PRELIMINARY HYDROLOGY AND HYDRAULICS STUDY

For:

Meyers Industrial
PL 20-0654

Meyers Ave
Escondido, CA 92029

APN: 228-312-05-00

Prepared By:

4-10-2022

Gregory W. Lang, P.E. RCE 68075 EXP: 06-30-23
Pasco Laret Suiter & Associates, Inc.
119 Aberdeen Drive
Cardiff, CA 92007

REGISTERED PROFESSIONAL ENGINEER
GREGORY W. LANG
No. RCE 68075
EXP. 06-30-23
Civil
STATE OF CALIFORNIA

PASCO LARET SUITER & ASSOCIATES
CIVIL ENGINEERING + LAND PLANNING + LAND SURVEYING

Prepared for:

VWP Escondido, LLC
2390 E. Camelback Road, Suite 305
Phoenix, AZ 85016

April 10, 2022

PLSA Job No. 3446

DECLARATION OF RESPONSIBLE CHARGE

I, hereby declare that I am the Engineer of Work for this project. That I have exercised responsible charge over the design of the project as defined in section 6703 of the business and professions code, and that the design is consistent with current standards.

I understand that the check of project drawings and specifications by the City of Escondido is confined to a review only and does not relieve me, as engineer of work, of my responsibilities for project design.

Gregory W. Lang R.C.E. 68075 EXP. 6-30-23	DATE

TABLE OF CONTENTS

VICINITY MAP

NTS

1. INTRODUCTION

This Preliminary Drainage Study for the proposed Meyers Industrial development has been prepared to analyze the hydrologic characteristics of the existing and proposed project site. This report presents both the methodology and the calculations used for determining the storm water runoff from the project site in the existing and proposed conditions produced by the 50-year, 6-hour storm event.

1.1 Project Description

The 4.26-acre project site consists of one undeveloped lot located south of the intersection of Barham Drive and Meyers Avenue along the west side of Meyers Avenue in the City of Escondido, San Diego County, California. The property is identified by the Assessor's Parcel Number (APN) 228-312-05-00.

The property is currently undeveloped land. The property is bordered by a modular home community to the west, and by a variety of commercial and industrial developments to the north, east and south.

The site condition is divided into one drainage basin, Basin A, draining to one (1) Point of Compliance, POC-1. Storm water runoff from the project site is routed to POC-1 located near the northeast corner of the site, adjacent to Meyers Avenue.

Treatment of storm water runoff from the site has been addressed in a separate report- "Priority Development Project (PDP) Storm Water Quality Management Plan (SWQMP) for Meyers Industrial" by Pasco Laret Suiter & Associates, dated April 10, 2022. Hydromodification (HMP) analysis has also been presented within the SWQMP.

Per City of Escondido drainage criteria, the Modified Rational Method should be used to determine peak flowrates when the contributing drainage area is up to 0.5 square mile in size. All public and private drainage facilities shall be designed for a 50-year frequency storm for all tributary areas less than 1 square mile.

Methodology used for the computation of design rainfall events, runoff coefficients, and rainfall intensity values are consistent with the criteria set forth in the "City of Escondido Design Standards and Standard Drawings, April 2014."

1.2 Existing Conditions

In the existing condition, a high point is located at the southwest corner of the property. Runoff from the site sheet flows to the northeast toward Meyers Avenue. Stormwater is collected in the existing curb and gutter along the west side of Meyers Avenue and flows north to an existing curb inlet located at the intersection of Meyers Avenue and E. Barham Drive. The existing City storm drain infrastructure drains north to an existing open channel that ultimately discharges to San Marcos Creek and then into Lake San Marcos.

A residential condominium project is proposed on the adjacent property to the south and west of the existing site. The residential project has been approved by the City of San Marcos and City of Escondido and construction has commenced. The proposed grading as part of the residential condominium project includes new access drives along the southern and western property boundaries. Existing offsite drainage will be intercepted by curb and gutters and proposed storm drains within these access drives and will not flow onto the project site. All existing offsite drainage from the south is intercepted and conveyed to a 36" RCP storm drain proposed in Meyers Ave per Grading and Improvement Plan GP19-0016 and P19-

0014. All existing offsite drainage from the west is intercepted and conveyed to a proposed storm drain in (Future) Sunrise View and Barham Drive per Improvement Plan IP20-00007 and P19-0014.

Per the United States Department of Agriculture (USDA) Web Soil Survey, the project site is predominantly Hydrologic Soil Group B with a small portion of Hydrologic Soil Group C in the northwest corner of the site. However, per the project's site-specific geotechnical report, the site is underlain with shallow bedrock and has very low infiltration rates (0 - 0.01 in/hr). The underlying soil is more accurately represented by Hydrologic Soil Group D. Therefore, for the purpose of this drainage study, the entire site was modeled with Type D soils. Refer to Appendix C of this report for the USDA Web Soil Survey and geotechnical findings. The site is not within a FEMA designated Flood Zone.

Table 1.1 below summarizes the existing condition 50-year peak flow at the project's discharge location. For delineated basin details, please refer to the Existing Condition Hydrology Node Map included in Appendix 1 of this report.

TABLE 1.1 – Summary of Existing Conditions

Drainage Basin	POC	Drainage Area (ac)	Runoff Coefficient, C	Time of Concentration, Tc (min)	Intensity, I (in/hr)	Q50 (cfs)
Basin A	POC-1	4.26	0.35	7.5	3.7	5.58

1.3 Proposed Conditions

The project will include the construction of a new 67,300+/- SF industrial building, paved roadways and parking areas, retaining walls, and other associated improvements. The project will be accessed by a proposed driveway off Meyers Avenue. Drainage improvements will consist of curb inlets, catch basins, ribbon gutters, brow ditches, storm drain pipes and an underground detention vault located near the northeast corner of the site. The proposed site will consist of one (1) major drainage basin with one (1) outfall to mimic existing conditions. The site grading and onsite storm drain system has been designed to avoid diversion of drainage. Storm water runoff from the project site is routed to POC-1 located near the northeast corner of the site, at a Type A cleanout and 18" storm drain lateral proposed per Improvement Plan P19-0014. The storm drain lateral connects to a proposed 36" RCP public storm drain pipe (per P19-0014) in Meyers Ave, where flow travels north to the existing public storm drain system under Barham Drive.

Prior to discharging from the project site, developed site runoff is drained to one (1) proposed underground detention vault (BMP-1) for peak flow attenuation. The detention vault is also responsible for handling hydromodification requirements for the project site; however, the volume of the BMP is controlled by the 50-year peak flow detention requirement to meet the pre-development peak flow runoff rate. Two (2) Modular Wetland Systems (MWS) are proposed upstream of the underground detention vault to provide storm water treatment. Treatment of storm water runoff from the site has been addressed in a separate report- "Priority Development Project (PDP) Storm Water Quality Management Plan (SWQMP) for Meyers Industrial" by Pasco Laret Suiter & Associates. Hydromodification (HMP) analysis has also been presented within the SWQMP.

The underground detention vault has been designed to provide flow control in the form of peak flow attenuation. The vault has been modified to include low-flow and mid-flow orifice outlets and an overflow weir to control peak flows. Overflow relief for the 50-year storm event is provided with a

partition weir installed in the vault and discharged directly to the proposed Type A cleanout and proposed 18" storm drain lateral (per P19-0014). The storm drain lateral will discharge into the proposed 36" RCP storm drain pipe per P19-0014 located in Meyers Avenue.

Runoff from disturbed slopes along the northerly and easterly boundaries of the proposed development will drain to a proposed Type B brow ditch along the top of the proposed wall at the northeast corner of the site. The brow ditch will discharge into the modified Type A cleanout (proposed per P16-0014) with Type F opening at the northeast corner of the site, where flow will discharge into the existing 18" storm drain at POC-1.

The associated fill slopes and landscape areas along the northerly and easterly boundaries of the proposed development will drain directly offsite. These areas do not drain to the storm water treatment BMPs or underground detention facility for peak flow attenuation. See discussion in project SWQMP.

Table 1.2 below summarizes the proposed unmitigated condition 50-year peak flow at the project's discharge location. Table 1.3 summarizes the proposed mitigated condition 50-year peak flow after routing through the project's detention facility. For delineated basin details, please refer to the Proposed Condition Hydrology Node Map included as an Attachment of this report.

TABLE 1.2 – Summary of Proposed Unmitigated Conditions

Drainage Basin	POC	Drainage Area (ac)	Runoff Coefficient, C	Time of Concentration, Tc (min)	Intensity, I (in/hr)	Q50 Unmitigated (cfs)
Basin A	POC-1	4.26	0.79	7.9	3.61	12.14

TABLE 1.3 – Summary of Proposed Mitigated Conditions

Drainage Basin	POC	Drainage Area (ac)	Runoff Coefficient, C	Time of Concentration, Tc (min)	Intensity, I (in/hr)	Q50 Mitigated (cfs)
Basin A	POC-1	4.26	0.79	17.1	2.53	5.53

The proposed Type A cleanout per P19-0014will need to be relocated slightly behind the proposed retaining wall at the northeast corner of the site. The proposed storm drain lateral will also be extended to the relocated Type A cleanout. The proposed project's drainage infrastructure will not significantly alter the existing site's drainage patterns on-site or discharge points. Additionally, the proposed 18" storm drain lateral can sufficiently convey the anticipated Q50 flowrate without any adverse effects. Please refer to Appendix 4 for pre-and post-development drainage calculations.

For additional information regarding the proposed storm drain infrastructure at the northeast corner of the site and within Meyers Ave, refer to Barham Drive and Meyers Avenue Improvement Plan P19-0014 on file with the City of Escondido.

2. METHODOLOGY

Runoff calculations for Meyers Industrial have been performed in accordance with the City of Escondido Design Standards and Standard Drawings dated April 2014. Per City of Escondido drainage criteria, the Modified Rational Method should be used to determine peak flowrates when the contributing drainage area is less than 0.5 square mile. Advanced Engineering Software (AES) were used to calculate the peak runoff from the 50-year, 6-hour storm event using the Rational Method. Please refer to this report's Appendix for the results of these calculations.

2.1 Rational Method

As mentioned above, runoff from the project site was calculated for the 50-year storm event. Runoff was calculated using the Rational Method which is given by the following equation:

$Q = C \times I \times A$

Where:
Q = Flow rate in cubic feet per second (cfs)
C = Runoff coefficient
I = Rainfall Intensity in inches per hour (in/hr)
A = Drainage basin area in acres, (ac)

Rational Method calculations were performed using the AES 2008 computer program. To perform the hydrology routing, the total watershed area is divided into sub-areas which discharge at designated nodes. The procedure for the sub-area summation model is as follows:

(1) Subdivide the watershed into an initial sub-areas and subsequent sub-areas, which are generally less than 10 acres in size. Assign upstream and downstream node numbers to each sub-area.

(2) Estimate an initial T_c by using the appropriate nomograph or overland flow velocity estimation. The minimum T_c considered is 5.0 minutes. All T_c values for the proposed project were assumed to be 5 minutes due to the small size of each contributing drainage area.

(3) Using the initial T_c, determine the corresponding values of I. Then Q = CIA.

(4) Using Q, estimate the travel time between this node and the next by Manning's equation as applied to particular channel or conduit linking the two nodes. Then, repeat the calculation for Q based on the revised intensity (which is a function of the revised time of concentration)

2.2 Runoff Coefficient

In accordance with City of Escondido design standards, runoff coefficients were based on land use. An appropriate runoff coefficient (C) for each type of land use in the subarea was selected from Figure 1 of the City of Escondido Design Standards and Standard Drawings and multiplied by the percentage of total area (A) included in that class. The sum of products for all land uses is the weighted runoff coefficient (∑[C]). See Table 2.1 below for weighted runoff coefficient "C" calculations. The Existing and Proposed Condition Hydrology Node Maps show the drainage basin subareas, on-site drainage system and nodal points.

The existing site includes undeveloped land or open space. The existing site is assumed to be 0% impervious. Therefore, a consistent runoff coefficient of 0.35 was used for the existing condition based on Figure 1 of the City of Escondido Design Standards and Standard Drawings.

In the proposed condition, all impervious surfaces were assigned an industrial runoff coefficient of 0.95. All slope soils and landscape areas will be amended and aerated to promote water retention; therefore, developed slopes and landscape areas were assigned a runoff coefficient of 0.25.

TABLE 2.1- Summary of Weighted Runoff Coefficient Calculations

Existing Condition Hydrology							
Up Node	Down Node	Total Area (ac)	C_1	A_1 (ac)	C_2	A_2 (ac)	C_{comp}
100	101	0.07	0.35	0.07	0.95	0.00	0.35
101	102	4.19	0.35	4.19	0.95	0.00	0.35
Proposed Condition Hydrology							
Up Node	Down Node	Total Area (ac)	C_1	A_1 (ac)	C_2	A_2 (ac)	C_{comp}
200	201	0.10	0.25	0.10	0.95	0.00	0.25
201	202	0.11	0.25	0.00	0.95	0.11	0.95
202	202	0.10	0.25	0.10	0.95	0.00	0.25
203	203	0.21	0.25	0.00	0.95	0.21	0.95
204	204	0.35	0.25	0.00	0.95	0.35	0.95
205	205	0.33	0.25	0.00	0.95	0.33	0.95
206	206	0.28	0.25	0.00	0.95	0.28	0.95
206	206	0.19	0.25	0.19	0.95	0.00	0.25
207	207	0.23	0.25	0.00	0.95	0.23	0.95
208	208	1.96	0.25	0.20	0.95	1.77	0.88
212	211	0.15	0.25	0.15	0.95	0.00	0.25
213	211	0.26	0.25	0.26	0.95	0.00	0.25

Note: C-values taken from Figure 1 of City of Escondido Design Standards. See Appendix 3 for references.

2.3 Rainfall Intensity

Rainfall intensity is calculated using the chart in Figure 1 - Run-off Intensity Duration Curve of the City of Escondido Design Standards and Standard Drawings. The intensity values for varying time of concentrations were input manually into the AES computer program where runoff calculations were performed. The 6-hour storm rainfall amount (P_6) for the 50-year storm frequency were determined using Isopluvial maps provided from Appendix B of the County of San Diego Hydrology Manual. See Appendix 3 of this report for Isopluvial maps for the 50-year rainfall event.

2.4 Tributary Areas

Drainage basins for the existing and proposed project site are delineated in the Existing and Proposed Condition Hydrology Node Maps located in Appendix 1 and 2 of this report and graphically portray the tributary area for each drainage basin.

2.5 Hydraulics

The hydraulics of existing and proposed storm drain pipes were analyzed using the AES computer program. For pipe flow, a Manning's N value of 0.011 was used to reflect the use of HDPE pipe. A Manning's N value of 0.013 was used to reflect the use of RCP pipe.

2.6 Curb Inlet and Catch Basin Sizing

Curb inlets and catch basins will be sized in accordance with City of Escondido Design Standards and Standard Drawings (April 2014) upon final engineering.

2.7 Detention Basin Routing

The detention facility was modeled using Storm Water Management Model (SWMM) version 5.1. The results of the SWMM study are presented within the PDP SWQMP by Pasco Laret Suiter and Associates for Meyers Industrial. SWMM models were prepared for the pre and post-developed conditions at the site in order to determine if the proposed underground detention vault meets the Hydromodification Management Plan (HMP) requirements for the Q_2 to Q_{10} return periods. The Rational Method study provided herein incorporates the composite vault outlet structure and stage-storage-discharge relationships of the SWMM study and is meant to enhance the HMP study to ensure that post-development peak flows are less than or equal to pre-development peak flows for the 6-hour 50-year storm event at the project's Point of Compliance (POC). See vault outlet structure details in Appendix 5.

Hydraulic Modified-Puls detention routing of the aforementioned Rational Method hydrology was performed using the Army Corps of Engineers HEC-HMS 4.3 software. The Modified-Puls detention routing analyzes the developed condition 50-year peak flow rate at the project's detention system. The stage-storage-discharge tables generated from SWMM were input into HEC-HMS to model the design of the vault outlet structure. This procedure was selected in order to model the flow control requirements and to accurately represent the middle stages of the BMP for accurate mid-flow orifice and emergency weir sizing. The stage-storage-discharge tables from the SWMM model have been provided in Appendix 5. The HEC-HMS Modified-Puls results are summarized in Table 2.2.

TABLE 2.2- Summary of Detention Basin Routing

Detention Basin	Tributary Area (ac)	Runoff Coefficient, C	50-Year Peak Inflow (cfs)	Inflow Tc (min)[(1)]	50-Year Peak Outflow (cfs)	Outflow Tc (min)	Peak Elevation (ft)[(2)]
BMP-1	3.86	0.84	11.84	10	5.29	17	5.28

Notes:
(1) Inflow time of concentration rounded to the nearest time interval that HEC-HMS could accept
(2) Peak elevation measured from the invert of the mid-flow orifice
(3) P6-50year = 2.8 in

A Rational method inflow hydrograph was generated using RickRat Hydro software from Rick Engineering. The parameters of the drainage area were entered into RickRat Hydro software to generate an inflow hydrograph. The data from this hydrograph was then entered into HEC-HMS software to model the release rates from the detention system.

HEC-HMS allows for hydrology input time steps of 1, 2, 3, 4, 5, 10, 15 & 20 minutes. Rick Rat Hydro requires a minimum time of concentration (Tc) of 5 minutes. Therefore, the time of concentration (Tc) used for the concentration of the hydrograph was rounded to the nearest time interval that RickRat Hydro and HEC-HMS could accept. The peak flow remains as per the modified Rational Method analysis and is not reduced (or increased) from this hydrograph development accordingly.

Rational method hydrographs, stage-storage-discharge relationships and HEC-HMS model output is provided in Appendix 5 of this report.

3. CALCULATIONS/RESULTS

3.1 Pre- & Post-Development Peak Flow Comparison

Below are a series of tables which summarize the calculations provided in the appendices of this report.

Table 3.1 itemizes the existing condition peak flow rate for the 50-year storm event for the existing drainage Basin A at the POC-1 outfall.

TABLE 3.1- Existing Condition Peak Flow Summary

Drainage Basin	Outfall Location	Runoff Coefficient, C	Drainage Area (ac)	50-Year Existing Peak Flow (cfs)
Basin A	POC-1	0.35	4.26	5.58

Table 3.2 itemizes the proposed mitigated condition peak flow rate for the 50-year storm event for the proposed drainage Basin A at the POC-1 outfall.

TABLE 3.2- Proposed Mitigated Condition Peak Flow Summary

Drainage Basin	Outfall Location	Runoff Coefficient, C	Drainage Area (ac)	50-Year Mitigated Peak Flow (cfs)
Basin A	POC-1	0.79	4.26	5.53

Table 3.3 shows that the total storm water peak flow for the proposed development is less than the existing storm water peak flow for the 50-year rainfall event.

TABLE 3.3- Existing Vs. Proposed Mitigated Condition Peak Flow Summary

Existing Condition Q50 (cfs)	Proposed Mitigated Condition Q50 (cfs)	Existing Vs. Proposed Q50 (cfs)
5.58	5.53	-0.05

3.2 Storm Water Quality

The proposed site will have a Modular Wetland System that will provide the required storm water quality treatment for the project. For information regarding BMP sizing and the water quality design, refer to the "Priority Development Project (PDP) Storm Water Quality Management Plan (SWQMP) for Meyers Industrial" by Pasco Laret Suiter & Associates under separate cover.

3.3 Hydromodification

The proposed site will include the implementation of an underground detention structure that will provide the required hydromodification mitigation for the project. For additional information regarding the calculations for the hydromodification sizing calculations, refer to the "Priority Development Project (PDP) Storm Water Quality Management Plan (SWQMP) for Meyers Industrial" by Pasco Laret Suiter & Associates, under separate cover.

4. CONCLUSION

As shown in Tables 3.1 through 3.3, the proposed project will not contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems. This report analyzed the 50-year storm event hydrology for the proposed site using the Advanced Engineering Software (AES) and proved that the post-developed peak flow is less than the pre-developed peak flow at the proposed discharge location, POC-1, located at the northeast corner of the site. In addition, the proposed storm drain system was sized adequately and calculations can be found in the Appendices of this report.

The proposed project will not substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on- or off-site. In addition, the proposed project will not increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site.

The project does not 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. Additionally, the project does not place structures within a 100-year flood hazard area which would impede or redirect flood flows.

Appendix 1

Existing Condition Hydrology Node Map

PARCEL 3
PM 14664

PARCEL 2
PM 14664

PARCEL 1
PM 14664

PARCEL B
PM 11936

PARCEL A
PM 11936

R/W

C/L

MEYERS AVENUE

PROP. 36" STORM DRAIN
PER P19-0014

PROP. 18" STORM
DRAIN PER P19-0014

102
5.58

(697.0 FG)

PROP. TYPE A CO
PER P19-0014

P/L

POR. PARCEL 4
PM 9838

PVT. DRIVEWAY

BARON
EL 715.5

715

720

725

730

735

710

BASIN A

L=570'

A=4.20
C=0.35

PARCEL 1
PM 2106

PARCEL 3
PM 9838

720

730

POR. PARCEL 4
PM 9838

(733.0 FG)

101
0.10

L=37'

A=0.06
C=0.35

100
--

(741.0 FG)

PRIVATE DRIVEWAY

710

738.6

750

760

740

LEGEND

DESCRIPTION	SYMBOL
HYDROLOGY NODE EXISTING Q50 (CFS)	100 1.00
SUB-BASIN AREA	A=0.10
WEIGHTED RUNOFF COEFFICIENT	C=0.35
RIGHT-OF-WAY	
PROPERTY LINE	
BASIN BOUNDARY	
SUB-BASIN BOUNDARY	
FLOWLINE	

HYDROLOGIC SOIL GROUP

HYDROLOGIC SOIL TYPE: B & C*
*FOR THE PURPOSE OF DRAINAGE CALCS, THE ENTIRE SITE WILL BE MODELED WITH TYPE D SOILS. SEE "PRELIMINARY HYDROLOGY AND HYDRAULICS STUDY FOR MEYERS INDUSTRIAL"BY PLSA DATED APRIL 2022 FOR DISCUSSION.

DEPTH TO GROUNDWATER

DEPTH TO GROUNDWATER > 20 FT

PROJECT CHARACTERISTICS

DRAINAGE BASIN AREA:	4.26 AC
EXISTING IMPERVIOUS AREA:	0 AC
EXISTING LANDSCAPE AREA:	0 AC
EXISTING PERVIOUS AREA:	4.26 AC

RUNOFF COEFFICIENT

IN ACCORDANCE WITH CITY OF ESCONDIDO STANDARDS, RUNOFF COEFFICIENTS WERE BASED ON LAND USE. AN APPROPRIATE RUNOFF COEFFICIENT WAS SELECTED FROM FIGURE 1 OF THE CITY OF ESCONDIDO DESIGN STANDARDS AND STANDARD DRAWINGS AND MULTIPLIED BY THE PERCENTAGE OF TOTAL AREA IN THAT CLASS. THE SUM OF THE PRODUCTS FOR ALL LAND USES IS THE WEIGHTED RUNOFF COEFFICIENT.

SEE TABLE 2.1 OF THE "PRELIMINARY HYDROLOGY AND HYDRAULICS STUDY FOR MEYERS INDUSTRIAL" BY PLSA DATED APRIL 2022 FOR WEIGHTED RUNOFF COEFFICEINT "C" CALCULATIONS.

SUMMARY OF EXISTING CONDITION 50-YEAR PEAK FLOWS

DRAINAGE BASIN	DRAINAGE AREA (AC)	IMPERVIOUS AREA (AC)	% IMP	WEIGHTED RUNOFF COEFFICIENT, C	50-YEAR PEAK FLOW (CFS)
BASIN A	4.26	0	0%	0.35	5.58

30' 15" 0 30' 60' 90'
SCALE: 1" = 30'

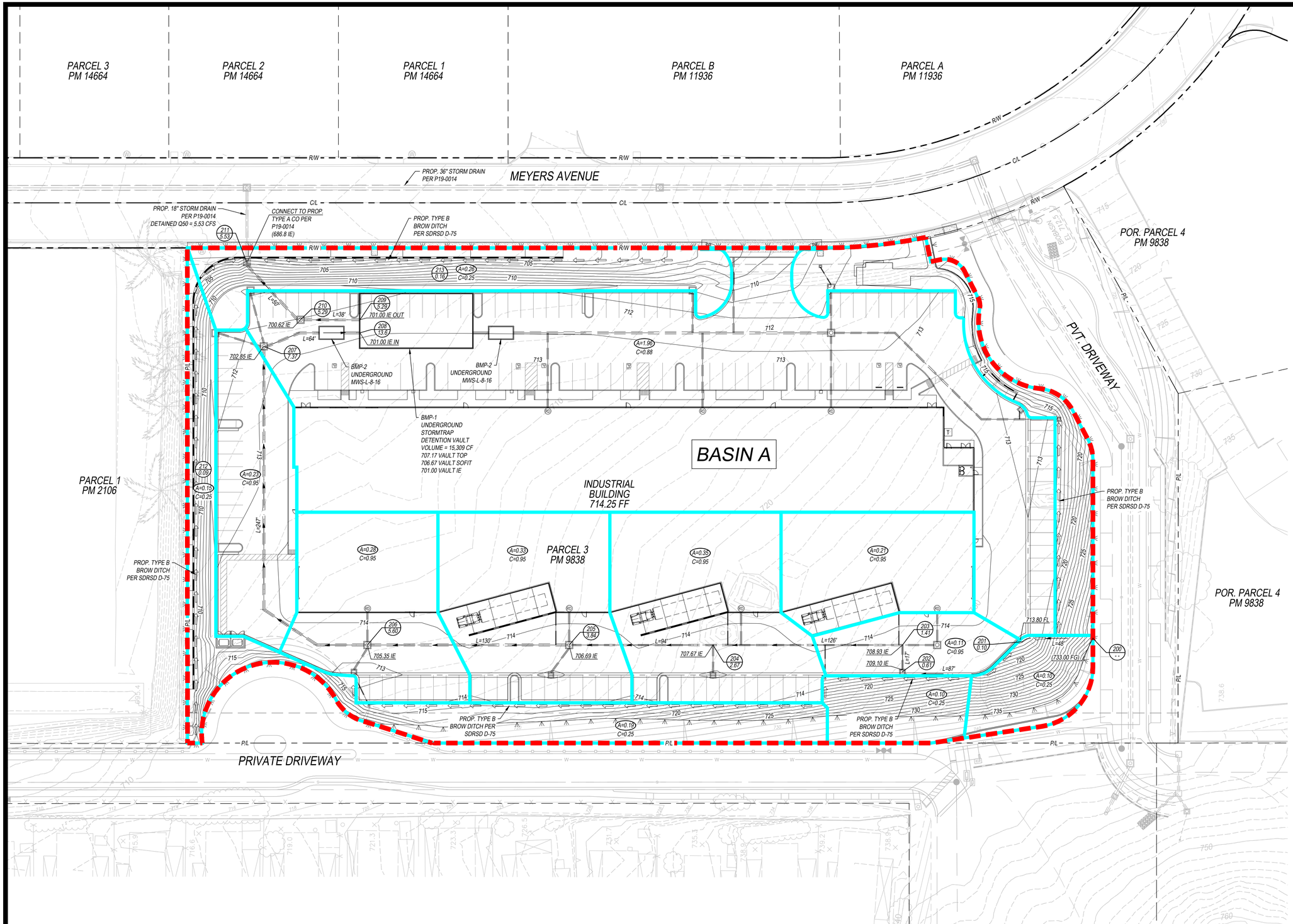
PASCO LARET SUITER & ASSOCIATES
San Diego | Encinitas | Orange County
Phone 858.259.8212 | www.plsaengineering.com

EXISTING CONDITION HYDROLOGY NODE MAP

MEYERS AVE
MEYERS AVE
ESCONDIDO, CA
PLSA JOB NO. 3446
SCALE 1"=30'
APRIL 2022
SHEET 1 OF 1

Appendix 2

Proposed Condition Hydrology Node Map



LEGEND

DESCRIPTION	SYMBOL
HYDROLOGY NODE MITIGATED Q50 (CFS)	100 1.00
SUB-BASIN AREA	A=0.10
WEIGHTED RUNOFF COEFFICIENT	C=0.35
RIGHT-OF-WAY	
PROPERTY LINE	
BASIN BOUNDARY	
SUB-BASIN BOUNDARY	
FLOWLINE	
PROPOSED BROW DITCH	

HYDROLOGIC SOIL GROUP

HYDROLOGIC SOIL TYPE: B & C*
*FOR THE PURPOSE OF DRAINAGE CALCS, THE ENTIRE SITE WILL BE MODELED WITH TYPE D SOILS. SEE "PRELIMINARY HYDROLOGY AND HYDRAULICS STUDY FOR MEYERS INDUSTRIAL" BY PLSA DATED APRIL 2022 FOR DISCUSSION.

DEPTH TO GROUNDWATER

DEPTH TO GROUNDWATER > 20 FT

PROJECT CHARACTERISTICS

DRAINAGE BASIN AREA:	4.26 AC
DISTURBED AREA:	4.10 AC
PROPOSED IMPERVIOUS AREA:	3.20 AC
PROPOSED LANDSCAPE AREA:	0.90 AC
PROPOSED PERVIOUS AREA:	0.16 AC

RUNOFF COEFFICIENT

IN ACCORDANCE WITH CITY OF ESCONDIDO STANDARDS, RUNOFF COEFFICIENTS WERE BASED ON LAND USE. AN APPROPRIATE RUNOFF COEFFICIENT WAS SELECTED FROM FIGURE 1 OF THE CITY OF ESCONDIDO DESIGN STANDARDS AND STANDARD DRAWINGS AND MULTIPLIED BY THE PERCENTAGE OF TOTAL AREA IN THAT CLASS. THE SUM OF THE PRODUCTS FOR ALL LAND USES IS THE WEIGHTED RUNOFF COEFFICIENT.

SEE TABLE 2.1 OF THE "PRELIMINARY HYDROLOGY AND HYDRAULICS STUDY FOR MEYERS INDUSTRIAL" BY PLSA DATED APRIL 2022 FOR WEIGHTED RUNOFF COEFFICEINT "C" CALCULATIONS.

SUMMARY OF PROPOSED CONDITION 50-YEAR PEAK FLOWS

DRAINAGE BASIN	DRAINAGE AREA (AC)	IMPERVIOUS AREA (AC)	% IMP	WEIGHTED RUNOFF COEFFICIENT, C	50-YEAR MITIGATED PEAK FLOW (CFS)
BASIN A	4.26	3.20	75.2%	0.79	5.53

30' 15" 0 30' 60' 90'
SCALE: 1" = 30'

PASCO LARET SUITER & ASSOCIATES
San Diego | Encinitas | Orange County
Phone 858.259.8212 | www.plsaengineering.com

PROPOSED CONDITION HYDROLOGY NODE MAP

MEYERS AVE
MEYERS AVE
ESCONDIDO, CA
PLSA JOB NO. 3446
SCALE 1"=30'
APRIL 2022
SHEET 1 OF 1

Appendix 3

Hydrology Design Summary

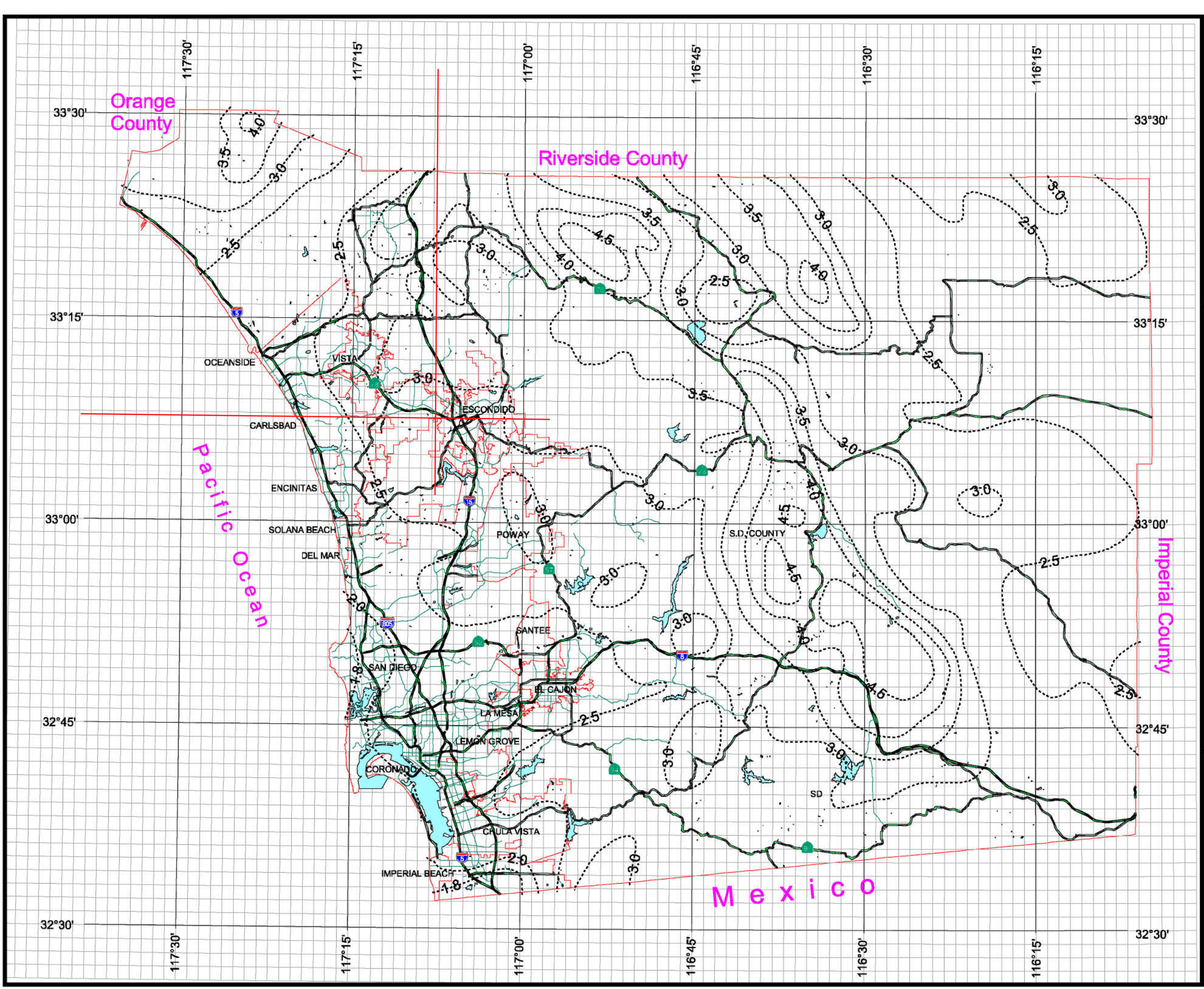
County of San Diego Hydrology Manual

Rainfall Isopluvials

50 Year Rainfall Event - 6 Hours

Isopluvial (inches)

P6 50 year = 2.8 inches



DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

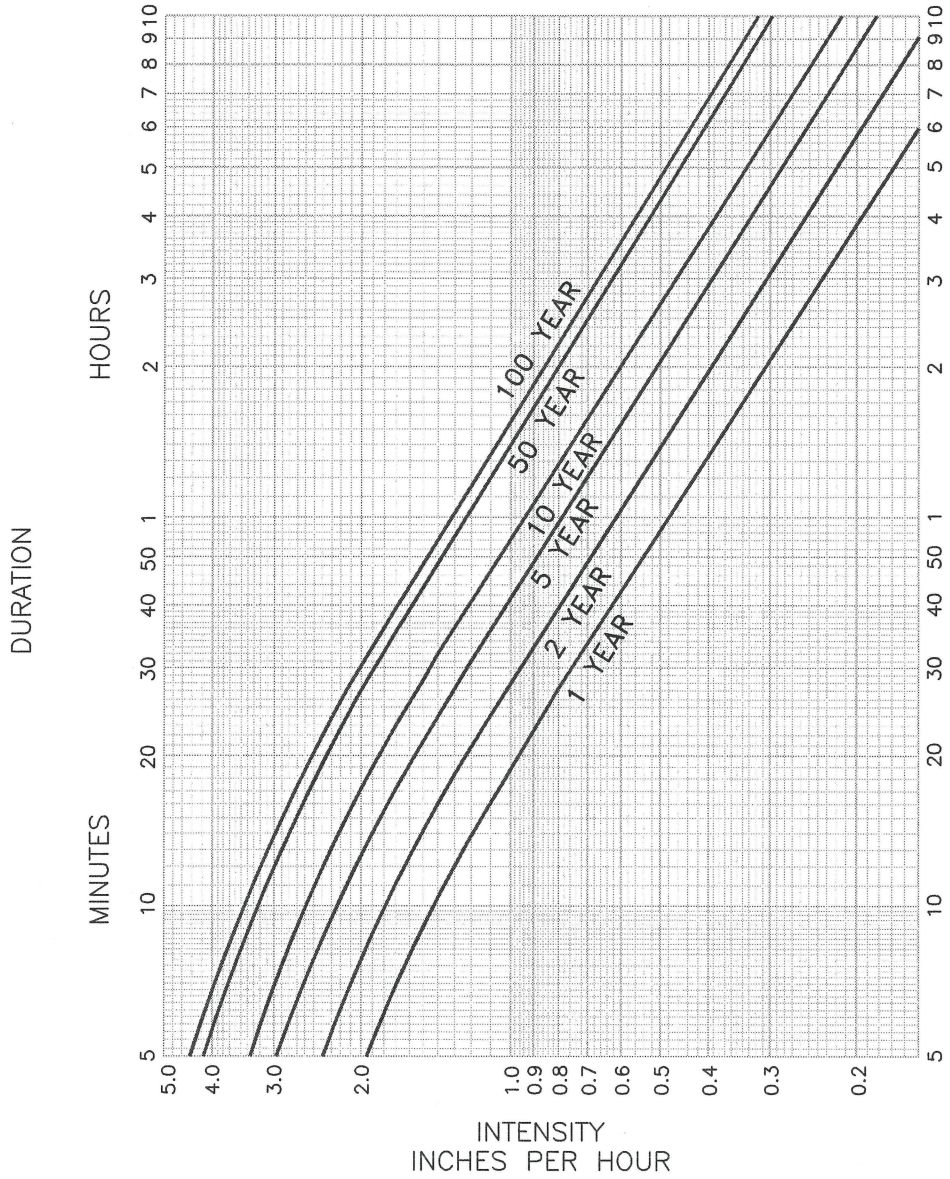
N
W E
S

3 0 3 Miles

THIS MAP IS PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.
Copyright SanGIS. All Rights Reserved.

This products may contain information from the SANDAG Regional Information System which cannot be reproduced without the written permission of SANDAG.

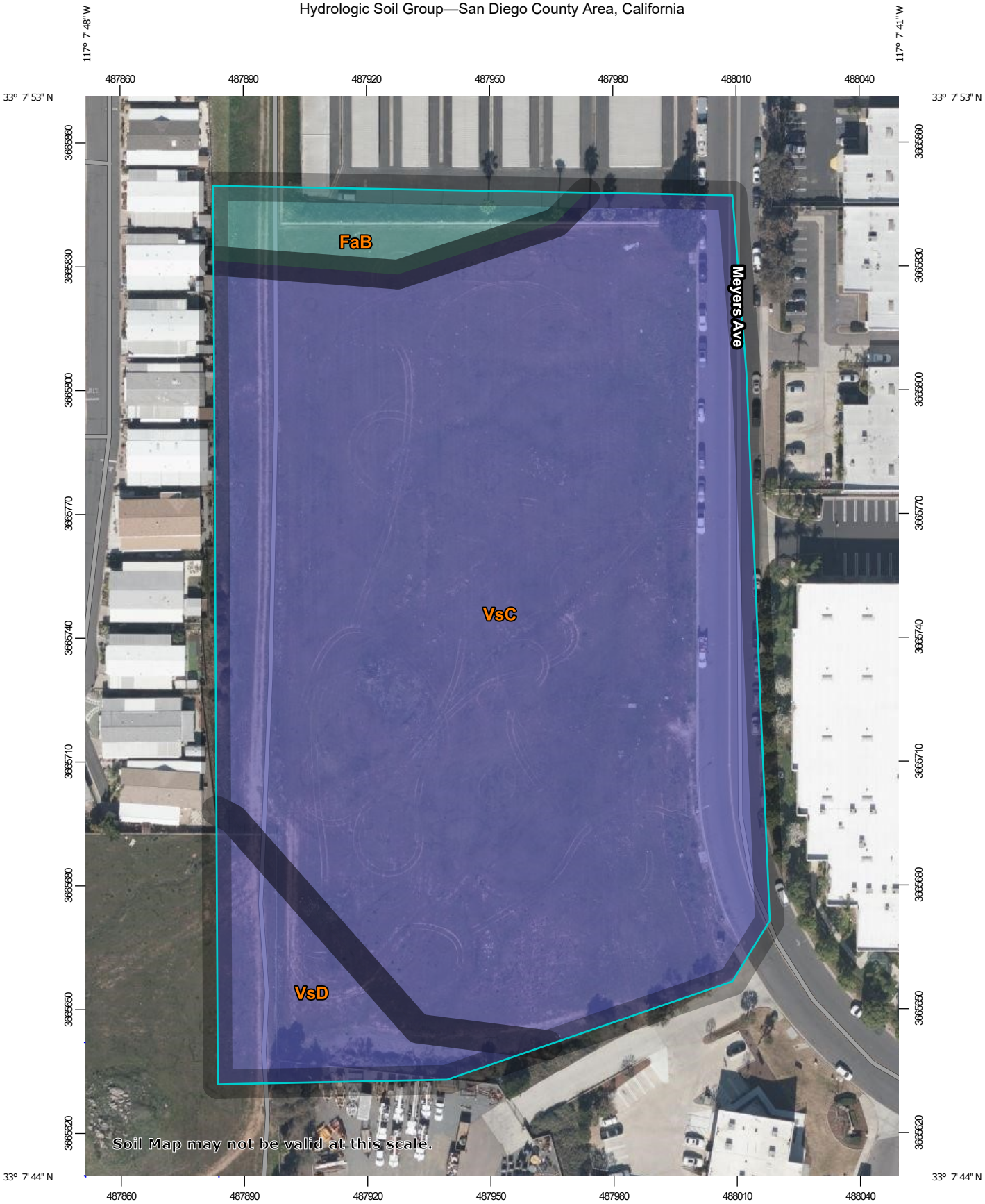
This product may contain information which has been reproduced with permission granted by Thomas Brothers Maps.



ESCONDIDO RUNOFF COEFFICIENTS

PARKS, GOLF COURSES, CEMETERIES	0.25
UNDEVELOPED LAND, OPEN SPACE	0.35
RURAL – OVER 1/2 ACRE LOTS	0.45
SINGLE FAMILY	0.55
MOBILE HOME	0.65
MULTIPLE UNITS	0.70
COMMERCIAL	0.85
INDUSTRIAL	0.95

APPROVED: Edward N. Domingue P. W. DIRECTOR/CITY ENGINEER	DATE: 04-02-2014	CITY OF ESCONDIDO DEPARTMENT OF PUBLIC WORKS	SCALE: NOT TO SCALE
REVISED	APPROVED	RUN-OFF INTENSITY DURATION CURVE	FIGURE NO. 1



Map Scale: 1:1,280 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 15 30 60 90

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

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 15, May 27, 2020

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

Date(s) aerial images were photographed: Jan 23, 2020—Feb 13, 2020

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
FaB	Fallbrook sandy loam, 2 to 5 percent slopes	C	0.4	5.3%
VsC	Vista coarse sandy loam, 5 to 9 percent slopes	B	5.9	86.7%
VsD	Vista coarse sandy loam, 9 to 15 percent slopes, MLRA 20	B	0.5	8.1%
Totals for Area of Interest			**6.8**	**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

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Final surface grades around structures should be designed to collect and direct surface water away from structures and toward appropriate drainage facilities. The ground around the structure should be graded so that surface water flows rapidly away from the structure without ponding. In general, we recommend that the ground adjacent to the structure slope away at a gradient of at least 2 percent. Densely vegetated areas where runoff can be impaired should have a minimum gradient of at least 5 percent within the first 5 feet from the structure. Roof gutters with downspouts that discharge directly into a closed drainage system are recommended on structures. Drainage patterns established at the time of fine grading should be maintained throughout the life of the proposed structures.

10.3 Site Runoff Considerations - Stormwater Disposal Systems

It is our understanding that the Client is considering that runoff generated from the facility to be disposed of in engineered subsurface features onsite. We performed percolation testing in order to provide an indication of the infiltration characteristics of the onsite materials. Our testing and findings are summarized in the following sections.

10.3.1 Percolation Testing

Following the drilling of exploratory borings B-1/P-1, B-2/P-2 and B-7/P-3, a 3-inch diameter perforated polyvinyl chloride (PVC) pipe was placed in the hole and gravel was placed around the pipe. The test holes were presoaked in general accordance with San Diego Region guidelines.

Percolation testing was performed until consistent results were obtained. The results were used to calculate the pre-adjusted percolation rate for the test hole. Upon conclusion of testing, the perforated pipe was removed from the test hole and the test hole was backfilled.

We note that a soil profile's percolation rate is not the same as its infiltration rate. Therefore, the measured/calculated field percolation rate was converted to an estimated infiltration rate utilizing a reduction factor determined using the Porchet method. Additionally, as indicated in the County of San Diego BMP guidelines (County of San Diego, 2016), a feasibility factor of safety of 2.0 is should be applied to the measured infiltration rates to account for remaining uncertainty and long-term deterioration that cannot be technically mitigated.

The following **Table 5** presents the measured percolation rate and corresponding infiltration rate calculated for the test hole.

TABLE 5
Summary of Percolation Testing

Location	Depth (ft.)	Pre-Adjusted Percolation Rate (in/hr)	Infiltration Rate* (in/hr)
B-1/P-1	~ 7-8	0.24	0.01
B-2/P-2	~ 8-9	0	0
B-7/P-3	~ 9-10	0	0

*Feasibility factor of safety of 2.0 is included

10.3.2 Summary of Findings

The County of San Diego BMP guidelines indicate that onsite storm-water disposal systems can be designed for "Full-Infiltration" for subsurface materials with corrected infiltration rates equal to or greater than 0.5-inches per hour, and for "Partial Infiltration" for corrected infiltration rates less than 0.5-inches per hour. However, based on the relatively low infiltration rates and the presence of shallow bedrock across the site, it is our preliminary conclusion that the onsite soils in the areas tested are not suitable for direct infiltration of storm-water (No Infiltration).

We provide the following conclusions regarding the percolation test results:

- It is our opinion that the percolation characteristics at the tested depths are generally representative of the site conditions in the vicinity of the test holes. Percolation testing was performed within natural bedrock materials consisting of primarily of dense sandy soils.

- As discussed in the County of San Diego BMP guidelines for percolation testing, the bottom of the borings where the percolation tests are performed should be at approximately the same depth of the invert of the proposed infiltration facility. The project civil engineer should determine if the tests performed meet this requirement.

- As discussed in the County of San Diego BMP guidelines, a correction factor should be applied to the measured infiltration rates to account for soil assessment method, soil type, soil variability, depth to groundwater, level of pretreatment, redundancy, and compaction during construction. The project civil engineer should determine the appropriate design-level factor of safety for the proposed disposal system.

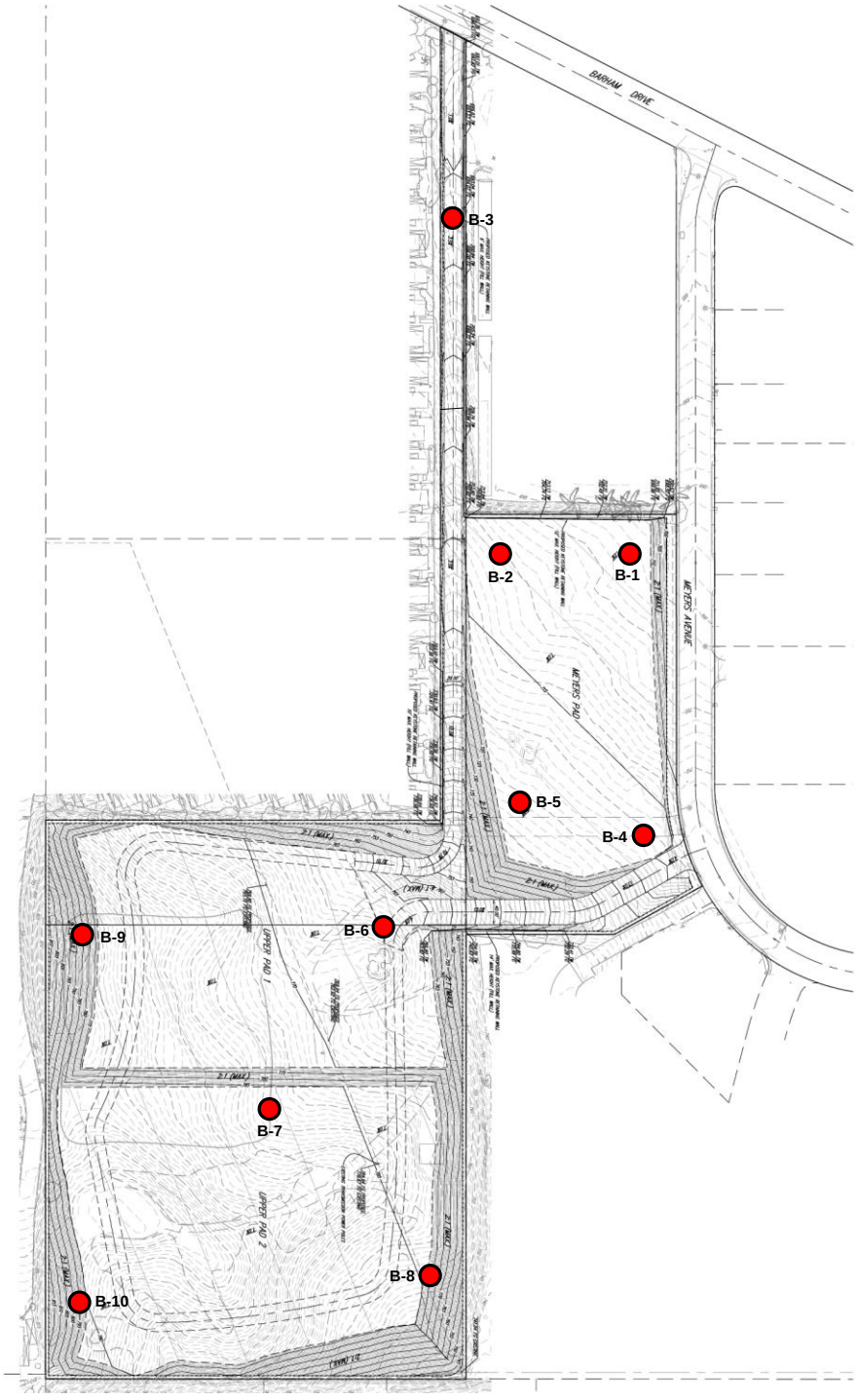
Design of the stormwater disposal system should be in accordance with the County of San Diego guidelines.

10.3.3 Structure Setback from Retention Devices

We recommend that storm-water disposal systems be situated at least three times their depth, or a minimum of 15 feet (whichever is greater), from the outside bottom edge of structural foundations.

Structural foundations include (but are not limited to) buildings, loading docks, retaining walls, and screen walls. The invert of storm-water infiltration should be outside a 1:1 (H:V) plane projected from the bottom of adjacent foundations.

Storm-water disposal systems should be checked and maintained on regular intervals. Storm-water devices including bio-swales that are located closer than 10 feet from any foundations/footings should be lined with an impermeable membrane to reduce the potential for saturation of foundation soils. Foundations may also need to be deepened.



Map Source: Excel Engineering; Sunrise Conceptual Model

LEGEND

B-10 *Approximate HSA Boring Location*

Scale: 1" = 365'

0 365 FT 730 FT

Note All Locations Are Approximate

N

FIELD EXPLORATION PLAN

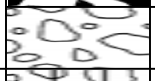
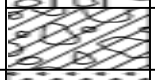
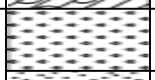
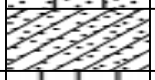
INTEGRAL PARTNERS FUNDING, LLC
Cities of San Marcos and Escondido
County of San Diego, California 92078/92029
EEI Project IPF-72446.4
Created July 2017

EEI Engineering Solutions

FIGURE 3

APPENDIX A
SOIL CLASSIFICATION CHART AND BORING LOGS

UNIFIED SOIL CLASSIFICATION (ASTM D-2487-98)

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL- SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SEIVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND- CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS,GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION REATINED ON NO. 4 SEIVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY-SANDS, SAND – SILT MIXTURES
				SC	CLAYEY SANDS, SAND – CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS

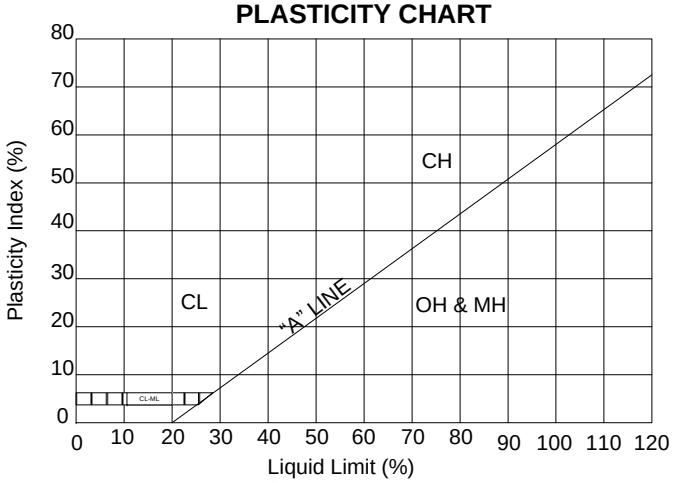
SAMPLER TYPES

- SPT
- Modified California (2.5" I.D.)
- Bulk
- Rock Core
- Shelby Tube
- Water Level

OTHER TESTS

ATT – Atterberg Limit (Plasticity Index)
CD – Consolidated Drained Triaxial
CON – Consolidation
COR – Corrosivity)
DS – Direct Shear
EI – Expansion Index
MAX – Maximum Density
RV – R-Value
SA – Sieve Analysis
-#200 - Percent Passing #200 Sieve
TV – Torvane Shear
UU – Unconsolidated Undrained Triaxial

PLASTICITY CHART



PENETRATION RESISTANCE
(Recorded As Blows/Foot)

SAND & GRAVEL		SILT & CLAY		
Relative Density	Blows/Foot* N_{60}	Consistency	Blows/Foot* N_{60}	Strength**(KSF)
Very Loose	0-4	Very Soft	0 - 2	0 – 0.5
Loose	4-10	Soft	2 - 4	0.5 – 1.0
Medium Dense	10-30	Medium Stiff	4 - 8	1.0 – 2.0
Dense	30-50	Stiff	8 - 15	2.0 – 4.0
Very Dense	Over 50	Very Stiff	15 - 30	4.0 – 8.0
		Hard	Over 30	Over 8.0

* Number of blows of 140LB hammer falling 30 inches to drive a 2 inch O.D. (1-3/8 inch I.D.) split barrel sampler the last 12 inches of an 18-inch drive (ASTM-1586 Standard Penetration Test)

** Undrained shear strength in kips/sq. ft. As determined by laboratory testing or approximated by the standard penetration test, pocket penetrometer, torvane, or visual observation

BORING NUMBER B-1/P-1

CLIENT Integral Communities
PROJECT NAME Barham Drive/San Marcos, California
PROJECT NUMBER IPF-72446.4
PROJECT LOCATION Barham Drive/Meyers Avenue, San Marcos, CA
DATE STARTED 7/7/17 **COMPLETED** 7/7/17
GROUND ELEVATION _____ **BORING DIAMETER** 8-inch
EQUIPMENT / RIG Truck-Mounted B-53
HAMMER EFFICIENCY (%) 68
METHOD 8" Hollow Stem Auger 140 lbs Auto Hammer
SPT CORRECTION 1.13 **CAL CORRECTION** 0.62
LOGGED BY WP **CHECKED BY** _____
GROUNDWATER DEPTH (ft) Not Encountered
NOTES _____

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	USCS SYMBOL	SAMPLE TYPE	PENETRATION RESISTANCE (blows/6-inches)	SPT N60	POCKET PEN (tsf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (PI:LL)	FINES CONTENT (%)	OTHER TESTS
0		**TOPSOIL**										
1		SILTY SAND - orange-brown, fine to coarse grained; slightly moist, loose	SM	BULK								EI
2												
3		@ 2.5' - **WEATHERED GRANITICS**			7							
		SILTY SAND with trace CLAY - orange-brown, fine to medium grained, moist, medium dense	SM	MC	10 17	17		11	118			DS MAX
4												
5		@ 5' - SILTY SAND - brown, fine to coarse grained, dry, very dense		MC	50 for 5"			3	126			
6												
7				MC	50 for 4"			4	114			
8												

Total depth: 8-feet
Percolation test performed
No groundwater encountered
Boring backfilled on 7/7/2017

GEOTECH LOG - COLUMNS BORING LOGS.GPJ GINT STD US LAB.GDT 8/2/17

BORING NUMBER B-2/P-2

CLIENT Integral Communities
PROJECT NAME Barham Drive/San Marcos, California
PROJECT NUMBER IPF-72446.4
PROJECT LOCATION Barham Drive/Meyers Avenue, San Marcos, CA
DATE STARTED 7/7/17 **COMPLETED** 7/7/17
GROUND ELEVATION _____ **BORING DIAMETER** 8-inch
EQUIPMENT / RIG Truck-Mounted B-53
HAMMER EFFICIENCY (%) 68
METHOD 8" Hollow Stem Auger 140 lbs Auto Hammer
SPT CORRECTION 1.13 **CAL CORRECTION** 0.62
LOGGED BY WP **CHECKED BY** _____
GROUNDWATER DEPTH (ft) Not Encountered
NOTES _____

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	USCS SYMBOL	SAMPLE TYPE	PENETRATION RESISTANCE (blows/6-inches)	SPT N60	POCKET PEN (tsf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (PI:LL)	FINES CONTENT (%)	OTHER TESTS
0		**TOPSOIL**										
1		SILTY SAND - orange-brown, fine to coarse grained; slightly moist, loose	SM									
2												
3		@ 2.5' -**WEATHERED GRANITICS**			20							
		SILTY SAND - orange-brown, fine to coarse grained, moist, medium dense	SM	MC	27 35	39		11	125			
4												
5		@ 5' - SILTY SAND - orange-brown, fine to coarse grained, moist, dense			12							
				MC	20 25	28		14	116			
6												
7												
8		@ 7.5' - becomes light brown			16							
				MC	27 47	46		10	120			
9												
10		@ 10' - becomes very dense		MC	50 for 6"			6	97			

Total depth: 10.5-feet
Percolation test performed
No groundwater encountered
Boring backfilled on 7/7/2017

GEOTECH LOG - COLUMNS BORING LOGS.GPJ GINT STD US LAB.GDT 8/2/17

BORING NUMBER B-4

CLIENT Integral Communities
PROJECT NAME Barham Drive/San Marcos, California
PROJECT NUMBER IPF-72446.4
PROJECT LOCATION Barham Drive/Meyers Avenue, San Marcos, CA
DATE STARTED 7/7/17 **COMPLETED** 7/7/17
GROUND ELEVATION _____ **BORING DIAMETER** 8-inch
EQUIPMENT / RIG Truck-Mounted B-53
HAMMER EFFICIENCY (%) 68
METHOD 8" Hollow Stem Auger 140 lbs Auto Hammer
SPT CORRECTION 1.13 **CAL CORRECTION** 0.62
LOGGED BY WP **CHECKED BY** _____
GROUNDWATER DEPTH (ft) Not Encountered
NOTES _____

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	USCS SYMBOL	SAMPLE TYPE	PENETRATION RESISTANCE (blows/6-inches)	SPT N60	POCKET PEN (tsf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (PI:LL)	FINES CONTENT (%)	OTHER TESTS
0		**TOPSOIL**										
1		SILTY-SAND - orange-brown, fine to coarse grained, slightly moist, very dense	SM									
2												
3		@ 2.5' - **WEATHERED GRANITICS**		MC	21 40 40	50		6	121			
4		SILTY-SAND - orange-brown, fine to coarse grained, slightly moist, very dense	SM									
5		@ 5' - SILTY SAND, CLAYEY SAND - orange, fine to medium grained, moist, medium dense		MC	5 15 30	28		13	121			
6												
7		@ 7.5' - SILTY-SAND - orange-brown, fine to coarse grained, slightly moist, very dense		MC	50 for 6"			11	93			
8												
9												
10		@10' - becomes dry		MC	36 50 for 3"			9	112			
11		@ 11.5' -minor seapage										
12				SPT	50 for 1"			14				

Total depth: 12.5-feet Due to Refusal
No groundwater encountered
Boring backfilled on 7/7/2017

GEOTECH LOG - COLUMNS BORING LOGS.GPJ GINT STD US LAB.GDT 8/2/17

BORING NUMBER B-5

CLIENT Integral Communities
PROJECT NAME Barham Drive/San Marcos, California
PROJECT NUMBER IPF-72446.4
PROJECT LOCATION Barham Drive/Meyers Avenue, San Marcos, CA
DATE STARTED 7/7/17 **COMPLETED** 7/7/17
GROUND ELEVATION _____ **BORING DIAMETER** 8-inch
EQUIPMENT / RIG Truck-Mounted B-53
HAMMER EFFICIENCY (%) 68
METHOD 8" Hollow Stem Auger 140 lbs Auto Hammer
SPT CORRECTION 1.13 **CAL CORRECTION** 0.62
LOGGED BY WP **CHECKED BY** _____
GROUNDWATER DEPTH (ft) Not Encountered
NOTES _____

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	USCS SYMBOL	SAMPLE TYPE	PENETRATION RESISTANCE (blows/6-inches)	SPT N60	POCKET PEN (tsf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (PI:LL)	FINES CONTENT (%)	OTHER TESTS
0		**TOPSOIL**										
1		SILTY-SAND -orange-brown, fine to coarse grained, slightly moist, loose	SM	BULK								COR
2												
3		@ 2.5' - **WEATHERED GRANITICS** SILTY-SAND - orange-brown, fine to coarse grained, slightly moist, medium dense		MC	5 7 10	11		7	99			DS MAX
4												
5		@ 7' - SILTY-SAND - orange- brown, fine to coarse grained, moist, very dense		MC	18 50 for 5"			8	121			
6												
7												
8		@ 7.5 -becomes gray brown		MC	50 for 6"			7	110			
9												
10			SM									
11				MC	34 50 for 6"			6	119			
12												
13												
14												
15		@ 15 - trace GRAVELS		SPT	50 for 3"			2				
16												
17				SPT	50 for 1"			2				

Total depth: 17.5-feet Due to Refusal
No groundwater encountered
Boring backfilled on 7/7/2017

GEOTECH LOG - COLUMNS BORING LOGS.GPJ GINT STD US LAB.GDT 8/2/17

Appendix 4

AES Rational Method Calculations

EXISTING CONDITION - 50-YEAR STORM

```
******************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2008 Advanced Engineering Software (aes)
              Ver. 15.0 Release Date: 04/01/2008  License ID 1452

                                        Analysis prepared by:

                                   PASCO LARET SUITER & ASSOCIATES
                                        535 NORTH HIGHWAY 101
                                    SUITE A
                                SOLANA BEACH CA 92705

------------------------------------------------------------------------------
  FILE NAME: 3446E50.DAT
  TIME/DATE OF STUDY: 09:53 06/03/2021
------------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  50.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   3.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  9
   1)   5.000;  4.200
   2)  10.000;  3.200
   3)  15.000;  2.700
   4)  20.000;  2.300
   5)  25.000;  2.200
   6)  30.000;  1.900
   7)  40.000;  1.600
   8)  50.000;  1.350
   9)  60.000;  1.200
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

******************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    57.00
  UPSTREAM ELEVATION(FEET) =    741.00
```

```
  DOWNSTREAM ELEVATION(FEET) =    733.00
  ELEVATION DIFFERENCE(FEET) =      8.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.731
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.200
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.10
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.10

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    733.00  DOWNSTREAM(FEET) =    697.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   570.00   CHANNEL SLOPE =  0.0632
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   5.000
  MANNING'S FACTOR = 0.025   MAXIMUM DEPTH(FEET) =   1.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.745
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.85
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.74
  AVERAGE FLOW DEPTH(FEET) =   0.13   TRAVEL TIME(MIN.) =   2.54
  Tc(MIN.) =    7.27
  SUBAREA AREA(ACRES) =     4.19       SUBAREA RUNOFF(CFS) =    5.49
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        4.3         PEAK FLOW RATE(CFS) =       5.58

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.20   FLOW VELOCITY(FEET/SEC.) =   4.62
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     627.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        4.3  TC(MIN.) =      7.27
  PEAK FLOW RATE(CFS)   =       5.58
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

PROPOSED CONDITION - 50-YEAR

```
******************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2008 Advanced Engineering Software (aes)
              Ver. 15.0 Release Date: 04/01/2008  License ID 1452

                              Analysis prepared by:

                         PASCO LARET SUITER & ASSOCIATES
                              535 NORTH HIGHWAY 101
                                     SUITE A
                              SOLANA BEACH CA 92705

------------------------------------------------------------------------------
  FILE NAME: 3446P50.DAT
  TIME/DATE OF STUDY: 09:58 03/25/2022
------------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  50.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   3.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  9
   1)   5.000;  4.200
   2)  10.000;  3.200
   3)  15.000;  2.700
   4)  20.000;  2.300
   5)  25.000;  2.200
   6)  30.000;  1.900
   7)  40.000;  1.600
   8)  50.000;  1.350
   9)  60.000;  1.200
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

******************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .2500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    48.00
  UPSTREAM ELEVATION(FEET) =    733.00
```

```
  DOWNSTREAM ELEVATION(FEET) =    713.80
  ELEVATION DIFFERENCE(FEET) =     19.20
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.921
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.200
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.10
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.10

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  713.80  DOWNSTREAM ELEVATION(FEET) =  713.10
  STREET LENGTH(FEET) =    87.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 26.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.018
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.32
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.19
    HALFSTREET FLOOD WIDTH(FEET) =    3.20
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.44
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.27
  STREET FLOW TRAVEL TIME(MIN.) =   1.01   Tc(MIN.) =    5.93
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.014
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.617
  SUBAREA AREA(ACRES) =    0.11      SUBAREA RUNOFF(CFS) =    0.42
  TOTAL AREA(ACRES) =        0.2        PEAK FLOW RATE(CFS) =       0.52

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.22   HALFSTREET FLOOD WIDTH(FEET) =   4.76
  FLOW VELOCITY(FEET/SEC.) =  1.51   DEPTH*VELOCITY(FT*FT/SEC.) =   0.33
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     135.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.014
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .2500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4984
  SUBAREA AREA(ACRES) =    0.10   SUBAREA RUNOFF(CFS) =    0.10
  TOTAL AREA(ACRES) =        0.3   TOTAL RUNOFF(CFS) =       0.62
  TC(MIN.) =    5.93

****************************************************************************
```

```
 FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   709.10  DOWNSTREAM(FEET) =   708.93
 FLOW LENGTH(FEET) =    17.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN   6.0 INCH PIPE IS   4.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   3.72
 ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       0.62
 PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =    6.01
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    203.00 =     152.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    203.00 TO NODE    203.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.999
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .9500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.6808
 SUBAREA AREA(ACRES) =    0.21   SUBAREA RUNOFF(CFS) =    0.80
 TOTAL AREA(ACRES) =        0.5   TOTAL RUNOFF(CFS) =       1.42
 TC(MIN.) =    6.01

****************************************************************************
 FLOW PROCESS FROM NODE    203.00 TO NODE    204.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   708.93  DOWNSTREAM(FEET) =   707.67
 FLOW LENGTH(FEET) =   126.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN   9.0 INCH PIPE IS   5.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.73
 ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       1.42
 PIPE TRAVEL TIME(MIN.) =   0.44    Tc(MIN.) =    6.45
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    204.00 =     278.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    204.00 TO NODE    204.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.910
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .9500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.7891
 SUBAREA AREA(ACRES) =    0.35   SUBAREA RUNOFF(CFS) =    1.30
 TOTAL AREA(ACRES) =        0.9   TOTAL RUNOFF(CFS) =       2.68
 TC(MIN.) =    6.45

****************************************************************************
 FLOW PROCESS FROM NODE    204.00 TO NODE    205.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =   707.67  DOWNSTREAM(FEET) =   706.69
  FLOW LENGTH(FEET) =    94.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.66
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.68
  PIPE TRAVEL TIME(MIN.) =   0.28    Tc(MIN.) =    6.73
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    205.00 =     372.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    205.00 TO NODE    205.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.854
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8333
  SUBAREA AREA(ACRES) =    0.33   SUBAREA RUNOFF(CFS) =    1.21
  TOTAL AREA(ACRES) =        1.2   TOTAL RUNOFF(CFS) =       3.85
  TC(MIN.) =    6.73

****************************************************************************
  FLOW PROCESS FROM NODE    205.00 TO NODE    206.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   706.69  DOWNSTREAM(FEET) =   705.35
  FLOW LENGTH(FEET) =   130.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   9.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.02
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.85
  PIPE TRAVEL TIME(MIN.) =   0.36    Tc(MIN.) =    7.09
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    206.00 =     502.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    206.00 TO NODE    206.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.782
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8554
  SUBAREA AREA(ACRES) =    0.28   SUBAREA RUNOFF(CFS) =    1.01
  TOTAL AREA(ACRES) =        1.5   TOTAL RUNOFF(CFS) =       4.79
  TC(MIN.) =    7.09

****************************************************************************
  FLOW PROCESS FROM NODE    206.00 TO NODE    206.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.782
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .2500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7865
  SUBAREA AREA(ACRES) =    0.19   SUBAREA RUNOFF(CFS) =    0.18
```

```
  TOTAL AREA(ACRES) =        1.7   TOTAL RUNOFF(CFS) =       4.97
  TC(MIN.) =    7.09

****************************************************************************
  FLOW PROCESS FROM NODE    206.00 TO NODE    207.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   705.35  DOWNSTREAM(FEET) =   702.85
  FLOW LENGTH(FEET) =   247.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.52
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.97
  PIPE TRAVEL TIME(MIN.) =   0.63    Tc(MIN.) =    7.72
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    207.00 =     749.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    207.00 TO NODE    207.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.656
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8063
  SUBAREA AREA(ACRES) =    0.23   SUBAREA RUNOFF(CFS) =    0.80
  TOTAL AREA(ACRES) =        1.9   TOTAL RUNOFF(CFS) =       5.60
  TC(MIN.) =    7.72

****************************************************************************
  FLOW PROCESS FROM NODE    207.00 TO NODE    208.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   702.85  DOWNSTREAM(FEET) =   701.00
  FLOW LENGTH(FEET) =    64.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   8.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.88
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.60
  PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =    7.83
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    208.00 =     813.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    208.00 TO NODE    208.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.635
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8800
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8437
  SUBAREA AREA(ACRES) =    1.96   SUBAREA RUNOFF(CFS) =    6.27
  TOTAL AREA(ACRES) =        3.9   TOTAL RUNOFF(CFS) =      11.84
  TC(MIN.) =    7.83

****************************************************************************
  FLOW PROCESS FROM NODE    209.00 TO NODE    210.00 IS CODE =  31
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   701.00  DOWNSTREAM(FEET) =   700.62
  FLOW LENGTH(FEET) =    38.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  14.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.81
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.84
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =    7.91
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    210.00 =     851.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    211.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   700.62  DOWNSTREAM(FEET) =   686.80
  FLOW LENGTH(FEET) =    50.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  28.10
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.84
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    7.94
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    211.00 =     901.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    211.00 TO NODE    211.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.612
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .2500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8063
  SUBAREA AREA(ACRES) =    0.26   SUBAREA RUNOFF(CFS) =    0.23
  TOTAL AREA(ACRES) =        4.1   TOTAL RUNOFF(CFS) =      12.00
  TC(MIN.) =    7.94

****************************************************************************
  FLOW PROCESS FROM NODE    211.00 TO NODE    211.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.612
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .2500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7867
  SUBAREA AREA(ACRES) =    0.15   SUBAREA RUNOFF(CFS) =    0.14
  TOTAL AREA(ACRES) =        4.3   TOTAL RUNOFF(CFS) =      12.14
  TC(MIN.) =    7.94
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        4.3  TC(MIN.) =      7.94
  PEAK FLOW RATE(CFS)   =      12.14
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

DETAINED CONDITION - 50 YEAR

```
******************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2008 Advanced Engineering Software (aes)
              Ver. 15.0 Release Date: 04/01/2008  License ID 1452

                              Analysis prepared by:

                         PASCO LARET SUITER & ASSOCIATES
                              535 NORTH HIGHWAY 101
                                     SUITE A
                              SOLANA BEACH CA 92705

------------------------------------------------------------------------------
  FILE NAME: 3446P50.DAT
  TIME/DATE OF STUDY: 10:10 03/25/2022
------------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  50.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   3.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  9
   1)   5.000;  4.200
   2)  10.000;  3.200
   3)  15.000;  2.700
   4)  20.000;  2.300
   5)  25.000;  2.200
   6)  30.000;  1.900
   7)  40.000;  1.600
   8)  50.000;  1.350
   9)  60.000;  1.200
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

******************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .2500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    48.00
  UPSTREAM ELEVATION(FEET) =    733.00
```

```
  DOWNSTREAM ELEVATION(FEET) =    713.80
  ELEVATION DIFFERENCE(FEET) =     19.20
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.921
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.200
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.10
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.10

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  713.80  DOWNSTREAM ELEVATION(FEET) =  713.10
  STREET LENGTH(FEET) =    87.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 26.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.018
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.32
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.19
    HALFSTREET FLOOD WIDTH(FEET) =    3.20
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.44
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.27
  STREET FLOW TRAVEL TIME(MIN.) =   1.01   Tc(MIN.) =    5.93
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.014
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.617
  SUBAREA AREA(ACRES) =    0.11      SUBAREA RUNOFF(CFS) =    0.42
  TOTAL AREA(ACRES) =        0.2        PEAK FLOW RATE(CFS) =       0.52

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.22   HALFSTREET FLOOD WIDTH(FEET) =   4.76
  FLOW VELOCITY(FEET/SEC.) =  1.51   DEPTH*VELOCITY(FT*FT/SEC.) =   0.33
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     135.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.014
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .2500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4984
  SUBAREA AREA(ACRES) =    0.10   SUBAREA RUNOFF(CFS) =    0.10
  TOTAL AREA(ACRES) =        0.3   TOTAL RUNOFF(CFS) =       0.62
  TC(MIN.) =    5.93

****************************************************************************
```

```
 FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   709.10  DOWNSTREAM(FEET) =   708.93
 FLOW LENGTH(FEET) =    17.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN   6.0 INCH PIPE IS   4.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   3.72
 ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       0.62
 PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =    6.01
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    203.00 =     152.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    203.00 TO NODE    203.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.999
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .9500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.6808
 SUBAREA AREA(ACRES) =    0.21   SUBAREA RUNOFF(CFS) =    0.80
 TOTAL AREA(ACRES) =        0.5   TOTAL RUNOFF(CFS) =       1.42
 TC(MIN.) =    6.01

****************************************************************************
 FLOW PROCESS FROM NODE    203.00 TO NODE    204.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   708.93  DOWNSTREAM(FEET) =   707.67
 FLOW LENGTH(FEET) =   126.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN   9.0 INCH PIPE IS   5.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.73
 ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       1.42
 PIPE TRAVEL TIME(MIN.) =   0.44    Tc(MIN.) =    6.45
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    204.00 =     278.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    204.00 TO NODE    204.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.910
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .9500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.7891
 SUBAREA AREA(ACRES) =    0.35   SUBAREA RUNOFF(CFS) =    1.30
 TOTAL AREA(ACRES) =        0.9   TOTAL RUNOFF(CFS) =       2.68
 TC(MIN.) =    6.45

****************************************************************************
 FLOW PROCESS FROM NODE    204.00 TO NODE    205.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =   707.67  DOWNSTREAM(FEET) =   706.69
  FLOW LENGTH(FEET) =    94.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.66
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.68
  PIPE TRAVEL TIME(MIN.) =   0.28    Tc(MIN.) =    6.73
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    205.00 =     372.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    205.00 TO NODE    205.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.854
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8333
  SUBAREA AREA(ACRES) =    0.33   SUBAREA RUNOFF(CFS) =    1.21
  TOTAL AREA(ACRES) =        1.2   TOTAL RUNOFF(CFS) =       3.85
  TC(MIN.) =    6.73

****************************************************************************
  FLOW PROCESS FROM NODE    205.00 TO NODE    206.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   706.69  DOWNSTREAM(FEET) =   705.35
  FLOW LENGTH(FEET) =   130.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   9.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.02
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.85
  PIPE TRAVEL TIME(MIN.) =   0.36    Tc(MIN.) =    7.09
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    206.00 =     502.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    206.00 TO NODE    206.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.782
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8554
  SUBAREA AREA(ACRES) =    0.28   SUBAREA RUNOFF(CFS) =    1.01
  TOTAL AREA(ACRES) =        1.5   TOTAL RUNOFF(CFS) =       4.79
  TC(MIN.) =    7.09

****************************************************************************
  FLOW PROCESS FROM NODE    206.00 TO NODE    206.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.782
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .2500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7865
  SUBAREA AREA(ACRES) =    0.19   SUBAREA RUNOFF(CFS) =    0.18
```

```
  TOTAL AREA(ACRES) =        1.7   TOTAL RUNOFF(CFS) =       4.97
  TC(MIN.) =    7.09

****************************************************************************
  FLOW PROCESS FROM NODE    206.00 TO NODE    207.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   705.35  DOWNSTREAM(FEET) =   702.85
  FLOW LENGTH(FEET) =   247.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.52
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.97
  PIPE TRAVEL TIME(MIN.) =   0.63    Tc(MIN.) =    7.72
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    207.00 =     749.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    207.00 TO NODE    207.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.656
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8063
  SUBAREA AREA(ACRES) =    0.23   SUBAREA RUNOFF(CFS) =    0.80
  TOTAL AREA(ACRES) =        1.9   TOTAL RUNOFF(CFS) =       5.60
  TC(MIN.) =    7.72

****************************************************************************
  FLOW PROCESS FROM NODE    207.00 TO NODE    208.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   702.85  DOWNSTREAM(FEET) =   701.00
  FLOW LENGTH(FEET) =    64.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   8.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.88
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.60
  PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =    7.83
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    208.00 =     813.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    208.00 TO NODE    208.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.635
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8800
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8437
  SUBAREA AREA(ACRES) =    1.96   SUBAREA RUNOFF(CFS) =    6.27
  TOTAL AREA(ACRES) =        3.9   TOTAL RUNOFF(CFS) =      11.84
  TC(MIN.) =    7.83

****************************************************************************
  FLOW PROCESS FROM NODE    209.00 TO NODE    209.00 IS CODE =   7
```

```
------------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
==============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  17.00   RAIN INTENSITY(INCH/HOUR) =  2.54
  TOTAL AREA(ACRES) =     3.86   TOTAL RUNOFF(CFS) =      5.29

******************************************************************************
  FLOW PROCESS FROM NODE    209.00 TO NODE    210.00 IS CODE =  31
------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   701.00  DOWNSTREAM(FEET) =   700.62
  FLOW LENGTH(FEET) =    38.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   9.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.58
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.29
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =   17.10
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    210.00 =     851.00 FEET.

******************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    211.00 IS CODE =  31
------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   700.62  DOWNSTREAM(FEET) =   686.80
  FLOW LENGTH(FEET) =    50.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  23.00
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.29
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =   17.13
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    211.00 =     901.00 FEET.

******************************************************************************
  FLOW PROCESS FROM NODE    211.00 TO NODE    211.00 IS CODE =  81
------------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.529
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .2500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5213
  SUBAREA AREA(ACRES) =    0.26   SUBAREA RUNOFF(CFS) =    0.16
  TOTAL AREA(ACRES) =        4.1   TOTAL RUNOFF(CFS) =       5.43
  TC(MIN.) =   17.13

******************************************************************************
  FLOW PROCESS FROM NODE    211.00 TO NODE    211.00 IS CODE =  81
------------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.529
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .2500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5118
  SUBAREA AREA(ACRES) =    0.15   SUBAREA RUNOFF(CFS) =    0.09
  TOTAL AREA(ACRES) =        4.3   TOTAL RUNOFF(CFS) =       5.53
```

```
  TC(MIN.) =   17.13
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =         4.3  TC(MIN.) =     17.13
  PEAK FLOW RATE(CFS)   =        5.53
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

Appendix 5

Modified-Puls Detention Routing

RATIONAL METHOD HYDROGRAPH PROGRAM
COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY

RUN DATE 3/25/2022
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 10 MIN.
6 HOUR RAINFALL 2.8 INCHES
BASIN AREA 3.86 ACRES
RUNOFF COEFFICIENT 0.8437
PEAK DISCHARGE 11.84 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 10	DISCHARGE (CFS) = 0.5
TIME (MIN) = 20	DISCHARGE (CFS) = 0.6
TIME (MIN) = 30	DISCHARGE (CFS) = 0.6
TIME (MIN) = 40	DISCHARGE (CFS) = 0.6
TIME (MIN) = 50	DISCHARGE (CFS) = 0.6
TIME (MIN) = 60	DISCHARGE (CFS) = 0.6
TIME (MIN) = 70	DISCHARGE (CFS) = 0.7
TIME (MIN) = 80	DISCHARGE (CFS) = 0.7
TIME (MIN) = 90	DISCHARGE (CFS) = 0.7
TIME (MIN) = 100	DISCHARGE (CFS) = 0.7
TIME (MIN) = 110	DISCHARGE (CFS) = 0.8
TIME (MIN) = 120	DISCHARGE (CFS) = 0.8
TIME (MIN) = 130	DISCHARGE (CFS) = 0.9
TIME (MIN) = 140	DISCHARGE (CFS) = 0.9
TIME (MIN) = 150	DISCHARGE (CFS) = 1
TIME (MIN) = 160	DISCHARGE (CFS) = 1
TIME (MIN) = 170	DISCHARGE (CFS) = 1.1
TIME (MIN) = 180	DISCHARGE (CFS) = 1.2
TIME (MIN) = 190	DISCHARGE (CFS) = 1.4
TIME (MIN) = 200	DISCHARGE (CFS) = 1.5
TIME (MIN) = 210	DISCHARGE (CFS) = 1.8
TIME (MIN) = 220	DISCHARGE (CFS) = 2.1
TIME (MIN) = 230	DISCHARGE (CFS) = 3
TIME (MIN) = 240	DISCHARGE (CFS) = 7.8
TIME (MIN) = 250	DISCHARGE (CFS) = 11.84
TIME (MIN) = 260	DISCHARGE (CFS) = 2.4
TIME (MIN) = 270	DISCHARGE (CFS) = 1.6
TIME (MIN) = 280	DISCHARGE (CFS) = 1.3
TIME (MIN) = 290	DISCHARGE (CFS) = 1.1
TIME (MIN) = 300	DISCHARGE (CFS) = 0.9
TIME (MIN) = 310	DISCHARGE (CFS) = 0.8
TIME (MIN) = 320	DISCHARGE (CFS) = 0.8
TIME (MIN) = 330	DISCHARGE (CFS) = 0.7
TIME (MIN) = 340	DISCHARGE (CFS) = 0.6
TIME (MIN) = 350	DISCHARGE (CFS) = 0.6
TIME (MIN) = 360	DISCHARGE (CFS) = 0.6
TIME (MIN) = 370	DISCHARGE (CFS) = 0

Outlet Structure for Discharge of BMP-1

Discharge vs. Elevation Table

Low Flow orifice		Mid Slot orifice		Emergency Overflow	
No.:	1	No.:	1	Invert:	5.17 ft
Invert:	0.00 ft	Invert:	2.00 ft	L:	6 ft
Dia:	1.75 in	Length:	2.00 ft	C_w:	3.1
Dia:	0.15 ft	Height	0.25 ft	Tank Dimensions	
A:	0.02 sf	A:	0.50 sf	Area:	2,700 sq-ft
C_o:	0.6	C_o:	0.6	Height:	5.67 ft
				Total Vol:	15,309 cu-ft

***Note: h = head above the invert of the lowest surface discharge opening.**

H (ft)	h* (ft)	Volume (ac-ft)	$Q_{orifice-low}$ (cfs)	$Q_{slot-mid}$ (cfs)	Q_{emerg} (cfs)	$Q_{mid + emerg}$ (cfs)	Q_{total} (cfs)
0.0000		0.0000	0.0000				0.000
0.2500		0.0155	0.0372				0.037
0.5000		0.0310	0.0548				0.055
0.7500		0.0465	0.0679				0.068
1.0000		0.0620	0.0789				0.079
1.2500		0.0775	0.0886				0.089
1.5000		0.0930	0.0973				0.097
1.7500		0.1085	0.1053				0.105
2.0000	0.000	0.1240	0.1127	0.000		0.000	0.113
2.2500	0.250	0.1395	0.1197	1.204		1.204	1.323
2.5000	0.500	0.1550	0.1262	1.702		1.702	1.829
2.7500	0.750	0.1705	0.1325	2.085		2.085	2.217
3.0000	1.000	0.1860	0.1385	2.407		2.407	2.546
3.2500	1.250	0.2014	0.1442	2.692		2.692	2.836
3.5000	1.500	0.2169	0.1497	2.949		2.949	3.098
3.7500	1.750	0.2324	0.1550	3.185		3.185	3.340
4.0000	2.000	0.2479	0.1601	3.405		3.405	3.565
4.2500	2.250	0.2634	0.1651	3.611		3.611	3.776
4.5000	2.500	0.2789	0.1699	3.807		3.807	3.976
4.7500	2.750	0.2944	0.1746	3.992		3.992	4.167
5.0000	3.000	0.3099	0.1792	4.170	0.000	4.170	4.349
5.2500	3.250	0.3254	0.1836	4.340	0.421	4.761	4.945
5.5000	3.500	0.3409	0.1880	4.504	3.526	8.030	8.218
5.6700	3.670	0.3514	0.1909	4.612	6.576	11.188	11.379

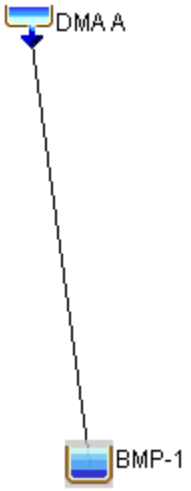
Note:

1. Weir equation, $Q=C_wL_e(h)^{3/2}$
2. Orifice equation, $Q=C_oA_e(2gh)^{1/2}$
3. Slot orifice acts as a weir when $h^* < h_{slot}$; slot orifice acts as an orifice when $h^* \geq h_{slot}$

HEC-HMS Detention Routing Summary

Meyers Industrial

PL 20-0654



Summary Results for Reservoir "BMP-1"

Project: Meyers Simulation Run: Q100
Reservoir: BMP-1

Start of Run:	01Jan2000, 00:00	Basin Model:	Post_Dev
End of Run:	01Jan2000, 06:05	Meteorologic Model:	Met 1
Compute Time:	25Mar2022, 11:31:10	Control Specifications:	Control 1

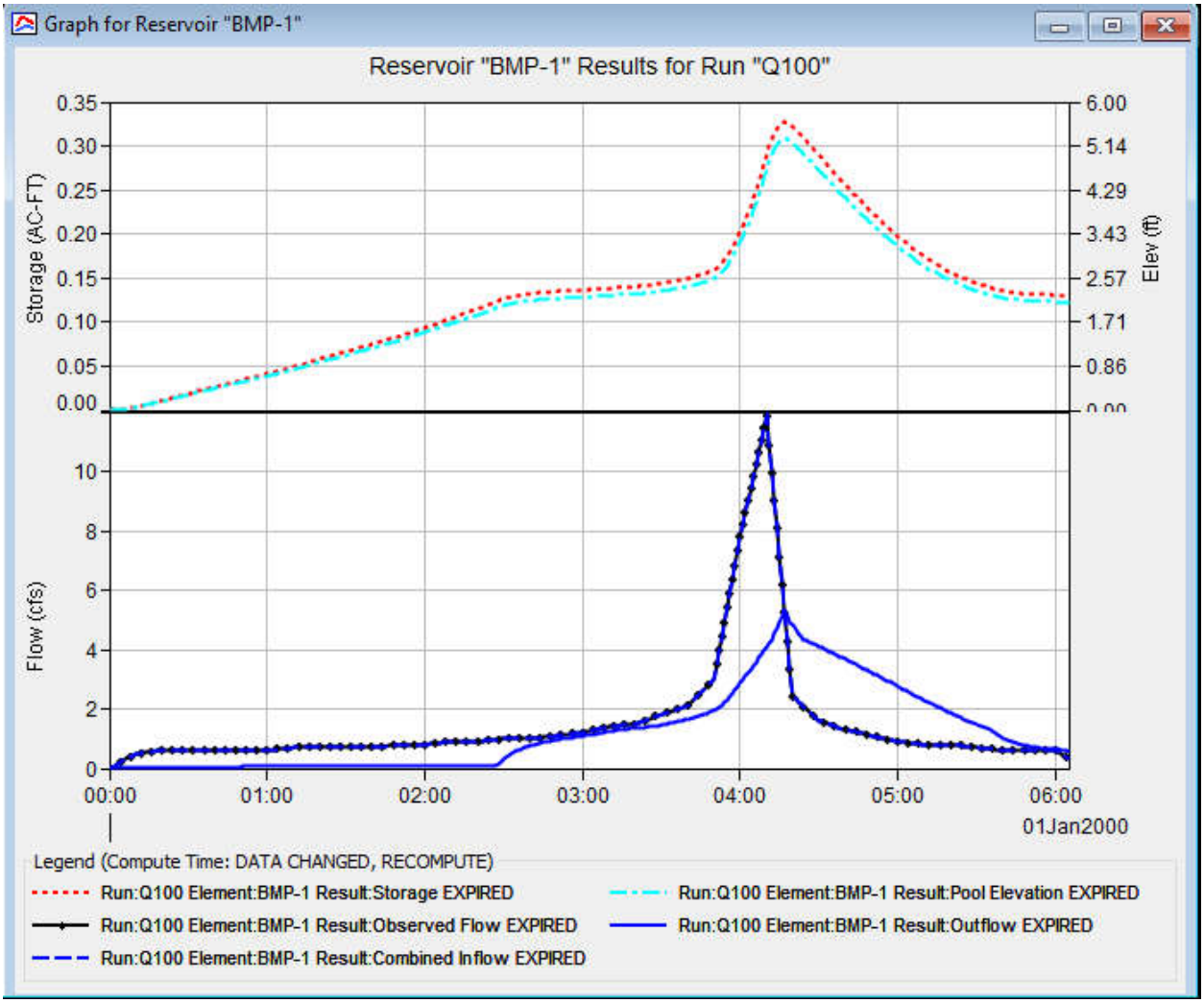
Volume Units: (•) IN ( ) AC-FT

Computed Results

Peak Inflow:	11.84 (CFS)	Date/Time of Peak Inflow:	01Jan2000, 04:09
Peak Discharge:	5.29 (CFS)	Date/Time of Peak Discharge:	01Jan2000, 04:17
Inflow Volume:	n/a	Peak Storage:	0.32701 (AC-FT)
Discharge Volume:	n/a	Peak Elevation:	5.276 (FT)

Observed Flow Gage BMP 1

Peak Discharge:	11.84 (CFS)	Date/Time of Peak Discharge:	01Jan2000, 04:10
Volume:	(IN)		
RMSE Std Dev:	0.83	Nash-Sutcliffe:	0.309
Percent Bias:	-17.16 %		


Graph for Reservoir "BMP-1"
Reservoir "BMP-1" Results for Run "Q100"
Storage (AC-FT)
Elev (ft)
Flow (cfs)
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
6.00
5.14
4.29
3.43
2.57
1.71
0.86
10
8
6
4
2
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
01Jan2000
Legend (Compute Time: DATA CHANGED, RECOMPUTE)
Run:Q100 Element:BMP-1 Result:Storage EXPIRED
Run:Q100 Element:BMP-1 Result:Pool Elevation EXPIRED
Run:Q100 Element:BMP-1 Result:Observed Flow EXPIRED
Run:Q100 Element:BMP-1 Result:Outflow EXPIRED
Run:Q100 Element:BMP-1 Result:Combined Inflow EXPIRED