50		Q	V
4+34	0.1990	0.49		Q	V
4+35	0.1997	0.47		Q	V
4+36	0.2003	0.46		Q	V
4+37	0.2009	0.45		Q	V
4+38	0.2015	0.44		Q	V
4+39	0.2021	0.42		Q	V
4+40	0.2027	0.41		Q	V
4+41	0.2033	0.41		Q	V
4+42	0.2038	0.40		Q	V
4+43	0.2043	0.39		Q	V
4+44	0.2049	0.38		Q	V
4+45	0.2054	0.38		Q	V
4+46	0.2059	0.37		Q	V
4+47	0.2064	0.36		Q	V
4+48	0.2069	0.35		Q	V
4+49	0.2074	0.35		Q	V
4+50	0.2078	0.34		Q	V
4+51	0.2083	0.34		Q	V
4+52	0.2088	0.33		Q	V
4+53	0.2092	0.33		Q	V
4+54	0.2097	0.32		Q	V
4+55	0.2101	0.32		Q	V
4+56	0.2105	0.31		Q	V
4+57	0.2110	0.31		Q	V
4+58	0.2114	0.30		Q	V
4+59	0.2118	0.30		Q	V
5+ 0	0.2122	0.30		Q	V
5+ 1	0.2126	0.29		Q	V
5+ 2	0.2130	0.29		Q	V
5+ 3	0.2134	0.29		Q	V
5+ 4	0.2138	0.28		Q	V
5+ 5	0.2142	0.28		Q	V
5+ 6	0.2146	0.27		Q	V
5+ 7	0.2149	0.27		Q	V
5+ 8	0.2153	0.27		Q	V
5+ 9	0.2157	0.27		Q	V
5+10	0.2160	0.26		Q	V
5+11	0.2164	0.26		Q	V
5+12	0.2167	0.26		Q	V
5+13	0.2171	0.26		Q	V
5+14	0.2174	0.25		Q	V
5+15	0.2178	0.25		Q	V
5+16	0.2181	0.25		Q	V
5+17	0.2185	0.24		Q	V
5+18	0.2188	0.24		Q	V
5+19	0.2191	0.24		Q	V
5+20	0.2195	0.24		Q	V
5+21	0.2198	0.24		Q	V
5+22	0.2201	0.23		Q	V

169210ldeHighway80Post

5+23	0.2204	0.23	Q				V
5+24	0.2207	0.23	Q				V
5+25	0.2210	0.23	Q				V
5+26	0.2214	0.23	Q				V
5+27	0.2217	0.22	Q				V
5+28	0.2220	0.22	Q				V
5+29	0.2223	0.22	Q				V
5+30	0.2226	0.22	Q				V
5+31	0.2229	0.22	Q				V
5+32	0.2232	0.21	Q				V
5+33	0.2235	0.21	Q				V
5+34	0.2238	0.21	Q				V
5+35	0.2240	0.21	Q				V
5+36	0.2243	0.21	Q				V
5+37	0.2246	0.21	Q				V
5+38	0.2249	0.21	Q				V
5+39	0.2252	0.20	Q				V
5+40	0.2255	0.20	Q				V
5+41	0.2257	0.20	Q				V
5+42	0.2260	0.20	Q				V
5+43	0.2263	0.20	Q				V
5+44	0.2266	0.20	Q				V
5+45	0.2268	0.20	Q				V
5+46	0.2271	0.19	Q				V
5+47	0.2274	0.19	Q				V
5+48	0.2276	0.19	Q				V
5+49	0.2279	0.19	Q				V
5+50	0.2281	0.19	Q				V
5+51	0.2284	0.19	Q				V
5+52	0.2287	0.19	Q				V
5+53	0.2289	0.19	Q				V
5+54	0.2292	0.18	Q				V
5+55	0.2294	0.18	Q				V
5+56	0.2297	0.18	Q				V
5+57	0.2299	0.18	Q				V
5+58	0.2302	0.18	Q				V
5+59	0.2304	0.18	Q				V
6+ 0	0.2306	0.18	Q				V
6+ 1	0.2309	0.18	Q				V
6+ 2	0.2311	0.18	Q				V
6+ 3	0.2314	0.17	Q				V
6+ 4	0.2316	0.17	Q				V
6+ 5	0.2318	0.17	Q				V
6+ 6	0.2321	0.17	Q				V
6+ 7	0.2323	0.17	Q				V
6+ 8	0.2326	0.17	Q				V
6+ 9	0.2328	0.17	Q				V

+++++
 Process from Point/Station 2.024 to Point/Station 1.023
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 1.700(Ac.)
 Runoff from this stream = 4.942(CFS)
 Time of concentration = 9.40 min.

169210ldeHighway80Post
Rainfall intensity = 5.085(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
------------	-----------------	----------	----------------------------

1	1.624	4.46	7.641
2	4.942	9.40	5.085

Qmax(1) =

$$\begin{array}{rcl} 1.000 * & 1.000 * & 1.624) + \\ 1.000 * & 0.474 * & 4.942) + = \end{array} \quad 3.967$$

Qmax(2) =

$$\begin{array}{rcl} 0.666 * & 1.000 * & 1.624) + \\ 1.000 * & 1.000 * & 4.942) + = \end{array} \quad 6.023$$

Total of 2 main streams to confluence:

Flow rates before confluence point:

1.624 4.942

Maximum flow rates at confluence using above data:

3.967 6.023

Area of streams before confluence:

0.250 1.700

Results of confluence:

Total flow rate = 6.023(CFS)

Time of concentration = 9.400 min.

Effective stream area after confluence = 1.950(Ac.)

End of computations, total study area = 1.950 (Ac.)

UNMITIGATED
Q100 TO POC

Appendix E – Detention Calculations

16921old80det

FLOOD HYDROGRAPH ROUTING PROGRAM
Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2012
Study date: 05/13/22

Olde Highway 80
Hydrograph

Program License Serial Number 6326

***** HYDROGRAPH INFORMATION *****
From study/file name: 16921oldehighway80post.rte
*****HYDROGRAPH DATA*****
Number of intervals = 368
Time interval = 1.0 (Min.)
Maximum/Peak flow rate = 7.648 (CFS)
Total volume = 0.343 (Ac.Ft)
Status of hydrographs being held in storage
Stream 1 Stream 2 Stream 3 Stream 4 Stream 5
Peak (CFS) 0.000 0.000 0.000 0.000 0.000
Vol (Ac.Ft) 0.000 0.000 0.000 0.000 0.000

+++++
Process from Point/Station 2.023 to Point/Station 2.024
**** RETARDING BASIN ROUTING ****

User entry of depth-outflow-storage data

Total number of inflow hydrograph intervals = 368
Hydrograph time unit = 1.000 (Min.)
Initial depth in storage basin = 0.50(Ft.)

Initial basin depth = 0.50 (Ft.)
Initial basin storage = 0.02 (Ac.Ft)
Initial basin outflow = 1.19 (CFS)

Depth vs. Storage and Depth vs. Discharge data:

Basin Depth (Ft.)	Storage (Ac.Ft)	Outflow (CFS)	(S-0*dt/2) (Ac.Ft)	(S+0*dt/2) (Ac.Ft)
0.000	0.000	0.000	0.000	0.000
2.100	0.100	5.000	0.097	0.103
2.101	0.101	4.576	0.098	0.104

Hydrograph Detention Basin Routing

16921old80det

Graph values: 'I'= unit inflow; 'O'=outflow at time shown

Time (Hours)	Inflow (CFS)	Outflow (CFS)	Storage (Ac.Ft)	.0	1.9	3.82	5.74	7.65	Depth (Ft.)
0.017	0.03	1.07	0.021	I 0					0.45
0.033	0.06	1.00	0.020	I 0					0.42
0.050	0.09	0.94	0.019	I 0					0.40
0.067	0.13	0.89	0.018	I 0					0.37
0.083	0.16	0.84	0.017	I 0					0.35
0.100	0.19	0.79	0.016	I 0					0.33
0.117	0.22	0.75	0.015	I 0					0.32
0.133	0.25	0.72	0.014	I 0					0.30
0.150	0.25	0.69	0.014	IO					0.29
0.167	0.25	0.66	0.013	IO					0.28
0.183	0.25	0.63	0.013	IO					0.27
0.200	0.25	0.61	0.012	IO					0.25
0.217	0.25	0.58	0.012	IO					0.24
0.233	0.25	0.56	0.011	IO					0.24
0.250	0.25	0.54	0.011	IO					0.23
0.267	0.25	0.52	0.010	IO					0.22
0.283	0.25	0.50	0.010	IO					0.21
0.300	0.26	0.49	0.010	IO					0.20
0.317	0.26	0.47	0.009	O					0.20
0.333	0.26	0.46	0.009	O					0.19
0.350	0.26	0.44	0.009	O					0.19
0.367	0.26	0.43	0.009	O					0.18
0.383	0.26	0.42	0.008	O					0.18
0.400	0.26	0.41	0.008	O					0.17
0.417	0.26	0.40	0.008	O					0.17
0.433	0.26	0.39	0.008	O					0.16
0.450	0.26	0.38	0.008	O					0.16
0.467	0.26	0.37	0.007	O					0.16
0.483	0.26	0.37	0.007	O					0.15
0.500	0.26	0.36	0.007	O					0.15
0.517	0.27	0.35	0.007	O					0.15
0.533	0.27	0.35	0.007	O					0.15
0.550	0.27	0.34	0.007	O					0.14
0.567	0.27	0.34	0.007	O					0.14
0.583	0.27	0.33	0.007	O					0.14
0.600	0.27	0.33	0.007	O					0.14
0.617	0.27	0.33	0.007	O					0.14
0.633	0.27	0.32	0.006	O					0.14
0.650	0.27	0.32	0.006	O					0.13
0.667	0.27	0.32	0.006	O					0.13
0.683	0.28	0.31	0.006	O					0.13
0.700	0.28	0.31	0.006	O					0.13
0.717	0.28	0.31	0.006	O					0.13
0.733	0.28	0.31	0.006	O					0.13
0.750	0.28	0.30	0.006	O					0.13
0.767	0.28	0.30	0.006	O					0.13
0.783	0.28	0.30	0.006	O					0.13
0.800	0.28	0.30	0.006	O					0.13
0.817	0.28	0.30	0.006	O					0.13
0.833	0.28	0.30	0.006	O					0.12
0.850	0.28	0.30	0.006	O					0.12
0.867	0.28	0.30	0.006	O					0.12
0.883	0.29	0.29	0.006	O					0.12
0.900	0.29	0.29	0.006	O					0.12
0.917	0.29	0.29	0.006	O					0.12
0.933	0.29	0.29	0.006	O					0.12
0.950	0.29	0.29	0.006	O					0.12
0.967	0.29	0.29	0.006	O					0.12

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0.983	0.29	0.29	0.006	0					0.12
1.000	0.29	0.29	0.006	0					0.12
1.017	0.29	0.29	0.006	0					0.12
1.033	0.29	0.29	0.006	0					0.12
1.050	0.29	0.29	0.006	0					0.12
1.067	0.29	0.29	0.006	0					0.12
1.083	0.30	0.29	0.006	0					0.12
1.100	0.30	0.29	0.006	0					0.12
1.117	0.30	0.29	0.006	0					0.12
1.133	0.30	0.29	0.006	0					0.12
1.150	0.30	0.29	0.006	0					0.12
1.167	0.30	0.30	0.006	0					0.12
1.183	0.31	0.30	0.006	0					0.12
1.200	0.31	0.30	0.006	0					0.12
1.217	0.31	0.30	0.006	0					0.12
1.233	0.31	0.30	0.006	0					0.13
1.250	0.31	0.30	0.006	0					0.13
1.267	0.31	0.30	0.006	0					0.13
1.283	0.31	0.30	0.006	0					0.13
1.300	0.31	0.30	0.006	0					0.13
1.317	0.31	0.30	0.006	0					0.13
1.333	0.31	0.30	0.006	0					0.13
1.350	0.31	0.30	0.006	0					0.13
1.367	0.32	0.30	0.006	0					0.13
1.383	0.32	0.30	0.006	0					0.13
1.400	0.32	0.31	0.006	0					0.13
1.417	0.32	0.31	0.006	0					0.13
1.433	0.32	0.31	0.006	0					0.13
1.450	0.32	0.31	0.006	0					0.13
1.467	0.33	0.31	0.006	0					0.13
1.483	0.33	0.31	0.006	0					0.13
1.500	0.33	0.31	0.006	0					0.13
1.517	0.33	0.31	0.006	0					0.13
1.533	0.33	0.31	0.006	0					0.13
1.550	0.33	0.32	0.006	0					0.13
1.567	0.33	0.32	0.006	0					0.13
1.583	0.33	0.32	0.006	0					0.13
1.600	0.33	0.32	0.006	0					0.13
1.617	0.34	0.32	0.006	0					0.13
1.633	0.34	0.32	0.006	0					0.13
1.650	0.34	0.32	0.006	0					0.14
1.667	0.34	0.32	0.006	0					0.14
1.683	0.34	0.32	0.006	0					0.14
1.700	0.35	0.33	0.007	0					0.14
1.717	0.35	0.33	0.007	0					0.14
1.733	0.35	0.33	0.007	0					0.14
1.750	0.35	0.33	0.007	0					0.14
1.767	0.35	0.33	0.007	0					0.14
1.783	0.35	0.33	0.007	0					0.14
1.800	0.35	0.33	0.007	0					0.14
1.817	0.36	0.34	0.007	0					0.14
1.833	0.36	0.34	0.007	0					0.14
1.850	0.36	0.34	0.007	0					0.14
1.867	0.36	0.34	0.007	0					0.14
1.883	0.36	0.34	0.007	0					0.14
1.900	0.36	0.34	0.007	0					0.14
1.917	0.37	0.34	0.007	0					0.14
1.933	0.37	0.35	0.007	0					0.15
1.950	0.37	0.35	0.007	0					0.15
1.967	0.37	0.35	0.007	0					0.15
1.983	0.38	0.35	0.007	0					0.15
2.000	0.38	0.35	0.007	0					0.15
2.017	0.38	0.35	0.007	0					0.15

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2.033	0.38	0.36	0.007	0					0.15
2.050	0.38	0.36	0.007	0					0.15
2.067	0.38	0.36	0.007	0					0.15
2.083	0.38	0.36	0.007	0					0.15
2.100	0.39	0.36	0.007	0					0.15
2.117	0.39	0.36	0.007	0					0.15
2.133	0.39	0.37	0.007	0					0.15
2.150	0.39	0.37	0.007	0					0.15
2.167	0.39	0.37	0.007	0					0.15
2.183	0.40	0.37	0.007	0					0.16
2.200	0.40	0.37	0.007	0					0.16
2.217	0.40	0.37	0.007	0					0.16
2.233	0.41	0.38	0.008	0					0.16
2.250	0.41	0.38	0.008	0					0.16
2.267	0.41	0.38	0.008	0					0.16
2.283	0.41	0.38	0.008	0					0.16
2.300	0.42	0.39	0.008	0					0.16
2.317	0.42	0.39	0.008	0					0.16
2.333	0.42	0.39	0.008	0					0.16
2.350	0.42	0.39	0.008	0					0.16
2.367	0.42	0.39	0.008	0					0.17
2.383	0.42	0.40	0.008	0					0.17
2.400	0.43	0.40	0.008	0					0.17
2.417	0.43	0.40	0.008	0					0.17
2.433	0.43	0.40	0.008	0					0.17
2.450	0.44	0.40	0.008	0					0.17
2.467	0.44	0.41	0.008	0					0.17
2.483	0.45	0.41	0.008	0					0.17
2.500	0.45	0.41	0.008	0					0.17
2.517	0.45	0.41	0.008	0					0.17
2.533	0.46	0.42	0.008	0					0.18
2.550	0.46	0.42	0.008	0					0.18
2.567	0.46	0.42	0.008	0					0.18
2.583	0.46	0.42	0.008	0					0.18
2.600	0.47	0.43	0.009	0					0.18
2.617	0.47	0.43	0.009	0					0.18
2.633	0.47	0.43	0.009	0					0.18
2.650	0.47	0.44	0.009	0					0.18
2.667	0.47	0.44	0.009	0					0.18
2.683	0.48	0.44	0.009	OI					0.18
2.700	0.48	0.44	0.009	OI					0.19
2.717	0.49	0.45	0.009	OI					0.19
2.733	0.50	0.45	0.009	OI					0.19
2.750	0.50	0.45	0.009	OI					0.19
2.767	0.51	0.46	0.009	OI					0.19
2.783	0.51	0.46	0.009	OI					0.19
2.800	0.52	0.46	0.009	OI					0.19
2.817	0.52	0.47	0.009	OI					0.20
2.833	0.52	0.47	0.009	OI					0.20
2.850	0.53	0.47	0.009	OI					0.20
2.867	0.53	0.48	0.010	OI					0.20
2.883	0.53	0.48	0.010	0					0.20
2.900	0.53	0.48	0.010	0					0.20
2.917	0.54	0.49	0.010	0					0.20
2.933	0.54	0.49	0.010	0					0.21
2.950	0.55	0.49	0.010	0					0.21
2.967	0.56	0.50	0.010	0					0.21
2.983	0.56	0.50	0.010	0					0.21
3.000	0.57	0.51	0.010	0					0.21
3.017	0.58	0.51	0.010	0					0.21
3.033	0.58	0.52	0.010	0					0.22
3.050	0.59	0.52	0.010	0					0.22
3.067	0.60	0.53	0.011	0					0.22

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3.083	0.60	0.53	0.011	0						0.22
3.100	0.61	0.54	0.011	0						0.22
3.117	0.61	0.54	0.011	0						0.23
3.133	0.62	0.55	0.011	0						0.23
3.150	0.62	0.55	0.011	0						0.23
3.167	0.63	0.56	0.011	0						0.23
3.183	0.63	0.56	0.011	0						0.24
3.200	0.64	0.57	0.011	0						0.24
3.217	0.65	0.57	0.011	0						0.24
3.233	0.66	0.58	0.012	0						0.24
3.250	0.67	0.58	0.012	0						0.24
3.267	0.68	0.59	0.012	0						0.25
3.283	0.69	0.59	0.012	0						0.25
3.300	0.71	0.60	0.012	0						0.25
3.317	0.72	0.61	0.012	0						0.26
3.333	0.73	0.62	0.012	OI						0.26
3.350	0.74	0.62	0.012	OI						0.26
3.367	0.74	0.63	0.013	OI						0.27
3.383	0.75	0.64	0.013	OI						0.27
3.400	0.76	0.65	0.013	OI						0.27
3.417	0.77	0.65	0.013	OI						0.28
3.433	0.77	0.66	0.013	OI						0.28
3.450	0.78	0.67	0.013	OI						0.28
3.467	0.79	0.68	0.014	OI						0.28
3.483	0.81	0.69	0.014	OI						0.29
3.500	0.83	0.70	0.014	OI						0.29
3.517	0.86	0.71	0.014	OI						0.30
3.533	0.88	0.72	0.014	OI						0.30
3.550	0.90	0.73	0.015	0						0.31
3.567	0.92	0.74	0.015	0						0.31
3.583	0.94	0.75	0.015	0						0.32
3.600	0.97	0.77	0.015	OI						0.32
3.617	0.98	0.78	0.016	OI						0.33
3.633	1.00	0.79	0.016	OI						0.33
3.650	1.02	0.81	0.016	OI						0.34
3.667	1.03	0.82	0.016	OI						0.35
3.683	1.05	0.84	0.017	OI						0.35
3.700	1.07	0.85	0.017	OI						0.36
3.717	1.08	0.87	0.017	OI						0.36
3.733	1.10	0.88	0.018	OI						0.37
3.750	1.16	0.90	0.018	OI						0.38
3.767	1.23	0.92	0.018	0 I						0.39
3.783	1.29	0.94	0.019	0 I						0.40
3.800	1.36	0.97	0.019	OI						0.41
3.817	1.42	0.99	0.020	OI						0.42
3.833	1.49	1.03	0.021	0 I						0.43
3.850	1.55	1.06	0.021	0 I						0.44
3.867	1.61	1.09	0.022	0 I						0.46
3.883	1.70	1.13	0.023	0 I						0.47
3.900	1.78	1.17	0.023	0 I						0.49
3.917	1.86	1.21	0.024	0 I						0.51
3.933	1.94	1.26	0.025	0 I						0.53
3.950	2.03	1.31	0.026	0 I						0.55
3.967	2.11	1.36	0.027	0 I						0.57
3.983	2.19	1.41	0.028	0 I						0.59
4.000	2.27	1.47	0.029	0 I						0.62
4.017	2.95	1.54	0.031	0	I					0.65
4.033	3.62	1.66	0.033	0		I				0.70
4.050	4.29	1.81	0.036	0			I			0.76
4.067	4.96	2.00	0.040	0				I		0.84
4.083	5.63	2.22	0.044		0				I	0.93
4.100	6.30	2.47	0.049		0				I	1.04
4.117	6.98	2.75	0.055		0				I	1.15

4.133	7.65	3.05	0.061			0			I	1.28
4.150	6.85	3.33	0.067			0			I	1.40
4.167	6.06	3.54	0.071			0			I	1.49
4.183	5.27	3.68	0.074			0			I	1.55
4.200	4.47	3.76	0.075			0		I		1.58
4.217	3.68	3.78	0.076			0				1.59
4.233	2.88	3.75	0.075			I				1.57
4.250	2.09	3.66	0.073		I					1.54
4.267	1.29	3.53	0.071	I		0				1.48
4.283	1.24	3.38	0.068	I		0				1.42
4.300	1.19	3.24	0.065	I		0				1.36
4.317	1.13	3.10	0.062	I		0				1.30
4.333	1.08	2.97	0.059	I		0				1.25
4.350	1.03	2.84	0.057	I		0				1.19
4.367	0.97	2.72	0.054	I		0				1.14
4.383	0.92	2.60	0.052	I		0				1.09
4.400	0.87	2.48	0.050	I		0				1.04
4.417	0.84	2.38	0.048	I		0				1.00
4.433	0.82	2.27	0.045	I		0				0.95
4.450	0.80	2.18	0.044	I		0				0.91
4.467	0.77	2.08	0.042	I	0					0.87
4.483	0.75	1.99	0.040	I	0					0.84
4.500	0.73	1.91	0.038	I	0					0.80
4.517	0.70	1.83	0.037	I	0					0.77
4.533	0.68	1.76	0.035	I	0					0.74
4.550	0.66	1.68	0.034	I	0					0.71
4.567	0.65	1.61	0.032	I	0					0.68
4.583	0.64	1.55	0.031	I	0					0.65
4.600	0.62	1.49	0.030	I	0					0.63
4.617	0.61	1.43	0.029	I	0					0.60
4.633	0.60	1.38	0.028	I	0					0.58
4.650	0.58	1.32	0.026	I	0					0.56
4.667	0.57	1.27	0.025	I	0					0.53
4.683	0.56	1.23	0.025	I	0					0.51
4.700	0.55	1.18	0.024	I	0					0.50
4.717	0.54	1.14	0.023	I	0					0.48
4.733	0.53	1.10	0.022	I	0					0.46
4.750	0.52	1.06	0.021	I	0					0.45
4.767	0.51	1.02	0.020	I	0					0.43
4.783	0.50	0.99	0.020	I	0					0.42
4.800	0.49	0.96	0.019	I	0					0.40
4.817	0.49	0.93	0.019	I	0					0.39
4.833	0.48	0.90	0.018	I	0					0.38
4.850	0.47	0.87	0.017	I	0					0.36
4.867	0.47	0.84	0.017	I	0					0.35
4.883	0.46	0.82	0.016	I	0					0.34
4.900	0.45	0.79	0.016	I	0					0.33
4.917	0.45	0.77	0.015	I	0					0.32
4.933	0.44	0.75	0.015	I	0					0.31
4.950	0.44	0.73	0.015	I	0					0.31
4.967	0.43	0.71	0.014	I	0					0.30
4.983	0.43	0.69	0.014	I	0					0.29
5.000	0.42	0.67	0.013	I</						

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5.183	0.37	0.52	0.010	IO				0.22
5.200	0.37	0.51	0.010	IO				0.22
5.217	0.36	0.50	0.010	IO				0.21
5.233	0.36	0.49	0.010	IO				0.21
5.250	0.36	0.48	0.010	IO				0.20
5.267	0.35	0.48	0.010	0				0.20
5.283	0.35	0.47	0.009	0				0.20
5.300	0.35	0.46	0.009	0				0.19
5.317	0.34	0.45	0.009	0				0.19
5.333	0.34	0.45	0.009	0				0.19
5.350	0.34	0.44	0.009	0				0.18
5.367	0.34	0.43	0.009	0				0.18
5.383	0.33	0.43	0.009	0				0.18
5.400	0.33	0.42	0.008	0				0.18
5.417	0.33	0.41	0.008	0				0.17
5.433	0.32	0.41	0.008	0				0.17
5.450	0.32	0.40	0.008	0				0.17
5.467	0.32	0.40	0.008	0				0.17
5.483	0.32	0.39	0.008	0				0.16
5.500	0.31	0.39	0.008	0				0.16
5.517	0.31	0.38	0.008	0				0.16
5.533	0.31	0.38	0.008	0				0.16
5.550	0.31	0.37	0.007	0				0.16
5.567	0.31	0.37	0.007	0				0.15
5.583	0.30	0.36	0.007	0				0.15
5.600	0.30	0.36	0.007	0				0.15
5.617	0.30	0.36	0.007	0				0.15
5.633	0.30	0.35	0.007	0				0.15
5.650	0.29	0.35	0.007	0				0.15
5.667	0.29	0.34	0.007	0				0.14
5.683	0.29	0.34	0.007	0				0.14
5.700	0.29	0.34	0.007	0				0.14
5.717	0.29	0.33	0.007	0				0.14
5.733	0.28	0.33	0.007	0				0.14
5.750	0.28	0.33	0.007	0				0.14
5.767	0.28	0.32	0.006	0				0.14
5.783	0.28	0.32	0.006	0				0.14
5.800	0.28	0.32	0.006	0				0.13
5.817	0.28	0.32	0.006	0				0.13
5.833	0.27	0.31	0.006	0				0.13
5.850	0.27	0.31	0.006	0				0.13
5.867	0.27	0.31	0.006	0				0.13
5.883	0.27	0.31	0.006	0				0.13
5.900	0.27	0.30	0.006	0				0.13
5.917	0.27	0.30	0.006	0				0.13
5.933	0.26	0.30	0.006	0				0.13
5.950	0.26	0.30	0.006	0				0.12
5.967	0.26	0.29	0.006	0				0.12
5.983	0.26	0.29	0.006	0				0.12
6.000	0.26	0.29	0.006	0				0.12
6.017	0.26	0.29	0.006	0				0.12
6.033	0.26	0.28	0.006	0				0.12
6.050	0.25	0.28	0.006	0				0.12
6.067	0.25	0.28	0.006	0				0.12
6.083	0.25	0.28	0.006	0				0.12
6.100	0.25	0.28	0.006	0				0.12
6.117	0.25	0.28	0.006	0				0.12
6.133	0.25	0.27	0.005	0				0.11
6.150	0.00	0.26	0.005	IO				0.11
6.167	0.00	0.25	0.005	IO				0.10
6.183	0.00	0.23	0.005	0				0.10
6.200	0.00	0.21	0.004	0				0.09
6.217	0.00	0.20	0.004	0				0.08

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6.233	0.00	0.19	0.004	0					0.08
6.250	0.00	0.17	0.003	0					0.07
6.267	0.00	0.16	0.003	0					0.07
6.283	0.00	0.15	0.003	0					0.06
6.300	0.00	0.14	0.003	0					0.06
6.317	0.00	0.13	0.003	0					0.06
6.333	0.00	0.12	0.002	0					0.05
6.350	0.00	0.12	0.002	0					0.05
6.367	0.00	0.11	0.002	0					0.05
6.383	0.00	0.10	0.002	0					0.04
6.400	0.00	0.09	0.002	0					0.04
6.417	0.00	0.09	0.002	0					0.04
6.433	0.00	0.08	0.002	0					0.03
6.450	0.00	0.08	0.002	0					0.03
6.467	0.00	0.07	0.001	0					0.03
6.483	0.00	0.07	0.001	0					0.03
6.500	0.00	0.06	0.001	0					0.03
6.517	0.00	0.06	0.001	0					0.02
6.533	0.00	0.05	0.001	0					0.02
6.550	0.00	0.05	0.001	0					0.02
6.567	0.00	0.05	0.001	0					0.02
6.583	0.00	0.04	0.001	0					0.02
6.600	0.00	0.04	0.001	0					0.02
6.617	0.00	0.04	0.001	0					0.02
6.633	0.00	0.04	0.001	0					0.01
6.650	0.00	0.03	0.001	0					0.01
6.667	0.00	0.03	0.001	0					0.01
6.683	0.00	0.03	0.001	0					0.01
6.700	0.00	0.03	0.001	0					0.01
6.717	0.00	0.03	0.001	0					0.01
6.733	0.00	0.02	0.000	0					0.01
6.750	0.00	0.02	0.000	0					0.01
6.767	0.00	0.02	0.000	0					0.01
6.783	0.00	0.02	0.000	0					0.01
6.800	0.00	0.02	0.000	0					0.01
6.817	0.00	0.02	0.000	0					0.01
6.833	0.00	0.02	0.000	0					0.01
6.850	0.00	0.01	0.000	0					0.01
6.867	0.00	0.01	0.000	0					0.01
6.883	0.00	0.01	0.000	0					0.01
6.900	0.00	0.01	0.000	0					0.00
6.917	0.00	0.01	0.000	0					0.00
6.933	0.00	0.01	0.000	0					0.00
6.950	0.00	0.01	0.000	0					0.00
6.967	0.00	0.01	0.000	0					0.00
6.983	0.00	0.01	0.000	0					0.00
7.000	0.00	0.01	0.000	0					0.00
7.017	0.00	0.01	0.000	0					0.00
7.033	0.00	0.01	0.000	0					0.00
7.050	0.00	0.01	0.000	0					0.00
7.067	0.00	0.01	0.000	0					0.00
7.083	0.00	0.01	0.000	0					0.00
7.100	0.00	0.01	0.000	0					0.00
7.117	0.00	0.00	0.000	0					0.00
7.133	0.00	0.00	0.000	0					0.00
7.150	0.00	0.00	0.000	0					0.00
7.167	0.00	0.00	0.000	0					0.00
7.183	0.00	0.00	0.000	0					0.00
7.200	0.00	0.00	0.000	0					0.00
7.217	0.00	0.00	0.000	0					0.00
7.233	0.00	0.00	0.000	0					0.00
7.250	0.00	0.00	0.000	0					0.00
7.267	0.00	0.00	0.000	0					0.00

7.283	0.00	0.00	0.000	0					0.00
7.300	0.00	0.00	0.000	0					0.00

*****HYDROGRAPH DATA*****

Number of intervals = 438
Time interval = 1.0 (Min.)
Maximum/Peak flow rate = 3.779 (CFS)
Total volume = 0.365 (Ac.Ft)

DETAINED Q100
OUT OF BASIN

Status of hydrographs being held in storage

	Stream 1	Stream 2	Stream 3	Stream 4	Stream 5
Peak (CFS)	0.000	0.000	0.000	0.000	0.000
Vol (Ac.Ft)	0.000	0.000	0.000	0.000	0.000

MODIFIED RATIONAL METHOD (FOR JUNCTION ANALYSIS)

Junction Equation: $T_1 < T_2$

$$Q_{T1} = Q_1 + T_1/T_2 (Q_2) \quad [\text{Per SDCHM}]$$

$$Q_{T1} = 1.624 + 4.46/9.4 (3.779) = 3.41 \text{ CFS}$$

$$Q_{T2} = Q_2 + I_2/I_1 (Q_1) \quad [\text{Per SDCHM}]$$

$$Q_{T2} = 3.779 + 5.085/7.641 (1.624) = \underline{\underline{4.86 \text{ CFS}}}$$

$$\underline{\underline{\text{Mitigated } Q_{100} = 4.86 \text{ CFS}}}$$

Outflow rating curve

Outflow Rating Curve at POC:

The outlet structures (2 overflow catch basins inside of the basin) were sized using both the weir & orifice equation and method as described in the San Diego County Hydraulic Design Manual. Both weir and orifice equations are used in this example and the more conservative value is selected to govern the design. The sizing calculations for the remaining head can be seen below:

$$Q = C * L * H^{(2/3)} \quad \text{per SDCHDM 6.4.2.3}$$

Target flow rate will be 5 CFS divided by two equal overflow catch basins, so 2.5 CFS into each catch basin.

$$Q = 2.5 \text{ CFS}$$

$$C = 3 \text{ per SDCHDM}$$

$$L = 2' \times 2' \text{ opening Catch Basin, so 8 feet}$$

$$2.5 \text{ CFS} = 3 \times 8 \text{ feet} \times H^{(2/3)}$$

$$\underline{H_w = 0.03 \text{ feet of head above weir crest}}$$

For the orifice calculation, a similar approach is taken, but by using the orifice equation:

$$Q = C_o A_o (2gH_o)^{(1/2)} \quad \text{per SDCHDM 6.4.3}$$

Target flow rate is 5 CFS also being divided by 2 catch basins, so 2.5 CFS into each catch basin.

$$Q = 2.5 \text{ CFS}$$

$$C_o = 0.6$$

$$A_o = 4 \text{ SF}$$

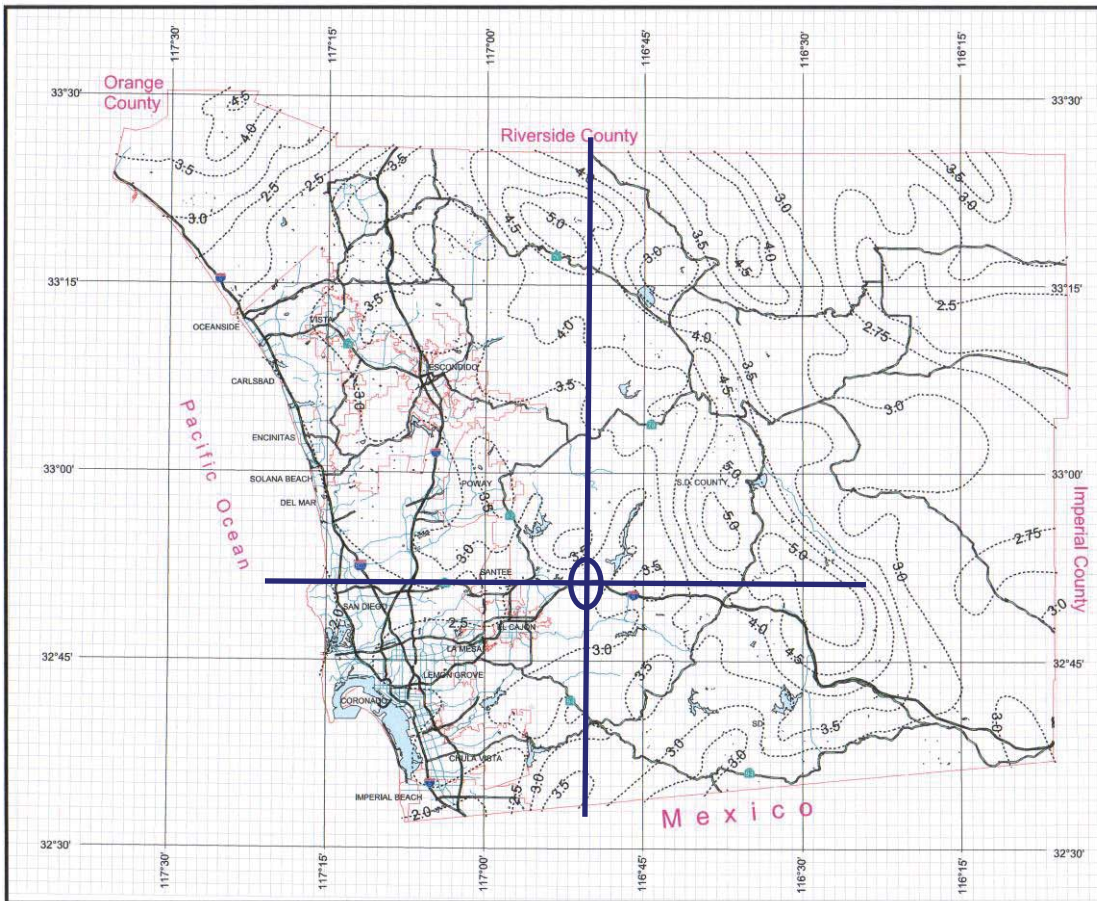
$$G = 32.2 \text{ ft/sec}^2$$

$$2.5 \text{ CFS} = (0.6) (4 \text{ SF}) (64.4 \text{ ft/s}^2 \times H_o)^{1/2}$$

$$\underline{H_o = 0.02 \text{ feet of head above weir crest}}$$

Therefore, we will design for the weir head elevation of 0.03 feet.

Appendix F – Referenced Tables and Figures



County of San Diego Hydrology Manual



Rainfall Isoplethials

100 Year Rainfall Event - 6 Hours

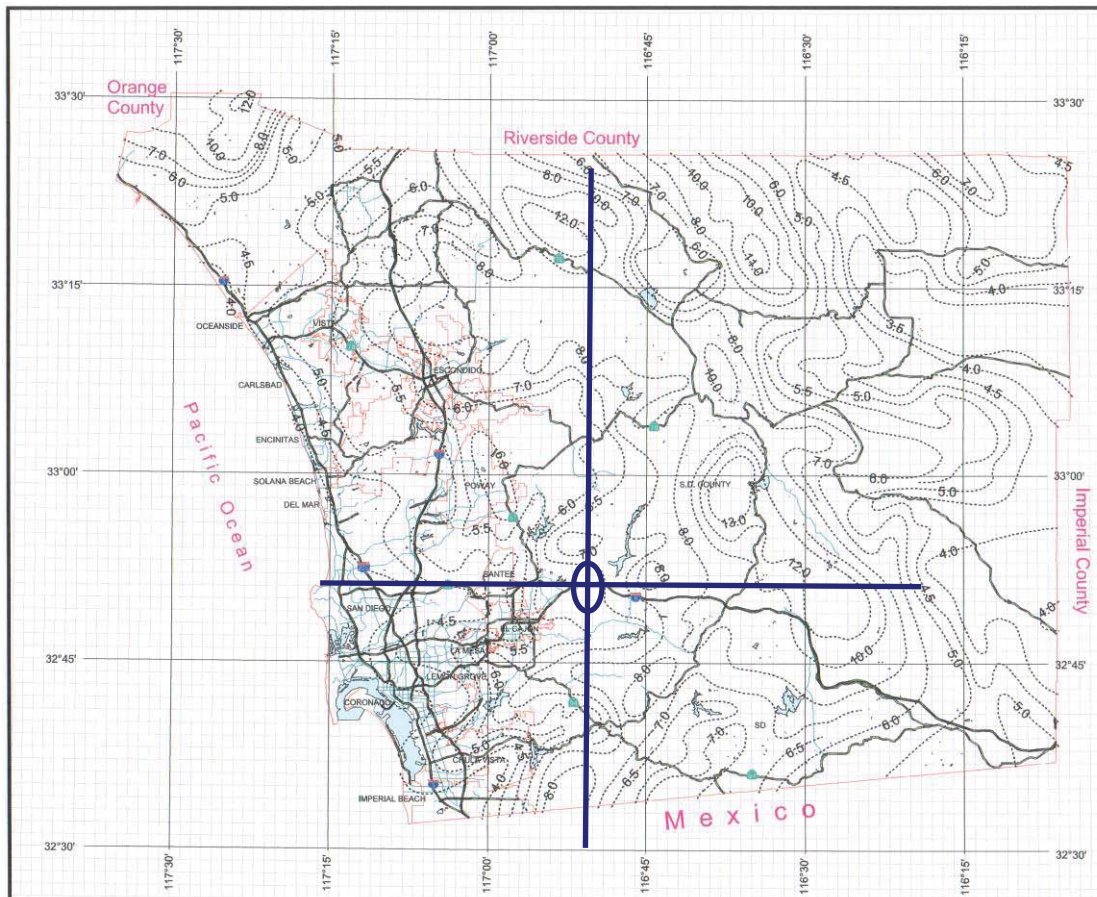


Lat: 32° 51' 17"
Long: 116° 50' 49"

P6 = 2.9 in



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County of San Diego Hydrology Manual



Rainfall Isoplethials

100 Year Rainfall Event - 24 Hours

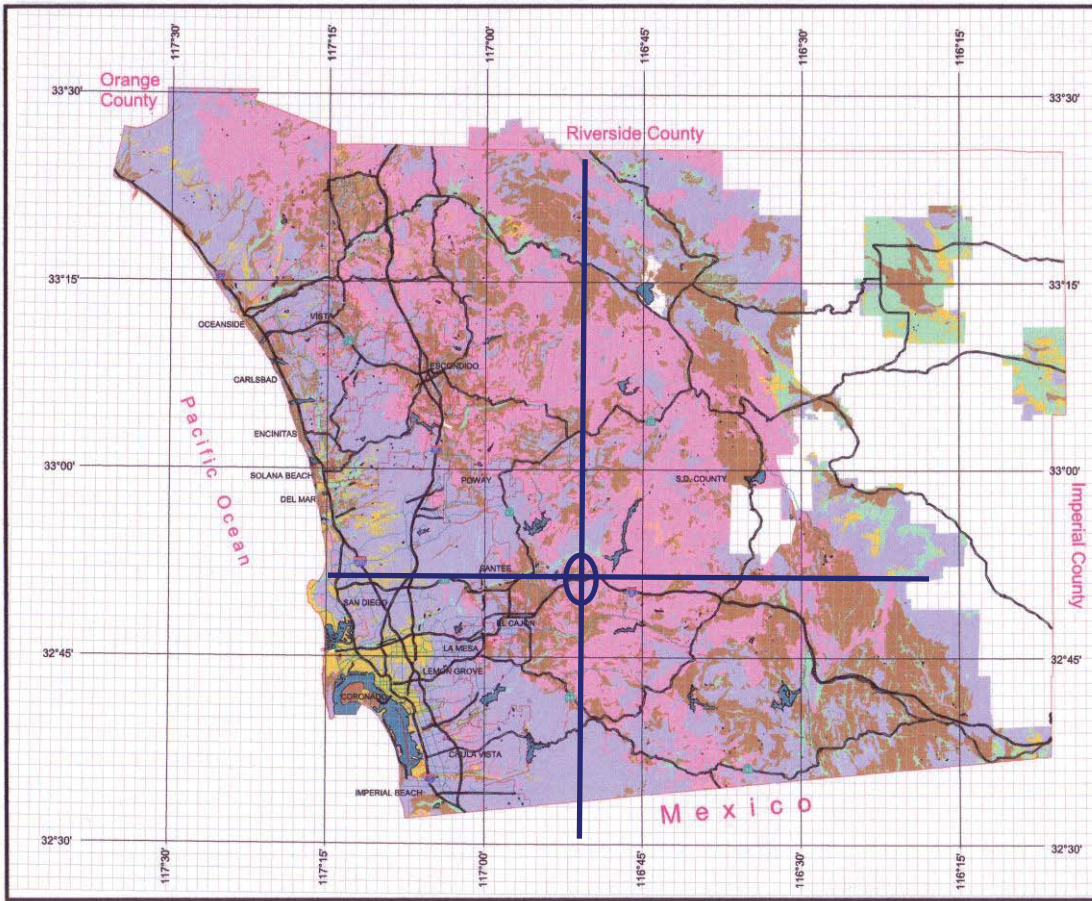


Lat: 32° 51' 17"
Long: 116° 50' 49"

P24 = 6.3 in



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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

**Soil Type =
D**



3 0 3 Miles

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

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

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

DU/A = dwelling units per acre

NRCS = National Resources Conservation Service

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/ 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	Basin	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