



Consultants, Inc.

PRELIMINARY DRAINAGE STUDY
FOR
Passerelle Tentative Map (Parcel 2)

TM _____

(Vacant) Horse Ranch Creek Road

Fallbrook, CA 92028

(APN 108-120-61)

Prepared for:

Passerelle, LLC

10531 4S Commons Dr # 700

San Diego, CA 92127

Prepared by:

REC Consultants, Inc.

2970 Fifth Ave, Suite 340

San Diego, CA 92103

(619) 232-9200



Prepared March 1, 2021

Revised August 22nd, 2023

Table of Contents

Declaration of Responsible Charge	2
Vicinity Map	3
1.0 Introduction.....	4
2.0 Hydrologic Description.....	4
2.1 Pre-Developed Condition.....	4
2.2 Post-Developed Condition	5
3.0 Hydrologic Methodology and Results	5
3.1 100-Year Existing Condition	6
3.2 100-Year Unmitigated Developed Condition	6
4.0 Detention Routing & Mitigated Condition Analysis	7
4.1 Modified Puls Detention Routing	7
4.2 100-Year Mitigated Post-Developed Condition.....	9
4.3 Outlet Structure Emergency Overflow.....	9
5.0 Hydraulic Analysis.....	10
6.0 Conclusion	10
Appendix A – Preliminary Grading Plan.....	13
Appendix B – Drainage Map	18
Appendix C – Pre-Developed Calculations	21
Appendix D – Post-Developed Calculations	32
Appendix E – Modified-Puls Detention Routing & Basin Design	69
Appendix F – Mitigated Post-Developed Calculations	71
Appendix G – Referenced Tables & Figures.....	90
Appendix H – Drainage Report for HRCR & Palamar College	91
Table 1: 100-Year Existing Condition Summary Table.....	6
Table 2: 100-Year Unmitigated Developed Condition Summary Table.....	6
Table 3: BMP Summary Table.....	8
Table 4: BMP Outlet Summary.....	9
Table 5: 100-Year Mitigated Developed Condition Summary Table	9
Table 6: Hydrology Summary Table.....	11

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.

William O'Gorman

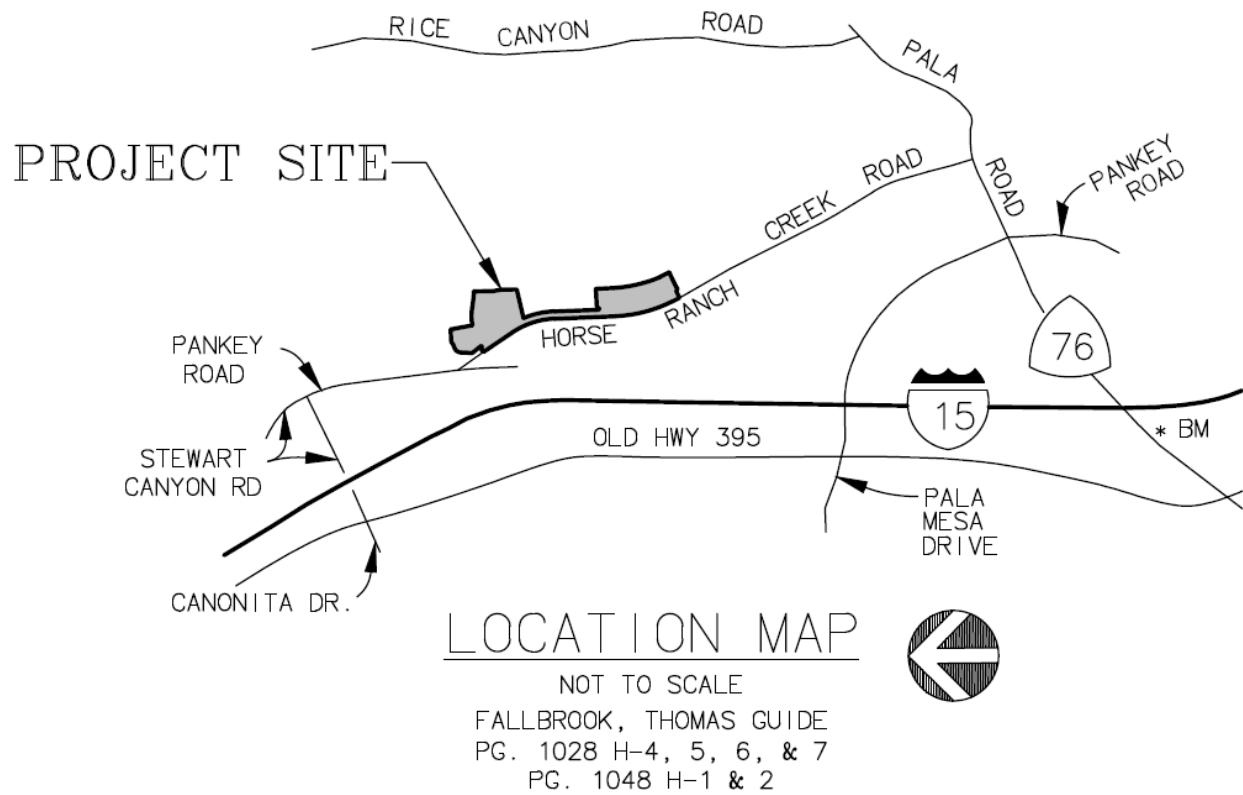
8-22-23

William O'Gorman, RCE 88286, EXP. 3-31-24

Date



Vicinity Map



1.0 Introduction

The original approved Campus Park project (Vesting Tentative Map 5338 RPL-7) is a 416.1-acre planned community composed of multi-family and single-family residential neighborhoods, a neighborhood commercial town center, professional office uses, parks and recreational facilities, and preservation of open space areas and trails. The Campus Park Multi-Family project will amend the Campus Park project to allow for the development of two multi-family condominium lots (Parcel 1 and Parcel 2), as well as road widening along Horse Ranch Creek Road. Parcel 1, located on Assessor's Parcel Number (APN) 108-120-62, is comprised of 3.02 acres and Parcel 2, located on APN 108-120-61, is comprised of 8.94 acres and were both originally designated for professional office (PO-1 and PO-2) uses in the Specific Plan. Only Parcel 2 and the road widening will be analyzed herein while Parcel 1 will be analyzed in a separate Preliminary Drainage Study. Parcel 2 is bound to the west by Horse Ranch Creek Road and to the north by Friesian Way. One hundred three detached multifamily residences with private drive aisles are proposed. Road widening along Horse Ranch Creek Road is also proposed. See the Tentative Map/Preliminary Grading Plan in Appendix A.

2.0 Hydrologic Description

2.1 Pre-Developed Condition

The pad has been previously graded and the improvements on Friesian Way built as part of the original Campus Park project. The site is mostly dirt with the entire pad gently sloping (approximately 2.5% slope) to the southwest to a desilting basin. The entire site is underlain by type-C soil according to the USGS Web Soil Survey. There will be three basins each draining to a separate Point Of Comparison (POC) in the predeveloped condition. Basin 1 contains the pad which drains to the desilting basin and a portion of Horse Ranch Creek Road which drains via surface flow and storms drain to an existing curb inlet (POC-1) on Horse Ranch Creek Road. Basin 2 is a portion of the existing fill slope located along the northern side of the project site along with a portion of Horse Ranch Creek Road and Friesian Way and the area from parcel 1 which drains to an existing cleanout on Friesian Way (POC-2). Basin 3 is a portion of the existing fill slope located near the southwest corner of the property and a large portion of Horse Ranch Creek Road which discharges to POC-3 via an existing storm drain system and the sports complex site to the east of the project site will also drain to POC-3. Pre-developed Q100 peak

flows at POC-3 are per *Drainage Report for Horse Ranch Creek Road & Palamar College (RBF JN 25-102702)* dated May 21, 2009 (**Appendix H**). Note that all three POC's confluence downstream in the adjacent creek.

2.2 Post-Developed Condition

As mentioned above, the owner is proposing to build 103 single family residences and drive aisles on a previously graded lot. The existing desilting basin will be removed, and an underground storage tank will be constructed. This underground storage tank will be used for hydromodification flow control and peak 100-year flow attenuation. The site will be broken into three drainage basins in the post-developed condition. Basin 1 consists of the developed area and a portion of Horse Ranch Creek Road that flows to POC-1. The majority of basin 1 will flow to the underground storage tank, however, there is a portion of the driveway along with the proposed road widening along Horse Ranch Creek Road that bypasses the tank and flows directly to POC-1. Basin 2 is a portion of the existing fill slope located along the northern side of the project site and a small portion of Horse Ranch Creek Road and Friesian Way along with Parcel 1 development that will continue draining to POC-2. Basin 3 is a portion of the existing fill slope located near the southwest corner of the property, the proposed road widening along Horse Ranch Creek Road that will continue draining to POC-3 and the sports complex site as well. See the attached Hydrology Maps in **Appendix B**.

3.0 Hydrologic Methodology and Results

The hydrologic analysis is done to assess the impact of the proposed improvements on the existing drainage patterns and any increase to 100-year peak flowrates that will require mitigation. The project's 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 project's 100-year peak flowrates for the existing and unmitigated post-developed conditions were analyzed using CIVILCADD/CIVILDESIGN Engineering Software Version 7.9 (Civild) developed by CivilDesign Corporation. The software is a computer application of the modified rational method in accordance with the County of San Diego Flood Control District's Hydrology Manual (2003).

3.1 100-Year Existing Condition

The below table summarizes the pre-developed runoff at key points. The full computer output file is titled “1581Parcel2Pre” and is found in **Appendix C**.

Table 1: 100-Year Existing Condition Summary Table

Node	Description	Effective C	Tc (min.)	I (in/hr)	Area (ac)	Q _{peak} (cfs)
1000	Runoff at POC 1	0.33	8.62	6.28	9.20	18.88
2000	Runoff at POC 2	0.41	14.38	4.509	3.77	5.68
*3.032	Existing Curb Inlet	0.67	13.06	4.964	1.65	5.49
*3.052	Existing Curb Inlet	0.67	7.94	6.841	0.71	3.25
3000	Runoff at POC 3	0.67	-	5.527	2.36	8.74

* Note: Hydrology data taken from *Drainage Report for Horse Ranch Creek Road & Palamar College (RBF JN 25-102702)* dated May 21, 2009

3.2 100-Year Unmitigated Developed Condition

The below table summarizes the unmitigated post-developed runoff at key points. The full computer output file is titled “1581Parcel2Post” and is found in **Appendix D**.

Table 2: 100-Year Unmitigated Developed Condition Summary Table

Nodes	Description	Effective C	Tc (min.)	I (in/hr)	Area (ac)	Q _{peak} (cfs)
1.000	Runoff to underground storage (BMP-A)	0.78	8.36	6.619	8.36	40.26
1000	Runoff at POC 1	0.73	9.08	6.531	9.36	44.76
2000	Runoff at POC 2	0.70	7.52	7.031	3.62	18.01
3.032	Existing Curb Inlet	0.47	21.55	3.594	2.76	4.61
3.052	Existing Curb Inlet	0.62	9.53	6.082	0.63	2.37
3000	Runoff at POC 3	0.50	-	6.675	3.39	6.98

4.0 Detention Routing & Mitigated Condition Analysis

4.1 Modified Puls Detention Routing

The Modified Puls Method (also called Storage Indication Method) has been used to determine the resulting hydrograph after routing takes place in the underground tank. The Modified Puls Method (including infiltration) can be written as:

$$\frac{(I_1+I_2)}{2} \Delta t - \frac{(O_1+O_2)}{2} \Delta t - \frac{(f_1+f_2)}{2} \Delta t = S_2 - S_1 \quad (4)$$

which is equivalent to:

$$2 \frac{S_2}{\Delta t} + O_2 = 2 \frac{S_1}{\Delta t} - O_1 + I_1 + I_2 - f_1 - f_2 \quad (5)$$

In equation (5) all the right hand side terms are known. I_1 , I_2 are the inflow at the start and end of the time interval (cfs), O_1 , O_2 are the outflow at the start and end of the time interval (cfs), f_1 , f_2 are the infiltration values at the start and end of the time interval (cfs), and S_1 , S_2 are the stage values at the start and end of the time interval (cu-ft). The time interval is 2 min for the 6 hr storm.

The Modified Green-Ampt Equation to model infiltration has been used (including influence of ponding water to increase infiltration). To simplify the modeling effort, Green-Ampt has been limited to the bottom area only, and the suction front effect has been ignored. The resulting equation is:

$$f = \frac{K}{43200} \left[1 + (\phi - \theta_i) \left(\frac{h - S_f}{F} \right) A_i \right] \quad (6)$$

The suction front influence has been neglected ($S_f = 0$); the saturated hydraulic conductivity of the natural soil (K , in/hr) has been assumed equal to 0.1875 in/hr (0.075 in/hr for compacted type c soil divided by the void ratio of 0.4). The effect of the depth of the water over the infiltrating soil (h , ft) multiplied by the area of infiltration (A_i) which is equal to the bottom of the gravel multiplied by the void ratio and divided by the total accumulated infiltration volume F , enhances the saturated hydraulic conductivity effect. Finally, the difference between porosity ϕ and initial moisture content θ_i has been assumed as 0.2 for modeling purposes.

The Modified Puls routing also requires the stage vs. elevation table, and the discharge vs. elevation table. Volume vs elevation is calculated with the datum $h = 0$ corresponding to the bottom of the gravel layer. Note that the routing was started with an initial depth of 0.75' (elevation of the lowest outlet) to allow for ponding for water quality. Discharge vs elevation considers orifices & slots (using the weir or orifice equation depending on if the outlet is working as a weir or as an orifice) and the riser (using the weir equation as the depth of the water at crest elevation does not floods the riser and it always works as a weir).

The runoff from the project site will be detained in a series of Oldcastle Stormcapture Concrete Tanks. The Stormcapture tanks will be placed under the proposed drive aisle and under the tot lots and other areas of pervious landscaping. The system will be hydraulically connected by a level storm drain pipe. The full modified puls routing can be found in **Appendix E**. A summary of the BMP routing results is below:

Table 3: BMP Summary Table

BMP	BMP Area (ft ²)	Max. Depth (ft)	Peak Depth (ft)	Max. Storage (ac-ft)	Peak Storage (ac-ft)	Q _{in} (cfs)	Q _{out} (cfs)
BMP-A: Underground (1.000)	7680 ⁽¹⁾	8.75 ⁽¹⁾	7.59	1.210	1.042	40.26	13.66

(1) The BMP area and depth corresponds to the bottom area of the gravel.

Table 4: BMP Outlet Summary

Orifice		Slot 1		Slot 2		Slot 3		Overflow Weir	
Diam. (in)	Elev. (ft)	Size (in)	Elev. (ft)	Size (in)	Elev. (ft)	Size (in)	Elev. (ft)	Width (ft)	Elev. (ft)
2 x 2 3/16	0.0	67 (W) x 1 (H)	3.0	9 (W) x 12 (H)	3.17	24 (W) x 1.5 (H)	5.25	7.0	6.92

Note: Elevation 0.0 is at the invert of the lowest surface orifice.

Only the storage volume and outlets above the lowest surface outlet were utilized for detention in the underground storage tank. A discussion of the gravel storage layer can be found in the

Stormwater Quality Management Plan (SWQMP) and Hydromodification Management Plan (HMP) associated with this project.

4.2 100-Year Mitigated Post-Developed Condition

The 100-year mitigated post-developed condition analysis was created by copying the unmitigated post-developed condition CivilD file and replacing all nodes upstream from the proposed underground tank with a user-defined flow. The 100-year peak flow rate and time of concentration were obtained from the results of the modifield-puls routing. The full computer output file is titled “1581Parcel2Mit” and is found in **Appendix F**.

Table 5: 100-Year Mitigated Developed Condition Summary Table

Nodes	Description	Effective C	Tc (min.)	I (in/hr)	Area (ac)	Q_{peak} (cfs)
1.000	Outflow from underground storage (BMP-A)	0.78	14.36	4.67	8.36	13.58
1000	Runoff at POC 1	0.73	15.30	4.548	9.36	16.86
2000	Runoff at POC 2	0.70	14.37	6.998	3.62	5.44
3.032	Existing Curb Inlet	0.47	21.55	3.594	2.76	4.61
3.052	Existing Curb Inlet	0.62	9.53	6.082	0.63	2.37
3000	Runoff at POC 3	0.50	-	6.675	3.39	6.98

4.3 Outlet Structure Emergency Overflow

An outlet structure is proposed downstream of the underground storage tanks. Inside the outlet structure, there is a 7 ft wide weir to control flows. In case of an emergency the weir is designed for the unmitigated developed flow rate of 40.26 cfs. The weir equation can be utilized to ensure there is sufficient head above the weir to convey the bypass flow:

$$Q = C \times L \times H^{1.5}$$

Where Q is flow rate (cfs), C is the weir coefficient of 3.1, L is the weir width (ft) and H is the head above the weir (ft). Since Q and L are known, solving for the height above the crest of the weir is:

$$H = \sqrt[1.5]{\frac{Q}{C \times L}} = \sqrt[1.5]{\frac{40.26 \text{ cfs}}{3.1 \times 7.0 \text{ ft}}} = 1.51 \text{ ft above the crest of the weir}$$

The proposed height above the crest of the weir is 2.26 ft which is greater than the required 1.51 ft calculated above. Therefore, in case of an emergency situation, the outlet structure has the necessary capacity. Downstream of the cleanout, the flow enters a storm drain pipe which will be adequately sized in final engineering for the calculated unmitigated Q100 using Civil-D.

5.0 Hydraulic Analysis

Nodes were placed at the upstream and downstream ends of the proposed storm drains, brow ditches and gutters in the unmitigated post-developed CivilD file in order for each facility to be sized within the program. As evident from the output file, all proposed drainage features are adequately sized to convey all flows from the project.

6.0 Conclusion

With the increase in impervious ground cover, the addition of road pavement, building roofs and hardscape, the unmitigated post-development peak 100-year flow rate has increased compared to the pre-development condition for POC-1 and POC-2. However, this increase can be mitigated through the use of an underground storage tank. A summary of the pre-developed and post-developed condition at the POCs is below:

Table 6: Hydrology Summary Table

POC	POC Location	Drainage Area (ac)			Peak 100-year flowrate (cfs)		
		Existing	Developed	Change	Existing	Developed	Change
1	Curb inlet on Horse Ranch Creek Road	9.20	9.36	+0.15	18.88	16.86	-2.02
2	Cleanout on Frisian Way	3.77	3.62	-0.15	5.68	5.44	-0.24
3	Stormdrain Cleanout on Horse Ranch Creek Road	2.36	3.39*	+1.03	8.74	6.98	-1.76

* Increase in area to POC-3 is due to the grading performed for the sports complex/park that increased the drainage area onto HRCR per *Horse Creek Ridge Phase 1, PDS2012-2700-15680*

As can be seen in the table above, the project will reduce the peak 100-year flow rate at POC-1 from 18.88 cfs in the pre-developed condition to 16.86 cfs in the mitigated post-developed condition. At POC-2 the project will reduce the peak 100-year flow rate from 5.68 in the pre-developed condition to 5.44 in the mitigated post-developed condition. POC-3 has increased in area from pre-developed conditions to post-developed conditions due to the grading that was performed for the sports complex/park that increased the drainage area onto HRCR per *Horse Creek Ridge Phase 1, PDS2012-2700-15680*. However, there was a slight decrease in peak 100-year flow rate from pre-developed conditions to mitigated post-developed conditions due to the C-value decreasing from the pre-developed analysis to the post-developed analysis. The pre-developed flowrates were taken from a drainage report titled *Drainage Report for Horse Ranch Creek Road & Palamar College (RBF JN 25-102702)* dated May 21, 2009 (**Appendix H**). This sufficiently demonstrates there will be no impacts downstream as a result of this development. Questions for CEQA purposes are answered below. Would the project:

A. Substantially alter the existing drainage patterns of the site or area, including through the alteration if the course of a stream or river, in a manner which would result in substantial erosion or siltation on – or off-site?

The project does not substantially alter the existing drainage pattern of the area and does not alter the course of a stream or river. The storm drain system is designed to route all resulting runoff to existing points of discharge.

B. Substantially alter the existing drainage patterns 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?

The project will not substantially alter the existing drainage pattern of the area as it will not alter the course of a stream or river, and also will not substantially increase the rate or amount of surface runoff in a manner which would result in on- or off-site flooding.

C. Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems?

The project will not create or contribute runoff water which would exceed the capacity of the existing storm water drainage system. All project discharge points release water at rates less than or equal to existing conditions.

D. 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? For example; research the foregoing and provide same (to indicate applicability or not) in the study?

The project does not place any housing within a 100-year flood hazard area. See FIRMETTE in in Appendix D.

E. Place within a 100-year flood hazard area structures which would impede or redirect flood flows?

There are no structures proposed within a 100-year flood hazard area. See FIRMETTE in in Appendix D.

F. 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?

N/A

Appendix A – Preliminary Grading Plan

GENERAL NOTES:

- COUNTY ASSESSORS PARCEL No. 108-120-61, 108-120-62
- TAX RATE AREA: 75169 (APN 108-120-61)
75035 (APN 108-120-62)
- GROSS AREA = 29.00 ACRES, NET AREA = 20.34 ± ACRES
- NUMBER OF LOTS IS 5 LOTS
(2) SINGLE-FAMILY CONDOMINIUM LOTS (TOTAL NUMBER OF UNITS 138)
(1) REMAINDER LOT
(2) PUBLIC STREET LOTS
- COMMUNITY PLAN: FALLBROOK
- NO SPECIAL ASSESSMENT ACT PROCEEDINGS ARE PROPOSED
- PARK FEES IN LIEU OF PARK LAND DEDICATION IS PROPOSED
- STREET LIGHTS TO BE INSTALLED IN ACCORDANCE WITH COUNTY STANDARDS.
- TOPOGRAPHY: AERIAL SURVEY PROVIDED BY RANCHO COASTAL ENGINEERING & SURVEYING ON DECEMBER 18, 2019.
- SEWER SERVICE: RAINBOW MUNICIPAL WATER DISTRICT - CHAD WILLIAMS 760-728-1178
- WATER SERVICE: RAINBOW MUNICIPAL WATER DISTRICT - CHAD WILLIAMS 760-728-1178
- FIRE PROTECTION SERVICE: NORTH COUNTY FIRE DISTRICT
DOMINIC FIERA FIRE MARSHALL 760 723 2040
- SCHOOLS: FALLBROOK UNIFIED SCHOOL DISTRICT - CYNTHIA MARTIN 760-731-5445
& FALLBROOK UNIFIED SCHOOL DISTRICT & UNION HIGH SCHOOL DISTRICT - BRENDA MEFFORD 760-723-6332 x6195
- ALL ONSITE STREETS WILL BE PRIVATE.
- ALL CUT AND FILL SLOPES ARE 2:1 UNLESS OTHERWISE NOTED.
- STORM DRAIN DETENTION FACILITIES SHALL BE PROVIDED IN ACCORDANCE WITH THE REQUIREMENTS OF THE COUNTY OF SAN DIEGO, DEPARTMENT OF PUBLIC WORKS.

LEGAL DESCRIPTION

PARCEL 2 OF PARCEL MAP NO. 21006, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, FILED IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY ON SEPTEMBER 25, 2012 AS FILE NO. 2012-0581442, OFFICIAL RECORDS

TOPO SOURCE

TOPOGRAPHY SURVEY PROVIDED BY RANCHO COASTAL ENGINEERING & SURVEYING.
DATE OF SURVEY DECEMBER 2019

EASEMENTS NOTES

SEE SHEET 2 FOR EASEMENTS PER PRELIMINARY TITLE REPORT PREPARED BY CHICAGO TITLE INSURANCE COMPANY ~ ORDER No. 00110425-996-SDI-CF2

NOISE RESTRICTION EASEMENT:

A NOISE RESTRICTION EASEMENT SHALL BE PLACED ON THE ENTIRE AREA OF THE PROJECT SITE AND WILL BE GRANTED TO THE COUNTY OF SAN DIEGO ON THE FINAL MAP.

SOLAR ACCESS STATEMENT:

ALL UNITS WITHIN THIS SUBDIVISION HAVE A MINIMUM OF 100 SQ. FT. OF SOLAR ACCESS FOR EACH FUTURE DWELLING UNIT ALLOWED BY THIS SUBDIVISION.

STREET LIGHT STATEMENT:

- THE SUBDIVIDER INTENDS TO COMPLY WITH THE STREET LIGHT REQUIREMENTS AS SPECIFIED IN THE COUNTY STANDARDS. THIS SUBDIVISION IS PROPOSING ONLY PRIVATE STREETS.
- ALL OUTDOOR LIGHTING SHALL CONFORM TO THE COUNTY OF SAN DIEGO LIGHTING CODE AND LIGHTING REQUIREMENTS WITHIN THE PERFORMANCE STANDARDS OF THE ZONING ORDINANCE

BASIS OF BEARINGS:

THE BASIS OF BEARINGS FOR THIS SURVEY IS CCS 83, ZONE 6, EPOCH 1991.35 GRID BEARING BETWEEN STATION "SDGPS 03" AND STATION "SDGPS 08" BOTH HAVING A CALIFORNIA COORDINATE VALUE OF FIRST ORDER ACCURACY, PER NATIONAL GEODETIC SURVEY DATA HTDP V2.4. SEE ROS 16810, I.E. NORTH 21°47'56" EAST. QUOTED BEARINGS FROM REFERENCE MAPS OR DEEDS MAY OR MAY NOT BE IN TERMS OF SAID SYSTEM. THE COMBINED GRID FACTOR AT STATION "SDGPS 03" IS 0.9999447. ELEVATION AT SAID STATION = 308.26 (NAVD 88) GRID DISTANCE = GROUND DISTANCE X COMBINED GRID FACTOR. ALL DISTANCES SHOWN ARE GROUND, UNLESS OTHERWISE NOTED.

CONDOMINIUM MAP STATEMENT:

THIS IS A MAP OF A CONDOMINIUM PROJECT AS DEFINED IN SECTION 1350 OF THE STATE OF CALIFORNIA CIVIL CODES

GRADING QUANTITIES

CUT 29,500
FILL 29,500
NET BALANCE

MAX CUT = 18'
MAX FILL = 12'

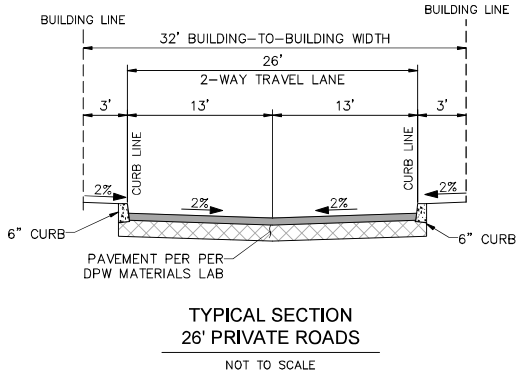
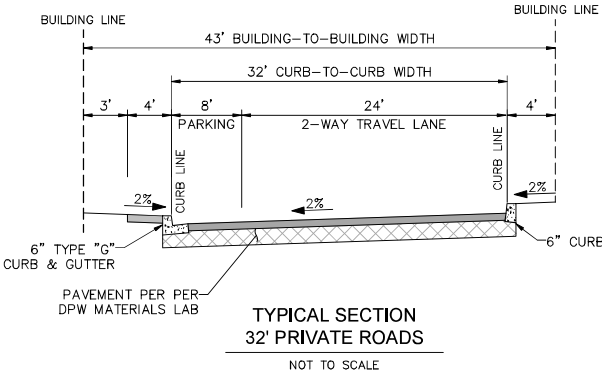
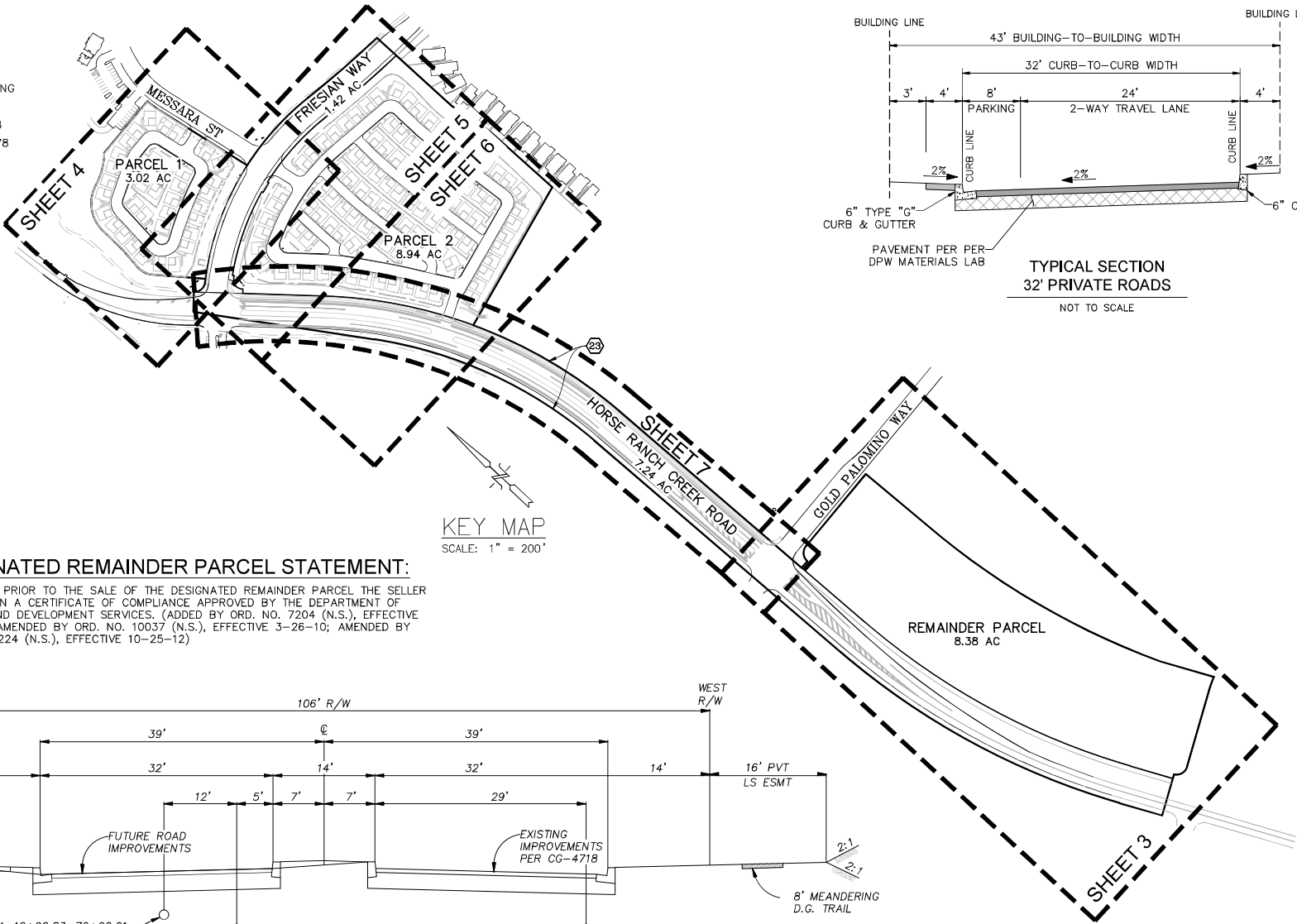
PLAN NOTE:

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

PRELIMINARY GRADING PLAN
"PASSERELLE"
COUNTY OF SAN DIEGO TRACT NO. _____
County of San Diego, California

NOTE:

PRIVATE ROAD STRUCTURAL SECTION SHALL BE A MINIMUM OF TWO INCHES OF ASPHALT CONCRETE OVER FOUR INCHES OF APPROVED BASE. ADEQUACY OF THE STRUCTURAL SECTION AND SURFACE DRAINAGE SHALL BE INSPECTED AND CERTIFIED BY THE DIRECTOR OF PUBLIC WORKS.



LEGEND

- PROPOSED:**
- R/W --- RIGHT-OF-WAY
 - P --- PROPERTY BOUNDARY
 - CENTERLINE
 - LOT LINE
 - EASEMENTS
 - BUILDING SETBACKS
 - S --- S --- PROPOSED SEWER MAIN
 - PROPOSED SEWER LATERAL
 - PROPOSED SEWER MANHOLE
- EXISTING:**
- EX FH
 - EX CONTOUR
 - EX POWER POLE
 - EX SEWER MAIN
 - EX SEWER MANHOLE

APN'S:

108-120-61, 108-120-63

SITE ADDRESS

VACANT LAND HORSE RANCH CREEK ROAD
5378' NORTH OF SR 76

OWNER / DEVELOPER:

I CERTIFY UNDER PENALTY OF PERJURY THAT I MEET THE ELIGIBILITY REQUIREMENTS TO SUBDIVIDE THIS PARCEL BY THE MINOR SUBDIVISION PROCESS, IN ACCORDANCE WITH THE ELIGIBILITY REQUIREMENTS IN SECTION 81.602 OF THE COUNTY OF SAN DIEGO SUBDIVISION ORDINANCE.

NAME: MONTY MCCULLOUGH,
MCCULLOUGH DESIGN DEVELOPMENT
ADDRESS: 16773 CAMINITO DEL VIENTECITO,
SAN DIEGO, CA 92127
TELEPHONE: (858) 431-9622

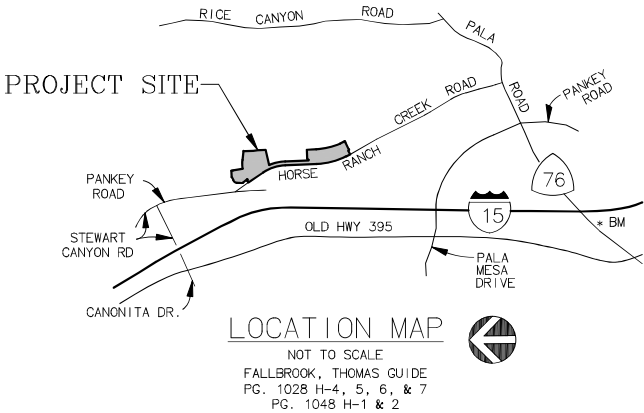
NAME _____ DATE _____

ENGINEER OF WORK

REC CONSULTANTS, INC.
2442 SECOND AVENUE
SAN DIEGO, CA 92101
PH. (619) 232-9200



JONATHAN RAAB RYDEEN R.C.E. 64811 DATE _____
EXPIRES ON 6/30/21



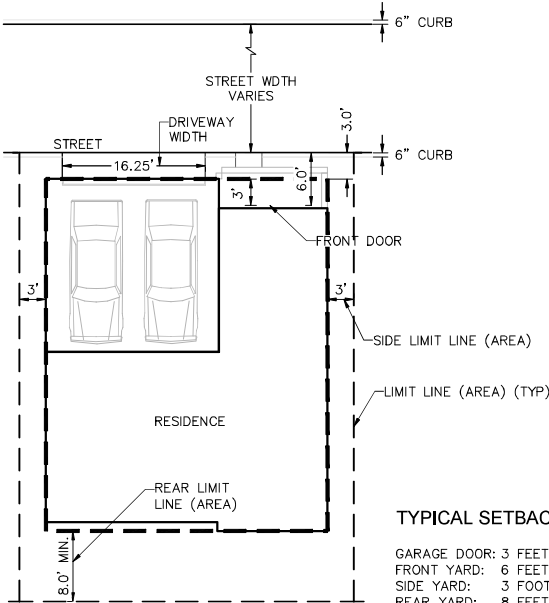
PRELIMINARY GRADING PLAN
"PASSERELLE"
COUNTY OF SAN DIEGO TRACT NO. ____
County of San Diego, California

EASEMENTS NOTES

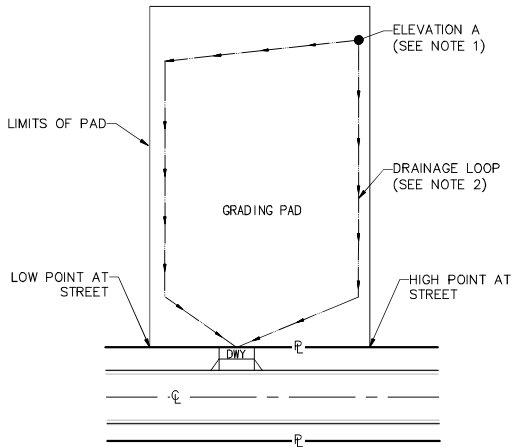
EASEMENTS PER PRELIMINARY TITLE REPORT PREPARED BY:
CHICAGO TITLE INSURANCE COMPANY ~ ORDER No. 00110425--996--SDI--CF2

- ① AN EXISTING EASEMENT TO SAN DIEGO GAS AND ELECTRIC COMPANY
PURPOSE: PUBLIC UTILITIES, INGRESS, EGRESS
RECORDED: AUGUST 27, 1926 IN BOOK 1248, PAGE 267 OF DEEDS (TO BE QUITCLAIMED)
- 2 AN EXISTING EASEMENT TO SAN DIEGO GAS AND ELECTRIC COMPANY
PURPOSE: PUBLIC UTILITIES, INGRESS, EGRESS
RECORDED: OCTOBER 21, 1937 AS INSTRUMENT NO.64819 IN BOOK 694, PAGE 462, OF OFFICIAL RECORDS (EASEMENT NOT LOCATED ON SUBJECT PROPERTY)
- 3 AN EXISTING EASEMENT TO SAN DIEGO GAS AND ELECTRIC COMPANY
PURPOSE: PUBLIC UTILITIES, INGRESS, EGRESS
RECORDED: OCTOBER 22, 1937 IN BOOK 714, PAGE 60 OF OFFICIAL RECORDS (EASEMENT NOT LOCATED ON SUBJECT PROPERTY)
- ④ AN EXISTING EASEMENT TO HENRY R. DEAN, ET AL
PURPOSE: ROAD PURPOSES
RECORDED: FEBRUARY 13, 1948 AS INSTRUMENT NO. 14948 IN BOOK 2269, PAGE 339, OF OFFICIAL RECORDS (TO BE QUITCLAIMED)
- ⑤ AN EXISTING EASEMENT TO THE COUNTY OF SAN DIEGO
PURPOSE: PUBLIC ROAD PURPOSES
RECORDED: AUGUST 10, 1948 AS INSTRUMENT NO. 78889 IN BOOK 2905, PAGE 434, OF OFFICIAL RECORDS (TO BE QUITCLAIMED)
- ⑥ AN EXISTING EASEMENT TO THE COUNTY OF SAN DIEGO
PURPOSE: PUBLIC ROAD PURPOSES
RECORDED: AUGUST 10, 1948 IN BOOK 2905, PAGE 435, OF OFFICIAL RECORDS (TO BE QUITCLAIMED)
- ⑦ AN EXISTING EASEMENT TO SAN DIEGO GAS AND ELECTRIC COMPANY
PURPOSE: PUBLIC UTILITIES, INGRESS, EGRESS
RECORDED: JUNE 20, 1951 IN BOOK 4151, PAGE 492, OF OFFICIAL RECORDS (TO BE QUITCLAIMED)
- 8 AN EXISTING EASEMENT TO SAN DIEGO GAS AND ELECTRIC COMPANY
PURPOSE: PUBLIC UTILITIES, INGRESS, EGRESS
RECORDED: DECEMBER 14, 1951 IN BOOK 4320, PAGE 280, OF OFFICIAL RECORDS (EASEMENT NOT LOCATED ON SUBJECT PROPERTY)
- 9 AN EXISTING EASEMENT TO THE SAN DIEGO GAS AND ELECTRIC COMPANY
PURPOSE: PUBLIC UTILITIES, INGRESS, EGRESS
RECORDED: JULY 2, 1974 AS INSTRUMENT NO. 74-177833, OF OFFICIAL RECORDS (EASEMENT NOT LOCATED ON SUBJECT PROPERTY)
- 10 AN EXISTING EASEMENT TO RAINBOW MUNICIPAL WATER DISTRICT, A MUNICIPAL CORPORATION
PURPOSE: PIPELINE OR PIPELINES
RECORDED: JUNE 13, 1978 AS INSTRUMENT NO. 78-244432, OF OFFICIAL RECORDS (EASEMENT NOT LOCATED ON SUBJECT PROPERTY)
- 11 AN EXISTING EASEMENT FOR TO RAINBOW MUNICIPAL WATER DISTRICT, A MUNICIPAL CORPORATION
PURPOSE: A PIPELINE OR PIPELINES
RECORDED: OCTOBER 6, 1978 AS INSTRUMENT NO. 78-0425959, OF OFFICIAL RECORDS (EASEMENT NOT LOCATED ON SUBJECT PROPERTY)
- ⑫ AN EXISTING EASEMENT TO WILLIAM B. BUCK, ET AL
PURPOSE: ROAD AND UTILITY PURPOSES
RECORDED: OCTOBER 31, 1978 AS INSTRUMENT NO. 78-471499, OF OFFICIAL RECORDS
QUITCLAIM DEED RECORDED JANUARY 9, 1981 AS FILE NO. 81-006489, WILLIAM B. BUCK ET AL, QUITCLAIM OF INTEREST OF THE HEREIN ABOVE DESCRIBED EASEMENT.
- ⑬ AN EXISTING EASEMENT TO PAKEY RANCH
PURPOSE: ROAD AND PUBLIC UTILITY
RECORDED: DECEMBER 4, 1979 AS INSTRUMENT NO. 79-508977, OF OFFICIAL RECORDS (TO BE QUITCLAIMED)
- ⑭ AN EXISTING EASEMENT TO ROBERT H. PANKEY AND ROSEMARY R. PANKEY, HUSBAND AND WIFE AS COMMUNITY PROPERTY, ET AL
PURPOSE: ROAD AND UTILITY PURPOSES
RECORDED: JANUARY 8, 1981 AS INSTRUMENT NO. 81-006490, OF OFFICIAL RECORDS (TO BE QUITCLAIMED)
AND RE-RECORDED JUNE 10, 1981 AS INSTRUMENT NO. 81-181138, OF OFFICIAL RECORDS. (TO BE QUITCLAIMED)
- ⑮ AN EXISTING EASEMENT FOR ROAD AND UTILITIES
RECORDED: MARCH 27, 1981 AS INSTRUMENT NO. 81-092782 (TO BE QUITCLAIMED)
- 16 AN EXISTING EASEMENT TO THE SAN LUIS REY MUNICIPAL WATER DISTRICT
PURPOSE: ACCESS AND DEVELOPMENT OF WATERS, WELLSITES, AND WATER WORKS
RECORDED: JULY 26, 1984 AS INSTRUMENT NO. 84-284008, OF OFFICIAL RECORDS (EASEMENT NOT LOCATED ON SUBJECT PROPERTY)
- 19 EXISTING EASEMENTS FOR THE PURPOSE SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS SHOWN OR AS OFFERED FOR DEDICATION ON THE RECORDED PARCEL MAP 13703. (EASEMENT NOT LOCATED ON SUBJECT PROPERTY)

- 21 A DOCUMENT ENTITLED 'AGREEMENT FOR GRANT OF EASEMENTS', DATED, JUNE 15, 2007, EXECUTED BY PASSERELLE, LLC, A CALIFORNIA LIMITED LIABILITY COMPANY AND PALOMAR COMMUNITY COLLEGE DISTRICT, SUBJECT TO ALL THE TERMS, PROVISIONS AND CONDITIONS THEREIN CONTAINED, RECORDED JUNE 14, 2007 AS INSTRUMENT NO. 2007-0403365, OF OFFICIAL RECORDS. A DOCUMENT ENTITLED 'AGREEMENT FOR GRANT OF EASEMENTS', DATED, JUNE 15, 2007, EXECUTED BY PASSERELLE, LLC, A CALIFORNIA LIMITED LIABILITY COMPANY AND PALOMAR COMMUNITY COLLEGE DISTRICT, SUBJECT TO ALL THE TERMS, PROVISIONS AND CONDITIONS THEREIN CONTAINED, RECORDED JUNE 14, 2007 AS INSTRUMENT NO. 2007-0403364, OF OFFICIAL RECORDS. (EASEMENT IS NOT PLOTABLE)
- 22 AN EXISTING EASEMENT TO SAN DIEGO GAS & ELECTRIC COMPANY, A CORPORATION
PURPOSE: UTILITIES, INGRESS & EGRESS
RECORDED: JANUARY 7, 2011, AS INSTRUMENT NO. 2011-0013745 OF OFFICIAL RECORDS (EASEMENT NOT LOCATED ON SUBJECT PROPERTY)
- ②③ AN EXISTING EASEMENT TO THE COUNTY OF SAN DIEGO
PURPOSE: PUBLIC HIGHWAY
RECORDED: JANUARY 10, 2011, AS INSTRUMENT NO. 2011-0017036 OF OFFICIAL RECORDS
- ②④ AN EXISTING EASEMENT TO THE COUNTY OF SAN DIEGO, A POLITICAL SUBDIVISION OF THE STATE OF CALIFORNIA
PURPOSE: COUNTY HIGHWAY
RECORDING DATE: DECEMBER 05, 2013
RECORDING NO: 2013-0706899 OF OFFICIAL RECORDS
- ②⑤ AN EXISTING EASEMENT TO RAINBOW MUNICIPAL WATER DISTRICT, A MUNICIPAL WATER DISTRICT
PURPOSE: PUBLIC UTILITIES, INGRESS, EGRESS
RECORDING DATE: MARCH 26, 2014
RECORDING NO: 2014-0117990 OF OFFICIAL RECORDS
- ②⑥ EXISTING EASEMENTS CONTAINED IN THAT CERTAIN DOCUMENT ENTITLED: EASEMENT AGREEMENT
RECORDING DATE: MAY 26, 2015
RECORDING NO: 2015-0265828 OF OFFICIAL RECORDS
- 35 AN EXISTING EASEMENT TO SAN DIEGO GAS AND ELECTRIC COMPANY, A CORPORATION
PURPOSE: PUBLIC UTILITIES, INGRESS, EGRESS
RECORDING DATE: MARCH 18, 2016
RECORDING NO: 2016-0120629 OF OFFICIAL RECORDS (EASEMENT IS NOT PLOTABLE)
- ②⑦ EXISTING MATTERS CONTAINED IN THAT CERTAIN DOCUMENT ENTITLED: TEMPORARY FUEL MANAGEMENT EASEMENT AGREEMENT
RECORDING DATE: MARCH 22, 2016
RECORDING NO: 2016-0126290 OF OFFICIAL RECORDS
- ②⑧ EXISTING MATTERS CONTAINED IN THAT CERTAIN DOCUMENT ENTITLED: WALLS AND FENCES EASEMENT AND COST-SHARING AGREEMENT
RECORDING DATE: DECEMBER 07, 2016
RECORDING NO: 2016-0671680 OF OFFICIAL RECORDS



2 TYP. MIN. RESIDENTIAL LOT CONFIGURATION
NOT TO SCALE



- NOTES:
- ELEVATION "A" IS LOCATED AT THE MOST REMOTE CORNER OF THE PAD FROM THE DRIVEWAY.
 - MINIMUM 1% SWALE TO STREET OR OTHER DISCHARGE POINT.
 - ALL SLOPE SURFACES SHALL BE PROTECTED BY APPROVED EROSION CONTROL MATERIAL.
 - ALL PADS TO BE BERMED TO PREVENT RUN-OFF TO ADJACENT PADS.

3 TYPICAL RESIDENTIAL PAD DRAINAGE
NOT TO SCALE

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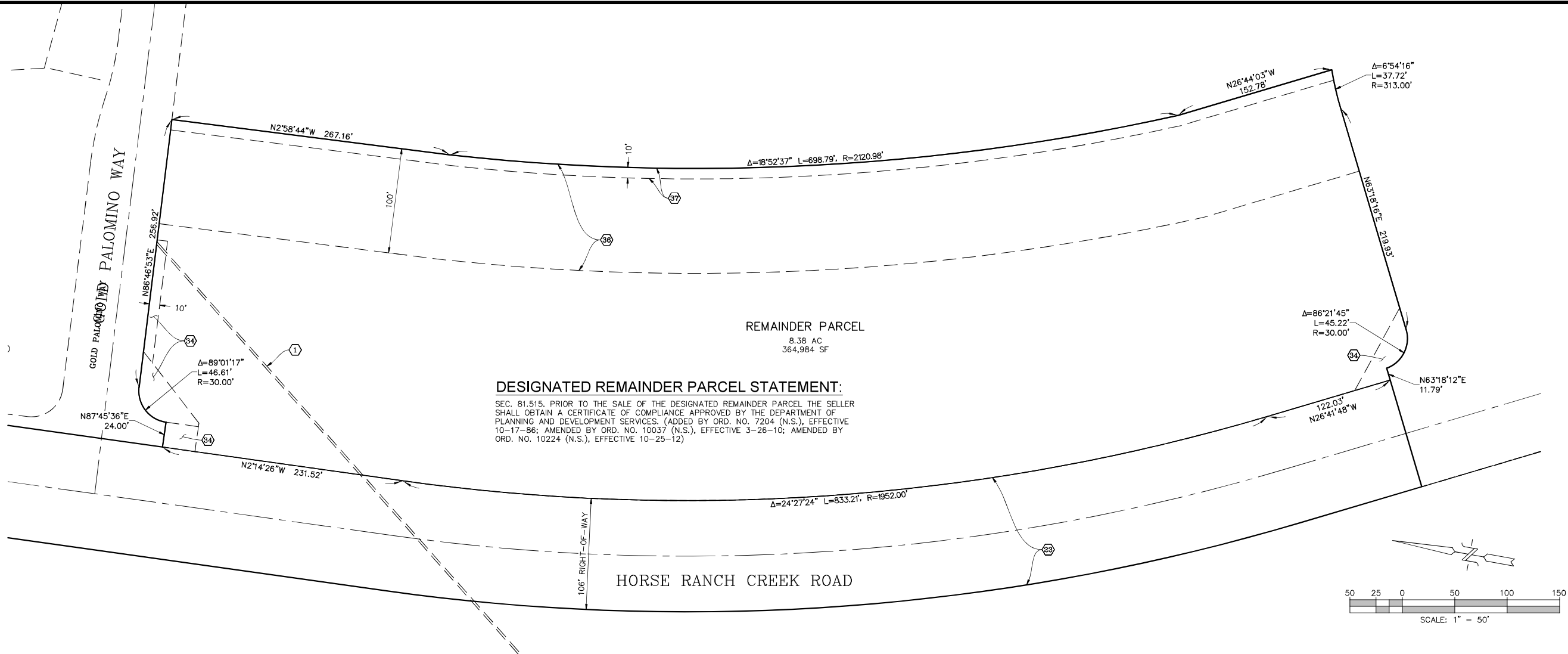
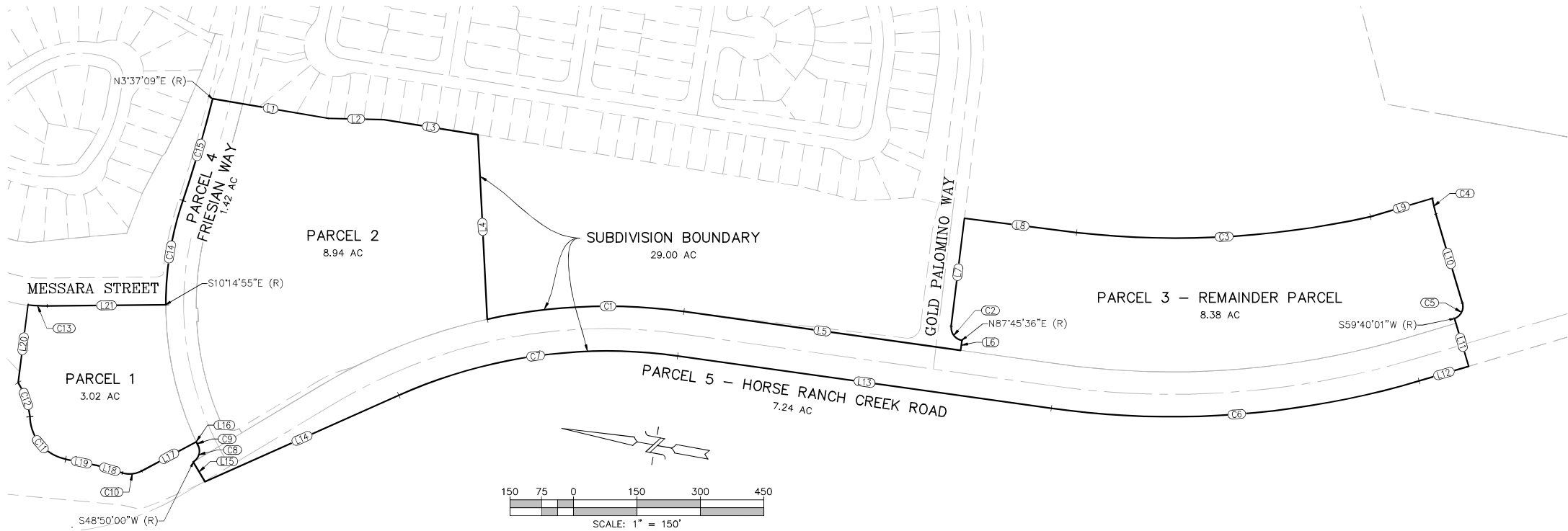
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PRELIMINARY GRADING PLAN
PASSERELLE
COUNTY OF SAN DIEGO TRACT NO. ____
County of San Diego, California

SHEET NO.
2 OF 18

DATA TABLE			
#	BEARING/DELTA	RADIUS	LENGTH
C1	$\Delta = 20^{\circ}24'20''$	1313.00'	467.62'
C2	$\Delta = 89^{\circ}01'17''$	30.00'	46.61'
C3	$\Delta = 18^{\circ}52'37''$	2120.98'	698.79'
C4	$\Delta = 6^{\circ}54'16''$	313.00'	37.72'
C5	$\Delta = 86^{\circ}21'45''$	30.00'	45.22'
C6	$\Delta = 24^{\circ}27'24''$	2058.00'	878.46'
C7	$\Delta = 32^{\circ}00'00''$	1207.00'	674.12'
C8	$\Delta = 84^{\circ}50'41''$	30.00'	44.42'
C9	$\Delta = 0^{\circ}44'03''$	767.00'	9.83'
C10	$\Delta = 44^{\circ}39'42''$	60.00'	46.77'
C11	$\Delta = 77^{\circ}32'54''$	104.66'	141.65'
C12	$\Delta = 24^{\circ}47'25''$	199.02'	86.11'
C13	$\Delta = 7^{\circ}21'11''$	355.00'	45.56'
C14	$\Delta = 18^{\circ}44'01''$	767.00'	250.78'
C15	$\Delta = 4^{\circ}51'57''$	2958.00'	251.21'
L1	N 00°33'32" W		277.64'
L2	N 08°59'44" W		131.04'
L3	N 01°05'43" W		225.35'
L4	N 76°53'58" E		437.11'
L5	N 02°14'26" W		660.87'

DATA TABLE			
#	BEARING/DELTA	RADIUS	LENGTH
L6	N 87°45'36" E		24.00'
L7	N 86°46'53" E		256.92'
L8	N 02°58'44" W		267.16'
L9	N 26°44'03" W		152.78'
L10	N 63°18'16" E		219.93'
L11	N 63°18'12" E		117.79'
L12	N 26°41'48" W		122.03'
L13	N 02°14'24" W		892.40'
L14	N 34°14'24" W		502.01'
L15	N 48°50'34" E		54.30'
L16	N 54°45'17" E		0.26'
L17	N 38°25'37" W		146.38'
L18	N 06°14'05" E		62.22'
L19	N 01°11'58" E		76.23'
L20	N 86°59'34" E		185.12'
L21	N 10°47'30" W		280.22'



DESIGNATED REMAINDER PARCEL STATEMENT:

SEC. 81.515. PRIOR TO THE SALE OF THE DESIGNATED REMAINDER PARCEL THE SELLER SHALL OBTAIN A CERTIFICATE OF COMPLIANCE APPROVED BY THE DEPARTMENT OF PLANNING AND DEVELOPMENT SERVICES. (ADDED BY ORD. NO. 7204 (N.S.), EFFECTIVE 10-17-86; AMENDED BY ORD. NO. 10037 (N.S.), EFFECTIVE 3-26-10; AMENDED BY ORD. NO. 10224 (N.S.), EFFECTIVE 10-25-12)

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PASSERELLE
COUNTY OF SAN DIEGO TRACT NO. _____
County of San Diego, California

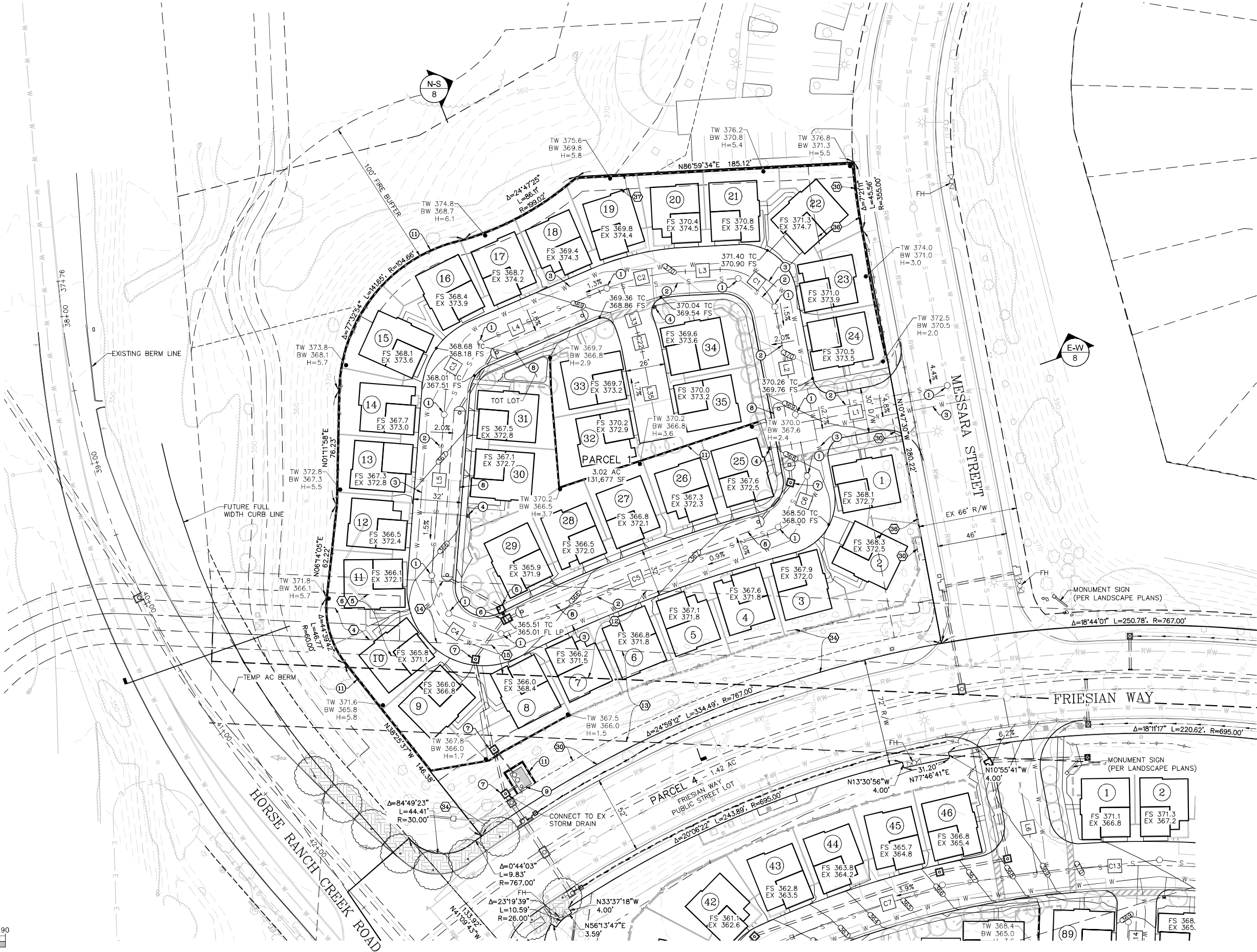
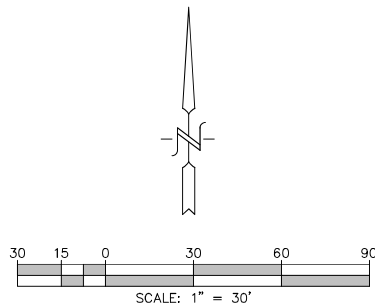
SHEET NO.

3 OF 18

PRIVATE ROAD CENTERLINE			
#	BEARING/Delta	RADIUS	LENGTH
C1	Δ = 82°12'56"	36.00'	51.66'
C2	Δ = 20°20'40"	166.00'	58.94'
C3	Δ = 62°17'18"	36.00'	39.14'
C4	Δ = 121°15'00"	36.00'	76.18'
C5	Δ = 11°29'20"	920.05'	184.49'
C6	Δ = 85°23'25"	36.00'	53.65'
C22	Δ = 7°11'32"	103.00'	12.93'
L1	S 79°12'30" W		100.03'
L2	N 10°47'30" W		107.85'
L3	S 86°59'34" W		23.25'
L4	S 66°38'54" W		87.77'
L5	S 04°21'35" W		128.88'
L33	S 17°59'03" E		34.76'
L35	S 10°47'30" E		56.16'

LEGEND

- 1 PROPOSED SEWER MAIN HOLE
- 2 PROPOSED SEWER MAIN
- 3 PROPOSED WATER MAIN
- 4 PROPOSED FIRE HYDRANT
- 5 PROPOSED CURB INLET
- 6 PROPOSED DIVERSION CHAMBER (SEE SHEET ____ FOR DETAILS)
- 7 PROPOSED STORM DRAIN CLEANOUT
- 8 PROPOSED UNDERGROUND STORAGE TANK (SEE SHEET ____ FOR DETAILS)
- 9 PROPOSED MODULAR WETLAND STRUCTURE (SEE SHEET ____ FOR DETAILS)
- 11 PROPOSED RETAINING WALL



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PRELIMINARY GRADING PLAN
PASSERELLE

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County of San Diego, California

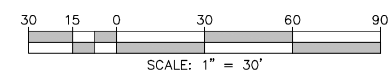
SHEET NO.
4 OF 18

#	BEARING/DELTA	RADIUS	LENGTH
C7	Δ = 15°52'38"	606.00'	167.93'
C8	Δ = 108°21'01"	38.00'	71.86'
C9	Δ = 8°14'56"	616.00'	88.69'
C10	Δ = 2°55'06"	1216.00'	61.94'
C11	Δ = 7°31'15"	919.61'	120.71'
C12	Δ = 85°20'43"	31.00'	46.18'
C13	Δ = 13°32'33"	606.00'	143.24'
C14	Δ = 2°55'55"	1416.53'	72.48'
C15	Δ = 58°00'57"	28.00'	28.35'
C16	Δ = 7°31'15"	1184.00'	155.41'
L6	S 10°47'30" E		117.95'

#	BEARING/DELTA	RADIUS	LENGTH
L7	N 41°09'35" W		87.32'
L8	N 32°54'39" W		91.04'
L9	S 05°33'55" E		228.71'
L10	S 01°57'20" W		17.87'
L11	S 83°23'23" E		160.92'
L12	N 00°08'23" E		42.57'
L13	N 55°29'31" E		23.50'
L14	N 01°57'20" E		63.25'
L15	N 05°33'55" W		175.76'
L16	S 01°57'20" W		57.50'



- LEGEND**
- ① PROPOSED SEWER MAIN HOLE
 - ② PROPOSED SEWER MAIN
 - ③ PROPOSED WATER MAIN
 - ④ PROPOSED FIRE HYDRANT
 - ⑤ PROPOSED CURB INLET
 - ⑥ PROPOSED DIVERSION CHAMBER (SEE SHEET ____ FOR DETAILS)
 - ⑦ PROPOSED STORM DRAIN CLEANOUT
 - ⑧ PROPOSED UNDERGROUND STORAGE TANK (SEE SHEET ____ FOR DETAILS)
 - ⑨ PROPOSED MODULAR WETLAND STRUCTURE (SEE SHEET ____ FOR DETAILS)
 - ⑩ PROPOSED STORM DRAIN INLET
 - ⑪ PROPOSED RETAINING WALL



SAVE DATE: 8/17/2023 ~ PLOT DATE: 8/17/2023 ~ FILE NAME: P:\Acad\1581 Campus Park Condo\Civil\Preliminary Grading Plan\Preliminary Grading Plan.dwg

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PRELIMINARY GRADING PLAN
PASSERELLE
COUNTY OF SAN DIEGO TRACT NO. ____
County of San Diego, California

SHEET NO.
5 OF 18

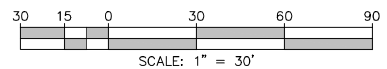


LEGEND

- 1 PROPOSED SEWER MAIN HOLE
- 2 PROPOSED SEWER MAIN
- 3 PROPOSED WATER MAIN
- 4 PROPOSED FIRE HYDRANT
- 5 PROPOSED CURB INLET
- 6 PROPOSED DIVERSION CHAMBER (SEE SHEET ____ FOR DETAILS)
- 7 PROPOSED STORM DRAIN CLEANOUT
- 8 PROPOSED UNDERGROUND STORAGE TANK (SEE SHEET ____ FOR DETAILS)
- 9 PROPOSED MODULAR WETLAND STRUCTURE (SEE SHEET ____ FOR DETAILS)
- 10 PROPOSED STORM DRAIN INLET
- 11 PROPOSED RETAINING WALL

PRIVATE ROAD CENTERLINE			
#	BEARING/DELTA	RADIUS	LENGTH
C9	$\Delta = 81^{\circ}4'56''$	616.00'	88.69'
C10	$\Delta = 2^{\circ}55'06''$	1216.00'	61.94'
C11	$\Delta = 7^{\circ}31'15''$	919.61'	120.71'
C14	$\Delta = 2^{\circ}55'55''$	1416.53'	72.48'
C15	$\Delta = 58^{\circ}00'57''$	28.00'	28.35'
C16	$\Delta = 7^{\circ}31'15''$	1184.00'	155.41'
C17	$\Delta = 7^{\circ}31'15''$	1055.33'	138.52'
C18	$\Delta = 73^{\circ}06'29''$	36.00'	45.94'
C19	$\Delta = 82^{\circ}27'53''$	31.00'	44.62'
C20	$\Delta = 65^{\circ}34'22''$	23.00'	26.32'
C21	$\Delta = 12^{\circ}41'00''$	164.00'	36.30'
L7	N 41°09'35" W		87.32'

PRIVATE ROAD CENTERLINE			
#	BEARING/DELTA	RADIUS	LENGTH
L8	N 32°54'39" W		91.04'
L9	S 05°33'55" E		228.71'
L13	N 55°29'31" E		23.50'
L15	N 05°33'55" W		175.76'
L17	S 05°33'55" E		273.83'
L18	N 29°59'33" W		129.80'
L19	S 76°53'58" W		216.15'
L20	N 60°00'27" E		29.83'
L21	N 76°53'58" E		54.33'
L22	N 64°12'58" E		82.33'



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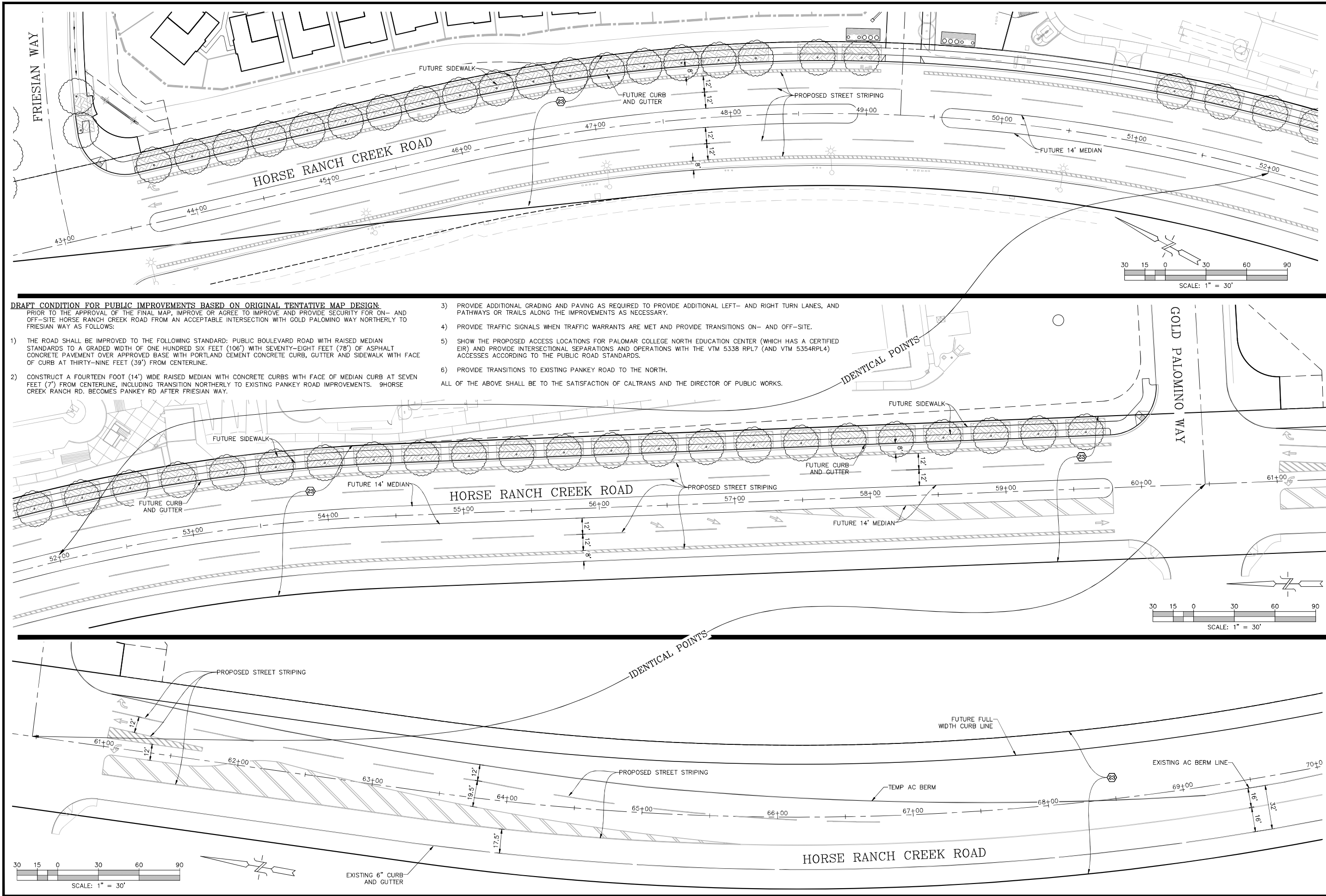
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SHEET NO.
6 OF 18



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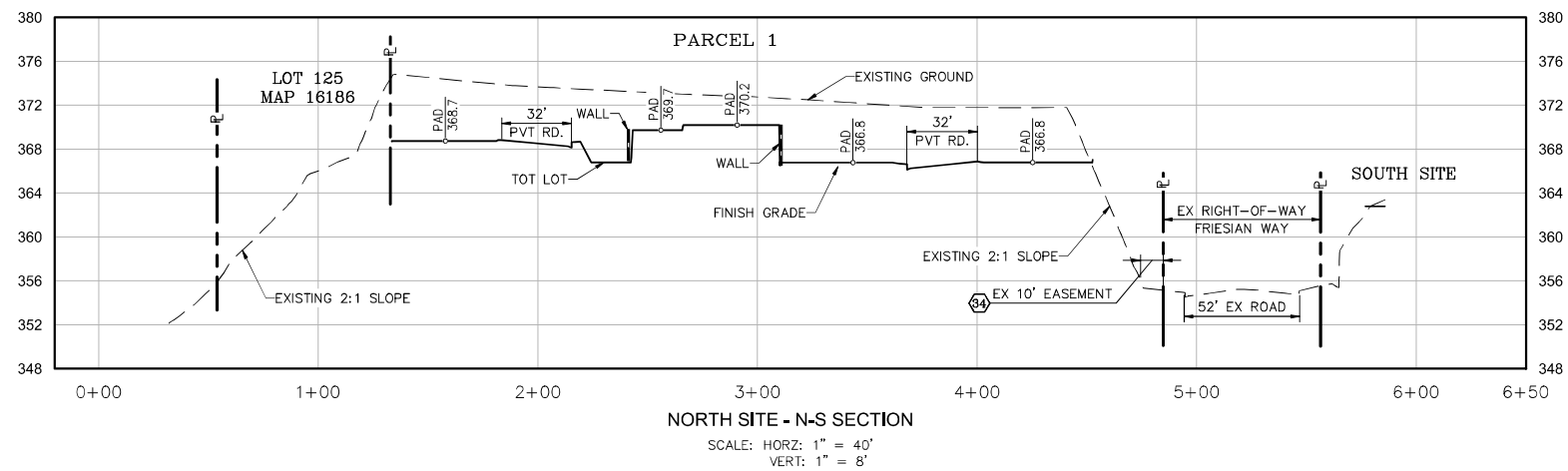
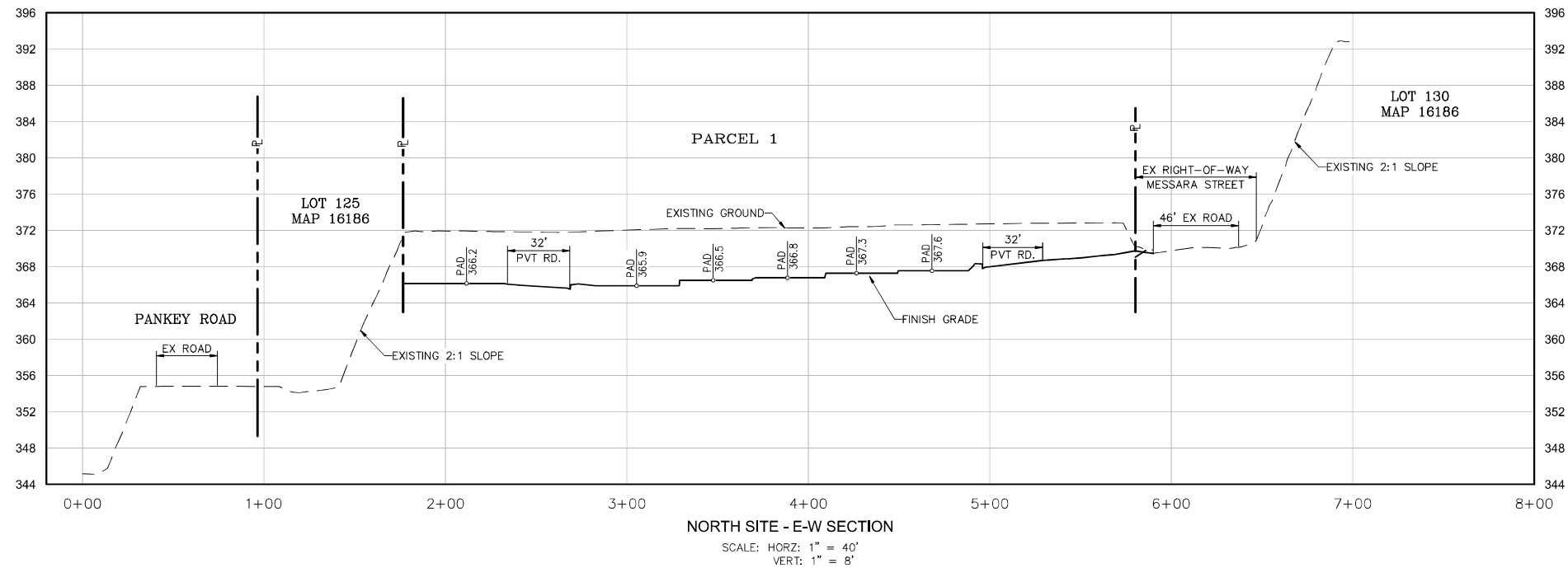
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BY	DATE	

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SHEET NO.
7 OF 18



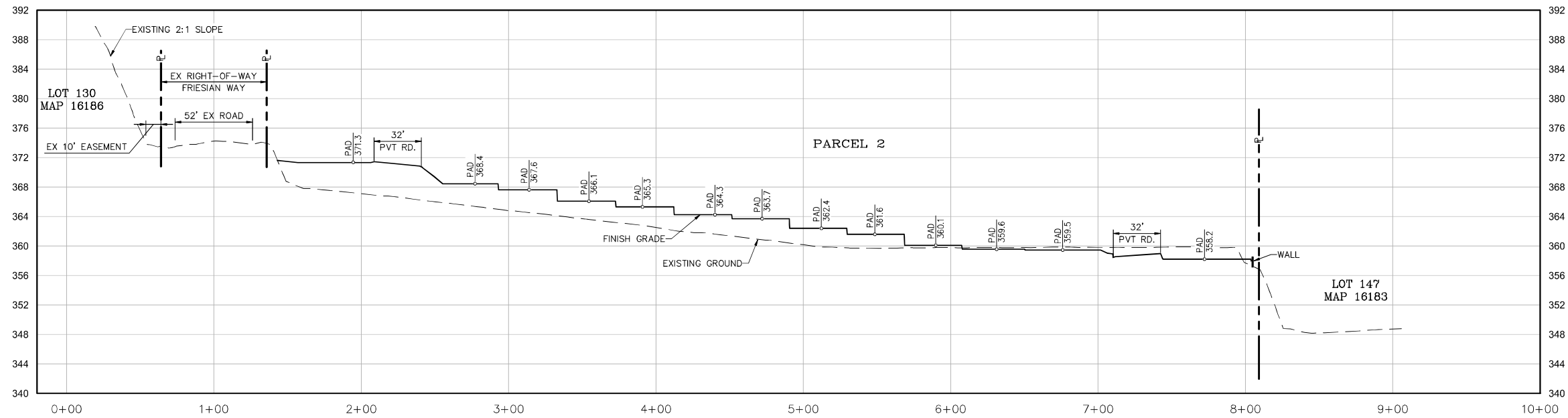
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COUNTY OF SAN DIEGO TRACT NO. _____
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BY DATE DESCRIPTION

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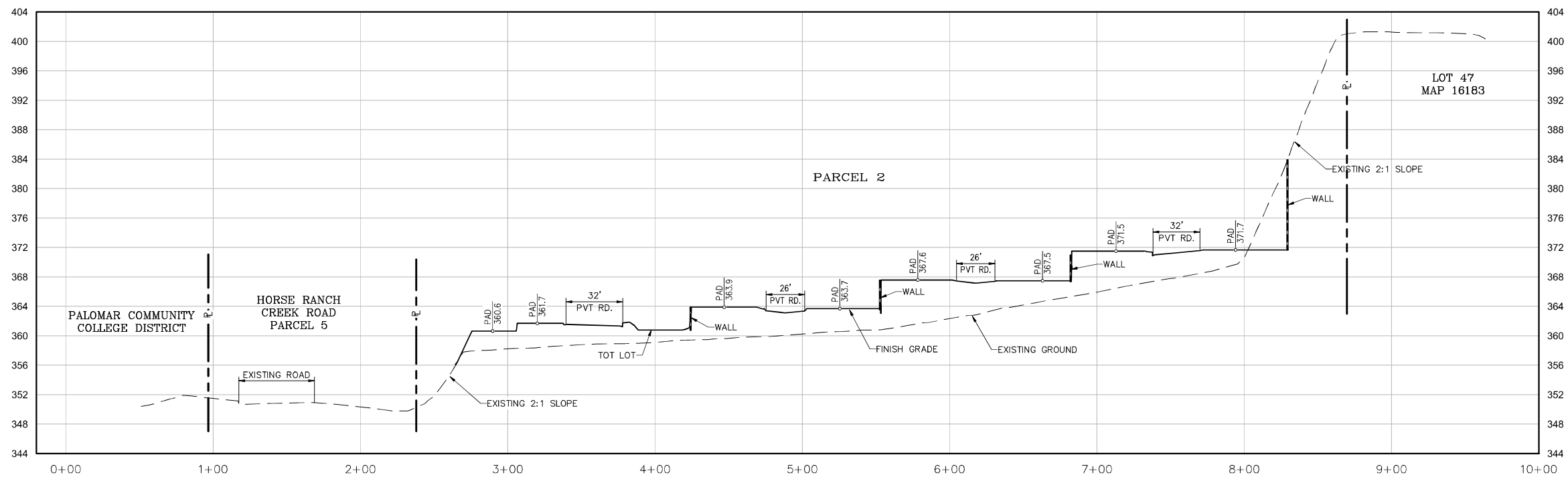
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8 OF 18



SOUTH SITE - N-S SECTION

SCALE: HORZ: 1" = 40'
VERT: 1" = 8'



SOUTH SITE - E-W SECTION

SCALE: HORZ: 1" = 40'
VERT: 1" = 8'



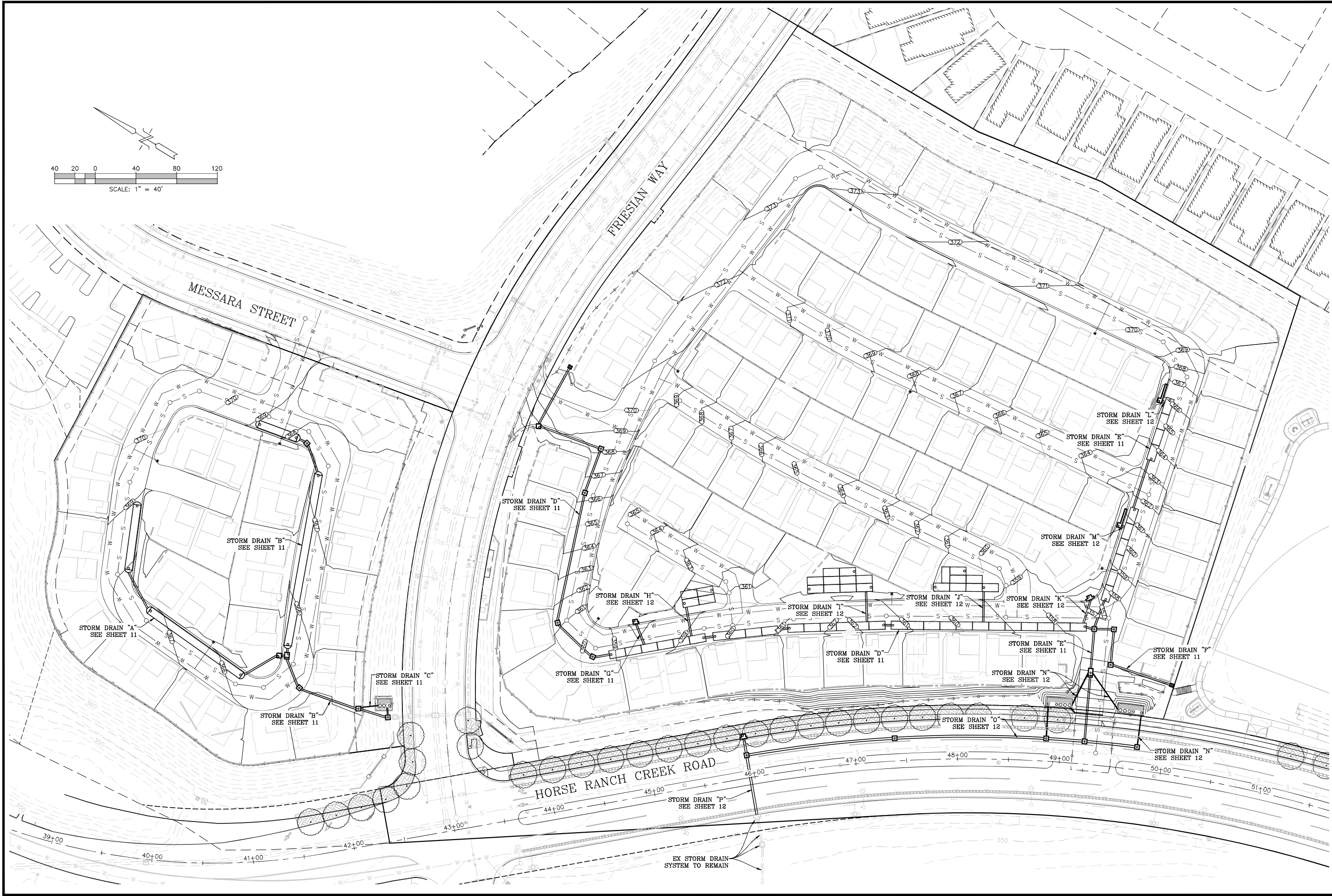
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PRELIMINARY GRADING PLAN
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SHEET NO.

9 OF 18



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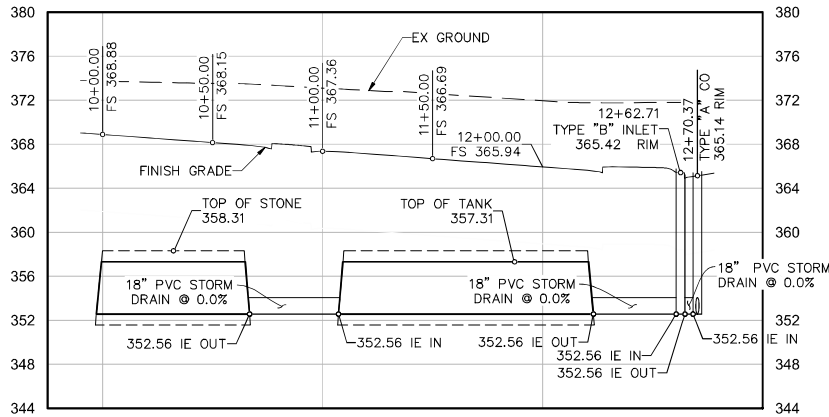
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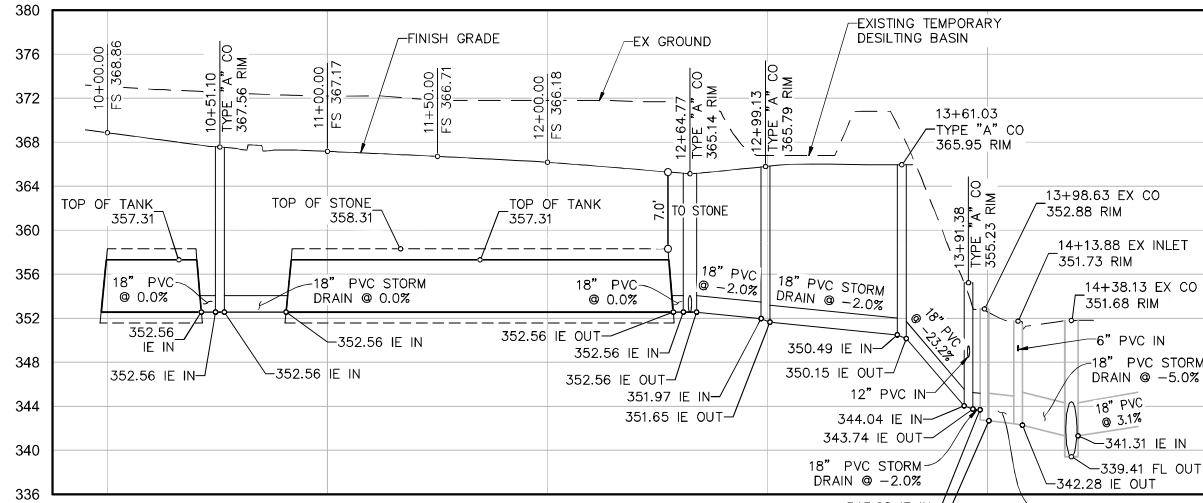
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SHEET NO.
10 OF 18



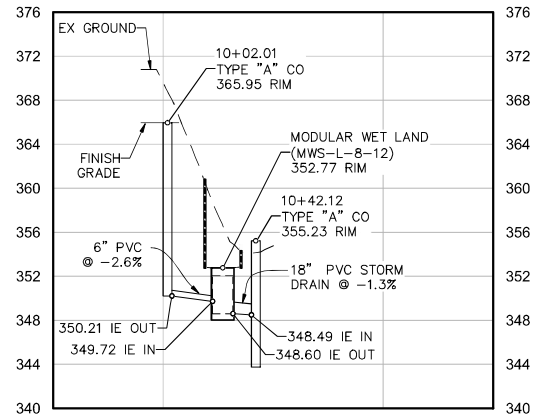
STORM DRAIN A SECTION

SCALE: HORZ: 1" = 40'
VERT: 1" = 8'



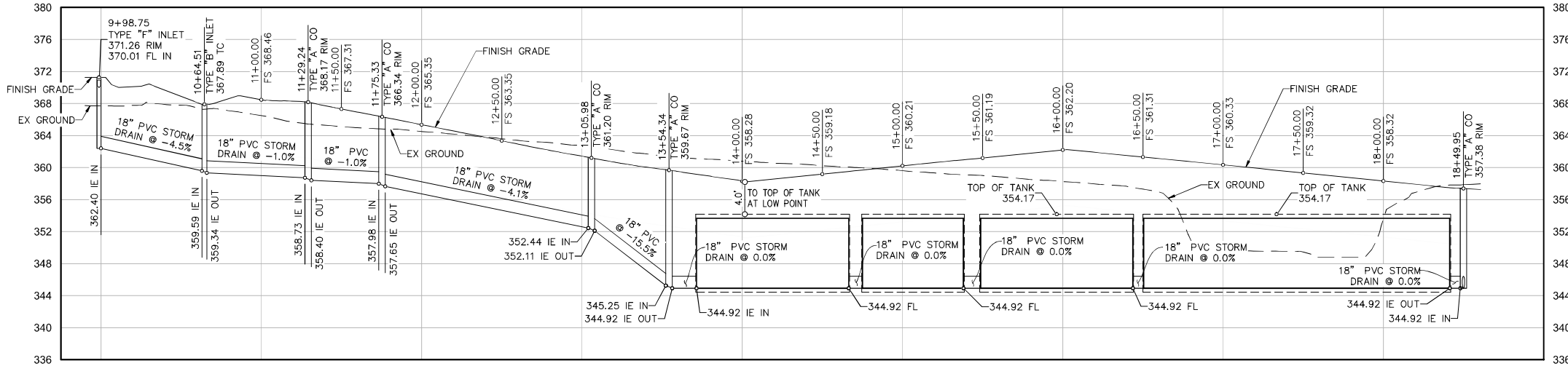
STORM DRAIN B SECTION

SCALE: HORZ: 1" = 40'
VERT: 1" = 8'



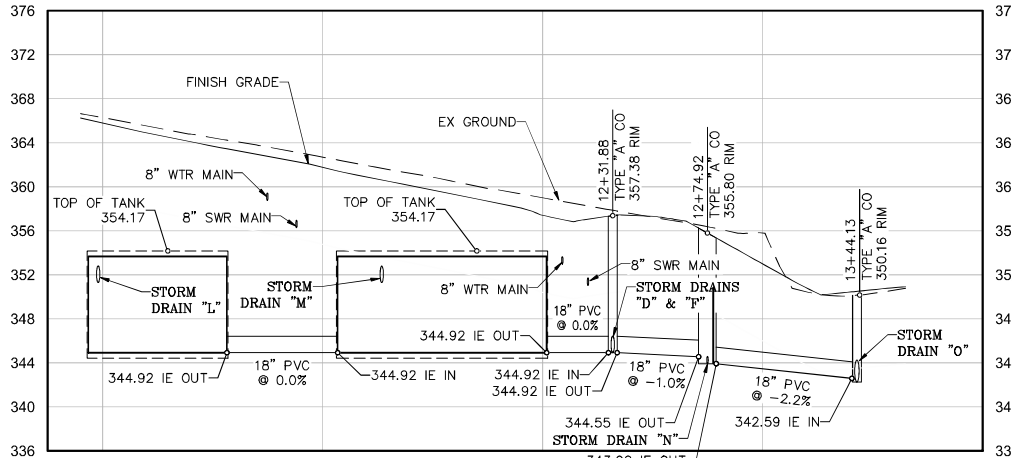
STORM DRAIN C SECTION

SCALE: HORZ: 1" = 40'
VERT: 1" = 8'



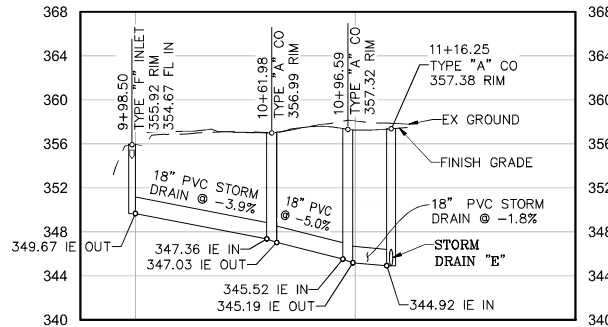
STORM DRAIN D SECTION

SCALE: HORZ: 1" = 40'
VERT: 1" = 8'



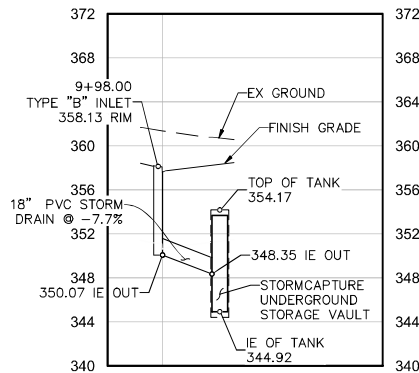
STORM DRAIN E SECTION

SCALE: HORZ: 1" = 40'
VERT: 1" = 8'



STORM DRAIN F SECTION

SCALE: HORZ: 1" = 40'
VERT: 1" = 8'



STORM DRAIN G SECTION

SCALE: HORZ: 1" = 40'
VERT: 1" = 8'

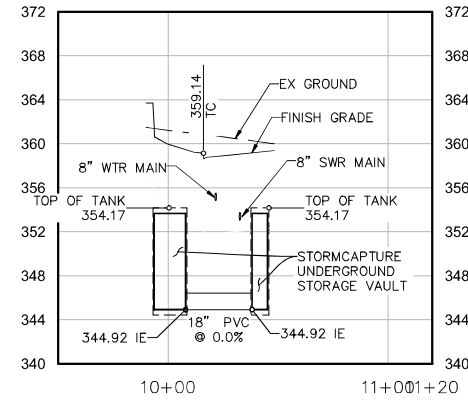
PRELIMINARY GRADING PLAN
PASSERELLE
COUNTY OF SAN DIEGO TRACT NO. _____
County of San Diego, California

REVISIONS		DESCRIPTION
BY	DATE	

JOB NO. 1581

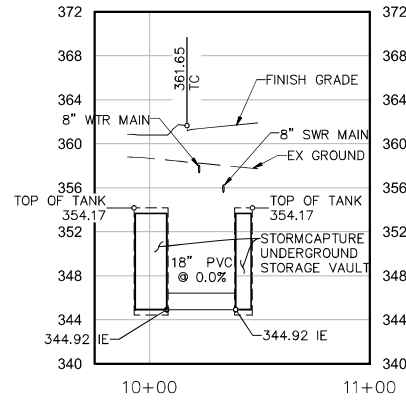
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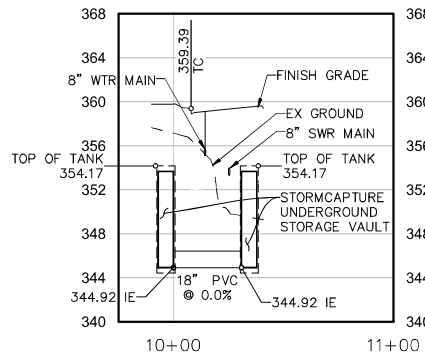
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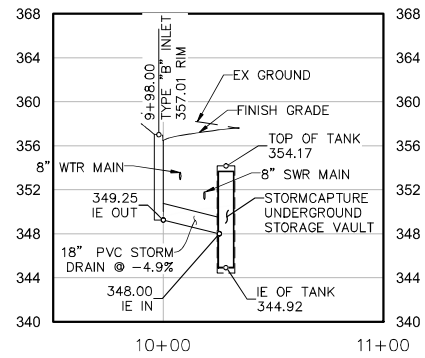
STORM DRAIN I SECTION

SCALE: HORZ: 1" = 40'
VERT: 1" = 8'



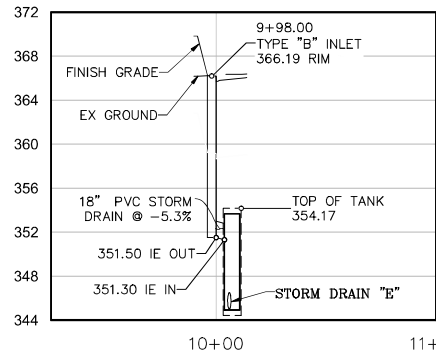
STORM DRAIN J SECTION

SCALE: HORZ: 1" = 40'
VERT: 1" = 8'



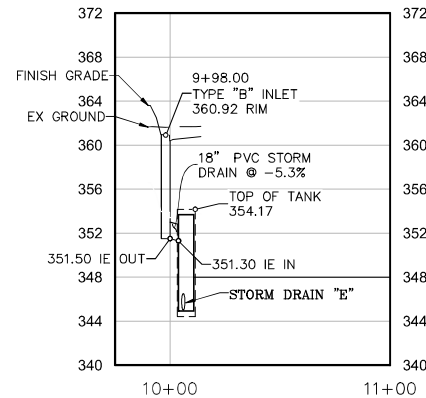
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SCALE: HORZ: 1" = 40'
VERT: 1" = 8'



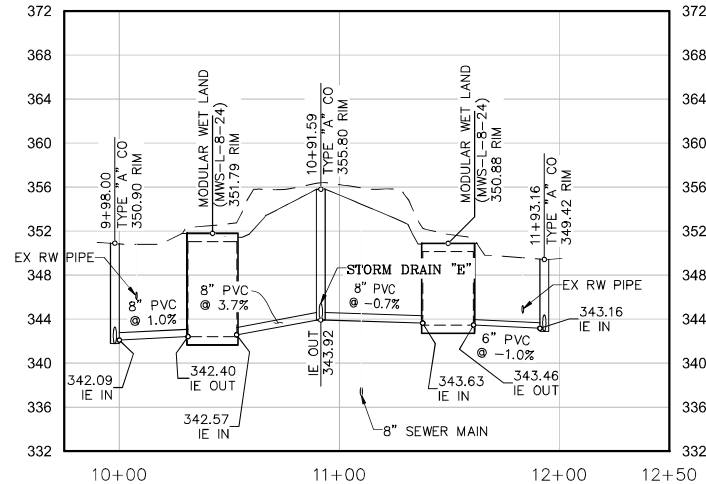
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SCALE: HORZ: 1" = 40'
VERT: 1" = 8'



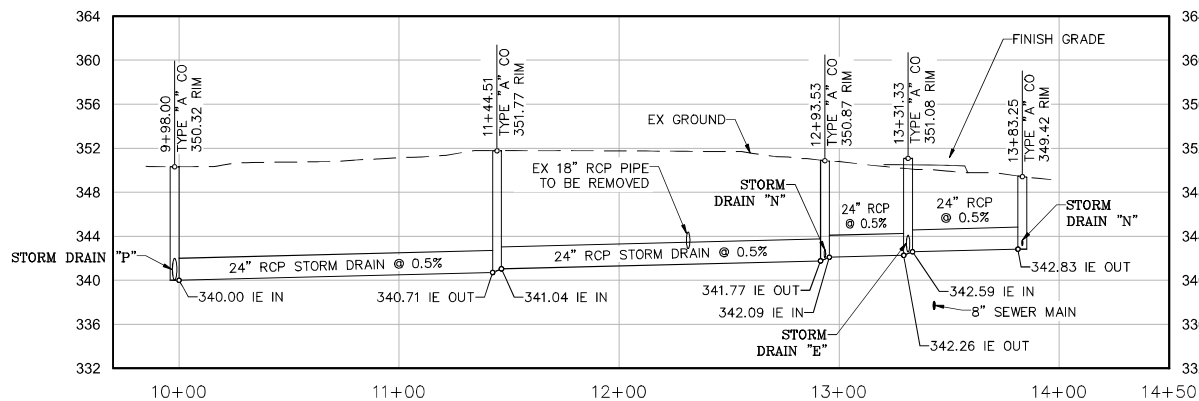
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SCALE: HORZ: 1" = 40'
VERT: 1" = 8'



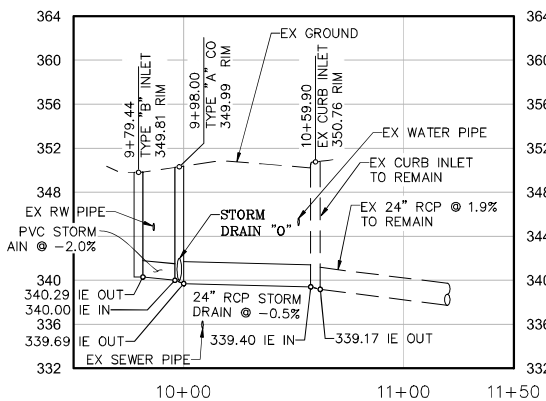
STORM DRAIN N SECTION

SCALE: HORZ: 1" = 40'
VERT: 1" = 8'



STORM DRAIN O SECTION

SCALE: HORZ: 1" = 40'
VERT: 1" = 8'



STORM DRAIN P SECTION

SCALE: HORZ: 1" = 40'
VERT: 1" = 8'

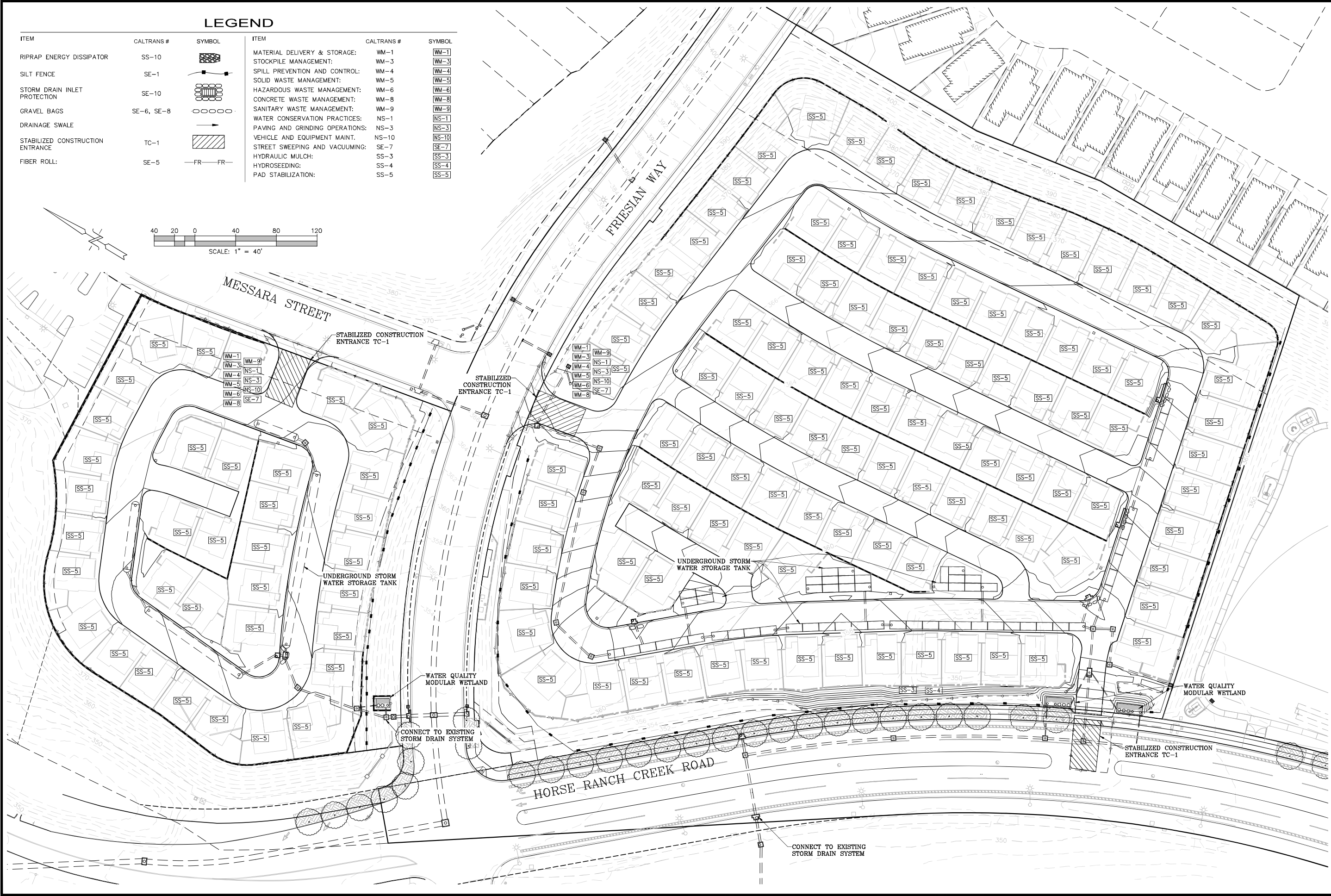


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REVISIONS		DESCRIPTION
BY	DATE	

JOB NO. 1581

PRELIMINARY GRADING PLAN
PASSERELLE
COUNTY OF SAN DIEGO TRACT NO. _____
County of San Diego, California



LEGEND					
ITEM	CALTRANS #	SYMBOL	ITEM	CALTRANS #	SYMBOL
RIPRAP ENERGY DISSIPATOR	SS-10		MATERIAL DELIVERY & STORAGE:	WM-1	
SILT FENCE	SE-1		STOCKPILE MANAGEMENT:	WM-3	
STORM DRAIN INLET PROTECTION	SE-10		SPILL PREVENTION AND CONTROL:	WM-4	
GRAVEL BAGS	SE-6, SE-8		SOLID WASTE MANAGEMENT:	WM-5	
DRAINAGE SWALE			HAZARDOUS WASTE MANAGEMENT:	WM-6	
STABILIZED CONSTRUCTION ENTRANCE	TC-1		CONCRETE WASTE MANAGEMENT:	WM-8	
FIBER ROLL:	SE-5		SANITARY WASTE MANAGEMENT:	WM-9	
			WATER CONSERVATION PRACTICES:	NS-1	
			PAVING AND GRINDING OPERATIONS:	NS-3	
			VEHICLE AND EQUIPMENT MAINT.	NS-10	
			STREET SWEEPING AND VACUUMING:	SE-7	
			HYDRAULIC MULCH:	SS-3	
			HYDROSEEDING:	SS-4	
			PAD STABILIZATION:	SS-5	

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BY	DATE	

PRELIMINARY GRADING PLAN ~ BMP PLAN
PASSERELLE

COUNTY OF SAN DIEGO TRACT NO. _____
County of San Diego, California

SHEET NO.

13 OF 18

JOB NO. 1581

LEGEND

- EX. STORM DRAIN
- PROP. STORM DRAIN
- EX. INLET/CATCHBASIN/CLEANOUT
- DRAINAGE MANAGEMENT AREA BOUNDARY
- DRAINAGE DIRECTION
- PROP. INLET/CATCHBASIN/CLEANOUT

SITE DESIGN BMPs

- SC-1 PREVENTION OF ILLICIT DISCHARGES INTO THE MS4
- SC-5 PROTECT TRASH STORAGE AREAS FROM RAINFALL, RUN-ON, RUNOFF, AND WIND DISPERSAL
- SC-6D1 NEED FOR FUTURE INDOOR & STRUCTURAL PEST CONTROL
- SC-6D2 LANDSCAPE/OUTDOOR PESTICIDE USE
- SC-6D3 REFUSE AREAS
- SC-6N FIRE SPRINKLER TEST WATER
- SC-6O MISCELLANEOUS DRAIN OR WASH WATER
- SC-6P PLAZAS, SIDEWALKS, AND PARKING LOTS

SOURCE CONTROL BMPs

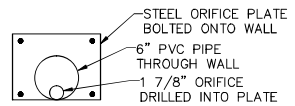
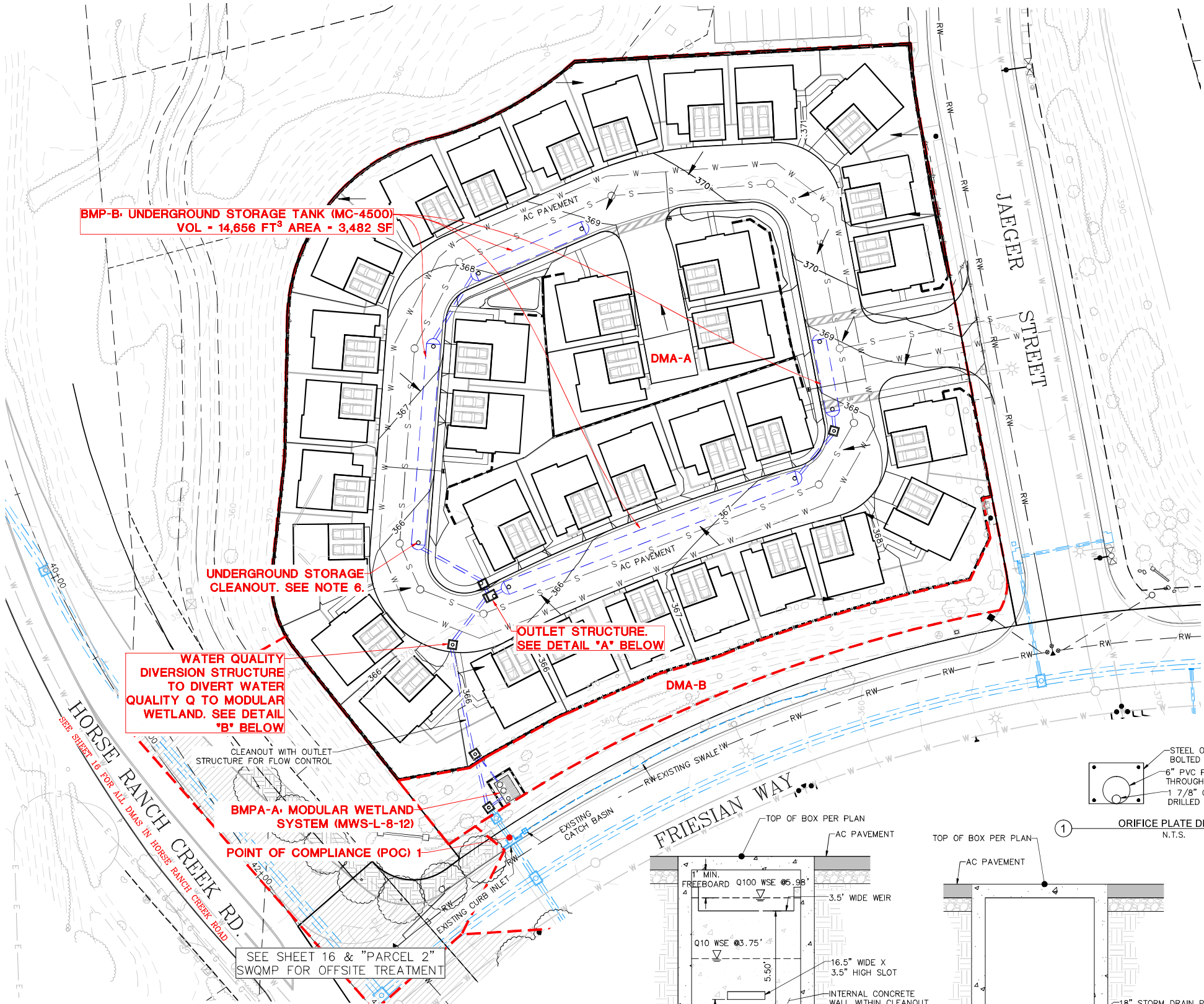
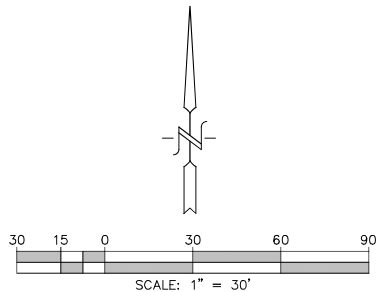
- SD-3 MINIMIZE IMPERVIOUS AREA
- SD-4 MINIMIZE SOIL COMPACTION
- SD-5 IMPERVIOUS AREA DISPERSION
- SD-6 RUNOFF COLLECTION
- SD-7 LANDSCAPING WITH NATIVE OR DROUGHT TOLERANT SPECIES

POST-CONSTRUCTION BMPs

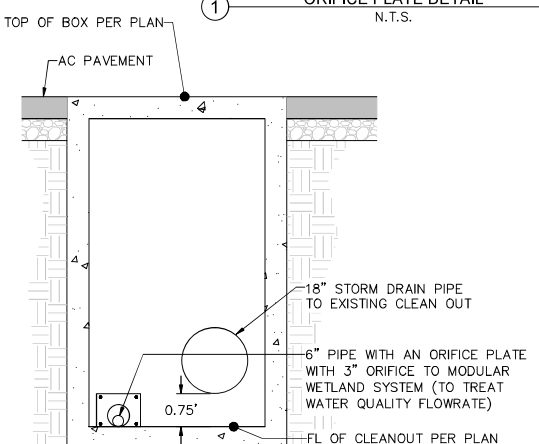
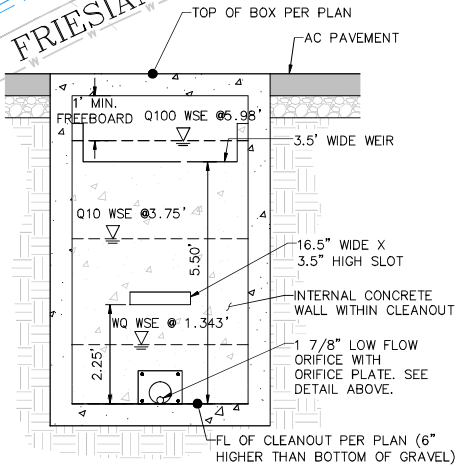
- MODULAR WETLAND SYSTEM (BF-3)
- UNDERGROUND STORAGE TANK

NOTES

- CCSYA: NONE. SEE EXHIBIT IN ATTACHMENT 9
- HYDROLOGIC SOIL GROUP: TYPE C PER COUNTY SOIL MAP
- APPROXIMATE DEPTH TO GROUNDWATER: >10' (PREGRADED LOT)
- EXISTING HYDRAULIC FEATURES: NONE
- EACH UNIT ASSUMED TO HAVE A 32'X10' MINIMUM IMPERVIOUS PATIO (NOT SHOWN)
- UNDERGROUND STORAGE MAINTENANCE ACCESS VIA CLEANOUT.



DMA & BMP SUMMARY TABLE								
DMA	DMA TYPE	BMP	TOTAL AREA (SF)	TOTAL AREA (AC)	IMPERVIOUS AREA (SF)	IMPERVIOUS AREA (AC)	PERVIOUS AREA (SF)	PERVIOUS AREA (AC)
A	DRAINS TO BMP	BMP-A: MODULAR WETLAND SYSTEM (BF-2) & BMP-B: UNDERGROUND STORAGE TANK	119,764	2.749	91,623	2.103	28,141	0.646
B	SELF-MITIGATING	N/A	8,497	0.195	0	0.000	8,497	0.195
TOTAL			128,261	2.944	91,623	2.103	36,638	0.841



NOTE: THE BOTTOM OF THE GRAVEL STORAGE LAYER FOR BMP-A IS 6" BELOW THE INVERT OF THE ORIFICE

A OUTLET STRUCTURE
SCALE: 1"=2'

B WQ DIVERSION STRUCTURE
SCALE: 1"=2'

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JOB NO. 1581

POST DEVELOPED DMA & HMP EXHIBIT
PASSERELLE (PARCEL 1)
COUNTY OF SAN DIEGO TRACT NO. _____
County of San Diego, California

LEGEND

- EX. STORM DRAIN
- PROP. STORM DRAIN
- EX. INLET/CATCHBASIN/CLEANOUT
- DRAINAGE MANAGEMENT AREA BOUNDARY

SITE DESIGN BMPs

- SC-1 PREVENTION OF ILLICIT DISCHARGES INTO THE MS4
- SC-2 STORM DRAIN STENCILING OR SIGNAGE
- SC-3 PROTECT TRASH STORAGE AREAS FROM RAINFALL, RUN-ON, RUNOFF, AND WIND DISPERSAL
- SC-6A ON-SITE STORM DRAIN INLETS
- SC-6B NEED FOR FUTURE INDOOR & STRUCTURAL PEST CONTROL
- SC-6C LANDSCAPE/OUTDOOR PESTICIDE USE
- SC-6D REFUSE AREAS
- SC-6E FIRE SPRINKLER TEST WATER
- SC-6F MISCELLANEOUS DRAIN OR WASH WATER
- SC-6G PLAZAS, SIDEWALKS, AND PARKING LOTS

SOURCE CONTROL BMPs

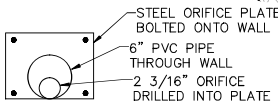
- SD-1 MAINTAIN NATURAL DRAINAGE PATHWAYS AND HYDROLOGIC FEATURES
- SD-2 MINIMIZE IMPERVIOUS AREA
- SD-3 MINIMIZE SOIL COMPACTION
- SD-4 IMPERVIOUS AREA DISPERSION
- SD-5 RUNOFF COLLECTION
- SD-7 LANDSCAPING WITH NATIVE OR DROUGHT TOLERANT SPECIES

POLLUTANT CONTROL BMPs

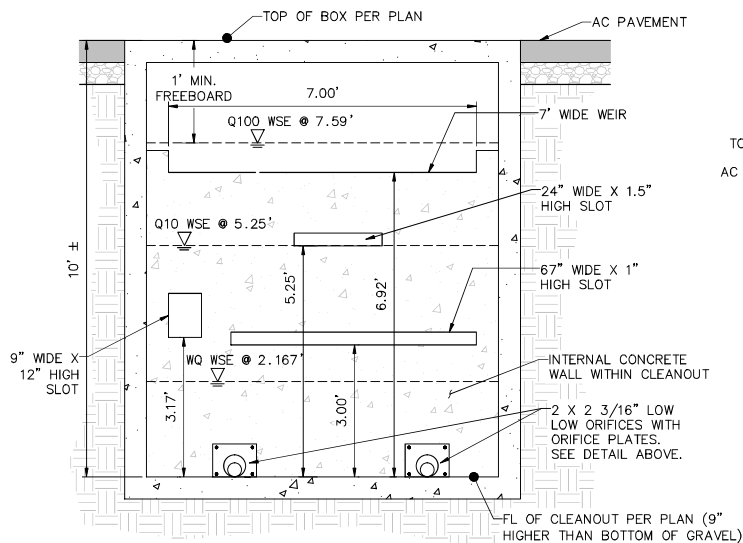
- MODULAR WETLAND SYSTEM (BF-3)
- STORMDRAIN PIPE
- UNDERGROUND DETENTION TANK

NOTES

- CCSYA: NONE. SEE EXHIBIT IN ATTACHMENT 9
- HYDROLOGIC SOIL GROUP: TYPE C PER COUNTY SOIL MAP
- THE UNDERGROUND DETENTION SYSTEM (BMP-A) IS COMPRISED OF A SERIES OF OLDCASTLE STORMCAPTURE TANKS (A = 3,072 SF, VOL = 52,704 CF)
- APPROXIMATE DEPTH TO GROUNDWATER: >10' (PREGRADED LOT)
- EXISTING HYDRAULIC FEATURES: NONE
- EACH UNIT ASSUMED TO HAVE A 32'X10' MINIMUM IMPERVIOUS PATIO (NOT SHOWN)
- UNDERGROUND STORAGE MAINTENANCE ACCESS VIA CLEANOUT.



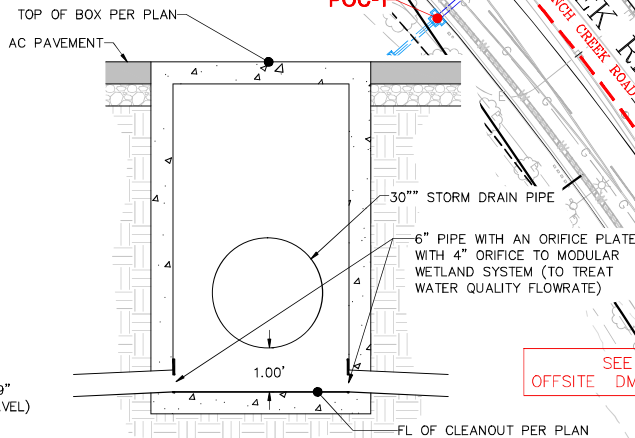
ORIFICE PLATE DETAIL
N.T.S.



A OUTLET STRUCTURE

SCALE: 1"=2'

DMA & BMP SUMMARY TABLE					
AREA	IMPERVIOUS (AC)	PERVIOUS (AC)	TOTAL AREA (AC)	DMA TYPE	BMP
DM-A	5.947	1.758	7.705	DRAINS TO BMP	BMP-A: UNDERGROUND STORAGE TANK & BMP-B: MODULAR WETLAND SYSTEM (BF-2)
DM-B	0.061	0.030	0.091	DRAINS TO BMP	BMP-B: MODULAR WETLAND SYSTEM (BF-2)
DMA-C	0.003	0.615	0.618	DRAINS TO BMP	BMP-A: UNDERGROUND STORAGE TANK & BMP-B: MODULAR WETLAND SYSTEM (BF-2)
DMA-D	0.000	0.165	0.165	SELF-MITIGATING	N/A
DMA-E	0.000	0.050	0.050	SELF-MITIGATING	N/A
TOTAL	6.011	2.618	8.629		



B WQ DIVERSION STRUCTURE

SCALE: 1"=2'

OUTLET STRUCTURE. SEE DETAIL "A" ON THE LEFT

WQ DIVERSION STRUCTURE. SEE DETAIL "B" ON THE LEFT

CLEANOUT WITH INTERNAL DIVERSION OUTLET STRUCTURE TO DISCHARGE LOW-FLOWS TO MODULAR WETLAND

POC-3 LOCATED
DOWNSTREAM SEE SHEET 16

SCALE: 1" = 40'

POST DEVELOPED DMA & HMP EXHIBIT
PASSERELLE (PARCEL 2)
COUNTY OF SAN DIEGO TRACT NO. _____
County of San Diego, California

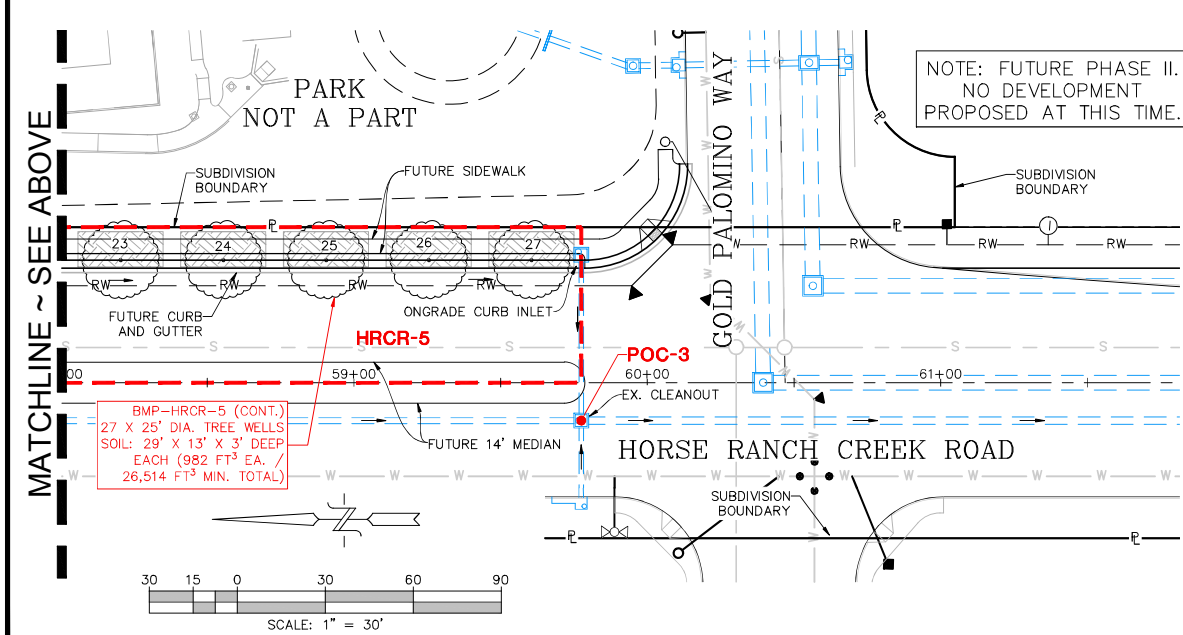
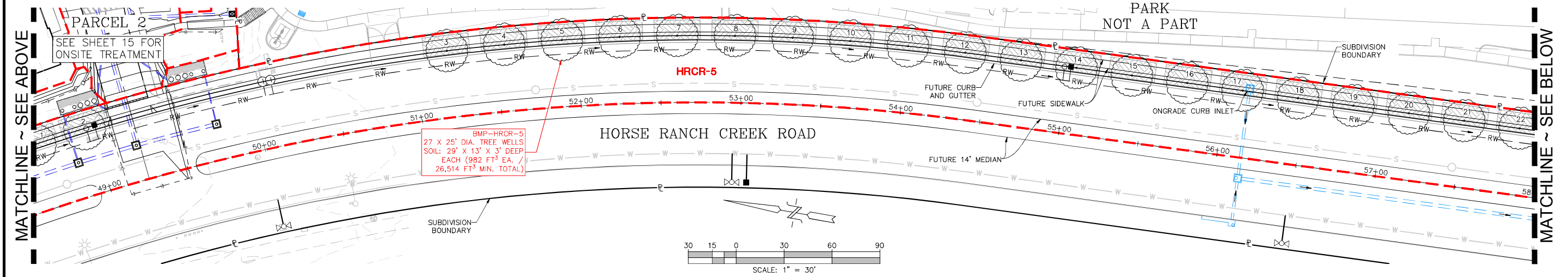
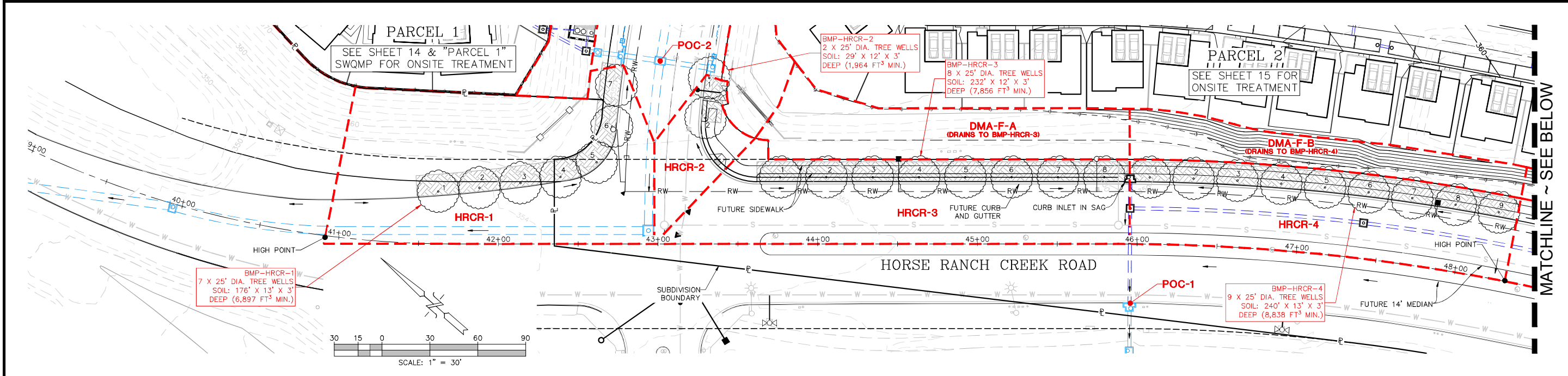
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SHEET NO.
15 OF 18



DMA & BMP SUMMARY TABLE									
DMA	POC	DMA TYPE	BMP	TOTAL AREA (SF)	TOTAL AREA (AC)	IMPERVIOUS AREA (SF)	IMPERVIOUS AREA (AC)	PERVIOUS AREA (SF)	PERVIOUS AREA (AC)
HRCR-1	1	DRAINS TO BMP	BMP-HRCR-1: Tree Well (SD-A)	18,827	0.432	8,300	0.191	10,527	0.242
HRCR-2	1	DRAINS TO BMP	BMP-HRCR-2: Tree Well (SD-A)	3,254	0.075	2,577	0.059	677	0.016
HRCR-3	2	DRAINS TO BMP	BMP-HRCR-3: Tree Well (SD-A)	14,616	0.336	10,681	0.245	3,935	0.090
DMA-F-A	2	DRAINS TO BMP	BMP-HRCR-3: Tree Well (SD-A)	7,931	0.182	0	0.000	7,931	0.182
HRCR-4	2	DRAINS TO BMP	BMP-HRCR-4: Tree Well (SD-A)	12,802	0.294	8,935	0.205	3,867	0.089
DMA-F-B	2	DRAINS TO BMP	BMP-HRCR-4: Tree Well (SD-A)	5,565	0.128	0	0.000	5,565	0.128
HRCR-5	3	DRAINS TO BMP	BMP-HRCR-5: Tree Well (SD-A)	61,406	1.410	43,575	1.000	17,831	0.409
TOTAL				124,401	2.856	74,068	1.700	50,333	1.155

- LEGEND
- EX. STORM DRAIN
 - PROP. STORM DRAIN
 - EX. INLET/CATCHBASIN/CLEANOUT
 - DRAINAGE MANAGEMENT AREA BOUNDARY
 - DIRECTION OF FLOW
 - TREE WELL (SD-A)

- NOTES
- ALL TREE WELLS ARE PER SAN DIEGO COUNTY DEPARTMENT OF PUBLIC WORKS GREEN STREET STANDARD DRAWING GS-1.02. SEE DETAIL ON SHEET 18.
 - TREE WELLS TO HAVE STRUCTURAL SOIL.
 - THE REMAINDER PARCEL IS PHASE II OF THE PROJECT. NO DEVELOPMENT IS PROPOSED AT THIS TIME. THE BMPs FOR PHASE II ONSITE AND FRONTAGE IMPROVEMENTS WILL BE DESIGNED PER A SUBSEQUENT PERMIT APPLICATION.

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BY	DATE	

POST DEVELOPED DMA & HMP EXHIBIT

PASSERELLE

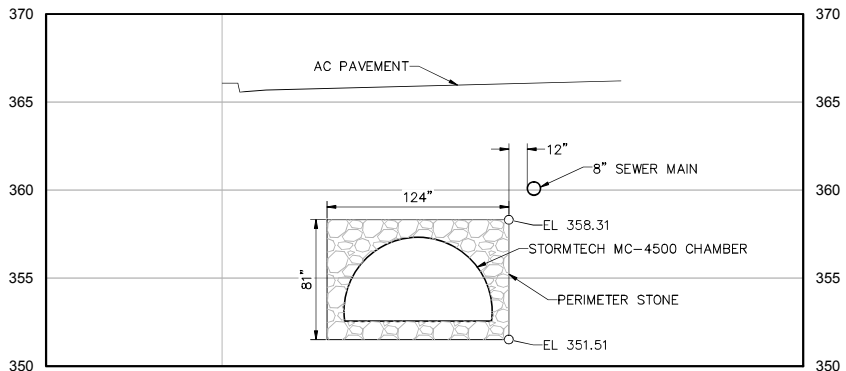
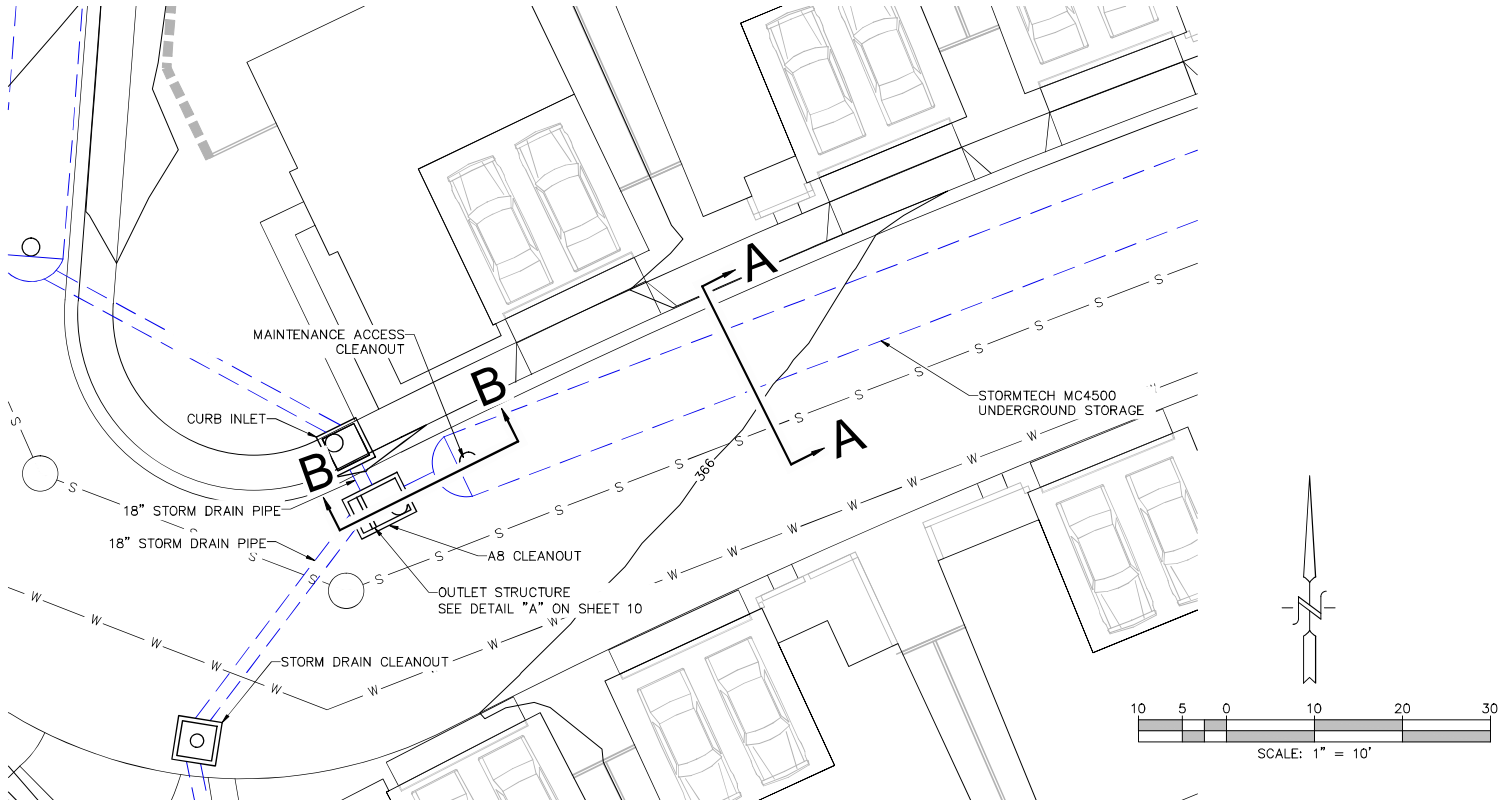
COUNTY OF SAN DIEGO TRACT NO. _____

County of San Diego, California

SHEET NO.

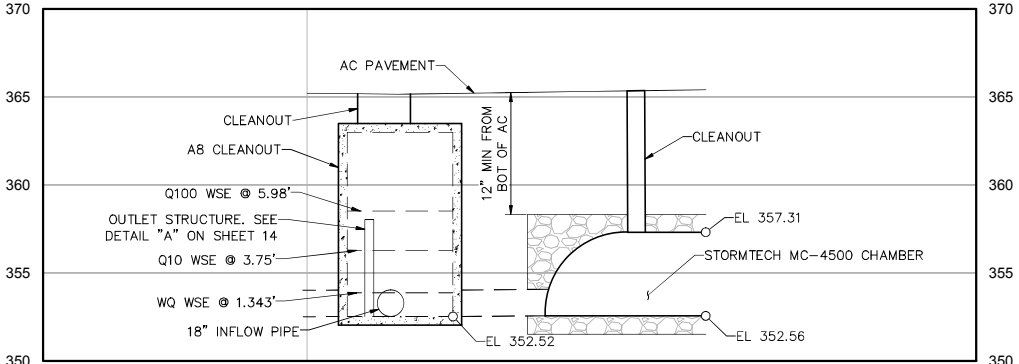
16 OF 18

PARCEL 1 ~ BMP SECTIONS



SECTION ~ A-A

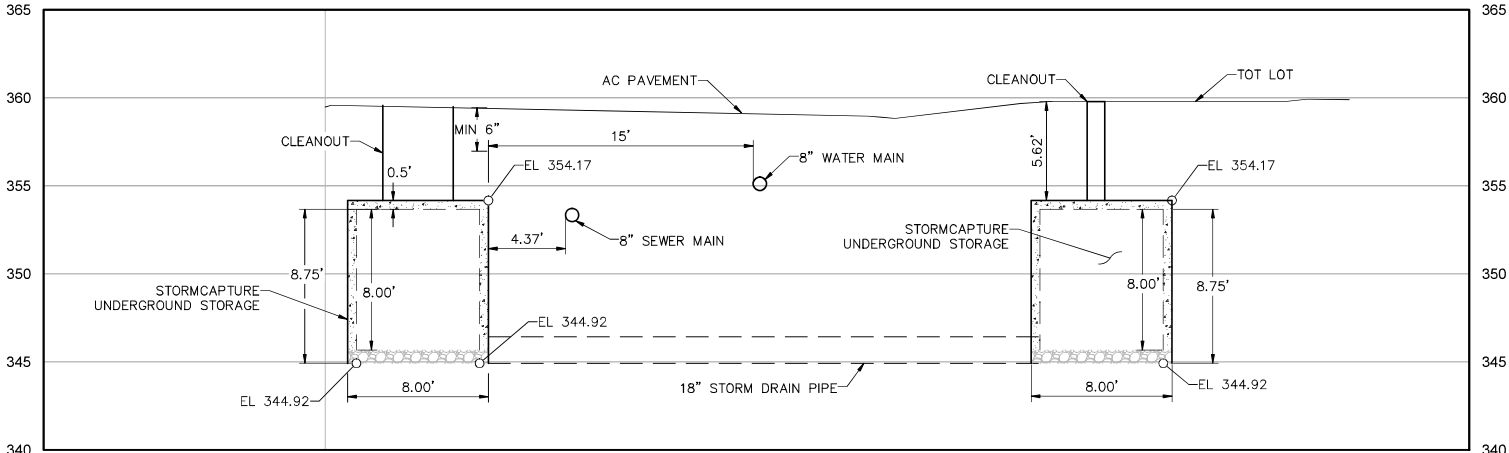
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VERT: 1" = 5'



SECTION ~ B-B

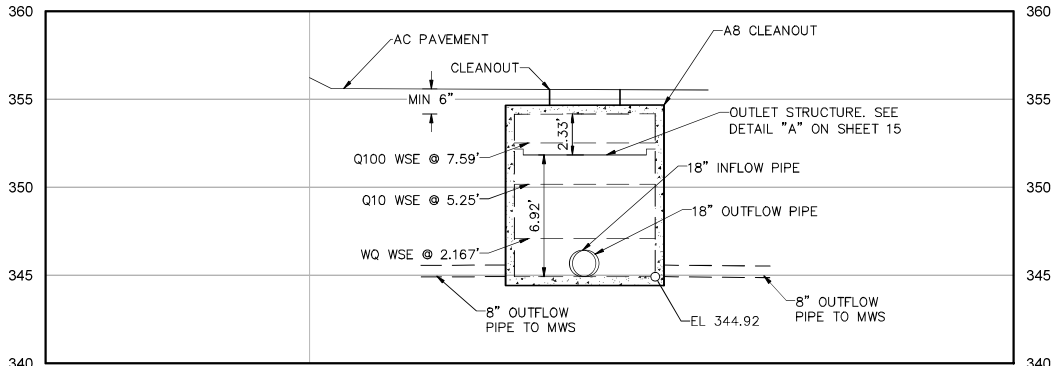
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VERT: 1" = 5'

PARCEL 2 ~ BMP SECTIONS



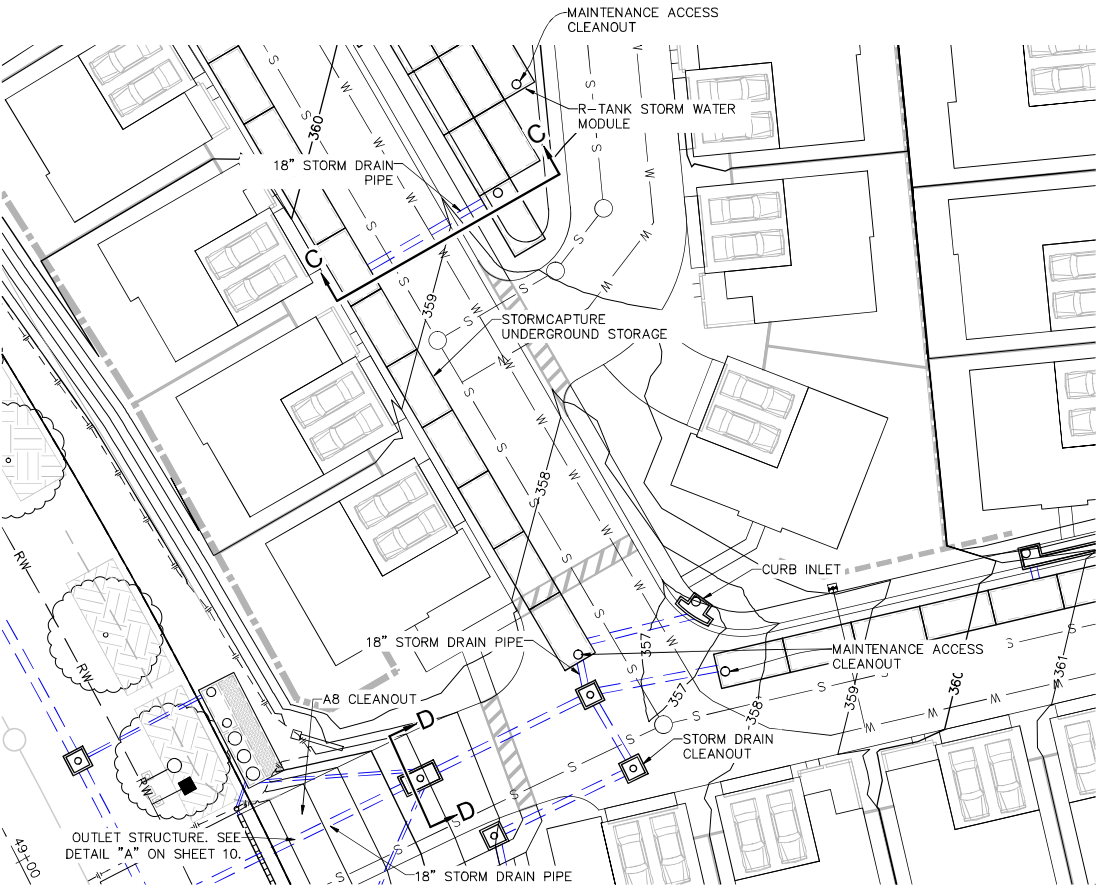
SECTION ~ C-C

SCALE: HORZ: 1" = 5'
VERT: 1" = 5'



SECTION ~ D-D

SCALE: HORZ: 1" = 5'
VERT: 1" = 5'



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POST DEVELOPED CROSS SECTION DETAILS
PASSERELLE (PARCELS 1&2)
COUNTY OF SAN DIEGO TRACT NO. _____
County of San Diego, California

SHEET NO.
17 OF 18

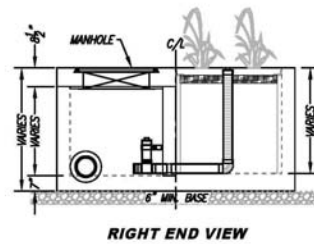
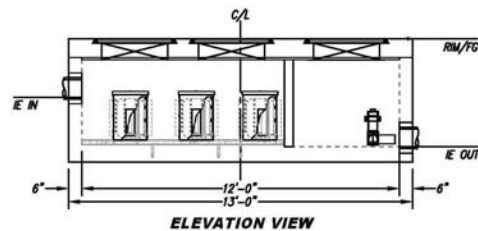
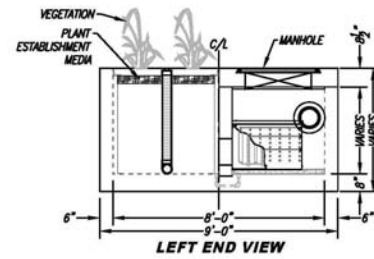
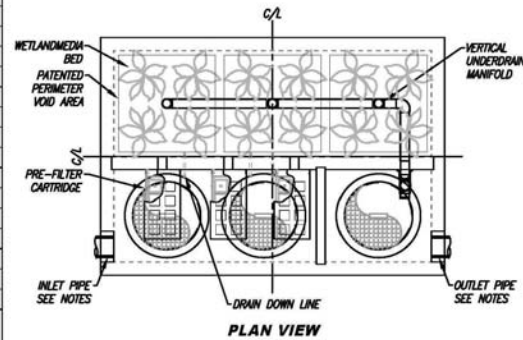
SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
FLOW BASED (CFS)			
0.346			
PEAK BYPASS REQUIRED (CFS) - IF APPLICABLE			OFFLINE
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE			
PRETREATMENT		BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD		PEDESTRIAN	
NOTES:			

INSTALLATION NOTES

- CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
- UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE FOR VERIFYING PROJECT ENGINEER'S RECOMMENDED BASE SPECIFICATIONS.
- CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL PIPES SHALL BE SEALED WATER TIGHT PER MANUFACTURER'S STANDARD CONNECTION DETAIL.
- CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL PIPES, RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO USE GROUT AND/OR BRICKS TO MATCH COVERS WITH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
- VEGETATION SUPPLIED AND INSTALLED BY OTHERS. ALL UNITS WITH VEGETATION MUST HAVE DRIP OR SPRAY IRRIGATION SUPPLIED AND INSTALLED BY OTHERS.
- CONTRACTOR RESPONSIBLE FOR CONTACTING CONTECH FOR ACTIVATION OF UNIT. MANUFACTURER'S WARRANTY IS VOID WITHOUT PROPER ACTIVATION BY A CONTECH REPRESENTATIVE.

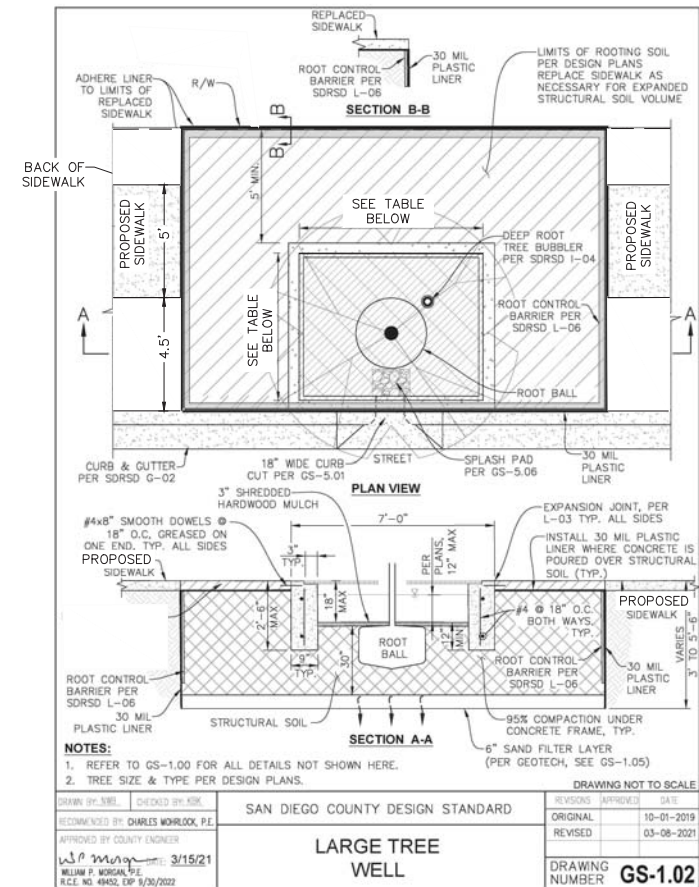
GENERAL NOTES

- MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
- ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT CONTECH.



TREATMENT FLOW (CFS)	0.346
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	2.0
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

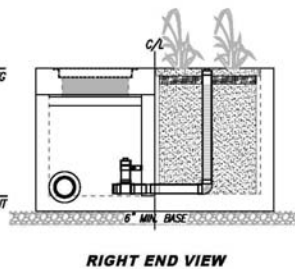
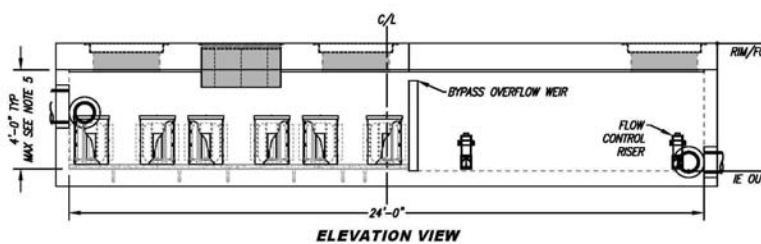
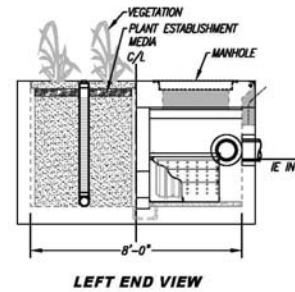
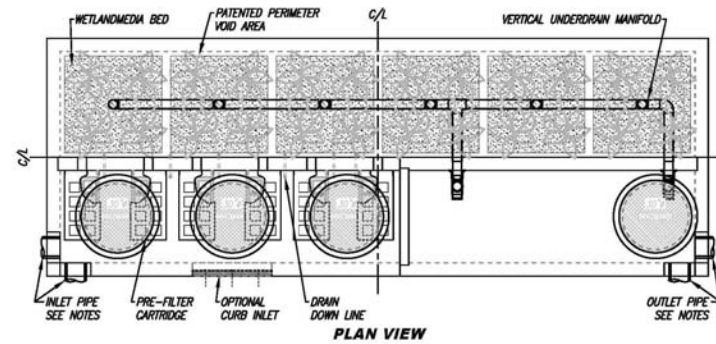
MWS-L-8-12-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL



NOTES:		DRAWING NOT TO SCALE	
1. REFER TO GS-1.00 FOR ALL DETAILS NOT SHOWN HERE.			
2. TREE SIZE & TYPE PER DESIGN PLANS.			
DESIGNED BY: NIEL		SAN DIEGO COUNTY DESIGN STANDARD	
CHECKED BY: KOK		REVISIONS	
RECOMMENDED BY: CHARLES WOODCOCK, P.E.		ORIGINAL	10-01-2019
APPROVED BY: COUNTY ENGINEER		REVISED	03-08-2021
W.P. WOODCOCK, P.E.		DRAWING NUMBER	
3/15/21		GS-1.02	
R.E.E. NO. 48452, EXP. 5/30/2022			

TREE WELL DIMENSIONS					
DMA	HRCR-1	HRCR-2	HRCR-3	HRCR-4	HRCR-5
LENGTH (FT)	26.0	20.0	29.0	29.0	29.0
WIDTH (FT)	13.0	16.5	12.0	12.0	12.0
DEPTH (FT)	3.0	3.0	3.0	3.0	3.0

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
TREATMENT FLOW (CFS)			
OPERATING HEAD (FT)			
PRETREATMENT LOADING RATE (GPM/SF)			
WETLAND MEDIA LOADING RATE (GPM/SF)			
PEAK BYPASS REQUIRED (CFS) - IF APPLICABLE			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD			
NOTES:			



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MWS-L-8-24-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL



Civil Engineering • Environmental
2970 FIFTH AVENUE, SUITE 340
SAN DIEGO, CA 92103
(619)232-9200 (619)232-9210 Fax



DESCRIPTION

REVISIONS

JOB NO. 1581

MODULAR WETLANDS STANDARD DETAILS

PASSERELLE (PARCELS 1&2)

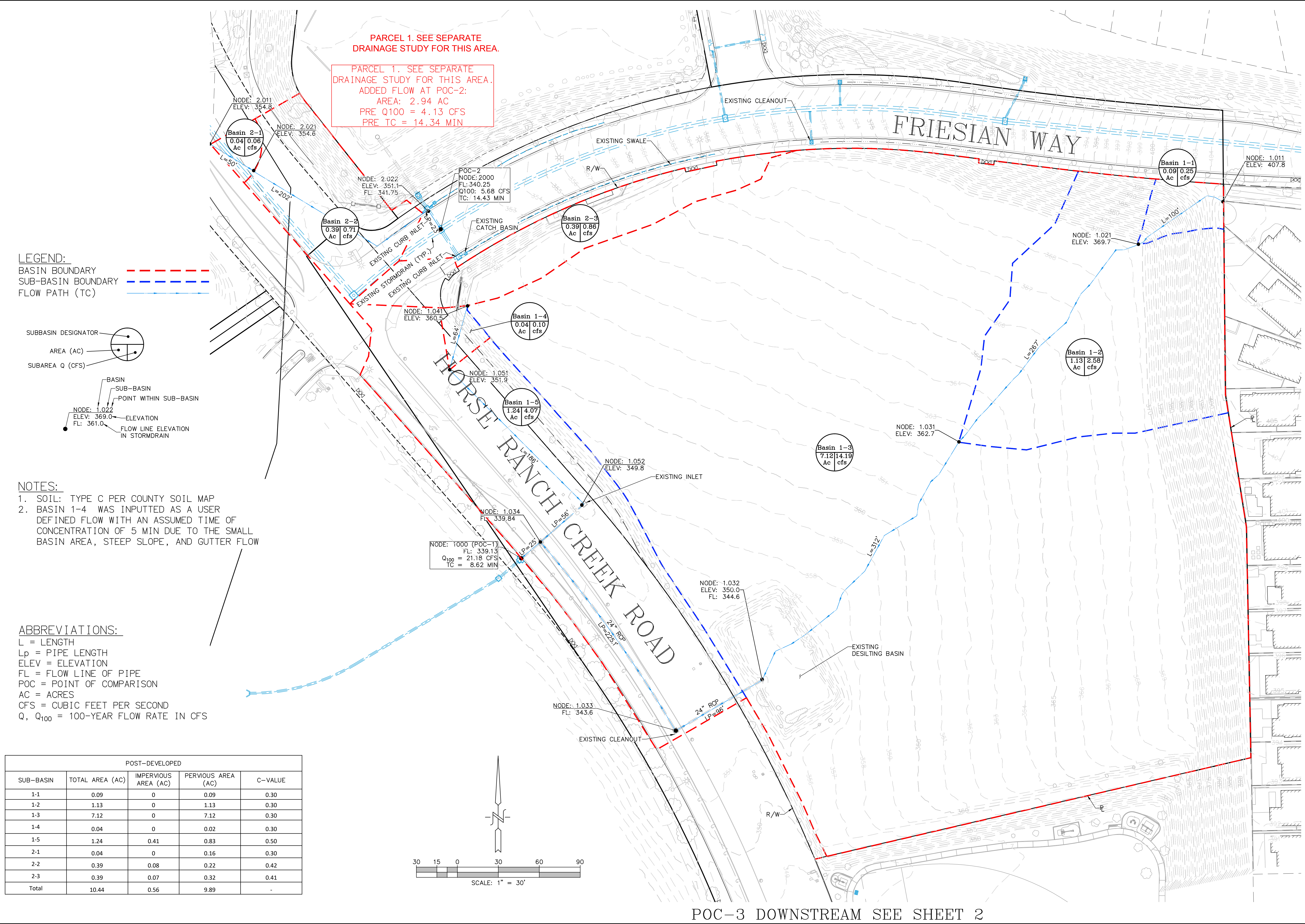
COUNTY OF SAN DIEGO TRACT NO. _____

County of San Diego, California

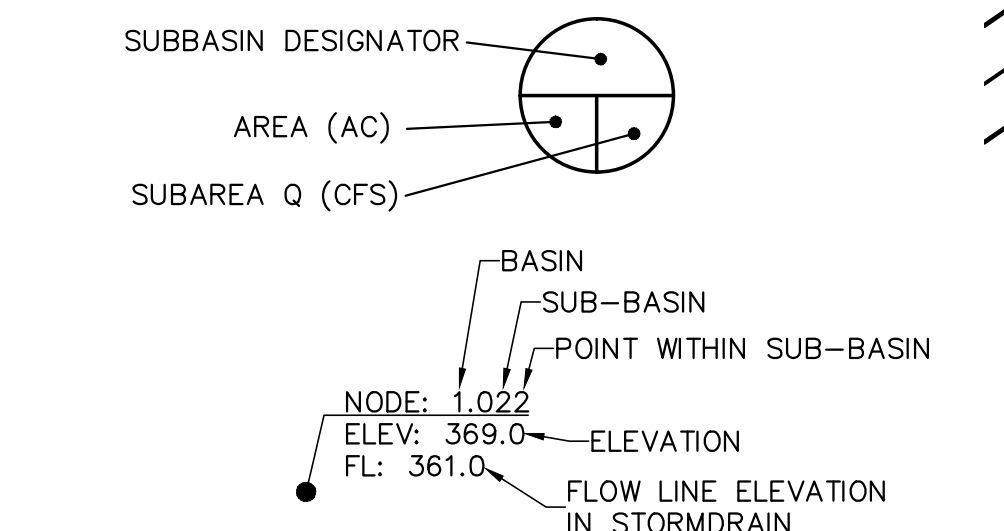
SHEET NO.

18 OF 18

Appendix B – Drainage Map



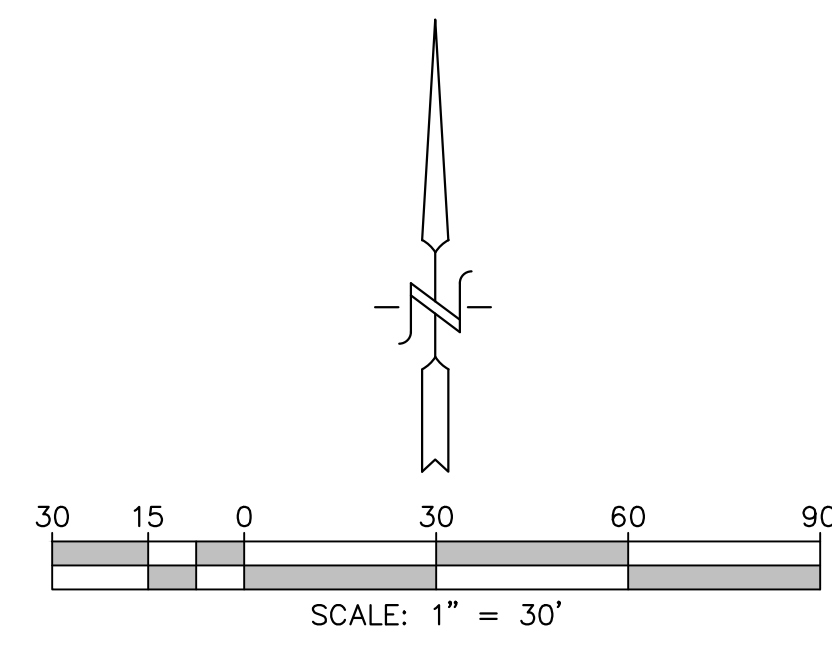
LEGEND:
BASIN BOUNDARY
SUB-BASIN BOUNDARY
FLOW PATH (TC)



NOTES:
1. SOIL: TYPE C PER COUNTY SOIL MAP
2. BASIN 1-4 WAS INPUTTED AS A USER
DEFINED FLOW WITH AN ASSUMED TIME OF
CONCENTRATION OF 5 MIN DUE TO THE SMALL
BASIN AREA, STEEP SLOPE, AND GUTTER FLOW

ABBREVIATIONS:
L = LENGTH
Lp = PIPE LENGTH
ELEV = ELEVATION
FL = FLOW LINE OF PIPE
POC = POINT OF COMPARISON
AC = ACRES
CFS = CUBIC FEET PER SECOND
Q, Q₁₀₀ = 100-YEAR FLOW RATE IN CFS

POST-DEVELOPED				
SUB-BASIN	TOTAL AREA (AC)	IMPERVIOUS AREA (AC)	PERVIOUS AREA (AC)	C-VALUE
1-1	0.09	0	0.09	0.30
1-2	1.13	0	1.13	0.30
1-3	7.12	0	7.12	0.30
1-4	0.04	0	0.02	0.30
1-5	1.24	0.41	0.83	0.50
2-1	0.04	0	0.16	0.30
2-2	0.39	0.08	0.22	0.42
2-3	0.39	0.07	0.32	0.41
Total	10.44	0.56	9.89	-



REVISIONS

NO.	DESCRIPTION	DATE	APP'D

Civil Engineering-Environmental
Land Surveying

R.E.C.
Consultants, Inc.

2442 Second Avenue
San Diego, CA 92101
(619)232-9200 (619)232-9210 Fax

DATE:
2/1/22

SCALE:
1" = 40'

DRAWN:
WOG

CHECKED:
WOG

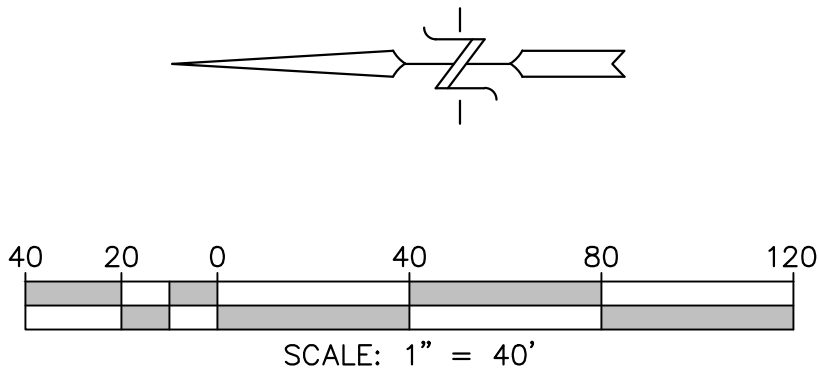
SHEET TITLE
PRE-DEV. DRAINAGE MAP

PROJECT
CAMPUS PARK CONDOS (PARCEL 2)
Horse Ranch Creek Rd
Fallbrook, CA 92028

SHEET
1

OF 2 SHEETS

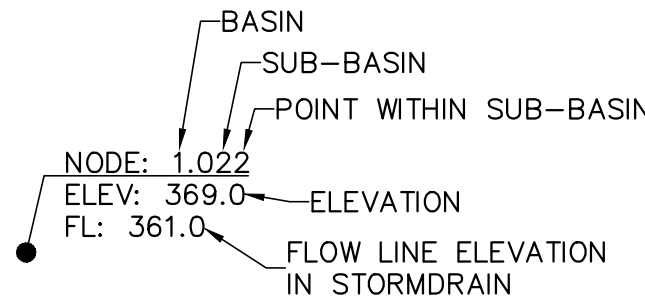
SAVE DATE: 8/21/2023 ~ ELOI DATE: 8/21/2023 ~ FILE NAME: P:\Acad\1581 Campus Park Condos\Reports\Drainage Study\Parcel 2\CAD\DRAINAGE-PRE1.dwg



BASIN BOUNDARY
SUB-BASIN BOUNDARY
FLOW PATH (TC)

1. SOIL: TYPE C PER COUNTY SOIL MAP
2. PEAK FLOW RATES TO EXISTING INLETS (NODE 3.032 AND 3.052) ARE PER DRAINAGE STUDY TITLED "DRAINAGE REPORT FOR HORSE RANCH CREEK ROAD & PALAMAR COLLEGE (RBF JN 25-102702) DATED MAY 21, 2009. SEE REPORT IN ATTACHED FOR DRAINAGE BASIN AND CALCS.

L = LENGTH
L_p = PIPE LENGTH
ELEV = ELEVATION
FL = FLOW LINE OF PIPE
POC = POINT OF COMPARISON
AC = ACRES
CFS = CUBIC FEET PER SECOND
Q, Q₁₀₀ = 100-YEAR FLOW RATE IN CFS

[illegible]

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: 08/22/23

 1581 - CAMPUS PARK CONDOS PARCEL 2
 Q100, PRE-DEVELOPED

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

Program License Serial Number 6292

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

Map data precipitation entered:
 6 hour, precipitation(inches) = 3.500
 24 hour precipitation(inches) = 6.000
 P6/P24 = 58.3%
 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 = 1.000
 Decimal fraction soil group D = 0.000
 [UNDISTURBED NATURAL TERRAIN]
 (Permanent Open Space)
 Impervious value, Ai = 0.000
 Sub-Area C Value = 0.300
 Initial subarea total flow distance = 100.000(Ft.)
 Highest elevation = 407.800(Ft.)
 Lowest elevation = 369.700(Ft.)
 Elevation difference = 38.100(Ft.) Slope = 38.100 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 100.00 (Ft)
 for the top area slope value of 38.10 %, in a development type of
 Permanent Open Space
 In Accordance With Figure 3-3
 Initial Area Time of Concentration = 4.28 minutes
 $TC = [1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{.5} / (\% \text{ slope}^{(1/3)})]$
 $TC = [1.8 * (1.1 - 0.3000) * (100.000^{.5}) / (38.100^{(1/3)})] = 4.28$
 Calculated TC of 4.279 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations

Rainfall intensity (I) = 9.222(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.300
 Subarea runoff = 0.249(CFS)
 Total initial stream area = 0.090(Ac.)

+++++
 Process from Point/Station 1.021 to Point/Station 1.031
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 1.576(CFS)
 Depth of flow = 0.180(Ft.), Average velocity = 1.935(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :
 Point number 'X' coordinate 'Y' coordinate
 1 0.00 1.00
 2 25.00 0.00
 3 50.00 1.00
 Manning's 'N' friction factor = 0.025

Sub-Channel flow = 1.576(CFS)
 ' ' flow top width = 9.024(Ft.)
 ' ' velocity = 1.935(Ft/s)
 ' ' area = 0.814(Sq.Ft)
 ' ' Froude number = 1.135

Upstream point elevation = 369.700(Ft.)
 Downstream point elevation = 362.700(Ft.)
 Flow length = 267.000(Ft.)
 Travel time = 2.30 min.
 Time of concentration = 6.58 min.
 Depth of flow = 0.180(Ft.)
 Average velocity = 1.935(Ft/s)
 Total irregular channel flow = 1.576(CFS)
 Irregular channel normal depth above invert elev. = 0.180(Ft.)
 Average velocity of channel(s) = 1.935(Ft/s)
 Adding area flow to channel

Rainfall intensity (I) = 7.726(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 = 1.000
 Decimal fraction soil group D = 0.000

[UNDISTURBED NATURAL TERRAIN]
 (Permanent Open Space)

Impervious value, Ai = 0.000
 Sub-Area C Value = 0.300

Rainfall intensity = 7.726(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.300 CA = 0.366
 Subarea runoff = 2.579(CFS) for 1.130(Ac.)
 Total runoff = 2.828(CFS) Total area = 1.220(Ac.)
 Depth of flow = 0.225(Ft.), Average velocity = 2.240(Ft/s)

+++++
 Process from Point/Station 1.031 to Point/Station 1.032

 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

 Estimated mean flow rate at midpoint of channel = 9.962(CFS)
 Depth of flow = 0.332(Ft.), Average velocity = 3.619(Ft/s)

***** Irregular Channel Data *****

 Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	1.00
2	25.00	0.00
3	50.00	1.00

Manning's 'N' friction factor = 0.025

Sub-Channel flow	=	9.962(CFS)
' flow top width	=	16.591(Ft.)
' velocity	=	3.619(Ft/s)
' area	=	2.753(Sq.Ft)
' Froude number	=	1.566

Upstream point elevation = 362.700(Ft.)

Downstream point elevation = 350.000(Ft.)

Flow length = 312.000(Ft.)

Travel time = 1.44 min.

Time of concentration = 8.02 min.

Depth of flow = 0.332(Ft.)

Average velocity = 3.619(Ft/s)

Total irregular channel flow = 9.962(CFS)

Irregular channel normal depth above invert elev. = 0.332(Ft.)

Average velocity of channel(s) = 3.619(Ft/s)

Adding area flow to channel

Rainfall intensity (I) = 6.801(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 = 1.000

Decimal fraction soil group D = 0.000

[UNDISTURBED NATURAL TERRAIN]

(Permanent Open Space)

Impervious value, Ai = 0.000

Sub-Area C Value = 0.300

Rainfall intensity = 6.801(In/Hr) for a 100.0 year storm

Effective runoff coefficient used for total area

(Q=KCIA) is C = 0.300 CA = 2.502

Subarea runoff = 14.190(CFS) for 7.120(Ac.)

Total runoff = 17.017(CFS) Total area = 8.340(Ac.)

Depth of flow = 0.406(Ft.), Average velocity = 4.137(Ft/s)

++++++

Process from Point/Station 1.032 to Point/Station 1.033

**** PIPEFLOW TRAVEL TIME (User specified size) ****

 Upstream point/station elevation = 344.600(Ft.)

Downstream point/station elevation = 343.600(Ft.)

Pipe length = 96.00(Ft.) Slope = 0.0104 Manning's N = 0.013

No. of pipes = 1 Required pipe flow = 17.017(CFS)

Given pipe size = 24.00(In.)

Calculated individual pipe flow = 17.017(CFS)

Normal flow depth in pipe = 15.33(In.)
 Flow top width inside pipe = 23.06(In.)
 Critical Depth = 17.83(In.)
 Pipe flow velocity = 8.04(Ft/s)
 Travel time through pipe = 0.20 min.
 Time of concentration (TC) = 8.21 min.

++++++
 Process from Point/Station 1.033 to Point/Station 1000.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 343.600(Ft.)
 Downstream point/station elevation = 340.250(Ft.)
 Pipe length = 223.10(Ft.) Slope = 0.0150 Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 17.017(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 17.017(CFS)
 Normal flow depth in pipe = 13.59(In.)
 Flow top width inside pipe = 23.79(In.)
 Critical Depth = 17.83(In.)
 Pipe flow velocity = 9.27(Ft/s)
 Travel time through pipe = 0.40 min.
 Time of concentration (TC) = 8.62 min.

++++++
 Process from Point/Station 1000.000 to Point/Station 1000.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 8.340(Ac.)
 Runoff from this stream = 17.017(CFS)
 Time of concentration = 8.62 min.
 Rainfall intensity = 6.492(In/Hr)
 Program is now starting with Main Stream No. 2

++++++
 Process from Point/Station 1.041 to Point/Station 1.051
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 [UNDISTURBED NATURAL TERRAIN]
 (Permanent Open Space)
 Impervious value, Ai = 0.000
 Sub-Area C Value = 0.300
 Initial subarea total flow distance = 65.000(Ft.)
 Highest elevation = 360.500(Ft.)
 Lowest elevation = 351.900(Ft.)
 Elevation difference = 8.600(Ft.) Slope = 13.231 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 100.00 (Ft)

for the top area slope value of 13.23 %, in a development type of
 Permanent Open Space
 In Accordance With Figure 3-3
 Initial Area Time of Concentration = 6.09 minutes
 $TC = [1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{.5} / (\% \text{ slope}^{(1/3)})]$
 $TC = [1.8 * (1.1 - 0.3000) * (100.000^{.5}) / (13.230^{(1/3)})] = 6.09$
 Rainfall intensity (I) = 8.121(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.300
 Subarea runoff = 0.097(CFS)
 Total initial stream area = 0.040(Ac.)

+++++
 Process from Point/Station 1.051 to Point/Station 1.052
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 1.064(CFS)
 Depth of flow = 0.251(Ft.), Average velocity = 1.128(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	1.00
2	15.00	0.00
3	30.00	1.00

 Manning's 'N' friction factor = 0.035

Sub-Channel flow = 1.064(CFS)

'	'	flow top width = 7.521(Ft.)
'	'	velocity = 1.128(Ft/s)
'	'	area = 0.943(Sq.Ft)
'	'	Froude number = 0.562

Upstream point elevation = 351.900(Ft.)
 Downstream point elevation = 349.800(Ft.)
 Flow length = 186.000(Ft.)
 Travel time = 2.75 min.
 Time of concentration = 8.84 min.
 Depth of flow = 0.251(Ft.)
 Average velocity = 1.128(Ft/s)
 Total irregular channel flow = 1.064(CFS)
 Irregular channel normal depth above invert elev. = 0.251(Ft.)
 Average velocity of channel(s) = 1.128(Ft/s)
 Adding area flow to channel
 Rainfall intensity (I) = 6.387(In/Hr) for a 100.0 year storm
 User specified 'C' value of 0.360 given for subarea
 Rainfall intensity = 6.387(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.357 CA = 0.307
 Subarea runoff = 1.865(CFS) for 0.820(Ac.)
 Total runoff = 1.962(CFS) Total area = 0.860(Ac.)
 Depth of flow = 0.315(Ft.), Average velocity = 1.315(Ft/s)

+++++
 Process from Point/Station 1.052 to Point/Station 1000.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 340.620(Ft.)
 Downstream point/station elevation = 340.250(Ft.)
 Pipe length = 56.00(Ft.) Slope = 0.0066 Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 1.962(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 1.962(CFS)
 Normal flow depth in pipe = 5.87(In.)
 Flow top width inside pipe = 16.88(In.)
 Critical Depth = 6.33(In.)
 Pipe flow velocity = 3.92(Ft/s)
 Travel time through pipe = 0.24 min.
 Time of concentration (TC) = 9.07 min.

++++++
 Process from Point/Station 1000.000 to Point/Station 1000.000
 ***** CONFLUENCE OF MAIN STREAMS *****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 0.860(Ac.)
 Runoff from this stream = 1.962(CFS)
 Time of concentration = 9.07 min.
 Rainfall intensity = 6.279(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	17.017	8.62	6.492
2	1.962	9.07	6.279
Qmax(1) =			
	1.000 *	1.000 *	17.017) +
	1.000 *	0.950 *	1.962) + = 18.880
Qmax(2) =			
	0.967 *	1.000 *	17.017) +
	1.000 *	1.000 *	1.962) + = 18.420

Total of 2 main streams to confluence:

Flow rates before confluence point:

17.017 1.962

Maximum flow rates at confluence using above data:

18.880 18.420

Area of streams before confluence:

8.340 0.860

Results of confluence:

Total flow rate = 18.880(CFS)

Time of concentration = 8.616 min.

Effective stream area after confluence = 9.200(Ac.)

++++++
 Process from Point/Station 2.022 to Point/Station 2.022

 **** USER DEFINED FLOW INFORMATION AT A POINT ****

User specified 'C' value of 0.300 given for subarea
 Rainfall intensity (I) = 4.674(In/Hr) for a 100.0 year storm
 User specified values are as follows:
 TC = 14.34 min. Rain intensity = 4.67(In/Hr)
 Total area = 2.940(Ac.) Total runoff = 4.130(CFS)

+++++
 Process from Point/Station 2.022 to Point/Station 2.022
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 2.940(Ac.)
 Runoff from this stream = 4.130(CFS)
 Time of concentration = 14.34 min.
 Rainfall intensity = 4.674(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 = 1.000
 Decimal fraction soil group D = 0.000
 [UNDISTURBED NATURAL TERRAIN]
 (Permanent Open Space)
 Impervious value, Ai = 0.000
 Sub-Area C Value = 0.300
 Initial subarea total flow distance = 50.000(Ft.)
 Highest elevation = 354.800(Ft.)
 Lowest elevation = 354.600(Ft.)
 Elevation difference = 0.200(Ft.) Slope = 0.400 %
 Top of Initial Area Slope adjusted by User to 0.500 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 50.00 (Ft)
 for the top area slope value of 0.50 %, in a development type of
 Permanent Open Space
 In Accordance With Figure 3-3
 Initial Area Time of Concentration = 12.83 minutes
 $TC = [1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{.5} / (\% \text{ slope}^{(1/3)})]$
 $TC = [1.8 * (1.1 - 0.3000) * (50.000^{.5}) / (0.500^{(1/3)})] = 12.83$
 Rainfall intensity (I) = 5.022(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.300
 Subarea runoff = 0.060(CFS)
 Total initial stream area = 0.040(Ac.)

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

Estimated mean flow rate at midpoint of channel = 0.384(CFS)
 Depth of flow = 0.172(Ft.), Average velocity = 1.085(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	1.00
2	12.00	0.00
3	24.00	1.00

Manning's 'N' friction factor = 0.035

Sub-Channel flow = 0.384(CFS)
 ' ' flow top width = 4.119(Ft.)
 ' ' velocity = 1.085(Ft/s)
 ' ' area = 0.354(Sq.Ft)
 ' ' Froude number = 0.653

Upstream point elevation = 354.600(Ft.)
 Downstream point elevation = 351.100(Ft.)
 Flow length = 202.000(Ft.)
 Travel time = 3.10 min.
 Time of concentration = 15.93 min.
 Depth of flow = 0.172(Ft.)
 Average velocity = 1.085(Ft/s)
 Total irregular channel flow = 0.384(CFS)
 Irregular channel normal depth above invert elev. = 0.172(Ft.)
 Average velocity of channel(s) = 1.085(Ft/s)
 Adding area flow to channel
 Rainfall intensity (I) = 4.367(In/Hr) for a 100.0 year storm
 User specified 'C' value of 0.420 given for subarea
 Rainfall intensity = 4.367(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.409 CA = 0.176
 Subarea runoff = 0.707(CFS) for 0.390(Ac.)
 Total runoff = 0.768(CFS) Total area = 0.430(Ac.)
 Depth of flow = 0.223(Ft.), Average velocity = 1.290(Ft/s)

++++
 Process from Point/Station 2.022 to Point/Station 2.022
 **** CONFLUENCE OF MAIN STREAMS ****

 The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 0.430(Ac.)
 Runoff from this stream = 0.768(CFS)
 Time of concentration = 15.93 min.
 Rainfall intensity = 4.367(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	4.130	14.34	4.674
2	0.768	15.93	4.367

Qmax(1) =

	1.000 *	1.000 *	4.130) +	
	1.000 *	0.900 *	0.768) + =	4.821
Qmax(2) =	0.934 *	1.000 *	4.130) +	
	1.000 *	1.000 *	0.768) + =	4.627

Total of 2 main streams to confluence:

Flow rates before confluence point:

4.130 0.768

Maximum flow rates at confluence using above data:

4.821 4.627

Area of streams before confluence:

2.940 0.430

Results of confluence:

Total flow rate = 4.821(CFS)

Time of concentration = 14.340 min.

Effective stream area after confluence = 3.370(Ac.)

 Process from Point/Station 2.022 to Point/Station 2000.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 341.750(Ft.)
 Downstream point/station elevation = 340.250(Ft.)
 Pipe length = 23.00(Ft.) Slope = 0.0652 Manning's N = 0.015
 No. of pipes = 1 Required pipe flow = 4.821(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 4.821(CFS)
 Normal flow depth in pipe = 4.46(In.)
 Flow top width inside pipe = 23.72(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 9.59(Ft/s)
 Travel time through pipe = 0.04 min.
 Time of concentration (TC) = 14.38 min.

 Process from Point/Station 2000.000 to Point/Station 2000.000
 **** SUBAREA FLOW ADDITION ****

Rainfall intensity (I) = 4.665(In/Hr) for a 100.0 year storm
 User specified 'C' value of 0.410 given for subarea
 Time of concentration = 14.38 min.
 Rainfall intensity = 4.665(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.324 CA = 1.218
 Subarea runoff = 0.860(CFS) for 0.390(Ac.)
 Total runoff = 5.681(CFS) Total area = 3.760(Ac.)
 End of computations, total study area = 12.960 (Ac.)

Appendix D – Post-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: 08/22/23

 1581 - CAMPUS PARK CONDOS PARCEL 2
 Q100, UNMITIGATED POST-DEVELOPED

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

Program License Serial Number 6292

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

Map data precipitation entered:
 6 hour, precipitation(inches) = 3.500
 24 hour precipitation(inches) = 6.000
 P6/P24 = 58.3%
 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 = 1.000
 Decimal fraction soil group D = 0.000
 [HIGH DENSITY RESIDENTIAL]
 (43.0 DU/A or Less)
 Impervious value, Ai = 0.800
 Sub-Area C Value = 0.780
 Initial subarea total flow distance = 65.000(Ft.)
 Highest elevation = 374.100(Ft.)
 Lowest elevation = 373.400(Ft.)
 Elevation difference = 0.700(Ft.) Slope = 1.077 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 65.00 (Ft)
 for the top area slope value of 1.08 %, in a development type of
 43.0 DU/A or Less
 In Accordance With Figure 3-3
 Initial Area Time of Concentration = 4.53 minutes
 $TC = [1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{.5} / (\% \text{ slope}^{(1/3)})]$
 $TC = [1.8 * (1.1 - 0.7800) * (65.000^{.5}) / (1.077^{(1/3)})] = 4.53$

Calculated TC of 4.530 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
 Rainfall intensity (I) = 9.222(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.780
 Subarea runoff = 0.288(CFS)
 Total initial stream area = 0.040(Ac.)

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

Upstream point elevation = 373.400(Ft.)
 Downstream point elevation = 365.700(Ft.)
 Channel length thru subarea = 461.000(Ft.)
 Channel base width = 0.000(Ft.)
 Slope or 'Z' of left channel bank = 50.000
 Slope or 'Z' of right channel bank = 0.330
 Estimated mean flow rate at midpoint of channel = 4.121(CFS)
 Manning's 'N' = 0.015
 Maximum depth of channel = 0.500(Ft.)
 Flow(q) thru subarea = 4.121(CFS)
 Depth of flow = 0.233(Ft.), Average velocity = 3.023(Ft/s)
 Channel flow top width = 11.715(Ft.)
 Flow Velocity = 3.02(Ft/s)
 Travel time = 2.54 min.
 Time of concentration = 7.07 min.
 Critical depth = 0.277(Ft.)
 Adding area flow to channel
 Rainfall intensity (I) = 7.373(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 = 1.000
 Decimal fraction soil group D = 0.000
 [HIGH DENSITY RESIDENTIAL]
 (43.0 DU/A or Less)
 Impervious value, Ai = 0.800
 Sub-Area C Value = 0.780
 Rainfall intensity = 7.373(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.780 CA = 1.069
 Subarea runoff = 7.592(CFS) for 1.330(Ac.)
 Total runoff = 7.879(CFS) Total area = 1.370(Ac.)
 Depth of flow = 0.297(Ft.), Average velocity = 3.554(Ft/s)
 Critical depth = 0.359(Ft.)

+++++
 Process from Point/Station 1.022 to Point/Station 1.072
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 361.700(Ft.)
 Downstream point/station elevation = 356.500(Ft.)
 Pipe length = 128.90(Ft.) Slope = 0.0403 Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 7.879(CFS)
 Nearest computed pipe diameter = 15.00(In.)
 Calculated individual pipe flow = 7.879(CFS)

Normal flow depth in pipe = 8.44(In.)
 Flow top width inside pipe = 14.88(In.)
 Critical Depth = 13.30(In.)
 Pipe flow velocity = 11.08(Ft/s)
 Travel time through pipe = 0.19 min.
 Time of concentration (TC) = 7.27 min.

++++++
 Process from Point/Station 1.720 to Point/Station 1.072
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1
 Stream flow area = 1.370(Ac.)
 Runoff from this stream = 7.879(CFS)
 Time of concentration = 7.27 min.
 Rainfall intensity = 7.246(In/Hr)
 Program is now starting with Main Stream No. 2

++++++
 Process from Point/Station 1.031 to Point/Station 1.042
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 [HIGH DENSITY RESIDENTIAL]
 (43.0 DU/A or Less)
 Impervious value, Ai = 0.800
 Sub-Area C Value = 0.780
 Initial subarea total flow distance = 65.000(Ft.)
 Highest elevation = 369.400(Ft.)
 Lowest elevation = 368.200(Ft.)
 Elevation difference = 1.200(Ft.) Slope = 1.846 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 75.00 (Ft)
 for the top area slope value of 1.85 %, in a development type of
 43.0 DU/A or Less
 In Accordance With Figure 3-3
 Initial Area Time of Concentration = 4.07 minutes
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5} / (% slope^{(1/3)})]$
 $TC = [1.8 * (1.1 - 0.7800) * (75.000^{.5}) / (1.846^{(1/3)})] = 4.07$
 Calculated TC of 4.066 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
 Rainfall intensity (I) = 9.222(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.780
 Subarea runoff = 0.360(CFS)
 Total initial stream area = 0.050(Ac.)

++++++
 Process from Point/Station 1.042 to Point/Station 1.071
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 368.200(Ft.)
 Downstream point elevation = 361.800(Ft.)
 Channel length thru subarea = 160.000(Ft.)
 Channel base width = 0.000(Ft.)
 Slope or 'Z' of left channel bank = 50.000
 Slope or 'Z' of right channel bank = 0.330
 Estimated mean flow rate at midpoint of channel = 1.367(CFS)
 Manning's 'N' = 0.015
 Maximum depth of channel = 0.500(Ft.)
 Flow(q) thru subarea = 1.367(CFS)
 Depth of flow = 0.131(Ft.), Average velocity = 3.182(Ft/s)
 Channel flow top width = 6.575(Ft.)
 Flow Velocity = 3.18(Ft/s)
 Travel time = 0.84 min.
 Time of concentration = 4.90 min.
 Critical depth = 0.179(Ft.)
 Adding area flow to channel
 Calculated TC of 4.904 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
 Rainfall intensity (I) = 9.222(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 = 1.000
 Decimal fraction soil group D = 0.000
 [HIGH DENSITY RESIDENTIAL]
 (43.0 DU/A or Less)
 Impervious value, Ai = 0.800
 Sub-Area C Value = 0.780
 Rainfall intensity = 9.222(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.780 CA = 0.257
 Subarea runoff = 2.014(CFS) for 0.280(Ac.)
 Total runoff = 2.374(CFS) Total area = 0.330(Ac.)
 Depth of flow = 0.161(Ft.), Average velocity = 3.654(Ft/s)
 Critical depth = 0.223(Ft.)

++++++
 Process from Point/Station 1.071 to Point/Station 1.071
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
 Stream flow area = 0.330(Ac.)
 Runoff from this stream = 2.374(CFS)
 Time of concentration = 4.90 min.
 Rainfall intensity = 9.222(In/Hr)

++++++
 Process from Point/Station 1.051 to Point/Station 1.061
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 [HIGH DENSITY RESIDENTIAL]

(43.0 DU/A or Less)
 Impervious value, $A_i = 0.800$
 Sub-Area C Value = 0.780
 Initial subarea total flow distance = 65.000(Ft.)
 Highest elevation = 374.100(Ft.)
 Lowest elevation = 373.400(Ft.)
 Elevation difference = 0.700(Ft.) Slope = 1.077 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 65.00 (Ft)
 for the top area slope value of 1.08 %, in a development type of
 43.0 DU/A or Less
 In Accordance With Figure 3-3
 Initial Area Time of Concentration = 4.53 minutes
 $TC = [1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{1.5} / (\% \text{ slope}^{1/3})]$
 $TC = [1.8 * (1.1 - 0.7800) * (65.000^{1.5}) / (1.077^{1/3})] = 4.53$
 Calculated TC of 4.530 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
 Rainfall intensity (I) = 9.222(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area ($Q=KCIA$) is $C = 0.780$
 Subarea runoff = 0.360(CFS)
 Total initial stream area = 0.050(Ac.)

+++++
 Process from Point/Station 1.061 to Point/Station 1.071
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 373.400(Ft.)
 Downstream point elevation = 361.800(Ft.)
 Channel length thru subarea = 593.000(Ft.)
 Channel base width = 0.000(Ft.)
 Slope or 'Z' of left channel bank = 50.000
 Slope or 'Z' of right channel bank = 50.000
 Estimated mean flow rate at midpoint of channel = 4.145(CFS)
 Manning's 'N' = 0.015
 Maximum depth of channel = 0.300(Ft.)
 Flow(q) thru subarea = 4.145(CFS)
 Depth of flow = 0.174(Ft.), Average velocity = 2.725(Ft/s)
 Channel flow top width = 17.443(Ft.)
 Flow Velocity = 2.72(Ft/s)
 Travel time = 3.63 min.
 Time of concentration = 8.16 min.
 Critical depth = 0.212(Ft.)
 Adding area flow to channel
 Rainfall intensity (I) = 6.725(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 = 1.000
 Decimal fraction soil group D = 0.000
 [HIGH DENSITY RESIDENTIAL]
 (43.0 DU/A or Less)
 Impervious value, $A_i = 0.800$
 Sub-Area C Value = 0.780
 Rainfall intensity = 6.725(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 ($Q=KCIA$) is $C = 0.780$ $CA = 1.170$
 Subarea runoff = 7.508(CFS) for 1.450(Ac.)

Total runoff = 7.868(CFS) Total area = 1.500(Ac.)
 Depth of flow = 0.222(Ft.), Average velocity = 3.198(Ft/s)
 Critical depth = 0.273(Ft.)

+++++
 Process from Point/Station 1.071 to Point/Station 1.071
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 1.500(Ac.)
 Runoff from this stream = 7.868(CFS)
 Time of concentration = 8.16 min.
 Rainfall intensity = 6.725(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	2.374	4.90	9.222
2	7.868	8.16	6.725

Qmax(1) =
 1.000 * 1.000 * 2.374) +
 1.000 * 0.601 * 7.868) + = 7.104

Qmax(2) =
 0.729 * 1.000 * 2.374) +
 1.000 * 1.000 * 7.868) + = 9.599

Total of 2 streams to confluence:
 Flow rates before confluence point:
 2.374 7.868
 Maximum flow rates at confluence using above data:
 7.104 9.599
 Area of streams before confluence:
 0.330 1.500
 Results of confluence:
 Total flow rate = 9.599(CFS)
 Time of concentration = 8.158 min.
 Effective stream area after confluence = 1.830(Ac.)

+++++
 Process from Point/Station 1.071 to Point/Station 1.072
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 361.800(Ft.)
 Downstream point elevation = 360.500(Ft.)
 Channel length thru subarea = 31.000(Ft.)
 Channel base width = 0.000(Ft.)
 Slope or 'Z' of left channel bank = 50.000
 Slope or 'Z' of right channel bank = 0.330
 Estimated mean flow rate at midpoint of channel = 9.809(CFS)
 Manning's 'N' = 0.015
 Maximum depth of channel = 0.500(Ft.)
 Flow(q) thru subarea = 9.809(CFS)
 Depth of flow = 0.271(Ft.), Average velocity = 5.302(Ft/s)

Channel flow top width = 13.646(Ft.)
 Flow Velocity = 5.30(Ft/s)
 Travel time = 0.10 min.
 Time of concentration = 8.26 min.
 Critical depth = 0.395(Ft.)
 Adding area flow to channel
 Rainfall intensity (I) = 6.673(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 = 1.000
 Decimal fraction soil group D = 0.000
 [HIGH DENSITY RESIDENTIAL]
 (43.0 DU/A or Less)
 Impervious value, Ai = 0.800
 Sub-Area C Value = 0.780
 Rainfall intensity = 6.673(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.780 CA = 1.490
 Subarea runoff = 0.343(CFS) for 0.080(Ac.)
 Total runoff = 9.942(CFS) Total area = 1.910(Ac.)
 Depth of flow = 0.273(Ft.), Average velocity = 5.320(Ft/s)
 Critical depth = 0.395(Ft.)

++++++
 Process from Point/Station 1.072 to Point/Station 1.072
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 1.910(Ac.)
 Runoff from this stream = 9.942(CFS)
 Time of concentration = 8.26 min.
 Rainfall intensity = 6.673(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	7.879	7.27	7.246
2	9.942	8.26	6.673
Qmax(1) =			
	1.000 *	1.000 *	7.879) +
	1.000 *	0.880 *	9.942) + = 16.630
Qmax(2) =			
	0.921 *	1.000 *	7.879) +
	1.000 *	1.000 *	9.942) + = 17.199

Total of 2 main streams to confluence:

Flow rates before confluence point:

7.879 9.942

Maximum flow rates at confluence using above data:

16.630 17.199

Area of streams before confluence:

1.370 1.910

Results of confluence:

Total flow rate = 17.199(CFS)
 Time of concentration = 8.255 min.
 Effective stream area after confluence = 3.280(Ac.)

 Process from Point/Station 1.072 to Point/Station 1.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 356.500(Ft.)
 Downstream point/station elevation = 350.300(Ft.)
 Pipe length = 99.40(Ft.) Slope = 0.0624 Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 17.199(CFS)
 Nearest computed pipe diameter = 18.00(In.)
 Calculated individual pipe flow = 17.199(CFS)
 Normal flow depth in pipe = 10.63(In.)
 Flow top width inside pipe = 17.70(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 15.83(Ft/s)
 Travel time through pipe = 0.10 min.
 Time of concentration (TC) = 8.36 min.

 Process from Point/Station 1.000 to Point/Station 1.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1
 Stream flow area = 3.280(Ac.)
 Runoff from this stream = 17.199(CFS)
 Time of concentration = 8.36 min.
 Rainfall intensity = 6.619(In/Hr)
 Summary of stream data:

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

1	17.199	8.36	6.619
---	--------	------	-------

Qmax(1) =
 1.000 * 1.000 * 17.199) + = 17.199

Total of 1 main streams to confluence:

Flow rates before confluence point:

17.199

Maximum flow rates at confluence using above data:

17.199

Area of streams before confluence:

3.280

Results of confluence:

Total flow rate = 17.199(CFS)
 Time of concentration = 8.360 min.

Effective stream area after confluence = 3.280(Ac.)

+++++
 Process from Point/Station 1.081 to Point/Station 1.091
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 [HIGH DENSITY RESIDENTIAL]
 (43.0 DU/A or Less)
 Impervious value, Ai = 0.800
 Sub-Area C Value = 0.780
 Initial subarea total flow distance = 65.000(Ft.)
 Highest elevation = 363.400(Ft.)
 Lowest elevation = 362.700(Ft.)
 Elevation difference = 0.700(Ft.) Slope = 1.077 %
 Top of Initial Area Slope adjusted by User to 1.000 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 65.00 (Ft)
 for the top area slope value of 1.00 %, in a development type of
 43.0 DU/A or Less
 In Accordance With Figure 3-3
 Initial Area Time of Concentration = 4.64 minutes
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5} / (% slope^{(1/3)})]$
 $TC = [1.8 * (1.1 - 0.7800) * (65.000^{.5}) / (1.000^{(1/3)})] = 4.64$
 Calculated TC of 4.644 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
 Rainfall intensity (I) = 9.222(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.780
 Subarea runoff = 0.144(CFS)
 Total initial stream area = 0.020(Ac.)

+++++
 Process from Point/Station 1.091 to Point/Station 1.092
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 362.700(Ft.)
 Downstream point elevation = 356.500(Ft.)
 Channel length thru subarea = 142.000(Ft.)
 Channel base width = 0.000(Ft.)
 Slope or 'Z' of left channel bank = 50.000
 Slope or 'Z' of right channel bank = 0.330
 Estimated mean flow rate at midpoint of channel = 1.267(CFS)
 Manning's 'N' = 0.015
 Maximum depth of channel = 0.500(Ft.)
 Flow(q) thru subarea = 1.267(CFS)
 Depth of flow = 0.125(Ft.), Average velocity = 3.227(Ft/s)
 Channel flow top width = 6.286(Ft.)
 Flow Velocity = 3.23(Ft/s)
 Travel time = 0.73 min.
 Time of concentration = 5.38 min.
 Critical depth = 0.174(Ft.)
 Adding area flow to channel

Rainfall intensity (I) = 8.799(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 = 1.000
 Decimal fraction soil group D = 0.000
 [HIGH DENSITY RESIDENTIAL]
 (43.0 DU/A or Less)
 Impervious value, Ai = 0.800
 Sub-Area C Value = 0.780
 Rainfall intensity = 8.799(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.780 CA = 0.265
 Subarea runoff = 2.190(CFS) for 0.320(Ac.)
 Total runoff = 2.333(CFS) Total area = 0.340(Ac.)
 Depth of flow = 0.157(Ft.), Average velocity = 3.759(Ft/s)
 Critical depth = 0.221(Ft.)

++++++
 Process from Point/Station 1.092 to Point/Station 1.112
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
 Stream flow area = 0.340(Ac.)
 Runoff from this stream = 2.333(CFS)
 Time of concentration = 5.38 min.
 Rainfall intensity = 8.799(In/Hr)

++++++
 Process from Point/Station 1.101 to Point/Station 1.111
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 [HIGH DENSITY RESIDENTIAL]
 (43.0 DU/A or Less)
 Impervious value, Ai = 0.800
 Sub-Area C Value = 0.780
 Initial subarea total flow distance = 65.000(Ft.)
 Highest elevation = 372.600(Ft.)
 Lowest elevation = 371.900(Ft.)
 Elevation difference = 0.700(Ft.) Slope = 1.077 %
 Top of Initial Area Slope adjusted by User to 1.000 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 65.00 (Ft)
 for the top area slope value of 1.00 %, in a development type of
 43.0 DU/A or Less
 In Accordance With Figure 3-3
 Initial Area Time of Concentration = 4.64 minutes
 $TC = [1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{.5}] / (\% \text{ slope}^{(1/3)})]$
 $TC = [1.8 * (1.1 - 0.7800) * (65.000^{.5})] / (1.000^{(1/3)}) = 4.64$
 Calculated TC of 4.644 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
 Rainfall intensity (I) = 9.222(In/Hr) for a 100.0 year storm

Effective runoff coefficient used for area (Q=KCIA) is $C = 0.780$
 Subarea runoff = 0.216(CFS)
 Total initial stream area = 0.030(Ac.)

+++++
 Process from Point/Station 1.111 to Point/Station 1.112
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 372.400(Ft.)
 Downstream point elevation = 356.500(Ft.)
 Channel length thru subarea = 619.000(Ft.)
 Channel base width = 0.000(Ft.)
 Slope or 'Z' of left channel bank = 50.000
 Slope or 'Z' of right channel bank = 50.000
 Estimated mean flow rate at midpoint of channel = 5.679(CFS)
 Manning's 'N' = 0.015
 Maximum depth of channel = 0.300(Ft.)
 Flow(q) thru subarea = 5.679(CFS)
 Depth of flow = 0.187(Ft.), Average velocity = 3.265(Ft/s)
 Channel flow top width = 18.652(Ft.)
 Flow Velocity = 3.26(Ft/s)
 Travel time = 3.16 min.
 Time of concentration = 7.80 min.
 Critical depth = 0.240(Ft.)
 Adding area flow to channel
 Rainfall intensity (I) = 6.920(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 = 1.000
 Decimal fraction soil group D = 0.000
 [HIGH DENSITY RESIDENTIAL]
 (43.0 DU/A or Less)
 Impervious value, $A_i = 0.800$
 Sub-Area C Value = 0.780
 Rainfall intensity = 6.920(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is $C = 0.780$ $CA = 1.599$
 Subarea runoff = 10.849(CFS) for 2.020(Ac.)
 Total runoff = 11.065(CFS) Total area = 2.050(Ac.)
 Depth of flow = 0.240(Ft.), Average velocity = 3.857(Ft/s)
 Critical depth = 0.313(Ft.)

+++++
 Process from Point/Station 1.092 to Point/Station 1.112
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 2.050(Ac.)
 Runoff from this stream = 11.065(CFS)
 Time of concentration = 7.80 min.
 Rainfall intensity = 6.920(In/Hr)
 Summary of stream data:

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

1	2.333	5.38	8.799
2	11.065	7.80	6.920

Qmax(1) =

1.000 *	1.000 *	2.333) +	
1.000 *	0.689 *	11.065) + =	9.958

Qmax(2) =

0.786 *	1.000 *	2.333) +	
1.000 *	1.000 *	11.065) + =	12.900

Total of 2 streams to confluence:

Flow rates before confluence point:

2.333 11.065

Maximum flow rates at confluence using above data:

9.958 12.900

Area of streams before confluence:

0.340 2.050

Results of confluence:

Total flow rate = 12.900(CFS)

Time of concentration = 7.804 min.

Effective stream area after confluence = 2.390(Ac.)

+++++

Process from Point/Station	1.112 to Point/Station	1.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****		

Upstream point/station elevation = 352.500(Ft.)
 Downstream point/station elevation = 350.300(Ft.)
 Pipe length = 23.30(Ft.) Slope = 0.0944 Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 12.900(CFS)
 Nearest computed pipe diameter = 15.00(In.)
 Calculated individual pipe flow = 12.900(CFS)
 Normal flow depth in pipe = 8.81(In.)
 Flow top width inside pipe = 14.77(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 17.22(Ft/s)
 Travel time through pipe = 0.02 min.
 Time of concentration (TC) = 7.83 min.

+++++

Process from Point/Station	1.000 to Point/Station	1.000
**** CONFLUENCE OF MAIN STREAMS ****		

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 2.390(Ac.)
 Runoff from this stream = 12.900(CFS)
 Time of concentration = 7.83 min.
 Rainfall intensity = 6.907(In/Hr)
 Program is now starting with Main Stream No. 3

+++++

Process from Point/Station	1.121 to Point/Station	1.131
----------------------------	------------------------	-------

 ***** INITIAL AREA EVALUATION *****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 [HIGH DENSITY RESIDENTIAL]
 (43.0 DU/A or Less)
 Impervious value, Ai = 0.800
 Sub-Area C Value = 0.780
 Initial subarea total flow distance = 65.000(Ft.)
 Highest elevation = 371.100(Ft.)
 Lowest elevation = 370.900(Ft.)
 Elevation difference = 0.200(Ft.) Slope = 0.308 %
 Top of Initial Area Slope adjusted by User to 1.000 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 65.00 (Ft)
 for the top area slope value of 1.00 %, in a development type of
 43.0 DU/A or Less
 In Accordance With Figure 3-3
 Initial Area Time of Concentration = 4.64 minutes
 $TC = [1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{1.5} / (\% \text{ slope}^{(1/3)})]$
 $TC = [1.8 * (1.1 - 0.7800) * (65.000^{1.5}) / (1.000^{(1/3)})] = 4.64$
 Calculated TC of 4.644 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
 Rainfall intensity (I) = 9.222(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.780
 Subarea runoff = 0.216(CFS)
 Total initial stream area = 0.030(Ac.)

++++++
 Process from Point/Station 1.131 to Point/Station 1.132
 ***** IMPROVED CHANNEL TRAVEL TIME *****

Upstream point elevation = 370.900(Ft.)
 Downstream point elevation = 357.700(Ft.)
 Channel length thru subarea = 299.000(Ft.)
 Channel base width = 0.000(Ft.)
 Slope or 'Z' of left channel bank = 0.330
 Slope or 'Z' of right channel bank = 50.000
 Estimated mean flow rate at midpoint of channel = 2.864(CFS)
 Manning's 'N' = 0.015
 Maximum depth of channel = 0.500(Ft.)
 Flow(q) thru subarea = 2.864(CFS)
 Depth of flow = 0.169(Ft.), Average velocity = 3.974(Ft/s)
 Channel flow top width = 8.518(Ft.)
 Flow Velocity = 3.97(Ft/s)
 Travel time = 1.25 min.
 Time of concentration = 5.90 min.
 Critical depth = 0.240(Ft.)
 Adding area flow to channel
 Rainfall intensity (I) = 8.290(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 = 1.000
 Decimal fraction soil group D = 0.000

[HIGH DENSITY RESIDENTIAL]
 (43.0 DU/A or Less)
 Impervious value, $A_i = 0.800$
 Sub-Area C Value = 0.780
 Rainfall intensity = 8.290(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 ($Q=KCIA$) is $C = 0.780$ $CA = 0.655$
 Subarea runoff = 5.216(CFS) for 0.810(Ac.)
 Total runoff = 5.431(CFS) Total area = 0.840(Ac.)
 Depth of flow = 0.215(Ft.), Average velocity = 4.663(Ft/s)
 Critical depth = 0.311(Ft.)

+++++
 Process from Point/Station 1.132 to Point/Station 1.152
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 3 in normal stream number 1
 Stream flow area = 0.840(Ac.)
 Runoff from this stream = 5.431(CFS)
 Time of concentration = 5.90 min.
 Rainfall intensity = 8.290(In/Hr)

+++++
 Process from Point/Station 1.141 to Point/Station 1.151
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 [HIGH DENSITY RESIDENTIAL]
 (43.0 DU/A or Less)
 Impervious value, $A_i = 0.800$
 Sub-Area C Value = 0.780
 Initial subarea total flow distance = 65.000(Ft.)
 Highest elevation = 365.000(Ft.)
 Lowest elevation = 364.300(Ft.)
 Elevation difference = 0.700(Ft.) Slope = 1.077 %
 Top of Initial Area Slope adjusted by User to 1.000 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 65.00 (Ft)
 for the top area slope value of 1.00 %, in a development type of
 43.0 DU/A or Less
 In Accordance With Figure 3-3
 Initial Area Time of Concentration = 4.64 minutes
 $TC = [1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{0.5} / (\% \text{ slope}^{(1/3)})]$
 $TC = [1.8 * (1.1 - 0.7800) * (65.000^{0.5}) / (1.000^{(1/3)})] = 4.64$
 Calculated TC of 4.644 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
 Rainfall intensity (I) = 9.222(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area ($Q=KCIA$) is $C = 0.780$
 Subarea runoff = 0.216(CFS)
 Total initial stream area = 0.030(Ac.)

+++++
 Process from Point/Station 1.151 to Point/Station 1.152
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 364.300(Ft.)
 Downstream point elevation = 357.700(Ft.)
 Channel length thru subarea = 245.000(Ft.)
 Channel base width = 0.000(Ft.)
 Slope or 'Z' of left channel bank = 50.000
 Slope or 'Z' of right channel bank = 50.000
 Estimated mean flow rate at midpoint of channel = 3.118(CFS)
 Manning's 'N' = 0.015
 Maximum depth of channel = 0.300(Ft.)
 Flow(q) thru subarea = 3.118(CFS)
 Depth of flow = 0.148(Ft.), Average velocity = 2.861(Ft/s)
 Channel flow top width = 14.764(Ft.)
 Flow Velocity = 2.86(Ft/s)
 Travel time = 1.43 min.
 Time of concentration = 6.07 min.
 Critical depth = 0.189(Ft.)
 Adding area flow to channel
 Rainfall intensity (I) = 8.136(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 = 1.000
 Decimal fraction soil group D = 0.000
 [HIGH DENSITY RESIDENTIAL]
 (43.0 DU/A or Less)
 Impervious value, Ai = 0.800
 Sub-Area C Value = 0.780
 Rainfall intensity = 8.136(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.780 CA = 0.733
 Subarea runoff = 5.750(CFS) for 0.910(Ac.)
 Total runoff = 5.966(CFS) Total area = 0.940(Ac.)
 Depth of flow = 0.188(Ft.), Average velocity = 3.365(Ft/s)
 Critical depth = 0.244(Ft.)

+++++
 Process from Point/Station 1.152 to Point/Station 1.184
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 3 in normal stream number 2
 Stream flow area = 0.940(Ac.)
 Runoff from this stream = 5.966(CFS)
 Time of concentration = 6.07 min.
 Rainfall intensity = 8.136(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	5.431	5.90	8.290
2	5.966	6.07	8.136
Qmax(1) =			

	1.000 *	1.000 *	5.431) +	
	1.000 *	0.971 *	5.966) + =	11.227
Qmax(2) =	0.982 *	1.000 *	5.431) +	
	1.000 *	1.000 *	5.966) + =	11.297

Total of 2 streams to confluence:

Flow rates before confluence point:

5.431 5.966

Maximum flow rates at confluence using above data:

11.227 11.297

Area of streams before confluence:

0.840 0.940

Results of confluence:

Total flow rate = 11.297(CFS)

Time of concentration = 6.071 min.

Effective stream area after confluence = 1.780(Ac.)

+++++
 Process from Point/Station 1.161 to Point/Station 1.171
 ***** INITIAL AREA EVALUATION *****

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 1.000

Decimal fraction soil group D = 0.000

[UNDISTURBED NATURAL TERRAIN]

(Permanent Open Space)

Impervious value, Ai = 0.000

Sub-Area C Value = 0.300

Initial subarea total flow distance = 100.000(Ft.)

Highest elevation = 407.900(Ft.)

Lowest elevation = 389.000(Ft.)

Elevation difference = 18.900(Ft.) Slope = 18.900 %

INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:

The maximum overland flow distance is 100.00 (Ft)

for the top area slope value of 18.90 %, in a development type of
 Permanent Open Space

In Accordance With Figure 3-3

Initial Area Time of Concentration = 5.41 minutes

TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(% slope^(1/3))

TC = [1.8*(1.1-0.3000)*(100.000^0.5)]/(18.900^(1/3))= 5.41

Rainfall intensity (I) = 8.769(In/Hr) for a 100.0 year storm

Effective runoff coefficient used for area (Q=KCIA) is C = 0.300

Subarea runoff = 0.158(CFS)

Total initial stream area = 0.060(Ac.)

+++++
 Process from Point/Station 1.171 to Point/Station 1.172
 ***** IMPROVED CHANNEL TRAVEL TIME *****

Upstream point elevation = 389.000(Ft.)

Downstream point elevation = 367.600(Ft.)

Channel length thru subarea = 315.000(Ft.)

Channel base width = 0.000(Ft.)

Slope or 'Z' of left channel bank = 1.000
 Slope or 'Z' of right channel bank = 1.000
 Estimated mean flow rate at midpoint of channel = 0.355(CFS)
 Manning's 'N' = 0.015
 Maximum depth of channel = 1.000(Ft.)
 Flow(q) thru subarea = 0.355(CFS)
 Depth of flow = 0.260(Ft.), Average velocity = 5.258(Ft/s)
 Channel flow top width = 0.520(Ft.)
 Flow Velocity = 5.26(Ft/s)
 Travel time = 1.00 min.
 Time of concentration = 6.40 min.
 Critical depth = 0.379(Ft.)
 Adding area flow to channel
 Rainfall intensity (I) = 7.861(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 = 1.000
 Decimal fraction soil group D = 0.000
 [UNDISTURBED NATURAL TERRAIN]
 (Permanent Open Space)
 Impervious value, Ai = 0.000
 Sub-Area C Value = 0.300
 Rainfall intensity = 7.861(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.300 CA = 0.063
 Subarea runoff = 0.337(CFS) for 0.150(Ac.)
 Total runoff = 0.495(CFS) Total area = 0.210(Ac.)
 Depth of flow = 0.294(Ft.), Average velocity = 5.714(Ft/s)
 Critical depth = 0.434(Ft.)

++++++
 Process from Point/Station 1.172 to Point/Station 1.181
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 364.000(Ft.)
 Downstream point/station elevation = 363.300(Ft.)
 Pipe length = 70.00(Ft.) Slope = 0.0100 Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 0.495(CFS)
 Nearest computed pipe diameter = 6.00(In.)
 Calculated individual pipe flow = 0.495(CFS)
 Normal flow depth in pipe = 4.38(In.)
 Flow top width inside pipe = 5.32(In.)
 Critical Depth = 4.31(In.)
 Pipe flow velocity = 3.23(Ft/s)
 Travel time through pipe = 0.36 min.
 Time of concentration (TC) = 6.77 min.

++++++
 Process from Point/Station 1.181 to Point/Station 1.181
 **** SUBAREA FLOW ADDITION ****

Rainfall intensity (I) = 7.587(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 = 1.000

Decimal fraction soil group D = 0.000
 [HIGH DENSITY RESIDENTIAL]
 (43.0 DU/A or Less)
 Impervious value, Ai = 0.800
 Sub-Area C Value = 0.780
 Time of concentration = 6.77 min.
 Rainfall intensity = 7.587(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.407 CA = 0.110
 Subarea runoff = 0.338(CFS) for 0.060(Ac.)
 Total runoff = 0.833(CFS) Total area = 0.270(Ac.)

++++++
 Process from Point/Station 1.181 to Point/Station 1.182
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 363.300(Ft.)
 Downstream point/station elevation = 361.600(Ft.)
 Pipe length = 84.90(Ft.) Slope = 0.0200 Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 0.833(CFS)
 Nearest computed pipe diameter = 9.00(In.)
 Calculated individual pipe flow = 0.833(CFS)
 Normal flow depth in pipe = 3.71(In.)
 Flow top width inside pipe = 8.86(In.)
 Critical Depth = 5.00(In.)
 Pipe flow velocity = 4.85(Ft/s)
 Travel time through pipe = 0.29 min.
 Time of concentration (TC) = 7.06 min.

++++++
 Process from Point/Station 1.182 to Point/Station 1.183
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 361.600(Ft.)
 Downstream point/station elevation = 357.900(Ft.)
 Pipe length = 137.80(Ft.) Slope = 0.0269 Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 0.833(CFS)
 Nearest computed pipe diameter = 6.00(In.)
 Calculated individual pipe flow = 0.833(CFS)
 Normal flow depth in pipe = 4.48(In.)
 Flow top width inside pipe = 5.22(In.)
 Critical Depth = 5.40(In.)
 Pipe flow velocity = 5.30(Ft/s)
 Travel time through pipe = 0.43 min.
 Time of concentration (TC) = 7.49 min.

++++++
 Process from Point/Station 1.183 to Point/Station 1.184
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 357.900(Ft.)
 Downstream point/station elevation = 353.700(Ft.)
 Pipe length = 53.70(Ft.) Slope = 0.0782 Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 0.833(CFS)

Nearest computed pipe diameter = 6.00(In.)
 Calculated individual pipe flow = 0.833(CFS)
 Normal flow depth in pipe = 3.11(In.)
 Flow top width inside pipe = 6.00(In.)
 Critical Depth = 5.40(In.)
 Pipe flow velocity = 8.11(Ft/s)
 Travel time through pipe = 0.11 min.
 Time of concentration (TC) = 7.60 min.

++++++
 Process from Point/Station 1.152 to Point/Station 1.184
 ***** CONFLUENCE OF MINOR STREAMS *****

Along Main Stream number: 3 in normal stream number 3
 Stream flow area = 0.270(Ac.)
 Runoff from this stream = 0.833(CFS)
 Time of concentration = 7.60 min.
 Rainfall intensity = 7.038(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	5.431	5.90	8.290
2	5.966	6.07	8.136
3	0.833	7.60	7.038

Qmax(1) =
 1.000 * 1.000 * 5.431) +
 1.000 * 0.971 * 5.966) +
 1.000 * 0.776 * 0.833) + = 11.873
 Qmax(2) =
 0.982 * 1.000 * 5.431) +
 1.000 * 1.000 * 5.966) +
 1.000 * 0.799 * 0.833) + = 11.962
 Qmax(3) =
 0.849 * 1.000 * 5.431) +
 0.865 * 1.000 * 5.966) +
 1.000 * 1.000 * 0.833) + = 10.605

Total of 3 streams to confluence:
 Flow rates before confluence point:
 5.431 5.966 0.833
 Maximum flow rates at confluence using above data:
 11.873 11.962 10.605
 Area of streams before confluence:
 0.840 0.940 0.270
 Results of confluence:
 Total flow rate = 11.962(CFS)
 Time of concentration = 6.071 min.
 Effective stream area after confluence = 2.050(Ac.)

++++++
 Process from Point/Station 1.184 to Point/Station 1.000
 ***** PIPEFLOW TRAVEL TIME (Program estimated size) *****

Upstream point/station elevation = 353.700(Ft.)
 Downstream point/station elevation = 350.300(Ft.)
 Pipe length = 28.80(Ft.) Slope = 0.1181 Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 11.962(CFS)
 Nearest computed pipe diameter = 12.00(In.)
 Calculated individual pipe flow = 11.962(CFS)
 Normal flow depth in pipe = 9.60(In.)
 Flow top width inside pipe = 9.60(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 17.76(Ft/s)
 Travel time through pipe = 0.03 min.
 Time of concentration (TC) = 6.10 min.

++++++
 Process from Point/Station 1.000 to Point/Station 1.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 3
 Stream flow area = 2.050(Ac.)
 Runoff from this stream = 11.962(CFS)
 Time of concentration = 6.10 min.
 Rainfall intensity = 8.113(In/Hr)
 Program is now starting with Main Stream No. 4

++++++
 Process from Point/Station 1.191 to Point/Station 1.201
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 [UNDISTURBED NATURAL TERRAIN]
 (Permanent Open Space)
 Impervious value, Ai = 0.000
 Sub-Area C Value = 0.300
 Initial subarea total flow distance = 100.000(Ft.)
 Highest elevation = 407.900(Ft.)
 Lowest elevation = 391.600(Ft.)
 Elevation difference = 16.300(Ft.) Slope = 16.300 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 100.00 (Ft)
 for the top area slope value of 16.30 %, in a development type of
 Permanent Open Space
 In Accordance With Figure 3-3
 Initial Area Time of Concentration = 5.68 minutes
 $TC = [1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{1.5} / (\% \text{ slope}^{(1/3)})]$
 $TC = [1.8 * (1.1 - 0.3000) * (100.000^{1.5}) / (16.300^{(1/3)})] = 5.68$
 Rainfall intensity (I) = 8.494(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.300
 Subarea runoff = 0.153(CFS)
 Total initial stream area = 0.060(Ac.)


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+++++
Process from Point/Station      1.201 to Point/Station      1.202
**** IMPROVED CHANNEL TRAVEL TIME ****

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Upstream point elevation = 391.600(Ft.)
Downstream point elevation = 355.900(Ft.)
Channel length thru subarea = 1101.000(Ft.)
Channel base width = 0.000(Ft.)
Slope or 'Z' of left channel bank = 1.000
Slope or 'Z' of right channel bank = 1.000
Estimated mean flow rate at midpoint of channel = 0.671(CFS)
Manning's 'N' = 0.015
Maximum depth of channel = 1.000(Ft.)
Flow(q) thru subarea = 0.671(CFS)
Depth of flow = 0.379(Ft.), Average velocity = 4.671(Ft/s)
Channel flow top width = 0.758(Ft.)
Flow Velocity = 4.67(Ft/s)
Travel time = 3.93 min.
Time of concentration = 9.61 min.
Critical depth = 0.488(Ft.)
Adding area flow to channel
Rainfall intensity (I) = 6.051(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 = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN ]
(Permanent Open Space )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
Rainfall intensity = 6.051(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.300 CA = 0.186
Subarea runoff = 0.973(CFS) for 0.560(Ac.)
Total runoff = 1.126(CFS) Total area = 0.620(Ac.)
Depth of flow = 0.460(Ft.), Average velocity = 5.316(Ft/s)
Critical depth = 0.602(Ft.)

```

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+++++
Process from Point/Station      1.202 to Point/Station      1.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

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```

Upstream point/station elevation = 351.900(Ft.)
Downstream point/station elevation = 350.300(Ft.)
Pipe length = 111.20(Ft.) Slope = 0.0144 Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.126(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 1.126(CFS)
Normal flow depth in pipe = 4.85(In.)
Flow top width inside pipe = 8.97(In.)
Critical Depth = 5.86(In.)
Pipe flow velocity = 4.63(Ft/s)
Travel time through pipe = 0.40 min.
Time of concentration (TC) = 10.01 min.

```

+++++
 Process from Point/Station 1.000 to Point/Station 1.000
 ***** CONFLUENCE OF MAIN STREAMS *****

The following data inside Main Stream is listed:

In Main Stream number: 4
 Stream flow area = 0.620(Ac.)
 Runoff from this stream = 1.126(CFS)
 Time of concentration = 10.01 min.
 Rainfall intensity = 5.894(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
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1	17.199	8.36	6.619
2	12.900	7.83	6.907
3	11.962	6.10	8.113
4	1.126	10.01	5.894

Qmax(1) =
 1.000 * 1.000 * 17.199) +
 0.958 * 1.000 * 12.900) +
 0.816 * 1.000 * 11.962) +
 1.000 * 0.835 * 1.126) + = 40.261

Qmax(2) =
 1.000 * 0.936 * 17.199) +
 1.000 * 1.000 * 12.900) +
 0.851 * 1.000 * 11.962) +
 1.000 * 0.782 * 1.126) + = 40.065

Qmax(3) =
 1.000 * 0.729 * 17.199) +
 1.000 * 0.779 * 12.900) +
 1.000 * 1.000 * 11.962) +
 1.000 * 0.609 * 1.126) + = 35.244

Qmax(4) =
 0.890 * 1.000 * 17.199) +
 0.853 * 1.000 * 12.900) +
 0.726 * 1.000 * 11.962) +
 1.000 * 1.000 * 1.126) + = 36.138

Total of 4 main streams to confluence:

Flow rates before confluence point:

17.199	12.900	11.962	1.126
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Maximum flow rates at confluence using above data:

40.261	40.065	35.244	36.138
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Area of streams before confluence:

3.280	2.390	2.050	0.620
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Results of confluence:

Total flow rate = 40.261(CFS)

Time of concentration = 8.360 min.

Effective stream area after confluence = 8.340(Ac.)

```

+++++
Process from Point/Station      1.000 to Point/Station      1.223
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

```

```

Upstream point/station elevation = 348.000(Ft.)
Downstream point/station elevation = 345.000(Ft.)
Pipe length = 148.70(Ft.) Slope = 0.0202 Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 40.261(CFS)
Nearest computed pipe diameter = 27.00(In.)
Calculated individual pipe flow = 40.261(CFS)
Normal flow depth in pipe = 20.32(In.)
Flow top width inside pipe = 23.30(In.)
Critical Depth = 25.14(In.)
Pipe flow velocity = 12.55(Ft/s)
Travel time through pipe = 0.20 min.
Time of concentration (TC) = 8.56 min.

```

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+++++
Process from Point/Station      1.223 to Point/Station      1.223
**** CONFLUENCE OF MAIN STREAMS ****

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The following data inside Main Stream is listed:

```

In Main Stream number: 1
Stream flow area = 8.340(Ac.)
Runoff from this stream = 40.261(CFS)
Time of concentration = 8.56 min.
Rainfall intensity = 6.520(In/Hr)
Program is now starting with Main Stream No. 2

```

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+++++
Process from Point/Station      1.211 to Point/Station      1.221
**** INITIAL AREA EVALUATION ****

```

```

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[ HIGH DENSITY RESIDENTIAL ]
(43.0 DU/A or Less )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Initial subarea total flow distance = 65.000(Ft.)
Highest elevation = 357.600(Ft.)
Lowest elevation = 352.800(Ft.)
Elevation difference = 4.800(Ft.) Slope = 7.385 %
Top of Initial Area Slope adjusted by User to 7.400 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 95.00 (Ft)
for the top area slope value of 7.40 %, in a development type of
43.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 2.88 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(% slope^(1/3))
TC = [1.8*(1.1-0.7800)*( 95.000^0.5)]/( 7.400^(1/3))= 2.88
Calculated TC of 2.881 minutes is less than 5 minutes,

```

resetting TC to 5.0 minutes for rainfall intensity calculations
 Rainfall intensity (I) = 9.222(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.780
 Subarea runoff = 0.216(CFS)
 Total initial stream area = 0.030(Ac.)

 Process from Point/Station 1.221 to Point/Station 1.222
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 352.800(Ft.)
 Downstream point elevation = 351.400(Ft.)
 Channel length thru subarea = 14.000(Ft.)
 Channel base width = 0.000(Ft.)
 Slope or 'Z' of left channel bank = 0.330
 Slope or 'Z' of right channel bank = 50.000
 Estimated mean flow rate at midpoint of channel = 0.396(CFS)
 Manning's 'N' = 0.015
 Maximum depth of channel = 0.500(Ft.)
 Flow(q) thru subarea = 0.396(CFS)
 Depth of flow = 0.069(Ft.), Average velocity = 3.292(Ft/s)
 Channel flow top width = 3.478(Ft.)
 Flow Velocity = 3.29(Ft/s)
 Travel time = 0.07 min.
 Time of concentration = 2.95 min.
 Critical depth = 0.109(Ft.)

Adding area flow to channel

Calculated TC of 2.952 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
 Rainfall intensity (I) = 9.222(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 = 1.000
 Decimal fraction soil group D = 0.000

[HIGH DENSITY RESIDENTIAL]
 (43.0 DU/A or Less)

Impervious value, Ai = 0.800

Sub-Area C Value = 0.780

Rainfall intensity = 9.222(In/Hr) for a 100.0 year storm

Effective runoff coefficient used for total area

(Q=KCIA) is C = 0.780 CA = 0.062

Subarea runoff = 0.360(CFS) for 0.050(Ac.)

Total runoff = 0.575(CFS) Total area = 0.080(Ac.)

Depth of flow = 0.080(Ft.), Average velocity = 3.615(Ft/s)

Critical depth = 0.127(Ft.)

 Process from Point/Station 1.222 to Point/Station 1.223
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 348.900(Ft.)
 Downstream point/station elevation = 345.000(Ft.)
 Pipe length = 61.90(Ft.) Slope = 0.0630 Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 0.575(CFS)
 Nearest computed pipe diameter = 6.00(In.)

Calculated individual pipe flow = 0.575(CFS)
 Normal flow depth in pipe = 2.67(In.)
 Flow top width inside pipe = 5.96(In.)
 Critical Depth = 4.64(In.)
 Pipe flow velocity = 6.81(Ft/s)
 Travel time through pipe = 0.15 min.
 Time of concentration (TC) = 3.10 min.

++++++
 Process from Point/Station 1.223 to Point/Station 1.223
 ***** CONFLUENCE OF MAIN STREAMS *****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 0.080(Ac.)
 Runoff from this stream = 0.575(CFS)
 Time of concentration = 3.10 min.
 Rainfall intensity = 9.222(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	40.261	8.56	6.520
2	0.575	3.10	9.222

Qmax(1) =
 1.000 * 1.000 * 40.261) +
 0.707 * 1.000 * 0.575) + = 40.668
 Qmax(2) =
 1.000 * 0.363 * 40.261) +
 1.000 * 1.000 * 0.575) + = 15.176

Total of 2 main streams to confluence:

Flow rates before confluence point:

40.261 0.575

Maximum flow rates at confluence using above data:

40.668 15.176

Area of streams before confluence:

8.340 0.080

Results of confluence:

Total flow rate = 40.668(CFS)

Time of concentration = 8.558 min.

Effective stream area after confluence = 8.420(Ac.)

++++++
 Process from Point/Station 1.223 to Point/Station 1.243
 ***** PIPEFLOW TRAVEL TIME (Program estimated size) *****

Upstream point/station elevation = 345.000(Ft.)
 Downstream point/station elevation = 339.610(Ft.)
 Pipe length = 294.10(Ft.) Slope = 0.0183 Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 40.668(CFS)

Nearest computed pipe diameter = 27.00(In.)
 Calculated individual pipe flow = 40.668(CFS)
 Normal flow depth in pipe = 21.42(In.)
 Flow top width inside pipe = 21.86(In.)
 Critical Depth = 25.21(In.)
 Pipe flow velocity = 12.01(Ft/s)
 Travel time through pipe = 0.41 min.
 Time of concentration (TC) = 8.97 min.

++++++
 Process from Point/Station 1.243 to Point/Station 1.243
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1
 Stream flow area = 8.420(Ac.)
 Runoff from this stream = 40.668(CFS)
 Time of concentration = 8.97 min.
 Rainfall intensity = 6.327(In/Hr)
 Program is now starting with Main Stream No. 2

++++++
 Process from Point/Station 1.231 to Point/Station 1.241
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 [MEDIUM DENSITY RESIDENTIAL]
 (14.5 DU/A or Less)
 Impervious value, Ai = 0.500
 Sub-Area C Value = 0.600
 Initial subarea total flow distance = 65.000(Ft.)
 Highest elevation = 352.900(Ft.)
 Lowest elevation = 352.030(Ft.)
 Elevation difference = 0.870(Ft.) Slope = 1.338 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 65.00 (Ft)
 for the top area slope value of 1.34 %, in a development type of
 14.5 DU/A or Less
 In Accordance With Figure 3-3
 Initial Area Time of Concentration = 6.58 minutes
 $TC = [1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{.5} / (\% \text{ slope}^{(1/3)})]$
 $TC = [1.8 * (1.1 - 0.6000) * (65.000^{.5}) / (1.340^{(1/3)})] = 6.58$
 Rainfall intensity (I) = 7.724(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
 Subarea runoff = 0.185(CFS)
 Total initial stream area = 0.040(Ac.)

++++++
 Process from Point/Station 1.241 to Point/Station 1.242
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 352.030(Ft.)
 Downstream point elevation = 350.040(Ft.)
 Channel length thru subarea = 249.000(Ft.)
 Channel base width = 0.000(Ft.)
 Slope or 'Z' of left channel bank = 0.330
 Slope or 'Z' of right channel bank = 50.000
 Estimated mean flow rate at midpoint of channel = 2.223(CFS)
 Manning's 'N' = 0.015
 Maximum depth of channel = 0.500(Ft.)
 Flow(q) thru subarea = 2.223(CFS)
 Depth of flow = 0.212(Ft.), Average velocity = 1.965(Ft/s)
 Channel flow top width = 10.672(Ft.)
 Flow Velocity = 1.96(Ft/s)
 Travel time = 2.11 min.
 Time of concentration = 8.69 min.
 Critical depth = 0.217(Ft.)
 Adding area flow to channel
 Rainfall intensity (I) = 6.454(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 = 1.000
 Decimal fraction soil group D = 0.000
 [HIGH DENSITY RESIDENTIAL]
 (24.0 DU/A or Less)
 Impervious value, Ai = 0.650
 Sub-Area C Value = 0.690
 Rainfall intensity = 6.454(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.686 CA = 0.645
 Subarea runoff = 3.978(CFS) for 0.900(Ac.)
 Total runoff = 4.163(CFS) Total area = 0.940(Ac.)
 Depth of flow = 0.268(Ft.), Average velocity = 2.298(Ft/s)
 Critical depth = 0.279(Ft.)

++++++
 Process from Point/Station 1.242 to Point/Station 1.243
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 340.660(Ft.)
 Downstream point/station elevation = 339.610(Ft.)
 Pipe length = 16.10(Ft.) Slope = 0.0652 Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 4.163(CFS)
 Nearest computed pipe diameter = 9.00(In.)
 Calculated individual pipe flow = 4.163(CFS)
 Normal flow depth in pipe = 7.27(In.)
 Flow top width inside pipe = 7.10(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 10.90(Ft/s)
 Travel time through pipe = 0.02 min.
 Time of concentration (TC) = 8.72 min.

++++++
 Process from Point/Station 1.243 to Point/Station 1.243
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2

Stream flow area = 0.940(Ac.)

Runoff from this stream = 4.163(CFS)

Time of concentration = 8.72 min.

Rainfall intensity = 6.443(In/Hr)

Summary of stream data:

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

1	40.668	8.97	6.327
---	--------	------	-------

2	4.163	8.72	6.443
---	-------	------	-------

Qmax(1) =

1.000 *	1.000 *	40.668) +	
0.982 *	1.000 *	4.163) + =	44.757

Qmax(2) =

1.000 *	0.972 *	40.668) +	
1.000 *	1.000 *	4.163) + =	43.710

Total of 2 main streams to confluence:

Flow rates before confluence point:

40.668	4.163
--------	-------

Maximum flow rates at confluence using above data:

44.757	43.710
--------	--------

Area of streams before confluence:

8.420	0.940
-------	-------

Results of confluence:

Total flow rate = 44.757(CFS)

Time of concentration = 8.966 min.

Effective stream area after confluence = 9.360(Ac.)

+++++

Process from Point/Station 1.243 to Point/Station 1000.000

**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 339.610(Ft.)

Downstream point/station elevation = 339.120(Ft.)

Pipe length = 61.60(Ft.) Slope = 0.0080 Manning's N = 0.013

No. of pipes = 1 Required pipe flow = 44.757(CFS)

Nearest computed pipe diameter = 33.00(In.)

Calculated individual pipe flow = 44.757(CFS)

Normal flow depth in pipe = 25.64(In.)

Flow top width inside pipe = 27.47(In.)

Critical Depth = 26.61(In.)

Pipe flow velocity = 9.04(Ft/s)

Travel time through pipe = 0.11 min.

Time of concentration (TC) = 9.08 min.

+++++

Process from Point/Station 2.022 to Point/Station 2.022

**** USER DEFINED FLOW INFORMATION AT A POINT ****

User specified 'C' value of 0.750 given for subarea
 Rainfall intensity (I) = 7.106(In/Hr) for a 100.0 year storm
 User specified values are as follows:
 TC = 7.49 min. Rain intensity = 7.11(In/Hr)
 Total area = 2.950(Ac.) Total runoff = 15.890(CFS)

 Process from Point/Station 2.022 to Point/Station 2.022
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 2.950(Ac.)
 Runoff from this stream = 15.890(CFS)
 Time of concentration = 7.49 min.
 Rainfall intensity = 7.106(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 = 1.000
 Decimal fraction soil group D = 0.000
 [MEDIUM DENSITY RESIDENTIAL]
 (14.5 DU/A or Less)
 Impervious value, Ai = 0.500
 Sub-Area C Value = 0.600
 Initial subarea total flow distance = 50.000(Ft.)
 Highest elevation = 354.800(Ft.)
 Lowest elevation = 354.300(Ft.)
 Elevation difference = 0.500(Ft.) Slope = 1.000 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 65.00 (Ft)
 for the top area slope value of 1.00 %, in a development type of
 14.5 DU/A or Less
 In Accordance With Figure 3-3
 Initial Area Time of Concentration = 7.26 minutes
 $TC = [1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{.5}] / (\% \text{ slope}^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.6000) * (65.000^{.5})] / (1.000^{(1/3)}) = 7.26$
 Rainfall intensity (I) = 7.253(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
 Subarea runoff = 0.174(CFS)
 Total initial stream area = 0.040(Ac.)

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

Upstream point elevation = 354.300(Ft.)
 Downstream point elevation = 351.200(Ft.)

Channel length thru subarea = 205.000(Ft.)
 Channel base width = 0.000(Ft.)
 Slope or 'Z' of left channel bank = 0.330
 Slope or 'Z' of right channel bank = 50.000
 Estimated mean flow rate at midpoint of channel = 0.853(CFS)
 Manning's 'N' = 0.015
 Maximum depth of channel = 0.500(Ft.)
 Flow(q) thru subarea = 0.853(CFS)
 Depth of flow = 0.131(Ft.), Average velocity = 1.964(Ft/s)
 Channel flow top width = 6.613(Ft.)
 Flow Velocity = 1.96(Ft/s)
 Travel time = 1.74 min.
 Time of concentration = 9.00 min.
 Critical depth = 0.148(Ft.)
 Adding area flow to channel
 Rainfall intensity (I) = 6.314(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 = 1.000
 Decimal fraction soil group D = 0.000
 [MEDIUM DENSITY RESIDENTIAL]
 (7.3 DU/A or Less)
 Impervious value, Ai = 0.400
 Sub-Area C Value = 0.540
 Rainfall intensity = 6.314(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.546 CA = 0.235
 Subarea runoff = 1.307(CFS) for 0.390(Ac.)
 Total runoff = 1.481(CFS) Total area = 0.430(Ac.)
 Depth of flow = 0.162(Ft.), Average velocity = 2.255(Ft/s)
 Critical depth = 0.185(Ft.)

++++++
 Process from Point/Station 2.022 to Point/Station 2.022
 ***** CONFLUENCE OF MAIN STREAMS *****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 0.430(Ac.)
 Runoff from this stream = 1.481(CFS)
 Time of concentration = 9.00 min.
 Rainfall intensity = 6.314(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	15.890	7.49	7.106
2	1.481	9.00	6.314
Qmax(1) =			
	1.000 *	1.000 *	15.890) +
	1.000 *	0.833 *	1.481) + = 17.123
Qmax(2) =			
	0.889 *	1.000 *	15.890) +
	1.000 *	1.000 *	1.481) + = 15.601

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 15.890 1.481
 Maximum flow rates at confluence using above data:
 17.123 15.601
 Area of streams before confluence:
 2.950 0.430

Results of confluence:
 Total flow rate = 17.123(CFS)
 Time of concentration = 7.490 min.
 Effective stream area after confluence = 3.380(Ac.)

+++++
 Process from Point/Station 2.022 to Point/Station 2000.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 341.750(Ft.)
 Downstream point/station elevation = 340.250(Ft.)
 Pipe length = 22.30(Ft.) Slope = 0.0673 Manning's N = 0.015
 No. of pipes = 1 Required pipe flow = 17.123(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 17.123(CFS)
 Normal flow depth in pipe = 8.21(In.)
 Flow top width inside pipe = 30.22(In.)
 Critical Depth = 15.86(In.)
 Pipe flow velocity = 14.10(Ft/s)
 Travel time through pipe = 0.03 min.
 Time of concentration (TC) = 7.52 min.

+++++
 Process from Point/Station 3.011 to Point/Station 3.021
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 [UNDISTURBED NATURAL TERRAIN]
 (Permanent Open Space)
 Impervious value, Ai = 0.000
 Sub-Area C Value = 0.300
 Initial subarea total flow distance = 70.000(Ft.)
 Highest elevation = 350.800(Ft.)
 Lowest elevation = 349.800(Ft.)
 Elevation difference = 1.000(Ft.) Slope = 1.429 %
 Top of Initial Area Slope adjusted by User to 1.400 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 70.00 (Ft)
 for the top area slope value of 1.40 %, in a development type of
 Permanent Open Space
 In Accordance With Table 3-2
 Initial Area Time of Concentration = 12.50 minutes

(for slope value of 1.00 %)
 Rainfall intensity (I) = 5.107(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.300
 Subarea runoff = 0.123(CFS)
 Total initial stream area = 0.080(Ac.)

+++++
 Process from Point/Station 3.021 to Point/Station 3.031
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 349.800(Ft.)
 Downstream point elevation = 347.800(Ft.)
 Channel length thru subarea = 280.000(Ft.)
 Channel base width = 10.000(Ft.)
 Slope or 'Z' of left channel bank = 20.000
 Slope or 'Z' of right channel bank = 20.000
 Estimated mean flow rate at midpoint of channel = 0.886(CFS)
 Manning's 'N' = 0.035
 Maximum depth of channel = 1.000(Ft.)
 Flow(q) thru subarea = 0.886(CFS)
 Depth of flow = 0.103(Ft.), Average velocity = 0.711(Ft/s)
 Channel flow top width = 14.133(Ft.)
 Flow Velocity = 0.71(Ft/s)
 Travel time = 6.56 min.
 Time of concentration = 19.06 min.
 Critical depth = 0.060(Ft.)

Adding area flow to channel
 Rainfall intensity (I) = 3.890(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 = 1.000
 Decimal fraction soil group D = 0.000
 [LOW DENSITY RESIDENTIAL]
 (1.0 DU/A or Less)
 Impervious value, Ai = 0.100
 Sub-Area C Value = 0.360
 Rainfall intensity = 3.890(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.356 CA = 0.402
 Subarea runoff = 1.441(CFS) for 1.050(Ac.)
 Total runoff = 1.564(CFS) Total area = 1.130(Ac.)
 Depth of flow = 0.142(Ft.), Average velocity = 0.856(Ft/s)
 Critical depth = 0.086(Ft.)

+++++
 Process from Point/Station 3.031 to Point/Station 3.032
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 347.800(Ft.)
 End of street segment elevation = 328.100(Ft.)
 Length of street segment = 560.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 32.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020

Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 0.125(In.)
 Manning's N in gutter = 0.0130
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 3.060(CFS)
 Depth of flow = 0.163(Ft.), Average velocity = 3.757(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 9.106(Ft.)
 Flow velocity = 3.76(Ft/s)
 Travel time = 2.48 min. TC = 21.55 min.
 Adding area flow to street
 Rainfall intensity (I) = 3.594(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 = 1.000
 Decimal fraction soil group D = 0.000
 [MEDIUM DENSITY RESIDENTIAL]
 (7.3 DU/A or Less)
 Impervious value, Ai = 0.400
 Sub-Area C Value = 0.540
 Rainfall intensity = 3.594(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.465 CA = 1.282
 Subarea runoff = 3.045(CFS) for 1.630(Ac.)
 Total runoff = 4.608(CFS) Total area = 2.760(Ac.)
 Street flow at end of street = 4.608(CFS)
 Half street flow at end of street = 4.608(CFS)
 Depth of flow = 0.192(Ft.), Average velocity = 4.157(Ft/s)
 Flow width (from curb towards crown)= 10.598(Ft.)

++++++
 Process from Point/Station 3.032 to Point/Station 3.033
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 316.900(Ft.)
 Downstream point/station elevation = 314.430(Ft.)
 Pipe length = 52.50(Ft.) Slope = 0.0470 Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 4.608(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 4.608(CFS)
 Normal flow depth in pipe = 5.49(In.)
 Flow top width inside pipe = 16.57(In.)
 Critical Depth = 9.89(In.)
 Pipe flow velocity = 10.10(Ft/s)
 Travel time through pipe = 0.09 min.
 Time of concentration (TC) = 21.64 min.

++++++
 Process from Point/Station 3.033 to Point/Station 3000.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 314.430(Ft.)
 Downstream point/station elevation = 307.800(Ft.)
 Pipe length = 358.70(Ft.) Slope = 0.0185 Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 4.608(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 4.608(CFS)
 Normal flow depth in pipe = 6.28(In.)
 Flow top width inside pipe = 21.10(In.)
 Critical Depth = 9.06(In.)
 Pipe flow velocity = 7.04(Ft/s)
 Travel time through pipe = 0.85 min.
 Time of concentration (TC) = 22.48 min.

++++++
 Process from Point/Station 3000.000 to Point/Station 3000.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 2.760(Ac.)
 Runoff from this stream = 4.608(CFS)
 Time of concentration = 22.48 min.
 Rainfall intensity = 3.497(In/Hr)
 Program is now starting with Main Stream No. 2

++++++
 Process from Point/Station 3.041 to Point/Station 3.051
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 [HIGH DENSITY RESIDENTIAL]
 (24.0 DU/A or Less)
 Impervious value, Ai = 0.650
 Sub-Area C Value = 0.690
 Initial subarea total flow distance = 95.000(Ft.)
 Highest elevation = 328.800(Ft.)
 Lowest elevation = 324.600(Ft.)
 Elevation difference = 4.200(Ft.) Slope = 4.421 %
 Top of Initial Area Slope adjusted by User to 4.400 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 95.00 (Ft)
 for the top area slope value of 4.40 %, in a development type of
 24.0 DU/A or Less
 In Accordance With Table 3-2
 Initial Area Time of Concentration = 7.80 minutes
 (for slope value of 5.00 %)
 Rainfall intensity (I) = 6.922(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.690
 Subarea runoff = 0.621(CFS)
 Total initial stream area = 0.130(Ac.)


```

+++++
Process from Point/Station      3.051 to Point/Station      3.052
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

```

```

Top of street segment elevation = 324.600(Ft.)
End of street segment elevation = 318.200(Ft.)
Length of street segment = 280.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 32.000(Ft.)
Distance from crown to crossfall grade break = 16.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.020
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 1.500(Ft.)
Gutter hike from flowline = 0.125(In.)
Manning's N in gutter = 0.0130
Manning's N from gutter to grade break = 0.0150
Manning's N from grade break to crown = 0.0150
Estimated mean flow rate at midpoint of street = 1.537(CFS)
Depth of flow = 0.133(Ft.), Average velocity = 2.694(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 7.650(Ft.)
Flow velocity = 2.69(Ft/s)
Travel time = 1.73 min. TC = 9.53 min.
Adding area flow to street
Rainfall intensity (I) = 6.082(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 = 1.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL ]
(14.5 DU/A or Less )
Impervious value, Ai = 0.500
Sub-Area C Value = 0.600
Rainfall intensity = 6.082(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.619 CA = 0.390
Subarea runoff = 1.749(CFS) for 0.500(Ac.)
Total runoff = 2.370(CFS) Total area = 0.630(Ac.)
Street flow at end of street = 2.370(CFS)
Half street flow at end of street = 2.370(CFS)
Depth of flow = 0.160(Ft.), Average velocity = 2.999(Ft/s)
Flow width (from curb towards crown)= 8.973(Ft.)

```

```

+++++
Process from Point/Station      3.052 to Point/Station      3000.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

```

```

Upstream point/station elevation = 308.800(Ft.)
Downstream point/station elevation = 307.800(Ft.)
Pipe length = 52.50(Ft.) Slope = 0.0190 Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.370(CFS)
Given pipe size = 18.00(In.)

```

Calculated individual pipe flow = 2.370(CFS)
 Normal flow depth in pipe = 4.92(In.)
 Flow top width inside pipe = 16.05(In.)
 Critical Depth = 6.99(In.)
 Pipe flow velocity = 6.05(Ft/s)
 Travel time through pipe = 0.14 min.
 Time of concentration (TC) = 9.68 min.

++++++
 Process from Point/Station 3000.000 to Point/Station 3000.000
 ***** CONFLUENCE OF MAIN STREAMS *****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 0.630(Ac.)
 Runoff from this stream = 2.370(CFS)
 Time of concentration = 9.68 min.
 Rainfall intensity = 6.023(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	4.608	22.48	3.497
2	2.370	9.68	6.023
Qmax(1) =			
	1.000 *	1.000 *	4.608) +
	0.581 *	1.000 *	2.370) + = 5.984
Qmax(2) =			
	1.000 *	0.430 *	4.608) +
	1.000 *	1.000 *	2.370) + = 4.354

Total of 2 main streams to confluence:

Flow rates before confluence point:

4.608 2.370

Maximum flow rates at confluence using above data:

5.984 4.354

Area of streams before confluence:

2.760 0.630

Results of confluence:

Total flow rate = 5.984(CFS)

Time of concentration = 22.485 min.

Effective stream area after confluence = 3.390(Ac.)

End of computations, total study area = 16.130 (Ac.)

Appendix E – Modified-Puls Detention Routing & Basin Design

Modified Puls / Storage Indication Method Legend

Time (hr): Time Elapsed in hours

Inflow, In (cfs): Inflow rate at a time step n

In+In+1 (cfs): Inflow rate at a time step n plus inflow rate at a time step n+1, (ft³/s)

Fn (cfs): Infiltration flow rate at a time step n

Inf. Vol, F (ft³): Inflow volume in cubic feet

2S1/At-O1 (cfs):

S = storage within a detention facility at a time step n

At = Time interval (sec)

O = Outflow rate at a time step n

2S2/At+O2 (cfs): Storage indication number, see variables above.

Outflow, On (cfs): Outflow rate at a time step n

Volume, S (ft³): Storage with a detention facility at a time step n

Elevation, h (ft-Osl): Water Surface Elevation in feet

Appendix F – Mitigated Post-Developed Calculations

may be used to estimate the stage-storage curve may be determined by either an average-end area calculation (Equation 6-1) or as the volume of a conic frustum (Equation 6-2):

$$V_{1,2} = \frac{(A_1 + A_2)}{2} (h_2 - h_1) \quad (6-1)$$

$$V_{1,2} = \frac{1}{3} (A_1 + A_2 + \sqrt{A_1 A_2}) (h_2 - h_1) \quad (6-2)$$

where ...

- $V_{1,2}$ = storage volume between elevations h_1 and h_2 (ft^3);
- A_1, A_2 = surface area at elevation elevations h_1 and h_2 , respectively (ft^2); and
- h_1, h_2 = lower and upper bounding elevations, respectively (ft).

The stage-storage curve begins at the bottom of the storage basin or the maximum elevation of sediment or debris allowed in the operation and maintenance plan, whichever is greater. Volume reduction factors may be applied to account for vegetation and/or additional sediment and debris deposition within the detention facility when necessary.

6.3.1.3 Stage-Discharge Curve

Stage-discharge curves define a relationship between the depth of water in the detention facility and the outflow or release from its outlet structures. Section 6.4 describes the basic procedures for calculating discharges from outlet control structures. Figure 6-3 illustrates a typical stage-discharge curve.

6.3.2 Storage Routing Calculations

Routing is the process of analyzing flows entering and leaving a detention facility in order to determine the change of the water surface elevation within the facility over time. Storage routing calculations are typically performed using computer programs. The routing of flows through a detention facility is fundamentally based on conservation of mass (Inflow-Outflow= Δ Storage), approximated as a finite-difference as:

$$\frac{S_{n+1} - S_n}{\Delta t} = \frac{I_n + I_{n+1}}{2} - \frac{O_n + O_{n+1}}{2} \quad (6-3)$$

where ...

- S_n, S_{n+1} = storage within a detention facility at a time step n and $n+1$, respectively (ft^3);
- Δt = time interval (sec);
- I_n, I_{n+1} = inflow rate at a time step n and $n+1$, respectively (ft^3/s); and
- O_n, O_{n+1} = outflow rate at a time step n and $n+1$, respectively (ft^3/s).

The most common method for performing routing analysis for a detention facility is the storage indication or modified Puls method. The storage indication method re-arranges the expression for mass conservation as:

$$\left(\frac{2S_{n+1}}{\Delta t} + O_{n+1} \right) = \left(\frac{2S_n}{\Delta t} - O_n \right) + (I_n + I_{n+1}) \quad (6-4)$$

The left-hand side of Equation 6-4 is usually called the storage indication number. The storage indication method facilitates the routing analysis of detention facilities, which can be accomplished by spreadsheet calculations or using computer programs such as the Corps of

Outlet Rating Curve (continued)

1.75	41.67
2.00	50.91
2.25	60.75
2.50	71.15
2.75	82.09
3.00	93.53

Stage- Storage Relationship

The stage-storage relationship can be determined using Equation 6-1:

$$V_{1,2} = \frac{(A_1 + A_2)}{2} (h_2 - h_1)$$

This equation yields the following relationship:

Stage-Storage Relationship

Stage (feet)	Storage (ft ³)
0.00	0
0.25	14,805
0.50	29,926
0.75	45,576
1.00	61,966
1.25	79,312
1.50	97,830
1.75	117,735
2.00	139,246
2.25	162,582
2.50	187,963
2.75	215,610
3.00	245,746

Storage Indication Method

Now that an inflow hydrograph and outlet-rating curve have been established, the Storage Indication Method can be used to determine the routing characteristics of the detention basin. Equation 6-4 summarizes this method:

$$\left(\frac{2S_{n+1}}{\Delta t} + O_{n+1} \right) = \left(\frac{2S_n}{\Delta t} - O_n \right) + (I_n + I_{n+1})$$

Typically, computer programs are used to perform the required calculations. However, hand calculations are possible. The following table shows a portion of the Storage Indication Method results:

Storage Indication Method

Time	Inflow I_n	$I_n + I_{n+1}$	Q_n	S_n	$2S_n/dt - O_n$	$2S_{n+1}/dt + O_{n+1}$	WSEL
0	0.00	4.70	0.00	0.00	0.00	4.70	0.23
15	4.70	9.50	2.09	1,172	0.51	10.01	0.35
30	4.80	9.90	3.88	2,758	2.25	12.15	0.39
45	5.10	10.40	4.58	3,403	2.98	13.38	0.42
60	5.30	11.00	4.99	3,775	3.40	14.40	0.44
75	5.70	11.60	5.33	4,083	3.75	15.35	0.46
90	5.90	12.30	5.64	4,370	4.07	16.37	0.48
105	6.40	13.10	5.97	4,679	4.43	17.53	0.50
120	6.70	14.10	6.35	5,027	4.82	18.92	0.52
135	7.40	15.30	6.74	5,480	5.44	20.74	0.54
150	7.90	16.90	7.24	6,074	6.26	23.16	0.57
165	9.00	18.80	7.91	6,862	7.34	26.14	0.61
180	9.80	21.80	8.73	7,835	8.68	30.48	0.67
195	12.00	25.60	9.93	9,249	10.63	36.23	0.74
210	13.60	33.60	11.51	11,121	13.20	46.80	0.85
225	20.00	49.40	14.11	14,712	18.59	67.99	1.04
240	29.40	129.40	19.25	21,929	29.48	158.88	1.78
255	100.00	116.10	42.61	52,321	73.66	189.76	2.01
270	16.10	26.90	51.24	62,334	87.28	114.18	1.42
285	10.80	19.20	30.69	37,570	52.80	72.00	1.08
300	8.40	15.40	20.22	23,300	31.56	46.96	0.85
315	7.00	13.10	14.15	14,766	18.67	31.77	0.68

This analysis indicates that the peak 100-year flow is attenuated from 100 cfs to 51.2 cfs. The maximum storage volume used is 62,334 ft³, with a maximum water surface elevation of 2.01 feet. Continuing the computations would demonstrate that the basin will empty within 72 hours.

Emergency Spillway

The emergency spillway must be able to convey the unattenuated peak flow of 100 cfs, ignoring the storage inside of the basin. The invert of the emergency spillway is placed just above the maximum water surface elevation. The maximum spillway depth is found by taking the difference between the top of embankment (5.0 feet) and the maximum water surface elevation (2.0 ft). Allowing for 1.0 foot of required freeboard, the spillway flow cannot be more than 2 ft deep. Therefore, the minimum length of the emergency spillway can be found using the broad-crested weir equation:

$$L = \frac{Q}{C_{BCW} H^{3/2}} = \frac{100}{3.0 * 2^{3/2}} = 11.76 ft$$

BMP-A INFLOW HYDROGRAPH

RUN DATE 2/2/2022
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 8 MIN.
6 HOUR RAINFALL 3.5 INCHES
BASIN AREA 8.34 ACRES
RUNOFF COEFFICIENT 0.78
PEAK DISCHARGE 40.26 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 8	DISCHARGE (CFS) = 1.4
TIME (MIN) = 16	DISCHARGE (CFS) = 1.4
TIME (MIN) = 24	DISCHARGE (CFS) = 1.4
TIME (MIN) = 32	DISCHARGE (CFS) = 1.4
TIME (MIN) = 40	DISCHARGE (CFS) = 1.5
TIME (MIN) = 48	DISCHARGE (CFS) = 1.5
TIME (MIN) = 56	DISCHARGE (CFS) = 1.6
TIME (MIN) = 64	DISCHARGE (CFS) = 1.6
TIME (MIN) = 72	DISCHARGE (CFS) = 1.7
TIME (MIN) = 80	DISCHARGE (CFS) = 1.7
TIME (MIN) = 88	DISCHARGE (CFS) = 1.8
TIME (MIN) = 96	DISCHARGE (CFS) = 1.8
TIME (MIN) = 104	DISCHARGE (CFS) = 1.9
TIME (MIN) = 112	DISCHARGE (CFS) = 1.9
TIME (MIN) = 120	DISCHARGE (CFS) = 2.1
TIME (MIN) = 128	DISCHARGE (CFS) = 2.1
TIME (MIN) = 136	DISCHARGE (CFS) = 2.2
TIME (MIN) = 144	DISCHARGE (CFS) = 2.3
TIME (MIN) = 152	DISCHARGE (CFS) = 2.5
TIME (MIN) = 160	DISCHARGE (CFS) = 2.6
TIME (MIN) = 168	DISCHARGE (CFS) = 2.8
TIME (MIN) = 176	DISCHARGE (CFS) = 2.9
TIME (MIN) = 184	DISCHARGE (CFS) = 3.3
TIME (MIN) = 192	DISCHARGE (CFS) = 3.5
TIME (MIN) = 200	DISCHARGE (CFS) = 4
TIME (MIN) = 208	DISCHARGE (CFS) = 4.3
TIME (MIN) = 216	DISCHARGE (CFS) = 5.2
TIME (MIN) = 224	DISCHARGE (CFS) = 6
TIME (MIN) = 232	DISCHARGE (CFS) = 8.8
TIME (MIN) = 240	DISCHARGE (CFS) = 16.4
TIME (MIN) = 248	DISCHARGE (CFS) = 40.26
TIME (MIN) = 256	DISCHARGE (CFS) = 7
TIME (MIN) = 264	DISCHARGE (CFS) = 4.7
TIME (MIN) = 272	DISCHARGE (CFS) = 3.7
TIME (MIN) = 280	DISCHARGE (CFS) = 3.1
TIME (MIN) = 288	DISCHARGE (CFS) = 2.7
TIME (MIN) = 296	DISCHARGE (CFS) = 2.4
TIME (MIN) = 304	DISCHARGE (CFS) = 2.2
TIME (MIN) = 312	DISCHARGE (CFS) = 2
TIME (MIN) = 320	DISCHARGE (CFS) = 1.9
TIME (MIN) = 328	DISCHARGE (CFS) = 1.7
TIME (MIN) = 336	DISCHARGE (CFS) = 1.6
TIME (MIN) = 344	DISCHARGE (CFS) = 1.5
TIME (MIN) = 352	DISCHARGE (CFS) = 1.5
TIME (MIN) = 360	DISCHARGE (CFS) = 1.4
TIME (MIN) = 368	DISCHARGE (CFS) = 0

PARCEL 2: Volume vs Elevation

Vconc (cfs)	h (ft)	Q
0	0.00	0.00
2304	0.75	0.00
3092	0.88	0.04
3879	1.00	0.10
4667	1.13	0.14
5454	1.25	0.16
7029	1.50	0.21
8604	1.75	0.24
10179	2.00	0.28
11754	2.25	0.30
13329	2.50	0.33
14904	2.75	0.35
16479	3.00	0.38
18054	3.25	0.40
19629	3.50	0.42
21204	3.75	0.436
22254	3.917	1.253
22779	4.00	1.550
24354	4.25	2.461
25929	4.50	3.44
27504	4.75	4.50
29079	5.00	5.65
30654	5.25	7.17
32229	5.50	8.16
33804	5.75	9.01
35379	6.00	9.77
36954	6.25	10.47
38529	6.50	11.12
40104	6.75	11.74
41679	7.00	12.32
43254	7.250	12.87
44829	7.500	13.40
46121	7.705	13.99
47192	7.875	16.22
47979	8.00	18.58
49554	8.25	24.55
51129	8.50	31.85
52704	8.75	40.25

Vconc: Concrete system

h: Elev. From bottom of gravel.

Outlet structure for Discharge of Underground System

Discharge vs Elevation Table

Low orifice	2.1875 "	Lower slot		Upper Slot:	
Number of orif:	2	# of slots:	1	# of slot:	1
Cg-low:	0.61	Invert:	3.000 ft	Invert:	4.25 ft
		B	5.583 ft	B:	2.000 ft
Middle orifice	1.875 "	h _{slot}	0.083 ft	h _{slot}	0.125 ft
Number of orif:	0				
Cg-middle:	0.61	Middle slot		Emergency weir	
invert elev:	0.000 ft	# of slots:	1	Invert:	6.917 ft
		Invert:	3.167 ft	W:	7.000 ft
		B:	0.750 ft		
*Note: h = head above the invert of the lowest surface discharge opening.		h _{slot}	1.000 ft		

h*	H/D-low	H/D-mid	Q _{low-orif}	Q _{low-weir}	Q _{tot-low}	Q _{mid-orif}	Q _{mid-weir}	Q _{tot-med}	Q _{slot-low}	Q _{slot-mid}	Q _{slot-up}	Q _{emerg}	Q _{tot}
(ft)	-	-	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.125	0.686	0.800	0.047	0.039	0.039	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.039
0.250	1.371	1.600	0.102	0.118	0.102	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.102
0.375	2.057	2.400	0.136	0.181	0.136	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.136
0.500	2.743	3.200	0.163	0.199	0.163	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.163
0.750	4.114	4.800	0.207	0.385	0.207	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.207
1.000	5.486	6.400	0.244	2.436	0.244	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.244
1.250	6.857	8.000	0.275	2.751	0.275	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.275
1.500	8.229	9.600	0.303	3.033	0.303	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.303
1.750	9.600	11.200	0.329	3.291	0.329	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.329
2.000	10.971	12.800	0.353	3.530	0.353	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.353
2.250	12.343	14.400	0.375	3.754	0.375	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.375
2.500	13.714	16.000	0.397	3.966	0.397	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.397
2.750	15.086	17.600	0.417	4.167	0.417	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.417
3.000	16.457	19.200	0.436	4.358	0.436	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.436
3.167	17.371	20.267	0.448	4.481	0.448	0.000	0.000	0.000	0.805	0.000	0.000	0.000	1.253
3.250	17.829	20.800	0.454	4.541	0.454	0.000	0.000	0.000	1.040	0.056	0.000	0.000	1.550
3.500	19.200	22.400	0.472	4.718	0.472	0.000	0.000	0.000	1.542	0.447	0.000	0.000	2.461
3.750	20.571	24.000	0.489	4.888	0.489	0.000	0.000	0.000	1.917	1.036	0.000	0.000	3.442
4.000	21.943	25.600	0.505	5.052	0.505	0.000	0.000	0.000	2.230	1.769	0.000	0.000	4.504
4.250	23.314	27.200	0.521	5.211	0.521	0.000	0.000	0.000	2.504	2.622	0.000	0.000	5.646
4.500	24.686	28.800	0.537	5.365	0.537	0.000	0.000	0.000	2.751	3.352	0.530	0.000	7.168
4.750	26.057	30.400	0.552	5.515	0.552	0.000	0.000	0.000	2.977	3.821	0.809	0.000	8.159
5.000	27.429	32.000	0.566	5.661	0.566	0.000	0.000	0.000	3.187	4.239	1.015	0.000	9.008
5.250	28.800	33.600	0.580	5.804	0.580	0.000	0.000	0.000	3.385	4.620	1.185	0.000	9.770
5.500	30.171	35.200	0.594	5.943	0.594	0.000	0.000	0.000	3.571	4.971	1.334	0.000	10.470
5.750	31.543	36.800	0.608	6.078	0.608	0.000	0.000	0.000	3.748	5.299	1.467	0.000	11.123
6.000	32.914	38.400	0.621	6.211	0.621	0.000	0.000	0.000	3.917	5.608	1.590	0.000	11.737
6.250	34.286	40.000	0.634	6.341	0.634	0.000	0.000	0.000	4.080	5.901	1.703	0.000	12.318
6.500	35.657	41.600	0.647	6.469	0.647	0.000	0.000	0.000	4.236	6.180	1.810	0.000	12.872
6.750	37.029	43.200	0.659	6.594	0.659	0.000	0.000	0.000	4.386	6.447	1.911	0.000	13.403
6.955	38.153	44.512	0.669	6.694	0.669	0.000	0.000	0.000	4.506	6.658	1.989	0.163	13.985
7.125	39.086	45.600	0.678	6.777	0.678	0.000	0.000	0.000	4.602	6.828	2.052	2.063	16.224
7.250	39.771	46.400	0.684	6.837	0.684	0.000	0.000	0.000	4.672	6.950	2.097	4.176	18.580
7.500	41.143	48.000	0.696	6.955	0.696	0.000	0.000	0.000	4.809	7.188	2.185	9.668	24.546
7.750	42.514	49.600	0.707	7.071	0.707	0.000	0.000	0.000	4.942	7.419	2.269	16.508	31.845
8.000	43.886	51.200	0.719	7.186	0.719	0.000	0.000	0.000	5.072	7.643	2.350	24.468	40.251

MODIFIED PULS

RESULTS: Routing of 6 hr - 100 yr hydrograph in Underground Pond. Campus Park - 1.
 Max outflow: 13.659 cfs initial elev: 0.75 ft
 Max elevation in pond: 7.590 ft (from bottom of gravel)
 Vol-out: 48266 cu-ft

Pond Storm: 6 hr - 100 yr

time (hr)	Inflow, In (cfs)	In+In+1 (cfs)	fn (cfs)	Inf. Vol, F (ft3)	2S1/At-O1 (cfs)	2S2/At+O2 (cfs)	Outflow, On (cfs)	Volume, S (ft3)	Elevation, h (ft-osl)
0.00	0.000	0.35	0.00	3072.0	38.40		0.000	2304	0.75
0.03	0.350	1.05	0.015	3072.9	38.73	38.73	0.001	2324	0.75
0.07	0.700	1.75	0.015	3074.8	39.74	39.75	0.004	2385	0.76
0.10	1.050	2.45	0.015	3076.6	41.45	41.46	0.009	2487	0.78
0.13	1.400	2.80	0.015	3078.4	43.83	43.86	0.016	2631	0.80
0.17	1.400	2.80	0.015	3080.3	46.55	46.60	0.024	2795	0.83
0.20	1.400	2.80	0.016	3082.2	49.26	49.32	0.032	2957	0.85
0.23	1.400	2.80	0.016	3084.0	51.95	52.03	0.041	3119	0.88
0.27	1.400	2.80	0.016	3085.9	54.61	54.71	0.054	3280	0.90
0.30	1.400	2.80	0.016	3087.8	57.24	57.37	0.067	3439	0.93
0.33	1.400	2.80	0.016	3089.7	59.85	60.01	0.079	3596	0.96
0.37	1.400	2.80	0.016	3091.6	62.44	62.62	0.092	3752	0.98
0.40	1.400	2.80	0.016	3093.5	65.00	65.21	0.103	3906	1.00
0.43	1.400	2.80	0.016	3095.4	67.55	67.77	0.110	4059	1.03
0.47	1.400	2.80	0.016	3097.3	70.08	70.32	0.116	4212	1.05
0.50	1.400	2.80	0.016	3099.3	72.61	72.85	0.123	4364	1.08
0.53	1.400	2.83	0.016	3101.2	75.11	75.37	0.130	4515	1.10
0.57	1.425	2.88	0.016	3103.1	77.63	77.91	0.136	4666	1.12
0.60	1.450	2.93	0.016	3105.1	80.19	80.48	0.141	4820	1.15
0.63	1.475	2.98	0.016	3107.1	82.79	83.09	0.147	4976	1.17
0.67	1.500	3.00	0.016	3109.0	85.43	85.73	0.152	5135	1.20
0.70	1.500	3.00	0.016	3111.0	88.08	88.40	0.158	5294	1.22
0.73	1.500	3.00	0.017	3113.0	90.72	91.05	0.163	5453	1.25
0.77	1.500	3.00	0.017	3115.0	93.35	93.69	0.168	5611	1.27
0.80	1.500	3.03	0.017	3117.0	95.97	96.32	0.172	5769	1.30
0.83	1.525	3.08	0.017	3119.0	98.61	98.97	0.177	5927	1.33
0.87	1.550	3.13	0.017	3121.0	101.29	101.65	0.181	6088	1.35
0.90	1.575	3.18	0.017	3123.0	104.01	104.38	0.186	6252	1.38
0.93	1.600	3.20	0.017	3125.0	106.77	107.15	0.190	6418	1.40
0.97	1.600	3.20	0.017	3127.1	109.55	109.94	0.195	6585	1.43
1.00	1.600	3.20	0.017	3129.1	112.32	112.71	0.200	6751	1.46
1.03	1.600	3.20	0.017	3131.2	115.07	115.48	0.204	6917	1.48
1.07	1.600	3.23	0.017	3133.2	117.82	118.24	0.209	7082	1.51
1.10	1.625	3.28	0.017	3135.3	120.59	121.01	0.212	7248	1.53
1.13	1.650	3.33	0.017	3137.4	123.39	123.83	0.216	7417	1.56
1.17	1.675	3.38	0.017	3139.5	126.24	126.68	0.220	7588	1.59
1.20	1.700	3.40	0.017	3141.6	129.14	129.58	0.224	7762	1.62
1.23	1.700	3.40	0.018	3143.7	132.04	132.50	0.228	7936	1.64
1.27	1.700	3.40	0.018	3145.8	134.94	135.41	0.232	8111	1.67
1.30	1.700	3.40	0.018	3147.9	137.84	138.31	0.236	8284	1.70
1.33	1.700	3.43	0.018	3150.0	140.72	141.20	0.240	8458	1.73
1.37	1.725	3.48	0.018	3152.2	143.62	144.11	0.244	8632	1.75
1.40	1.750	3.53	0.018	3154.3	146.57	147.06	0.248	8809	1.78
1.43	1.775	3.58	0.018	3156.4	149.55	150.06	0.251	8988	1.81
1.47	1.800	3.60	0.018	3158.6	152.58	153.09	0.255	9170	1.84
1.50	1.800	3.60	0.018	3160.8	155.63	156.15	0.259	9353	1.87

time (hr)	Inflow, In (cfs)	In+In+1 (cfs)	fn (cfs)	Inf. Vol, F (ft3)	2S1/At-O1 (cfs)	2S2/At+O2 (cfs)	Outflow, On (cfs)	Volume, S (ft3)	Elevation, h (ft-osl)
1.53	1.800	3.60	0.018	3163.0	158.67	159.19	0.262	9536	1.90
1.57	1.800	3.60	0.018	3165.1	161.70	162.23	0.266	9718	1.93
1.60	1.800	3.63	0.018	3167.3	164.72	165.26	0.269	9900	1.96
1.63	1.825	3.68	0.018	3169.5	167.77	168.31	0.273	10082	1.98
1.67	1.850	3.73	0.018	3171.7	170.85	171.40	0.277	10268	2.01
1.70	1.875	3.78	0.019	3174.0	173.98	174.54	0.280	10456	2.04
1.73	1.900	3.80	0.019	3176.2	177.15	177.72	0.283	10646	2.07
1.77	1.900	3.80	0.019	3178.4	180.34	180.91	0.287	10838	2.10
1.80	1.900	3.80	0.019	3180.7	183.52	184.10	0.290	11029	2.13
1.83	1.900	3.80	0.019	3182.9	186.70	187.28	0.294	11219	2.17
1.87	1.900	3.85	0.019	3185.2	189.86	190.46	0.297	11410	2.20
1.90	1.950	3.95	0.019	3187.5	193.07	193.68	0.301	11603	2.23
1.93	2.000	4.05	0.019	3189.8	196.38	196.99	0.304	11801	2.26
1.97	2.050	4.15	0.019	3192.0	199.78	200.39	0.307	12005	2.29
2.00	2.100	4.20	0.019	3194.3	203.27	203.89	0.311	12215	2.32
2.03	2.100	4.20	0.019	3196.7	206.80	207.43	0.314	12427	2.36
2.07	2.100	4.20	0.019	3199.0	210.32	210.96	0.318	12639	2.39
2.10	2.100	4.20	0.019	3201.3	213.84	214.49	0.321	12850	2.42
2.13	2.100	4.23	0.020	3203.6	217.35	218.00	0.325	13061	2.46
2.17	2.125	4.28	0.020	3206.0	220.88	221.54	0.328	13273	2.49
2.20	2.150	4.33	0.020	3208.4	224.46	225.12	0.332	13487	2.53
2.23	2.175	4.38	0.020	3210.7	228.07	228.74	0.335	13704	2.56
2.27	2.200	4.43	0.020	3213.1	231.73	232.41	0.338	13924	2.59
2.30	2.225	4.48	0.020	3215.5	235.43	236.12	0.342	14147	2.63
2.33	2.250	4.53	0.020	3217.9	239.18	239.87	0.345	14371	2.67
2.37	2.275	4.58	0.020	3220.3	242.97	243.66	0.348	14599	2.70
2.40	2.300	4.65	0.020	3222.7	246.80	247.50	0.352	14829	2.74
2.43	2.350	4.75	0.020	3225.1	250.70	251.41	0.355	15063	2.78
2.47	2.400	4.85	0.020	3227.6	254.69	255.41	0.359	15303	2.81
2.50	2.450	4.95	0.020	3230.0	258.77	259.50	0.362	15548	2.85
2.53	2.500	5.03	0.021	3232.5	262.95	263.68	0.366	15799	2.89
2.57	2.525	5.08	0.021	3235.0	267.20	267.93	0.369	16054	2.93
2.60	2.550	5.13	0.021	3237.5	271.48	272.23	0.373	16311	2.97
2.63	2.575	5.18	0.021	3240.0	275.81	276.57	0.377	16571	3.01
2.67	2.600	5.25	0.021	3242.5	280.19	280.95	0.380	16834	3.06
2.70	2.650	5.35	0.021	3245.0	284.63	285.39	0.384	17101	3.10
2.73	2.700	5.45	0.021	3247.5	289.16	289.93	0.387	17373	3.14
2.77	2.750	5.55	0.021	3250.1	293.78	294.57	0.391	17651	3.19
2.80	2.800	5.63	0.021	3252.6	298.50	299.29	0.395	17934	3.23
2.83	2.825	5.68	0.021	3255.2	303.29	304.08	0.399	18221	3.28
2.87	2.850	5.73	0.022	3257.8	308.11	308.92	0.402	18511	3.32
2.90	2.875	5.78	0.022	3260.4	312.98	313.80	0.406	18803	3.37
2.93	2.900	5.90	0.022	3263.0	317.90	318.72	0.410	19098	3.42
2.97	3.000	6.10	0.022	3265.6	322.92	323.75	0.414	19400	3.46
3.00	3.100	6.30	0.022	3268.2	328.14	328.98	0.418	19714	3.51
3.03	3.200	6.50	0.022	3270.9	333.56	334.40	0.422	20039	3.57
3.07	3.300	6.65	0.022	3273.6	339.16	340.01	0.426	20375	3.62
3.10	3.350	6.75	0.022	3276.2	344.91	345.77	0.430	20720	3.67
3.13	3.400	6.85	0.023	3278.9	350.74	351.61	0.434	21071	3.73
3.17	3.450	6.95	0.023	3281.6	356.35	357.55	0.602	21417	3.78
3.20	3.500	7.13	0.023	3284.4	361.54	363.25	0.856	21744	3.84
3.23	3.625	7.38	0.023	3287.1	366.43	368.62	1.096	22051	3.88

time (hr)	Inflow, In (cfs)	In+In+1 (cfs)	fn (cfs)	Inf. Vol, F (ft3)	2S1/At+O1 (cfs)	2S2/At+O2 (cfs)	Outflow, On (cfs)	Volume, S (ft3)	Elevation, h (ft-osl)
3.27	3.750	7.63	0.023	3289.9	371.14	373.76	1.306	22347	3.93
3.30	3.875	7.88	0.023	3292.6	375.79	378.72	1.469	22635	3.98
3.33	4.000	8.08	0.023	3295.4	380.35	383.61	1.631	22919	4.02
3.37	4.075	8.23	0.023	3298.2	384.80	388.38	1.791	23195	4.07
3.40	4.150	8.38	0.023	3301.0	389.09	392.98	1.945	23462	4.11
3.43	4.225	8.53	0.024	3303.8	393.23	397.42	2.094	23719	4.15
3.47	4.300	8.83	0.024	3306.7	397.23	401.71	2.238	23968	4.19
3.50	4.525	9.28	0.024	3309.5	401.24	406.01	2.382	24218	4.23
3.53	4.750	9.73	0.024	3312.3	405.40	410.47	2.537	24476	4.27
3.57	4.975	10.18	0.024	3315.2	409.67	415.07	2.703	24742	4.31
3.60	5.200	10.60	0.024	3318.1	414.05	419.80	2.873	25015	4.35
3.63	5.400	11.00	0.024	3321.0	418.51	424.60	3.046	25293	4.40
3.67	5.600	11.40	0.024	3323.9	423.02	429.46	3.221	25574	4.44
3.70	5.800	11.80	0.024	3326.8	427.58	434.37	3.398	25858	4.49
3.73	6.000	12.70	0.024	3329.7	432.15	439.33	3.587	26144	4.53
3.77	6.700	14.10	0.024	3332.6	437.21	444.81	3.800	26460	4.58
3.80	7.400	15.50	0.025	3335.6	443.16	451.26	4.051	26832	4.64
3.83	8.100	16.90	0.025	3338.5	449.93	458.61	4.336	27256	4.71
3.87	8.800	19.50	0.025	3341.5	457.45	466.78	4.665	27727	4.79
3.90	10.700	23.30	0.025	3344.5	466.73	476.90	5.088	28309	4.88
3.93	12.600	27.10	0.025	3347.5	478.71	489.98	5.633	29061	5.00
3.97	14.500	30.90	0.026	3350.6	492.77	505.76	6.494	29956	5.14
4.00	16.400	38.77	0.026	3353.7	508.88	523.62	7.370	30975	5.30
4.03	22.365	50.70	0.026	3356.8	531.13	547.59	8.231	32362	5.52
4.07	28.330	62.63	0.027	3360.0	563.23	581.77	9.272	34350	5.84
4.10	34.295	74.56	0.028	3363.2	604.89	625.80	10.455	36921	6.24
4.13	40.260	72.21	0.029	3366.6	655.95	679.39	11.719	40060	6.74
4.17	31.945	55.58	0.030	3370.1	702.59	728.10	12.755	42920	7.20
4.20	23.630	38.95	0.031	3373.7	731.39	758.10	13.354	44685	7.48
4.23	15.315	22.32	0.031	3377.5	742.96	770.27	13.659	45397	7.59
4.27	7.000	13.43	0.032	3381.3	738.16	765.21	13.525	45101	7.54
4.30	6.425	12.28	0.032	3385.1	725.07	751.52	13.224	44298	7.42
4.33	5.850	11.13	0.031	3388.8	711.40	737.28	12.942	43460	7.28
4.37	5.275	9.98	0.031	3392.6	697.18	722.46	12.639	42589	7.14
4.40	4.700	9.15	0.031	3396.3	682.46	707.10	12.321	41687	7.00
4.43	4.450	8.65	0.030	3399.9	667.58	691.55	11.984	40774	6.86
4.47	4.200	8.15	0.030	3403.5	652.88	676.17	11.646	39871	6.71
4.50	3.950	7.65	0.029	3407.1	638.37	660.97	11.299	38980	6.57
4.53	3.700	7.25	0.029	3410.6	624.07	645.96	10.945	38101	6.43
4.57	3.550	6.95	0.029	3414.1	610.08	631.26	10.589	37240	6.30
4.60	3.400	6.65	0.028	3417.5	596.53	616.98	10.226	36405	6.16
4.63	3.250	6.35	0.028	3420.9	583.39	603.12	9.866	35595	6.03
4.67	3.100	6.10	0.028	3424.3	570.69	589.68	9.495	34811	5.91
4.70	3.000	5.90	0.027	3427.6	558.48	576.74	9.130	34056	5.79
4.73	2.900	5.70	0.027	3430.8	546.81	564.32	8.754	33334	5.68
4.77	2.800	5.50	0.027	3434.1	535.69	552.46	8.383	32645	5.57
4.80	2.700	5.33	0.027	3437.3	525.12	541.14	8.008	31988	5.46
4.83	2.625	5.18	0.026	3440.5	515.16	530.40	7.617	31367	5.36
4.87	2.550	5.03	0.026	3443.6	505.79	520.28	7.249	30782	5.27
4.90	2.475	4.88	0.026	3446.7	497.22	510.76	6.768	30240	5.18
4.93	2.400	4.75	0.026	3449.8	489.47	502.05	6.290	29745	5.11
4.97	2.350	4.65	0.025	3452.9	482.45	494.17	5.858	29298	5.03

time (hr)	Inflow, In (cfs)	In+In+1 (cfs)	fn (cfs)	Inf. Vol, F (ft3)	2S1/At-O1 (cfs)	2S2/At+O2 (cfs)	Outflow, On (cfs)	Volume, S (ft3)	Elevation, h (ft-osl)
5.00	2.300	4.55	0.025	3455.9	476.03	487.05	5.511	28892	4.97
5.03	2.250	4.45	0.025	3459.0	470.05	480.53	5.239	28517	4.91
5.07	2.200	4.35	0.025	3462.0	464.48	474.45	4.985	28168	4.86
5.10	2.150	4.25	0.025	3465.0	459.28	468.78	4.749	27842	4.80
5.13	2.100	4.15	0.025	3467.9	454.43	463.48	4.528	27537	4.76
5.17	2.050	4.05	0.025	3470.9	449.86	458.53	4.333	27252	4.71
5.20	2.000	3.98	0.024	3473.8	445.56	453.86	4.152	26983	4.67
5.23	1.975	3.93	0.024	3476.8	441.52	449.48	3.982	26730	4.63
5.27	1.950	3.88	0.024	3479.7	437.75	445.40	3.823	26494	4.59
5.30	1.925	3.83	0.024	3482.6	434.23	441.58	3.674	26274	4.55
5.33	1.900	3.75	0.024	3485.5	430.93	438.01	3.535	26068	4.52
5.37	1.850	3.65	0.024	3488.3	427.82	434.64	3.407	25874	4.49
5.40	1.800	3.55	0.024	3491.2	424.84	431.42	3.292	25688	4.46
5.43	1.750	3.45	0.024	3494.1	421.98	428.34	3.181	25510	4.43
5.47	1.700	3.38	0.024	3496.9	419.24	425.39	3.074	25339	4.41
5.50	1.675	3.33	0.024	3499.8	416.62	422.56	2.973	25176	4.38
5.53	1.650	3.28	0.024	3502.6	414.14	419.90	2.877	25021	4.36
5.57	1.625	3.23	0.024	3505.4	411.80	417.37	2.786	24875	4.33
5.60	1.600	3.18	0.023	3508.3	409.58	414.98	2.699	24737	4.31
5.63	1.575	3.13	0.023	3511.1	407.47	412.71	2.618	24605	4.29
5.67	1.550	3.08	0.023	3513.9	405.47	410.55	2.540	24481	4.27
5.70	1.525	3.03	0.023	3516.7	403.57	408.50	2.466	24362	4.25
5.73	1.500	3.00	0.023	3519.5	401.75	406.55	2.400	24249	4.23
5.77	1.500	3.00	0.023	3522.2	400.02	404.70	2.338	24142	4.22
5.80	1.500	3.00	0.023	3525.0	398.41	402.98	2.280	24042	4.20
5.83	1.500	3.00	0.023	3527.8	396.92	401.37	2.227	23949	4.19
5.87	1.500	2.98	0.023	3530.6	395.52	399.87	2.176	23862	4.17
5.90	1.475	2.93	0.023	3533.3	394.19	398.45	2.128	23779	4.16
5.93	1.450	2.88	0.023	3536.1	392.90	397.07	2.082	23699	4.15
5.97	1.425	2.83	0.023	3538.8	391.66	395.73	2.037	23622	4.13
6.00	1.400	2.45	0.023	3541.6	390.45	394.44	1.994	23547	4.12
6.03	1.050	1.75	0.023	3544.3	388.97	392.85	1.941	23455	4.11
6.07	0.700	1.05	0.023	3547.1	386.94	390.68	1.868	23329	4.09
6.10	0.350	0.35	0.023	3549.8	384.39	387.95	1.776	23170	4.06
6.13	0.000	0.00	0.023	3552.5	381.36	384.70	1.667	22982	4.03
6.17	0.000	0.00	0.023	3555.3	378.21	381.32	1.554	22786	4.00
6.20	0.000	0.00	0.023	3558.0	375.27	378.17	1.450	22603	3.97
6.23	0.000	0.00	0.022	3560.7	372.51	375.22	1.354	22432	3.94
6.27	0.000	0.00	0.022	3563.4	369.94	372.47	1.264	22272	3.92
6.30	0.000	0.00	0.022	3566.1	367.59	369.90	1.153	22125	3.90
6.33	0.000	0.00	0.022	3568.7	365.45	367.55	1.048	21990	3.87
6.37	0.000	0.00	0.022	3571.4	363.50	365.41	0.952	21867	3.86
6.40	0.000	0.00	0.022	3574.1	361.73	363.46	0.865	21756	3.84
6.43	0.000	0.00	0.022	3576.7	360.11	361.68	0.786	21654	3.82
6.47	0.000	0.00	0.022	3579.4	358.64	360.07	0.714	21561	3.81
6.50	0.000	0.00	0.022	3582.0	357.30	358.59	0.648	21477	3.79
6.53	0.000	0.00	0.022	3584.7	356.08	357.25	0.588	21400	3.78
6.57	0.000	0.00	0.022	3587.3	354.97	356.03	0.534	21330	3.77
6.60	0.000	0.00	0.022	3589.9	353.95	354.92	0.484	21266	3.76
6.63	0.000	0.00	0.022	3592.6	353.03	353.91	0.439	21208	3.75
6.67	0.000	0.00	0.022	3595.2	352.12	352.99	0.435	21153	3.74
6.70	0.000	0.00	0.022	3597.8	351.20	352.07	0.435	21098	3.73

time (hr)	Inflow, In (cfs)	In+In+1 (cfs)	fn (cfs)	Inf. Vol, F (ft3)	2S1/At-O1 (cfs)	2S2/At+O2 (cfs)	Outflow, On (cfs)	Volume, S (ft3)	Elevation, h (ft-osl)
6.73	0.000	0.00	0.022	3600.5	350.29	351.16	0.434	21044	3.72
6.77	0.000	0.00	0.022	3603.1	349.38	350.25	0.433	20989	3.72
6.80	0.000	0.00	0.022	3605.7	348.47	349.34	0.433	20934	3.71
6.83	0.000	0.00	0.022	3608.3	347.57	348.43	0.432	20880	3.70
6.87	0.000	0.00	0.022	3610.9	346.66	347.52	0.431	20826	3.69
6.90	0.000	0.00	0.022	3613.5	345.76	346.62	0.431	20771	3.68
6.93	0.000	0.00	0.022	3616.1	344.85	345.71	0.430	20717	3.67
6.97	0.000	0.00	0.022	3618.7	343.95	344.81	0.429	20663	3.66
7.00	0.000	0.00	0.022	3621.3	343.05	343.91	0.429	20609	3.66
7.03	0.000	0.00	0.022	3623.9	342.15	343.01	0.428	20555	3.65
7.07	0.000	0.00	0.022	3626.5	341.25	342.11	0.427	20501	3.64
7.10	0.000	0.00	0.022	3629.1	340.36	341.21	0.427	20447	3.63
7.13	0.000	0.00	0.022	3631.7	339.46	340.31	0.426	20393	3.62
7.17	0.000	0.00	0.022	3634.3	338.57	339.42	0.425	20340	3.61
7.20	0.000	0.00	0.021	3636.8	337.68	338.53	0.425	20286	3.60
7.23	0.000	0.00	0.021	3639.4	336.79	337.63	0.424	20233	3.60
7.27	0.000	0.00	0.021	3642.0	335.90	336.74	0.423	20179	3.59
7.30	0.000	0.00	0.021	3644.5	335.01	335.85	0.423	20126	3.58
7.33	0.000	0.00	0.021	3647.1	334.12	334.97	0.422	20073	3.57
7.37	0.000	0.00	0.021	3649.7	333.24	334.08	0.421	20019	3.56
7.40	0.000	0.00	0.021	3652.2	332.35	333.19	0.421	19966	3.55
7.43	0.000	0.00	0.021	3654.8	331.47	332.31	0.420	19913	3.55
7.47	0.000	0.00	0.021	3657.4	330.59	331.43	0.419	19860	3.54
7.50	0.000	0.00	0.021	3659.9	329.71	330.54	0.419	19808	3.53
7.53	0.000	0.00	0.021	3662.5	328.83	329.66	0.418	19755	3.52
7.57	0.000	0.00	0.021	3665.0	327.95	328.79	0.418	19702	3.51
7.60	0.000	0.00	0.021	3667.5	327.07	327.91	0.417	19649	3.50
7.63	0.000	0.00	0.021	3670.1	326.20	327.03	0.416	19597	3.49
7.67	0.000	0.00	0.021	3672.6	325.33	326.16	0.416	19545	3.49
7.70	0.000	0.00	0.021	3675.2	324.45	325.28	0.415	19492	3.48
7.73	0.000	0.00	0.021	3677.7	323.58	324.41	0.414	19440	3.47
7.77	0.000	0.00	0.021	3680.2	322.71	323.54	0.414	19388	3.46
7.80	0.000	0.00	0.021	3682.7	321.85	322.67	0.413	19336	3.45
7.83	0.000	0.00	0.021	3685.3	320.98	321.80	0.412	19284	3.45
7.87	0.000	0.00	0.021	3687.8	320.11	320.94	0.412	19232	3.44
7.90	0.000	0.00	0.021	3690.3	319.25	320.07	0.411	19180	3.43
7.93	0.000	0.00	0.021	3692.8	318.39	319.21	0.410	19128	3.42
7.97	0.000	0.00	0.021	3695.3	317.53	318.35	0.410	19076	3.41
8.00	0.000	0.00	0.021	3697.8	316.67	317.49	0.409	19025	3.40
8.03	0.000	0.00	0.021	3700.3	315.81	316.63	0.408	18973	3.40
8.07	0.000	0.00	0.021	3702.9	314.95	315.77	0.408	18922	3.39
8.10	0.000	0.00	0.021	3705.4	314.10	314.91	0.407	18870	3.38
8.13	0.000	0.00	0.021	3707.8	313.24	314.05	0.406	18819	3.37
8.17	0.000	0.00	0.021	3710.3	312.39	313.20	0.406	18768	3.36
8.20	0.000	0.00	0.021	3712.8	311.54	312.35	0.405	18717	3.36
8.23	0.000	0.00	0.021	3715.3	310.69	311.50	0.404	18666	3.35
8.27	0.000	0.00	0.021	3717.8	309.84	310.65	0.404	18615	3.34
8.30	0.000	0.00	0.021	3720.3	308.99	309.80	0.403	18564	3.33
8.33	0.000	0.00	0.021	3722.8	308.14	308.95	0.402	18513	3.32
8.37	0.000	0.00	0.021	3725.3	307.30	308.10	0.402	18462	3.31
8.40	0.000	0.00	0.021	3727.7	306.46	307.26	0.401	18411	3.31
8.43	0.000	0.00	0.021	3730.2	305.61	306.42	0.400	18361	3.30

time (hr)	Inflow, In (cfs)	In+In+1 (cfs)	fn (cfs)	Inf. Vol, F (ft3)	2S1/At-O1 (cfs)	2S2/At+O2 (cfs)	Outflow, On (cfs)	Volume, S (ft3)	Elevation, h (ft-osl)
8.47	0.000	0.00	0.021	3732.7	304.77	305.57	0.400	18310	3.29
8.50	0.000	0.00	0.021	3735.1	303.93	304.73	0.399	18260	3.28
8.53	0.000	0.00	0.021	3737.6	303.10	303.89	0.399	18210	3.27
8.57	0.000	0.00	0.021	3740.1	302.26	303.05	0.398	18159	3.27
8.60	0.000	0.00	0.020	3742.5	301.42	302.22	0.397	18109	3.26
8.63	0.000	0.00	0.020	3745.0	300.59	301.38	0.397	18059	3.25
8.67	0.000	0.00	0.020	3747.4	299.76	300.55	0.396	18009	3.24
8.70	0.000	0.00	0.020	3749.9	298.92	299.72	0.395	17959	3.23
8.73	0.000	0.00	0.020	3752.3	298.09	298.88	0.395	17909	3.23
8.77	0.000	0.00	0.020	3754.8	297.27	298.05	0.394	17860	3.22
8.80	0.000	0.00	0.020	3757.2	296.44	297.22	0.393	17810	3.21
8.83	0.000	0.00	0.020	3759.7	295.61	296.40	0.393	17760	3.20
8.87	0.000	0.00	0.020	3762.1	294.79	295.57	0.392	17711	3.20
8.90	0.000	0.00	0.020	3764.6	293.96	294.75	0.391	17661	3.19
8.93	0.000	0.00	0.020	3767.0	293.14	293.92	0.391	17612	3.18
8.97	0.000	0.00	0.020	3769.4	292.32	293.10	0.390	17563	3.17
9.00	0.000	0.00	0.020	3771.8	291.50	292.28	0.389	17514	3.16
9.03	0.000	0.00	0.020	3774.3	290.69	291.46	0.389	17464	3.16
9.07	0.000	0.00	0.020	3776.7	289.87	290.64	0.388	17415	3.15
9.10	0.000	0.00	0.020	3779.1	289.05	289.83	0.387	17366	3.14
9.13	0.000	0.00	0.020	3781.5	288.24	289.01	0.387	17318	3.13
9.17	0.000	0.00	0.020	3784.0	287.43	288.20	0.386	17269	3.13
9.20	0.000	0.00	0.020	3786.4	286.62	287.39	0.385	17220	3.12
9.23	0.000	0.00	0.020	3788.8	285.81	286.58	0.385	17172	3.11
9.27	0.000	0.00	0.020	3791.2	285.00	285.77	0.384	17123	3.10
9.30	0.000	0.00	0.020	3793.6	284.19	284.96	0.383	17075	3.09
9.33	0.000	0.00	0.020	3796.0	283.39	284.15	0.383	17026	3.09
9.37	0.000	0.00	0.020	3798.4	282.58	283.35	0.382	16978	3.08
9.40	0.000	0.00	0.020	3800.8	281.78	282.54	0.381	16930	3.07
9.43	0.000	0.00	0.020	3803.2	280.98	281.74	0.381	16882	3.06
9.47	0.000	0.00	0.020	3805.6	280.18	280.94	0.380	16833	3.06
9.50	0.000	0.00	0.020	3808.0	279.38	280.14	0.380	16785	3.05
9.53	0.000	0.00	0.020	3810.4	278.58	279.34	0.379	16738	3.04
9.57	0.000	0.00	0.020	3812.7	277.78	278.54	0.378	16690	3.03
9.60	0.000	0.00	0.020	3815.1	276.99	277.74	0.378	16642	3.03
9.63	0.000	0.00	0.020	3817.5	276.20	276.95	0.377	16594	3.02
9.67	0.000	0.00	0.020	3819.9	275.40	276.16	0.376	16547	3.01
9.70	0.000	0.00	0.020	3822.3	274.61	275.36	0.376	16499	3.00
9.73	0.000	0.00	0.020	3824.6	273.82	274.57	0.375	16452	3.00
9.77	0.000	0.00	0.020	3827.0	273.03	273.78	0.374	16405	2.99
9.80	0.000	0.00	0.020	3829.4	272.25	272.99	0.374	16357	2.98
9.83	0.000	0.00	0.020	3831.7	271.46	272.21	0.373	16310	2.97
9.87	0.000	0.00	0.020	3834.1	270.68	271.42	0.372	16263	2.97
9.90	0.000	0.00	0.020	3836.5	269.90	270.64	0.372	16216	2.96
9.93	0.000	0.00	0.020	3838.8	269.11	269.86	0.371	16169	2.95
9.97	0.000	0.00	0.020	3841.2	268.33	269.07	0.370	16122	2.94
10.00	0.000	0.00	0.020	3843.5	267.56	268.29	0.370	16075	2.94
10.03	0.000	0.00	0.020	3845.9	266.78	267.52	0.369	16029	2.93
10.07	0.000	0.00	0.020	3848.2	266.00	266.74	0.368	15982	2.92
10.10	0.000	0.00	0.020	3850.6	265.23	265.96	0.368	15936	2.91
10.13	0.000	0.00	0.020	3852.9	264.45	265.19	0.367	15889	2.91
10.17	0.000	0.00	0.020	3855.3	263.68	264.42	0.366	15843	2.90

time (hr)	Inflow, In (cfs)	In+In+1 (cfs)	fn (cfs)	Inf. Vol, F (ft3)	2S1/At-O1 (cfs)	2S2/At+O2 (cfs)	Outflow, On (cfs)	Volume, S (ft3)	Elevation, h (ft-osl)
10.20	0.000	0.00	0.019	3857.6	262.91	263.64	0.366	15797	2.89
10.23	0.000	0.00	0.019	3860.0	262.14	262.87	0.365	15750	2.88
10.27	0.000	0.00	0.019	3862.3	261.38	262.10	0.364	15704	2.88
10.30	0.000	0.00	0.019	3864.6	260.61	261.34	0.364	15658	2.87
10.33	0.000	0.00	0.019	3867.0	259.84	260.57	0.363	15612	2.86
10.37	0.000	0.00	0.019	3869.3	259.08	259.80	0.362	15567	2.86
10.40	0.000	0.00	0.019	3871.6	258.32	259.04	0.362	15521	2.85
10.43	0.000	0.00	0.019	3873.9	257.56	258.28	0.361	15475	2.84
10.47	0.000	0.00	0.019	3876.3	256.80	257.52	0.361	15429	2.83
10.50	0.000	0.00	0.019	3878.6	256.04	256.76	0.360	15384	2.83
10.53	0.000	0.00	0.019	3880.9	255.28	256.00	0.359	15338	2.82
10.57	0.000	0.00	0.019	3883.2	254.53	255.24	0.359	15293	2.81
10.60	0.000	0.00	0.019	3885.5	253.77	254.49	0.358	15248	2.80
10.63	0.000	0.00	0.019	3887.8	253.02	253.73	0.357	15203	2.80
10.67	0.000	0.00	0.019	3890.1	252.27	252.98	0.357	15157	2.79
10.70	0.000	0.00	0.019	3892.4	251.52	252.23	0.356	15112	2.78
10.73	0.000	0.00	0.019	3894.8	250.77	251.48	0.355	15067	2.78
10.77	0.000	0.00	0.019	3897.1	250.02	250.73	0.355	15022	2.77
10.80	0.000	0.00	0.019	3899.4	249.27	249.98	0.354	14978	2.76
10.83	0.000	0.00	0.019	3901.7	248.53	249.23	0.353	14933	2.75
10.87	0.000	0.00	0.019	3903.9	247.78	248.49	0.353	14888	2.75
10.90	0.000	0.00	0.019	3906.2	247.04	247.75	0.352	14844	2.74
10.93	0.000	0.00	0.019	3908.5	246.30	247.00	0.351	14799	2.73
10.97	0.000	0.00	0.019	3910.8	245.56	246.26	0.351	14755	2.73
11.00	0.000	0.00	0.019	3913.1	244.82	245.52	0.350	14710	2.72
11.03	0.000	0.00	0.019	3915.4	244.09	244.78	0.349	14666	2.71
11.07	0.000	0.00	0.019	3917.7	243.35	244.05	0.349	14622	2.71
11.10	0.000	0.00	0.019	3920.0	242.62	243.31	0.348	14578	2.70
11.13	0.000	0.00	0.019	3922.2	241.88	242.58	0.347	14534	2.69
11.17	0.000	0.00	0.019	3924.5	241.15	241.84	0.347	14490	2.68
11.20	0.000	0.00	0.019	3926.8	240.42	241.11	0.346	14446	2.68
11.23	0.000	0.00	0.019	3929.0	239.69	240.38	0.345	14402	2.67
11.27	0.000	0.00	0.019	3931.3	238.97	239.65	0.345	14359	2.66
11.30	0.000	0.00	0.019	3933.6	238.24	238.93	0.344	14315	2.66
11.33	0.000	0.00	0.019	3935.9	237.51	238.20	0.343	14271	2.65
11.37	0.000	0.00	0.019	3938.1	236.79	237.48	0.343	14228	2.64
11.40	0.000	0.00	0.019	3940.4	236.07	236.75	0.342	14185	2.64
11.43	0.000	0.00	0.019	3942.6	235.35	236.03	0.341	14141	2.63
11.47	0.000	0.00	0.019	3944.9	234.63	235.31	0.341	14098	2.62
11.50	0.000	0.00	0.019	3947.1	233.91	234.59	0.340	14055	2.62
11.53	0.000	0.00	0.019	3949.4	233.20	233.87	0.339	14012	2.61
11.57	0.000	0.00	0.019	3951.6	232.48	233.16	0.339	13969	2.60
11.60	0.000	0.00	0.019	3953.9	231.77	232.44	0.338	13926	2.59
11.63	0.000	0.00	0.019	3956.1	231.05	231.73	0.338	13883	2.59
11.67	0.000	0.00	0.019	3958.4	230.34	231.02	0.337	13841	2.58
11.70	0.000	0.00	0.019	3960.6	229.63	230.31	0.336	13798	2.57
11.73	0.000	0.00	0.019	3962.9	228.92	229.60	0.336	13756	2.57
11.77	0.000	0.00	0.019	3965.1	228.22	228.89	0.335	13713	2.56
11.80	0.000	0.00	0.019	3967.3	227.51	228.18	0.334	13671	2.55
11.83	0.000	0.00	0.019	3969.6	226.81	227.47	0.334	13628	2.55
11.87	0.000	0.00	0.019	3971.8	226.10	226.77	0.333	13586	2.54
11.90	0.000	0.00	0.019	3974.0	225.40	226.07	0.332	13544	2.53

time (hr)	Inflow, In (cfs)	In+In+1 (cfs)	fn (cfs)	Inf. Vol, F (ft3)	2S1/At+O1 (cfs)	2S2/At+O2 (cfs)	Outflow, On (cfs)	Volume, S (ft3)	Elevation, h (ft-osl)
11.93	0.000	0.00	0.019	3976.3	224.70	225.36	0.332	13502	2.53
11.97	0.000	0.00	0.019	3978.5	224.00	224.66	0.331	13460	2.52
12.00	0.000	0.00	0.019	3980.7	223.30	223.97	0.330	13418	2.51
12.03	0.000	0.00	0.019	3982.9	222.61	223.27	0.330	13376	2.51
12.07	0.000	0.00	0.018	3985.2	221.91	222.57	0.329	13334	2.50
12.10	0.000	0.00	0.018	3987.4	221.22	221.88	0.329	13293	2.49
12.13	0.000	0.00	0.018	3989.6	220.53	221.18	0.328	13251	2.49
12.17	0.000	0.00	0.018	3991.8	219.83	220.49	0.327	13210	2.48
12.20	0.000	0.00	0.018	3994.0	219.14	219.80	0.326	13168	2.47
12.23	0.000	0.00	0.018	3996.2	218.46	219.11	0.326	13127	2.47
12.27	0.000	0.00	0.018	3998.4	217.77	218.42	0.325	13086	2.46
12.30	0.000	0.00	0.018	4000.6	217.08	217.73	0.324	13044	2.45
12.33	0.000	0.00	0.018	4002.8	216.40	217.05	0.324	13003	2.45
12.37	0.000	0.00	0.018	4005.0	215.72	216.36	0.323	12962	2.44
12.40	0.000	0.00	0.018	4007.2	215.03	215.68	0.322	12921	2.44
12.43	0.000	0.00	0.018	4009.4	214.35	215.00	0.322	12881	2.43
12.47	0.000	0.00	0.018	4011.6	213.68	214.32	0.321	12840	2.42
12.50	0.000	0.00	0.018	4013.8	213.00	213.64	0.320	12799	2.42
12.53	0.000	0.00	0.018	4016.0	212.32	212.96	0.320	12759	2.41
12.57	0.000	0.00	0.018	4018.2	211.65	212.29	0.319	12718	2.40
12.60	0.000	0.00	0.018	4020.4	210.97	211.61	0.318	12678	2.40
12.63	0.000	0.00	0.018	4022.6	210.30	210.94	0.318	12637	2.39
12.67	0.000	0.00	0.018	4024.8	209.63	210.27	0.317	12597	2.38
12.70	0.000	0.00	0.018	4027.0	208.96	209.60	0.316	12557	2.38
12.73	0.000	0.00	0.018	4029.1	208.29	208.93	0.316	12517	2.37
12.77	0.000	0.00	0.018	4031.3	207.63	208.26	0.315	12477	2.36
12.80	0.000	0.00	0.018	4033.5	206.96	207.59	0.314	12437	2.36
12.83	0.000	0.00	0.018	4035.7	206.30	206.93	0.314	12397	2.35
12.87	0.000	0.00	0.018	4037.9	205.64	206.26	0.313	12357	2.35
12.90	0.000	0.00	0.018	4040.0	204.97	205.60	0.313	12317	2.34
12.93	0.000	0.00	0.018	4042.2	204.32	204.94	0.312	12278	2.33
12.97	0.000	0.00	0.018	4044.4	203.66	204.28	0.311	12238	2.33
13.00	0.000	0.00	0.018	4046.5	203.00	203.62	0.311	12199	2.32
13.03	0.000	0.00	0.018	4048.7	202.34	202.96	0.310	12159	2.31
13.07	0.000	0.00	0.018	4050.9	201.69	202.31	0.309	12120	2.31
13.10	0.000	0.00	0.018	4053.0	201.04	201.65	0.309	12081	2.30
13.13	0.000	0.00	0.018	4055.2	200.38	201.00	0.308	12041	2.30
13.17	0.000	0.00	0.018	4057.3	199.73	200.35	0.307	12002	2.29
13.20	0.000	0.00	0.018	4059.5	199.08	199.70	0.307	11963	2.28
13.23	0.000	0.00	0.018	4061.6	198.44	199.05	0.306	11924	2.28
13.27	0.000	0.00	0.018	4063.8	197.79	198.40	0.305	11886	2.27
13.30	0.000	0.00	0.018	4065.9	197.14	197.75	0.305	11847	2.26
13.33	0.000	0.00	0.018	4068.1	196.50	197.11	0.304	11808	2.26
13.37	0.000	0.00	0.018	4070.2	195.86	196.46	0.304	11770	2.25
13.40	0.000	0.00	0.018	4072.4	195.21	195.82	0.303	11731	2.25
13.43	0.000	0.00	0.018	4074.5	194.57	195.18	0.302	11693	2.24
13.47	0.000	0.00	0.018	4076.7	193.94	194.54	0.302	11654	2.23
13.50	0.000	0.00	0.018	4078.8	193.30	193.90	0.301	11616	2.23
13.53	0.000	0.00	0.018	4080.9	192.66	193.26	0.300	11578	2.22
13.57	0.000	0.00	0.018	4083.1	192.03	192.63	0.299	11540	2.22
13.60	0.000	0.00	0.018	4085.2	191.39	191.99	0.299	11502	2.21
13.63	0.000	0.00	0.018	4087.3	190.76	191.36	0.298	11464	2.20

time (hr)	Inflow, In (cfs)	In+In+1 (cfs)	fn (cfs)	Inf. Vol, F (ft3)	2S1/At+O1 (cfs)	2S2/At+O2 (cfs)	Outflow, On (cfs)	Volume, S (ft3)	Elevation, h (ft-osl)
13.67	0.000	0.00	0.018	4089.5	190.13	190.73	0.297	11426	2.20
13.70	0.000	0.00	0.018	4091.6	189.50	190.10	0.297	11388	2.19
13.73	0.000	0.00	0.018	4093.7	188.88	189.47	0.296	11350	2.19
13.77	0.000	0.00	0.018	4095.9	188.25	188.84	0.295	11313	2.18
13.80	0.000	0.00	0.018	4098.0	187.63	188.21	0.295	11275	2.17
13.83	0.000	0.00	0.018	4100.1	187.00	187.59	0.294	11238	2.17
13.87	0.000	0.00	0.018	4102.2	186.38	186.97	0.293	11200	2.16
13.90	0.000	0.00	0.018	4104.3	185.76	186.34	0.293	11163	2.16
13.93	0.000	0.00	0.018	4106.5	185.14	185.72	0.292	11126	2.15
13.97	0.000	0.00	0.018	4108.6	184.52	185.10	0.291	11089	2.14
14.00	0.000	0.00	0.018	4110.7	183.90	184.49	0.291	11052	2.14
14.03	0.000	0.00	0.018	4112.8	183.29	183.87	0.290	11015	2.13
14.07	0.000	0.00	0.018	4114.9	182.68	183.25	0.289	10978	2.13
14.10	0.000	0.00	0.018	4117.0	182.06	182.64	0.289	10941	2.12
14.13	0.000	0.00	0.018	4119.1	181.45	182.03	0.288	10904	2.12
14.17	0.000	0.00	0.018	4121.2	180.84	181.42	0.287	10868	2.11
14.20	0.000	0.00	0.018	4123.3	180.23	180.81	0.287	10831	2.10
14.23	0.000	0.00	0.018	4125.4	179.63	180.20	0.286	10795	2.10
14.27	0.000	0.00	0.017	4127.5	179.02	179.59	0.285	10758	2.09
14.30	0.000	0.00	0.017	4129.6	178.42	178.99	0.285	10722	2.09
14.33	0.000	0.00	0.017	4131.7	177.81	178.38	0.284	10686	2.08
14.37	0.000	0.00	0.017	4133.8	177.21	177.78	0.284	10650	2.07
14.40	0.000	0.00	0.017	4135.9	176.61	177.18	0.283	10614	2.07
14.43	0.000	0.00	0.017	4138.0	176.01	176.57	0.282	10578	2.06
14.47	0.000	0.00	0.017	4140.1	175.41	175.98	0.282	10542	2.06
14.50	0.000	0.00	0.017	4142.2	174.82	175.38	0.281	10506	2.05
14.53	0.000	0.00	0.017	4144.3	174.22	174.78	0.280	10470	2.05
14.57	0.000	0.00	0.017	4146.4	173.63	174.19	0.280	10434	2.04
14.60	0.000	0.00	0.017	4148.5	173.03	173.59	0.279	10399	2.03
14.63	0.000	0.00	0.017	4150.5	172.44	173.00	0.278	10363	2.03
14.67	0.000	0.00	0.017	4152.6	171.85	172.41	0.278	10328	2.02
14.70	0.000	0.00	0.017	4154.7	171.26	171.82	0.277	10292	2.02
14.73	0.000	0.00	0.017	4156.8	170.68	171.23	0.276	10257	2.01
14.77	0.000	0.00	0.017	4158.9	170.09	170.64	0.276	10222	2.01
14.80	0.000	0.00	0.017	4160.9	169.50	170.05	0.275	10187	2.00
14.83	0.000	0.00	0.017	4163.0	168.92	169.47	0.275	10152	2.00
14.87	0.000	0.00	0.017	4165.1	168.34	168.89	0.274	10117	1.99
14.90	0.000	0.00	0.017	4167.2	167.76	168.30	0.273	10082	1.98
14.93	0.000	0.00	0.017	4169.2	167.18	167.72	0.272	10047	1.98
14.97	0.000	0.00	0.017	4171.3	166.60	167.14	0.272	10012	1.97
15.00	0.000	0.00	0.017	4173.4	166.02	166.57	0.271	9978	1.97
15.03	0.000	0.00	0.017	4175.4	165.45	165.99	0.270	9943	1.96
15.07	0.000	0.00	0.017	4177.5	164.88	165.41	0.270	9909	1.96
15.10	0.000	0.00	0.017	4179.5	164.30	164.84	0.269	9874	1.95
15.13	0.000	0.00	0.017	4181.6	163.73	164.27	0.268	9840	1.95
15.17	0.000	0.00	0.017	4183.7	163.16	163.70	0.268	9806	1.94
15.20	0.000	0.00	0.017	4185.7	162.59	163.13	0.267	9772	1.94
15.23	0.000	0.00	0.017	4187.8	162.03	162.56	0.266	9738	1.93
15.27	0.000	0.00	0.017	4189.8	161.46	161.99	0.266	9704	1.92
15.30	0.000	0.00	0.017	4191.9	160.90	161.43	0.265	9670	1.92
15.33	0.000	0.00	0.017	4193.9	160.34	160.86	0.264	9636	1.91
15.37	0.000	0.00	0.017	4196.0	159.77	160.30	0.264	9602	1.91

time (hr)	Inflow, In (cfs)	In+In+1 (cfs)	fn (cfs)	Inf. Vol, F (ft3)	2S1/At-O1 (cfs)	2S2/At+O2 (cfs)	Outflow, On (cfs)	Volume, S (ft3)	Elevation, h (ft-osl)
15.40	0.000	0.00	0.017	4198.0	159.21	159.74	0.263	9569	1.90
15.43	0.000	0.00	0.017	4200.1	158.66	159.18	0.262	9535	1.90
15.47	0.000	0.00	0.017	4202.1	158.10	158.62	0.262	9502	1.89
15.50	0.000	0.00	0.017	4204.2	157.54	158.06	0.261	9468	1.89
15.53	0.000	0.00	0.017	4206.2	156.99	157.51	0.260	9435	1.88
15.57	0.000	0.00	0.017	4208.2	156.44	156.95	0.260	9402	1.88
15.60	0.000	0.00	0.017	4210.3	155.88	156.40	0.259	9369	1.87
15.63	0.000	0.00	0.017	4212.3	155.33	155.85	0.258	9335	1.87
15.67	0.000	0.00	0.017	4214.4	154.78	155.30	0.258	9303	1.86
15.70	0.000	0.00	0.017	4216.4	154.24	154.75	0.257	9270	1.86
15.73	0.000	0.00	0.017	4218.4	153.69	154.20	0.256	9237	1.85
15.77	0.000	0.00	0.017	4220.5	153.15	153.66	0.256	9204	1.85
15.80	0.000	0.00	0.017	4222.5	152.60	153.11	0.255	9171	1.84
15.83	0.000	0.00	0.017	4224.5	152.06	152.57	0.254	9139	1.83
15.87	0.000	0.00	0.017	4226.5	151.52	152.03	0.254	9106	1.83
15.90	0.000	0.00	0.017	4228.6	150.98	151.48	0.253	9074	1.82
15.93	0.000	0.00	0.017	4230.6	150.44	150.94	0.252	9042	1.82
15.97	0.000	0.00	0.017	4232.6	149.90	150.41	0.252	9009	1.81
16.00	0.000	0.00	0.017	4234.6	149.37	149.87	0.251	8977	1.81
16.03	0.000	0.00	0.017	4236.7	148.83	149.33	0.250	8945	1.80
16.07	0.000	0.00	0.017	4238.7	148.30	148.80	0.250	8913	1.80
16.10	0.000	0.00	0.017	4240.7	147.77	148.27	0.249	8881	1.79
16.13	0.000	0.00	0.017	4242.7	147.24	147.73	0.248	8849	1.79
16.17	0.000	0.00	0.017	4244.7	146.71	147.20	0.248	8817	1.78
16.20	0.000	0.00	0.017	4246.7	146.18	146.67	0.247	8786	1.78
16.23	0.000	0.00	0.017	4248.8	145.65	146.15	0.247	8754	1.77
16.27	0.000	0.00	0.017	4250.8	145.13	145.62	0.246	8722	1.77
16.30	0.000	0.00	0.017	4252.8	144.60	145.09	0.245	8691	1.76
16.33	0.000	0.00	0.017	4254.8	144.08	144.57	0.245	8659	1.76
16.37	0.000	0.00	0.017	4256.8	143.56	144.05	0.244	8628	1.75
16.40	0.000	0.00	0.017	4258.8	143.04	143.53	0.243	8597	1.75
16.43	0.000	0.00	0.017	4260.8	142.52	143.00	0.243	8566	1.74
16.47	0.000	0.00	0.017	4262.8	142.00	142.49	0.242	8535	1.74
16.50	0.000	0.00	0.017	4264.8	141.49	141.97	0.241	8504	1.73
16.53	0.000	0.00	0.017	4266.8	140.97	141.45	0.241	8473	1.73
16.57	0.000	0.00	0.017	4268.8	140.46	140.94	0.240	8442	1.72
16.60	0.000	0.00	0.017	4270.8	139.95	140.43	0.239	8411	1.72
16.63	0.000	0.00	0.017	4272.8	139.44	139.91	0.238	8381	1.71
16.67	0.000	0.00	0.017	4274.8	138.93	139.40	0.238	8350	1.71
16.70	0.000	0.00	0.017	4276.8	138.42	138.89	0.237	8319	1.70
16.73	0.000	0.00	0.017	4278.8	137.91	138.39	0.236	8289	1.70
16.77	0.000	0.00	0.017	4280.8	137.41	137.88	0.236	8259	1.70
16.80	0.000	0.00	0.017	4282.8	136.91	137.38	0.235	8229	1.69
16.83	0.000	0.00	0.017	4284.8	136.41	136.87	0.234	8198	1.69
16.87	0.000	0.00	0.017	4286.7	135.91	136.37	0.234	8168	1.68
16.90	0.000	0.00	0.017	4288.7	135.41	135.87	0.233	8138	1.68
16.93	0.000	0.00	0.017	4290.7	134.91	135.37	0.232	8108	1.67
16.97	0.000	0.00	0.017	4292.7	134.41	134.88	0.232	8079	1.67
17.00	0.000	0.00	0.017	4294.7	133.92	134.38	0.231	8049	1.66
17.03	0.000	0.00	0.017	4296.7	133.42	133.88	0.230	8019	1.66
17.07	0.000	0.00	0.016	4298.6	132.93	133.39	0.229	7990	1.65
17.10	0.000	0.00	0.016	4300.6	132.44	132.90	0.229	7960	1.65

time (hr)	Inflow, In (cfs)	In+In+1 (cfs)	fn (cfs)	Inf. Vol, F (ft3)	2S1/At-O1 (cfs)	2S2/At+O2 (cfs)	Outflow, On (cfs)	Volume, S (ft3)	Elevation, h (ft-osl)
17.13	0.000	0.00	0.016	4302.6	131.95	132.41	0.228	7931	1.64
17.17	0.000	0.00	0.016	4304.6	131.46	131.92	0.227	7902	1.64
17.20	0.000	0.00	0.016	4306.5	130.98	131.43	0.227	7872	1.63
17.23	0.000	0.00	0.016	4308.5	130.49	130.95	0.226	7843	1.63
17.27	0.000	0.00	0.016	4310.5	130.01	130.46	0.225	7814	1.62
17.30	0.000	0.00	0.016	4312.5	129.53	129.98	0.225	7785	1.62
17.33	0.000	0.00	0.016	4314.4	129.05	129.49	0.224	7756	1.62
17.37	0.000	0.00	0.016	4316.4	128.57	129.01	0.223	7727	1.61
17.40	0.000	0.00	0.016	4318.4	128.09	128.53	0.223	7699	1.61
17.43	0.000	0.00	0.016	4320.3	127.61	128.06	0.222	7670	1.60
17.47	0.000	0.00	0.016	4322.3	127.14	127.58	0.221	7641	1.60
17.50	0.000	0.00	0.016	4324.3	126.66	127.10	0.221	7613	1.59
17.53	0.000	0.00	0.016	4326.2	126.19	126.63	0.220	7584	1.59
17.57	0.000	0.00	0.016	4328.2	125.72	126.16	0.220	7556	1.58
17.60	0.000	0.00	0.016	4330.2	125.25	125.68	0.219	7528	1.58
17.63	0.000	0.00	0.016	4332.1	124.78	125.21	0.218	7500	1.57
17.67	0.000	0.00	0.016	4334.1	124.31	124.74	0.218	7472	1.57
17.70	0.000	0.00	0.016	4336.0	123.84	124.28	0.217	7444	1.57
17.73	0.000	0.00	0.016	4338.0	123.38	123.81	0.216	7416	1.56
17.77	0.000	0.00	0.016	4339.9	122.91	123.34	0.216	7388	1.56
17.80	0.000	0.00	0.016	4341.9	122.45	122.88	0.215	7360	1.55
17.83	0.000	0.00	0.016	4343.8	121.99	122.42	0.214	7332	1.55
17.87	0.000	0.00	0.016	4345.8	121.53	121.96	0.214	7305	1.54
17.90	0.000	0.00	0.016	4347.7	121.07	121.50	0.213	7277	1.54
17.93	0.000	0.00	0.016	4349.7	120.61	121.04	0.212	7250	1.54
17.97	0.000	0.00	0.016	4351.6	120.16	120.58	0.212	7222	1.53
18.00	0.000	0.00	0.016	4353.6	119.70	120.12	0.211	7195	1.53
18.03	0.000	0.00	0.016	4355.5	119.25	119.67	0.211	7168	1.52
18.07	0.000	0.00	0.016	4357.5	118.80	119.22	0.210	7140	1.52
18.10	0.000	0.00	0.016	4359.4	118.35	118.76	0.209	7113	1.51
18.13	0.000	0.00	0.016	4361.4	117.90	118.31	0.209	7086	1.51
18.17	0.000	0.00	0.016	4363.3	117.45	117.86	0.208	7059	1.50
18.20	0.000	0.00	0.016	4365.2	117.00	117.41	0.207	7032	1.50
18.23	0.000	0.00	0.016	4367.2	116.55	116.97	0.207	7006	1.50
18.27	0.000	0.00	0.016	4369.1	116.11	116.52	0.206	6979	1.49
18.30	0.000	0.00	0.016	4371.0	115.67	116.08	0.205	6952	1.49
18.33	0.000	0.00	0.016	4373.0	115.23	115.63	0.205	6926	1.48
18.37	0.000	0.00	0.016	4374.9	114.79	115.19	0.204	6899	1.48
18.40	0.000	0.00	0.016	4376.9	114.35	114.75	0.203	6873	1.48
18.43	0.000	0.00	0.016	4378.8	113.91	114.32	0.202	6847	1.47
18.47	0.000	0.00	0.016	4380.7	113.48	113.88	0.202	6821	1.47
18.50	0.000	0.00	0.016	4382.6	113.04	113.44	0.201	6795	1.46
18.53	0.000	0.00	0.016	4384.6	112.61	113.01	0.200	6769	1.46
18.57	0.000	0.00	0.016	4386.5	112.18	112.58	0.199	6743	1.45
18.60	0.000	0.00	0.016	4388.4	111.75	112.15	0.199	6717	1.45
18.63	0.000	0.00	0.016	4390.4	111.32	111.72	0.198	6691	1.45
18.67	0.000	0.00	0.016	4392.3	110.89	111.29	0.197	6665	1.44
18.70	0.000	0.00	0.016	4394.2	110.47	110.86	0.197	6640	1.44
18.73	0.000	0.00	0.016	4396.1	110.05	110.44	0.196	6614	1.43
18.77	0.000	0.00	0.016	4398.0	109.62	110.01	0.195	6589	1.43
18.80	0.000	0.00	0.016	4400.0	109.20	109.59	0.194	6564	1.43
18.83	0.000	0.00	0.016	4401.9	108.78	109.17	0.194	6539	1.42

time (hr)	Inflow, In (cfs)	In+In+1 (cfs)	fn (cfs)	Inf. Vol, F (ft3)	2S1/At-O1 (cfs)	2S2/At+O2 (cfs)	Outflow, On (cfs)	Volume, S (ft3)	Elevation, h (ft-osl)
18.87	0.000	0.00	0.016	4403.8	108.36	108.75	0.193	6513	1.42
18.90	0.000	0.00	0.016	4405.7	107.95	108.33	0.192	6488	1.41
18.93	0.000	0.00	0.016	4407.6	107.53	107.92	0.192	6463	1.41
18.97	0.000	0.00	0.016	4409.5	107.12	107.50	0.191	6439	1.41
19.00	0.000	0.00	0.016	4411.5	106.71	107.09	0.190	6414	1.40
19.03	0.000	0.00	0.016	4413.4	106.30	106.68	0.190	6389	1.40
19.07	0.000	0.00	0.016	4415.3	105.89	106.26	0.189	6365	1.39
19.10	0.000	0.00	0.016	4417.2	105.48	105.85	0.188	6340	1.39
19.13	0.000	0.00	0.016	4419.1	105.07	105.45	0.187	6316	1.39
19.17	0.000	0.00	0.016	4421.0	104.67	105.04	0.187	6291	1.38
19.20	0.000	0.00	0.016	4422.9	104.26	104.63	0.186	6267	1.38
19.23	0.000	0.00	0.016	4424.8	103.86	104.23	0.185	6243	1.38
19.27	0.000	0.00	0.016	4426.7	103.46	103.83	0.185	6219	1.37
19.30	0.000	0.00	0.016	4428.6	103.06	103.43	0.184	6195	1.37
19.33	0.000	0.00	0.016	4430.5	102.66	103.03	0.183	6171	1.36
19.37	0.000	0.00	0.016	4432.5	102.26	102.63	0.183	6147	1.36
19.40	0.000	0.00	0.016	4434.4	101.87	102.23	0.182	6123	1.36
19.43	0.000	0.00	0.016	4436.3	101.47	101.84	0.181	6099	1.35
19.47	0.000	0.00	0.016	4438.2	101.08	101.44	0.181	6076	1.35
19.50	0.000	0.00	0.016	4440.1	100.69	101.05	0.180	6052	1.34
19.53	0.000	0.00	0.016	4442.0	100.30	100.66	0.179	6029	1.34
19.57	0.000	0.00	0.016	4443.8	99.91	100.27	0.179	6005	1.34
19.60	0.000	0.00	0.016	4445.7	99.52	99.88	0.178	5982	1.33
19.63	0.000	0.00	0.016	4447.6	99.13	99.49	0.177	5959	1.33
19.67	0.000	0.00	0.016	4449.5	98.75	99.10	0.177	5935	1.33
19.70	0.000	0.00	0.016	4451.4	98.36	98.72	0.176	5912	1.32
19.73	0.000	0.00	0.016	4453.3	97.98	98.33	0.176	5889	1.32
19.77	0.000	0.00	0.016	4455.2	97.60	97.95	0.175	5866	1.32
19.80	0.000	0.00	0.016	4457.1	97.22	97.57	0.174	5844	1.31
19.83	0.000	0.00	0.016	4459.0	96.84	97.19	0.174	5821	1.31
19.87	0.000	0.00	0.016	4460.9	96.46	96.81	0.173	5798	1.30
19.90	0.000	0.00	0.016	4462.8	96.09	96.43	0.172	5776	1.30
19.93	0.000	0.00	0.016	4464.7	95.71	96.06	0.172	5753	1.30
19.97	0.000	0.00	0.016	4466.5	95.34	95.68	0.171	5731	1.29
20.00	0.000	0.00	0.016	4468.4	94.97	95.31	0.170	5708	1.29
20.03	0.000	0.00	0.016	4470.3	94.60	94.93	0.170	5686	1.29
20.07	0.000	0.00	0.016	4472.2	94.23	94.56	0.169	5664	1.28
20.10	0.000	0.00	0.016	4474.1	93.86	94.19	0.169	5642	1.28
20.13	0.000	0.00	0.016	4476.0	93.49	93.83	0.168	5619	1.28
20.17	0.000	0.00	0.016	4477.8	93.12	93.46	0.167	5597	1.27
20.20	0.000	0.00	0.016	4479.7	92.76	93.09	0.167	5575	1.27
20.23	0.000	0.00	0.016	4481.6	92.39	92.73	0.166	5554	1.27
20.27	0.000	0.00	0.016	4483.5	92.03	92.36	0.166	5532	1.26
20.30	0.000	0.00	0.016	4485.4	91.67	92.00	0.165	5510	1.26
20.33	0.000	0.00	0.016	4487.2	91.31	91.64	0.164	5489	1.26
20.37	0.000	0.00	0.016	4489.1	90.95	91.28	0.164	5467	1.25
20.40	0.000	0.00	0.016	4491.0	90.59	90.92	0.163	5445	1.25
20.43	0.000	0.00	0.016	4492.9	90.24	90.56	0.162	5424	1.25
20.47	0.000	0.00	0.016	4494.7	89.88	90.21	0.162	5403	1.24
20.50	0.000	0.00	0.016	4496.6	89.53	89.85	0.161	5382	1.24
20.53	0.000	0.00	0.016	4498.5	89.18	89.50	0.160	5360	1.24
20.57	0.000	0.00	0.016	4500.3	88.83	89.15	0.159	5339	1.23

time (hr)	Inflow, In (cfs)	In+In+1 (cfs)	fn (cfs)	Inf. Vol, F (ft3)	2S1/At+O1 (cfs)	2S2/At+O2 (cfs)	Outflow, On (cfs)	Volume, S (ft3)	Elevation, h (ft-osl)
20.60	0.000	0.00	0.016	4502.2	88.48	88.80	0.159	5318	1.23
20.63	0.000	0.00	0.016	4504.1	88.13	88.45	0.158	5298	1.23
20.67	0.000	0.00	0.016	4505.9	87.79	88.10	0.157	5277	1.22
20.70	0.000	0.00	0.016	4507.8	87.44	87.76	0.157	5256	1.22
20.73	0.000	0.00	0.016	4509.7	87.10	87.41	0.156	5235	1.22
20.77	0.000	0.00	0.016	4511.5	86.76	87.07	0.155	5215	1.21
20.80	0.000	0.00	0.016	4513.4	86.42	86.73	0.154	5194	1.21
20.83	0.000	0.00	0.016	4515.3	86.08	86.39	0.154	5174	1.21
20.87	0.000	0.00	0.016	4517.1	85.75	86.05	0.153	5154	1.20
20.90	0.000	0.00	0.016	4519.0	85.41	85.71	0.152	5134	1.20
20.93	0.000	0.00	0.016	4520.9	85.08	85.38	0.152	5114	1.20
20.97	0.000	0.00	0.016	4522.7	84.74	85.04	0.151	5094	1.19
21.00	0.000	0.00	0.015	4524.6	84.41	84.71	0.150	5074	1.19
21.03	0.000	0.00	0.015	4526.4	84.08	84.38	0.150	5054	1.19
21.07	0.000	0.00	0.015	4528.3	83.75	84.05	0.149	5034	1.18
21.10	0.000	0.00	0.015	4530.2	83.42	83.72	0.148	5014	1.18
21.13	0.000	0.00	0.015	4532.0	83.10	83.39	0.147	4995	1.18
21.17	0.000	0.00	0.015	4533.9	82.77	83.07	0.147	4975	1.17
21.20	0.000	0.00	0.015	4535.7	82.45	82.74	0.146	4956	1.17
21.23	0.000	0.00	0.015	4537.6	82.13	82.42	0.145	4936	1.17
21.27	0.000	0.00	0.015	4539.4	81.81	82.10	0.145	4917	1.16
21.30	0.000	0.00	0.015	4541.3	81.49	81.78	0.144	4898	1.16
21.33	0.000	0.00	0.015	4543.1	81.17	81.46	0.143	4879	1.16
21.37	0.000	0.00	0.015	4545.0	80.86	81.14	0.143	4860	1.16
21.40	0.000	0.00	0.015	4546.8	80.54	80.82	0.142	4841	1.15
21.43	0.000	0.00	0.015	4548.7	80.23	80.51	0.142	4822	1.15
21.47	0.000	0.00	0.015	4550.5	79.91	80.20	0.141	4803	1.15
21.50	0.000	0.00	0.015	4552.4	79.60	79.88	0.140	4785	1.14
21.53	0.000	0.00	0.015	4554.2	79.29	79.57	0.140	4766	1.14
21.57	0.000	0.00	0.015	4556.1	78.98	79.26	0.139	4747	1.14
21.60	0.000	0.00	0.015	4557.9	78.68	78.95	0.138	4729	1.13
21.63	0.000	0.00	0.015	4559.8	78.37	78.65	0.138	4710	1.13
21.67	0.000	0.00	0.015	4561.6	78.07	78.34	0.137	4692	1.13
21.70	0.000	0.00	0.015	4563.5	77.76	78.03	0.136	4674	1.13
21.73	0.000	0.00	0.015	4565.3	77.46	77.73	0.136	4656	1.12
21.77	0.000	0.00	0.015	4567.1	77.16	77.43	0.135	4638	1.12
21.80	0.000	0.00	0.015	4569.0	76.86	77.13	0.134	4620	1.12
21.83	0.000	0.00	0.015	4570.8	76.56	76.83	0.133	4602	1.11
21.87	0.000	0.00	0.015	4572.7	76.27	76.53	0.133	4584	1.11
21.90	0.000	0.00	0.015	4574.5	75.97	76.24	0.132	4566	1.11
21.93	0.000	0.00	0.015	4576.3	75.68	75.94	0.131	4549	1.11
21.97	0.000	0.00	0.015	4578.2	75.39	75.65	0.130	4531	1.10
22.00	0.000	0.00	0.015	4580.0	75.10	75.36	0.129	4514	1.10
22.03	0.000	0.00	0.015	4581.9	74.81	75.07	0.129	4496	1.10
22.07	0.000	0.00	0.015	4583.7	74.53	74.78	0.128	4479	1.10
22.10	0.000	0.00	0.015	4585.5	74.24	74.49	0.127	4462	1.09
22.13	0.000	0.00	0.015	4587.4	73.96	74.21	0.126	4445	1.09
22.17	0.000	0.00	0.015	4589.2	73.67	73.93	0.126	4428	1.09
22.20	0.000	0.00	0.015	4591.0	73.39	73.64	0.125	4411	1.08
22.23	0.000	0.00	0.015	4592.9	73.12	73.36	0.124	4394	1.08
22.27	0.000	0.00	0.015	4594.7	72.84	73.08	0.124	4378	1.08
22.30	0.000	0.00	0.015	4596.5	72.56	72.81	0.123	4361	1.08

time (hr)	Inflow, In (cfs)	In+In+1 (cfs)	fn (cfs)	Inf. Vol, F (ft3)	2S1/At+O1 (cfs)	2S2/At+O2 (cfs)	Outflow, On (cfs)	Volume, S (ft3)	Elevation, h (ft-osl)
22.33	0.000	0.00	0.015	4598.4	72.29	72.53	0.122	4345	1.07
22.37	0.000	0.00	0.015	4600.2	72.01	72.26	0.121	4328	1.07
22.40	0.000	0.00	0.015	4602.0	71.74	71.98	0.121	4312	1.07
22.43	0.000	0.00	0.015	4603.8	71.47	71.71	0.120	4295	1.07
22.47	0.000	0.00	0.015	4605.7	71.20	71.44	0.119	4279	1.06
22.50	0.000	0.00	0.015	4607.5	70.93	71.17	0.119	4263	1.06
22.53	0.000	0.00	0.015	4609.3	70.67	70.90	0.118	4247	1.06
22.57	0.000	0.00	0.015	4611.1	70.40	70.64	0.117	4231	1.06
22.60	0.000	0.00	0.015	4613.0	70.14	70.37	0.116	4215	1.05
22.63	0.000	0.00	0.015	4614.8	69.88	70.11	0.116	4200	1.05
22.67	0.000	0.00	0.015	4616.6	69.62	69.85	0.115	4184	1.05
22.70	0.000	0.00	0.015	4618.4	69.36	69.59	0.114	4168	1.05
22.73	0.000	0.00	0.015	4620.3	69.10	69.33	0.114	4153	1.04
22.77	0.000	0.00	0.015	4622.1	68.84	69.07	0.113	4137	1.04
22.80	0.000	0.00	0.015	4623.9	68.59	68.81	0.112	4122	1.04
22.83	0.000	0.00	0.015	4625.7	68.33	68.56	0.112	4107	1.04
22.87	0.000	0.00	0.015	4627.6	68.08	68.30	0.111	4092	1.03
22.90	0.000	0.00	0.015	4629.4	67.83	68.05	0.110	4076	1.03
22.93	0.000	0.00	0.015	4631.2	67.58	67.80	0.110	4061	1.03
22.97	0.000	0.00	0.015	4633.0	67.33	67.55	0.109	4046	1.03
23.00	0.000	0.00	0.015	4634.8	67.08	67.30	0.108	4032	1.02
23.03	0.000	0.00	0.015	4636.6	66.84	67.05	0.108	4017	1.02
23.07	0.000	0.00	0.015	4638.5	66.59	66.81	0.107	4002	1.02
23.10	0.000	0.00	0.015	4640.3	66.35	66.56	0.107	3987	1.02
23.13	0.000	0.00	0.015	4642.1	66.11	66.32	0.106	3973	1.01
23.17	0.000	0.00	0.015	4643.9	65.87	66.08	0.105	3958	1.01
23.20	0.000	0.00	0.015	4645.7	65.63	65.84	0.105	3944	1.01
23.23	0.000	0.00	0.015	4647.5	65.39	65.60	0.104	3930	1.01
23.27	0.000	0.00	0.015	4649.4	65.15	65.36	0.103	3915	1.01
23.30	0.000	0.00	0.015	4651.2	64.92	65.12	0.103	3901	1.00
23.33	0.000	0.00	0.015	4653.0	64.68	64.89	0.102	3887	1.00
23.37	0.000	0.00	0.015	4654.8	64.45	64.65	0.101	3873	1.00
23.40	0.000	0.00	0.015	4656.6	64.22	64.42	0.100	3859	1.00
23.43	0.000	0.00	0.015	4658.4	63.99	64.19	0.099	3845	0.99
23.47	0.000	0.00	0.015	4660.2	63.76	63.96	0.098	3832	0.99
23.50	0.000	0.00	0.015	4662.0	63.54	63.73	0.097	3818	0.99
23.53	0.000	0.00	0.015	4663.8	63.32	63.51	0.096	3805	0.99
23.57	0.000	0.00	0.015	4665.7	63.10	63.29	0.095	3792	0.99
23.60	0.000	0.00	0.015	4667.5	62.88	63.07	0.094	3778	0.98
23.63	0.000	0.00	0.015	4669.3	62.66	62.85	0.093	3765	0.98
23.67	0.000	0.00	0.015	4671.1	62.45	62.63	0.092	3753	0.98
23.70	0.000	0.00	0.015	4672.9	62.24	62.42	0.091	3740	0.98
23.73	0.000	0.00	0.015	4674.7	62.03	62.21	0.090	3727	0.98
23.77	0.000	0.00	0.015	4676.5	61.82	62.00	0.089	3715	0.97
23.80	0.000	0.00	0.015	4678.3	61.62	61.79	0.088	3702	0.97
23.83	0.000	0.00	0.015	4680.1	61.41	61.59	0.087	3690	0.97
23.87	0.000	0.00	0.015	4681.9	61.21	61.38	0.086	3678	0.97
23.90	0.000	0.00	0.015	4683.7	61.01	61.18	0.085	3666	0.97
23.93	0.000	0.00	0.015	4685.5	60.82	60.98	0.084	3654	0.96
23.97	0.000	0.00	0.015	4687.3	60.62	60.79	0.083	3642	0.96
24.00	0.000	0.00	0.015	4689.1	60.43	60.59	0.082	3630	0.96
24.03	0.000	0.00	0.015	4690.9	60.23	60.40	0.081	3619	0.96

time (hr)	Inflow, In (cfs)	In+In+1 (cfs)	fn (cfs)	Inf. Vol, F (ft3)	2S1/At+O1 (cfs)	2S2/At+O2 (cfs)	Outflow, On (cfs)	Volume, S (ft3)	Elevation, h (ft-osl)
24.07	0.000	0.00	0.015	4692.7	60.04	60.20	0.080	3607	0.96
24.10	0.000	0.00	0.015	4694.5	59.86	60.01	0.079	3596	0.96
24.13	0.000	0.00	0.015	4696.3	59.67	59.83	0.078	3585	0.95
24.17	0.000	0.00	0.015	4698.1	59.48	59.64	0.077	3574	0.95
24.20	0.000	0.00	0.015	4699.9	59.30	59.45	0.076	3563	0.95
24.23	0.000	0.00	0.015	4701.7	59.12	59.27	0.076	3552	0.95
24.27	0.000	0.00	0.015	4703.5	58.94	59.09	0.075	3541	0.95
24.30	0.000	0.00	0.015	4705.3	58.76	58.91	0.074	3530	0.94
24.33	0.000	0.00	0.015	4707.1	58.59	58.73	0.073	3520	0.94
24.37	0.000	0.00	0.015	4708.9	58.41	58.56	0.072	3509	0.94
24.40	0.000	0.00	0.015	4710.7	58.24	58.38	0.071	3499	0.94
24.43	0.000	0.00	0.015	4712.5	58.07	58.21	0.071	3488	0.94
24.47	0.000	0.00	0.015	4714.3	57.90	58.04	0.070	3478	0.94
24.50	0.000	0.00	0.015	4716.1	57.73	57.87	0.069	3468	0.93
24.53	0.000	0.00	0.015	4717.9	57.57	57.70	0.068	3458	0.93
24.57	0.000	0.00	0.015	4719.7	57.40	57.54	0.067	3448	0.93
24.60	0.000	0.00	0.015	4721.5	57.24	57.37	0.067	3438	0.93
24.63	0.000	0.00	0.015	4723.3	57.08	57.21	0.066	3429	0.93
24.67	0.000	0.00	0.015	4725.1	56.92	57.05	0.065	3419	0.93
24.70	0.000	0.00	0.015	4726.9	56.76	56.89	0.064	3409	0.93
24.73	0.000	0.00	0.015	4728.7	56.60	56.73	0.063	3400	0.92
24.77	0.000	0.00	0.015	4730.4	56.45	56.57	0.063	3391	0.92
24.80	0.000	0.00	0.015	4732.2	56.29	56.42	0.062	3381	0.92
24.83	0.000	0.00	0.015	4734.0	56.14	56.26	0.061	3372	0.92
24.87	0.000	0.00	0.015	4735.8	55.99	56.11	0.060	3363	0.92
24.90	0.000	0.00	0.015	4737.6	55.84	55.96	0.060	3354	0.92
24.93	0.000	0.00	0.015	4739.4	55.69	55.81	0.059	3345	0.92
24.97	0.000	0.00	0.015	4741.2	55.55	55.66	0.058	3336	0.91
25.00	0.000	0.00	0.015	4743.0	55.40	55.52	0.058	3328	0.91
25.03	0.000	0.00	0.015	4744.8	55.26	55.37	0.057	3319	0.91
25.07	0.000	0.00	0.015	4746.6	55.12	55.23	0.056	3310	0.91
25.10	0.000	0.00	0.015	4748.3	54.97	55.09	0.056	3302	0.91
25.13	0.000	0.00	0.015	4750.1	54.83	54.94	0.055	3293	0.91
25.17	0.000	0.00	0.015	4751.9	54.70	54.80	0.054	3285	0.91
25.20	0.000	0.00	0.015	4753.7	54.56	54.67	0.054	3277	0.90
25.23	0.000	0.00	0.015	4755.5	54.42	54.53	0.053	3269	0.90
25.27	0.000	0.00	0.015	4757.3	54.29	54.39	0.052	3261	0.90
25.30	0.000	0.00	0.015	4759.1	54.16	54.26	0.052	3252	0.90
25.33	0.000	0.00	0.015	4760.9	54.02	54.13	0.051	3245	0.90
25.37	0.000	0.00	0.015	4762.6	53.89	54.00	0.050	3237	0.90
25.40	0.000	0.00	0.015	4764.4	53.77	53.86	0.050	3229	0.90
25.43	0.000	0.00	0.015	4766.2	53.64	53.74	0.049	3221	0.90
25.47	0.000	0.00	0.015	4768.0	53.51	53.61	0.048	3214	0.89
25.50	0.000	0.00	0.015	4769.8	53.39	53.48	0.048	3206	0.89
25.53	0.000	0.00	0.015	4771.6	53.26	53.36	0.047	3198	0.89
25.57	0.000	0.00	0.015	4773.3	53.14	53.23	0.047	3191	0.89
25.60	0.000	0.00	0.015	4775.1	53.02	53.11	0.046	3184	0.89
25.63	0.000	0.00	0.015	4776.9	52.90	52.99	0.046	3176	0.89
25.67	0.000	0.00	0.015	4778.7	52.78	52.87	0.045	3169	0.89
25.70	0.000	0.00	0.015	4780.5	52.66	52.75	0.044	3162	0.89
25.73	0.000	0.00	0.015	4782.3	52.54	52.63	0.044	3155	0.89
25.77	0.000	0.00	0.015	4784.0	52.42	52.51	0.043	3148	0.88

time (hr)	Inflow, In (cfs)	In+In+1 (cfs)	fn (cfs)	Inf. Vol, F (ft3)	2S1/At-O1 (cfs)	2S2/At+O2 (cfs)	Outflow, On (cfs)	Volume, S (ft3)	Elevation, h (ft-osl)
25.80	0.000	0.00	0.015	4785.8	52.31	52.39	0.043	3141	0.88
25.83	0.000	0.00	0.015	4787.6	52.19	52.28	0.042	3134	0.88
25.87	0.000	0.00	0.015	4789.4	52.08	52.16	0.042	3127	0.88
25.90	0.000	0.00	0.015	4791.2	51.97	52.05	0.041	3121	0.88
25.93	0.000	0.00	0.015	4793.0	51.86	51.94	0.041	3114	0.88
25.97	0.000	0.00	0.015	4794.7	51.75	51.83	0.040	3107	0.88
26.00	0.000	0.00	0.015	4796.5	51.64	51.72	0.039	3101	0.88
26.03	0.000	0.00	0.015	4798.3	51.53	51.61	0.039	3094	0.88
26.07	0.000	0.00	0.015	4800.1	51.43	51.50	0.039	3088	0.87
26.10	0.000	0.00	0.015	4801.9	51.32	51.40	0.038	3082	0.87
26.13	0.000	0.00	0.015	4803.6	51.22	51.29	0.038	3075	0.87
26.17	0.000	0.00	0.015	4805.4	51.11	51.19	0.038	3069	0.87
26.20	0.000	0.00	0.015	4807.2	51.01	51.08	0.037	3063	0.87
26.23	0.000	0.00	0.015	4809.0	50.90	50.98	0.037	3056	0.87
26.27	0.000	0.00	0.015	4810.7	50.80	50.87	0.037	3050	0.87
26.30	0.000	0.00	0.015	4812.5	50.70	50.77	0.036	3044	0.87
26.33	0.000	0.00	0.015	4814.3	50.60	50.67	0.036	3038	0.87
26.37	0.000	0.00	0.015	4816.1	50.49	50.57	0.036	3032	0.87
26.40	0.000	0.00	0.015	4817.9	50.39	50.46	0.035	3026	0.86
26.43	0.000	0.00	0.015	4819.6	50.29	50.36	0.035	3020	0.86
26.47	0.000	0.00	0.015	4821.4	50.19	50.26	0.035	3014	0.86
26.50	0.000	0.00	0.015	4823.2	50.10	50.16	0.035	3008	0.86
26.53	0.000	0.00	0.015	4825.0	50.00	50.07	0.034	3002	0.86
26.57	0.000	0.00	0.015	4826.7	49.90	49.97	0.034	2996	0.86
26.60	0.000	0.00	0.015	4828.5	49.80	49.87	0.034	2990	0.86
26.63	0.000	0.00	0.015	4830.3	49.71	49.77	0.033	2984	0.86
26.67	0.000	0.00	0.015	4832.1	49.61	49.68	0.033	2979	0.86
26.70	0.000	0.00	0.015	4833.8	49.52	49.58	0.033	2973	0.86
26.73	0.000	0.00	0.015	4835.6	49.42	49.49	0.033	2967	0.86
26.77	0.000	0.00	0.015	4837.4	49.33	49.39	0.032	2962	0.85
26.80	0.000	0.00	0.015	4839.2	49.23	49.30	0.032	2956	0.85
26.83	0.000	0.00	0.015	4840.9	49.14	49.20	0.032	2950	0.85
26.87	0.000	0.00	0.015	4842.7	49.05	49.11	0.031	2945	0.85
26.90	0.000	0.00	0.015	4844.5	48.96	49.02	0.031	2939	0.85
26.93	0.000	0.00	0.015	4846.2	48.86	48.93	0.031	2934	0.85
26.97	0.000	0.00	0.015	4848.0	48.77	48.83	0.031	2928	0.85
27.00	0.000	0.00	0.015	4849.8	48.68	48.74	0.030	2923	0.85
27.03	0.000	0.00	0.015	4851.6	48.59	48.65	0.030	2917	0.85
27.07	0.000	0.00	0.015	4853.3	48.50	48.56	0.030	2912	0.85
27.10	0.000	0.00	0.015	4855.1	48.41	48.47	0.030	2907	0.85
27.13	0.000	0.00	0.015	4856.9	48.33	48.38	0.029	2901	0.84
27.17	0.000	0.00	0.015	4858.6	48.24	48.30	0.029	2896	0.84
27.20	0.000	0.00	0.015	4860.4	48.15	48.21	0.029	2891	0.84
27.23	0.000	0.00	0.015	4862.2	48.06	48.12	0.029	2886	0.84
27.27	0.000	0.00	0.015	4864.0	47.98	48.04	0.028	2880	0.84
27.30	0.000	0.00	0.015	4865.7	47.89	47.95	0.028	2875	0.84
27.33	0.000	0.00	0.015	4867.5	47.81	47.86	0.028	2870	0.84
27.37	0.000	0.00	0.015	4869.3	47.72	47.78	0.028	2865	0.84
27.40	0.000	0.00	0.015	4871.0	47.64	47.69	0.027	2860	0.84
27.43	0.000	0.00	0.015	4872.8	47.56	47.61	0.027	2855	0.84
27.47	0.000	0.00	0.015	4874.6	47.47	47.53	0.027	2850	0.84
27.50	0.000	0.00	0.015	4876.3	47.39	47.44	0.027	2845	0.84

time (hr)	Inflow, In (cfs)	In+In+1 (cfs)	fn (cfs)	Inf. Vol, F (ft3)	2S1/At+O1 (cfs)	2S2/At+O2 (cfs)	Outflow, On (cfs)	Volume, S (ft3)	Elevation, h (ft-osl)
27.53	0.000	0.00	0.015	4878.1	47.31	47.36	0.026	2840	0.84
27.57	0.000	0.00	0.015	4879.9	47.23	47.28	0.026	2835	0.83
27.60	0.000	0.00	0.015	4881.7	47.14	47.20	0.026	2830	0.83
27.63	0.000	0.00	0.015	4883.4	47.06	47.11	0.026	2825	0.83
27.67	0.000	0.00	0.015	4885.2	46.98	47.03	0.025	2821	0.83
27.70	0.000	0.00	0.015	4887.0	46.90	46.95	0.025	2816	0.83
27.73	0.000	0.00	0.015	4888.7	46.82	46.87	0.025	2811	0.83
27.77	0.000	0.00	0.015	4890.5	46.75	46.80	0.025	2806	0.83
27.80	0.000	0.00	0.015	4892.3	46.67	46.72	0.024	2802	0.83
27.83	0.000	0.00	0.015	4894.0	46.59	46.64	0.024	2797	0.83
27.87	0.000	0.00	0.015	4895.8	46.51	46.56	0.024	2792	0.83
27.90	0.000	0.00	0.015	4897.6	46.44	46.48	0.024	2788	0.83
27.93	0.000	0.00	0.015	4899.3	46.36	46.41	0.024	2783	0.83
27.97	0.000	0.00	0.015	4901.1	46.28	46.33	0.023	2778	0.83
28.00	0.000	0.00	0.015	4902.9	46.21	46.25	0.023	2774	0.82
28.03	0.000	0.00	0.015	4904.6	46.13	46.18	0.023	2769	0.82
28.07	0.000	0.00	0.015	4906.4	46.06	46.10	0.023	2765	0.82
28.10	0.000	0.00	0.015	4908.2	45.98	46.03	0.022	2760	0.82
28.13	0.000	0.00	0.015	4909.9	45.91	45.95	0.022	2756	0.82
28.17	0.000	0.00	0.015	4911.7	45.84	45.88	0.022	2751	0.82
28.20	0.000	0.00	0.015	4913.4	45.76	45.81	0.022	2747	0.82
28.23	0.000	0.00	0.015	4915.2	45.69	45.73	0.022	2743	0.82
28.27	0.000	0.00	0.015	4917.0	45.62	45.66	0.021	2738	0.82
28.30	0.000	0.00	0.015	4918.7	45.55	45.59	0.021	2734	0.82
28.33	0.000	0.00	0.015	4920.5	45.48	45.52	0.021	2730	0.82
28.37	0.000	0.00	0.015	4922.3	45.40	45.45	0.021	2725	0.82
28.40	0.000	0.00	0.015	4924.0	45.33	45.37	0.021	2721	0.82
28.43	0.000	0.00	0.015	4925.8	45.26	45.30	0.020	2717	0.82
28.47	0.000	0.00	0.015	4927.6	45.19	45.23	0.020	2713	0.81
28.50	0.000	0.00	0.015	4929.3	45.13	45.16	0.020	2709	0.81
28.53	0.000	0.00	0.015	4931.1	45.06	45.10	0.020	2705	0.81
28.57	0.000	0.00	0.015	4932.8	44.99	45.03	0.019	2700	0.81
28.60	0.000	0.00	0.015	4934.6	44.92	44.96	0.019	2696	0.81
28.63	0.000	0.00	0.015	4936.4	44.85	44.89	0.019	2692	0.81
28.67	0.000	0.00	0.015	4938.1	44.79	44.82	0.019	2688	0.81
28.70	0.000	0.00	0.015	4939.9	44.72	44.76	0.019	2684	0.81
28.73	0.000	0.00	0.015	4941.6	44.65	44.69	0.018	2680	0.81
28.77	0.000	0.00	0.015	4943.4	44.59	44.62	0.018	2676	0.81
28.80	0.000	0.00	0.015	4945.2	44.52	44.56	0.018	2672	0.81
28.83	0.000	0.00	0.015	4946.9	44.46	44.49	0.018	2668	0.81
28.87	0.000	0.00	0.015	4948.7	44.39	44.43	0.018	2665	0.81
28.90	0.000	0.00	0.015	4950.5	44.33	44.36	0.018	2661	0.81
28.93	0.000	0.00	0.015	4952.2	44.26	44.30	0.017	2657	0.81
28.97	0.000	0.00	0.015	4954.0	44.20	44.23	0.017	2653	0.81
29.00	0.000	0.00	0.015	4955.7	44.14	44.17	0.017	2649	0.80
29.03	0.000	0.00	0.015	4957.5	44.07	44.11	0.017	2645	0.80
29.07	0.000	0.00	0.015	4959.3	44.01	44.04	0.017	2642	0.80
29.10	0.000	0.00	0.015	4961.0	43.95	43.98	0.016	2638	0.80
29.13	0.000	0.00	0.015	4962.8	43.89	43.92	0.016	2634	0.80
29.17	0.000	0.00	0.015	4964.5	43.82	43.86	0.016	2630	0.80
29.20	0.000	0.00	0.015	4966.3	43.76	43.80	0.016	2627	0.80
29.23	0.000	0.00	0.015	4968.0	43.70	43.73	0.016	2623	0.80

time (hr)	Inflow, In (cfs)	In+In+1 (cfs)	fn (cfs)	Inf. Vol, F (ft3)	2S1/At-O1 (cfs)	2S2/At+O2 (cfs)	Outflow, On (cfs)	Volume, S (ft3)	Elevation, h (ft-osl)
29.27	0.000	0.00	0.015	4969.8	43.64	43.67	0.016	2619	0.80
29.30	0.000	0.00	0.015	4971.6	43.58	43.61	0.015	2616	0.80
29.33	0.000	0.00	0.015	4973.3	43.52	43.55	0.015	2612	0.80
29.37	0.000	0.00	0.015	4975.1	43.46	43.49	0.015	2609	0.80
29.40	0.000	0.00	0.015	4976.8	43.41	43.43	0.015	2605	0.80
29.43	0.000	0.00	0.015	4978.6	43.35	43.38	0.015	2602	0.80
29.47	0.000	0.00	0.015	4980.4	43.29	43.32	0.014	2598	0.80
29.50	0.000	0.00	0.015	4982.1	43.23	43.26	0.014	2595	0.80
29.53	0.000	0.00	0.015	4983.9	43.17	43.20	0.014	2591	0.80
29.57	0.000	0.00	0.015	4985.6	43.12	43.14	0.014	2588	0.80
29.60	0.000	0.00	0.015	4987.4	43.06	43.09	0.014	2584	0.79
29.63	0.000	0.00	0.015	4989.1	43.00	43.03	0.014	2581	0.79
29.67	0.000	0.00	0.015	4990.9	42.95	42.97	0.013	2578	0.79
29.70	0.000	0.00	0.015	4992.7	42.89	42.92	0.013	2574	0.79
29.73	0.000	0.00	0.015	4994.4	42.83	42.86	0.013	2571	0.79
29.77	0.000	0.00	0.015	4996.2	42.78	42.81	0.013	2568	0.79
29.80	0.000	0.00	0.015	4997.9	42.72	42.75	0.013	2564	0.79
29.83	0.000	0.00	0.015	4999.7	42.67	42.70	0.013	2561	0.79
29.87	0.000	0.00	0.015	5001.4	42.62	42.64	0.012	2558	0.79
29.90	0.000	0.00	0.015	5003.2	42.56	42.59	0.012	2554	0.79
29.93	0.000	0.00	0.015	5004.9	42.51	42.53	0.012	2551	0.79
29.97	0.000	0.00	0.015	5006.7	42.46	42.48	0.012	2548	0.79
30.00	0.000	0.00	0.015	5008.5	42.40	42.43	0.012	2545	0.79
30.03	0.000	0.00	0.015	5010.2	42.35	42.37	0.012	2542	0.79
30.07	0.000	0.00	0.015	5012.0	42.30	42.32	0.012	2539	0.79
30.10	0.000	0.00	0.015	5013.7	42.25	42.27	0.011	2535	0.79
30.13	0.000	0.00	0.015	5015.5	42.19	42.22	0.011	2532	0.7862
30.17	0.000	0.00	0.015	5017.2	42.14	42.16	0.011	2529	0.7857
30.20	0.000	0.00	0.015	5019.0	42.09	42.11	0.011	2526	0.7853
30.23	0.000	0.00	0.015	5020.7	42.04	42.06	0.011	2523	0.7848
30.27	0.000	0.00	0.015	5022.5	41.99	42.01	0.011	2520	0.7843
30.30	0.000	0.00	0.015	5024.2	41.94	41.96	0.010	2517	0.7838
30.33	0.000	0.00	0.015	5026.0	41.89	41.91	0.010	2514	0.7833
30.37	0.000	0.00	0.015	5027.7	41.84	41.86	0.010	2511	0.7829
30.40	0.000	0.00	0.015	5029.5	41.79	41.81	0.010	2508	0.7824
30.43	0.000	0.00	0.015	5031.3	41.74	41.76	0.010	2505	0.7819
30.47	0.000	0.00	0.015	5033.0	41.69	41.71	0.010	2502	0.7815
30.50	0.000	0.00	0.015	5034.8	41.65	41.66	0.010	2499	0.7810
30.53	0.000	0.00	0.015	5036.5	41.60	41.62	0.009	2496	0.7805
30.57	0.000	0.00	0.015	5038.3	41.55	41.57	0.009	2494	0.7801
30.60	0.000	0.00	0.015	5040.0	41.50	41.52	0.009	2491	0.7796
30.63	0.000	0.00	0.015	5041.8	41.45	41.47	0.009	2488	0.7792
30.67	0.000	0.00	0.015	5043.5	41.41	41.43	0.009	2485	0.7787
30.70	0.000	0.00	0.015	5045.3	41.36	41.38	0.009	2482	0.7783
30.73	0.000	0.00	0.015	5047.0	41.31	41.33	0.009	2479	0.78
30.77	0.000	0.00	0.015	5048.8	41.27	41.29	0.008	2477	0.78
30.80	0.000	0.00	0.015	5050.5	41.22	41.24	0.008	2474	0.78
30.83	0.000	0.00	0.015	5052.3	41.18	41.19	0.008	2471	0.78
30.87	0.000	0.00	0.015	5054.0	41.13	41.15	0.008	2468	0.78
30.90	0.000	0.00	0.015	5055.8	41.09	41.10	0.008	2466	0.78
30.93	0.000	0.00	0.015	5057.5	41.04	41.06	0.008	2463	0.78
30.97	0.000	0.00	0.015	5059.3	41.00	41.01	0.008		

MODIFIED PULS

page # 1

At 0.033 hr

min 0 ft

datum: 0 ft

initial elev. 0 ft

Outlet structure:

Complex Hydromodification Structure

Safety Factor (infiltr): 1

Storage coefficients for Bio-Retention 5

 $S = ah^3 + bh^2 + ch$; (h: elevation over datum)

a NOT USED

b NOT USED ft

c NOT USED ft²

A 3072 sq-ft

f 0.1875 in/hr

Volume-elevation-Outflow curve**24 hr Storm Events ($\Delta t = 6.00$ min).**

S	h	Slope h/S	2S/At+O	O	Slope
0	0.000	0.0003	0.00	0.000	0.0000
2304	0.750	0.0002	38.40	0.000	0.0029
3092	0.875	0.0002	51.56	0.039	0.0048
3879	1.000	0.0002	64.75	0.102	0.0026
4667	1.125	0.0002	77.91	0.136	0.0021
5454	1.250	0.0002	91.06	0.163	0.0017
7029	1.500	0.0002	117.36	0.207	0.0014
8604	1.750	0.0002	143.64	0.244	0.0012
10179	2.000	0.0002	169.93	0.275	0.0011
11754	2.250	0.0002	196.20	0.303	0.0010
13329	2.500	0.0002	222.48	0.329	0.0009
14904	2.750	0.0002	248.75	0.353	0.0009
16479	3.000	0.0002	275.03	0.375	0.0008
18054	3.250	0.0002	301.30	0.397	0.0008
19629	3.500	0.0002	327.57	0.417	0.0007
21204	3.750	0.0002	353.84	0.436	0.0446
22254	3.917	0.0002	372.15	1.253	0.0328
22779	4.000	0.0002	381.20	1.550	0.0336
24354	4.250	0.0002	408.36	2.461	0.0360
25929	4.500	0.0002	435.59	3.442	0.0389
27504	4.750	0.0002	462.90	4.504	0.0417
29079	5.000	0.0002	490.30	5.646	0.0548
30654	5.250	0.0002	518.07	7.168	0.0364
32229	5.500	0.0002	545.31	8.159	0.0313
33804	5.750	0.0002	572.41	9.008	0.0282
35379	6.000	0.0002	599.42	9.770	0.0260
36954	6.250	0.0002	626.37	10.470	0.0243
38529	6.500	0.0002	653.27	11.123	0.0229
40104	6.750	0.0002	680.14	11.737	0.0217
41679	7.000	0.0002	706.97	12.318	0.0207
43254	7.250	0.0002	733.77	12.872	0.0198
44829	7.500	0.0002	760.55	13.403	0.0263
46121	7.705	0.0002	782.66	13.985	0.1114
47192	7.875	0.0002	802.75	16.224	0.1522
47979	8.000	0.0002	818.23	18.580	0.1852
49554	8.250	0.0002	850.45	24.546	0.2176
51129	8.500	0.0002	884.00	31.845	0.2426
52704	8.750		918.65	40.251	



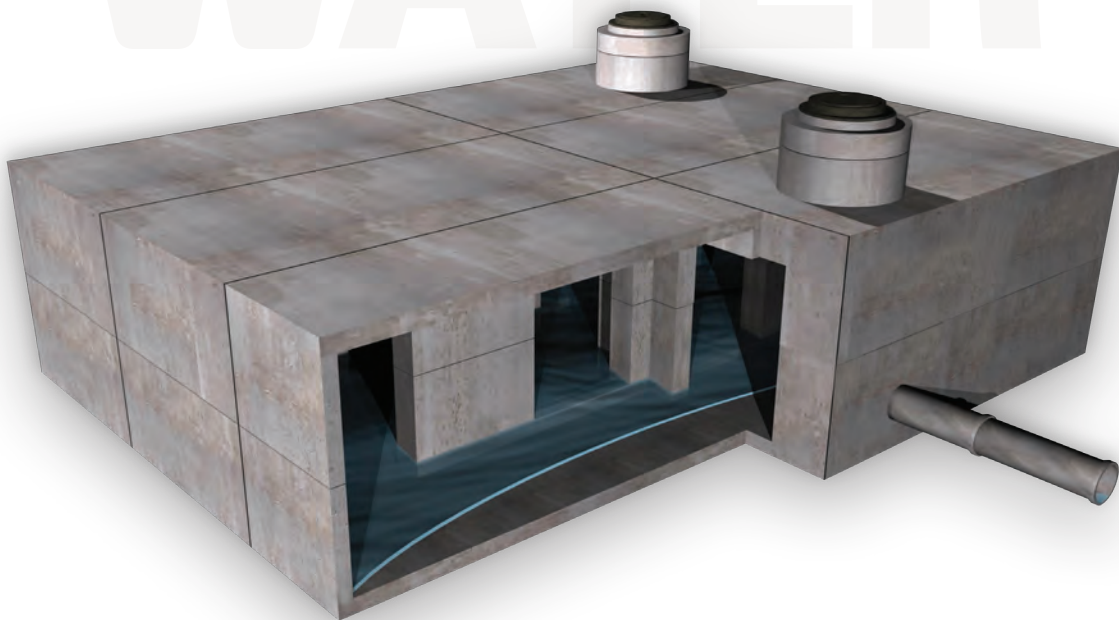
WEATHER the Storm



StormCapture® System

STORMCAPTURE[®]

Modular Stormwater Management System for Infiltration,
Detention, Retention, Treatment and Harvesting



StormCapture[®] System

Backfill Requirements—Modules are typically backfilled with existing site materials.

Custom Sizes—Available in internal heights from 2' to 14' to best-fit site needs.

Design Assistance—Let our professionals customize for your specific needs.

Easy to Install—Fast installation with minimal handling.

Large Storage Capacity—Smaller system footprint for greater design flexibility.

Modular Design—Precast concrete modules measure 8' wide by 16' long OD, (7' x 15' ID), with customizable heights.

Traffic Loading—Only requires 6" of cover.

Treatment Train—Available with pre-treatment, post-treatment, or both.

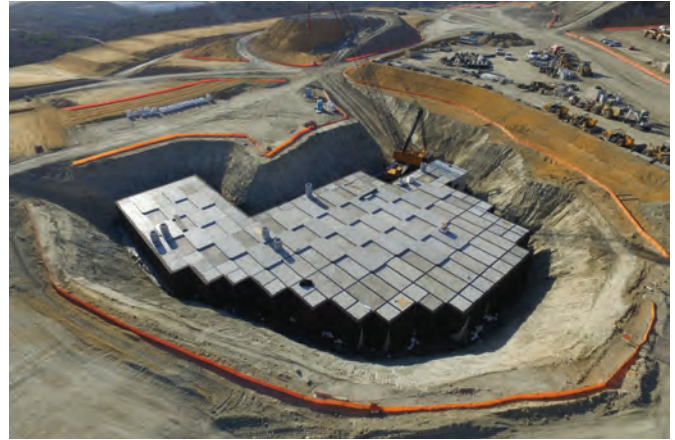


StormCapture Advantages

Same-day staging and installation of StormCapture project.



StormCapture offers fast installation with minimal handling.



StormCapture modules are designed for HS20 traffic loading.



Fast Service – Get help from our national engineering team with layouts and specifications to meet your project's requirements.

Cost Savings – Highly competitive installation and maintenance costs.

Codes – Designed to the latest codes for HS-20-44 (full truckload plus impact).

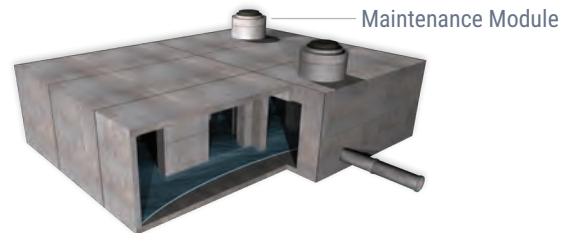
Sustainability – The system is maintainable for long-term sustainability.

LID – Ideal for Low-Impact Development (LID).

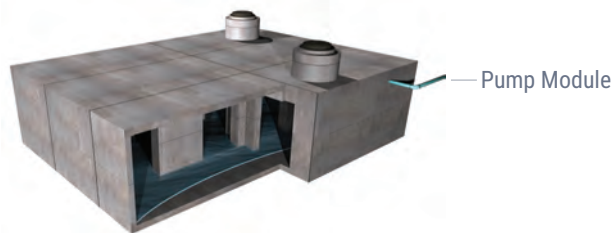
LEED – Manufactured locally with recycled material for potential LEED credits. LEED 2009 for New Construction & Major Renovation, U.S. Green Building Council: Sustainable Sites (5.1, 5.2, 6.1, 6.2), Materials & Resources (4.1, 4.2, 5.1, 5.2), Water Efficiency (1.1, 1.2, 3.1, 3.2).

Applications

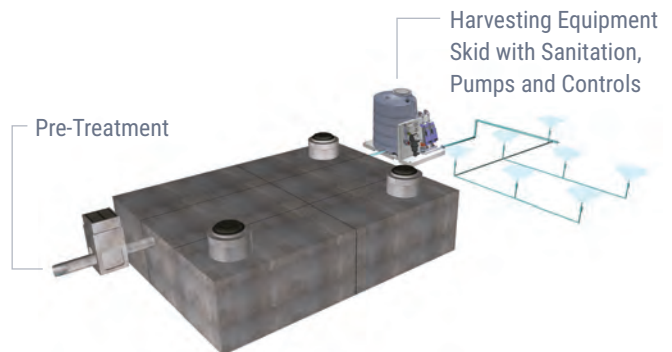
StormCapture offers numerous options for infiltration, detention, retention, treatment and harvesting to solve your stormwater management needs. Let us show you how we can design and customize a solution for you.



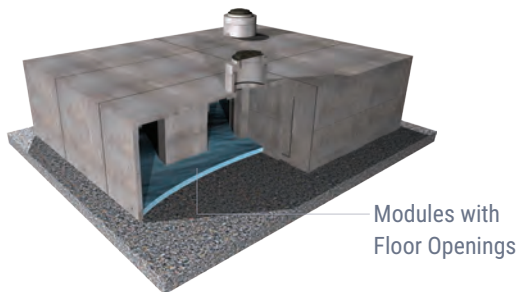
DETENTION



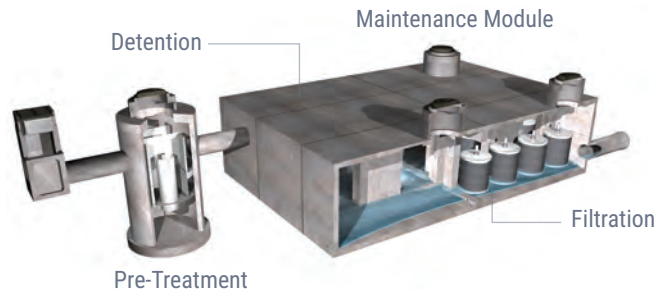
RETENTION



HARVESTING



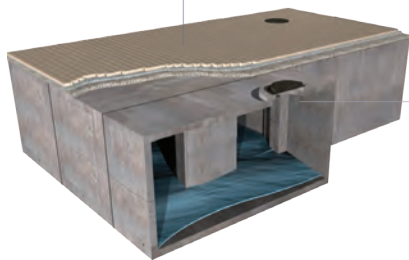
INFILTRATION



TREATMENT

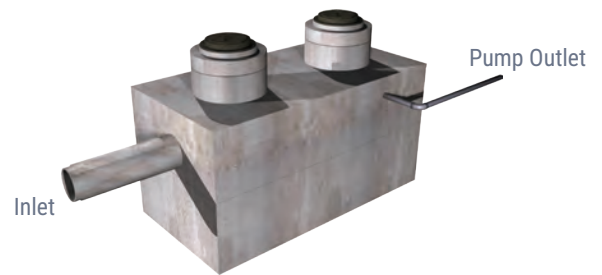


Permeable Interlocking
Concrete Pavers



Modules with
HydraPorts™

PERMECAPTURE

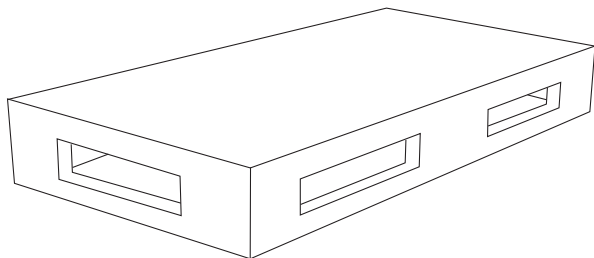


CISTERNS

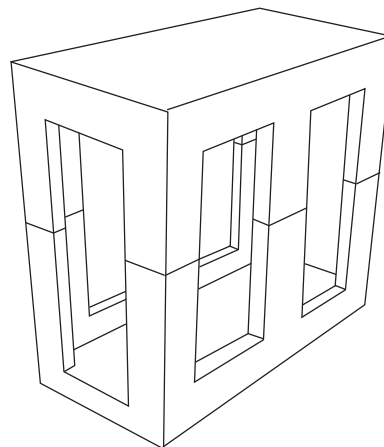
INSTALLED IN JUST ONE DAY



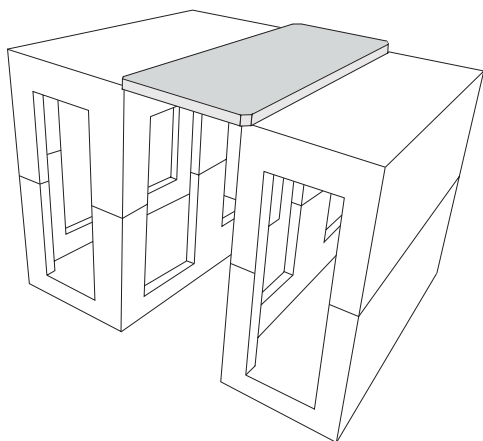
StormCapture Modules



SC1 - Single piece modules can be used for applications from 2' to 7' tall. Appropriate for cisterns, infiltration, detention and retention systems. SC1 modules are typically installed on minimally compacted gravel base, depending on specific project requirements.



SC2 - Two piece modules can be used for applications from 7' to 14' tall for maximum storage capacity in a condensed footprint. Appropriate for cisterns, infiltration, detention and retention systems. SC2 modules are typically installed on compacted native subgrade.



Link Slab - Unique design allows for significant reduction in the quantity of modules and associated costs, while providing maximum storage capacity.



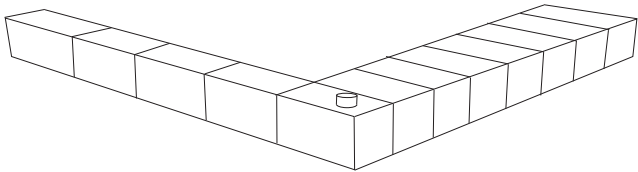
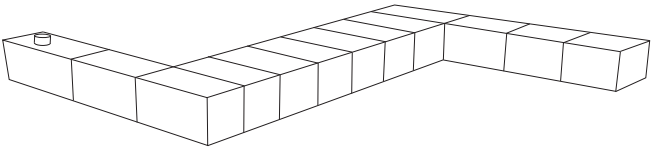
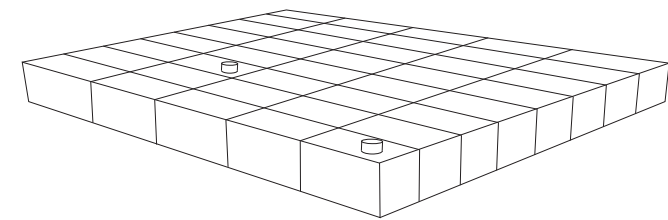
Module Sizes & Capacities

Modules are 8'x16' outside dimensions.
Capacity varies by configuration of openings.

INSIDE DIMENSIONS (FT)	CAPACITY RANGE (FT³)
7x15x2	210-212
7x15x3	315-325
7x15x4	420-442
7x15x5	525-559
7x15x6	630-678
7x15x7	735-793
7x15x8	840-910

INSIDE DIMENSIONS (FT)	CAPACITY RANGE (FT³)
7x15x9	945-1,027
7x15x10	1,050-1,140
7x15x11	1,155 - 1,257
7x15x12	1,260 - 1,374
7x15x13	1,365 -1,491
7x15x14	1,470 - 1,608

Endless Configurations



**Contact us today to start
designing your system!**



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Appendix F – Mitigated Post-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: 08/22/23

 1581 - CAMPUS PARK CONDOS PARCEL 2
 Q100, MITIGATED

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

Program License Serial Number 6292

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

Map data precipitation entered:
 6 hour, precipitation(inches) = 3.500
 24 hour precipitation(inches) = 6.000
 P6/P24 = 58.3%
 San Diego hydrology manual 'C' values used

+++++
 Process from Point/Station 1.000 to Point/Station 1.000
 **** USER DEFINED FLOW INFORMATION AT A POINT ****

 User specified 'C' value of 0.780 given for subarea
 Rainfall intensity (I) = 4.670(In/Hr) for a 100.0 year storm
 User specified values are as follows:
 TC = 14.36 min. Rain intensity = 4.67(In/Hr)
 Total area = 8.340(Ac.) Total runoff = 13.660(CFS)

+++++
 Process from Point/Station 1.000 to Point/Station 1.223
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

 Upstream point/station elevation = 348.000(Ft.)
 Downstream point/station elevation = 345.000(Ft.)
 Pipe length = 148.70(Ft.) Slope = 0.0202 Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 13.660(CFS)
 Nearest computed pipe diameter = 18.00(In.)
 Calculated individual pipe flow = 13.660(CFS)
 Normal flow depth in pipe = 13.55(In.)
 Flow top width inside pipe = 15.53(In.)
 Critical Depth = 16.47(In.)
 Pipe flow velocity = 9.57(Ft/s)

Travel time through pipe = 0.26 min.
 Time of concentration (TC) = 14.62 min.

+++++
 Process from Point/Station 1.223 to Point/Station 1.223
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1
 Stream flow area = 8.340(Ac.)
 Runoff from this stream = 13.660(CFS)
 Time of concentration = 14.62 min.
 Rainfall intensity = 4.616(In/Hr)
 Program is now starting with Main Stream No. 2

+++++
 Process from Point/Station 1.211 to Point/Station 1.221
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 [HIGH DENSITY RESIDENTIAL]
 (43.0 DU/A or Less)
 Impervious value, Ai = 0.800
 Sub-Area C Value = 0.780
 Initial subarea total flow distance = 65.000(Ft.)
 Highest elevation = 357.600(Ft.)
 Lowest elevation = 352.800(Ft.)
 Elevation difference = 4.800(Ft.) Slope = 7.385 %
 Top of Initial Area Slope adjusted by User to 7.400 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 95.00 (Ft)
 for the top area slope value of 7.40 %, in a development type of
 43.0 DU/A or Less
 In Accordance With Figure 3-3
 Initial Area Time of Concentration = 2.88 minutes
 $TC = [1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{.5} / (\% \text{ slope}^{(1/3)})]$
 $TC = [1.8 * (1.1 - 0.7800) * (95.000^{.5}) / (7.400^{(1/3)})] = 2.88$
 Calculated TC of 2.881 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
 Rainfall intensity (I) = 9.222(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.780
 Subarea runoff = 0.216(CFS)
 Total initial stream area = 0.030(Ac.)

+++++
 Process from Point/Station 1.221 to Point/Station 1.222
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 352.800(Ft.)
 Downstream point elevation = 351.400(Ft.)
 Channel length thru subarea = 14.000(Ft.)

Channel base width = 0.000(Ft.)
 Slope or 'Z' of left channel bank = 0.330
 Slope or 'Z' of right channel bank = 50.000
 Estimated mean flow rate at midpoint of channel = 0.396(CFS)
 Manning's 'N' = 0.015
 Maximum depth of channel = 0.500(Ft.)
 Flow(q) thru subarea = 0.396(CFS)
 Depth of flow = 0.069(Ft.), Average velocity = 3.292(Ft/s)
 Channel flow top width = 3.478(Ft.)
 Flow Velocity = 3.29(Ft/s)
 Travel time = 0.07 min.
 Time of concentration = 2.95 min.
 Critical depth = 0.109(Ft.)
 Adding area flow to channel
 Calculated TC of 2.952 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
 Rainfall intensity (I) = 9.222(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 = 1.000
 Decimal fraction soil group D = 0.000
 [HIGH DENSITY RESIDENTIAL]
 (43.0 DU/A or Less)
 Impervious value, Ai = 0.800
 Sub-Area C Value = 0.780
 Rainfall intensity = 9.222(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.780 CA = 0.062
 Subarea runoff = 0.360(CFS) for 0.050(Ac.)
 Total runoff = 0.575(CFS) Total area = 0.080(Ac.)
 Depth of flow = 0.080(Ft.), Average velocity = 3.615(Ft/s)
 Critical depth = 0.127(Ft.)

++++++
 Process from Point/Station 1.222 to Point/Station 1.223
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 348.900(Ft.)
 Downstream point/station elevation = 345.000(Ft.)
 Pipe length = 61.90(Ft.) Slope = 0.0630 Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 0.575(CFS)
 Nearest computed pipe diameter = 6.00(In.)
 Calculated individual pipe flow = 0.575(CFS)
 Normal flow depth in pipe = 2.67(In.)
 Flow top width inside pipe = 5.96(In.)
 Critical Depth = 4.64(In.)
 Pipe flow velocity = 6.81(Ft/s)
 Travel time through pipe = 0.15 min.
 Time of concentration (TC) = 3.10 min.

++++++
 Process from Point/Station 1.223 to Point/Station 1.223
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 0.080(Ac.)
 Runoff from this stream = 0.575(CFS)
 Time of concentration = 3.10 min.
 Rainfall intensity = 9.222(In/Hr)
 Summary of stream data:

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

1	13.660	14.62	4.616
2	0.575	3.10	9.222

Qmax(1) =
 1.000 * 1.000 * 13.660) +
 0.501 * 1.000 * 0.575) + = 13.948

Qmax(2) =
 1.000 * 0.212 * 13.660) +
 1.000 * 1.000 * 0.575) + = 3.475

Total of 2 main streams to confluence:

Flow rates before confluence point:

13.660 0.575

Maximum flow rates at confluence using above data:

13.948 3.475

Area of streams before confluence:

8.340 0.080

Results of confluence:

Total flow rate = 13.948(CFS)

Time of concentration = 14.619 min.

Effective stream area after confluence = 8.420(Ac.)

 Process from Point/Station 1.223 to Point/Station 1.243
 ***** PIPEFLOW TRAVEL TIME (Program estimated size) *****

Upstream point/station elevation = 345.000(Ft.)
 Downstream point/station elevation = 339.610(Ft.)
 Pipe length = 294.10(Ft.) Slope = 0.0183 Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 13.948(CFS)
 Nearest computed pipe diameter = 18.00(In.)
 Calculated individual pipe flow = 13.948(CFS)
 Normal flow depth in pipe = 14.44(In.)
 Flow top width inside pipe = 14.34(In.)
 Critical Depth = 16.55(In.)
 Pipe flow velocity = 9.17(Ft/s)
 Travel time through pipe = 0.53 min.
 Time of concentration (TC) = 15.15 min.

 Process from Point/Station 1.243 to Point/Station 1.243
 ***** CONFLUENCE OF MAIN STREAMS *****

The following data inside Main Stream is listed:

In Main Stream number: 1

Stream flow area = 8.420(Ac.)

Runoff from this stream = 13.948(CFS)

Time of concentration = 15.15 min.

Rainfall intensity = 4.510(In/Hr)

Program is now starting with Main Stream No. 2

Process from Point/Station 1.231 to Point/Station 1.241
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 1.000

Decimal fraction soil group D = 0.000

[MEDIUM DENSITY RESIDENTIAL]

(14.5 DU/A or Less)

Impervious value, Ai = 0.500

Sub-Area C Value = 0.600

Initial subarea total flow distance = 65.000(Ft.)

Highest elevation = 352.900(Ft.)

Lowest elevation = 352.030(Ft.)

Elevation difference = 0.870(Ft.) Slope = 1.338 %

INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:

The maximum overland flow distance is 65.00 (Ft)

for the top area slope value of 1.34 %, in a development type of
14.5 DU/A or Less

In Accordance With Figure 3-3

Initial Area Time of Concentration = 6.58 minutes

TC = $[1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{.5} / (\% \text{ slope}^{(1/3)})]$

TC = $[1.8 * (1.1 - 0.6000) * (65.000^{.5}) / (1.340^{(1/3)})] = 6.58$

Rainfall intensity (I) = 7.724(In/Hr) for a 100.0 year storm

Effective runoff coefficient used for area (Q=KCIA) is C = 0.600

Subarea runoff = 0.185(CFS)

Total initial stream area = 0.040(Ac.)

Process from Point/Station 1.241 to Point/Station 1.242
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 352.030(Ft.)

Downstream point elevation = 350.040(Ft.)

Channel length thru subarea = 249.000(Ft.)

Channel base width = 0.000(Ft.)

Slope or 'Z' of left channel bank = 0.330

Slope or 'Z' of right channel bank = 50.000

Estimated mean flow rate at midpoint of channel = 2.223(CFS)

Manning's 'N' = 0.015

Maximum depth of channel = 0.500(Ft.)

Flow(q) thru subarea = 2.223(CFS)

Depth of flow = 0.212(Ft.), Average velocity = 1.965(Ft/s)

Channel flow top width = 10.672(Ft.)

Flow Velocity = 1.96(Ft/s)

Travel time = 2.11 min.

Time of concentration = 8.69 min.
 Critical depth = 0.217(Ft.)
 Adding area flow to channel
 Rainfall intensity (I) = 6.454(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 = 1.000
 Decimal fraction soil group D = 0.000
 [HIGH DENSITY RESIDENTIAL]
 (24.0 DU/A or Less)
 Impervious value, Ai = 0.650
 Sub-Area C Value = 0.690
 Rainfall intensity = 6.454(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.686 CA = 0.645
 Subarea runoff = 3.978(CFS) for 0.900(Ac.)
 Total runoff = 4.163(CFS) Total area = 0.940(Ac.)
 Depth of flow = 0.268(Ft.), Average velocity = 2.298(Ft/s)
 Critical depth = 0.279(Ft.)

++++++
 Process from Point/Station 1.242 to Point/Station 1.243
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 340.660(Ft.)
 Downstream point/station elevation = 339.610(Ft.)
 Pipe length = 16.10(Ft.) Slope = 0.0652 Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 4.163(CFS)
 Nearest computed pipe diameter = 9.00(In.)
 Calculated individual pipe flow = 4.163(CFS)
 Normal flow depth in pipe = 7.27(In.)
 Flow top width inside pipe = 7.10(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 10.90(Ft/s)
 Travel time through pipe = 0.02 min.
 Time of concentration (TC) = 8.72 min.

++++++
 Process from Point/Station 1.243 to Point/Station 1.243
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 0.940(Ac.)
 Runoff from this stream = 4.163(CFS)
 Time of concentration = 8.72 min.
 Rainfall intensity = 6.443(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	13.948	15.15	4.510
2	4.163	8.72	6.443

$Q_{\max}(1) =$
 $1.000 * 1.000 * 13.948) +$
 $0.700 * 1.000 * 4.163) + = 16.863$
 $Q_{\max}(2) =$
 $1.000 * 0.575 * 13.948) +$
 $1.000 * 1.000 * 4.163) + = 12.188$

Total of 2 main streams to confluence:

Flow rates before confluence point:

13.948 4.163

Maximum flow rates at confluence using above data:

16.863 12.188

Area of streams before confluence:

8.420 0.940

Results of confluence:

Total flow rate = 16.863(CFS)

Time of concentration = 15.153 min.

Effective stream area after confluence = 9.360(Ac.)

++++++
 Process from Point/Station 1.243 to Point/Station 1000.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 339.610(Ft.)
 Downstream point/station elevation = 339.120(Ft.)
 Pipe length = 61.60(Ft.) Slope = 0.0080 Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 16.863(CFS)
 Nearest computed pipe diameter = 24.00(In.)
 Calculated individual pipe flow = 16.863(CFS)
 Normal flow depth in pipe = 16.78(In.)
 Flow top width inside pipe = 22.01(In.)
 Critical Depth = 17.76(In.)
 Pipe flow velocity = 7.19(Ft/s)
 Travel time through pipe = 0.14 min.
 Time of concentration (TC) = 15.30 min.

++++++
 Process from Point/Station 2.022 to Point/Station 2.022
 **** USER DEFINED FLOW INFORMATION AT A POINT ****

User specified 'C' value of 0.750 given for subarea
 Rainfall intensity (I) = 4.676(In/Hr) for a 100.0 year storm
 User specified values are as follows:
 TC = 14.33 min. Rain intensity = 4.68(In/Hr)
 Total area = 2.950(Ac.) Total runoff = 3.940(CFS)

++++++
 Process from Point/Station 2.022 to Point/Station 2.022
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1

Stream flow area = 2.950(Ac.)
 Runoff from this stream = 3.940(CFS)
 Time of concentration = 14.33 min.
 Rainfall intensity = 4.676(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 = 1.000
 Decimal fraction soil group D = 0.000
 [MEDIUM DENSITY RESIDENTIAL]
 (14.5 DU/A or Less)
 Impervious value, Ai = 0.500
 Sub-Area C Value = 0.600
 Initial subarea total flow distance = 50.000(Ft.)
 Highest elevation = 354.800(Ft.)
 Lowest elevation = 354.300(Ft.)
 Elevation difference = 0.500(Ft.) Slope = 1.000 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 65.00 (Ft)
 for the top area slope value of 1.00 %, in a development type of
 14.5 DU/A or Less
 In Accordance With Figure 3-3
 Initial Area Time of Concentration = 7.26 minutes
 $TC = [1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{.5} / (\% \text{ slope}^{(1/3)})]$
 $TC = [1.8 * (1.1 - 0.6000) * (65.000^{.5}) / (1.000^{(1/3)})] = 7.26$
 Rainfall intensity (I) = 7.253(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
 Subarea runoff = 0.174(CFS)
 Total initial stream area = 0.040(Ac.)

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

Upstream point elevation = 354.300(Ft.)
 Downstream point elevation = 351.200(Ft.)
 Channel length thru subarea = 205.000(Ft.)
 Channel base width = 0.000(Ft.)
 Slope or 'Z' of left channel bank = 0.330
 Slope or 'Z' of right channel bank = 50.000
 Estimated mean flow rate at midpoint of channel = 0.853(CFS)
 Manning's 'N' = 0.015
 Maximum depth of channel = 0.500(Ft.)
 Flow(q) thru subarea = 0.853(CFS)
 Depth of flow = 0.131(Ft.), Average velocity = 1.964(Ft/s)
 Channel flow top width = 6.613(Ft.)
 Flow Velocity = 1.96(Ft/s)
 Travel time = 1.74 min.
 Time of concentration = 9.00 min.
 Critical depth = 0.148(Ft.)

Adding area flow to channel
 Rainfall intensity (I) = 6.314(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 = 1.000
 Decimal fraction soil group D = 0.000
 [MEDIUM DENSITY RESIDENTIAL]
 (7.3 DU/A or Less)
 Impervious value, Ai = 0.400
 Sub-Area C Value = 0.540
 Rainfall intensity = 6.314(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.546 CA = 0.235
 Subarea runoff = 1.307(CFS) for 0.390(Ac.)
 Total runoff = 1.481(CFS) Total area = 0.430(Ac.)
 Depth of flow = 0.162(Ft.), Average velocity = 2.255(Ft/s)
 Critical depth = 0.185(Ft.)

++++
 Process from Point/Station 2.022 to Point/Station 2.022
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 0.430(Ac.)
 Runoff from this stream = 1.481(CFS)
 Time of concentration = 9.00 min.
 Rainfall intensity = 6.314(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	3.940	14.33	4.676
2	1.481	9.00	6.314
Qmax(1) =			
	1.000 *	1.000 *	3.940) +
	0.741 *	1.000 *	1.481) + = 5.037
Qmax(2) =			
	1.000 *	0.628 *	3.940) +
	1.000 *	1.000 *	1.481) + = 3.955

Total of 2 main streams to confluence:

Flow rates before confluence point:

3.940 1.481

Maximum flow rates at confluence using above data:

5.037 3.955

Area of streams before confluence:

2.950 0.430

Results of confluence:

Total flow rate = 5.037(CFS)

Time of concentration = 14.330 min.

Effective stream area after confluence = 3.380(Ac.)


```

+++++
Process from Point/Station      2.022 to Point/Station      2000.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

```

```

Upstream point/station elevation = 341.750(Ft.)
Downstream point/station elevation = 340.250(Ft.)
Pipe length = 22.30(Ft.) Slope = 0.0673 Manning's N = 0.015
No. of pipes = 1 Required pipe flow = 5.037(CFS)
Given pipe size = 36.00(In.)
Calculated individual pipe flow = 5.037(CFS)
Normal flow depth in pipe = 4.52(In.)
Flow top width inside pipe = 23.85(In.)
Critical Depth = 8.41(In.)
Pipe flow velocity = 9.81(Ft/s)
Travel time through pipe = 0.04 min.
Time of concentration (TC) = 14.37 min.

```

```

+++++
Process from Point/Station      2000.000 to Point/Station      2000.000
**** CONFLUENCE OF MAIN STREAMS ****

```

The following data inside Main Stream is listed:

```

In Main Stream number: 1
Stream flow area = 3.380(Ac.)
Runoff from this stream = 5.037(CFS)
Time of concentration = 14.37 min.
Rainfall intensity = 4.668(In/Hr)
Program is now starting with Main Stream No. 2

```

```

+++++
Process from Point/Station      2.031 to Point/Station      2000.000
**** INITIAL AREA EVALUATION ****

```

```

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL ]
(1.0 DU/A or Less )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.360
Initial subarea total flow distance = 275.000(Ft.)
Highest elevation = 366.460(Ft.)
Lowest elevation = 352.040(Ft.)
Elevation difference = 14.420(Ft.) Slope = 5.244 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of 5.24 %, in a development type of
1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 7.67 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(% slope^(1/3))
TC = [1.8*(1.1-0.3600)*( 100.000^0.5)]/( 5.240^(1/3))= 7.67

```

Rainfall intensity (I) = 6.998(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.360
 Subarea runoff = 0.605(CFS)
 Total initial stream area = 0.240(Ac.)

++++++
 Process from Point/Station 2000.000 to Point/Station 2000.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 0.240(Ac.)
 Runoff from this stream = 0.605(CFS)
 Time of concentration = 7.67 min.
 Rainfall intensity = 6.998(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	5.037	14.37	4.668
2	0.605	7.67	6.998
Qmax(1) =			
	1.000 *	1.000 *	5.037) +
	0.667 *	1.000 *	0.605) + = 5.440
Qmax(2) =			
	1.000 *	0.534 *	5.037) +
	1.000 *	1.000 *	0.605) + = 3.293

Total of 2 main streams to confluence:

Flow rates before confluence point:

5.037 0.605

Maximum flow rates at confluence using above data:

5.440 3.293

Area of streams before confluence:

3.380 0.240

Results of confluence:

Total flow rate = 5.440(CFS)

Time of concentration = 14.368 min.

Effective stream area after confluence = 3.620(Ac.)

++++++
 Process from Point/Station 3.011 to Point/Station 3.021
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 1.000

Decimal fraction soil group D = 0.000

[UNDISTURBED NATURAL TERRAIN

(Permanent Open Space)

Impervious value, Ai = 0.000

Sub-Area C Value = 0.300
 Initial subarea total flow distance = 70.000(Ft.)
 Highest elevation = 350.800(Ft.)
 Lowest elevation = 349.800(Ft.)
 Elevation difference = 1.000(Ft.) Slope = 1.429 %
 Top of Initial Area Slope adjusted by User to 1.400 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 70.00 (Ft)
 for the top area slope value of 1.40 %, in a development type of
 Permanent Open Space
 In Accordance With Table 3-2
 Initial Area Time of Concentration = 12.50 minutes
 (for slope value of 1.00 %)
 Rainfall intensity (I) = 5.107(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.300
 Subarea runoff = 0.123(CFS)
 Total initial stream area = 0.080(Ac.)

++++++
 Process from Point/Station 3.021 to Point/Station 3.031
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 349.800(Ft.)
 Downstream point elevation = 347.800(Ft.)
 Channel length thru subarea = 280.000(Ft.)
 Channel base width = 10.000(Ft.)
 Slope or 'Z' of left channel bank = 20.000
 Slope or 'Z' of right channel bank = 20.000
 Estimated mean flow rate at midpoint of channel = 0.886(CFS)
 Manning's 'N' = 0.035
 Maximum depth of channel = 1.000(Ft.)
 Flow(q) thru subarea = 0.886(CFS)
 Depth of flow = 0.103(Ft.), Average velocity = 0.711(Ft/s)
 Channel flow top width = 14.133(Ft.)
 Flow Velocity = 0.71(Ft/s)
 Travel time = 6.56 min.
 Time of concentration = 19.06 min.
 Critical depth = 0.060(Ft.)
 Adding area flow to channel
 Rainfall intensity (I) = 3.890(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 = 1.000
 Decimal fraction soil group D = 0.000
 [LOW DENSITY RESIDENTIAL]
 (1.0 DU/A or Less)
 Impervious value, Ai = 0.100
 Sub-Area C Value = 0.360
 Rainfall intensity = 3.890(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.356 CA = 0.402
 Subarea runoff = 1.441(CFS) for 1.050(Ac.)
 Total runoff = 1.564(CFS) Total area = 1.130(Ac.)
 Depth of flow = 0.142(Ft.), Average velocity = 0.856(Ft/s)
 Critical depth = 0.086(Ft.)

+++++
 Process from Point/Station 3.031 to Point/Station 3.032
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 347.800(Ft.)
 End of street segment elevation = 328.100(Ft.)
 Length of street segment = 560.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 32.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 1.500(Ft.)
 Gutter hike from flowline = 0.125(In.)
 Manning's N in gutter = 0.0130
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 3.060(CFS)
 Depth of flow = 0.163(Ft.), Average velocity = 3.757(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 9.106(Ft.)
 Flow velocity = 3.76(Ft/s)
 Travel time = 2.48 min. TC = 21.55 min.
 Adding area flow to street
 Rainfall intensity (I) = 3.594(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 = 1.000
 Decimal fraction soil group D = 0.000
 [MEDIUM DENSITY RESIDENTIAL]
 (7.3 DU/A or Less)
 Impervious value, Ai = 0.400
 Sub-Area C Value = 0.540
 Rainfall intensity = 3.594(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.465 CA = 1.282
 Subarea runoff = 3.045(CFS) for 1.630(Ac.)
 Total runoff = 4.608(CFS) Total area = 2.760(Ac.)
 Street flow at end of street = 4.608(CFS)
 Half street flow at end of street = 4.608(CFS)
 Depth of flow = 0.192(Ft.), Average velocity = 4.157(Ft/s)
 Flow width (from curb towards crown)= 10.598(Ft.)

+++++
 Process from Point/Station 3.032 to Point/Station 3.033
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 316.900(Ft.)
 Downstream point/station elevation = 314.430(Ft.)
 Pipe length = 52.50(Ft.) Slope = 0.0470 Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 4.608(CFS)
 Given pipe size = 18.00(In.)

Calculated individual pipe flow = 4.608(CFS)
 Normal flow depth in pipe = 5.49(In.)
 Flow top width inside pipe = 16.57(In.)
 Critical Depth = 9.89(In.)
 Pipe flow velocity = 10.10(Ft/s)
 Travel time through pipe = 0.09 min.
 Time of concentration (TC) = 21.64 min.

++++++
 Process from Point/Station 3.033 to Point/Station 3000.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 314.430(Ft.)
 Downstream point/station elevation = 307.800(Ft.)
 Pipe length = 358.70(Ft.) Slope = 0.0185 Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 4.608(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 4.608(CFS)
 Normal flow depth in pipe = 6.28(In.)
 Flow top width inside pipe = 21.10(In.)
 Critical Depth = 9.06(In.)
 Pipe flow velocity = 7.04(Ft/s)
 Travel time through pipe = 0.85 min.
 Time of concentration (TC) = 22.48 min.

++++++
 Process from Point/Station 3000.000 to Point/Station 3000.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 2.760(Ac.)
 Runoff from this stream = 4.608(CFS)
 Time of concentration = 22.48 min.
 Rainfall intensity = 3.497(In/Hr)
 Program is now starting with Main Stream No. 2

++++++
 Process from Point/Station 3.041 to Point/Station 3.051
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 [HIGH DENSITY RESIDENTIAL]
 (24.0 DU/A or Less)
 Impervious value, Ai = 0.650
 Sub-Area C Value = 0.690
 Initial subarea total flow distance = 95.000(Ft.)
 Highest elevation = 328.800(Ft.)
 Lowest elevation = 324.600(Ft.)
 Elevation difference = 4.200(Ft.) Slope = 4.421 %
 Top of Initial Area Slope adjusted by User to 4.400 %

INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:

The maximum overland flow distance is 95.00 (Ft)
for the top area slope value of 4.40 %, in a development type of
24.0 DU/A or Less

In Accordance With Table 3-2

Initial Area Time of Concentration = 7.80 minutes

(for slope value of 5.00 %)

Rainfall intensity (I) = 6.922(In/Hr) for a 100.0 year storm

Effective runoff coefficient used for area (Q=KCIA) is C = 0.690

Subarea runoff = 0.621(CFS)

Total initial stream area = 0.130(Ac.)

+++++
Process from Point/Station 3.051 to Point/Station 3.052
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 324.600(Ft.)

End of street segment elevation = 318.200(Ft.)

Length of street segment = 280.000(Ft.)

Height of curb above gutter flowline = 6.0(In.)

Width of half street (curb to crown) = 32.000(Ft.)

Distance from crown to crossfall grade break = 16.000(Ft.)

Slope from gutter to grade break (v/hz) = 0.020

Slope from grade break to crown (v/hz) = 0.020

Street flow is on [1] side(s) of the street

Distance from curb to property line = 10.000(Ft.)

Slope from curb to property line (v/hz) = 0.020

Gutter width = 1.500(Ft.)

Gutter hike from flowline = 0.125(In.)

Manning's N in gutter = 0.0130

Manning's N from gutter to grade break = 0.0150

Manning's N from grade break to crown = 0.0150

Estimated mean flow rate at midpoint of street = 1.537(CFS)

Depth of flow = 0.133(Ft.), Average velocity = 2.694(Ft/s)

Streetflow hydraulics at midpoint of street travel:

Halfstreet flow width = 7.650(Ft.)

Flow velocity = 2.69(Ft/s)

Travel time = 1.73 min. TC = 9.53 min.

Adding area flow to street

Rainfall intensity (I) = 6.082(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 = 1.000

Decimal fraction soil group D = 0.000

[MEDIUM DENSITY RESIDENTIAL]

(14.5 DU/A or Less)

Impervious value, Ai = 0.500

Sub-Area C Value = 0.600

Rainfall intensity = 6.082(In/Hr) for a 100.0 year storm

Effective runoff coefficient used for total area

(Q=KCIA) is C = 0.619 CA = 0.390

Subarea runoff = 1.749(CFS) for 0.500(Ac.)

Total runoff = 2.370(CFS) Total area = 0.630(Ac.)

Street flow at end of street = 2.370(CFS)

Half street flow at end of street = 2.370(CFS)

Depth of flow = 0.160(Ft.), Average velocity = 2.999(Ft/s)

Flow width (from curb towards crown)= 8.973(Ft.)

+++++
 Process from Point/Station 3.052 to Point/Station 3000.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 308.800(Ft.)
 Downstream point/station elevation = 307.800(Ft.)
 Pipe length = 52.50(Ft.) Slope = 0.0190 Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.370(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 2.370(CFS)
 Normal flow depth in pipe = 4.92(In.)
 Flow top width inside pipe = 16.05(In.)
 Critical Depth = 6.99(In.)
 Pipe flow velocity = 6.05(Ft/s)
 Travel time through pipe = 0.14 min.
 Time of concentration (TC) = 9.68 min.

+++++
 Process from Point/Station 3000.000 to Point/Station 3000.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 0.630(Ac.)
 Runoff from this stream = 2.370(CFS)
 Time of concentration = 9.68 min.
 Rainfall intensity = 6.023(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	4.608	22.48	3.497
2	2.370	9.68	6.023
Qmax(1) =			
	1.000 *	1.000 *	4.608) +
	0.581 *	1.000 *	2.370) + = 5.984
Qmax(2) =			
	1.000 *	0.430 *	4.608) +
	1.000 *	1.000 *	2.370) + = 4.354

Total of 2 main streams to confluence:

Flow rates before confluence point:

4.608 2.370

Maximum flow rates at confluence using above data:

5.984 4.354

Area of streams before confluence:

2.760 0.630

Results of confluence:

Total flow rate = 5.984(CFS)

Time of concentration =	22.485 min.	
Effective stream area after confluence =		3.390(Ac.)
End of computations, total study area =		16.370 (Ac.)

Appendix G – Referenced Tables & Figures

County of San Diego Hydrology Manual



Rainfall Isophuvials

100 Year Rainfall Event - 6 Hours



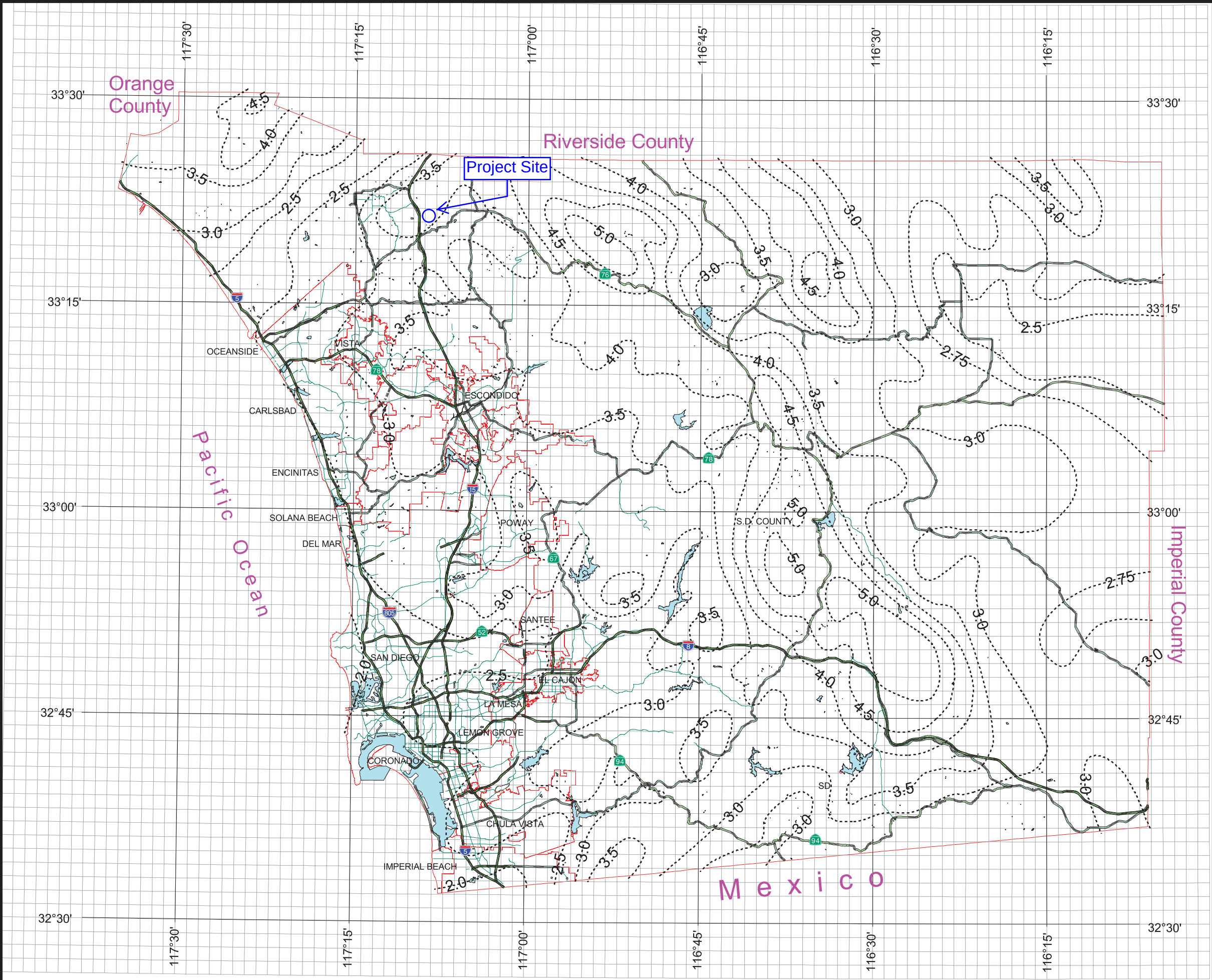
P6= 3.5 in



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County of San Diego Hydrology Manual

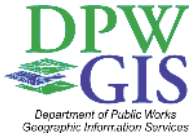


Rainfall Isophyvals

100 Year Rainfall Event - 24 Hours



P24= 6 in

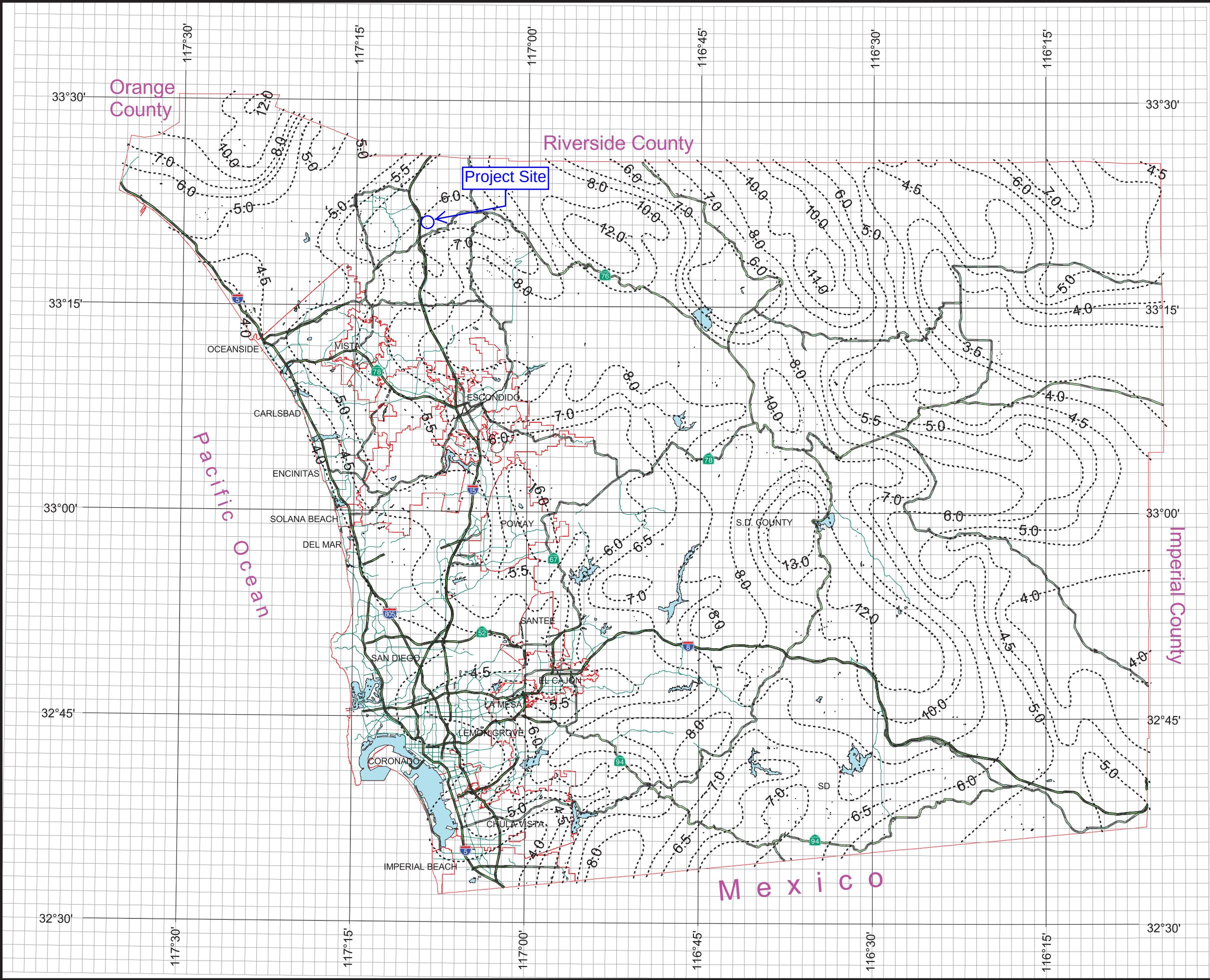


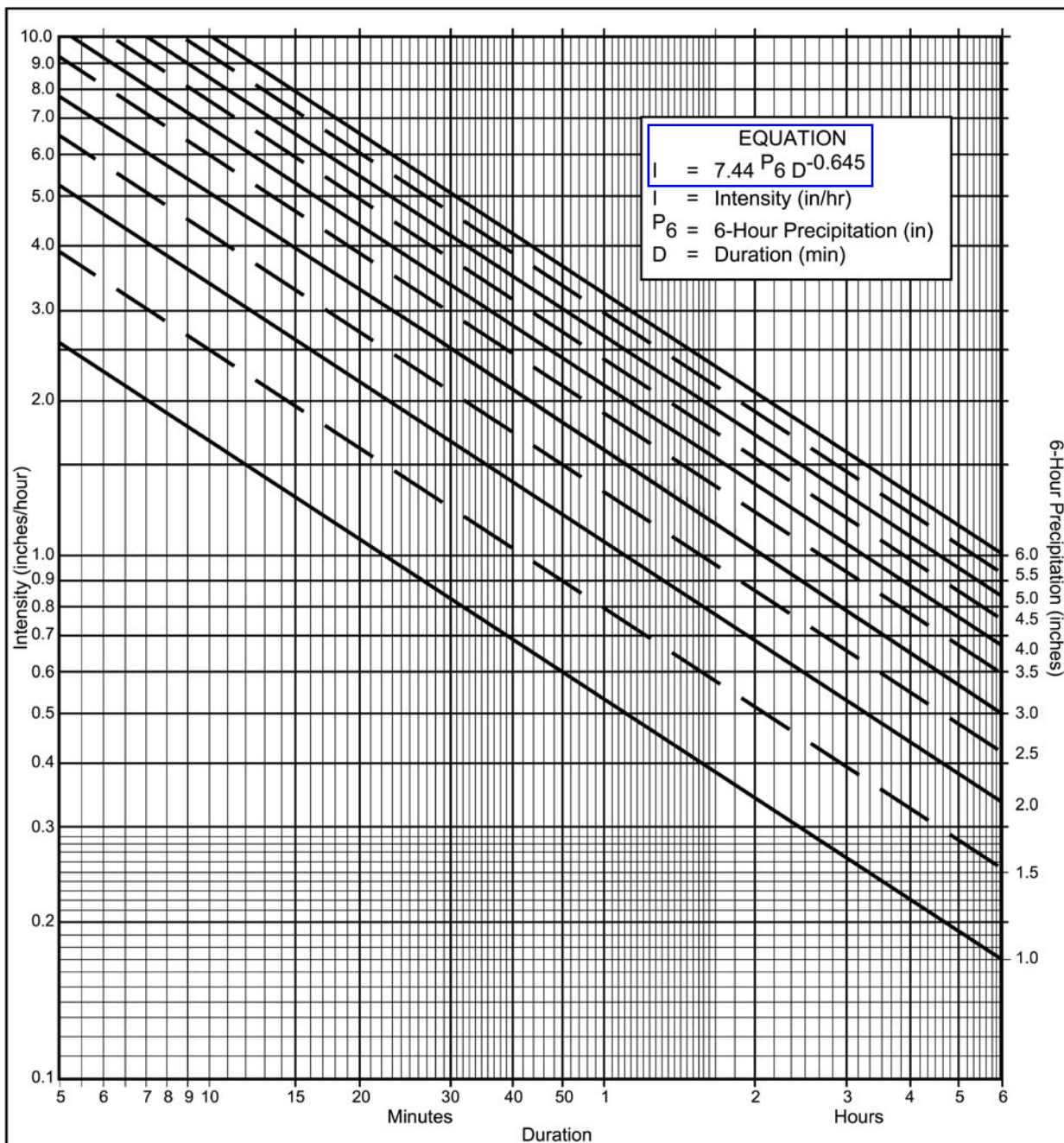
3 0 3 Miles

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Directions for Application:

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

Application Form:

- Selected frequency 100 year
- $P_6 = \underline{3.5}$ in., $P_{24} = \underline{6}$ in., $\frac{P_6}{P_{24}} = \underline{58} \%^{(2)}$
- Adjusted $P_6^{(2)} = \underline{3.5}$ in.
- $t_x = \underline{**}$ min.
- $I = \underline{**}$ in./hr.

**** = See calculations**

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

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

Intensity-Duration Design Chart - Template

FIGURE

3-1

Hydrologic Soil Group—San Diego County Area, California



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available

Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL:
 Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: San Diego County Area, California
 Survey Area Data: Version 14, Sep 16, 2019

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

Date(s) aerial images were photographed: Dec 31, 2009—Dec 9, 2018

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
WmB	Wyman loam, 2 to 5 percent slopes	C	2.1	14.8%
WmC	Wyman loam, 5 to 9 percent slopes	C	11.9	85.2%
Totals for Area of Interest			14.0	100.0%

Description

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

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

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

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

Rating Options

Aggregation Method: Dominant Condition

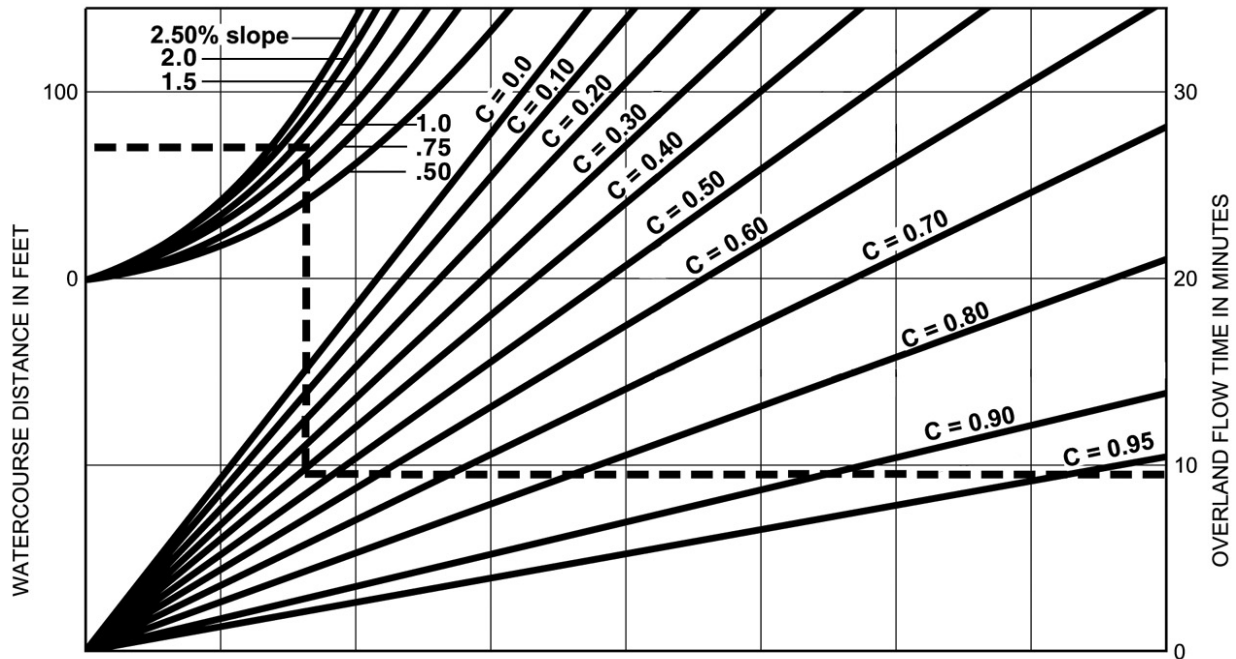
**Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS**

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



EXAMPLE:

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

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

SOURCE: Airport Drainage, Federal Aviation Administration, 1965

F I G U R E

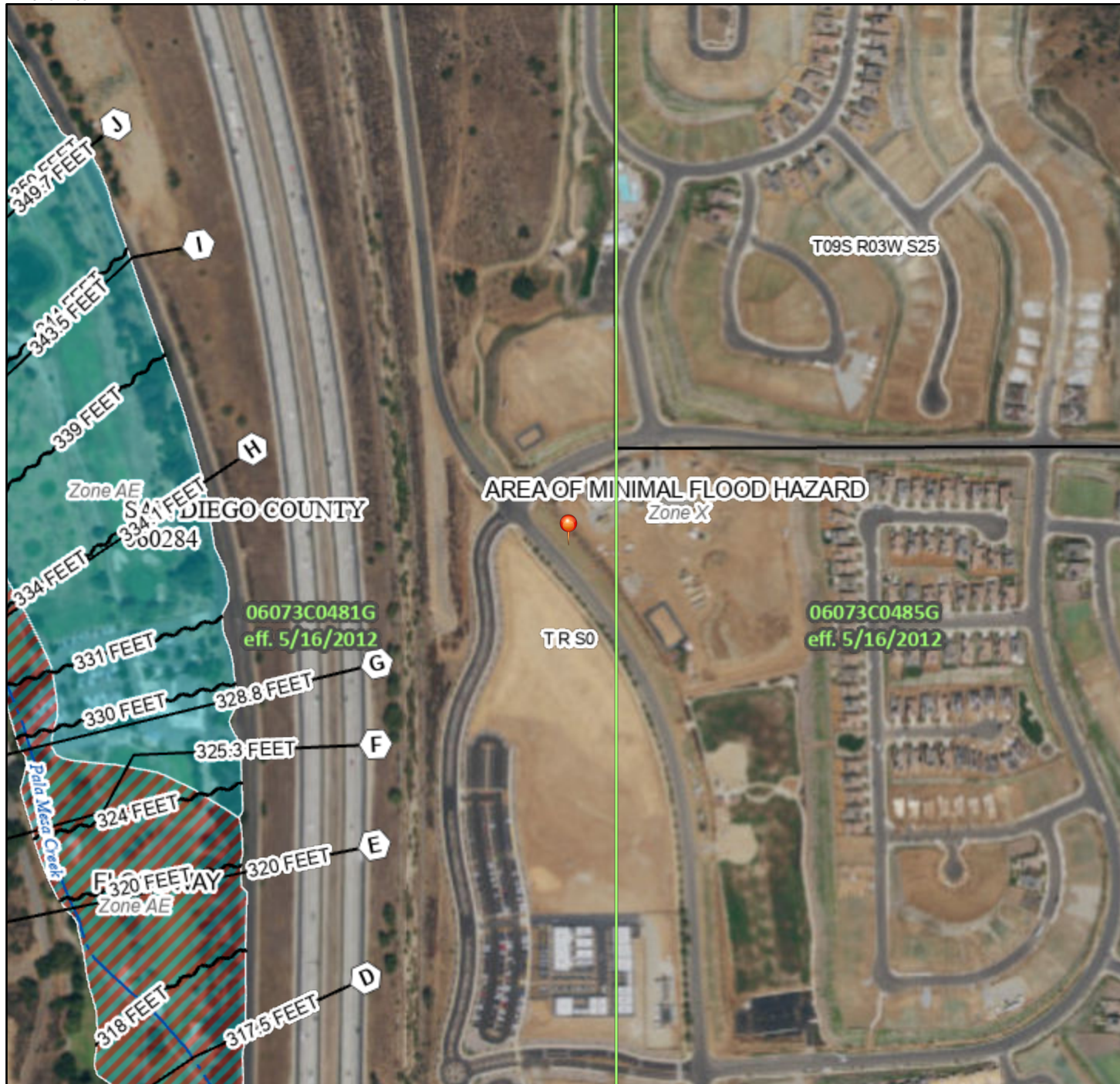
Rational Formula - Overland Time of Flow Nomograph

3-3

National Flood Hazard Layer FIRMette



117°9'43"W 33°21'42"N



0 250 500 1,000 1,500 2,000 Feet

1:6,000

117°9'5"W 33°21'12"N

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
GENERAL STRUCTURES		Area of Undetermined Flood Hazard Zone D
		Channel, Culvert, or Storm Sewer
OTHER FEATURES		Levee, Dike, or Floodwall
		Cross Sections with 1% Annual Chance Water Surface Elevation
MAP PANELS		Coastal Transect
		Base Flood Elevation Line (BFE)
OTHER FEATURES		Limit of Study
		Jurisdiction Boundary
OTHER FEATURES		Coastal Transect Baseline
		Profile Baseline
OTHER FEATURES		Hydrographic Feature
		Digital Data Available
MAP PANELS		No Digital Data Available
		Unmapped



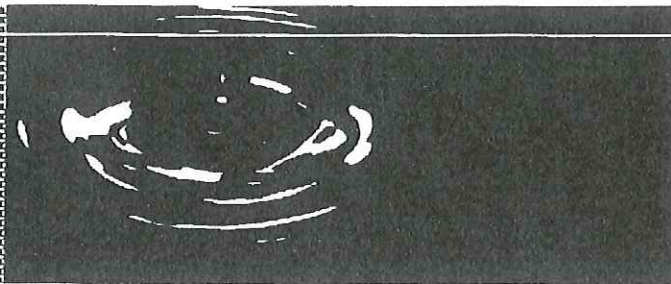
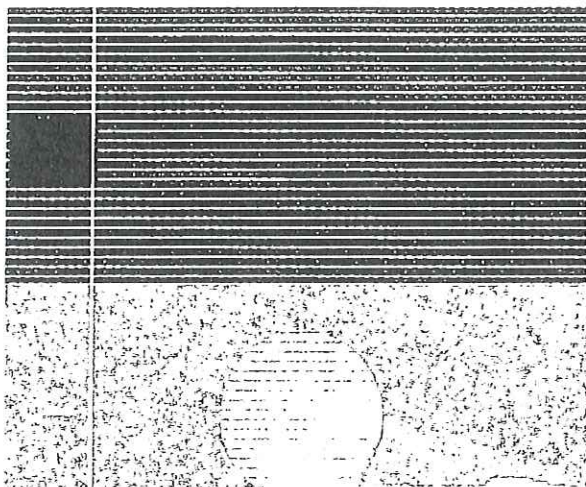
The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/3/2021 at 11:42 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Appendix H – Drainage Report for HRCR & Palamar College



Drainage Report

Horse Ranch Creek Road & Palomar College

*No
Comment
Jey m*

May 21, 2009
Revised November 2009
Revised April 2010

Prepared for:

Palomar Community College District
1140 West Mission Road
San Marcos, CA 92069-1487
760-744-1150

Prepared by:

RBF
CONSULTING

RBF CONSULTING

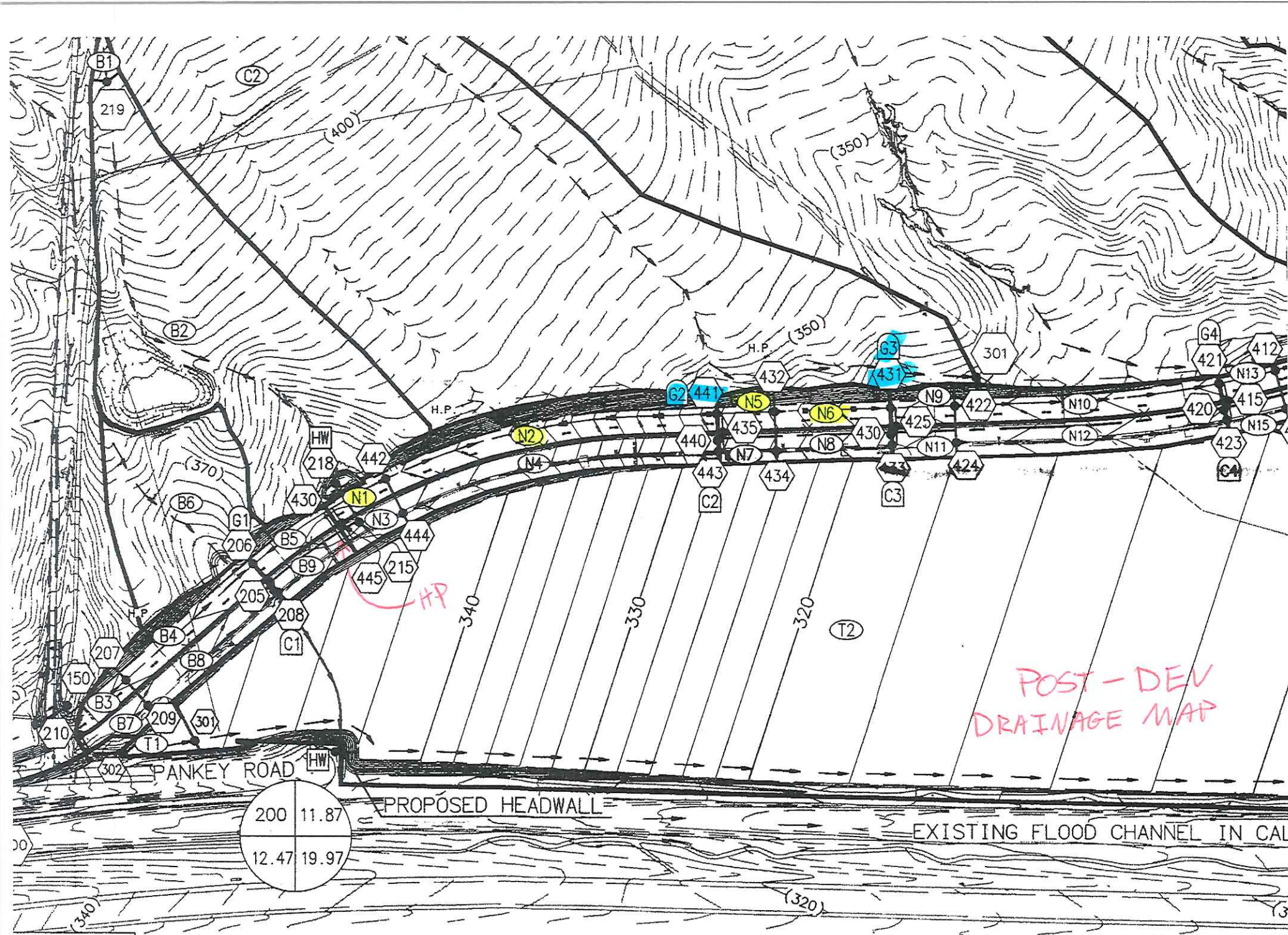
9755 Clairemont Mesa Blvd. Suite 100
San Diego, CA 92124
858.614.5000 telephone
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RBF Contact Person:

Rich Lucera, RCE 58089, CFM, CPESC
Braeden MacGuire, EIT, CFM

RBF JN 25-102702





POST-DEV
DRAINAGE MAP

TOPOGRAPHIC
FLOWRATE

PROPOSED CONDITION HYDROLOGIC SUMMARY TABLE

NODE		SUBAREA	SOIL TYPE	BASIN AREA	SOIL AREA	% of Area	COVER TYPE	COMPOSITE 'C'	U/S ELEVATION	D/S ELEVATION	L
From	To			(ac)	(ac)				(ft)	(ft)	(ft)
102	101	A1	C	0.21	0.21	100%	Desert Shrub (Poor)	0.3	888.0	850.0	100
101	100	A2	B	46.36	21.59	47%	Desert Shrub (Poor)	0.28	850.0	340.0	3322
			C		24.77	53%					
220	219	B1	B	0.09	0.09	100%	Desert Shrub (Poor)	0.25	434.0	426.0	100
219	218	B2	B	7.14	7.14	100%	Desert Shrub (Poor)	0.25	426.0	345.0	1089
210	207	B3	B	0.2	0.2	100%	Urban Newly Graded	0.67	356.1	354.0	160
207	206	B4	B	0.66	0.66	100%	Urban Newly Graded	0.67	354.0	350.4	362
208	206	B5	B	0.32	0.32	100%	Urban Newly Graded	0.67	N/A	N/A	N/A
206	206	B6	B	2.39	2.39	100%	Desert Shrub (Poor)	0.25	N/A	N/A	N/A
210	209	B7	B	0.2	0.2	100%	Streets and Roads	0.7	356.1	353.8	156
209	208	B8	B	0.57	0.57	100%	Streets and Roads	0.7	353.8	350.4	361.96
208	208	B9	B	0.3	0.3	100%	Streets and Roads	0.7	N/A	N/A	N/A
303	302	C1	B	0.2	0.2	100%	Desert Shrub (Poor)	0.25	840.0	800.0	100
302	301	C2	B	32.24	22.14	69%	Desert Shrub (Poor)	0.27	800.0	332.0	3228
			C		10.1	31%					
404	403	D1	C	0.32	0.32	100%	Desert Shrub (Poor)	0.3	730.0	696.0	100
403	402	D2	B	47.48	4.82	10%	Desert Shrub (Poor)	0.29	696.0	484.0	1568
			C		42.66	90%					
402	401	D3	B	59.05	45.09	76%	Desert Shrub (Poor)	0.26	484.0	304.0	3656
			C		13.96	24%					
503	502	E1	B	0.2	0.2	100%	Desert Shrub (Poor)	0.25	450.0	443.0	100
502	501	E2	B	14.48	14.48	100%	Desert Shrub (Poor)	0.25	443.0	303.5	2518
604	603	F1	C	0.2	0.2	100%	Desert Shrub (Poor)	0.3	809.0	785.0	100
603	602	F2	B	71.8	4.09	6%	Desert Shrub (Poor)	0.30	785.0	356.0	2855
			C		67.71	94%					
602	601	F3	B	94.83	37.32	39%	Desert Shrub (Poor)	0.28	356.0	301.5	1164
			C		57.51	61%					
703	702	G1	C	0.2	0.2	100%	Desert Shrub (Poor)	0.3	505.0	495.0	100
702	701	G2	B	31.77	17.1	54%	Desert Shrub (Poor)	0.27	495.0	288.0	1450
			C		14.67	46%					
903	902	I1	C	0.2	0.2	100%	Desert Shrub (Poor)	0.3	503.0	490.0	140
902	913	I2	B	9.93	8.61	87%	Desert Shrub (Poor)	0.26	490.0	292.7	1435
			C		1.32	13%					
915	914	I3	B	0.2	0.2	100%	Urban Newly Graded	0.67	301.3	299.3	147
914	913	I4	B	0.89	0.89	100%	Urban Newly Graded	0.67	299.3	292.7	512
915	912	I5	B	0.2	0.2	100%	Streets and Roads	0.7	301.3	299.3	152
912	910	I6	B	0.82	0.82	100%	Streets and Roads	0.7	299.3	292.8	512
1004	1003	J1	C	0.2	0.2	100%	Desert Shrub (Poor)	0.3	809.0	795.0	100
1003	1002	J2	C	17.87	17.87	100%	Desert Shrub (Poor)	0.3	795.0	468.0	1668
1002	1001	J3	B	64.14	19.82	31%	Desert Shrub (Poor)	0.28	468.0	271.5	2243
			C		44.32	69%					
1015	1013	J4	B	0.28	0.28	100%	Urban Newly Graded	0.67	289.6	287.7	153
1013	1012	J5	B	0.99	0.99	100%	Urban Newly Graded	0.67	287.7	281.3	620
1015	1011	J6	B	0.2	0.2	100%	Streets and Roads	0.7	289.6	287.7	153
1011	1010	J7	B	0.99	0.99	100%	Streets and Roads	0.7	287.7	281.4	626
1145	1144	K1	C	0.2	0.2	100%	Desert Shrub (Poor)	0.3	960.0	930.0	70
1144	1142	K2	B	35.46	22.25	63%	Desert Shrub (Poor)	0.27	930.0	273.0	2253
			C		13.21	37%					
1140	1139	K3	C	0.09	0.09	100%	Desert Shrub (Poor)	0.3	784.0	725.0	114
1139	1116	K4	C	1.87	1.87	100%	Desert Shrub (Poor)	0.3	725.0	280.9	825
1135	1132	K5	C	0.19	0.19	100%	Urban Newly Graded	0.67	281.5	279.2	190
1132	1131	K6	B	0.41	0.18	44%	Urban Newly Graded	0.68	279.2	276.3	338
			C		0.23	56%					
1131	1131	K7	B	0.67	0.67	100%	Urban Newly Graded	0.67	N/A	N/A	N/A
1135	1134	K8	C	0.25	0.25	100%	Streets and Roads	0.71	281.5	279.2	190
1134	1133	K9	B	0.52	0.34	65%	Streets and Roads	0.70	279.2	276.3	316
			C		0.18	35%					
1133	1133	K10	B	0.86	0.86	100%	Streets and Roads	0.7	N/A	N/A	N/A
1120	1117	K11	C	0.19	0.19	100%	Urban Newly Graded	0.69	285.2	283.0	184
1117	1116	K12	C	0.25	0.25	100%	Urban Newly Graded	0.69	283.0	280.9	207
1120	1119	K13	C	0.25	0.25	100%	Streets and Roads	0.71	285.2	283.1	184
1119	1118	K14	C	0.33	0.33	100%	Streets and Roads	0.71	283.1	280.9	207
1203	1202	L1	C	0.2	0.2	100%	Desert Shrub (Poor)	0.3	775.0	725.0	100
1202	1201	L2	C	21.88	21.88	100%	Desert Shrub (Poor)	0.3	725.0	269.4	1401
1215	1211	L3	C	0.15	0.15	100%	Urban Newly Graded	0.69	285.3	283.9	156

PROPOSED CONDITION HYDROLOGIC SUMMARY TABLE

NODE		SUBAREA	SOIL TYPE	BASIN AREA	SOIL AREA	% of Area	COVER TYPE	COMPOSITE 'C'	U/S ELEVATION	D/S ELEVATION	L
From	To			(ac)					(ft)	(ft)	(ft)
1211	1210	L4	B	0.52	0.38	73%	Urban Newly Graded	0.68	283.9	278.7	425
			C		0.14	27%					
1215	1214	L5	C	0.2		100%	Streets and Roads	0.71	285.3	283.9	159
1214	1213	L6	B	0.6	0.53	88%	Streets and Roads	0.70	283.9	277.5	376
			C		0.07	12%					
445	442	N1	B	0.18	0.18	100%	Urban Newly Graded	0.67	352.8	350.6	167
442	441	N2	B	1.47	1.47	100%	Urban Newly Graded	0.67	350.6	328.4	717
445	444	N3	B	0.21	0.21	100%	Streets and Roads	0.7	352.6	350.5	162
444	443	N4	B	1.09	1.09	100%	Streets and Roads	0.7	350.5	328.4	682
435	432	N5	B	0.23	0.23	100%	Urban Newly Graded	0.67	328.7	323.5	148
432	431	N6	B	0.48	0.48	100%	Urban Newly Graded	0.67	323.5	318.4	244
435	434	N7	B	0.19	0.19	100%	Streets and Roads	0.7	328.7	323.4	153
434	433	N8	B	0.39	0.39	100%	Streets and Roads	0.7	323.4	318.4	231
425	422	N9	B	0.25	0.25	100%	Urban Newly Graded	0.67	319.1	317.1	161
422	421	N10	B	0.86	0.86	100%	Urban Newly Graded	0.67	317.1	311.5	548
425	424	N11	B	0.22	0.22	100%	Streets and Roads	0.7	319.1	317.1	161
424	423	N12	B	0.91	0.91	100%	Streets and Roads	0.7	317.1	311.5	566
415	412	N13	B	0.15	0.15	100%	Urban Newly Graded	0.67	312.2	310.3	148
412	411	N14	B	0.32	0.32	100%	Urban Newly Graded	0.67	310.3	308.2	265
415	414	N15	B	0.2	0.2	100%	Streets and Roads	0.7	312.2	310.2	158
414	413	N16	B	0.44	0.44	100%	Streets and Roads	0.7	310.2	308.1	276
411	411	N17	B	0.72	0.72	100%	Urban Newly Graded	0.67	N/A	N/A	N/A
413	413	N18	B	0.95	0.95	100%	Streets and Roads	0.7	N/A	N/A	N/A
405	405	N19	B	1.54	1.54	100%	Urban Newly Graded	0.67	N/A	N/A	N/A
665	663	P1	B	0.2	0.2	100%	Urban Newly Graded	0.67	314.1	311.2	196
663	662	P2	B	0.37	0.37	100%	Urban Newly Graded	0.67	311.2	307.8	305
665	661	P3	B	0.28	0.28	100%	Streets and Roads	0.7	314.1	311.2	196
661	660	P4	B	0.51	0.51	100%	Streets and Roads	0.7	311.2	307.7	305
815	813	Q1	B	0.2	0.2	100%	Urban Newly Graded	0.67	308.4	305.9	196
813	812	Q2	B	0.58	0.58	100%	Urban Newly Graded	0.67	305.9	300.6	463
815	811	Q3	B	0.28	0.28	100%	Streets and Roads	0.7	308.4	305.8	200
811	810	Q4	B	0.78	0.78	100%	Streets and Roads	0.7	305.8	300.6	463
965	963	R1	B	0.23	0.23	100%	Urban Newly Graded	0.67	293.4	291.4	156
963	962	R2	B	0.48	0.48	100%	Urban Newly Graded	0.67	291.4	289.0	243
965	961	R3	B	0.2	0.2	100%	Streets and Roads	0.7	293.4	291.4	161
961	960	R4	B	0.38	0.38	100%	Streets and Roads	0.7	291.4	289.0	243
1301	1300	S1	B	0.3	0.3	100%	Urban Newly Graded	0.67	N/A	N/A	N/A
1401	1400	S2	B	0.47	0.47	100%	Streets and Roads	0.7	N/A	N/A	N/A
302	301	T1	B	0.23	0.23	100%	Urban Newly Graded	0.67	349.1	346.8	152
301	300	T2	B	56.47	56.47	100%	Urban Newly Graded	0.67	346.8	284.0	4320

645.76

PIPE-FLOW VELOCITY (FEET/SEC.) = 9.54
ESTIMATED PIPE DIAMETER (INCH) = 33.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 45.87
PIPE TRAVEL TIME (MIN.) = 0.06 Tc (MIN.) = 9.63
LONGEST FLOWPATH FROM NODE 1203.00 TO NODE 1200.00 = 1640.26 FEET.

FLOW PROCESS FROM NODE 1301.00 TO NODE 1300.00 IS CODE = 22

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

=====

USER-SPECIFIED RUNOFF COEFFICIENT = .6700
S.C.S. CURVE NUMBER (AMC II) = 86
USER SPECIFIED Tc (MIN.) = 5.000
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 9.222
SUBAREA RUNOFF (CFS) = 1.85
TOTAL AREA (ACRES) = 0.30 TOTAL RUNOFF (CFS) = 1.85

FLOW PROCESS FROM NODE 1401.00 TO NODE 1400.00 IS CODE = 22

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

=====

*USER SPECIFIED (SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .7000
S.C.S. CURVE NUMBER (AMC II) = 86
USER SPECIFIED Tc (MIN.) = 5.000
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 9.222
SUBAREA RUNOFF (CFS) = 3.03
TOTAL AREA (ACRES) = 0.47 TOTAL RUNOFF (CFS) = 3.03

FLOW PROCESS FROM NODE 445.00 TO NODE 442.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

=====

USER-SPECIFIED RUNOFF COEFFICIENT = .6700
S.C.S. CURVE NUMBER (AMC II) = 86
INITIAL SUBAREA FLOW-LENGTH (FEET) = 167.00
UPSTREAM ELEVATION (FEET) = 352.60
DOWNSTREAM ELEVATION (FEET) = 350.60
ELEVATION DIFFERENCE (FEET) = 2.00
SUBAREA OVERLAND TIME OF FLOW (MIN.) = 5.965
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
THE MAXIMUM OVERLAND FLOW LENGTH = 66.98
(Reference: Table 3-1B of Hydrology Manual)
THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 8.230
SUBAREA RUNOFF (CFS) = 0.99
TOTAL AREA (ACRES) = 0.18 TOTAL RUNOFF (CFS) = 0.99

FLOW PROCESS FROM NODE 442.00 TO NODE 441.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 350.60 DOWNSTREAM(FEET) = 328.40
CHANNEL LENGTH THRU SUBAREA(FEET) = 717.00 CHANNEL SLOPE = 0.0310
CHANNEL BASE(FEET) = 0.00 "Z" FACTOR = 50.000
MANNING'S FACTOR = 0.035 MAXIMUM DEPTH(FEET) = 0.50
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.964
USER-SPECIFIED RUNOFF COEFFICIENT = .6700
S.C.S. CURVE NUMBER (AMC II) = 86
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 3.48
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 1.68
AVERAGE FLOW DEPTH(FEET) = 0.20 TRAVEL TIME(MIN.) = 7.09
Tc(MIN.) = 13.06
SUBAREA AREA(ACRES) = 1.47 SUBAREA RUNOFF(CFS) = 4.89
AREA-AVERAGE RUNOFF COEFFICIENT = 0.670
TOTAL AREA(ACRES) = 1.65 PEAK FLOW RATE(CFS) = 5.49

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END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.25 FLOW VELOCITY(FEET/SEC.) = 1.80
LONGEST FLOWPATH FROM NODE 445.00 TO NODE 441.00 = 884.00 FEET.

FLOW PROCESS FROM NODE 441.00 TO NODE 440.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 316.62 DOWNSTREAM(FEET) = 315.53
FLOW LENGTH(FEET) = 54.25 MANNING'S N = 0.013
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN 18.0 INCH PIPE IS 7.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 7.49
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 5.49
PIPE TRAVEL TIME(MIN.) = 0.12 Tc(MIN.) = 13.18
LONGEST FLOWPATH FROM NODE 445.00 TO NODE 440.00 = 938.25 FEET.

Pipe 4

FLOW PROCESS FROM NODE 440.00 TO NODE 440.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<

=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 13.18
RAINFALL INTENSITY(INCH/HR) = 4.94
TOTAL STREAM AREA(ACRES) = 1.65
PEAK FLOW RATE(CFS) AT CONFLUENCE = 5.49

FLOW PROCESS FROM NODE 445.00 TO NODE 444.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

=====

*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .7000
S.C.S. CURVE NUMBER (AMC II) = 86
INITIAL SUBAREA FLOW-LENGTH(FEET) = 162.00
UPSTREAM ELEVATION(FEET) = 352.60

DOWNSTREAM ELEVATION (FEET) = 350.50
ELEVATION DIFFERENCE (FEET) = 2.10
SUBAREA OVERLAND TIME OF FLOW (MIN.) = 5.240
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
THE MAXIMUM OVERLAND FLOW LENGTH = 62.96
(Reference: Table 3-1B of Hydrology Manual)
THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 8.947
SUBAREA RUNOFF (CFS) = 1.32
TOTAL AREA (ACRES) = 0.21 TOTAL RUNOFF (CFS) = 1.32

FLOW PROCESS FROM NODE 444.00 TO NODE 443.00 IS CODE = 62

>>>>> COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA <<<<<
>>>>> (STREET TABLE SECTION # 2 USED) <<<<<
=====

UPSTREAM ELEVATION (FEET) = 350.50 DOWNSTREAM ELEVATION (FEET) = 328.40
STREET LENGTH (FEET) = 682.00 CURB HEIGHT (INCHES) = 6.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 16.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1
Manning's FRICTION FACTOR for Streetflow Section (curb-to-curb) = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 3.91
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH (FEET) = 0.31
HALFSTREET FLOOD WIDTH (FEET) = 9.40
AVERAGE FLOW VELOCITY (FEET/SEC.) = 3.90
PRODUCT OF DEPTH & VELOCITY (FT*FT/SEC.) = 1.23
STREET FLOW TRAVEL TIME (MIN.) = 2.91 Tc (MIN.) = 8.15
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 6.727
*USER SPECIFIED (SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .7000
S.C.S. CURVE NUMBER (AMC II) = 86
AREA-AVERAGE RUNOFF COEFFICIENT = 0.700
SUBAREA AREA (ACRES) = 1.09 SUBAREA RUNOFF (CFS) = 5.13
TOTAL AREA (ACRES) = 1.30 PEAK FLOW RATE (CFS) = 6.12

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH (FEET) = 0.35 HALFSTREET FLOOD WIDTH (FEET) = 11.38
FLOW VELOCITY (FEET/SEC.) = 4.33 DEPTH*VELOCITY (FT*FT/SEC.) = 1.53
LONGEST FLOWPATH FROM NODE 445.00 TO NODE 443.00 = 844.00 FEET.

FLOW PROCESS FROM NODE 443.00 TO NODE 440.00 IS CODE = 31

>>>>> COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA <<<<<
>>>>> USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) <<<<<
=====

ELEVATION DATA: UPSTREAM (FEET) = 317.56 DOWNSTREAM (FEET) = 315.53
FLOW LENGTH (FEET) = 20.25 MANNING'S N = 0.013
ESTIMATED PIPE DIAMETER (INCH) INCREASED TO 18.000

DEPTH OF FLOW IN 18.0 INCH PIPE IS 5.4 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 13.83
 ESTIMATED PIPE DIAMETER (INCH) = 18.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 6.12
 PIPE TRAVEL TIME (MIN.) = 0.02 Tc (MIN.) = 8.18
 LONGEST FLOWPATH FROM NODE 445.00 TO NODE 440.00 = 864.25 FEET.

 FLOW PROCESS FROM NODE 440.00 TO NODE 440.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<
 =====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION (MIN.) = 8.18
 RAINFALL INTENSITY (INCH/HR) = 6.71
 TOTAL STREAM AREA (ACRES) = 1.30
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 6.12

** CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/ HOUR)	AREA (ACRE)
1	5.49	13.18	4.935	1.65
2	6.12	8.18	6.714	1.30

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/ HOUR)
1	9.53	8.18	6.714
2	9.99	13.18	4.935

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 9.99 Tc (MIN.) = 13.18
 TOTAL AREA (ACRES) = 2.95
 LONGEST FLOWPATH FROM NODE 445.00 TO NODE 440.00 = 938.25 FEET.

 FLOW PROCESS FROM NODE 440.00 TO NODE 430.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
 =====

ELEVATION DATA: UPSTREAM (FEET) = 315.20 DOWNSTREAM (FEET) = 306.23
 FLOW LENGTH (FEET) = 283.00 MANNING'S N = 0.013
 ESTIMATED PIPE DIAMETER (INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN 18.0 INCH PIPE IS 9.7 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 10.33
 ESTIMATED PIPE DIAMETER (INCH) = 18.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 9.99
 PIPE TRAVEL TIME (MIN.) = 0.46 Tc (MIN.) = 13.64
 LONGEST FLOWPATH FROM NODE 445.00 TO NODE 430.00 = 1221.25 FEET.

FLOW PROCESS FROM NODE 430.00 TO NODE 430.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

=====

TOTAL NUMBER OF STREAMS = 3
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 13.64
RAINFALL INTENSITY(INCH/HR) = 4.83
TOTAL STREAM AREA(ACRES) = 2.95
PEAK FLOW RATE(CFS) AT CONFLUENCE = 9.99

FLOW PROCESS FROM NODE 435.00 TO NODE 432.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

=====

USER-SPECIFIED RUNOFF COEFFICIENT = .6700
S.C.S. CURVE NUMBER (AMC II) = 86
INITIAL SUBAREA FLOW-LENGTH(FEET) = 148.00
UPSTREAM ELEVATION(FEET) = 328.70
DOWNSTREAM ELEVATION(FEET) = 323.50
ELEVATION DIFFERENCE(FEET) = 5.20
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 4.865
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
THE MAXIMUM OVERLAND FLOW LENGTH = 91.28
(Reference: Table 3-1B of Hydrology Manual)
THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 9.222
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
SUBAREA RUNOFF(CFS) = 1.42
TOTAL AREA(ACRES) = 0.23 TOTAL RUNOFF(CFS) = 1.42

FLOW PROCESS FROM NODE 432.00 TO NODE 431.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<

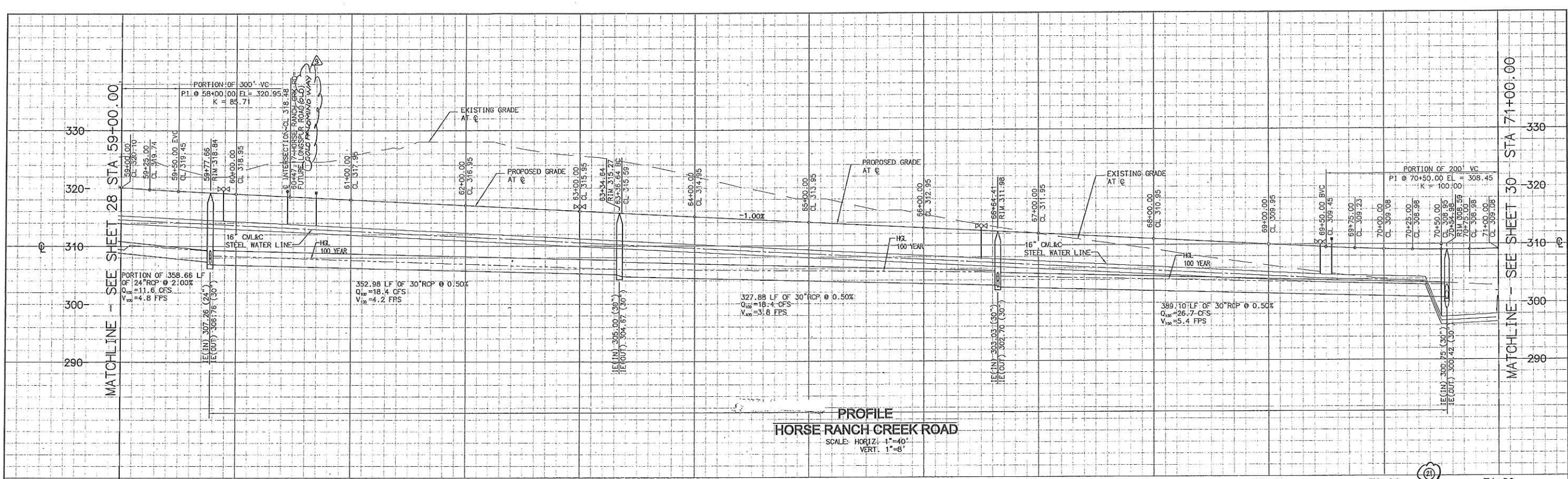
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ELEVATION DATA: UPSTREAM(FEET) = 323.50 DOWNSTREAM(FEET) = 318.40
CHANNEL LENGTH THRU SUBAREA(FEET) = 244.00 CHANNEL SLOPE = 0.0209
CHANNEL BASE(FEET) = 0.00 "Z" FACTOR = 50.000
MANNING'S FACTOR = 0.035 MAXIMUM DEPTH(FEET) = 0.50
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 6.841
USER-SPECIFIED RUNOFF COEFFICIENT = .6700
S.C.S. CURVE NUMBER (AMC II) = 86
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 2.52
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 1.32
AVERAGE FLOW DEPTH(FEET) = 0.20 TRAVEL TIME(MIN.) = 3.08
Tc(MIN.) = 7.94
SUBAREA AREA(ACRES) = 0.48 SUBAREA RUNOFF(CFS) = 2.20
AREA-AVERAGE RUNOFF COEFFICIENT = 0.670
TOTAL AREA(ACRES) = 0.71 PEAK FLOW RATE(CFS) = 3.25

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.22 FLOW VELOCITY(FEET/SEC.) = 1.39
LONGEST FLOWPATH FROM NODE 435.00 TO NODE 431.00 = 392.00 FEET.

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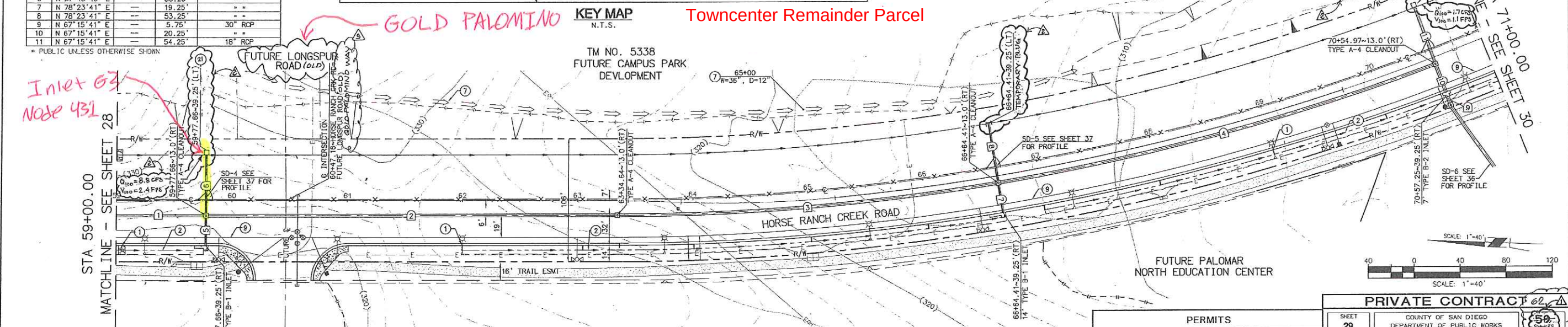
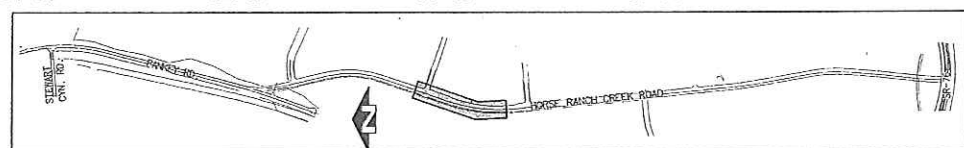
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* STORM DRAIN DATA (1350-D)

NO.	BEARINGS/DELTA	RADIUS	LENGTH	NOTE
1	N 02°14'20" W	--	74.66'	24" RCP
2	N 02°14'20" W	--	349.98'	--
3	06°16'53" W	2022.00'	327.55'	30" RCP
4	11°10'45" W	2022.00'	394.52'	--
5	N 87°45'40" E	--	19.25'	18" RCP
6	N 87°45'40" E	--	53.25'	--
7	N 78°23'41" E	--	19.25'	--
8	N 78°23'41" E	--	53.25'	--
9	N 67°15'41" E	--	5.75'	30" RCP
10	N 67°15'41" E	--	20.25'	--
11	N 67°15'41" E	--	54.25'	18" RCP

* PUBLIC UNLESS OTHERWISE SHOWN



RECORD PLAN
DATE: 10/14/13
BY: HUNG TRANG
RCE: 73266 EXP: 12/31/14



PLAN
HORSE RANCH CREEK ROAD

- CONSTRUCTION NOTES
- MODIFIED CURB OPENING PER DETAIL 2 ON SHEET 4 (SEE SHEET 4 FOR SPACING REQUIREMENT)
 - VEGETATED SHALE PER DETAIL 1 ON SHEET 4
 - TYPE B DRAINAGE DITCH PER COUNTY STD. DWG. D-75
 - PROPOSED WATER LINE, SEE WATER PLANS FOR PLAN & PROFILE
 - TEMP. DRAINAGE INLET PER DETAIL 6 ON SHEET 4

COUNTY APPROVED CHANGES

NO.	DESCRIPTION	APPROVED BY	DATE
1	REVISED TOTAL SHEET COUNT	K9B	5/23/2011
2	MODIFICATIONS TO TEMPORARY DRAIN INLETS (SHT. 4, 21-34)	K9B	12/8/2011
3	REVISED TOTAL SHEET COUNT	K9B	10/25/13
4	RECORD PLAN	K9B	10/25/13

PERMITS

SPECIFIC PLAN NO. UY 4718, GPA-09-006
NOTICE OF INTENT NO. W010# 0 37C358873
UY 4718, SCH#2002011136

BENCH MARK

DESCRIPTION: 2.25" COOT DISC STAMPED SW 15/76 1980
LOCATION: SW 15/76
RECORD FROM: CALTRANS CONTROL MONUMENT DATA
ELEVATION: 305.49 DATUM: USCGS DATUM OF 1929

PRIVATE CONTRACT 02

SHEET 29

COUNTY OF SAN DIEGO
DEPARTMENT OF PUBLIC WORKS

PLANS FOR THE IMPROVEMENT OF:
HORSE RANCH CREEK ROAD
STORM DRAIN PLAN

CALIFORNIA COORDINATE INDEX: 2075-6285 (CCR3) 435-1783 (CC27)

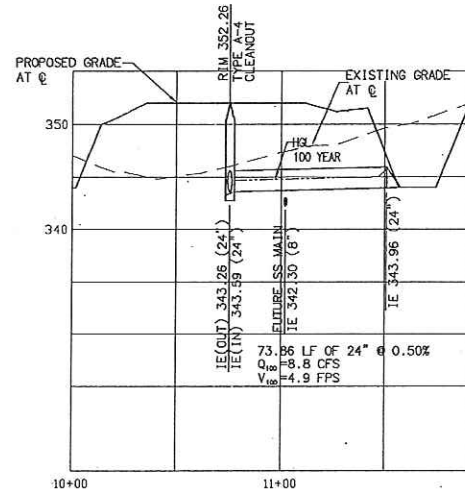
RECOMMENDED FOR APPROVAL:

APPROVED FOR: MUHAMMAD FARHATODDINE
COUNTY ENGINEER
BY: NARI ANOOGAT
Engineer of work: EXP. 3/31/11
KEVIN VOGELSGANG RCE 47213

DECKED BY: IMPROVEMENT PLAN NO. CG-4718
APPROVAL DATE: 10/25/2010

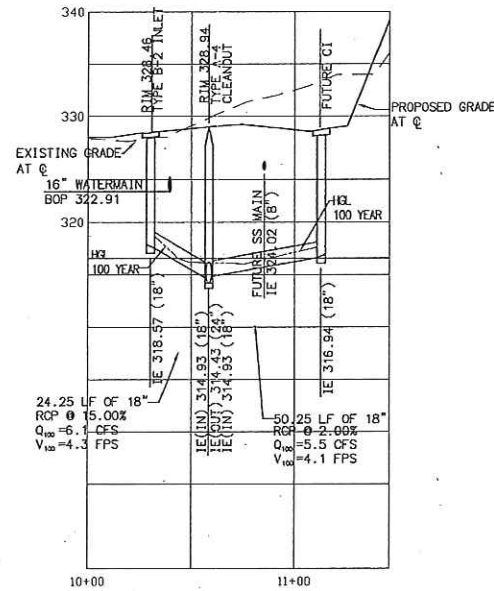
RECORD PLAN: PDS 2013-LDPCHG-00046

IMPROVEMENT PLANS



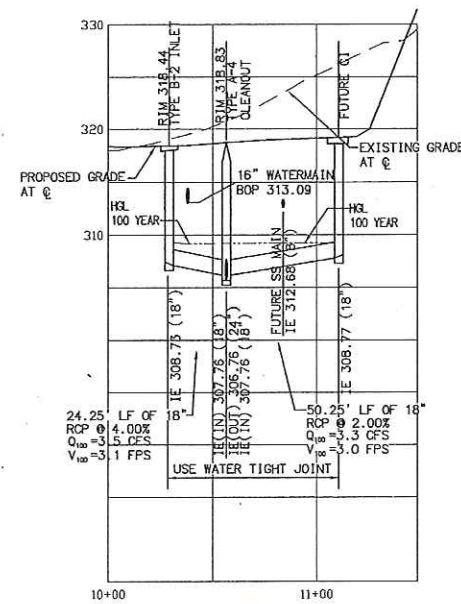
SD-2

STA: 48+25.01
SEE SHEET 28 FOR PLAN



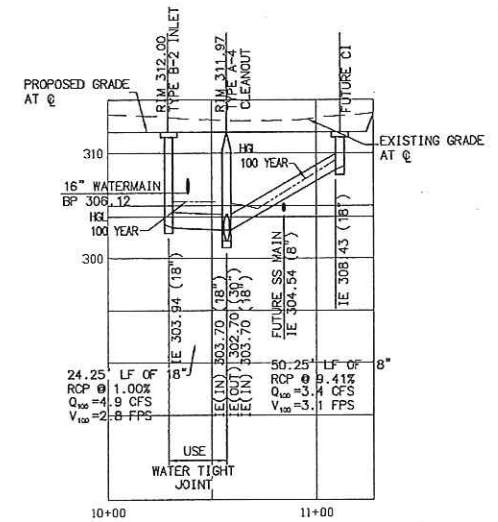
SD-3

STA: 56+15.00
SEE SHEET 28 FOR PLAN



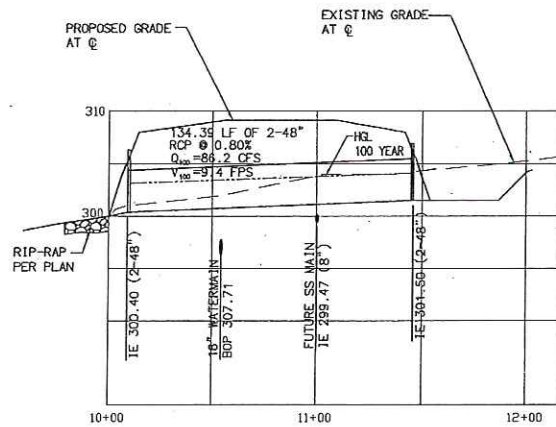
SD-4

STA: 59+77.66
SEE SHEET 29 FOR PLAN



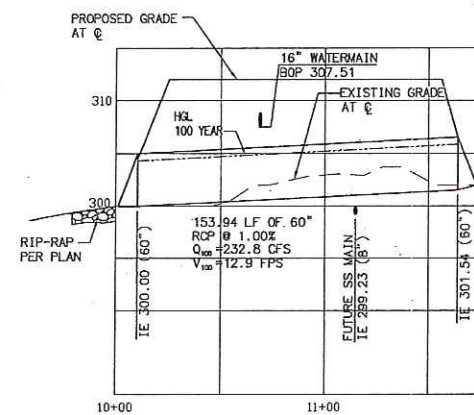
SD-5

STA: 66+64.41
SEE SHEET 29 FOR PLAN



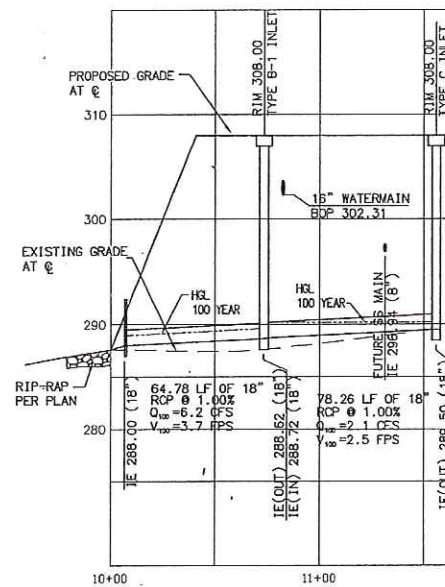
SD-7

STA: 71+92.43
SEE SHEET 30 FOR PLAN



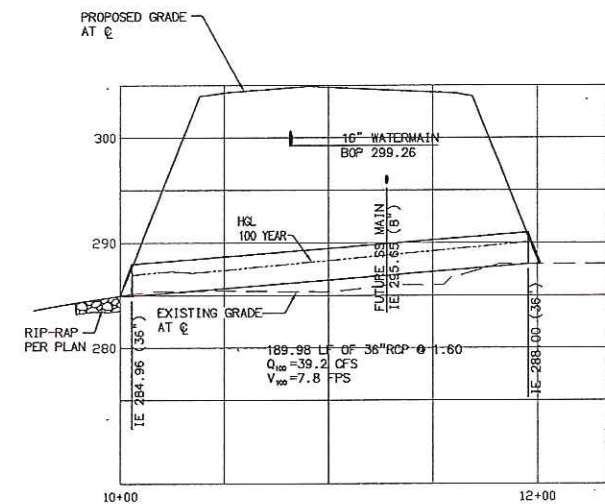
SD-8

STA: 76+49.06
SEE SHEET 30 FOR PLAN



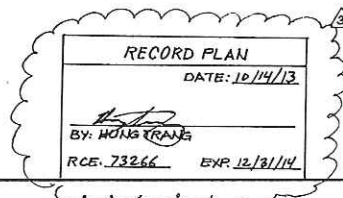
SD-9

STA: 81+20.00
SEE SHEET 30 FOR PLAN



SD-10

STA: 83+95.00
SEE SHEET 31 FOR PLAN



COUNTY APPROVED CHANGES			
NO.	DESCRIPTION	APPROVED BY	DATE
1	REVISED TOTAL SHEET COUNT	nk	5/23/2011
2	REVISED TOTAL SHEET COUNT	K9B	9/17/13
3	RECORD PLAN	K9B	10/25/13

PERMITS	
SPECIFIC PLAN NO.	UY 4718, GPA-09-006
NOTICE OF INTENT NO.	WDIQ# 9 37C358R73
	UY 4718, SCH#2007011136
BENCH MARK	
DESCRIPTION:	2.25" CDOT DISC STAMPED SW 15/76 1980
LOCATION:	SW 15/76
RECORD FROM:	CALTRANS CONTROL MONUMENT DATA
ELEVATION:	306.49
DATUM:	USC&GS DATUM OF 1929

PRIVATE CONTRACT 62	
SHEET 37	COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC WORKS
PLANS FOR THE IMPROVEMENT OF: HORSE RANCH CREEK ROAD STORM DRAIN PLAN	
CALIFORNIA COORDINATE INDEX: 2075-6285 (CDR3) 435-1783 (CD27)	
RECOMMENDED FOR APPROVAL:	APPROVED FOR: MOHAMAD FAHREDDINE COUNTY ENGINEER
Engineer of work: EXP. 3/31/11	DECEDED BY: RCE 4213
APPROVAL DATE: 10/12/2010	IMPROVEMENT PLAN NO. CG-4718

RECORD PLAN: PDS 2013-LDPCHG-00046

IMPROVEMENT PLANS