Appendix H

Preliminary Hydrology Study (2022, revised 2024)

PRELIMINARY HYDROLOGY STUDY

FOR

DISCRETIONARY APPROVAL – DEVELOPMENT PLAN, TENTATIVE MAP, DENSITY BONUS

(UNASSIGNED) GUAJOME LAKE ROAD, OCEANSIDE CA

PLANNING CASE NO: T22-00004 / D22-00009 / DB22-00005

CITY OF OCEANSIDE, CA

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PRELIMINARY

TYLER G. LAWSON, RCE 80356 DATE

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1.0 EXECUTIVE SUMMARY

1.1 Introduction

This Preliminary Hydrology Study for the proposed development at an assigned addressed along Guajome Lake Road has been prepared to analyze the hydrologic and hydraulic characteristics of the existing and proposed project site. This report intends to present both the methodology and the calculations used for determining the runoff from the project site in both the pre-developed (existing) conditions and the post-developed (proposed) conditions produced by the 100-year, 6-hour design storm event. For hydromodification management and compliance including analysis up to the 10-year, 6-hour storm event, refer to the project Storm Water Quality Management Plan (SWQMP) prepared by Pasco, Laret, Suiter & Associates under separate cover.

1.2 Existing Conditions

The subject property is located just east of Guajome Lake Road, south of the intersection of with Albright Street in the City of Oceanside. The site is bordered directly to the north by the existing single-family residences off Albright Street, to the east by existing single-family residences located along Seattle Slew Way, and to the south by a single-family lot located at 2837 Guajome Lake Road. West of Guajome Lake Road immediately adjacent the subject property is Guajome Regional Park and the Guajome County Park Willow Trail.

The project site has a General Plan Land Use designation of Single-Family Detached Residential (SFD-R) and a Zoning Designation of Single-Family Residential, Scenic Park Overlay, and Equestrian Overlay (RS-SP-EQ). The site itself is a primarly vacant, undeveloped parcel that consists of a dirt driveway leading to two existing structures located further east within the property. An existing ridgeline near the center of the site separates a naturally sloping portion of the lot from existing Coastal Sage Scrub and other habitat / riparian areas along with a non-wetland water ephemeral stream that ultimately empties into Guajome Lake. The site is located within the Mission Hydrologic Sub-Area of the Lower San Luis Hydrologic Area within the San Luis Rey Watershed (903.11).

The existing site is comprised of approximately 16.79 gross acres. The site contains a large amount of terrain with roughly 40-50 feet of elevation difference from the ridgeline located in the center of the property down to Guajome Lake Road to the west. Additionally, another roughly 50 feet of elevation difference exists from the ridgeline to the ephemeral stream to the east. Runoff through the site primarily flows via sheet flow methods to three different discharge locations leaving the property. A local high point exists adjacent to the site along Guajome Lake Road, directing runoff to the north and south. As such, one main point of discharge from Basin EX-1 exists in the southwest corner of the site at a local low spot on Guajome Lake Road, and another from Basin EX-2 in the southeast corner of the site. Local sump inlets on the east side of the road feed culverts that discharge west of Guajome Lake Road to continue downstream. Basin EX-1 outlet continues northwest and appears to outlet to Guajome Lake. Basin EX-2 continues southeast towards an existing pond east of Ozark Road. Separately, Basin EX-3 consists of a portion of the proposed

project disturbance east of the ridgeline, that continues to drain to the east and the existing stream. This stream appears to continue northwest and outlet to Guajome Lake within Guajome Regional Park.

A review of the site topography offsite and at the property edge conditions revealed that the existing improvements to the north prevent additional runoff from entering the site from that direction. Additionally, an existing driveway serving 2837 Guajome Lake Road and the conditions along the southern property boundary prevent additional drainage from entering the subject property offsite. To the west, Guajome Lake Road is located at the bottom of the site topography and downstream of the analyzed drainage basins. Lastly, to the east, the existing single-family residences along Seattle Slew Way are located downstream of the ridgeline separating drainage running east or west on the property, and do not drain onto the subject property. For the purpose of the analysis, the limits were contained to the proposed disturbed areas of the site only in order to compare the impact of the proposed development to the existing conditions.

Per the Web Soil Survey application available through the United States Department of Agriculture, the area is generally categorized to have majority group D soils within the proposed disturbed limits. A portion of the site is also mapped as Type A, but is located within the riparian areas delineated by the project biologist and outside the proposed disturbed limits of work. Thus, Type D soils are assumed for this analysis for use in determining runoff coefficients for use in the Rational Method calculations for the portions onsite. Based upon soil type and the amount of existing impervious area onsite, a runoff coefficient of 0.35 was calculated for the existing site using the methodology described in section 3.1.2 of the San Diego County Hydrology Manual and the formula provided therein. This runoff coefficient was applied to each drainage basin for use in determining peak runoff leaving the site from the property discharge location. Using the Rational Method Procedure outlined in the San Diego County Hydrology Manual, a peak flow rate and time of concentration was calculated for the analyzed basin for the 100-year, 6-hour storm event. Table 1 below summarizes the results of the Rational Method calculations.

EXISTING DRAINAGE FLOWS				
DRAINAGE AREA	DRAINAGE AREA (ACRES)	Q_{100} (CFS)	I_{100} (IN/HR)	DISCHARGE LOCATION
EX-1	4.15 Ac	7.77	5.35	POC-1
EX-2	4.34 Ac	8.35	5.5	POC-2
EX-3	1.92 Ac	5.13	7.64	POC-3

Table 1. Existing Condition Peak Drainage Flow Rates

Table 1 above lists the peak flow rates for the project site in the existing condition for the respective rainfall events. The peak flow rate for the 100-year, 6-hour storm for Basin EX-

1 was determined to be 7.77 cfs with a time of concentration of 8.7 minutes, discharging from the northwest corner of the site, 8.35 cfs with a time of concentration of 8.3 minutes for Basin EX-2 discharging from the southwest corner of the site, and 5.13 cfs with a time of concentration of 5.0 minutes discharging from the northeast corner of the site. Refer to pre-development hydrology calculations included in Section 3.1 of this report for a detailed analysis of the existing drainage basin, as well as a pre-development hydrology node map included in the appendix of this report for pre-development drainage basin delineation and discharge locations leaving the subject property.

1.3 Proposed Project

The proposed project includes the mass grading of the proposed property, along with the construction of 83x new single-family lots and residences and 5x separate lettered lots consisting of active and passive open space as well as storm water treatment. Additionally, the project proposes to install backbone utility infrastructure consisting of storm drain, public water main, and sewer force main and lift station to serve the new residences. Various surface, grading, and utility improvements typical of this type of construction are also proposed. The proposed pad elevations vary from 150.0 in the southwest corner of the site to 180.0 in the northeast corner of the site. Additional information can be seen on the project Preliminary Grading Plan submitted as part of the Tentative Map, Density Bonus and Development Plan application under separate cover.

The proposed private lots will primarily drain from the rear of each property away from the building and out to the front of each lot by a combination of sheet flow methods / swale grading and private storm drain piping. A high point exists at the northwest corner of the site within the private road, which is then sloped to the south and west from there. Proposed storm drain curb inlets will intercept and capture curb and gutter flow, directing runoff to the storm drain backbone system. Lots that cannot feasibly drain to the private road and storm drain inlets will tie directly into the buried storm drain backbone from their respective lot. From there, storm drain will convey drainage to one (1) of three (3) different biofiltration basin BMP's for treatment, hydromodification management and flood control mitigation of the 100-year, 6-hour storm event peak flow rate. All proposed hardscape within the developed area of the project will be captured and routed to the BMP's. From there, an outlet pipe will then convey treated and detained runoff to the appropriate points of discharge from the subject property.

As in the existing condition, the project site will not accept any offsite runon from the adjacent properties to the north, south, east, or west. Similar to the existing condition, the analyzed watershed can be broken down into three major drainage basins with three separate discharge locations from the site. The majority of the site's disturbed area is split between basins PR-1 and PR-2. Basin PR-1 is approximately 5.28 acres in size and will continue to discharge from POC-1 at the southwest corner of the site after being piped under Guajome Lake Road. As mentioned previously in this report, this outlet location continues northwest and appears to outlet to Guajome Lake. Basin PR-2 is approximately 4.76 acres in size, with portions being routed to two (2) different biofiltration basins. Discharge leaving from both biofiltration basins will continue to discharge to POC-2 at the

southeast corner of the site, also being piped under Guajome Lake Road. This will continue southwest toward an existing pond east of Ozark Road. These discharge locations both follow existing drainage patterns once leaving the subject property and continuing downstream. Basin PR-3 comprises the remaining area of the site included in this analysis that will be graded but will continue flowing north to the Basin EX-3 discharge location as in the existing condition. These portions will reach the existing ephemeral stream and continue to be conveyed northwest to Guajome Lake.

Based on the proposed land use and soil type of the subject property, runoff coefficients for this site were determined using Table 3-1 Runoff Coefficients for Urban Areas of the San Diego County Hydrology Manual. Refer to section 3.2 of this report, as well as the post-development hydrology map included in Appendix A, for additional analysis and a summary of runoff coefficients used for the proposed development. Using the Rational Method Procedure outlined in the San Diego County Hydrology Manual, a peak flow rate and time of concentration were calculated for the 100-year, 6-hour storm event for each of the drainage basins in the proposed condition. Table 2 below summarizes the results of the Rational Method calculations.

PROPOSED DRAINAGE FLOWS				
DRAINAGE AREA	DRAINAGE AREA (ACRES)	Q_{100} (CFS)	I_{100} (IN/HR)	DISCHARGE LOCATION
PR-1.1	4.70 Ac	19.54	6.03	BMP-1
PR-1.2	0.58 Ac	2.65	5.95	POC-1
PR-1 (Tot)	5.28 Ac	21.90	-	POC-1
PR-2.1	2.85 Ac	12.29	5.87	BMP-2
PR-2.2	1.07 Ac	3.75	5.14	BMP-3
PR-2.3	0.84 Ac	3.41	5.80	POC-2
PR-2 (Tot)	4.76 Ac	19.34	-	POC-2
PR-3	0.38 Ac	1.01	7.64	POC-3

Table 2. Proposed Condition Peak Drainage Flow Rates

The results above show the undetained peak flows leaving the subject property at the three (3) main points of discharge in the proposed condition, in order to compare to pre-developed conditions. Refer to Section 3.3 of this report for a full discussion of the routing analysis performed for the project in order to size the onsite detention facilities to mitigate peak flows to pre-project conditions. Refer to post-development hydrology calculations included in Section 3.2 of this report for detailed analyses of the proposed drainage basins

as well as a post-development hydrology node map included in Appendix A of this report for post-development drainage delineation and discharge locations.

COMPARISON DRAINAGE FLOWS			
DRAINAGE AREA	DRAINAGE AREA (ACRES)	Q_{100} (CFS)	I_{100} (IN/HR)
EX-1	4.15 Ac	7.77	5.35
PR-1	5.28 Ac	21.90	-
EX-2	4.49 Ac	8.35	5.5
PR-2	4.76 Ac	19.34	-
EX-3	1.94 Ac	5.13	7.64
PR-3	0.38 Ac	1.01	7.64

Table 3. Comparison Peak Drainage Flow Rates

As this section of the report only serves to analyze the total, unmitigated peak runoff generated from the proposed project, refer to Section 3.3 of this report for a discussion of the detention components of the site. This analysis takes into account the proposed flood control mitigation facilities proposed onsite, which include the two biofiltration basin BMP's. The results of the detention analysis provide a resultant, mitigated peak runoff leaving the site in addition to the detained time to peak (see Appendix B for results of the dynamic detention analysis performed using HydroCAD-10 software).

In an effort to comply with the City of Oceanside's Stormwater standards, all runoff generated onsite will be conveyed to an onsite biofiltration facility for treatment and pollutant removal. For a discussion regarding hydromodification management requirements and compliance, refer to the project Storm Water Quality Management Plan (SWQMP) under separate cover. In an effort to comply with the City of Oceanside's storm water standards for all development projects, the project site will implement source control and site design BMP's in addition to the proposed biofiltration treatment control BMP's where feasible and applicable in accordance with the City of Oceanside's BMP Design Manual, February 2016 edition. Proposed impervious area and soil compaction are minimized to the greatest extent feasible, and dispersion is promoted as well. Partial infiltration and evapotranspiration in landscaped areas will assist in slowing peak discharges and in reducing total volume generated during storm events, while in addition serving to comply with volume retention requirements of the project. The onsite landscaped areas will assist to remove sediment and particulate-bound pollutants from storm water prior to leaving the project site.

1.4 Conclusions

Based upon the hydrology calculations performed for the project site, there is an increase in unmitigated peak runoff in the post-developed condition compared to the existing condition due to the increase in proposed site hardscape from the currently vacant condition. For a discussion on the detention analysis performed for the project site, refer to Section 3.3 below as well as the Appendix of this report. Based on the analysis included in this report, the proposed onsite detention facilities accommodate the increase in peak runoff generated in the proposed condition, mitigating peak flows to below pre-developed conditions at the appropriate points of discharge. The site has been designed and graded in a way to minimize earthwork to the greatest extent feasible and maintain historic drainage patterns. Water leaving the subject property will continue to do so from the same points of discharge as in the existing condition. Thus, water will not be diverted away from existing drainage patterns, and the proposed development and resulting peak runoff will not have an adverse effect on the downstream watershed and existing infrastructure.

1.5 References

"San Diego County Hydrology Manual", revised June 2003, County of San Diego, Department of Public Works, Flood Control Section.

"San Diego County Hydraulic Design Manual", revised September 2014, County of San Diego, Department of Public Works, Flood Control Section

"Master Plan of Drainage, Update 2013", revised October 2013, City of Oceanside, prepared by Tory R. Walker Engineering, Inc.

"*City of Oceanside BMP Design Manual for Permanent Site Design, Storm Water Treatment and Hydromodification Management*", revised February 2016, City of Oceanside, prepared by GHD

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov.

2.0 METHODOLOGY

2.1 Introduction

The hydrologic model used to perform the hydrologic analysis presented in this report utilizes the Rational Method (RM) equation, Q = CIA. The RM formula estimates the peak rate of runoff based on the variables of area, runoff coefficient, and rainfall intensity. The rainfall intensity (I) is equal to:

$$I = 7.44 \times P_6 \times D^{-0.645}$$

Where:

I = Intensity (in/hr)
P_6 = 6-hour precipitation (inches)
D = duration (minutes – use Tc)

Using the Time of Concentration (Tc), which is the time required for a given element of water that originates at the most remote point of the basin being analyzed to reach the point at which the runoff from the basin is being analyzed. The RM equation determines the storm water runoff rate (Q) for a given basin in terms of flow (typically in cubic feet per second (cfs) but sometimes as gallons per minute (gpm)). The RM equation is as follows:

$$Q = CIA$$

Where:

Q = flow (in cfs)
C = runoff coefficient, ratio of rainfall that produces storm water runoff (runoff vs. infiltration/evaporation/absorption/etc)
I = average rainfall intensity for a duration equal to the Tc for the area, in inches per hour.
A = drainage area contributing to the basin in acres.

The RM equation assumes that the storm event being analyzed delivers precipitation to the entire basin uniformly, and therefore the peak discharge rate will occur when a raindrop that falls at the most remote portion of the basin arrives at the point of analysis. The RM also assumes that the fraction of rainfall that becomes runoff or the runoff coefficient C is not affected by the storm intensity, I, or the precipitation zone number.

2.2 County of San Diego Criteria

As defined by the County Hydrology Manual dated June 2003, the rational method is the preferred equation for determining the hydrologic characteristics of basins up to approximately one square mile in size. The County of San Diego has developed its own tables, nomographs, and methodologies for analyzing storm water runoff for areas within the county. The County has also developed precipitation isopluvial contour maps that show even lines of rainfall anticipated from a given storm event (i.e. 100-year, 6-hour storm).

One of the variables of the RM equation is the runoff coefficient, C. The runoff coefficient is dependent only upon land use and soil type and the County of San Diego has developed a table of Runoff Coefficients for Urban Areas to be applied to basin located within the County of San Diego. The table categorizes the land use, the associated development density (dwelling units per acre) and the percentage of impervious area. Each of the categories listed has an associated runoff coefficient, C, for each soil type class.

The County has also illustrated in detail the methodology for determining the time of concentration, in particular the initial time of concentration. The County has adopted the Federal Aviation Agency's (FAA) overland time of flow equation. This equation essentially limits the flow path length for the initial time of concentration to lengths under 100 feet, and is dependent on land use and slope.

2.3 City of Oceanside Standards

The City of Oceanside has additional information, overview, analysis, and findings for watersheds located within the City which are outlined in the Master Plan of Drainage, 2013 Update. Please refer to this manual for reference and further details.

2.4 Runoff Coefficient Determination

As stated in section 2.2, the runoff coefficient is dependent only upon land use and soil type and the County of San Diego has developed a table of Runoff Coefficients for Urban Areas to be applied to basin located within the County of San Diego. The table, included at the end of this section, categorizes the land use, the associated development density (dwelling units per acre) and the percentage of impervious area.

2.5 AES Rational Method Computer Model

The Rational Method computer program developed by Advanced Engineering Software (AES) satisfies the County of San Diego design criteria, therefore it is the computer model used for this study. The AES hydrologic model is capable of creating independent node-link models of each interior drainage basin and linking these sub-models together at confluence points to determine peak flow rates. The program utilizes base information input by the user to perform calculations for up to 15 hydrologic processes. The required base information includes drainage basin area, storm water facility locations and sizes, land

uses, flow patterns, and topographic elevations. The hydrologic conditions were analyzed in accordance with the 2003 County of San Diego Hydrology Manual criteria as follows:

Design Storm	100-year, 6-hour
100-year, 6-hour Precipitation	2.9 inches
Rainfall Intensity	Based on the 2003 County of San Diego Hydrology Manual criteria
Runoff Coefficient	Weighted Runoff Coefficients per Section 3.1, 3.2 of this report and Table 3-2 of SDHDM

2.5.1 AES Computer Model Code Information

0: Enter Comment
2: Initial Subarea Analysis
3: Pipe/Box/Culvert Travel Time
5: Open Channel Travel Time
7: User-Specified hydrology data at Node
8: Addition of sub-area runoff to Main Stream
10: Copy Main Stream data onto a Memory Bank
11: Confluence Memory Bank data with Main Stream
13: Clear the Main Stream

3.0 HYDROLOGY MODEL OUTPUT

3.1 Pre-Developed Hydrologic Model Output (100 Year Event)

Pre-Development:

Q = CIA *Rational Method Equation
P_{100} = 2.9 in *100-Year, 6-Hour Rainfall Precipitation

Total Disturbed Area

Total Area = 453,625 sf ➔ 10.41 Acres
Impervious Area = 700 sf ➔ 0.02 Ac
Pervious Area = 452,925 sf ➔ 10.39 Acres

Cn, Weighted Runoff Coefficient,
- 0.35, Cn value for natural ground, Type D Soils
  *Per San Diego County Hydrology Manual (SDCHM) Section 3.1.2
- 0.90, Cn value for developed/impervious surface
  *Per SDCHM Section 3.1.2

$$Cn = \frac{0.35 \times 452{,}925 + .9 \times 700 \text{ sf}}{453{,}625 \text{ sf}} = 0.35$$

Basin EX-1

Total Area = 180,901 sf ➔ 4.15 Acres

Initial Slope ~10%, Land Use = Natural
Ti = 6.9 mins *Table 3-2 per SDCHM

Tt = {[11.9*(389 ft / 5,280 ft/mile)^3]/41.4 ft}^0.385 = .030 hours
= .030 hours * 60 min / hr = 1.8 min

Tc = 6.9 + 1.8 = 8.7 min
Tc = **8.7 min**

P_6 = 2.9
$I = 7.44 \times P_6 \times D^{-0.645}$
$I = 7.44 \times 2.9 \times 8.7^{-0.645} \approx$ 5.35 in/hr

Q_{100} = C*I*A
Q_{100} = 0.35 x 5.35 in/hr x 4.15 Ac = 7.77 cfs

****Discharging from the site to the northwest in a culvert under Guajome Lake Rd**

Basin EX-2

Total Area = 188,893 sf ➔ 4.34 Acres

Initial Slope ~10%, Land Use = Natural
Ti = 6.9 mins *Table 3-2 per SDCHM

Tt = {[11.9*(307 ft / 5,280 ft/mile)^3]/38.6 ft}^0.385 = .024 hours
= .024 hours * 60 min / hr 1.43 min

Tc = 6.9 + 1.43 = 8.33 min
Tc = **8.33 min**

P_6 = 2.9
$I = 7.44 \times P_6 \times D^{-0.645}$
$I = 7.44 \times 2.9 \times 8.33^{-0.645} \approx$ 5.5 in/hr

Q_{100} = C*I*A
Q_{100} = 0.35 x 5.5 in/hr x 4.34 Ac = 8.64 cfs

****Discharging from the site to the southwest in a culvert under Guajome Lake Rd**

Basin EX-3

Total Area = 83,714 sf ➔ 1.92 Acres

Tc = **5.0 min**

P_6 = 2.9
$I = 7.44 \times P_6 \times D^{-0.645}$
$I = 7.44 \times 2.9 \times 5.0^{-0.645} \approx$ 7.64 in/hr
$I_{100} \approx$ 7.64 in/hr

Q_{100} = C*I*A
Q_{100} = 0.35 x 7.64 in/hr x 1.92 Ac = 5.13 cfs

****Discharging from the site to the northeast in the existing stream**

Pre-Development – Total Site Runoff

Pre-Development (Basin EX-1)
Q_{100} = 7.77 cfs

Pre-Development (Basin EX-2)
Q_{100} = 8.35 cfs

Pre-Development (Basin EX-3)
Q_{100} = 5.13 cfs

3.2 Post-Developed Hydrologic Model Output (100-Year Event)

Post-Development:

$Q = CIA$ *Rational Method Equation
$P_{100} = 2.9$ *100-Year, 6-Hour Rainfall Precipitation

Entire Disturbed Area (Onsite Drainage Basin)

Total Area = 453,625 sf ➔ 10.41 Acres
Impervious Area = 275,690 sf ➔ 6.33 Ac
Pervious Area = 177,665 sf ➔ 4.08 Ac

Basin PR-1.1 (Discharging to BMP 1)

Total Area = 204,669 sf ➔ 4.70 Acres
Impervious Area = 124,716 sf ➔ 2.86 Ac
Pervious Area = 79,953 sf ➔ 1.84 Ac

Cn, Weighted Runoff Coefficient,
- 0.35, Cn value for natural ground, Type D Soils
  *Per San Diego County Hydrology Manual (SDCHM) Section 3.1.2
- 0.90, Cn value for developed/impervious surface
  *Per SDCHM Section 3.1.2

$$Cn = \frac{0.35 \times 79{,}953 + .9 \times 124{,}716 \text{ sf}}{204{,}669 \text{ sf}} = 0.69$$

$Cn = 0.69$ *Weighted Runoff Coefficient for Onsite

$Q = Cn \times I_{100} \times A$ *Q based on flow to proposed BMP

Leaving the property across Guajome Lake Road to the northwest
T_C = 7.23 min (See attached AES calculations)
Q_{100} = 19.54 cfs (See attached AES calculations)

Basin PR-1.2 (Discharging to the Northwest of the site to San Luis Rey River)

Total Area = 25,401 sf ➔ 0.58 Acres
Impervious Area = 19,578 sf ➔ 0.45 Ac
Pervious Area = 5,823 sf ➔ 0.13 Ac

Cn, Weighted Runoff Coefficient,
- 0.35, Cn value for natural ground, Type D Soils
  *Per San Diego County Hydrology Manual (SDCHM) Section 3.1.2
- 0.90, Cn value for developed/impervious surface
  *Per SDCHM Section 3.1.2

$$Cn = \frac{0.35 \times 5{,}823 + .9 \times 19{,}578 \text{ sf}}{25{,}401 \text{ sf}} = 0.77$$

Cn = 0.77 *Weighted Runoff Coefficient for Offsite

$Q = Cn \times I_{100} \times A$ *Q based on flow to proposed BMP

Leaving the property across Guajome Lake Road to the northwest
T_C = 7.38 min (See attached AES calculations)
Q_{100} = 2.65 cfs (See attached AES calculations)

Basin PR-1 (Discharging to the Northwest of the site to San Luis Rey River)

Total Area = 230,070 sf ➔ 5.28 Acres
Impervious Area = 144,294 sf ➔ 3.31 Ac
Pervious Area = 85,776 sf ➔ 1.97 Ac

Leaving the property across Guajome Lake Road to the northwest
T_C = 7.40 min (See attached AES calculations)
Q_{100} = 21.90 cfs (See attached AES calculations)

Basin PR-2.1 (Discharging to BMP #2)

Total Area = 124,016 sf ➔ 2.85 Acres
Impervious Area = 86,009 sf ➔ 1.97 Ac
Pervious Area = 38,007 sf ➔ 0.88 Ac

Cn, Weighted Runoff Coefficient,
- 0.35, Cn value for natural ground, Type D Soils
  *Per San Diego County Hydrology Manual (SDCHM) Section 3.1.2
- 0.90, Cn value for developed/impervious surface
  *Per SDCHM Section 3.1.2

$$Cn = \frac{0.35 \times 38{,}007 + .9 \times 86{,}009 \text{ sf}}{124{,}016 \text{ sf}} = 0.73$$

Cn = 0.73 *Weighted Runoff Coefficient for Site
$Q = Cn \times I_{100} \times A$ *Q based on flow to proposed BMP

Entering BMP #2
T_C = 7.53 min (See attached AES calculations)
Q_{100} = 12.29 cfs (See attached AES calculations)

Basin PR-2.2 (Discharging to BMP #3)

Total Area = 46,503 sf ➔ 1.07 Acres
Impervious Area = 22,690 sf ➔ 0.52 Ac
Pervious Area = 23,813 sf ➔ 0.55 Ac

Cn, Weighted Runoff Coefficient,
- 0.35, Cn value for natural ground, Type D Soils
  *Per San Diego County Hydrology Manual (SDCHM) Section 3.1.2
- 0.90, Cn value for developed/impervious surface
  *Per SDCHM Section 3.1.2

$$Cn = \frac{0.35 \times 23{,}813 + .9 \times 22{,}690 \text{ sf}}{46{,}503 \text{ sf}} = 0.62$$

Cn = 0.62 *Weighted Runoff Coefficient for Site
$Q = Cn \times I_{100} \times A$ *Q based on flow to proposed BMP

Entering BMP #2
T_C = 9.24 min (See attached AES calculations)
Q_{100} = 3.75 cfs (See attached AES calculations)

Basin PR-2.3 (Discharging to the Southwest corner of the site)

Total Area = 36,617 sf ➔ 0.84 Acres
Impervious Area = 22,697 sf ➔ 0.53 Ac
Pervious Area = 13,650 sf ➔ 0.31 Ac

Cn, Weighted Runoff Coefficient,
- 0.35, Cn value for natural ground, Type D Soils
  *Per San Diego County Hydrology Manual (SDCHM) Section 3.1.2
- 0.90, Cn value for developed/impervious surface
  *Per SDCHM Section 3.1.2

$$Cn = \frac{0.35 \times 13{,}650 + 0.9 \times 22{,}697 \text{ sf}}{36{,}617 \text{ sf}} = 0.70$$

Cn = 0.70 *Weighted Runoff Coefficient for Site
$Q = Cn \times I_{100} \times A$ *Q based on flow to proposed BMP

T_C = 7.66 min (See attached AES calculations)
Q_{100} = 3.41 cfs (See attached AES calculations)

Basin PR-2 (Discharging to the Southwest corner of the site)

Total Area = 219,062 sf ➔ 5.03 Acres
Impervious Area = 135,181 sf ➔ 3.10 Ac
Pervious Area = 83,881 sf ➔ 1.93 Ac

Discharging from the site to the southwest corner entering the existing inlet
T_C = 7.66 min (See attached AES calculations)
Q_{100} = 19.33 cfs (See attached AES calculations)

Basin PR-3

Total Area = 16,419 sf ➔ 0.38 Acres

Tc = **5.0 min**

$P_6 = 2.9$
$I = 7.44 \times P_6 \times D^{-0.645}$
$I = 7.44 \times 2.9 \times 5.0^{-0.645} \approx 7.64$ in/hr
$I_{100} \approx 7.64$ in/hr

$Q_{100} = C*I*A$
$Q_{100} = 0.67 \times 7.64$ in/hr x 0.38 Ac = 1.01 cfs

****Discharging from the site to the northeast in the existing stream**

Pre-Development vs. Post-Development (Undetained – Total Site Runoff)

Pre-Development (Basin EX-1)	Post-Development (PR-1)	Delta
Q_{100} = 7.77 cfs	**Q_{100} = 21.90 cfs**	**14.13 cfs**
Pre-Development (Basin EX-2)	Post-Development (PR-2)	Delta
Q_{100} = 8.35 cfs	**Q_{100} = 19.33 cfs**	**10.98 cfs**
Pre-Development (Basin EX-3)	Post-Development (PR-3)	Delta
Q_{100} = 5.13 cfs	**Q_{100} = 1.01 cfs**	**-4.12 cfs**

3.3 Detention Analysis (100-Year Event)

The onsite detention facilities consist of at-grade biofiltration basin BMP's to provide mitigation of the 100-year, 6-hour storm event peak flow rate. HydroCAD-10 software has the ability to route the 100-year, 6-hour storm event inflow hydrograph (generated and modeled using RatHydro, which is a Rational Method Design Storm Hydrograph software that creates a hydrograph using the results of the Rational Method calculations) through each biofiltration basin. Based on the basin cross-section geometry, stage-storage and outlet structure data, HydroCAD-10 has the ability to perform a dynamic / routing analysis and calculate the detained peak flow rate as well as detained time to peak.

All site runoff will be conveyed from the rear of each proposed lot out to the front by either sheet flow methods or within private storm drain piping. The majority of lots will discharge to the street before being routed to curb inlets that tie into the storm drain backbone system. Lots that cannot feasibly drain to the surface of the road will tie directly into the storm drain backbone system. Once in the storm drain backbone system runoff will be routed to one of three biofiltration basin BMP's for treatment in compliance with water quality requirements of the MS4 Permit, as well as detention. The biofiltration basin BMP's consists of a storage layer, engineered soil layer, and surface ponding with an emergency overflow grate located on top of the outlet structure. A subdrain system is proposed within the basin storage layer to route water to the proposed outlet structure, where flows will be metered into the box to comply with hydromodification criteria. Additionally, the outlet structure located within each biofiltration basin will further serve to mitigate peak flows before discharging directly offsite and has been designed for conjunctive use. This drainage path with both outlets from the biofiltration basin BMPs have been modeled in the HydroCAD-10 analysis as seen on the Routing Diagram included in Appendix B of this report.

PROPOSED DRAINAGE FLOWS (MIT)				
DRAINAGE AREA	DRAINAGE AREA (ACRES)	Q_{100} (CFS)	I_{100} (IN/HR)	DISCHARGE LOCATION
PR-1.1	4.70 Ac	5.85	3.96	BMP #1
PR-1.2	0.58 Ac	2.65	5.72	POC-1
PR-1 (TOT)	5.28 Ac	7.66	-	POC-1
PR-2.1	2.85 Ac	5.21	4.26	BMP #2
PR-2.2	1.07 Ac	0.83	3.44	BMP #3
PR-2.3	0.84 Ac	3.41	5.80	POC-2
PR-2 (Tot)	4.76 Ac	8.29	-	POC-2

Table 3. Proposed Condition Peak Drainage Flow Rates (Mitigated)

Table 3 above lists the peak flow rates for the project site in the proposed, mitigated condition after being routed through the onsite biofiltration basins and discharging from the property. Based on the results of the HydroCAD-10 analysis, the proposed biofiltration basins provide mitigation for the 100-year, 6-hour storm event peak flow rate. The resulting total peak discharge leaving the site for Basin PR-1 is 7.66 cfs, which is below the pre-development Q100 of 7.77 cfs, and for Basin PR-2 is 8.29 cfs, which is below the pre-development Q_{100} of 8.35 cfs at the same points of discharge just west of Guajome Lake Road.

3.3.1 Proposed Detained Condition Output Summary (100-Year Event)

Summary of Pre-Development Flows

Peak Runoff Generated (At Northwest Corner)
Total Area = 180,901 sf (EX-1) → 4.15 Acres
Q_{100} = 7.77 cfs

Peak Runoff Generated (At Southwest Corner)
Total Area = 188,983 sf (EX-2) → 4.34 Acres
Q_{100} = 8.35 cfs

Peak Runoff Generated (At Northeast Corner)
Total Area = 83,714 sf (EX-3) → 1.92 Acres
Q_{100} = 5.13 cfs

Summary of Post-Development Flows (Mitigated)

Peak Runoff Generated (At Northwest Corner)
Total Area = 230,070 sf (PR-1) → 5.28 Acres
Q_{100} = 7.66 cfs < 7.77 cfs in the existing condition

Peak Runoff Generated (At Southwest Corner)
Total Area = 207,136 sf (PR-2) → 4.76 Acres
Q_{100} = 8.29 cfs < 8.35 cfs in the existing condition

Peak Runoff Generated (At Northeast Corner)
Total Area = 16,419 sf (PR-3) → 0.38 Acres
Q_{100} = 1.01 cfs < 5.13 cfs in the existing condition

3.4 Hydromodification Analysis

Refer to the project Storm Water Quality Management Plan (SWQMP) prepared by Pasco, Laret, Suiter & Associates under separate cover for discussion of hydromodification management strategy and compliance to satisfy the requirements of the MS4 Permit.

3.5 Storm Water Pollutant Control

To meet the requirements of the MS4 Permit, the storm water treatment facilities are designed to treat onsite storm water pollutants contained in the volume of runoff from a 24-hour, 85th percentile storm event by infiltrating runoff through an engineered soil layer. Refer to the project Storm Water Quality Management Plan (SWQMP) prepared by Pasco, Laret, Suiter & Associates under separate cover for discussion of pollutant control.

APPENDIX A

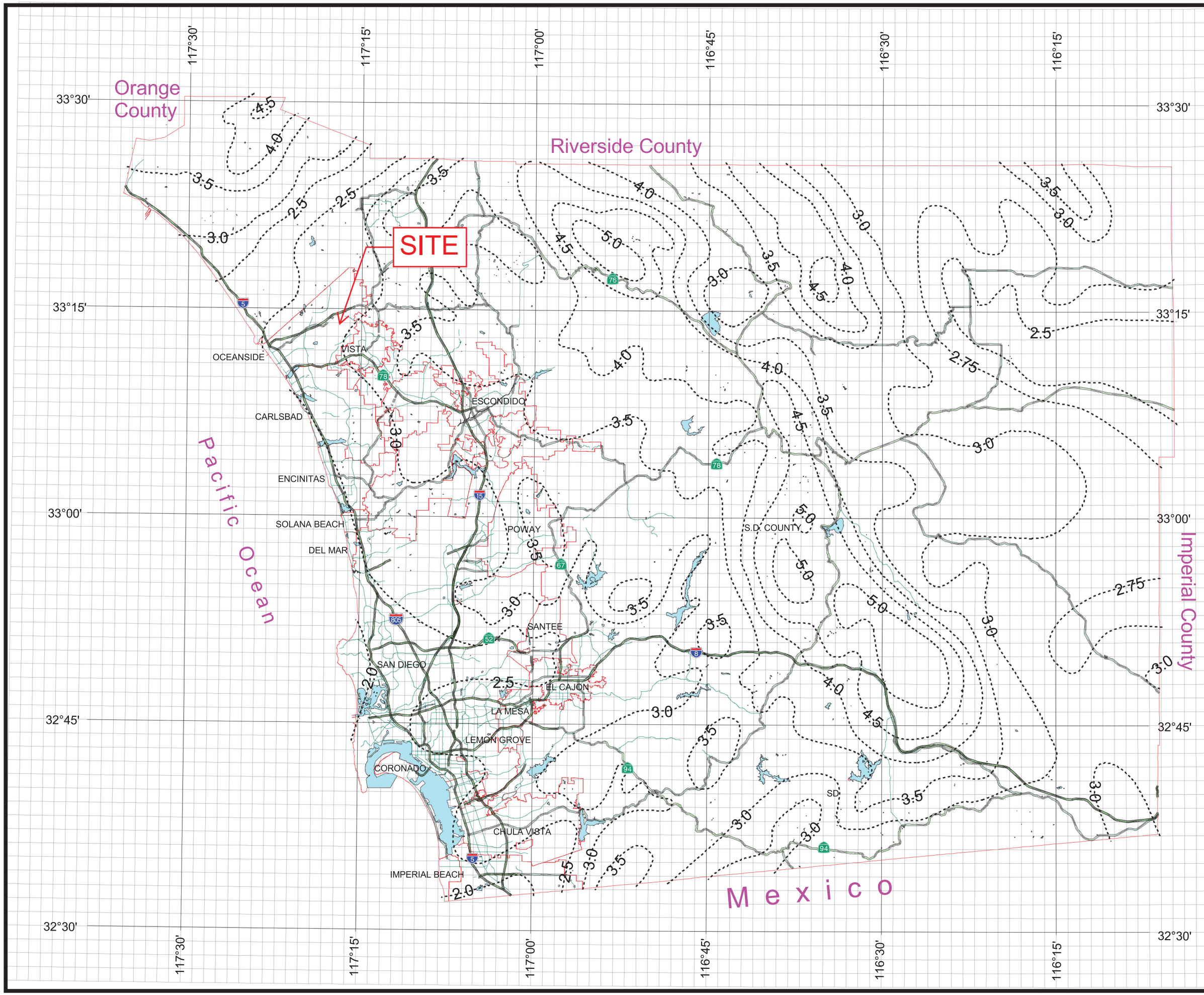
Hydrology Support Material

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)



DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
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N
W E
S

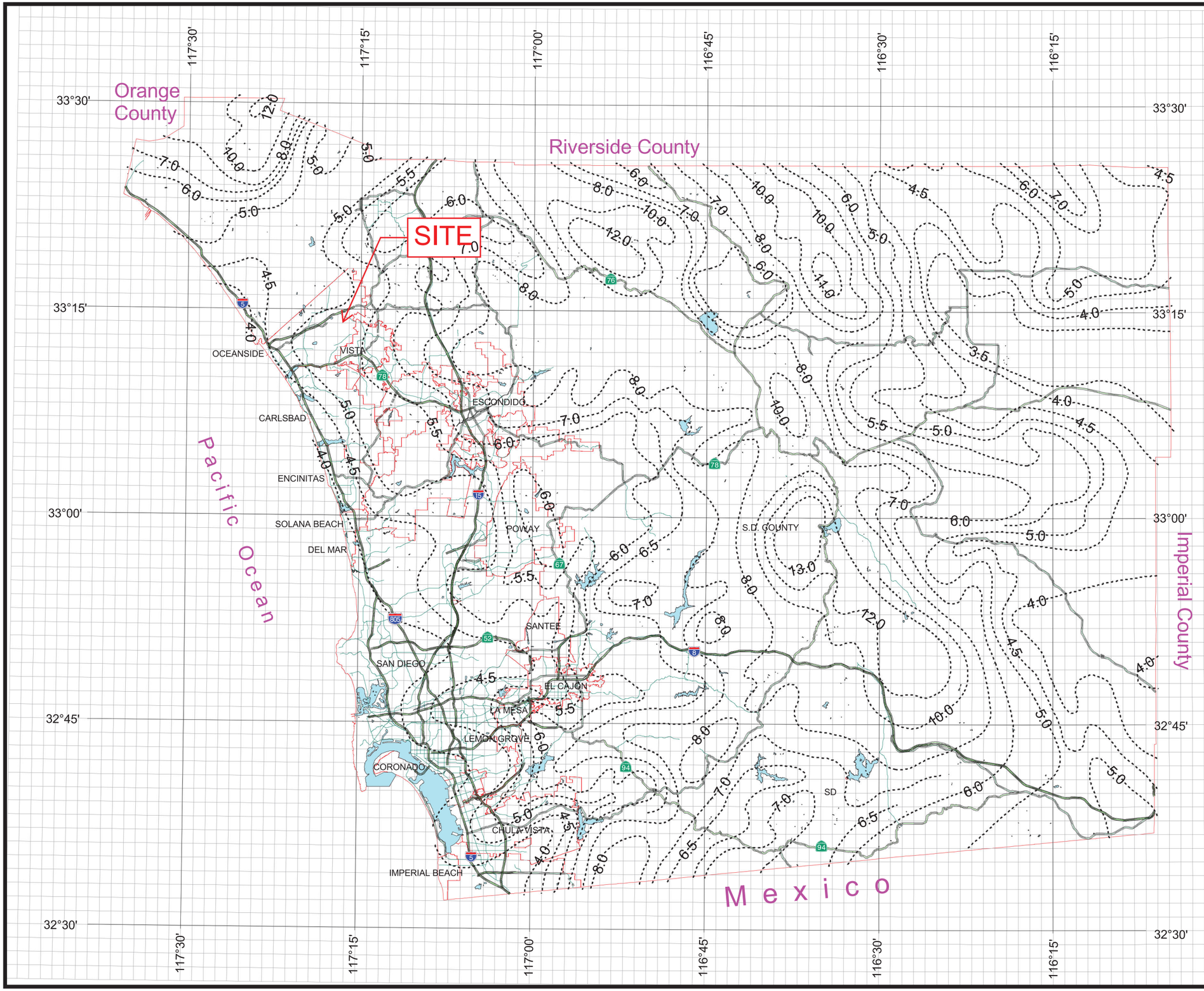
3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)



DPW GIS
Department of Public Works
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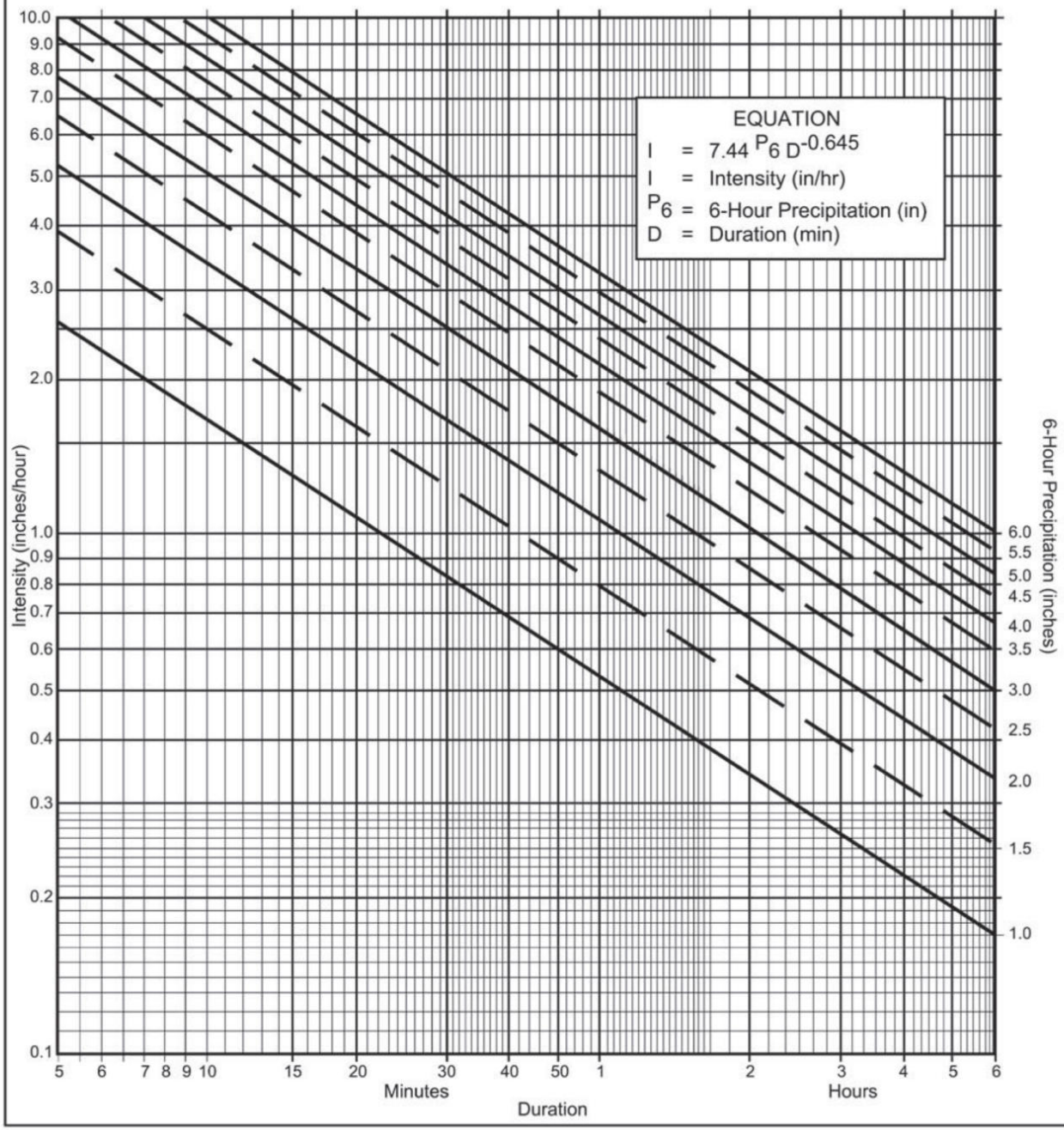
3 0 3 Miles



Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicaple to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency 100 year

(b) P_6 = 2.9 in., P_{24} = 5.2, $\frac{P_6}{P_{24}}$ = 56 %(2)

(c) Adjusted P_6(2) = 2.9 in.

(d) t_x = varies min.

(e) I = varies in./hr.

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

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

Intensity-Duration Design Chart - Template

FIGURE 3-1

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

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

*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).
DU/A = dwelling units per acre
NRCS = National Resources Conservation Service

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

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

Table 3-2

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

Element*	DU/ Acre	.5%		1%		2%		3%		5%		10%	
		L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i
Natural		50	13.2	70	12.5	85	10.9	100	10.3	100	8.7	100	6.9
LDR	1	50	12.2	70	11.5	85	10.0	100	9.5	100	8.0	100	6.4
LDR	2	50	11.3	70	10.5	85	9.2	100	8.8	100	7.4	100	5.8
LDR	2.9	50	10.7	70	10.0	85	8.8	95	8.1	100	7.0	100	5.6
MDR	4.3	50	10.2	70	9.6	80	8.1	95	7.8	100	6.7	100	5.3
MDR	7.3	50	9.2	65	8.4	80	7.4	95	7.0	100	6.0	100	4.8
MDR	10.9	50	8.7	65	7.9	80	6.9	90	6.4	100	5.7	100	4.5
MDR	14.5	50	8.2	65	7.4	80	6.5	90	6.0	100	5.4	100	4.3
HDR	24	50	6.7	65	6.1	75	5.1	90	4.9	95	4.3	100	3.5
HDR	43	50	5.3	65	4.7	75	4.0	85	3.8	95	3.4	100	2.7
N. Com		50	5.3	60	4.5	75	4.0	85	3.8	95	3.4	100	2.7
G. Com		50	4.7	60	4.1	75	3.6	85	3.4	90	2.9	100	2.4
O.P./Com		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
Limited I.		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
General I.		50	3.7	60	3.2	70	2.7	80	2.6	90	2.3	100	1.9

*See Table 3-1 for more detailed description


117° 16' 5" W
117° 15' 40" W
475020
475090
475160
475230
475300
475370
475440
475510
475580
475650
33° 14' 46" N
33° 14' 33" N
3678590
3678520
3678450
3678380
3678310
3678240
BsD
VaB
LeE2
LeD2
Albright St
Bronco Way
Guajome Lake Rd
Soil Map may not be valid at this scale.
Map Scale: 1:2,970 if printed on A landscape (11" x 8.5") sheet.
N
Meters
0 40 80 160 240
Feet
0 100 200 400 600
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 16, Sep 13, 2021

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

Date(s) aerial images were photographed: Jan 24, 2020—Feb 12, 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
BsD	Bosanko clay, 9 to 15 percent slopes	D	0.6	3.3%
LeD2	Las Flores loamy fine sand, 9 to 15 percent slopes, eroded	D	9.7	56.4%
LeE2	Las Flores loamy fine sand, 15 to 30 percent slopes, eroded	D	2.9	17.0%
VaB	Visalia sandy loam, 2 to 5 percent slopes	A	4.0	23.2%
Totals for Area of Interest			**17.1**	**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.

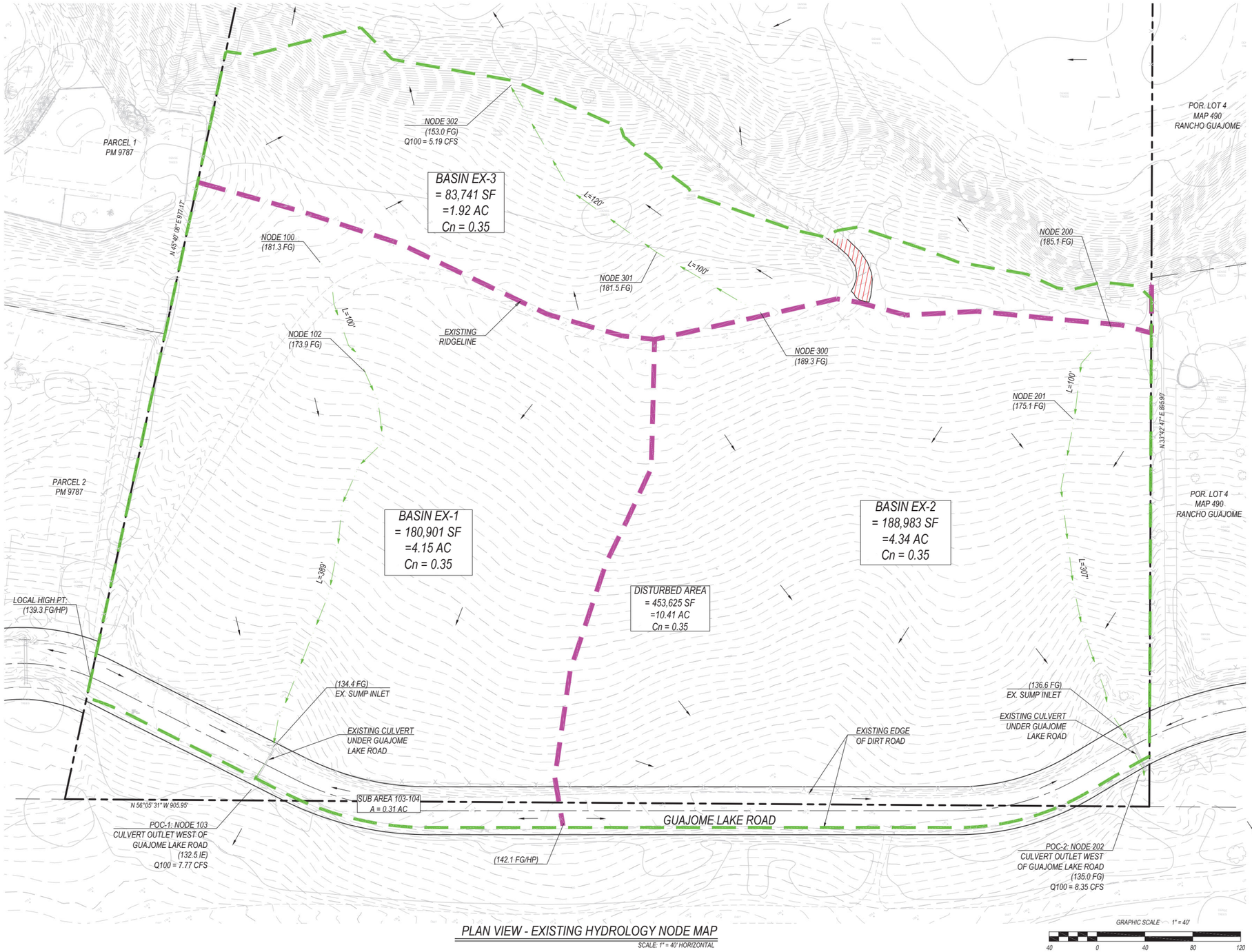
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



PLAN VIEW - EXISTING HYDROLOGY NODE MAP

SCALE: 1" = 40' HORIZONTAL

LEGEND

PROPERTY LINE	
RIGHT-OF-WAY	
CENTERLINE OF ROAD	
ADJACENT LOT LINE	
EXISTING FLOW PATH	
FLOW DIRECTION	
EXISTING MAJOR DRAINAGE BASIN BOUNDARY	
EXISTING IMPERVIOUS AREA	

PROJECT SITE - AREA CALCULATIONS

TOTAL DISTURBED / ANALYZED AREA	453,625 SF (10.41 AC)
EXISTING PERVIOUS AREA	700 SF (0.016 AC)
EXISTING IMPERVIOUS AREA	452,925 SF (10.39 AC)
IMPERVIOUS %	~0.0%
Cn	0.35

BASIN EX-1 - AREA CALCULATIONS

TOTAL DRAINAGE BASIN AREA	180,901 SF (4.15 AC)
Cn	0.35
Q100	7.77 CFS
TC	8.7 MINS

BASIN EX-2 - AREA CALCULATIONS

TOTAL DRAINAGE BASIN AREA	188,983 SF (4.34 AC)
Cn	0.35
Q100	8.35 CFS
TC	8.3 MINS

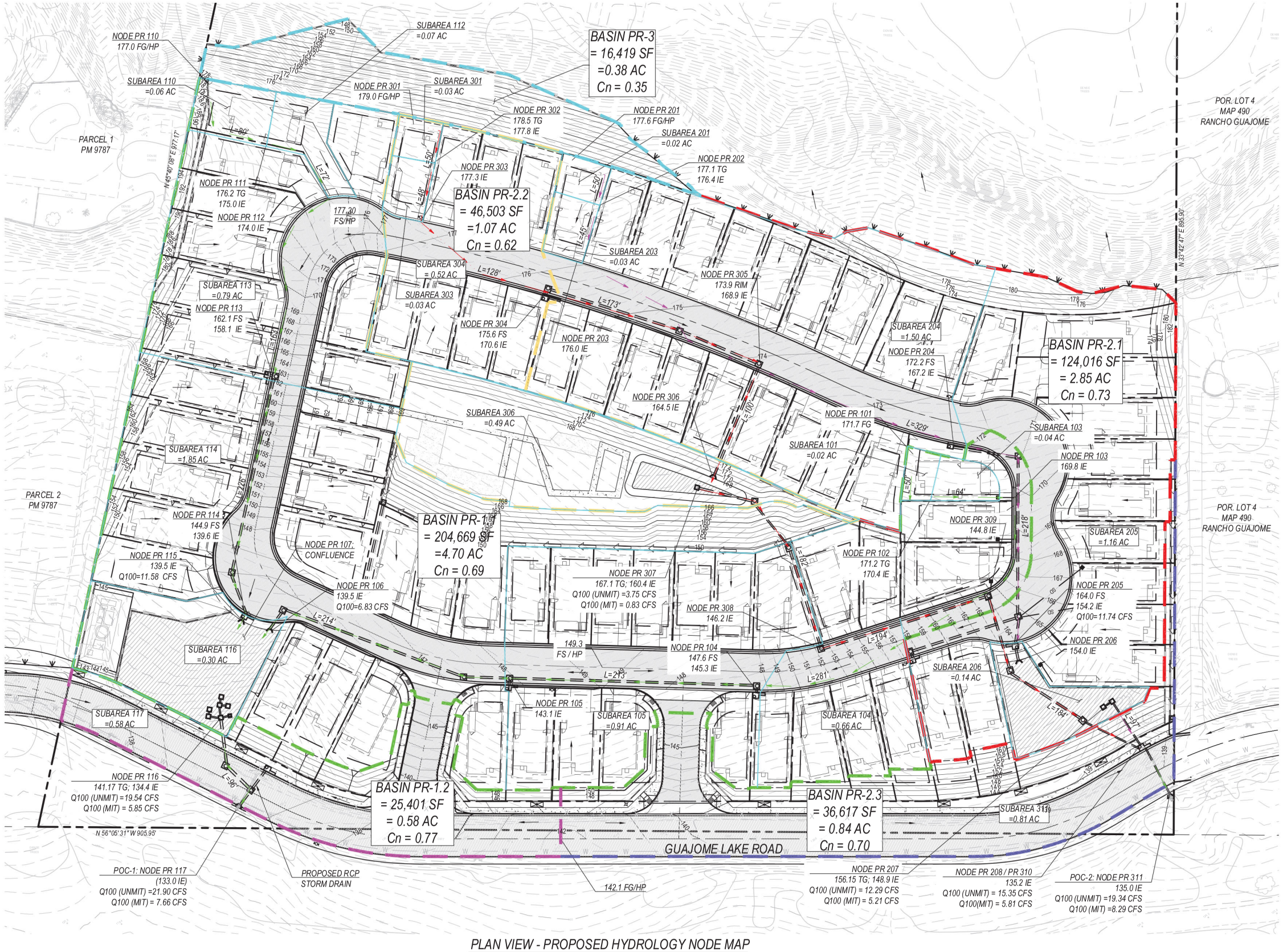
BASIN EX-3 - AREA CALCULATIONS

TOTAL DRAINAGE BASIN AREA	83,714 SF (1.92 AC)
Cn	0.35
Q100	5.13 CFS
TC	5.0 MINS

REGISTERED PROFESSIONAL ENGINEER
TYLER G LAWSON
No. 80356
Exp. 12/31/24
CIVIL
STATE OF CALIFORNIA

EXISTING HYDROLOGY EXHIBIT
GUAJOME LAKE ROAD
CITY OF OCEANSIDE, CA

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



LEGEND

- PROPERTY LINE
- RIGHT-OF-WAY
- CENTERLINE OF ROAD
- FLOW PATH (PR-1.1)
- FLOW PATH (PR-2.1)
- FLOW PATH (PR-2.2)
- FLOW DIRECTION
- PROPOSED MAJOR BASIN 1.1 BOUNDARY
- PROPOSED MAJOR BASIN 1.2 BOUNDARY
- PROPOSED MAJOR BASIN 2.1 BOUNDARY
- PROPOSED MAJOR BASIN 2.2 BOUNDARY
- PROPOSED MAJOR BASIN 2.3 BOUNDARY
- PROPOSED MAJOR BASIN 3 BOUNDARY
- PROPOSED BASIN SUBAREA

PROJECT SITE - AREA CALCULATIONS

TOTAL AREA	453,625 SF (10.41 AC)
PROPOSED IMPERVIOUS AREA	275,690 SF (6.33 AC)
PROPOSED PERVIOUS AREA	177,665 SF (4.08 AC)
IMPERVIOUS %	60.8%

BASIN PR-1.1 - AREA CALCULATIONS

TOTAL BASIN AREA	204,669 SF (4.70 AC)
PROPOSED IMPERVIOUS AREA	124,716 SF (2.86 AC)
PROPOSED PERVIOUS AREA	79,953 SF (1.84 AC)
Cn	0.69
Q100 (UNMIT)	19.54 CFS
Q100 (MIT)	5.85 CFS
TC(UNMIT)	7.40 MINS
TC(MIT)	13.13 MINS

BASIN PR-1.2 - AREA CALCULATIONS

TOTAL BASIN AREA	25,401 SF (0.58 AC)
PROPOSED IMPERVIOUS AREA	19,578 SF (0.45 AC)
PROPOSED PERVIOUS AREA	5,823 SF (0.13 AC)
Cn	0.77
Q100	2.65 CFS

BASIN PR-1 - AREA CALCULATIONS

TOTAL BASIN AREA	230,070 SF (5.28 AC)
Q100 (UNMIT)	21.90 CFS
Q100 (MIT)	7.66 CFS
TC(UNMIT)	7.40 mins
TC(MIT)	13.33 MINS

PLAN VIEW - PROPOSED HYDROLOGY NODE MAP

SCALE: 1" = 40' HORIZONTAL

BASIN PR-2.1 - AREA CALCULATIONS

TOTAL BASIN AREA	124,016 SF (2.85 AC)
PROPOSED IMPERVIOUS AREA	86,009 SF (1.97 AC)
PROPOSED PERVIOUS AREA	38,007 SF (0.88 AC)
Cn	0.73
Q100 (UNMIT)	12.29 CFS
Q100 (MIT)	5.21 CFS
TC(UNMIT)	7.45 MINS
TC(MIT)	12.25 MINS

BASIN PR-2.2 - AREA CALCULATIONS

TOTAL BASIN AREA	46,503 SF (1.07 AC)
PROPOSED IMPERVIOUS AREA	22,690 SF (0.52 AC)
PROPOSED PERVIOUS AREA	23,813 SF (0.55AC)
Cn	0.62
Q100 (UNMIT)	3.75 CFS
Q100 (MIT)	0.83 CFS
TC(UNMIT)	9.24 MINS
TC(MIT)	16.24 MINS

BASIN PR-2.3 - AREA CALCULATIONS

TOTAL BASIN AREA	36,617 SF (0.84 AC)
PROPOSED IMPERVIOUS AREA	22,967 SF (0.53 AC)
PROPOSED PERVIOUS AREA	13,650 SF (0.31 AC)
Cn	0.70
Q100 (UNMIT)	3.41 CFS

BASIN PR-2 - AREA CALCULATIONS

TOTAL BASIN AREA	207,136 SF (4.76 AC)
Q100 (UNMIT)	19.34 CFS
Q100 (MIT)	8.29 CFS
TC(UMIT)	7.66 MINS
TC(MIT)	12.52 MINS

BASIN PR-3 - AREA CALCULATIONS

TOTAL BASIN AREA	16,419 SF (0.38 AC)
Cn	0.35
Q100	1.01 CFS
TC	5.0 MINS

0 40 80 120

GRAPHIC SCALE: 1" = 40'

PROPOSED HYDROLOGY EXHIBIT
GUAJOME LAKE ROAD
CITY OF OCEANSIDE, CA

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

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
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              Ver. 23.0 Release Date: 07/01/2016  License ID 1452

                              Analysis prepared by:
```

```
 ************************* DESCRIPTION OF STUDY *************************
* PASCO LARET SUITER & ASSOC                                            *
 * BASIN PR-1 (UNMIT)                                                    *
 * GUAJOME LAKE                                                          *
 *************************************************************************

  FILE NAME: PR13775.DAT
  TIME/DATE OF STUDY: 14:53 08/15/2024
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.900
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   3.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *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   16.0     11.0    0.018/0.018/0.020   0.50    1.50 0.0312 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 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    101.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    171.70
  DOWNSTREAM ELEVATION(FEET) =    171.20
  ELEVATION DIFFERENCE(FEET) =      0.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.218
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.433
  SUBAREA RUNOFF(CFS) =      0.10
  TOTAL AREA(ACRES) =      0.02   TOTAL RUNOFF(CFS) =      0.10

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   171.20  DOWNSTREAM(FEET) =   169.80
  FLOW LENGTH(FEET) =    64.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   3.0 INCH PIPE IS   2.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.80
  ESTIMATED PIPE DIAMETER(INCH) =   3.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.10
  PIPE TRAVEL TIME(MIN.) =   0.38    Tc(MIN.) =    5.60
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    103.00 =     114.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.102
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6900
  SUBAREA AREA(ACRES) =    0.04   SUBAREA RUNOFF(CFS) =    0.20
  TOTAL AREA(ACRES) =        0.1   TOTAL RUNOFF(CFS) =       0.29
  TC(MIN.) =    5.60

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
```

```
==========================================================================
  UPSTREAM ELEVATION(FEET) =  169.80  DOWNSTREAM ELEVATION(FEET) =  147.60
  STREET LENGTH(FEET) =   281.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  11.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  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) =       1.75
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.23
    HALFSTREET FLOOD WIDTH(FEET) =    5.39
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.61
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.04
  STREET FLOW TRAVEL TIME(MIN.) =   1.02   Tc(MIN.) =    6.62
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.378
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.690
  SUBAREA AREA(ACRES) =    0.66      SUBAREA RUNOFF(CFS) =    2.90
  TOTAL AREA(ACRES) =        0.7        PEAK FLOW RATE(CFS) =       3.17

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.26   HALFSTREET FLOOD WIDTH(FEET) =   7.45
  FLOW VELOCITY(FEET/SEC.) =  5.14   DEPTH*VELOCITY(FT*FT/SEC.) =   1.35
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    104.00 =     395.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   147.60  DOWNSTREAM(FEET) =   143.10
  FLOW LENGTH(FEET) =   213.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.79
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.17
  PIPE TRAVEL TIME(MIN.) =   0.52    Tc(MIN.) =    7.14
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    105.00 =     608.00 FEET.

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

```
  FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.072
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6900
  SUBAREA AREA(ACRES) =    0.91   SUBAREA RUNOFF(CFS) =    3.81
  TOTAL AREA(ACRES) =        1.6   TOTAL RUNOFF(CFS) =       6.83
  TC(MIN.) =    7.14

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   143.10  DOWNSTREAM(FEET) =   139.50
  FLOW LENGTH(FEET) =   214.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.45
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.83
  PIPE TRAVEL TIME(MIN.) =   0.48    Tc(MIN.) =    7.62
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    106.00 =     822.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.62
  RAINFALL INTENSITY(INCH/HR) =   5.82
  TOTAL STREAM AREA(ACRES) =     1.63
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.83

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    111.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =    177.00
```

```
  DOWNSTREAM ELEVATION(FEET) =    176.20
  ELEVATION DIFFERENCE(FEET) =      0.80
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.950
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.830
  SUBAREA RUNOFF(CFS) =      0.28
  TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.28

****************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   176.20  DOWNSTREAM(FEET) =   174.00
  FLOW LENGTH(FEET) =    72.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   2.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.27
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.28
  PIPE TRAVEL TIME(MIN.) =   0.28    Tc(MIN.) =    6.23
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    112.00 =     152.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    112.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.630
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6900
  SUBAREA AREA(ACRES) =    0.07   SUBAREA RUNOFF(CFS) =    0.32
  TOTAL AREA(ACRES) =        0.1   TOTAL RUNOFF(CFS) =       0.59
  TC(MIN.) =    6.23

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    113.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  174.00  DOWNSTREAM ELEVATION(FEET) =  162.10
  STREET LENGTH(FEET) =   163.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00
```

```
  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  11.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  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) =       2.29
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.20
    HALFSTREET FLOOD WIDTH(FEET) =    4.07
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.27
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.86
  STREET FLOW TRAVEL TIME(MIN.) =   0.64   Tc(MIN.) =    6.87
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.226
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.690
  SUBAREA AREA(ACRES) =    0.79      SUBAREA RUNOFF(CFS) =    3.39
  TOTAL AREA(ACRES) =        0.9        PEAK FLOW RATE(CFS) =       3.95

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.23   HALFSTREET FLOOD WIDTH(FEET) =   5.90
  FLOW VELOCITY(FEET/SEC.) =  4.58   DEPTH*VELOCITY(FT*FT/SEC.) =   1.08
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    113.00 =     315.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    113.00 TO NODE    114.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   162.10  DOWNSTREAM(FEET) =   139.60
  FLOW LENGTH(FEET) =   226.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   6.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.72
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.95
  PIPE TRAVEL TIME(MIN.) =   0.30    Tc(MIN.) =    7.16
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    114.00 =     541.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    114.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.059
```

```
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6900
  SUBAREA AREA(ACRES) =    1.85   SUBAREA RUNOFF(CFS) =    7.73
  TOTAL AREA(ACRES) =        2.8   TOTAL RUNOFF(CFS) =      11.58
  TC(MIN.) =    7.16

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    115.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   139.60  DOWNSTREAM(FEET) =   139.50
  FLOW LENGTH(FEET) =    20.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.43
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.58
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    7.23
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    115.00 =     561.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    115.00 TO NODE    115.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.23
  RAINFALL INTENSITY(INCH/HR) =   6.03
  TOTAL STREAM AREA(ACRES) =     2.77
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     11.58

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        6.83     7.62        5.823          1.63
      2       11.58     7.23        6.026          2.77

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       18.06     7.23       6.026
      2       18.02     7.62       5.823
```

```
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      18.06   Tc(MIN.) =    7.23
  TOTAL AREA(ACRES) =        4.4
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    115.00 =     822.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    116.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.026
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6900
  SUBAREA AREA(ACRES) =    0.30   SUBAREA RUNOFF(CFS) =    1.25
  TOTAL AREA(ACRES) =        4.7   TOTAL RUNOFF(CFS) =      19.54
  TC(MIN.) =    7.23

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    117.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   134.40  DOWNSTREAM(FEET) =   133.00
  FLOW LENGTH(FEET) =    96.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.26
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      19.54
  PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =    7.40
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    117.00 =     918.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    117.00 TO NODE    117.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.935
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .7700
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6988
  SUBAREA AREA(ACRES) =    0.58   SUBAREA RUNOFF(CFS) =    2.65
  TOTAL AREA(ACRES) =        5.3   TOTAL RUNOFF(CFS) =      21.90
  TC(MIN.) =    7.40
============================================================================
  END OF STUDY SUMMARY:
```

```
  TOTAL AREA(ACRES)     =         5.3  TC(MIN.) =      7.40
  PEAK FLOW RATE(CFS)   =      21.90
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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**************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2016 Advanced Engineering Software (aes)
              Ver. 23.0 Release Date: 07/01/2016  License ID 1452

                              Analysis prepared by:
```

```
 ************************* DESCRIPTION OF STUDY *************************
* PASCO LARET SUITER & ASSOC                                            *
* BASIN PR-2 (UNMIT)                                                    *
* GUAJOME LAKE                                                          *
 ************************************************************************

  FILE NAME: PR23775.DAT
  TIME/DATE OF STUDY: 15:00 08/15/2024
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.900
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   3.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *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   16.0     11.0    0.018/0.018/0.020   0.50    1.50 0.0312 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 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    201.00 TO NODE    202.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 *USER SPECIFIED(SUBAREA):
 RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .7300
 S.C.S. CURVE NUMBER (AMC II) =   0
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
 UPSTREAM ELEVATION(FEET) =    177.60
 DOWNSTREAM ELEVATION(FEET) =    177.10
 ELEVATION DIFFERENCE(FEET) =      0.50
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.709
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.641
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.11
 TOTAL AREA(ACRES) =      0.02   TOTAL RUNOFF(CFS) =      0.11

****************************************************************************
 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) =   177.10  DOWNSTREAM(FEET) =   176.00
 FLOW LENGTH(FEET) =    45.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN   3.0 INCH PIPE IS   2.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   3.04
 ESTIMATED PIPE DIAMETER(INCH) =   3.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       0.11
 PIPE TRAVEL TIME(MIN.) =   0.25    Tc(MIN.) =    4.96
 LONGEST FLOWPATH FROM NODE    201.00 TO NODE    203.00 =      95.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    203.00 TO NODE    203.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.641
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 *USER SPECIFIED(SUBAREA):
 RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .7300
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.7300
 SUBAREA AREA(ACRES) =    0.03   SUBAREA RUNOFF(CFS) =    0.17
 TOTAL AREA(ACRES) =        0.0   TOTAL RUNOFF(CFS) =       0.28
 TC(MIN.) =    4.96

****************************************************************************
 FLOW PROCESS FROM NODE    203.00 TO NODE    204.00 IS CODE =  62
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
================================================================================
  UPSTREAM ELEVATION(FEET) =  176.00  DOWNSTREAM ELEVATION(FEET) =  172.20
  STREET LENGTH(FEET) =   329.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  11.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  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) =       3.63
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.35
    HALFSTREET FLOOD WIDTH(FEET) =   12.18
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.52
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.87
  STREET FLOW TRAVEL TIME(MIN.) =   2.18   Tc(MIN.) =    7.14
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.074
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .7300
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.730
  SUBAREA AREA(ACRES) =    1.50      SUBAREA RUNOFF(CFS) =    6.65
  TOTAL AREA(ACRES) =        1.5        PEAK FLOW RATE(CFS) =       6.87

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.41   HALFSTREET FLOOD WIDTH(FEET) =  15.79
  FLOW VELOCITY(FEET/SEC.) =  2.93   DEPTH*VELOCITY(FT*FT/SEC.) =   1.21
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    204.00 =     424.00 FEET.

****************************************************************************
  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) =   172.20  DOWNSTREAM(FEET) =   154.20
  FLOW LENGTH(FEET) =   218.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.70
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.87
  PIPE TRAVEL TIME(MIN.) =   0.27    Tc(MIN.) =    7.40
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    205.00 =     642.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    205.00 TO NODE    205.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.933
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .7300
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7300
  SUBAREA AREA(ACRES) =    1.16   SUBAREA RUNOFF(CFS) =    5.02
  TOTAL AREA(ACRES) =        2.7   TOTAL RUNOFF(CFS) =      11.74
  TC(MIN.) =    7.40

****************************************************************************
  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) =   154.20  DOWNSTREAM(FEET) =   154.00
  FLOW LENGTH(FEET) =    20.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.07
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.74
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    7.45
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    206.00 =     662.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    206.00 TO NODE    206.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.909
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .7300
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7300
  SUBAREA AREA(ACRES) =    0.14   SUBAREA RUNOFF(CFS) =    0.60
  TOTAL AREA(ACRES) =        2.9   TOTAL RUNOFF(CFS) =      12.29
  TC(MIN.) =    7.45

****************************************************************************
  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) =   148.90  DOWNSTREAM(FEET) =   135.20
  FLOW LENGTH(FEET) =    97.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   9.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  18.89
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.29
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =    7.53
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    208.00 =     759.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    208.00 TO NODE    208.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.53
  RAINFALL INTENSITY(INCH/HR) =   5.87
  TOTAL STREAM AREA(ACRES) =     2.85
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     12.29

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .6200
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    179.00
  DOWNSTREAM ELEVATION(FEET) =    178.50
  ELEVATION DIFFERENCE(FEET) =      0.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.109
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.714
  SUBAREA RUNOFF(CFS) =      0.12
  TOTAL AREA(ACRES) =      0.03   TOTAL RUNOFF(CFS) =      0.12

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   178.50  DOWNSTREAM(FEET) =   177.30
  FLOW LENGTH(FEET) =    48.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   3.0 INCH PIPE IS   2.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.11
  ESTIMATED PIPE DIAMETER(INCH) =   3.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.12
```

```
  PIPE TRAVEL TIME(MIN.) =   0.26    Tc(MIN.) =    6.37
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    303.00 =      98.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 TO NODE    303.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.538
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .6200
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6200
  SUBAREA AREA(ACRES) =    0.03   SUBAREA RUNOFF(CFS) =    0.12
  TOTAL AREA(ACRES) =        0.1   TOTAL RUNOFF(CFS) =       0.24
  TC(MIN.) =    6.37

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 TO NODE    304.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  177.30  DOWNSTREAM ELEVATION(FEET) =  175.60
  STREET LENGTH(FEET) =   128.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  11.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  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) =       1.20
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.26
    HALFSTREET FLOOD WIDTH(FEET) =    7.19
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.06
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.53
  STREET FLOW TRAVEL TIME(MIN.) =   1.03   Tc(MIN.) =    7.40
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.933
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .6200
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.620
  SUBAREA AREA(ACRES) =    0.52      SUBAREA RUNOFF(CFS) =    1.91
  TOTAL AREA(ACRES) =        0.6        PEAK FLOW RATE(CFS) =       2.13
```

```
  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.30   HALFSTREET FLOOD WIDTH(FEET) =   9.43
  FLOW VELOCITY(FEET/SEC.) =  2.33   DEPTH*VELOCITY(FT*FT/SEC.) =   0.70
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    304.00 =     226.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    305.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   175.60  DOWNSTREAM(FEET) =   168.90
  FLOW LENGTH(FEET) =   173.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   5.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.70
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.13
  PIPE TRAVEL TIME(MIN.) =   0.37    Tc(MIN.) =    7.78
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    305.00 =     399.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    305.00 TO NODE    306.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   168.90  DOWNSTREAM(FEET) =   164.50
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   5.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.09
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.13
  PIPE TRAVEL TIME(MIN.) =   0.21    Tc(MIN.) =    7.98
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    306.00 =     499.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    306.00 TO NODE    306.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.651
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .6200
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6200
  SUBAREA AREA(ACRES) =    0.49   SUBAREA RUNOFF(CFS) =    1.72
  TOTAL AREA(ACRES) =        1.1   TOTAL RUNOFF(CFS) =       3.75
  TC(MIN.) =    7.98
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    307.00 TO NODE    308.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   160.40  DOWNSTREAM(FEET) =   146.20
  FLOW LENGTH(FEET) =   182.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   6.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.39
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.75
  PIPE TRAVEL TIME(MIN.) =   0.27    Tc(MIN.) =    8.25
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    308.00 =     681.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    308.00 TO NODE    309.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   146.20  DOWNSTREAM(FEET) =   144.80
  FLOW LENGTH(FEET) =   194.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   9.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.72
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.75
  PIPE TRAVEL TIME(MIN.) =   0.69    Tc(MIN.) =    8.93
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    309.00 =     875.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    309.00 TO NODE    310.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   144.80  DOWNSTREAM(FEET) =   135.20
  FLOW LENGTH(FEET) =   184.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.95
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.75
  PIPE TRAVEL TIME(MIN.) =   0.31    Tc(MIN.) =    9.24
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    310.00 =    1059.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    310.00 TO NODE    310.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
```

```
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.24
  RAINFALL INTENSITY(INCH/HR) =   5.14
  TOTAL STREAM AREA(ACRES) =     1.07
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.75

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       12.29     7.53        5.865          2.85
      2        3.75     9.24        5.141          1.07

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       15.35     7.53       5.865
      2       14.52     9.24       5.141

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      15.35   Tc(MIN.) =    7.53
  TOTAL AREA(ACRES) =        3.9
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    310.00 =    1059.00 FEET.

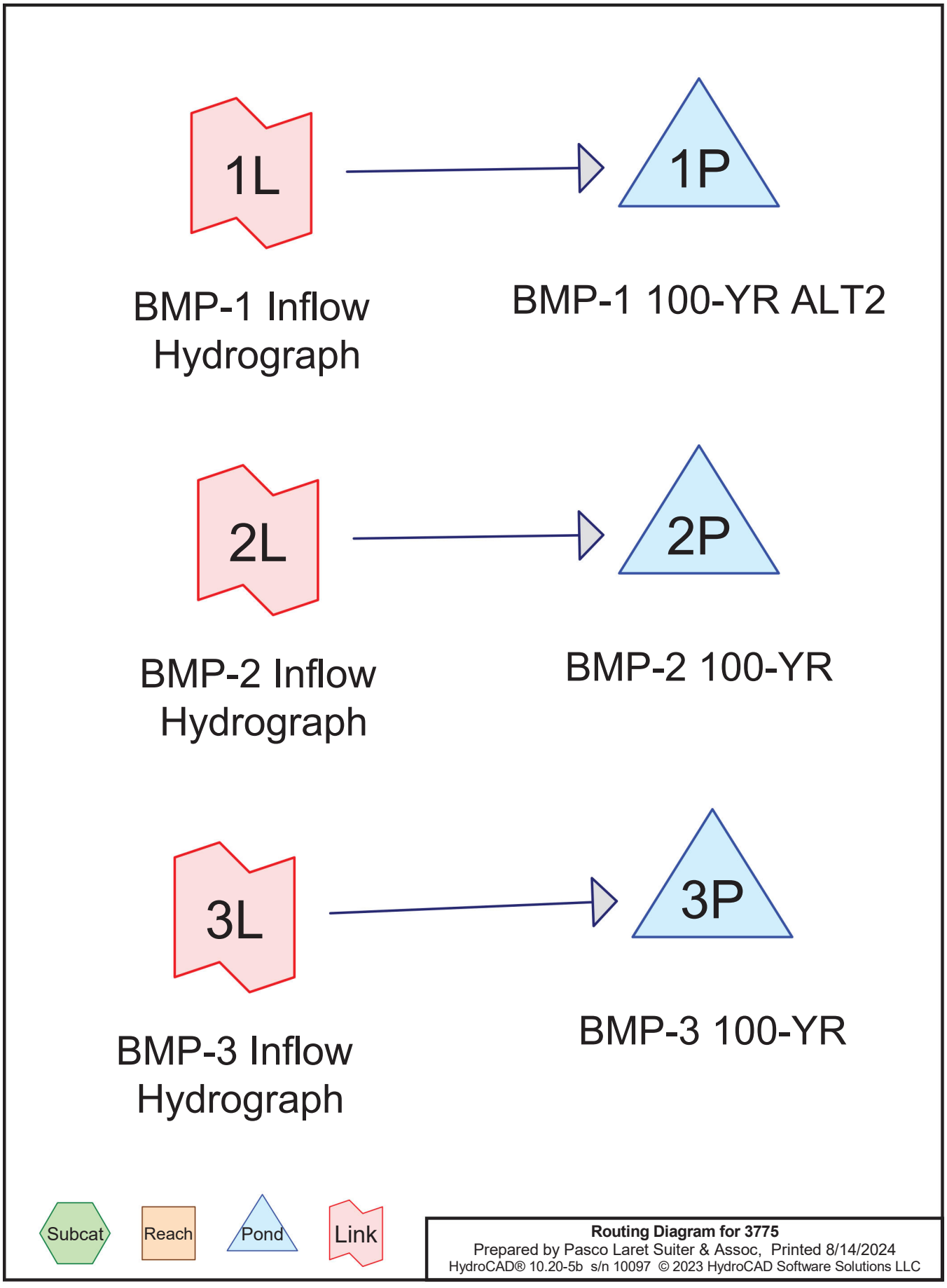
****************************************************************************
  FLOW PROCESS FROM NODE    310.00 TO NODE    311.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   135.20  DOWNSTREAM(FEET) =   135.00
  FLOW LENGTH(FEET) =    44.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  17.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.62
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      15.35
  PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =    7.66
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    311.00 =    1103.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    311.00 TO NODE    311.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.801
  *USER SPECIFIED(SUBAREA):
```

```
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .7000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7000
  SUBAREA AREA(ACRES) =    0.84   SUBAREA RUNOFF(CFS) =    3.41
  TOTAL AREA(ACRES) =        4.8   TOTAL RUNOFF(CFS) =      19.33
  TC(MIN.) =    7.66
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        4.8  TC(MIN.) =      7.66
  PEAK FLOW RATE(CFS)   =      19.33
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

Appendix B

Storm Water Pollutant Control and Detention Calculations



Routing Diagram for 3775
Prepared by Pasco Laret Suiter & Assoc, Printed 8/14/2024

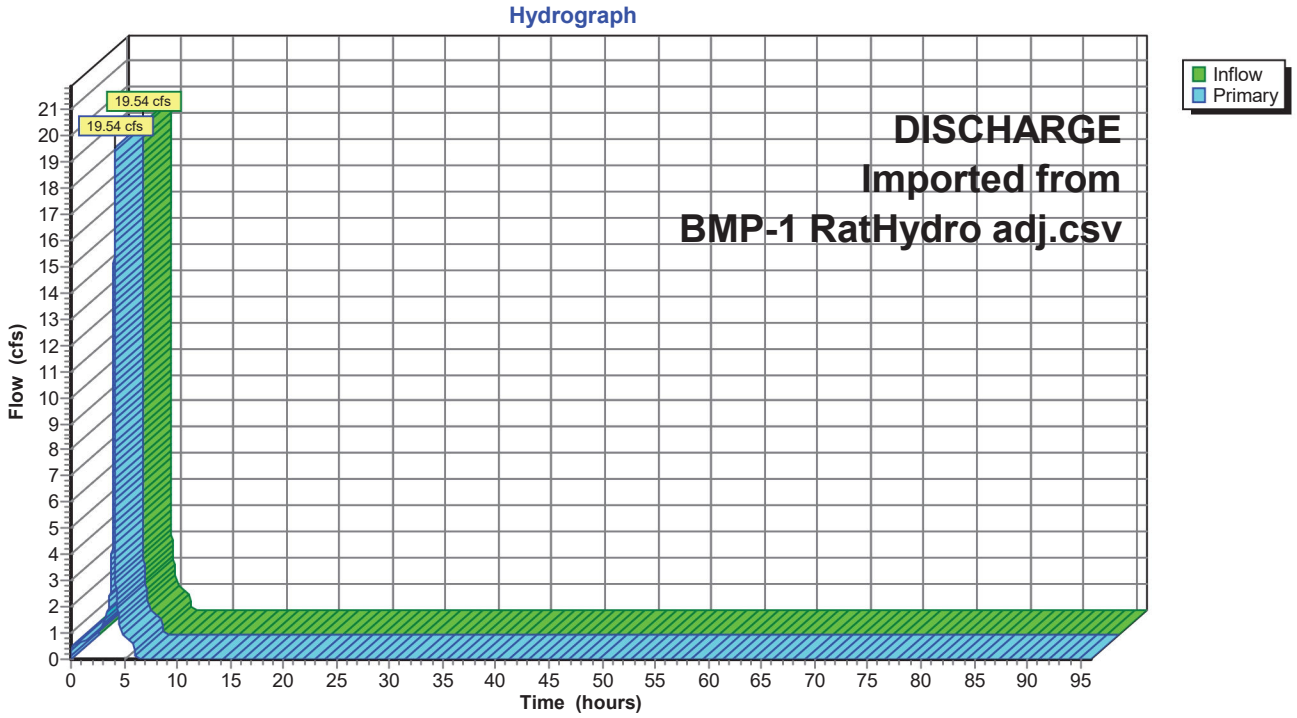
Summary for Link 1L: BMP-1 Inflow Hydrograph

Inflow = 19.54 cfs @ 4.08 hrs, Volume= 0.779 af
Primary = 19.54 cfs @ 4.08 hrs, Volume= 0.779 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1P : BMP-1 100-YR ALT2

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.001 hrs

DISCHARGE Imported from BMP-1 RatHydro adj.csv

Link 1L: BMP-1 Inflow Hydrograph



Summary for Pond 1P: BMP-1 100-YR ALT2

Inflow	=	19.54 cfs @	4.08 hrs,	Volume=	0.779 af
Outflow	=	5.85 cfs @	4.18 hrs,	Volume=	0.779 af, Atten= 70%, Lag= 5.9 min
Primary	=	5.85 cfs @	4.18 hrs,	Volume=	0.779 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.001 hrs
Peak Elev= 101.67' @ 4.18 hrs Surf.Area= 8,045 sf Storage= 9,401 cf

Plug-Flow detention time= 19.6 min calculated for 0.779 af (100% of inflow)
Center-of-Mass det. time= 19.6 min (231.5 - 211.8)

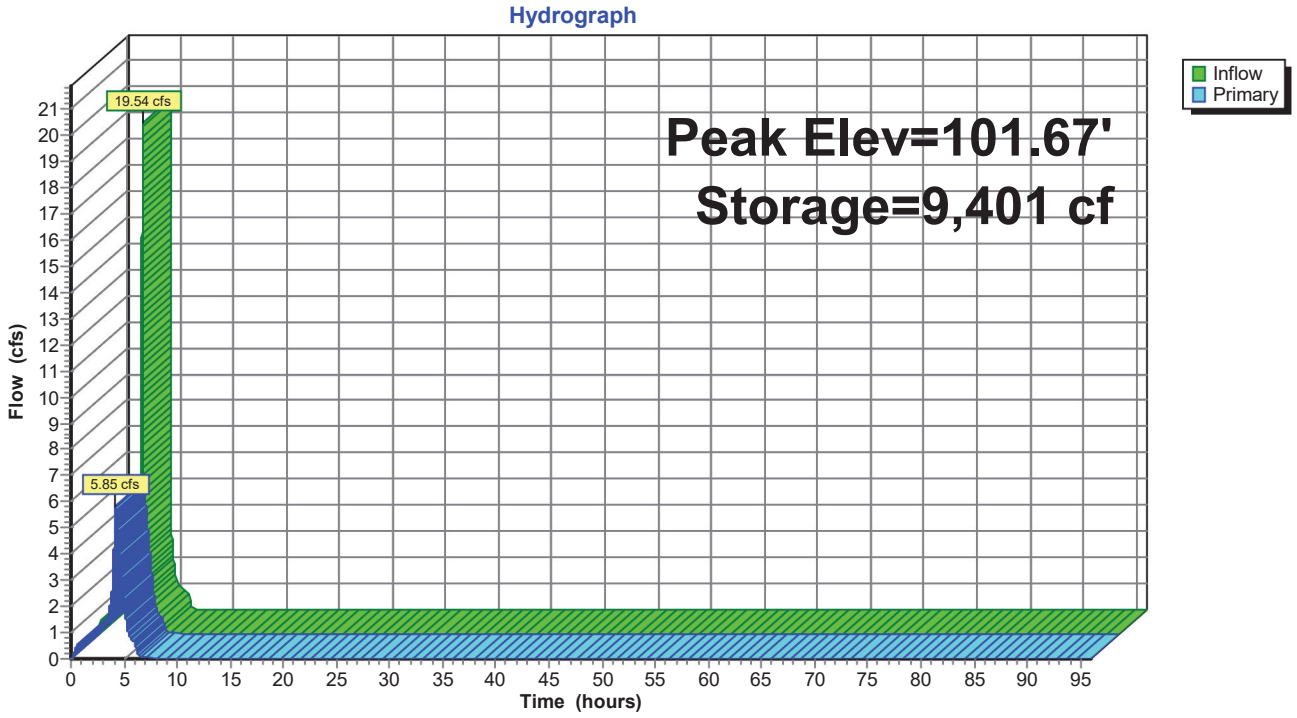
Volume	Invert	Avail.Storage	Storage Description
#1	100.50'	12,068 cf	**Biofiltration Basin (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
100.50	8,045	0.0	0	0	8,045
102.00	8,045	100.0	12,068	12,068	8,522

Device	Routing	Invert	Outlet Devices
#1	Primary	95.00'	**18.00" Round Outlet** L= 10.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 95.00' / 94.90' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	100.50'	**21.00" W x 2.00" H Vert. Orifice X 4.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	101.67'	**36.00" x 36.00" Horiz. Grate** C= 0.600 in 36.00" x 36.00" Grate (100% open area) Limited to weir flow at low heads
#4	Device 1	101.67'	**36.00" x 36.00" Horiz. Grate** C= 0.600 in 36.00" x 36.00" Grate (100% open area) Limited to weir flow at low heads
#5	Device 1	101.67'	**36.00" x 36.00" Horiz. Grate** C= 0.600 in 36.00" x 36.00" Grate (100% open area) Limited to weir flow at low heads
#6	Device 1	101.67'	**36.00" x 36.00" Horiz. Grate** C= 0.600 in 36.00" x 36.00" Grate (100% open area) Limited to weir flow at low heads
#7	Device 1	101.67'	**36.00" x 36.00" Horiz. Grate** C= 0.600 in 36.00" x 36.00" Grate (100% open area) Limited to weir flow at low heads
#8	Device 1	101.67'	**36.00" x 36.00" Horiz. Grate** C= 0.600 in 36.00" x 36.00" Grate (100% open area) Limited to weir flow at low heads
#9	Device 1	101.67'	**18.00" x 18.00" Horiz. Grate** C= 0.600 in 18.00" x 18.00" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=5.85 cfs @ 4.18 hrs HW=101.67' (Free Discharge)
└─**1=Outlet** (Passes 5.85 cfs of 20.70 cfs potential flow)
  ├─**2=Orifice** (Orifice Controls 5.85 cfs @ 5.01 fps)
  ├─**3=Grate** (Controls 0.00 cfs)
  ├─**4=Grate** (Controls 0.00 cfs)
  ├─**5=Grate** (Controls 0.00 cfs)
  ├─**6=Grate** (Controls 0.00 cfs)
  ├─**7=Grate** (Controls 0.00 cfs)
  ├─**8=Grate** (Controls 0.00 cfs)
  └─**9=Grate** (Controls 0.00 cfs)

Pond 1P: BMP-1 100-YR ALT2



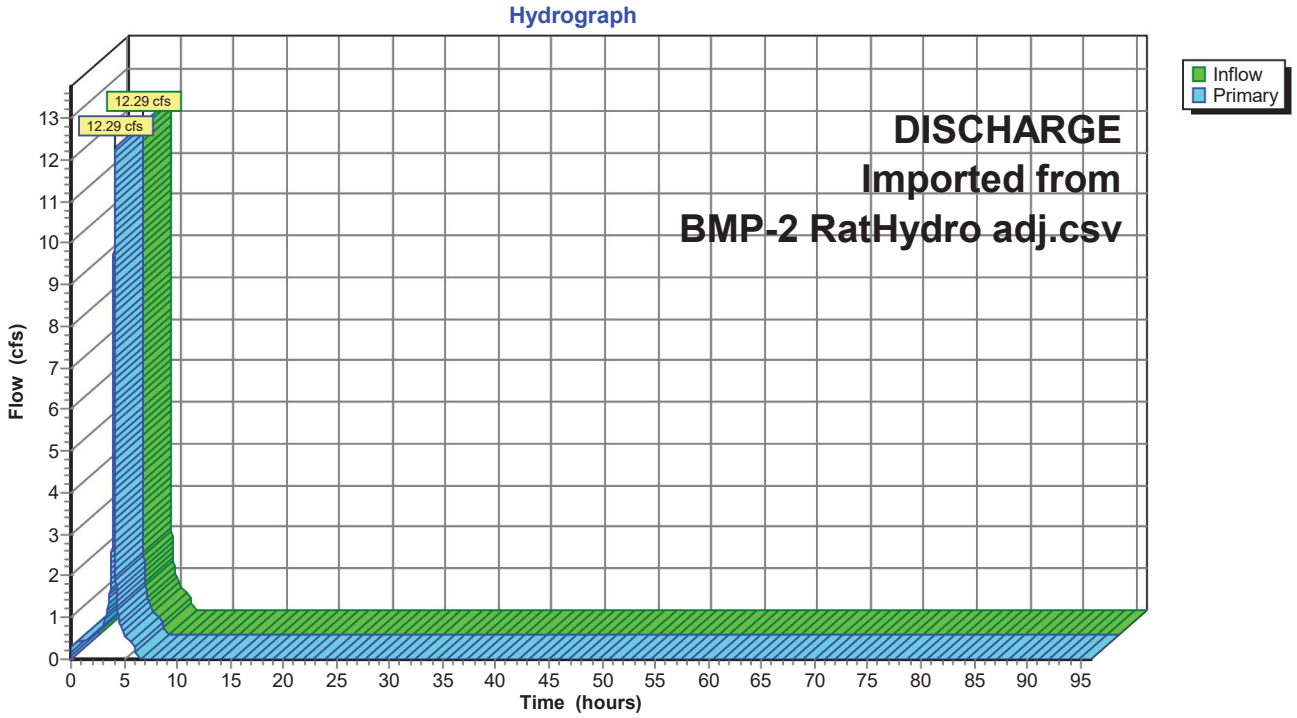
Summary for Link 2L: BMP-2 Inflow Hydrograph

Inflow = 12.29 cfs @ 4.08 hrs, Volume= 0.497 af
Primary = 12.29 cfs @ 4.08 hrs, Volume= 0.497 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 2P : BMP-2 100-YR

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.001 hrs

DISCHARGE Imported from BMP-2 RatHydro adj.csv

Link 2L: BMP-2 Inflow Hydrograph



Summary for Pond 2P: BMP-2 100-YR

Inflow	=	12.29 cfs @	4.08 hrs, Volume=	0.497 af
Outflow	=	5.21 cfs @	4.16 hrs, Volume=	0.497 af, Atten= 58%, Lag= 4.8 min
Primary	=	5.21 cfs @	4.16 hrs, Volume=	0.497 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.001 hrs
Peak Elev= 102.05' @ 4.16 hrs Surf.Area= 4,500 sf Storage= 4,731 cf

Plug-Flow detention time= 14.0 min calculated for 0.497 af (100% of inflow)
Center-of-Mass det. time= 14.0 min (225.8 - 211.8)

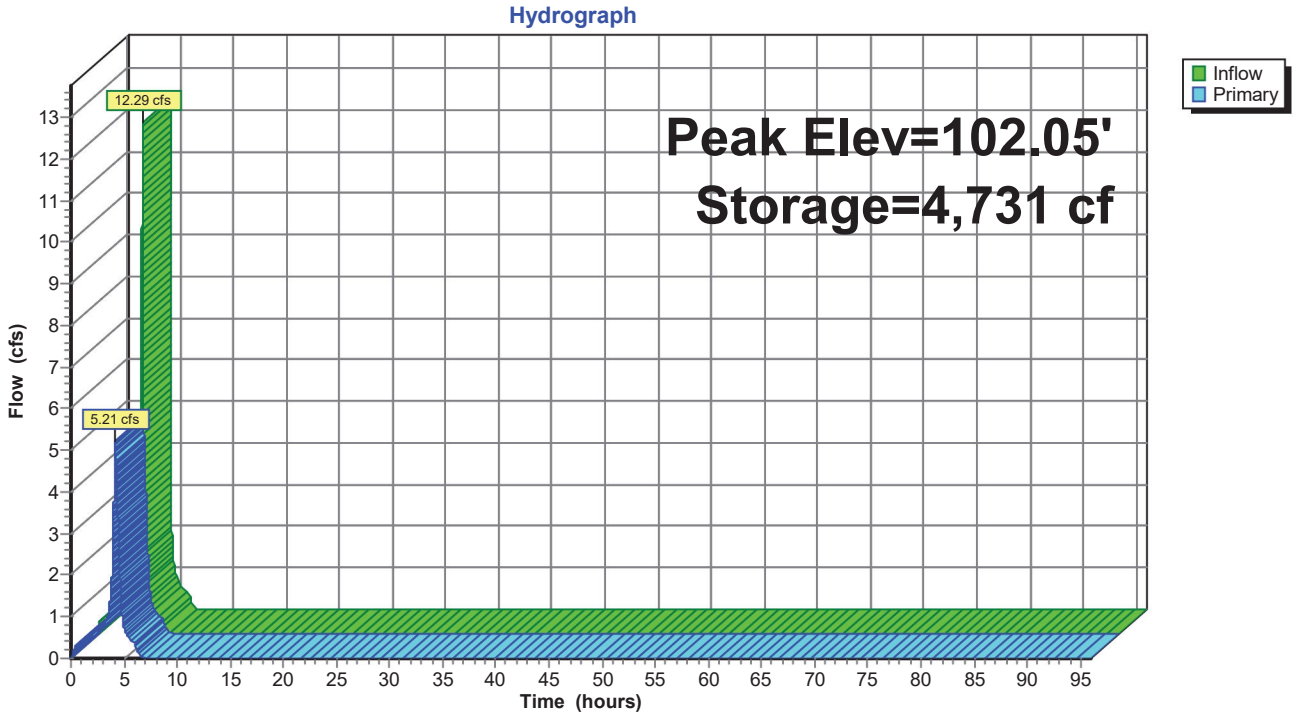
Volume	Invert	Avail.Storage	Storage Description
#1	101.00'	7,875 cf	**Biofiltration Basin (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
101.00	4,500	0.0	0	0	4,500
102.75	4,500	100.0	7,875	7,875	4,916

Device	Routing	Invert	Outlet Devices
#1	Primary	95.00'	**18.00" Round Outlet** L= 10.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 95.00' / 94.90' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	101.00'	**18.00" W x 3.00" H Vert. Orifice X 3.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	102.15'	**36.00" x 36.00" Horiz. Grate** C= 0.600 in 36.00" x 36.00" Grate (100% open area) Limited to weir flow at low heads
#4	Device 1	102.15'	**36.00" x 36.00" Horiz. Grate** C= 0.600 in 36.00" x 36.00" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=5.21 cfs @ 4.16 hrs HW=102.05' (Free Discharge)
└─**1=Outlet** (Passes 5.21 cfs of 21.36 cfs potential flow)
  ├─**2=Orifice** (Orifice Controls 5.21 cfs @ 4.63 fps)
  ├─**3=Grate** (Controls 0.00 cfs)
  └─**4=Grate** (Controls 0.00 cfs)

Pond 2P: BMP-2 100-YR



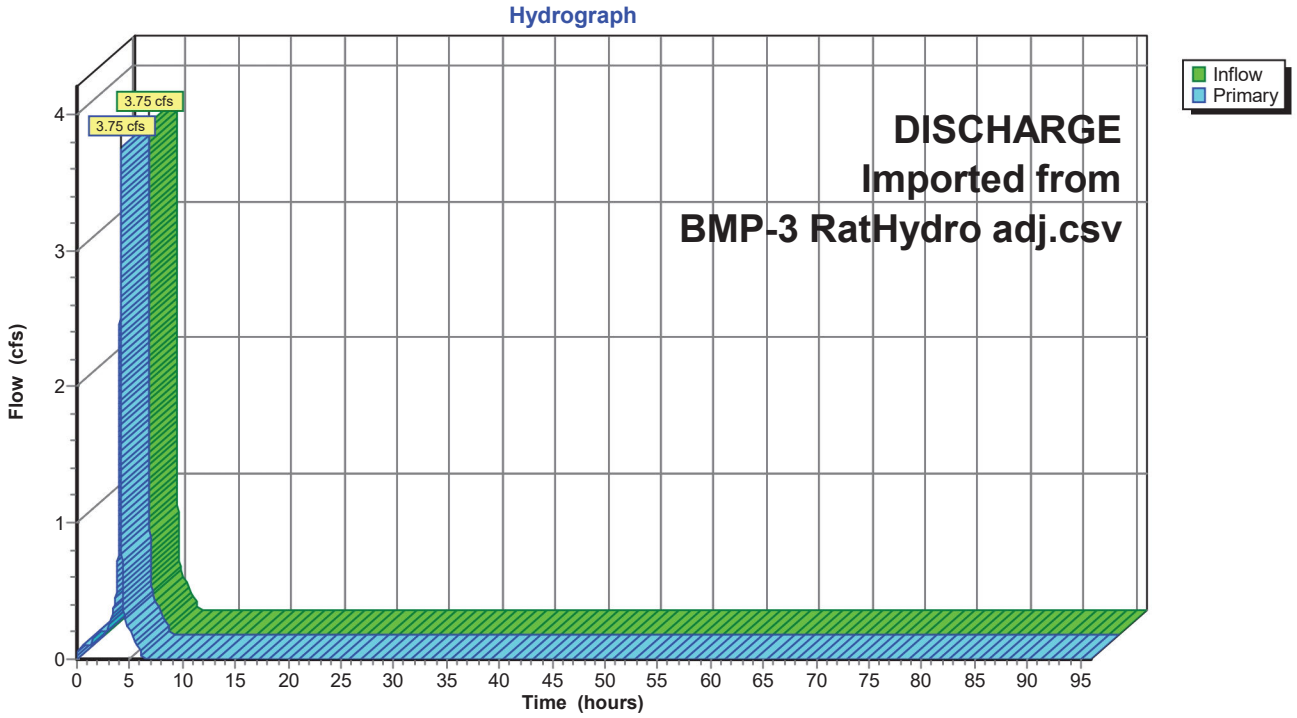
Summary for Link 3L: BMP-3 Inflow Hydrograph

Inflow = 3.75 cfs @ 4.13 hrs, Volume= 0.155 af
Primary = 3.75 cfs @ 4.13 hrs, Volume= 0.155 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 3P : BMP-3 100-YR

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.001 hrs

DISCHARGE Imported from BMP-3 RatHydro adj.csv

Link 3L: BMP-3 Inflow Hydrograph



Summary for Pond 3P: BMP-3 100-YR

Inflow	=	3.75 cfs @	4.13 hrs,	Volume=	0.155 af
Outflow	=	0.83 cfs @	4.26 hrs,	Volume=	0.155 af, Atten= 78%, Lag= 7.4 min
Primary	=	0.83 cfs @	4.26 hrs,	Volume=	0.155 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.001 hrs
Peak Elev= 102.03' @ 4.26 hrs Surf.Area= 1,840 sf Storage= 2,332 cf

Plug-Flow detention time= 32.4 min calculated for 0.155 af (100% of inflow)
Center-of-Mass det. time= 32.4 min (248.8 - 216.4)

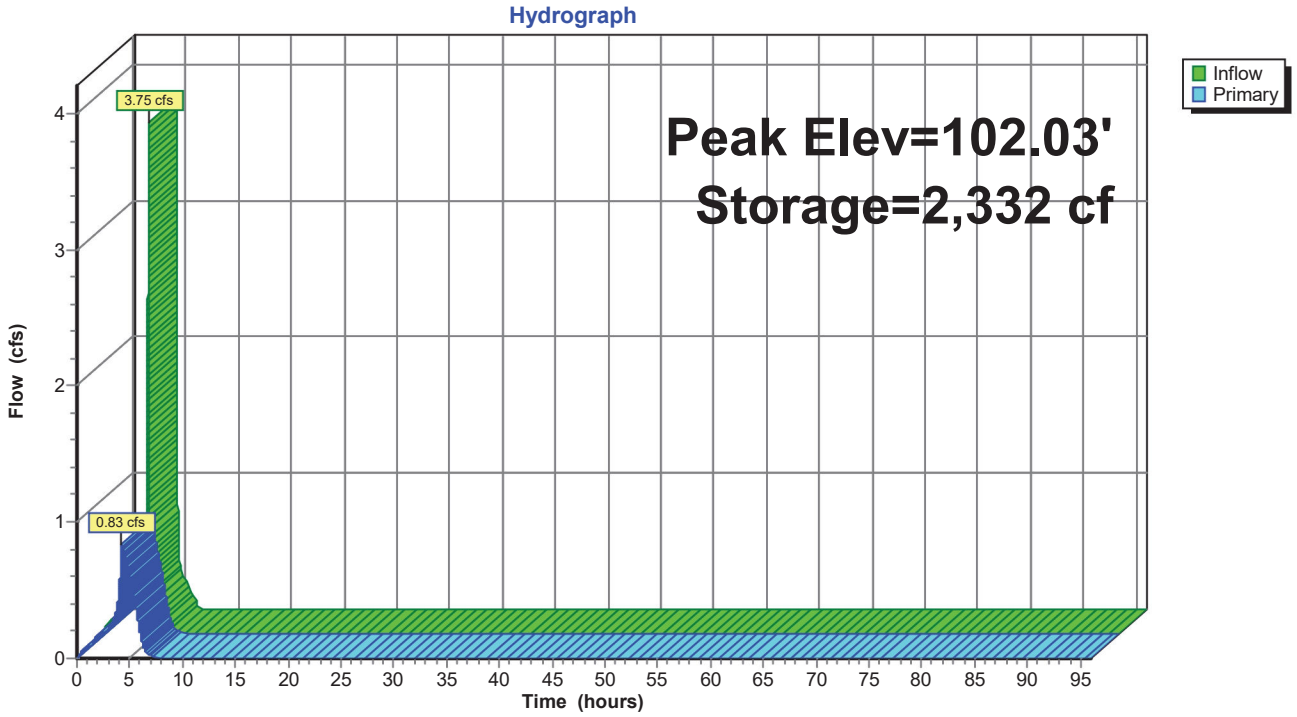
Volume	Invert	Avail.Storage	Storage Description
#1	100.50'	4,334 cf	**Biofiltration Basin (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
100.50	1,231	0.0	0	0	1,231
103.00	2,291	100.0	4,334	4,334	2,353

Device	Routing	Invert	Outlet Devices
#1	Primary	96.00'	**18.00" Round Outlet** L= 10.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 96.00' / 95.90' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	100.50'	**7.00" W x 3.00" H Vert. Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	102.60'	**36.00" x 36.00" Horiz. Grate** C= 0.600 in 36.00" x 36.00" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.83 cfs @ 4.26 hrs HW=102.03' (Free Discharge)
└**1=Outlet** (Passes 0.83 cfs of 19.55 cfs potential flow)
  ├**2=Orifice** (Orifice Controls 0.83 cfs @ 5.70 fps)
  └**3=Grate** (Controls 0.00 cfs)

Pond 3P: BMP-3 100-YR



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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2016 Advanced Engineering Software (aes)
              Ver. 23.0 Release Date: 07/01/2016  License ID 1452

                           Analysis prepared by:



 ************************** DESCRIPTION OF STUDY **************************
* 3775 GUAJOME LAKE RD                                                   *
* PR-1 MITIGATED CONDITION                                               *
* 100-YR                                                                 *
 ************************************************************************

  FILE NAME: PR13775D.DAT
  TIME/DATE OF STUDY: 14:40 08/05/2024
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.900
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   3.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *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   16.0     11.0    0.018/0.018/0.020   0.50    1.50 0.0312 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 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    101.00 TO NODE    102.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
========================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    171.70
  DOWNSTREAM ELEVATION(FEET) =    171.20
  ELEVATION DIFFERENCE(FEET) =      0.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.218
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.433
  SUBAREA RUNOFF(CFS) =      0.10
  TOTAL AREA(ACRES) =      0.02   TOTAL RUNOFF(CFS) =      0.10

************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  31
------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
```

```
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   171.20  DOWNSTREAM(FEET) =   169.80
  FLOW LENGTH(FEET) =    64.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   3.0 INCH PIPE IS   2.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.80
  ESTIMATED PIPE DIAMETER(INCH) =   3.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.10
  PIPE TRAVEL TIME(MIN.) =   0.38    Tc(MIN.) =    5.60
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    103.00 =     114.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.102
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6900
  SUBAREA AREA(ACRES) =    0.04   SUBAREA RUNOFF(CFS) =    0.20
  TOTAL AREA(ACRES) =        0.1   TOTAL RUNOFF(CFS) =       0.29
  TC(MIN.) =    5.60

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  169.80  DOWNSTREAM ELEVATION(FEET) =  147.60
  STREET LENGTH(FEET) =   281.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  11.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  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) =       1.75
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.23
    HALFSTREET FLOOD WIDTH(FEET) =    5.39
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.61
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.04
  STREET FLOW TRAVEL TIME(MIN.) =   1.02   Tc(MIN.) =    6.62
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.378
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.690
  SUBAREA AREA(ACRES) =    0.66      SUBAREA RUNOFF(CFS) =    2.90
  TOTAL AREA(ACRES) =        0.7        PEAK FLOW RATE(CFS) =       3.17

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.26   HALFSTREET FLOOD WIDTH(FEET) =   7.45
  FLOW VELOCITY(FEET/SEC.) =  5.14   DEPTH*VELOCITY(FT*FT/SEC.) =   1.35
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    104.00 =     395.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   147.60  DOWNSTREAM(FEET) =   143.10
  FLOW LENGTH(FEET) =   213.00   MANNING'S N =  0.013
```

```
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.79
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.17
  PIPE TRAVEL TIME(MIN.) =   0.52    Tc(MIN.) =    7.14
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    105.00 =     608.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.072
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6900
  SUBAREA AREA(ACRES) =    0.91   SUBAREA RUNOFF(CFS) =    3.81
  TOTAL AREA(ACRES) =        1.6   TOTAL RUNOFF(CFS) =       6.83
  TC(MIN.) =    7.14

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   143.10  DOWNSTREAM(FEET) =   139.50
  FLOW LENGTH(FEET) =   214.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.45
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.83
  PIPE TRAVEL TIME(MIN.) =   0.48    Tc(MIN.) =    7.62
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    106.00 =     822.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.62
  RAINFALL INTENSITY(INCH/HR) =   5.82
  TOTAL STREAM AREA(ACRES) =     1.63
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.83

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    111.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =    177.00
  DOWNSTREAM ELEVATION(FEET) =    176.20
  ELEVATION DIFFERENCE(FEET) =      0.80
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.950
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.830
  SUBAREA RUNOFF(CFS) =      0.28
  TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.28

****************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  31
```

```
--------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   176.20  DOWNSTREAM(FEET) =   174.00
  FLOW LENGTH(FEET) =    72.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   2.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.27
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.28
  PIPE TRAVEL TIME(MIN.) =   0.28    Tc(MIN.) =    6.23
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    112.00 =     152.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    112.00 IS CODE =  81
--------------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.630
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6900
  SUBAREA AREA(ACRES) =    0.07   SUBAREA RUNOFF(CFS) =    0.32
  TOTAL AREA(ACRES) =        0.1   TOTAL RUNOFF(CFS) =       0.59
  TC(MIN.) =    6.23

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    113.00 IS CODE =  62
--------------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
================================================================================
  UPSTREAM ELEVATION(FEET) =  174.00  DOWNSTREAM ELEVATION(FEET) =  162.10
  STREET LENGTH(FEET) =   163.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  11.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  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) =       2.29
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.20
    HALFSTREET FLOOD WIDTH(FEET) =    4.07
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.27
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.86
  STREET FLOW TRAVEL TIME(MIN.) =   0.64   Tc(MIN.) =    6.87
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.226
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.690
  SUBAREA AREA(ACRES) =    0.79      SUBAREA RUNOFF(CFS) =    3.39
  TOTAL AREA(ACRES) =        0.9        PEAK FLOW RATE(CFS) =       3.95

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.23   HALFSTREET FLOOD WIDTH(FEET) =   5.90
  FLOW VELOCITY(FEET/SEC.) =  4.58   DEPTH*VELOCITY(FT*FT/SEC.) =   1.08
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    113.00 =     315.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    113.00 TO NODE    114.00 IS CODE =  31
--------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
```

```
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   162.10  DOWNSTREAM(FEET) =   139.60
  FLOW LENGTH(FEET) =   226.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   6.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.72
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.95
  PIPE TRAVEL TIME(MIN.) =   0.30    Tc(MIN.) =    7.16
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    114.00 =     541.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    114.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.059
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6900
  SUBAREA AREA(ACRES) =    1.85   SUBAREA RUNOFF(CFS) =    7.73
  TOTAL AREA(ACRES) =        2.8   TOTAL RUNOFF(CFS) =      11.58
  TC(MIN.) =    7.16

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    115.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   139.60  DOWNSTREAM(FEET) =   139.50
  FLOW LENGTH(FEET) =    20.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.43
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.58
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    7.23
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    115.00 =     561.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    115.00 TO NODE    115.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.23
  RAINFALL INTENSITY(INCH/HR) =   6.03
  TOTAL STREAM AREA(ACRES) =     2.77
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     11.58

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        6.83     7.62        5.823          1.63
      2       11.58     7.23        6.026          2.77

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       18.06     7.23       6.026
      2       18.02     7.62       5.823

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      18.06   Tc(MIN.) =    7.23
  TOTAL AREA(ACRES) =        4.4
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    115.00 =     822.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    116.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.026
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6900
  SUBAREA AREA(ACRES) =    0.30   SUBAREA RUNOFF(CFS) =    1.25
  TOTAL AREA(ACRES) =        4.7   TOTAL RUNOFF(CFS) =      19.54
  TC(MIN.) =    7.23

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    116.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  13.13   RAIN INTENSITY(INCH/HOUR) =  4.10
  TOTAL AREA(ACRES) =     4.70   TOTAL RUNOFF(CFS) =      5.85

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    117.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   135.00  DOWNSTREAM(FEET) =   133.00
  FLOW LENGTH(FEET) =    96.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.86
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.85
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =   13.33
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    117.00 =     918.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    117.00 TO NODE    117.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   13.33
  RAINFALL INTENSITY(INCH/HR) =   4.06
  TOTAL STREAM AREA(ACRES) =     4.70
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.85

****************************************************************************
  FLOW PROCESS FROM NODE    117.00 TO NODE    117.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =   7.38   RAIN INTENSITY(INCH/HOUR) =  5.94
  TOTAL AREA(ACRES) =     0.58   TOTAL RUNOFF(CFS) =      2.65

****************************************************************************
  FLOW PROCESS FROM NODE    117.00 TO NODE    117.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.38
  RAINFALL INTENSITY(INCH/HR) =   5.94
  TOTAL STREAM AREA(ACRES) =     0.58
```

PEAK FLOW RATE(CFS) AT CONFLUENCE = 2.65

** CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	5.85	13.33	4.059	4.70
2	2.65	7.38	5.944	0.58

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	5.89	7.38	5.944
2	7.66	13.33	4.059

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 7.66 Tc(MIN.) = 13.33
TOTAL AREA(ACRES) = 5.3
LONGEST FLOWPATH FROM NODE 101.00 TO NODE 117.00 = 918.00 FEET.

==========

END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 5.3 TC(MIN.) = 13.33
PEAK FLOW RATE(CFS) = 7.66

==========

END OF RATIONAL METHOD ANALYSIS

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2016 Advanced Engineering Software (aes)
              Ver. 23.0 Release Date: 07/01/2016  License ID 1452

                          Analysis prepared by:



 ************************** DESCRIPTION OF STUDY **************************
* 3775 GUAJOME LAKE RD                                                   *
* PR-2 MITIGATED CONDITION                                               *
* 100-YR                                                                 *
 ************************************************************************

  FILE NAME: PR23775D.DAT
  TIME/DATE OF STUDY: 09:19 08/06/2024
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.900
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   3.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *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   16.0     11.0    0.018/0.018/0.020   0.50    1.50 0.0312 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 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    201.00 TO NODE    202.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
========================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .7300
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    177.60
  DOWNSTREAM ELEVATION(FEET) =    177.10
  ELEVATION DIFFERENCE(FEET) =      0.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.709
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.641
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.11
  TOTAL AREA(ACRES) =      0.02   TOTAL RUNOFF(CFS) =      0.11

************************************************************************
  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) =   177.10  DOWNSTREAM(FEET) =   176.00
  FLOW LENGTH(FEET) =    45.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   3.0 INCH PIPE IS   2.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.04
  ESTIMATED PIPE DIAMETER(INCH) =   3.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.11
  PIPE TRAVEL TIME(MIN.) =   0.25    Tc(MIN.) =    4.96
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    203.00 =      95.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    203.00 TO NODE    203.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.641
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .7300
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7300
  SUBAREA AREA(ACRES) =    0.03   SUBAREA RUNOFF(CFS) =    0.17
  TOTAL AREA(ACRES) =        0.0   TOTAL RUNOFF(CFS) =       0.28
  TC(MIN.) =    4.96

****************************************************************************
  FLOW PROCESS FROM NODE    203.00 TO NODE    204.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  176.00  DOWNSTREAM ELEVATION(FEET) =  172.20
  STREET LENGTH(FEET) =   329.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  11.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  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) =       3.63
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.35
    HALFSTREET FLOOD WIDTH(FEET) =   12.18
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.52
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.87
  STREET FLOW TRAVEL TIME(MIN.) =   2.18   Tc(MIN.) =    7.14
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.074
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .7300
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.730
  SUBAREA AREA(ACRES) =    1.50      SUBAREA RUNOFF(CFS) =    6.65
  TOTAL AREA(ACRES) =        1.5        PEAK FLOW RATE(CFS) =       6.87

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.41   HALFSTREET FLOOD WIDTH(FEET) =  15.79
  FLOW VELOCITY(FEET/SEC.) =  2.93   DEPTH*VELOCITY(FT*FT/SEC.) =   1.21
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    204.00 =     424.00 FEET.

****************************************************************************
  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) =   172.20  DOWNSTREAM(FEET) =   154.20
  FLOW LENGTH(FEET) =   218.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.70
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.87
  PIPE TRAVEL TIME(MIN.) =   0.27    Tc(MIN.) =    7.40
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    205.00 =     642.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    205.00 TO NODE    205.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.933
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .7300
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7300
  SUBAREA AREA(ACRES) =    1.16   SUBAREA RUNOFF(CFS) =    5.02
  TOTAL AREA(ACRES) =        2.7   TOTAL RUNOFF(CFS) =      11.74
  TC(MIN.) =    7.40

****************************************************************************
  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) =   154.20  DOWNSTREAM(FEET) =   154.00
  FLOW LENGTH(FEET) =    20.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.07
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.74
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    7.45
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    206.00 =     662.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    206.00 TO NODE    206.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.909
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .7300
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7300
  SUBAREA AREA(ACRES) =    0.14   SUBAREA RUNOFF(CFS) =    0.60
  TOTAL AREA(ACRES) =        2.9   TOTAL RUNOFF(CFS) =      12.29
  TC(MIN.) =    7.45

****************************************************************************
  FLOW PROCESS FROM NODE    206.00 TO NODE    206.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  12.25   RAIN INTENSITY(INCH/HOUR) =  4.29
  TOTAL AREA(ACRES) =     2.85   TOTAL RUNOFF(CFS) =      5.21

****************************************************************************
  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) =   150.10  DOWNSTREAM(FEET) =   134.40
  FLOW LENGTH(FEET) =    97.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   6.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.32
```

```
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.21
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =   12.35
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    208.00 =     759.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    208.00 TO NODE    208.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   12.35
  RAINFALL INTENSITY(INCH/HR) =   4.26
  TOTAL STREAM AREA(ACRES) =     2.85
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.21

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .6200
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    179.00
  DOWNSTREAM ELEVATION(FEET) =    178.50
  ELEVATION DIFFERENCE(FEET) =      0.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.109
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.714
  SUBAREA RUNOFF(CFS) =      0.12
  TOTAL AREA(ACRES) =      0.03   TOTAL RUNOFF(CFS) =      0.12

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   178.50  DOWNSTREAM(FEET) =   177.30
  FLOW LENGTH(FEET) =    48.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   3.0 INCH PIPE IS   2.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.11
  ESTIMATED PIPE DIAMETER(INCH) =   3.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.12
  PIPE TRAVEL TIME(MIN.) =   0.26    Tc(MIN.) =    6.37
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    303.00 =      98.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 TO NODE    303.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.538
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .6200
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6200
  SUBAREA AREA(ACRES) =    0.03   SUBAREA RUNOFF(CFS) =    0.12
  TOTAL AREA(ACRES) =        0.1   TOTAL RUNOFF(CFS) =       0.24
  TC(MIN.) =    6.37

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 TO NODE    304.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  177.30  DOWNSTREAM ELEVATION(FEET) =  175.60
  STREET LENGTH(FEET) =   128.00   CURB HEIGHT(INCHES) =  6.0
```

```
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  11.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  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) =       1.20
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.26
    HALFSTREET FLOOD WIDTH(FEET) =    7.19
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.06
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.53
  STREET FLOW TRAVEL TIME(MIN.) =   1.03   Tc(MIN.) =    7.40
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.933
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .6200
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.620
  SUBAREA AREA(ACRES) =    0.52      SUBAREA RUNOFF(CFS) =    1.91
  TOTAL AREA(ACRES) =        0.6        PEAK FLOW RATE(CFS) =       2.13

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.30   HALFSTREET FLOOD WIDTH(FEET) =   9.43
  FLOW VELOCITY(FEET/SEC.) =  2.33   DEPTH*VELOCITY(FT*FT/SEC.) =   0.70
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    304.00 =     226.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    305.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   175.60  DOWNSTREAM(FEET) =   168.90
  FLOW LENGTH(FEET) =   173.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   5.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.70
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.13
  PIPE TRAVEL TIME(MIN.) =   0.37    Tc(MIN.) =    7.78
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    305.00 =     399.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    305.00 TO NODE    306.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   168.90  DOWNSTREAM(FEET) =   164.50
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   5.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.09
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.13
  PIPE TRAVEL TIME(MIN.) =   0.21    Tc(MIN.) =    7.98
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    306.00 =     499.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    306.00 TO NODE    306.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.651
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .6200
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6200
```

```
  SUBAREA AREA(ACRES) =    0.49   SUBAREA RUNOFF(CFS) =    1.72
  TOTAL AREA(ACRES) =        1.1   TOTAL RUNOFF(CFS) =       3.75
  TC(MIN.) =    7.98

****************************************************************************
  FLOW PROCESS FROM NODE    306.00 TO NODE    306.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  15.38   RAIN INTENSITY(INCH/HOUR) =  3.70
  TOTAL AREA(ACRES) =     1.07   TOTAL RUNOFF(CFS) =      0.83

****************************************************************************
  FLOW PROCESS FROM NODE    307.00 TO NODE    308.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   161.00  DOWNSTREAM(FEET) =   146.20
  FLOW LENGTH(FEET) =   182.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   3.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.05
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.83
  PIPE TRAVEL TIME(MIN.) =   0.38    Tc(MIN.) =   15.76
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    308.00 =     681.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    308.00 TO NODE    309.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   146.20  DOWNSTREAM(FEET) =   144.80
  FLOW LENGTH(FEET) =   194.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   5.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.24
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.83
  PIPE TRAVEL TIME(MIN.) =   1.00    Tc(MIN.) =   16.76
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    309.00 =     875.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    309.00 TO NODE    310.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   144.80  DOWNSTREAM(FEET) =   135.20
  FLOW LENGTH(FEET) =   184.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   3.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.83
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.83
  PIPE TRAVEL TIME(MIN.) =   0.45    Tc(MIN.) =   17.21
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    310.00 =    1059.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    310.00 TO NODE    310.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   17.21
  RAINFALL INTENSITY(INCH/HR) =   3.44
  TOTAL STREAM AREA(ACRES) =     1.07
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.83
```

```
  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        5.21    12.35        4.264          2.85
      2        0.83    17.21        3.443          1.07

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        5.81    12.35       4.264
      2        5.04    17.21       3.443

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       5.81   Tc(MIN.) =   12.35
  TOTAL AREA(ACRES) =        3.9
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    310.00 =    1059.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    310.00 TO NODE    311.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   135.20  DOWNSTREAM(FEET) =   135.00
  FLOW LENGTH(FEET) =    44.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.38
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.81
  PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =   12.52
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    311.00 =    1103.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    311.00 TO NODE    311.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   12.52
  RAINFALL INTENSITY(INCH/HR) =   4.23
  TOTAL STREAM AREA(ACRES) =     3.92
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.81

****************************************************************************
  FLOW PROCESS FROM NODE    311.00 TO NODE    311.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =   7.66   RAIN INTENSITY(INCH/HOUR) =  5.80
  TOTAL AREA(ACRES) =     0.84   TOTAL RUNOFF(CFS) =      3.41

****************************************************************************
  FLOW PROCESS FROM NODE    311.00 TO NODE    311.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.66
  RAINFALL INTENSITY(INCH/HR) =   5.80
  TOTAL STREAM AREA(ACRES) =     0.84
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.41

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
```

```
  NUMBER       (CFS)      (MIN.)    (INCH/HOUR)     (ACRE)
      1         5.81     12.52         4.228           3.92
      2         3.41      7.66         5.803           0.84

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF       Tc       INTENSITY
  NUMBER       (CFS)     (MIN.)    (INCH/HOUR)
      1         7.64      7.66        5.803
      2         8.29     12.52        4.228

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       8.29   Tc(MIN.) =   12.52
  TOTAL AREA(ACRES) =        4.8
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    311.00 =    1103.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        4.8  TC(MIN.) =     12.52
  PEAK FLOW RATE(CFS)   =       8.29
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```