Appendix I2
Drainage Study

DRAINAGE STUDY
for
RENZULLI ESTATES (TM)

APN: 319-020-01-00

Prepared for:

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TABLE OF CONTENTS

CHAPTER 1

EXECUTIVE SUMMARY

CHAPTER 1 - EXECUTIVE SUMMARY

1.1 - Introduction

The proposed 40.56 acre development site is located at 11495 cypress canyon road in the scripps miramar ranch community planning area. The property is presently occupied by an existing single-family residence and several outbuildings. (See the Vicinity Map below).

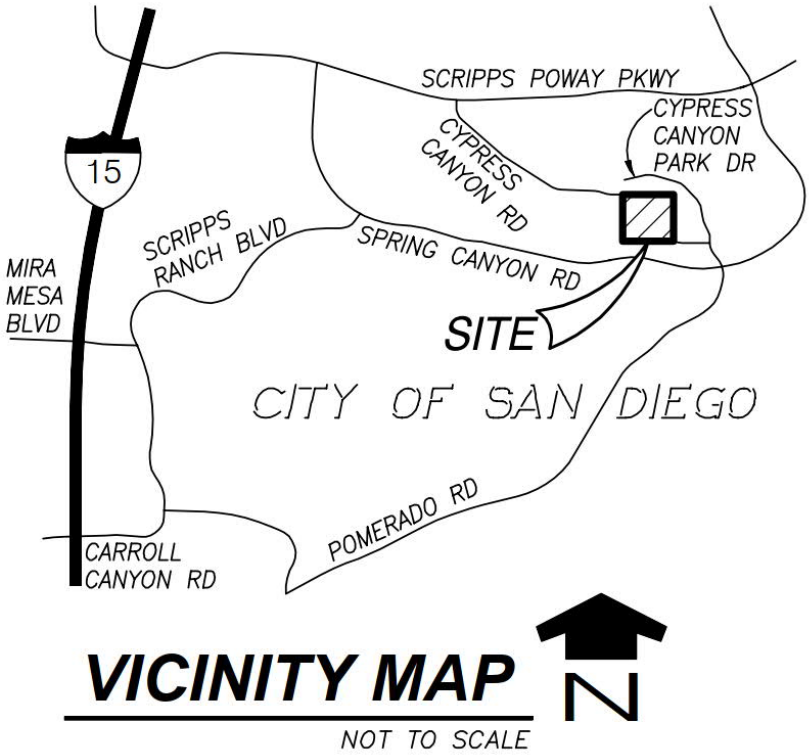
The current development proposal consists of the construction of 100 single-family homes and 12 multi-family affordable income rental units, along with public road and public & private utility improvements and both public & private hoa open spaces. All existing buildings on site will be removed as part of the development proposal. The storm drain and storm water quality control facilities are proposed to meet the City requirements. This study will quantify runoff for the 100-year storm event and assess the detention basin's capacity to mitigate the proposed development's impact. It will also conduct hydraulic analysis for the proposed channel, the steep storm drain, and the impact basin.

The total drainage area of the project is 58.14 acres, the site is receiving run-on from undeveloped slopes on the southern edge; The total project area is 40.56 acres which are constituted by a nearly 1330 ft. x 1330 ft. square. Since the site locates deep inside of a developed area, it is generally surrounded by mature residential neighborhoods in all four directions with complete drainage utilities to which our onsite runoff will ultimately connect and discharge.

Direct impacts to non-wetland waters of the state and wetlands subject to regulation by the RWQCB and CDFW, including direct, permanent impacts ephemeral stream channel and herbaceous wetland habitat, will occur due to project implementation. State law regulates impacts to non-wetland waters of the State. The project is expected to be required to obtain a Waste Discharge Requirement authorization from the RWQCB and a Section 1602 Lake and Streambed Alteration Agreement from CDFW prior to construction. Based on recent federal guidance from the U.S. Environmental Protection Agency (i.e., Navigable Waters Protection Rule), these areas are not expected to fall under the jurisdiction of the U.S. Army Corps of Engineers and an Approved Jurisdictional Determination will be request from U.S. Army Corps of Engineer staff to confirm this assumption.

Treatment of storm water runoff from the site has been addressed in a separate report – ‘The Priority Development Project Storm Water Quality Management Plan (SWQMP) for Renzulli Estates’ dated October, 2023, prepared by Hunsaker & Associates San Diego Inc.

Per City’s drainage criteria, the onsite hydrology calculation will be based on 100-year storm event.



Per County of San Diego drainage criteria, the Modified Rational Method should be used to determine peak design flowrates when the contributing drainage area is less than 1.0 square mile. Since the total watershed area discharging from the site is less than 1.0 square mile, the AES-2015 computer software was used to model the runoff response per the Modified Rational Method. Methodology used for the computation of design rainfall events, runoff coefficients, and rainfall intensity values are consistent with criteria set forth in the "County of San Diego 2003 Hydrology Manual." A more detailed explanation of methodology used for this analysis is listed in Chapter 2 of this report.

A hydraulic analysis is included in Chapter 6 to provide preliminary sizing for the proposed steep pipe located to the north of the development area, along with the necessary energy dissipation feature – an impact basin (or equivalent such as D-41) at the outlet of this pipeline. Additionally, an HEC-RAS analysis has been conducted to calculate parameters including water surface elevation, the extent of the 100-year inundation area, and flow velocity within the proposed channel running south of the project site. This analysis also evaluates the effectiveness of the planned drop structures along the channel.

Detailed calculations such as on-site storm drain hydraulics, inlet calculations, and street capacity calculations will be addressed during final engineering.

The 100-yr P6 and P24 rainfall depth are provided in Chapter 2.

1.2 – Summary of Existing Conditions

The 40.56-acre hydrologic catchment primarily consists of natural grades and hills all covered by native vegetation and shrubs. The site is accessible from Cypress Canyon Rd (Northwest entry), Mundial St (North entry), and Cypress Canyon Rd (Southeast entry). In addition, the Cypress Valley Dr ends against the southwest site boundary from the west with an approx. 6' tall retaining wall growing from an existing natural channel bed (Cypress Canyon) at the southwest boundary. The flow in Cypress Canyon is ephemeral and is partially from our onsite runoff from the north of the canyon, it runs from east to west and drains into an existing storm drain headwall under Cypress Valley Dr.

The overall drainage area is bisected into north and south by a ridgeline running through the center of the site from northwest to southeast. In the south area, the primary portion of the total runoff drains to southeast storm drain headwall at Cypress Valley Dr, in addition to these flows, there is offsite run-on of approximately 19.19 acres; the incoming drainage area is delineated by Spring Canyon Road, Elderwood Lane and Caminito Dulce. Another small drainage area drains to the east entry at Cypress Canyon Rd and continues to gutter flow to the inlet at Cypress Canyon Rd and Cypress Canyon Park Dr intersection. The north drainage area was further divided into 6 sub-catch basins based on the topo and drains separately to the existing inlets and catch basins located at Cypress Canyon Rd, Mundial St, and nearby basins which are all labeled in our drainage maps.

1.3 – Summary of Developed Condition

The project site is constituted by two major planning areas, single-family site (primarily in the center of the project site) and affordable site (East side of the site). The single-family site consists of 100 single-family residential dwellings in the central area. The affordable site has two 6-units apartment building as well as associated parking spaces. The traffic of the site is organized by proposed streets and two entries located at northwest corner, and southeast corner of the site boundary.

The development of the site will include adding the storm drains, curb inlets, cleanouts along the proposed onsite streets, roads and parking spaces to collect and convey the storm runoff to the two proposed detention and water quality control basins located at northwest part of the development area.

The project also proposed bypassing storm drains, ditches to collect and convey the sloped area runoff directly to downstream storm drains around the site. For most undisturbed areas within the site, the natural drainage pattern remains unchanged. However, there is a minor exception where approximately 2 acres of existing slopes, which used to drain southeast towards Cypress Canyon Rd., have been redirected northward through a proposed storm drain. This redirected flow is combined with on-site runoff and directed to a biofiltration/detention basin for treatment and mitigation. It's important to note that this diversion does not impact northward flow, and reducing southeastward flow does not affect existing channels, as the flow in its

current condition reaches the downstream road. Additionally, a channel is being proposed to convey the run-on coming from the existing-undisturbed-slopes on the south west area of the project.

After the majority of the onsite runoff is treated and detained by the biofiltration basins, the outflow will confluence with the bypass storm drain and discharge north into Mundial St. existing 24" storm drain and south into Cypress Canyon which has transformed into an underground storm drain at the end of Cypress Valley Dr. adjacent to our east side boundary.

The last portion of the onsite runoff at northwest corner is generated from a small section of the proposed road connecting with existing Cypress Canyon Rd. The existing drainage system at this entry consists of two concrete ditches on each side of the Cypress Canyon Rd. They accept the runoff from our site and discharge to two storm drain inlets on Cypress Canyon Road and Angelique Street. Two storm drain inlets are proposed at the end of the proposed street to capture the peak flow generated from it; In order to meet the water quality requirements, the water quality control measurements are proposed, i.e., two Filterra Unit structures (or equivalent) will be installed at these two inlets on Cypress Canyon Rd control the water quality. The outflow from Filterra Units then discharges, without detention, into the storm drain on Cypress Canyon Road, where it will be conveyed northerly via Angelique St. storm drain system, similar to existing conditions.

Multiple calculation nodes were defined around our site boundary based on the existing and proposed condition drainage pattern and the hydrology results were labeled at each node for both existing conditions and proposed conditions. These results from PR and EX condition will be compared to ensure no overall impact exists after implementing attenuation measurements.

Pollution Control and Hydromodification Flow Control of the overall site will be addressed in the separate report 'The Priority Development Project Storm Water Quality Management Plan (SWQMP) for Renzulli Estates' dated October, 2023 prepared by Hunsaker & Associates San Diego Inc.

1.4 – Results and Recommendations

Table 1 below summarizes the existing and proposed peak flows from the site. The developed peak flows consider the flow attenuation from the proposed detention basin. Per the San Diego County rainfall isolpluvial maps, the design rainfall depth for 100-year flow event at the project site area is 3.0-inches.

Table 1 - Summary of 100 Year Peak Flows

	Existing Condition			Developed Condition				Flow difference between PR(ATT) and EX
	EX NODEs	AREA (acres)	Q100 (cfs)	PR NODEs	AREA (acres)	Q100 (cfs) Unattenuated	Q100 (cfs) Attenuated**	
	104	3.0	5.69	104	2.90	5.75	5.75	0.06
	200	1.66	3.90	N/A	0	0	0	-3.9
	300	12.72	24.63	300	14.79	37.64	22.33	-3.30
	306	2.84	6.64	306	1.58	3.83	3.83	-2.81
	600	37.1	92.06	600	38.14	88.44	64.13	-27.93
	702	0.59	1.41	702	0.25	1.72	1.72	0.31
	708	0.23	1.45	708	0.48	2.11	2.11	0.66
Total	-	58.14	135.78	-	58.14	139.49	99.87	-36.91

** Design flows used for storm drain design.

Since the proposed development will increase runoff generated by the project site, the project will utilize onsite detention facilities to mitigate the increase in peak flow. As a result, although at node 104, 708 & 702 the proposed condition generates a slightly higer flow than existing condition, in all other nodes the mitigated Q100 of proposed condition all demonstrated flow rate decreases as well as an overall 36.91 cfs flow rate reduction in compare to that of the existing condition. Runoff generated by the project will not exceed pre-project peak flow rates, and therefore the project creats no negative impacts to any adjacent properties.

The runoff velocities will be dissipated by rock riprap at storm drain outfalls. Refer to Chapter 6 for preliminary impact basin and riprap design. A more detailed riprap design (per SDRSD D-40) will be provided with hydraulics during the final engineering stage.

The project has been designed to honor pre-project watershed basins and outfall locations. Considering the limitations which result from subdivision layout and design, minor exchanges in watershed areas occur but are minimized to the maximum extent practicable.

Since the project site is located outside any FEMA floodplain zones, there is no requirement for a Letter of Map Revision (per FEMA MAP #06073C1362G).

For the detention calculation, refer to the calculations in Chapter 5.

The above results show there is no adverse impact from the proposed development after the attenuation because there is reduction in flows.

Peak flow rates listed above were generated based on the criteria set forth in the "*2003 San Diego County Hydrology Manual*" (methodology presented in Chapter 2 of this report). The Modified Rational Method output is located in Chapter 3.

1.5 - References

"San Diego County Hydrology Manual"; Department of Public Works – Flood Control Division; County of San Diego, California; Revised June 2003.

"*The Priority Development Project Storm Water Quality Management Plan (SWQMP) for Renzulli Estates*" dated October, 2023 prepared by Hunsaker & Associates San Diego Inc.

CHAPTER 2

METHODOLOGY & MODEL DEVELOPMENT

CHAPTER 2

METHODOLOGY & MODEL DEVELOPMENT

2.1 – County of San Diego Drainage Design Criteria

2.3 SELECTION OF HYDROLOGIC METHOD AND DESIGN CRITERIA

Design Frequency – The flood frequency for determining the design storm discharge is 50 years for drainage that is upstream of any major roadway and 100 years frequency for all design storms at a major roadway, crossing the major roadway and thereafter. The 50-year storm flows shall be contained within the pipe and not encroach into the travel lane. For the 100-year storm this includes allowing one lane of a four-lane road (four or more lanes) to be used for conveyance without encroaching onto private property outside the dedicated street right-of-way. Natural channels that remain natural within private property are excluded from the right-of-way guideline.

Design Method – The choice of method to determine flows (discharge) shall be based on the size of the watershed area. For an area 0 to approximately l square mile the Rational Method or the Modified Rational Method shall be used. For watershed areas larger than l square mile the NRCS hydrologic method shall be used. Please check with the governing agency for any variations to these guidelines.

SECTION 3
RATIONAL METHOD AND MODIFIED RATIONAL METHOD

3.1 THE RATIONAL METHOD

The Rational Method (RM) is a mathematical formula used to determine the maximum runoff rate from a given rainfall. It has particular application in urban storm drainage, where it is used to estimate peak runoff rates from small urban and rural watersheds for the design of storm drains and small drainage structures. The RM is recommended for analyzing the runoff response from drainage areas up to approximately l square mile in size. It should not be used in instances where there is a junction of independent drainage systems or for drainage areas greater than approximately l square mile in size. In these instances, the Modified Rational Method (MRM) should be used for junctions of independent drainage systems in watersheds up to approximately l square mile in size (see Section 3.4), or the NRCS Hydrologic Method should be used for watersheds greater than approximately l square mile in size (see Section 4).

The RM can be applied using any design storm frequency *(e.g.,* 100-year, 50-year, 10-year, etc.). The local agency determines the design storm frequency that must be used based on the type of project and specific local requirements. A discussion of design storm frequency is provided in Section 2.3 of this manual. A procedure has been developed that converts the 6-hour and 24-hour precipitation isopluvial map data to an Intensity-Duration curve that can be used for the rainfall intensity in the RM formula as shown in Figure 3-1. The RM is applicable to a 6-hour storm duration because the procedure uses Intensity-Duration Design Charts that are based on a 6-hour storm duration.

3.1.1 Rational Method Formula

The RM formula estimates the peak rate of runoff at any location in a watershed as a function of the drainage area (A), runoff coefficient (C), and rainfall intensity (I) for a duration equal to the time of concentration (TC), which is the time required for water to

flow from the most remote point of the basin to the location being analyzed. The RM formula is expressed as follows:

$$Q = C\ I\ A$$

Where: Q = peak discharge, in cubic feet per second (cfs)

C = runoff coefficient, proportion of the rainfall that runs off the surface (no units)

I = average rainfall intensity for a duration equal to the T_c for the area, in inches per hour (Note: If the computed T_c is less than 5 minutes, use 5 minutes for computing the peak discharge, Q)

A = drainage area contributing to the design location, in acres

Combining the units for the expression CIA yields:

$$\left(\frac{1\ \text{acre} \times \text{inch}}{\text{hour}}\right)\left(\frac{43{,}560\ \text{ft}^2}{\text{acre}}\right)\left(\frac{1\ \text{foot}}{12\ \text{inches}}\right)\left(\frac{1\ \text{hour}}{3{,}600\ \text{seconds}}\right) \Rightarrow 1.008\ \text{cfs}$$

For practical purposes the unit conversion coefficient difference of 0.8% can be ignored.

The RM formula is based on the assumption that for constant rainfall intensity, the peak discharge rate at a point will occur when the raindrop that falls at the most upstream point in the tributary drainage basin arrives at the point of interest.

Unlike the MRM (discussed in Section 3.4) or the NRCS hydrologic method (discussed in Section 4), the RM does not create hydrographs and therefore does not add separate subarea hydrographs at collection points. Instead, the RM develops peak discharges in the main line by increasing the T_c as flow travels downstream.

Characteristics of, or assumptions inherent to, the RM are listed below:

- The discharge flow rate resulting from any I is maximum when the I lasts as long as or longer than the T_c.

- The storm frequency of peak discharges is the same as that of I for the given T_c.

- The fraction of rainfall that becomes runoff (or the runoff coefficient, C) is independent of I or precipitation zone number (PZN) condition (PZN Condition is discussed in Section 4.1.2.4).

- The peak rate of runoff is the only information produced by using the RM.

3.1.2 Runoff Coefficient

Table 3-1 lists the estimated runoff coefficients for urban areas. The concepts related to the runoff coefficient were evaluated in a report entitled *Evaluation, Rational Method "C" Values* (Hill, 2002) that was reviewed by the Hydrology Manual Committee. The Report is available at San Diego County Department of Public Works, Flood Control Section and on the San Diego County Department of Public Works web page.

The runoff coefficients are based on land use and soil type. Soil type can be determined from the soil type map provided in Appendix A. An appropriate runoff coefficient (C) for each type of land use in the subarea should be selected from this table and multiplied by the percentage of the total area (A) included in that class. The sum of the products for all land uses is the weighted runoff coefficient (Σ[CA]). Good engineering judgment should be used when applying the values presented in Table 3-1, as adjustments to these values may be appropriate based on site-specific characteristics. In any event, the impervious percentage (% Impervious) as given in the table, for any area, shall govern the selected value for C. The runoff coefficient can also be calculated for an area based on soil type and impervious percentage using the following formula:

$$C = 0.90 \times (\% \text{ Impervious}) + C_p \times (1 - \% \text{ Impervious})$$

Where: C_p = Pervious Coefficient Runoff Value for the soil type (shown in Table 3-1 as Undisturbed Natural Terrain/Permanent Open Space, 0% Impervious). Soil type can be determined from the soil type map provided in Appendix A.

The values in Table 3-1 are typical for most urban areas. However, if the basin contains rural or agricultural land use, parks, golf courses, or other types of nonurban land use that are expected to be permanent, the appropriate value should be selected based upon the soil and cover and approved by the local agency.

3.1.3 Rainfall Intensity

The rainfall intensity (I) is the rainfall in inches per hour (in/hr) for a duration equal to the T_c for a selected storm frequency. Once a particular storm frequency has been selected for design and a T_c calculated for the drainage area, the rainfall intensity can be determined from the Intensity-Duration Design Chart (Figure 3-1). The 6-hour storm rainfall amount (P_6) and the 24-hour storm rainfall amount (P_{24}) for the selected storm frequency are also needed for calculation of I. P_6 and P_{24} can be read from the isopluvial maps provided in Appendix B. An Intensity-Duration Design Chart applicable to all areas within San Diego County is provided as Figure 3-1. Figure 3-2 provides an example of use of the Intensity-Duration Design Chart. Intensity can also be calculated using the following equation:

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

Where: P_6 = adjusted 6-hour storm rainfall amount (see discussion below)
D = duration in minutes (use T_c)

Note: This equation applies only to the 6-hour storm rainfall amount (i.e., P_6 cannot be changed to P_{24} to calculate a 24-hour intensity using this equation).

The Intensity-Duration Design Chart and the equation are for the 6-hour storm rainfall amount. In general, P_6 for the selected frequency should be between 45% and 65% of P_{24} for the selected frequency. If P_6 is not within 45% to 65% of P_{24}, P_6 should be increased or decreased as necessary to meet this criteria. The isopluvial lines are based on precipitation gauge data. At the time that the isopluvial lines were created, the majority of precipitation gauges in San Diego County were read daily, and these readings yielded 24-hour precipitation data. Some 6-hour data were available from the few recording gauges distributed throughout the County at that time; however, some 6-hour data were extrapolated. Therefore, the 24-hour precipitation data for San Diego County are considered to be more reliable.

3.1.4 Time of Concentration

The Time of Concentration (T_c) is the time required for runoff to flow from the most remote part of the drainage area to the point of interest. The T_c is composed of two components: initial time of concentration (T_i) and travel time (T_t). Methods of computation for T_i and T_t are discussed below. The T_i is the time required for runoff to travel across the surface of the most remote subarea in the study, or "initial subarea." Guidelines for designating the initial subarea are provided within the discussion of computation of T_i. The T_t is the time required for the runoff to flow in a watercourse (e.g., swale, channel, gutter, pipe) or series of watercourses from the initial subarea to the point of interest. For the RM, the T_c at any point within the drainage area is given by:

$$T_c = T_i + T_t$$

Methods of calculation differ for natural watersheds (nonurbanized) and for urban drainage systems. When analyzing storm drain systems, the designer must consider the possibility that an existing natural watershed may become urbanized during the useful life of the storm drain system. Future land uses must be used for T_c and runoff calculations, and can be determined from the local Community General Plan.

3.1.4.1 Initial Time of Concentration

The initial time of concentration is typically based on sheet flow at the upstream end of a drainage basin. The Overland Time of Flow (Figure 3-3) is approximated by an equation developed by the Federal Aviation Agency (FAA) for analyzing flow on runaways (FAA, 1970). The usual runway configuration consists of a crown, like most freeways, with sloping pavement that directs flow to either side of the runway. This type of flow is uniform in the direction perpendicular to the velocity and is very shallow. Since these depths are ¼ of an inch (more or less) in magnitude, the relative roughness is high. Some higher relative roughness values for overland flow are presented in Table 3.5 of the *HEC-1 Flood Hydrograph Package User's Manual* (USACE, 1990).

The sheet flow that is predicted by the FAA equation is limited to conditions that are similar to runway topography. Some considerations that limit the extent to which the FAA equation applies are identified below:

- Urban Areas – This "runway type" runoff includes:
  1) Flat roofs, sloping at 1% ±
  2) Parking lots at the extreme upstream drainage basin boundary (at the "ridge" of a catchment area).
     Even a parking lot is limited in the amounts of sheet flow. Parked or moving vehicles would "break-up" the sheet flow, concentrating runoff into streams that are not characteristic of sheet flow.
  3) Driveways are constructed at the upstream end of catchment areas in some developments. However, if flow from a roof is directed to a driveway through a downspout or other conveyance mechanism, flow would be concentrated.
  4) Flat slopes are prone to meandering flow that tends to be disrupted by minor irregularities and obstructions. Maximum Overland Flow lengths are shorter for the flatter slopes (see Table 3-2).

- Rural or Natural Areas - The FAA equation is applicable to these conditions since (.5% to 10%) slopes that are uniform in width of flow have slow velocities consistent with the equation. Irregularities in terrain limit the length of application.
  1) Most hills and ridge lines have a relatively flat area near the drainage divide. However, with flat slopes of .5% ±, minor irregularities would cause flow to concentrate into streams.
  2) Parks, lawns and other vegetated areas would have slow velocities that are consistent with the FAA Equation.

The concepts related to the initial time of concentration were evaluated in a report entitled *Initial Time of Concentration, Analysis of Parameters* (Hill, 2002) that was reviewed by the Hydrology Manual Committee. The Report is available at San Diego County Department of Public Works, Flood Control Section and on the San Diego County Department of Public Works web page.

3.1.4.1A Planning Considerations

The purpose of most hydrology studies is to develop flood flow values for areas that are not at the upstream end of the basin. Another example is the Master Plan, which is usually completed before the actual detailed design of lots, streets, etc. are accomplished. In these situations it is necessary that the initial time of concentration be determined without detailed information about flow patterns.

To provide guidance for the initial time of concentration design parameters, Table 3-2 includes the Land Use Elements and other variables related to the Time of Concentration. The table development included a review of the typical "layout" of the different Land Use Elements and related flow patterns and consideration of the extent of the sheet flow regimen, the effect of ponding, the significance to the drainage basin, downstream effects, etc.

3.1.4.1B Computation Criteria

(a) Developed Drainage Areas With Overland Flow - T_i may be obtained directly from the chart, "Rational Formula – Overland Time of Flow Nomograph," shown in Figure 3-3 or from Table 3-2. This chart is based on the Federal Aviation Agency (FAA) equation (FAA, 1970). For the short rain durations (<15 minutes) involved, intensities are high but the depth of flooding is limited and much of the runoff is stored temporarily in the overland flow and in shallow ponded areas. In developed areas, overland flow is limited to lengths given in Table 3-2. Beyond these distances, flow tends to become concentrated into streets, gutters, swales, ditches, etc.

(b) Natural Or Rural Watersheds – These areas usually have an initial subarea at the upstream end with sheet flow. The sheet flow length is limited to 50 to 100 feet as specified in Table 3-2. The Overland Time of Flow Nomograph, Figure 3-3, can be used to obtain T_i. The initial time of concentration can excessively affect the magnitude of flow further downstream in the drainage basin. For instance, variations in the initial time of concentration for an initial subarea of one acre can change the flow further downstream where the area is 400 acres by 100%. Therefore, the initial time of concentration is limited (see Table 3-2).

The Rational Method procedure included in the original Hydrology Manual (1971) and Design and Procedure Manual (1968) included a 10 minute value to be added to the initial time of concentration developed through the Kirpich Formula (see Figure 3-4) for a natural watershed. That procedure is superceded by the procedure above to use Table 3-2 or Figure 3-3 to determine T_i for the appropriate sheet flow length of the initial subarea. The values for natural watersheds given in Table 3-2 vary from 13 to 7 minutes, depending on slope. If the total length of the initial subarea is greater than the maximum length allowable based on Table 3-2, add the travel time based on the Kirpich formula for the remaining length of the initial subarea.

3.1.4.2 Travel Time

The T_t is the time required for the runoff to flow in a watercourse (e.g., swale, channel, gutter, pipe) or series of watercourses from the initial subarea to the point of interest. The T_t is computed by dividing the length of the flow path by the computed flow velocity. Since the velocity normally changes as a result of each change in flow rate or slope, such as at an inlet or grade break, the total T_t must be computed as the sum of the T_t's for each section of the flow path. Use Figure 3-6 to estimate time of travel for street gutter flow. Velocity in a channel can be estimated by using the nomograph shown in Figure 3-7 (Manning's Equation Nomograph).

(a) Natural Watersheds – This includes rural, ranch, and agricultural areas with natural channels. Obtain T_t directly from the Kirpich nomograph in Figure 3-4 or from the equation. This nomograph requires values for length and change in elevation along the effective slope line for the subarea. See Figure 3-5 for a representation of the effective slope line.

This nomograph is based on the Kirpich formula, which was developed with data from agricultural watersheds ranging from 1.25 to 112 acres in area, 350 to 4,000 feet in length, and 2.7 to 8.8% slope (Kirpich, 1940). A maximum length of 4,000 feet should be used for the subarea length. Typically, as the flow length increases, the depth of flow will increase, and therefore it is considered a concentration of flow at points beyond lengths listed in Figure 3-2. However, because the Kirpich formula has been shown to be applicable for watersheds up to 4,000 feet in length (Kirpich, 1940), a subarea may be designated with a length up to 4,000 feet provided the topography and slope of the natural channel are generally uniform.

Justification needs to be included with this calculation showing that the watershed will remain natural forever. Examples include areas located in the Multiple Species Conservation Plan (MSCP), areas designated as open space or rural in a community's General Plan, and Cleveland National Forest.

(b) Urban Watersheds - Flow through a closed conduit where no additional flow can enter the system during the travel, length, velocity and T_t are determined using the peak flow in the conduit. In cases where the conduit is not closed and additional flow from a contributing subarea is added to the total flow during travel (e.g., street flow in a gutter), calculation of velocity and T_t is performed using an assumed average flow based on the total area (including upstream subareas) contributing to the point of interest. The Manning equation is usually used to determine velocity. Discharges for small watersheds typically range from 2 to 3 cfs per acre, depending on land use, drainage area, and slope and rainfall intensity.

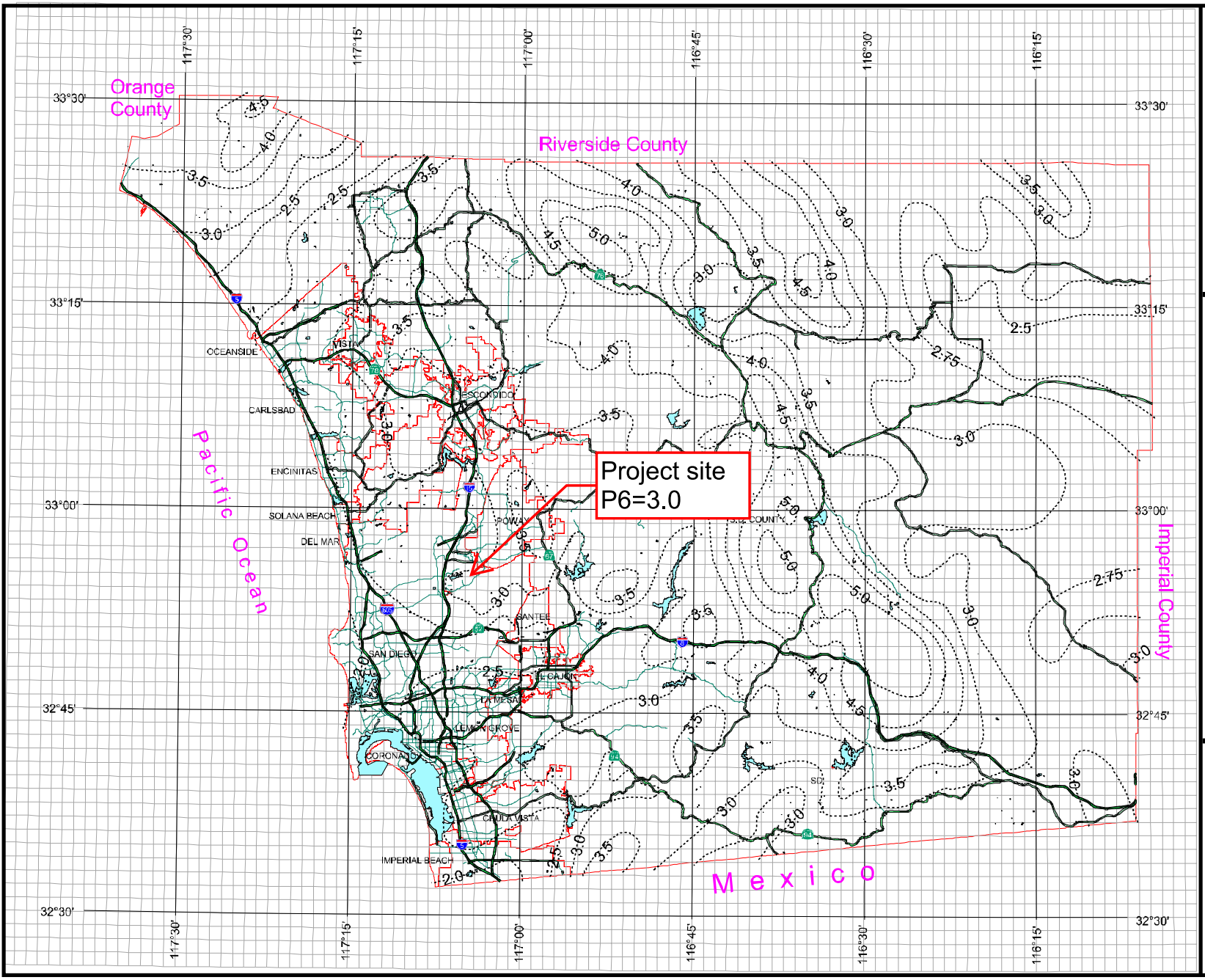
Note: The MRM should be used to calculate the peak discharge when there is a junction from independent subareas into the drainage system.

CHAPTER 2

METHODOLOGY & MODEL DEVELOPMENT

2.2 – Design Rainfall Determination

100-Year, 6-Hour Rainfall Isopluvial Map



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
We Have San Diego Covered!

N
W E
S

3 0 3 Miles

CHAPTER 2

METHODOLOGY & MODEL DEVELOPMENT

2.2 – Design Rainfall Determination

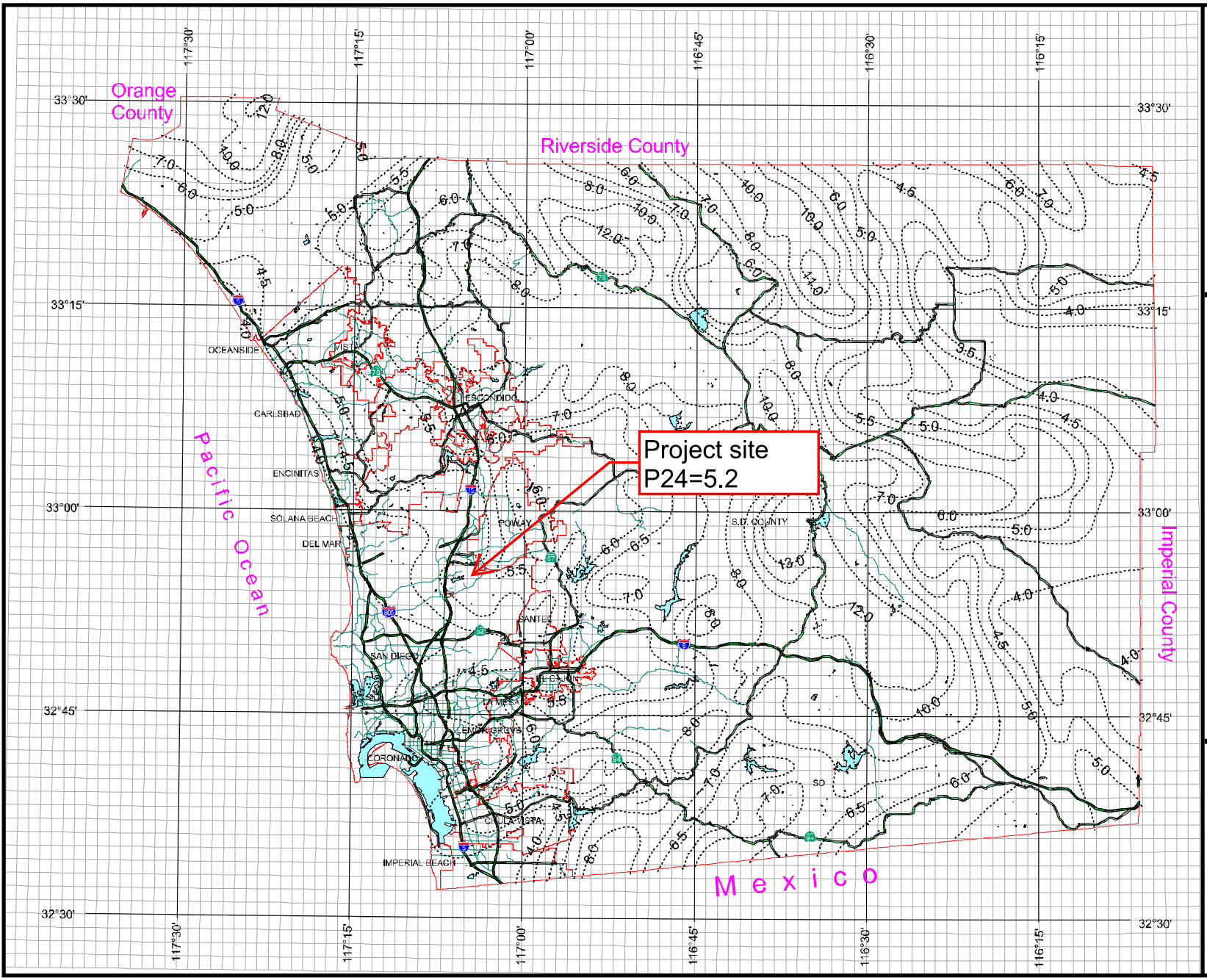
100-Year, 24-Hour Rainfall Isopluvial Map

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)



DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

N
W E
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3 0 3 Miles

CHAPTER 2

METHODOLOGY & MODEL DEVELOPMENT

2.3 – Runoff Coefficient Determination

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

For the gradings
For the Single Family site
For the Affordable Site
For the roads

CHAPTER 2

METHODOLOGY & MODEL DEVELOPMENT

2.4 – Rainfall Intensity Determination

Maximum Overland Flow Length & Initial Time of Concentration Table

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

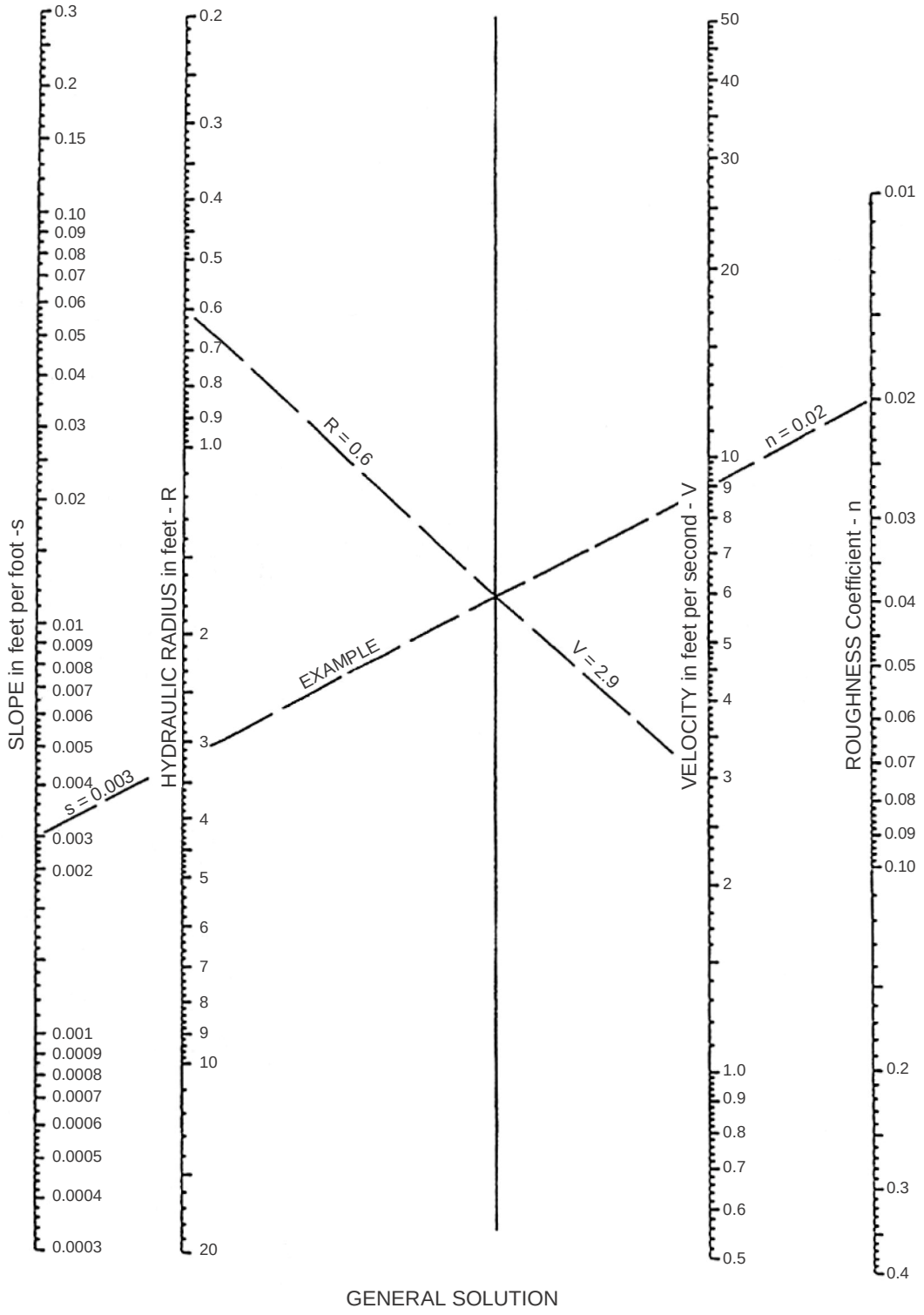
CHAPTER 2

METHODOLOGY & MODEL DEVELOPMENT

2.4 – Rainfall Intensity Determination

Manning's Equation Nomograph

EQUATION: $V = \frac{1.49}{n} R^{2/3} s^{1/2}$



GENERAL SOLUTION

SOURCE: USDOT, FHWA, HDS-3 (1961)

FIGURE 3-7

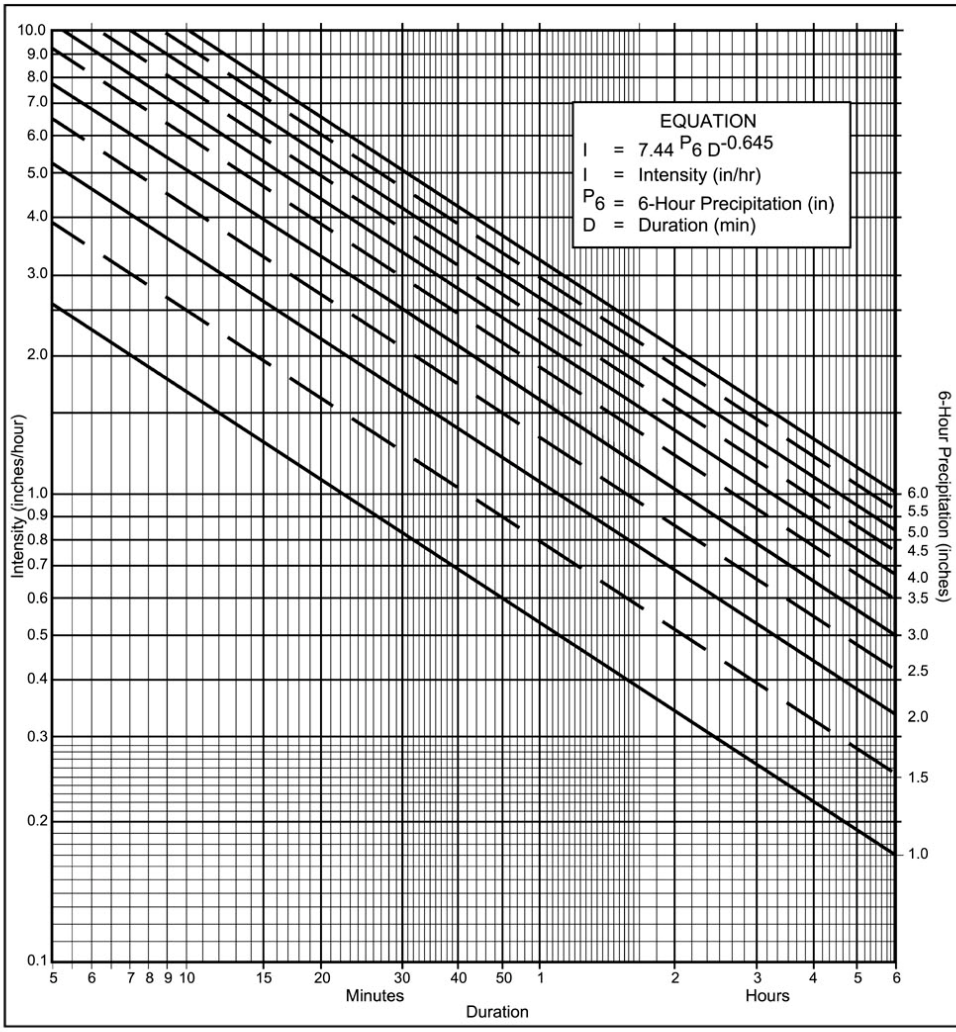
Manning's Equation Nomograph

CHAPTER 2

METHODOLOGY & MODEL DEVELOPMENT

2.4 – Rainfall Intensity Determination

Intensity-Duration Design Chart



Directions for Application:

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

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

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

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

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

Application Form:

(a) Selected frequency 100 year

(b) P_6 = 3.0 in., P_{24} = 5.2, $\frac{P_6}{P_{24}}$ = 58 %(2)

(c) Adjusted P_6(2) = 3.0 in.

(d) t_x = _____ min.

(e) I = _____ in./hr.

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

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

Intensity-Duration Design Chart - Template

FIGURE 3-1

CHAPTER 2

METHODOLOGY & MODEL DEVELOPMENT

2.5 - Rational Method Model Development Summary

Rational Method Hydrologic Analysis

Computer Software Package – AES-2015

Design Storm - 100 - Year Return Interval

Land Use – Single Family, and High Density Residential (HDR) in Developed Areas

Soil Type – From the soil map, group D is discovered from the site. Group D soils have very slow infiltration rates when thoroughly wetted. Consisting chiefly of clay soils with a high swelling potential, soils with a high permanent water table, soils with claypan or clay layer at or near the surface, and shallow soils over nearly impervious materials, Group D soils have a very slow rate of water transmission.

Runoff Coefficient – Based on the proposed site design, the overall planned site imperviousness ranges from approximately 45% to 68% (please refer to the DMA map in the PDP SWQMP for details). According to County Table 3.1, runoff coefficients have been determined as follows (more conservative runoff factors were determined):

Onsite graded pervious slopes: 0.35
Single-family site: 0.63
Affordable site: 0.79
Roads: 0.87

Method of Analysis – The Rational Method is the most widely used hydrologic model for estimating peak runoff rates. Applied to small urban and semi-urban areas with drainage areas less than 1.0 square mile, the Rational Method relates storm rainfall intensity, a runoff coefficient, and drainage area to peak runoff rate. This relationship is expressed by the equation:

Q = CIA, where:

Q = The peak runoff rate in cubic feet per second at the point of analysis.

C = A runoff coefficient representing the area - averaged ratio of runoff to rainfall intensity.

I = The time-averaged rainfall intensity in inches per hour corresponding to the time of concentration.

A = The drainage basin area in acres.

To perform a node-link study, the total watershed area is divided into subareas which discharge at designated nodes.

The procedure for the subarea summation model is as follows:

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

(2) Estimate an initial T_c by using the appropriate nomograph or overland flow velocity estimation.

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

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

The nodes are joined together by links, which may be street gutter flows, drainage swales, drainage ditches, pipe flow, or various channel flows. The AES-2010 computer subarea menu is as follows:

SUBAREA HYDROLOGIC PROCESS

1. Confluence analysis at node.
2. Initial subarea analysis (including time of concentration calculation).
3. Pipeflow travel time (computer estimated).
4. Pipeflow travel time (user specified).
5. Trapezoidal channel travel time.
6. Street flow analysis through subarea.
7. User - specified information at node.
8. Addition of subarea runoff to main line.
9. V-gutter flow through area.
10. Copy main stream data to memory bank
11. Confluence main stream data with a memory bank
12. Clear a memory bank

At the confluence point of two or more basins, the following procedure is used to combine peak flow rates to account for differences in the basin's times of concentration. This adjustment is based on the assumption that each basin's hydrographs are triangular in shape.

(1). If the collection streams have the same times of concentration, then the Q values are directly summed,

$Q_p = Q_a + Q_b$; $T_p = T_a = T_b$

(2). If the collection streams have different times of concentration, the smaller of the tributary Q values may be adjusted as follows:

(i). The most frequent case is where the collection stream with the longer time of concentration has the larger Q. The smaller Q value is adjusted by the ratio of rainfall intensities.

$Q_p = Q_a + Q_b \ (I_a/I_b)$; $T_p = T_a$

(ii). In some cases, the collection stream with the shorter time of concentration has the larger Q. Then the smaller Q is adjusted by a ratio of the T values.

$Q_p = Q_b + Q_a \ (T_b/T_a)$; $T_p = T_b$

CHAPTER 2

METHODOLOGY & MODEL DEVELOPMENT

2.6 – Hydraulic Design Criteria

2.6 Hydraulic Analysis Criteria

The hydrology calculations discussed in chapter 2 provide peak flowrates which are entered into a separate program called Hydraflow Storm Sewer to perform hydraulic analysis and design of storm drain lines.

Hydraulic analysis was performed for the pipe on node 242 to node 300 due to its steepness to check velocity at the outfall location and provide adequate energy dissipation.

Please note that: For outfall on node 242 two conditions have been encountered.

1-For the determination of HGL (Hydraulic Grade Line) elevations, the initial water surface elevation (tailwater) has been set at the crown.

2-For energy dissipation calculations (impact basin design), a 'Free Outfall' condition was assumed."

CHAPTER 2

METHODOLOGY & MODEL DEVELOPMENT

2.7 – Detention Design Criteria

2.7 Detention Analysis Criteria

To ensure effective flood control, we have addressed the increased peak flow rates at the site's outfall location by designing two proposed basins. These basins' mitigation processes were modeled using RickRatHydro as input for EPA SWMM 5.1.

The hydrology calculations discussed in Chapter 2 have provided us with peak flow rates, time of concentration, watershed area, average runoff factor, and 100-Year-6-Hour rainfall depth. These parameters were input into a separate program called RickRatHydro, which generated inflow hydrographs for each basin. Subsequently, these hydrographs were imported into EPA SWMM 5.1 and routed through the proposed basins using an iterative approach that involved outlet structures.

This process continued until the resulting flow rate at the outfall matched or was less than that of the existing conditions, and the water surface elevation remained at least 1 foot below the top of the basin. The proposed biofiltration systems BF-1-1 and BF-1-2 are designed to serve multiple purposes, including pollutant control, hydromodification control, and detention of the 100-year storm event flows.

The detention basin routing calculations adhere to the San Diego County guidelines for conjunctive use facilities dated January 2020. It's important to note that the storage volume for flood control is separate from the volume provided for pollutant control, and volume infiltrated is not considered as part of the volume for flood control."

CHAPTER 3

EXISTING AND PROPOSED CONDITION RATIONAL METHOD HYDROLOGIC 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 1982-2015 Advanced Engineering Software (aes)
              Ver. 22.0 Release Date: 07/01/2015  License ID 1239

                              Analysis prepared by:



 ************************* DESCRIPTION OF STUDY *************************
* RENZULLI ESTATES EXISTING CONDITION HYD                                *
*                                                                        *
*                                                                        *
 ************************************************************************

  FILE NAME: R:\1207\HYD\DR\TM\CALCS\AES\100EX.DAT
  TIME/DATE OF STUDY: 14:09 09/14/2023
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.000
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  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   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
  2   17.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  7.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

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

```
  FLOW PROCESS FROM NODE    100.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    70.46
  UPSTREAM ELEVATION(FEET) =    980.00
  DOWNSTREAM ELEVATION(FEET) =    970.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.260
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.650
  SUBAREA RUNOFF(CFS) =      0.27
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.27

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    104.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    970.00  DOWNSTREAM(FEET) =    720.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   877.00   CHANNEL SLOPE =  0.2851
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   1.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.418
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.14
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.93
  AVERAGE FLOW DEPTH(FEET) =   0.08   TRAVEL TIME(MIN.) =   3.72
  Tc(MIN.) =    8.98
  SUBAREA AREA(ACRES) =     2.90       SUBAREA RUNOFF(CFS) =    5.50
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        3.0         PEAK FLOW RATE(CFS) =       5.69

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.11   FLOW VELOCITY(FEET/SEC.) =   5.13
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =     947.46 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    107.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    94.61
  UPSTREAM ELEVATION(FEET) =    980.00
  DOWNSTREAM ELEVATION(FEET) =    960.00
```

```
  ELEVATION DIFFERENCE(FEET) =     20.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.095
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.956
  SUBAREA RUNOFF(CFS) =      0.24
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.24

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    300.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    960.00  DOWNSTREAM(FEET) =    755.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   987.48   CHANNEL SLOPE =  0.2071
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   1.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      12.63
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.34
  AVERAGE FLOW DEPTH(FEET) =   0.20   TRAVEL TIME(MIN.) =   2.60
  Tc(MIN.) =    8.69
  SUBAREA AREA(ACRES) =    12.62       SUBAREA RUNOFF(CFS) =   24.44
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       12.7         PEAK FLOW RATE(CFS) =      24.63

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.29   FLOW VELOCITY(FEET/SEC.) =   8.17
  LONGEST FLOWPATH FROM NODE    106.00 TO NODE    300.00 =    1082.09 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    304.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    62.59
  UPSTREAM ELEVATION(FEET) =    906.00
  DOWNSTREAM ELEVATION(FEET) =    886.00
  ELEVATION DIFFERENCE(FEET) =     20.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.958
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.28
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.28

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

```
  FLOW PROCESS FROM NODE    304.00 TO NODE    306.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    886.00  DOWNSTREAM(FEET) =    770.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   395.23   CHANNEL SLOPE =  0.2935
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   1.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.678
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.51
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.29
  AVERAGE FLOW DEPTH(FEET) =   0.08   TRAVEL TIME(MIN.) =   1.54
  Tc(MIN.) =    6.49
  SUBAREA AREA(ACRES) =     2.74       SUBAREA RUNOFF(CFS) =    6.40
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        2.8         PEAK FLOW RATE(CFS) =       6.64

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   5.50
  LONGEST FLOWPATH FROM NODE    302.00 TO NODE    306.00 =     457.82 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    708.00 TO NODE    708.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   245.00
  UPSTREAM ELEVATION(FEET) =    880.00
  DOWNSTREAM ELEVATION(FEET) =    848.00
  ELEVATION DIFFERENCE(FEET) =     32.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =   100.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.833
  SUBAREA RUNOFF(CFS) =      0.55
  TOTAL AREA(ACRES) =      0.23   TOTAL RUNOFF(CFS) =      0.55

****************************************************************************
  FLOW PROCESS FROM NODE    702.00 TO NODE    702.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
```

```
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   311.00
  UPSTREAM ELEVATION(FEET) =    901.00
  DOWNSTREAM ELEVATION(FEET) =    848.00
  ELEVATION DIFFERENCE(FEET) =     53.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =   100.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.833
  SUBAREA RUNOFF(CFS) =      1.41
  TOTAL AREA(ACRES) =      0.59   TOTAL RUNOFF(CFS) =      1.41

****************************************************************************
  FLOW PROCESS FROM NODE    504.00 TO NODE    506.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    52.00
  UPSTREAM ELEVATION(FEET) =    916.00
  DOWNSTREAM ELEVATION(FEET) =    910.00
  ELEVATION DIFFERENCE(FEET) =      6.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.519
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.30
  TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.30

****************************************************************************
  FLOW PROCESS FROM NODE    506.00 TO NODE    600.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    910.00  DOWNSTREAM(FEET) =    788.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   608.65   CHANNEL SLOPE =  0.2004
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   1.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.494
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.41
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.48
  AVERAGE FLOW DEPTH(FEET) =   0.12   TRAVEL TIME(MIN.) =   2.26
  Tc(MIN.) =    6.78
  SUBAREA AREA(ACRES) =     4.43       SUBAREA RUNOFF(CFS) =   10.07
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        4.5         PEAK FLOW RATE(CFS) =      10.32
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.17   FLOW VELOCITY(FEET/SEC.) =   5.88
  LONGEST FLOWPATH FROM NODE    504.00 TO NODE    600.00 =     660.65 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    600.00 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.) =    6.78
  RAINFALL INTENSITY(INCH/HR) =   6.49
  TOTAL STREAM AREA(ACRES) =     4.54
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     10.32

****************************************************************************
  FLOW PROCESS FROM NODE    508.00 TO NODE    510.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    73.76
  UPSTREAM ELEVATION(FEET) =    884.00
  DOWNSTREAM ELEVATION(FEET) =    850.00
  ELEVATION DIFFERENCE(FEET) =     34.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.382
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.538
  SUBAREA RUNOFF(CFS) =      0.29
  TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.29

****************************************************************************
  FLOW PROCESS FROM NODE    510.00 TO NODE    600.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    850.00  DOWNSTREAM(FEET) =    788.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   169.36   CHANNEL SLOPE =  0.3661
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   1.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.330
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      40.79
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  11.86
  AVERAGE FLOW DEPTH(FEET) =   0.33   TRAVEL TIME(MIN.) =   0.24
  Tc(MIN.) =    5.62
```

```
  SUBAREA AREA(ACRES) =    31.56       SUBAREA RUNOFF(CFS) =   80.97
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       31.7         PEAK FLOW RATE(CFS) =      81.25

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.50   FLOW VELOCITY(FEET/SEC.) =  15.45
  LONGEST FLOWPATH FROM NODE    508.00 TO NODE    600.00 =     243.12 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    512.00 TO NODE    600.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.330
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.88   SUBAREA RUNOFF(CFS) =    2.26
  TOTAL AREA(ACRES) =       32.5   TOTAL RUNOFF(CFS) =      83.51
  TC(MIN.) =    5.62

****************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    600.00 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.) =    5.62
  RAINFALL INTENSITY(INCH/HR) =   7.33
  TOTAL STREAM AREA(ACRES) =    32.55
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     83.51

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       10.32     6.78        6.494          4.54
      2       83.51     5.62        7.330         32.55

  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       92.06     5.62       7.330
      2       84.30     6.78       6.494

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
```

```
  PEAK FLOW RATE(CFS) =      92.06   Tc(MIN.) =    5.62
  TOTAL AREA(ACRES) =       37.1
  LONGEST FLOWPATH FROM NODE    504.00 TO NODE    600.00 =     660.65 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    112.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    47.21
  UPSTREAM ELEVATION(FEET) =    980.00
  DOWNSTREAM ELEVATION(FEET) =    970.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.306
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.28
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.28

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    200.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    970.00  DOWNSTREAM(FEET) =    799.63
  CHANNEL LENGTH THRU SUBAREA(FEET) =   480.00   CHANNEL SLOPE =  0.3549
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   1.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.709
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.11
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.73
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   2.14
  Tc(MIN.) =    6.45
  SUBAREA AREA(ACRES) =     1.56       SUBAREA RUNOFF(CFS) =    3.66
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        1.7         PEAK FLOW RATE(CFS) =       3.90

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.08   FLOW VELOCITY(FEET/SEC.) =   4.77
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    200.00 =     527.21 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.7  TC(MIN.) =      6.45
  PEAK FLOW RATE(CFS)   =       3.90
============================================================================
```

==========

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 1982-2015 Advanced Engineering Software (aes)
              Ver. 22.0 Release Date: 07/01/2015  License ID 1239

                              Analysis prepared by:



 ************************* DESCRIPTION OF STUDY *************************
* RENZULLI ESTATES PROPOSED CONDITION HYD                                *
* 100 YEAR UNATTENUATED                                                  *
*                                                                        *
 **************************************************************************

  FILE NAME: R:\1207\HYD\DR\TM\CALCS\AES\100PR.DAT
  TIME/DATE OF STUDY: 10:04 10/06/2023
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.000
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  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   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
  2   17.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  7.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

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

```
 FLOW PROCESS FROM NODE    110.00 TO NODE    112.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 USER-SPECIFIED RUNOFF COEFFICIENT = .3500
 S.C.S. CURVE NUMBER (AMC II) =  88
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    97.01
 UPSTREAM ELEVATION(FEET) =    980.00
 DOWNSTREAM ELEVATION(FEET) =    972.00
 ELEVATION DIFFERENCE(FEET) =      8.00
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.582
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.620
 SUBAREA RUNOFF(CFS) =      0.23
 TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.23

****************************************************************************
 FLOW PROCESS FROM NODE    112.00 TO NODE    114.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    972.00  DOWNSTREAM(FEET) =    893.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   618.66   CHANNEL SLOPE =  0.1277
 CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
 MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   2.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.378
 USER-SPECIFIED RUNOFF COEFFICIENT = .3500
 S.C.S. CURVE NUMBER (AMC II) =  88
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.58
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.12
 AVERAGE FLOW DEPTH(FEET) =   0.16   TRAVEL TIME(MIN.) =   2.50
 Tc(MIN.) =    9.08
 SUBAREA AREA(ACRES) =     1.42       SUBAREA RUNOFF(CFS) =    2.67
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
 TOTAL AREA(ACRES) =        1.5         PEAK FLOW RATE(CFS) =       2.86

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.23   FLOW VELOCITY(FEET/SEC.) =   5.01
 LONGEST FLOWPATH FROM NODE    110.00 TO NODE    114.00 =     715.67 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    114.00 TO NODE    200.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   889.00  DOWNSTREAM(FEET) =   887.04
 FLOW LENGTH(FEET) =    36.73   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   8.87
```

```
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.86
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =    9.15
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    200.00 =     752.40 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    206.00 TO NODE    200.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.352
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3910
  SUBAREA AREA(ACRES) =    0.13   SUBAREA RUNOFF(CFS) =    0.61
  TOTAL AREA(ACRES) =        1.6   TOTAL RUNOFF(CFS) =       3.45
  TC(MIN.) =    9.15

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    204.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   887.04  DOWNSTREAM(FEET) =   880.50
  FLOW LENGTH(FEET) =    29.52   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.51
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.45
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    9.18
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    204.00 =     781.92 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    208.00 TO NODE    204.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.340
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4309
  SUBAREA AREA(ACRES) =    0.15   SUBAREA RUNOFF(CFS) =    0.70
  TOTAL AREA(ACRES) =        1.8   TOTAL RUNOFF(CFS) =       4.14
  TC(MIN.) =    9.18

****************************************************************************
  FLOW PROCESS FROM NODE    204.00 TO NODE    216.00 IS CODE =  31
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   880.50  DOWNSTREAM(FEET) =   871.50
  FLOW LENGTH(FEET) =   842.14   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.51
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.14
  PIPE TRAVEL TIME(MIN.) =   2.55    Tc(MIN.) =   11.73
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    216.00 =    1624.06 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    216.00 TO NODE    216.00 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.) =   11.73
  RAINFALL INTENSITY(INCH/HR) =   4.56
  TOTAL STREAM AREA(ACRES) =     1.80
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.14

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    212.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   120.12
  UPSTREAM ELEVATION(FEET) =    897.40
  DOWNSTREAM ELEVATION(FEET) =    896.00
  ELEVATION DIFFERENCE(FEET) =      1.40
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.089
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    61.66
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.76
  TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.76

****************************************************************************
  FLOW PROCESS FROM NODE    212.00 TO NODE    214.00 IS CODE =  62
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
================================================================================
  UPSTREAM ELEVATION(FEET) =  896.00  DOWNSTREAM ELEVATION(FEET) =  886.81
  STREET LENGTH(FEET) =   481.04   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 17.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.40
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.32
    HALFSTREET FLOOD WIDTH(FEET) =    9.93
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.08
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.00
  STREET FLOW TRAVEL TIME(MIN.) =   2.61   Tc(MIN.) =    5.70
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.267
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  SUBAREA AREA(ACRES) =    0.83      SUBAREA RUNOFF(CFS) =    5.25
  TOTAL AREA(ACRES) =        0.9        PEAK FLOW RATE(CFS) =       5.94

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.38   HALFSTREET FLOOD WIDTH(FEET) =  12.51
  FLOW VELOCITY(FEET/SEC.) =  3.53   DEPTH*VELOCITY(FT*FT/SEC.) =   1.33
  LONGEST FLOWPATH FROM NODE    210.00 TO NODE    214.00 =     601.16 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    214.00 TO NODE    216.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   882.80  DOWNSTREAM(FEET) =   877.26
  FLOW LENGTH(FEET) =    26.50   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.80
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.94
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    5.72
  LONGEST FLOWPATH FROM NODE    210.00 TO NODE    216.00 =     627.66 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    218.00 TO NODE    218.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.246
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.12   SUBAREA RUNOFF(CFS) =    0.76
  TOTAL AREA(ACRES) =        1.1   TOTAL RUNOFF(CFS) =       6.68
  TC(MIN.) =    5.72

****************************************************************************
  FLOW PROCESS FROM NODE    218.00 TO NODE    216.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   878.50  DOWNSTREAM(FEET) =   877.26
  FLOW LENGTH(FEET) =     4.50   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  20.33
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.68
  PIPE TRAVEL TIME(MIN.) =   0.00    Tc(MIN.) =    5.72
  LONGEST FLOWPATH FROM NODE    210.00 TO NODE    216.00 =     632.16 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    216.00 TO NODE    216.00 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.) =    5.72
  RAINFALL INTENSITY(INCH/HR) =   7.24
  TOTAL STREAM AREA(ACRES) =     1.06
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.68

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        4.14    11.73        4.560          1.80
      2        6.68     5.72        7.243          1.06

  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        8.70     5.72       7.243
      2        8.35    11.73       4.560

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       8.70   Tc(MIN.) =    5.72
  TOTAL AREA(ACRES) =        2.9
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    216.00 =    1624.06 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    216.00 TO NODE    222.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   877.26  DOWNSTREAM(FEET) =   876.60
  FLOW LENGTH(FEET) =    60.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.62
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.70
  PIPE TRAVEL TIME(MIN.) =   0.15    Tc(MIN.) =    5.88
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    222.00 =    1684.06 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    222.00 TO NODE    222.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    107.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    78.22
  UPSTREAM ELEVATION(FEET) =    980.00
  DOWNSTREAM ELEVATION(FEET) =    964.00
  ELEVATION DIFFERENCE(FEET) =     16.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.542
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.396
  SUBAREA RUNOFF(CFS) =      0.26
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.26
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    108.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    964.00  DOWNSTREAM(FEET) =    891.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   626.86   CHANNEL SLOPE =  0.1165
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.705
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.31
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.80
  AVERAGE FLOW DEPTH(FEET) =   0.15   TRAVEL TIME(MIN.) =   2.75
  Tc(MIN.) =    8.29
  SUBAREA AREA(ACRES) =     1.04       SUBAREA RUNOFF(CFS) =    2.08
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        1.1         PEAK FLOW RATE(CFS) =       2.28

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.21   FLOW VELOCITY(FEET/SEC.) =   4.51
  LONGEST FLOWPATH FROM NODE    106.00 TO NODE    108.00 =     705.08 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    222.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   881.40  DOWNSTREAM(FEET) =   876.60
  FLOW LENGTH(FEET) =   153.61   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.87
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.28
  PIPE TRAVEL TIME(MIN.) =   0.37    Tc(MIN.) =    8.66
  LONGEST FLOWPATH FROM NODE    106.00 TO NODE    222.00 =     858.69 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    222.00 TO NODE    222.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        2.28     8.66       5.545        1.14
```

```
 LONGEST FLOWPATH FROM NODE    106.00 TO NODE    222.00 =     858.69 FEET.

 ** MEMORY BANK #  1 CONFLUENCE DATA **
 STREAM     RUNOFF      Tc      INTENSITY     AREA
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1        8.70     5.88       7.123        2.86
 LONGEST FLOWPATH FROM NODE    110.00 TO NODE    222.00 =    1684.06 FEET.

 ** PEAK FLOW RATE TABLE **
 STREAM    RUNOFF       Tc      INTENSITY
 NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1      10.25       5.88        7.123
     2       9.05       8.66        5.545

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      10.25   Tc(MIN.) =    5.88
 TOTAL AREA(ACRES) =        4.0

****************************************************************************
 FLOW PROCESS FROM NODE    222.00 TO NODE    222.00 IS CODE =  12
----------------------------------------------------------------------------
 >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    222.00 TO NODE    226.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   876.60  DOWNSTREAM(FEET) =   852.86
 FLOW LENGTH(FEET) =   528.90   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  11.86
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      10.25
 PIPE TRAVEL TIME(MIN.) =   0.74    Tc(MIN.) =    6.62
 LONGEST FLOWPATH FROM NODE    110.00 TO NODE    226.00 =    2212.96 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    226.00 TO NODE    226.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    6.62
 RAINFALL INTENSITY(INCH/HR) =   6.60
 TOTAL STREAM AREA(ACRES) =     4.00
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     10.25
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    234.00 TO NODE    236.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6300
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.07
  UPSTREAM ELEVATION(FEET) =    891.30
  DOWNSTREAM ELEVATION(FEET) =    890.60
  ELEVATION DIFFERENCE(FEET) =      0.70
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.660
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.570
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.41

****************************************************************************
  FLOW PROCESS FROM NODE    236.00 TO NODE    226.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  890.60  DOWNSTREAM ELEVATION(FEET) =  863.10
  STREET LENGTH(FEET) =   700.67   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 17.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.81
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
    HALFSTREET FLOOD WIDTH(FEET) =    8.91
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.18
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.27
  STREET FLOW TRAVEL TIME(MIN.) =   2.80   Tc(MIN.) =    9.46
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.240
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6300
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.630
  SUBAREA AREA(ACRES) =    2.04      SUBAREA RUNOFF(CFS) =    6.73
  TOTAL AREA(ACRES) =        2.1        PEAK FLOW RATE(CFS) =       7.06
```

```
  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.36   HALFSTREET FLOOD WIDTH(FEET) =  11.57
  FLOW VELOCITY(FEET/SEC.) =  4.85   DEPTH*VELOCITY(FT*FT/SEC.) =   1.73
  LONGEST FLOWPATH FROM NODE    234.00 TO NODE    226.00 =     765.74 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    226.00 TO NODE    226.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.46
  RAINFALL INTENSITY(INCH/HR) =   5.24
  TOTAL STREAM AREA(ACRES) =     2.14
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.06

****************************************************************************
  FLOW PROCESS FROM NODE    228.00 TO NODE    230.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6300
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    57.61
  UPSTREAM ELEVATION(FEET) =    888.20
  DOWNSTREAM ELEVATION(FEET) =    887.60
  ELEVATION DIFFERENCE(FEET) =      0.60
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.335
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.785
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.43

****************************************************************************
  FLOW PROCESS FROM NODE    230.00 TO NODE    224.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  887.60  DOWNSTREAM ELEVATION(FEET) =  863.10
  STREET LENGTH(FEET) =   491.10   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 17.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
```

```
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.08
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.28
    HALFSTREET FLOOD WIDTH(FEET) =    7.66
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.37
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.22
  STREET FLOW TRAVEL TIME(MIN.) =   1.87   Tc(MIN.) =    8.21
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.742
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6300
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.630
  SUBAREA AREA(ACRES) =    1.46      SUBAREA RUNOFF(CFS) =    5.28
  TOTAL AREA(ACRES) =        1.6        PEAK FLOW RATE(CFS) =       5.64

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) =  10.01
  FLOW VELOCITY(FEET/SEC.) =  5.04   DEPTH*VELOCITY(FT*FT/SEC.) =   1.64
  LONGEST FLOWPATH FROM NODE    228.00 TO NODE    224.00 =     548.71 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    224.00 TO NODE    226.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   853.50  DOWNSTREAM(FEET) =   852.86
  FLOW LENGTH(FEET) =    30.40   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.67
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.64
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =    8.27
  LONGEST FLOWPATH FROM NODE    228.00 TO NODE    226.00 =     579.11 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    226.00 TO NODE    226.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.27
  RAINFALL INTENSITY(INCH/HR) =   5.71
  TOTAL STREAM AREA(ACRES) =     1.56
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.64
```

```
  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       10.25     6.62        6.596          4.00
      2        7.06     9.46        5.240          2.14
      3        5.64     8.27        5.712          1.56

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       19.71     6.62       6.596
      2       20.70     8.27       5.712
      3       20.38     9.46       5.240

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      20.70   Tc(MIN.) =    8.27
  TOTAL AREA(ACRES) =        7.7
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    226.00 =    2212.96 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    226.00 TO NODE    240.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   852.86  DOWNSTREAM(FEET) =   844.00
  FLOW LENGTH(FEET) =   141.87   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.76
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      20.70
  PIPE TRAVEL TIME(MIN.) =   0.15    Tc(MIN.) =    8.42
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    240.00 =    2354.83 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    240.00 TO NODE    240.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.646
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5616
  SUBAREA AREA(ACRES) =    0.49   SUBAREA RUNOFF(CFS) =    0.97
  TOTAL AREA(ACRES) =        8.2   TOTAL RUNOFF(CFS) =     25.97
  TC(MIN.) =    8.42
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    240.00 TO NODE    242.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   840.50  DOWNSTREAM(FEET) =   839.20
  FLOW LENGTH(FEET) =   121.83   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  19.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.58
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      25.97
  PIPE TRAVEL TIME(MIN.) =   0.24    Tc(MIN.) =    8.66
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    242.00 =    2476.66 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    124.00 TO NODE    242.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.546
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5494
  SUBAREA AREA(ACRES) =    0.50   SUBAREA RUNOFF(CFS) =    0.97
  TOTAL AREA(ACRES) =        8.7   TOTAL RUNOFF(CFS) =      26.48
  TC(MIN.) =    8.66

****************************************************************************
  FLOW PROCESS FROM NODE    242.00 TO NODE    244.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   839.20  DOWNSTREAM(FEET) =   762.00
  FLOW LENGTH(FEET) =   294.26   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   9.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  29.15
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      26.48
  PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =    8.83
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    244.00 =    2770.92 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    244.00 TO NODE    300.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    762.00  DOWNSTREAM(FEET) =    748.00
```

```
  CHANNEL LENGTH THRU SUBAREA(FEET) =   272.23   CHANNEL SLOPE =  0.0514
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =      26.48
  FLOW VELOCITY(FEET/SEC.) =   6.89   FLOW DEPTH(FEET) =   0.97
  TRAVEL TIME(MIN.) =   0.66   Tc(MIN.) =    9.49
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    300.00 =    3043.15 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    300.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.49
  RAINFALL INTENSITY(INCH/HR) =   5.23
  TOTAL STREAM AREA(ACRES) =     8.69
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     26.48

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    122.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    62.60
  UPSTREAM ELEVATION(FEET) =    860.00
  DOWNSTREAM ELEVATION(FEET) =    840.00
  ELEVATION DIFFERENCE(FEET) =     20.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.958
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.25
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.25

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    300.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    840.00  DOWNSTREAM(FEET) =    748.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   433.46   CHANNEL SLOPE =  0.2122
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.972
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
```

```
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.84
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.47
  AVERAGE FLOW DEPTH(FEET) =   0.24   TRAVEL TIME(MIN.) =   1.12
  Tc(MIN.) =    6.07
  SUBAREA AREA(ACRES) =     2.93       SUBAREA RUNOFF(CFS) =    7.15
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        3.0         PEAK FLOW RATE(CFS) =       7.37

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.35   FLOW VELOCITY(FEET/SEC.) =   7.91
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    300.00 =     496.06 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    300.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.07
  RAINFALL INTENSITY(INCH/HR) =   6.97
  TOTAL STREAM AREA(ACRES) =     3.02
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.37

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    118.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    86.33
  UPSTREAM ELEVATION(FEET) =    880.00
  DOWNSTREAM ELEVATION(FEET) =    860.00
  ELEVATION DIFFERENCE(FEET) =     20.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.823
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.165
  SUBAREA RUNOFF(CFS) =      0.25
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.25

****************************************************************************
  FLOW PROCESS FROM NODE    118.00 TO NODE    300.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    860.00  DOWNSTREAM(FEET) =    748.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   448.14   CHANNEL SLOPE =  0.2499
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   2.00
```

```
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.406
 USER-SPECIFIED RUNOFF COEFFICIENT = .3500
 S.C.S. CURVE NUMBER (AMC II) =  88
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.60
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.77
 AVERAGE FLOW DEPTH(FEET) =   0.22   TRAVEL TIME(MIN.) =   1.10
 Tc(MIN.) =    6.93
 SUBAREA AREA(ACRES) =     2.98       SUBAREA RUNOFF(CFS) =    6.68
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
 TOTAL AREA(ACRES) =        3.1         PEAK FLOW RATE(CFS) =       6.91

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.32   FLOW VELOCITY(FEET/SEC.) =   8.31
 LONGEST FLOWPATH FROM NODE    116.00 TO NODE    300.00 =     534.47 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    300.00 TO NODE    300.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
 TIME OF CONCENTRATION(MIN.) =    6.93
 RAINFALL INTENSITY(INCH/HR) =   6.41
 TOTAL STREAM AREA(ACRES) =     3.08
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.91

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       26.48     9.49        5.229          8.69
     2        7.37     6.07        6.972          3.02
     3        6.91     6.93        6.406          3.08

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  3 STREAMS.

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc      INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       33.29     6.07       6.972
     2       35.29     6.93       6.406
     3       37.64     9.49       5.229

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      37.64   Tc(MIN.) =    9.49
 TOTAL AREA(ACRES) =       14.8
 LONGEST FLOWPATH FROM NODE    110.00 TO NODE    300.00 =    3043.15 FEET.

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

```
 FLOW PROCESS FROM NODE    400.00 TO NODE    402.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8700
 S.C.S. CURVE NUMBER (AMC II) =  88
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   122.16
 UPSTREAM ELEVATION(FEET) =    897.40
 DOWNSTREAM ELEVATION(FEET) =    896.10
 ELEVATION DIFFERENCE(FEET) =      1.30
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.158
 WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
          THE MAXIMUM OVERLAND FLOW LENGTH =    60.64
          (Reference: Table 3-1B of Hydrology Manual)
          THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.62
 TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.62

****************************************************************************
 FLOW PROCESS FROM NODE    402.00 TO NODE    404.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  896.10  DOWNSTREAM ELEVATION(FEET) =  855.71
 STREET LENGTH(FEET) =   913.21   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 17.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.33
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.36
   HALFSTREET FLOOD WIDTH(FEET) =   11.49
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.09
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.81
 STREET FLOW TRAVEL TIME(MIN.) =   2.99   Tc(MIN.) =    6.15
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.920
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8700
 S.C.S. CURVE NUMBER (AMC II) =  88
```

```
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  SUBAREA AREA(ACRES) =    2.21      SUBAREA RUNOFF(CFS) =   13.30
  TOTAL AREA(ACRES) =        2.3        PEAK FLOW RATE(CFS) =      13.85

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.42   HALFSTREET FLOOD WIDTH(FEET) =  14.85
  FLOW VELOCITY(FEET/SEC.) =  5.96   DEPTH*VELOCITY(FT*FT/SEC.) =   2.52
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    404.00 =    1035.37 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    404.00 TO NODE    410.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   847.00  DOWNSTREAM(FEET) =   846.70
  FLOW LENGTH(FEET) =    26.50   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.48
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.85
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    6.20
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    410.00 =    1061.87 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    410.00 TO NODE    410.00 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.) =    6.20
  RAINFALL INTENSITY(INCH/HR) =   6.88
  TOTAL STREAM AREA(ACRES) =     2.30
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     13.85

****************************************************************************
  FLOW PROCESS FROM NODE    406.00 TO NODE    408.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6300
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    95.00
  UPSTREAM ELEVATION(FEET) =    892.20
  DOWNSTREAM ELEVATION(FEET) =    891.20
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.746
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.79
```

```
          (Reference: Table 3-1B of Hydrology Manual)
          THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.516
  SUBAREA RUNOFF(CFS) =      0.45
  TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.45

****************************************************************************
  FLOW PROCESS FROM NODE    408.00 TO NODE    410.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  891.20  DOWNSTREAM ELEVATION(FEET) =  855.71
  STREET LENGTH(FEET) =   512.65   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 17.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.98
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.27
    HALFSTREET FLOOD WIDTH(FEET) =    6.96
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.95
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.31
  STREET FLOW TRAVEL TIME(MIN.) =   1.73   Tc(MIN.) =    8.47
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.625
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6300
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.630
  SUBAREA AREA(ACRES) =    1.42      SUBAREA RUNOFF(CFS) =    5.03
  TOTAL AREA(ACRES) =        1.5        PEAK FLOW RATE(CFS) =       5.42

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.31   HALFSTREET FLOOD WIDTH(FEET) =   9.15
  FLOW VELOCITY(FEET/SEC.) =  5.68   DEPTH*VELOCITY(FT*FT/SEC.) =   1.76
  LONGEST FLOWPATH FROM NODE    406.00 TO NODE    410.00 =     607.65 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    410.00 TO NODE    410.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
```

```
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.47
  RAINFALL INTENSITY(INCH/HR) =   5.62
  TOTAL STREAM AREA(ACRES) =     1.53
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.42

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       13.85     6.20        6.877          2.30
      2        5.42     8.47        5.625          1.53

  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       17.82     6.20       6.877
      2       16.75     8.47       5.625

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      17.82   Tc(MIN.) =    6.20
  TOTAL AREA(ACRES) =        3.8
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    410.00 =    1061.87 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    410.00 TO NODE    422.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   846.70  DOWNSTREAM(FEET) =   844.40
  FLOW LENGTH(FEET) =   124.98   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.56
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      17.82
  PIPE TRAVEL TIME(MIN.) =   0.22    Tc(MIN.) =    6.42
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    422.00 =    1186.85 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    422.00 TO NODE    422.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.42
  RAINFALL INTENSITY(INCH/HR) =   6.73
```

```
  TOTAL STREAM AREA(ACRES) =     3.83
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     17.82

****************************************************************************
  FLOW PROCESS FROM NODE    416.00 TO NODE    418.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6300
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    56.53
  UPSTREAM ELEVATION(FEET) =    890.00
  DOWNSTREAM ELEVATION(FEET) =    863.00
  ELEVATION DIFFERENCE(FEET) =     27.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.953
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.55
  TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.55

****************************************************************************
  FLOW PROCESS FROM NODE    418.00 TO NODE    420.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  863.00  DOWNSTREAM ELEVATION(FEET) =  854.14
  STREET LENGTH(FEET) =   712.23   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 17.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.33
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.37
    HALFSTREET FLOOD WIDTH(FEET) =   12.04
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.76
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.01
  STREET FLOW TRAVEL TIME(MIN.) =   4.30   Tc(MIN.) =    7.25
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.218
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6300
```

```
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.630
  SUBAREA AREA(ACRES) =    1.89      SUBAREA RUNOFF(CFS) =    7.40
  TOTAL AREA(ACRES) =        2.0        PEAK FLOW RATE(CFS) =       7.83

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.43   HALFSTREET FLOOD WIDTH(FEET) =  15.24
  FLOW VELOCITY(FEET/SEC.) =  3.21   DEPTH*VELOCITY(FT*FT/SEC.) =   1.38
  LONGEST FLOWPATH FROM NODE    416.00 TO NODE    420.00 =     768.76 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    420.00 TO NODE    422.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   848.50  DOWNSTREAM(FEET) =   844.40
  FLOW LENGTH(FEET) =    36.37   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.45
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.83
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    7.29
  LONGEST FLOWPATH FROM NODE    416.00 TO NODE    422.00 =     805.13 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    422.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.197
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5945
  SUBAREA AREA(ACRES) =    0.29   SUBAREA RUNOFF(CFS) =    0.63
  TOTAL AREA(ACRES) =        2.3   TOTAL RUNOFF(CFS) =       8.44
  TC(MIN.) =    7.29

****************************************************************************
  FLOW PROCESS FROM NODE    422.00 TO NODE    422.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.29
  RAINFALL INTENSITY(INCH/HR) =   6.20
  TOTAL STREAM AREA(ACRES) =     2.29
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      8.44
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    424.00 TO NODE    426.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6300
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    38.98
  UPSTREAM ELEVATION(FEET) =    890.00
  DOWNSTREAM ELEVATION(FEET) =    864.80
  ELEVATION DIFFERENCE(FEET) =     25.20
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.452
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE    426.00 TO NODE    428.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  864.80  DOWNSTREAM ELEVATION(FEET) =  853.94
  STREET LENGTH(FEET) =   845.24   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 17.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.57
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.39
    HALFSTREET FLOOD WIDTH(FEET) =   13.21
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.99
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.17
  STREET FLOW TRAVEL TIME(MIN.) =   4.71   Tc(MIN.) =    7.16
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.267
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6300
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.630
  SUBAREA AREA(ACRES) =    2.52      SUBAREA RUNOFF(CFS) =    9.95
```

```
  TOTAL AREA(ACRES) =        2.6        PEAK FLOW RATE(CFS) =      10.34

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.47   HALFSTREET FLOOD WIDTH(FEET) =  16.96
  FLOW VELOCITY(FEET/SEC.) =  3.45   DEPTH*VELOCITY(FT*FT/SEC.) =   1.61
  LONGEST FLOWPATH FROM NODE    424.00 TO NODE    428.00 =     884.22 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    428.00 TO NODE    422.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   846.00  DOWNSTREAM(FEET) =   844.40
  FLOW LENGTH(FEET) =     4.50   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  25.24
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.34
  PIPE TRAVEL TIME(MIN.) =   0.00    Tc(MIN.) =    7.17
  LONGEST FLOWPATH FROM NODE    424.00 TO NODE    422.00 =     888.72 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    422.00 TO NODE    422.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.17
  RAINFALL INTENSITY(INCH/HR) =   6.27
  TOTAL STREAM AREA(ACRES) =     2.62
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     10.34

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       17.82     6.42        6.726          3.83
      2        8.44     7.29        6.197          2.29
      3       10.34     7.17        6.266          2.62

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       34.52     6.42       6.726
      2       35.24     7.17       6.266
```

```
      3       35.08     7.29       6.197

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      35.24   Tc(MIN.) =    7.17
  TOTAL AREA(ACRES) =        8.7
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    422.00 =    1186.85 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    422.00 TO NODE    436.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   851.10  DOWNSTREAM(FEET) =   842.68
  FLOW LENGTH(FEET) =   571.76   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  21.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.22
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      35.24
  PIPE TRAVEL TIME(MIN.) =   0.93    Tc(MIN.) =    8.10
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    436.00 =    1758.61 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    436.00 TO NODE    436.00 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.) =    8.10
  RAINFALL INTENSITY(INCH/HR) =   5.79
  TOTAL STREAM AREA(ACRES) =     8.74
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     35.24

****************************************************************************
  FLOW PROCESS FROM NODE    430.00 TO NODE    432.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6300
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    97.45
  UPSTREAM ELEVATION(FEET) =    856.00
  DOWNSTREAM ELEVATION(FEET) =    855.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.783
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.39
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
```

```
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.493
SUBAREA RUNOFF(CFS) =      0.41
TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.41

****************************************************************************
  FLOW PROCESS FROM NODE    432.00 TO NODE    436.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  855.00  DOWNSTREAM ELEVATION(FEET) =  849.56
  STREET LENGTH(FEET) =   406.58   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 17.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.90
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.29
    HALFSTREET FLOOD WIDTH(FEET) =    8.29
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.36
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.69
  STREET FLOW TRAVEL TIME(MIN.) =   2.87   Tc(MIN.) =    9.65
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.172
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6300
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.630
  SUBAREA AREA(ACRES) =    0.91      SUBAREA RUNOFF(CFS) =    2.96
  TOTAL AREA(ACRES) =        1.0        PEAK FLOW RATE(CFS) =       3.29

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =  10.55
  FLOW VELOCITY(FEET/SEC.) =  2.67   DEPTH*VELOCITY(FT*FT/SEC.) =   0.90
  LONGEST FLOWPATH FROM NODE    430.00 TO NODE    436.00 =     504.03 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    436.00 TO NODE    436.00 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.) =    9.65
  RAINFALL INTENSITY(INCH/HR) =   5.17
  TOTAL STREAM AREA(ACRES) =     1.01
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.29

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       35.24     8.10        5.791          8.74
      2        3.29     9.65        5.172          1.01

  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       38.00     8.10       5.791
      2       34.76     9.65       5.172

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      38.00   Tc(MIN.) =    8.10
  TOTAL AREA(ACRES) =        9.8
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    436.00 =    1758.61 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    436.00 TO NODE    446.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   842.35  DOWNSTREAM(FEET) =   842.00
  FLOW LENGTH(FEET) =    35.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  24.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.03
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      38.00
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    8.16
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    446.00 =    1793.61 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    446.00 TO NODE    446.00 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.) =    8.16
  RAINFALL INTENSITY(INCH/HR) =   5.76
  TOTAL STREAM AREA(ACRES) =     9.75
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     38.00
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    438.00 TO NODE    440.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6300
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    76.92
  UPSTREAM ELEVATION(FEET) =    862.80
  DOWNSTREAM ELEVATION(FEET) =    862.00
  ELEVATION DIFFERENCE(FEET) =      0.80
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.763
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.60
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.505
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.41

****************************************************************************
  FLOW PROCESS FROM NODE    440.00 TO NODE    446.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  862.00  DOWNSTREAM ELEVATION(FEET) =  849.56
  STREET LENGTH(FEET) =   499.39   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 17.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.95
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
    HALFSTREET FLOOD WIDTH(FEET) =    8.76
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.34
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.01
  STREET FLOW TRAVEL TIME(MIN.) =   2.50   Tc(MIN.) =    9.26
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.312
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6300
```

```
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.630
  SUBAREA AREA(ACRES) =    1.51      SUBAREA RUNOFF(CFS) =    5.05
  TOTAL AREA(ACRES) =        1.6        PEAK FLOW RATE(CFS) =       5.39

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.35   HALFSTREET FLOOD WIDTH(FEET) =  11.41
  FLOW VELOCITY(FEET/SEC.) =  3.79   DEPTH*VELOCITY(FT*FT/SEC.) =   1.34
  LONGEST FLOWPATH FROM NODE    438.00 TO NODE    446.00 =     576.31 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    446.00 TO NODE    446.00 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.) =    9.26
  RAINFALL INTENSITY(INCH/HR) =   5.31
  TOTAL STREAM AREA(ACRES) =     1.61
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.39

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       38.00     8.16        5.761          9.75
      2        5.39     9.26        5.312          1.61

  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       42.75     8.16       5.761
      2       40.43     9.26       5.312

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      42.75   Tc(MIN.) =    8.16
  TOTAL AREA(ACRES) =       11.4
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    446.00 =    1793.61 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    446.00 TO NODE    502.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   841.67  DOWNSTREAM(FEET) =   841.38
  FLOW LENGTH(FEET) =    26.50   MANNING'S N =  0.013
```

```
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  22.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.85
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      42.75
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    8.21
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    502.00 =    1820.11 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    502.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.741
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6525
  SUBAREA AREA(ACRES) =    0.71   SUBAREA RUNOFF(CFS) =    1.43
  TOTAL AREA(ACRES) =       12.1   TOTAL RUNOFF(CFS) =      45.21
  TC(MIN.) =    8.21

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    448.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   841.38  DOWNSTREAM(FEET) =   838.12
  FLOW LENGTH(FEET) =   237.62   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  24.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.58
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      45.21
  PIPE TRAVEL TIME(MIN.) =   0.37    Tc(MIN.) =    8.58
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    448.00 =    2057.73 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    448.00 TO NODE    448.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.578
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6380
  SUBAREA AREA(ACRES) =    0.61   SUBAREA RUNOFF(CFS) =    1.19
  TOTAL AREA(ACRES) =       12.7   TOTAL RUNOFF(CFS) =      45.21
  TC(MIN.) =    8.58
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
  FLOW PROCESS FROM NODE    448.00 TO NODE    450.00 IS CODE =  31
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   838.12  DOWNSTREAM(FEET) =   836.12
  FLOW LENGTH(FEET) =   199.81   MANNING'S N =  0.013
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  24.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.57
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      45.21
  PIPE TRAVEL TIME(MIN.) =   0.35    Tc(MIN.) =    8.93
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    450.00 =    2257.54 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    450.00 TO NODE    450.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.437
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6191
  SUBAREA AREA(ACRES) =    0.89   SUBAREA RUNOFF(CFS) =    1.69
  TOTAL AREA(ACRES) =       13.6   TOTAL RUNOFF(CFS) =      45.67
  TC(MIN.) =    8.93

****************************************************************************
  FLOW PROCESS FROM NODE    450.00 TO NODE    452.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   836.12  DOWNSTREAM(FEET) =   794.00
  FLOW LENGTH(FEET) =   278.06   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  26.90
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      45.67
  PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =    9.10
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    452.00 =    2535.60 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    452.00 TO NODE    600.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    794.00  DOWNSTREAM(FEET) =    787.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =    57.76   CHANNEL SLOPE =  0.1125
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   2.00
```

```
  CHANNEL FLOW THRU SUBAREA(CFS) =      45.67
  FLOW VELOCITY(FEET/SEC.) =  10.61   FLOW DEPTH(FEET) =   1.05
  TRAVEL TIME(MIN.) =   0.09   Tc(MIN.) =    9.19
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    600.00 =    2593.36 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    600.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.19
  RAINFALL INTENSITY(INCH/HR) =   5.34
  TOTAL STREAM AREA(ACRES) =    13.57
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     45.67

****************************************************************************
  FLOW PROCESS FROM NODE    504.00 TO NODE    506.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   105.25
  UPSTREAM ELEVATION(FEET) =    854.00
  DOWNSTREAM ELEVATION(FEET) =    828.00
  ELEVATION DIFFERENCE(FEET) =     26.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =   100.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.833
  SUBAREA RUNOFF(CFS) =      0.24
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.24

****************************************************************************
  FLOW PROCESS FROM NODE    506.00 TO NODE    600.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    828.00  DOWNSTREAM(FEET) =    787.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   277.28   CHANNEL SLOPE =  0.1461
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.043
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.92
```

```
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.51
  AVERAGE FLOW DEPTH(FEET) =   0.12   TRAVEL TIME(MIN.) =   1.32
  Tc(MIN.) =    7.58
  SUBAREA AREA(ACRES) =     0.64       SUBAREA RUNOFF(CFS) =    1.35
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        0.7         PEAK FLOW RATE(CFS) =       1.57

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.16   FLOW VELOCITY(FEET/SEC.) =   4.30
  LONGEST FLOWPATH FROM NODE    504.00 TO NODE    600.00 =     382.53 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    600.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.58
  RAINFALL INTENSITY(INCH/HR) =   6.04
  TOTAL STREAM AREA(ACRES) =     0.74
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.57

****************************************************************************
  FLOW PROCESS FROM NODE    508.00 TO NODE    510.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    66.63
  UPSTREAM ELEVATION(FEET) =    880.00
  DOWNSTREAM ELEVATION(FEET) =    848.00
  ELEVATION DIFFERENCE(FEET) =     32.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.115
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.789
  SUBAREA RUNOFF(CFS) =      0.27
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.27

****************************************************************************
  FLOW PROCESS FROM NODE    510.00 TO NODE    600.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    848.00  DOWNSTREAM(FEET) =    787.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1600.24   CHANNEL SLOPE =  0.0378
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.154
```

```
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      21.50
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.81
  AVERAGE FLOW DEPTH(FEET) =   0.95   TRAVEL TIME(MIN.) =   4.59
  Tc(MIN.) =    9.70
  SUBAREA AREA(ACRES) =    22.85       SUBAREA RUNOFF(CFS) =   41.22
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       23.0         PEAK FLOW RATE(CFS) =      41.40

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.30   FLOW VELOCITY(FEET/SEC.) =   6.91
  LONGEST FLOWPATH FROM NODE    508.00 TO NODE    600.00 =    1666.87 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    512.00 TO NODE    600.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.154
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.88   SUBAREA RUNOFF(CFS) =    1.59
  TOTAL AREA(ACRES) =       23.8   TOTAL RUNOFF(CFS) =      42.99
  TC(MIN.) =    9.70

****************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    600.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.70
  RAINFALL INTENSITY(INCH/HR) =   5.15
  TOTAL STREAM AREA(ACRES) =    23.83
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     42.99

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       45.67     9.19        5.336         13.57
      2        1.57     7.58        6.043          0.74
      3       42.99     9.70        5.154         23.83

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.
```

```
  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       75.49     7.58       6.043
      2       87.79     9.19       5.336
      3       88.44     9.70       5.154

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      88.44   Tc(MIN.) =    9.70
  TOTAL AREA(ACRES) =       38.1
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    600.00 =    2593.36 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    700.00 TO NODE    702.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   213.54
  UPSTREAM ELEVATION(FEET) =    850.00
  DOWNSTREAM ELEVATION(FEET) =    844.48
  ELEVATION DIFFERENCE(FEET) =      5.52
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.627
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    75.85
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.72
  TOTAL AREA(ACRES) =      0.25   TOTAL RUNOFF(CFS) =      1.72

****************************************************************************
  FLOW PROCESS FROM NODE    702.00 TO NODE    704.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   840.00  DOWNSTREAM(FEET) =   838.92
  FLOW LENGTH(FEET) =    29.73   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.68
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.72
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =    2.70
  LONGEST FLOWPATH FROM NODE    700.00 TO NODE    704.00 =     243.27 FEET.

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

```
  FLOW PROCESS FROM NODE    704.00 TO NODE    704.00 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.) =    2.70
  RAINFALL INTENSITY(INCH/HR) =   7.90
  TOTAL STREAM AREA(ACRES) =     0.25
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.72

****************************************************************************
  FLOW PROCESS FROM NODE    706.00 TO NODE    708.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   257.40
  UPSTREAM ELEVATION(FEET) =    850.00
  DOWNSTREAM ELEVATION(FEET) =    844.48
  ELEVATION DIFFERENCE(FEET) =      5.52
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.714
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    71.45
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.31
  TOTAL AREA(ACRES) =      0.19   TOTAL RUNOFF(CFS) =      1.31

****************************************************************************
  FLOW PROCESS FROM NODE    710.00 TO NODE    708.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6323
  SUBAREA AREA(ACRES) =    0.16   SUBAREA RUNOFF(CFS) =    0.44
  TOTAL AREA(ACRES) =        0.3   TOTAL RUNOFF(CFS) =       1.75
  TC(MIN.) =    2.71

****************************************************************************
  FLOW PROCESS FROM NODE    708.10 TO NODE    708.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
```

```
==========================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5558
  SUBAREA AREA(ACRES) =    0.13   SUBAREA RUNOFF(CFS) =    0.36
  TOTAL AREA(ACRES) =        0.5   TOTAL RUNOFF(CFS) =       2.11
  TC(MIN.) =    2.71

****************************************************************************
  FLOW PROCESS FROM NODE    708.00 TO NODE    704.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   840.00  DOWNSTREAM(FEET) =   838.92
  FLOW LENGTH(FEET) =    12.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.77
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.11
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    2.73
  LONGEST FLOWPATH FROM NODE    706.00 TO NODE    704.00 =     269.40 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    704.00 TO NODE    704.00 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.) =    2.73
  RAINFALL INTENSITY(INCH/HR) =   7.90
  TOTAL STREAM AREA(ACRES) =     0.48
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.11

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        1.72     2.70        7.904          0.25
      2        2.11     2.73        7.904          0.48

  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        3.80     2.70       7.904
      2        3.83     2.73       7.904

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       3.83   Tc(MIN.) =    2.73
  TOTAL AREA(ACRES) =        0.7
  LONGEST FLOWPATH FROM NODE    706.00 TO NODE    704.00 =     269.40 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    96.76
  UPSTREAM ELEVATION(FEET) =    980.00
  DOWNSTREAM ELEVATION(FEET) =    970.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.164
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.906
  SUBAREA RUNOFF(CFS) =      0.24
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.24

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    104.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    970.00  DOWNSTREAM(FEET) =    720.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   876.89   CHANNEL SLOPE =  0.2851
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.666
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.05
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.60
  AVERAGE FLOW DEPTH(FEET) =   0.19   TRAVEL TIME(MIN.) =   2.21
  Tc(MIN.) =    8.38
  SUBAREA AREA(ACRES) =     2.80       SUBAREA RUNOFF(CFS) =    5.55
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        2.9         PEAK FLOW RATE(CFS) =       5.75

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.28   FLOW VELOCITY(FEET/SEC.) =   8.11
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =     973.65 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    304.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    72.47
  UPSTREAM ELEVATION(FEET) =    848.00
  DOWNSTREAM ELEVATION(FEET) =    822.00
  ELEVATION DIFFERENCE(FEET) =     26.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.335
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.581
  SUBAREA RUNOFF(CFS) =      0.29
  TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.29

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    306.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    822.00  DOWNSTREAM(FEET) =    770.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   253.00   CHANNEL SLOPE =  0.2055
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.919
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.08
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.19
  AVERAGE FLOW DEPTH(FEET) =   0.17   TRAVEL TIME(MIN.) =   0.81
  Tc(MIN.) =    6.15
  SUBAREA AREA(ACRES) =     1.47       SUBAREA RUNOFF(CFS) =    3.56
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        1.6         PEAK FLOW RATE(CFS) =       3.83

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.24   FLOW VELOCITY(FEET/SEC.) =   6.45
  LONGEST FLOWPATH FROM NODE    302.00 TO NODE    306.00 =     325.47 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.6  TC(MIN.) =      6.15
  PEAK FLOW RATE(CFS)   =       3.83
============================================================================
============================================================================
  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 1982-2015 Advanced Engineering Software (aes)
              Ver. 22.0 Release Date: 07/01/2015  License ID 1239

                              Analysis prepared by:



 ************************* DESCRIPTION OF STUDY *************************
* RENZULLI ESTATES PROPOSED CONDITION HYD                                *
* 100 YEAR ATTENUATED                                                    *
*                                                                        *
 **************************************************************************

  FILE NAME: R:\1207\HYD\DR\TM\CALCS\AES\100PRATT.DAT
  TIME/DATE OF STUDY: 10:53 10/06/2023
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.000
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  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   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
  2   17.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  7.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

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

```
 FLOW PROCESS FROM NODE    110.00 TO NODE    112.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 USER-SPECIFIED RUNOFF COEFFICIENT = .3500
 S.C.S. CURVE NUMBER (AMC II) =  88
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    97.01
 UPSTREAM ELEVATION(FEET) =    980.00
 DOWNSTREAM ELEVATION(FEET) =    972.00
 ELEVATION DIFFERENCE(FEET) =      8.00
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.582
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.620
 SUBAREA RUNOFF(CFS) =      0.23
 TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.23

****************************************************************************
 FLOW PROCESS FROM NODE    112.00 TO NODE    114.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    972.00  DOWNSTREAM(FEET) =    893.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   618.66   CHANNEL SLOPE =  0.1277
 CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
 MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   2.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.378
 USER-SPECIFIED RUNOFF COEFFICIENT = .3500
 S.C.S. CURVE NUMBER (AMC II) =  88
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.58
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.12
 AVERAGE FLOW DEPTH(FEET) =   0.16   TRAVEL TIME(MIN.) =   2.50
 Tc(MIN.) =    9.08
 SUBAREA AREA(ACRES) =     1.42       SUBAREA RUNOFF(CFS) =    2.67
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
 TOTAL AREA(ACRES) =        1.5         PEAK FLOW RATE(CFS) =       2.86

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.23   FLOW VELOCITY(FEET/SEC.) =   5.01
 LONGEST FLOWPATH FROM NODE    110.00 TO NODE    114.00 =     715.67 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    114.00 TO NODE    200.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   889.00  DOWNSTREAM(FEET) =   887.04
 FLOW LENGTH(FEET) =    36.73   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   8.87
```

```
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.86
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =    9.15
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    200.00 =     752.40 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    206.00 TO NODE    200.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.352
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3910
  SUBAREA AREA(ACRES) =    0.13   SUBAREA RUNOFF(CFS) =    0.61
  TOTAL AREA(ACRES) =        1.6   TOTAL RUNOFF(CFS) =       3.45
  TC(MIN.) =    9.15

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    204.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   887.04  DOWNSTREAM(FEET) =   880.50
  FLOW LENGTH(FEET) =    29.52   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.51
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.45
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    9.18
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    204.00 =     781.92 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    208.00 TO NODE    204.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.340
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4309
  SUBAREA AREA(ACRES) =    0.15   SUBAREA RUNOFF(CFS) =    0.70
  TOTAL AREA(ACRES) =        1.8   TOTAL RUNOFF(CFS) =       4.14
  TC(MIN.) =    9.18

****************************************************************************
  FLOW PROCESS FROM NODE    204.00 TO NODE    216.00 IS CODE =  31
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   880.50  DOWNSTREAM(FEET) =   871.50
  FLOW LENGTH(FEET) =   842.14   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.51
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.14
  PIPE TRAVEL TIME(MIN.) =   2.55    Tc(MIN.) =   11.73
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    216.00 =    1624.06 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    216.00 TO NODE    216.00 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.) =   11.73
  RAINFALL INTENSITY(INCH/HR) =   4.56
  TOTAL STREAM AREA(ACRES) =     1.80
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.14

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    212.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   120.12
  UPSTREAM ELEVATION(FEET) =    897.40
  DOWNSTREAM ELEVATION(FEET) =    896.00
  ELEVATION DIFFERENCE(FEET) =      1.40
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.089
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    61.66
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.76
  TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.76

****************************************************************************
  FLOW PROCESS FROM NODE    212.00 TO NODE    214.00 IS CODE =  62
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
================================================================================
  UPSTREAM ELEVATION(FEET) =  896.00  DOWNSTREAM ELEVATION(FEET) =  886.81
  STREET LENGTH(FEET) =   481.04   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 17.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.40
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.32
    HALFSTREET FLOOD WIDTH(FEET) =    9.93
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.08
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.00
  STREET FLOW TRAVEL TIME(MIN.) =   2.61   Tc(MIN.) =    5.70
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.267
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  SUBAREA AREA(ACRES) =    0.83      SUBAREA RUNOFF(CFS) =    5.25
  TOTAL AREA(ACRES) =        0.9        PEAK FLOW RATE(CFS) =       5.94

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.38   HALFSTREET FLOOD WIDTH(FEET) =  12.51
  FLOW VELOCITY(FEET/SEC.) =  3.53   DEPTH*VELOCITY(FT*FT/SEC.) =   1.33
  LONGEST FLOWPATH FROM NODE    210.00 TO NODE    214.00 =     601.16 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    214.00 TO NODE    216.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   882.80  DOWNSTREAM(FEET) =   877.26
  FLOW LENGTH(FEET) =    26.50   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.80
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.94
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    5.72
  LONGEST FLOWPATH FROM NODE    210.00 TO NODE    216.00 =     627.66 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    218.00 TO NODE    218.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.246
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.12   SUBAREA RUNOFF(CFS) =    0.76
  TOTAL AREA(ACRES) =        1.1   TOTAL RUNOFF(CFS) =       6.68
  TC(MIN.) =    5.72

****************************************************************************
  FLOW PROCESS FROM NODE    218.00 TO NODE    216.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   878.50  DOWNSTREAM(FEET) =   877.26
  FLOW LENGTH(FEET) =     4.50   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  20.33
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.68
  PIPE TRAVEL TIME(MIN.) =   0.00    Tc(MIN.) =    5.72
  LONGEST FLOWPATH FROM NODE    210.00 TO NODE    216.00 =     632.16 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    216.00 TO NODE    216.00 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.) =    5.72
  RAINFALL INTENSITY(INCH/HR) =   7.24
  TOTAL STREAM AREA(ACRES) =     1.06
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.68

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        4.14    11.73        4.560          1.80
      2        6.68     5.72        7.243          1.06

  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        8.70     5.72       7.243
      2        8.35    11.73       4.560

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       8.70   Tc(MIN.) =    5.72
  TOTAL AREA(ACRES) =        2.9
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    216.00 =    1624.06 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    216.00 TO NODE    222.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   877.26  DOWNSTREAM(FEET) =   876.60
  FLOW LENGTH(FEET) =    60.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.62
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.70
  PIPE TRAVEL TIME(MIN.) =   0.15    Tc(MIN.) =    5.88
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    222.00 =    1684.06 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    222.00 TO NODE    222.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    107.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    78.22
  UPSTREAM ELEVATION(FEET) =    980.00
  DOWNSTREAM ELEVATION(FEET) =    964.00
  ELEVATION DIFFERENCE(FEET) =     16.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.542
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.396
  SUBAREA RUNOFF(CFS) =      0.26
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.26
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    108.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    964.00  DOWNSTREAM(FEET) =    891.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   626.86   CHANNEL SLOPE =  0.1165
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.705
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.31
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.80
  AVERAGE FLOW DEPTH(FEET) =   0.15   TRAVEL TIME(MIN.) =   2.75
  Tc(MIN.) =    8.29
  SUBAREA AREA(ACRES) =     1.04       SUBAREA RUNOFF(CFS) =    2.08
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        1.1         PEAK FLOW RATE(CFS) =       2.28

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.21   FLOW VELOCITY(FEET/SEC.) =   4.51
  LONGEST FLOWPATH FROM NODE    106.00 TO NODE    108.00 =     705.08 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    222.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   881.40  DOWNSTREAM(FEET) =   876.60
  FLOW LENGTH(FEET) =   153.61   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.87
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.28
  PIPE TRAVEL TIME(MIN.) =   0.37    Tc(MIN.) =    8.66
  LONGEST FLOWPATH FROM NODE    106.00 TO NODE    222.00 =     858.69 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    222.00 TO NODE    222.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        2.28     8.66       5.545        1.14
```

```
 LONGEST FLOWPATH FROM NODE    106.00 TO NODE    222.00 =     858.69 FEET.

 ** MEMORY BANK #  1 CONFLUENCE DATA **
 STREAM     RUNOFF      Tc      INTENSITY     AREA
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1        8.70     5.88       7.123        2.86
 LONGEST FLOWPATH FROM NODE    110.00 TO NODE    222.00 =    1684.06 FEET.

 ** PEAK FLOW RATE TABLE **
 STREAM    RUNOFF       Tc      INTENSITY
 NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1      10.25       5.88        7.123
     2       9.05       8.66        5.545

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      10.25   Tc(MIN.) =    5.88
 TOTAL AREA(ACRES) =        4.0

****************************************************************************
 FLOW PROCESS FROM NODE    222.00 TO NODE    222.00 IS CODE =  12
----------------------------------------------------------------------------
 >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    222.00 TO NODE    226.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   876.60  DOWNSTREAM(FEET) =   852.86
 FLOW LENGTH(FEET) =   528.90   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  11.86
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      10.25
 PIPE TRAVEL TIME(MIN.) =   0.74    Tc(MIN.) =    6.62
 LONGEST FLOWPATH FROM NODE    110.00 TO NODE    226.00 =    2212.96 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    226.00 TO NODE    226.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    6.62
 RAINFALL INTENSITY(INCH/HR) =   6.60
 TOTAL STREAM AREA(ACRES) =     4.00
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     10.25
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    234.00 TO NODE    236.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6300
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.07
  UPSTREAM ELEVATION(FEET) =    891.30
  DOWNSTREAM ELEVATION(FEET) =    890.60
  ELEVATION DIFFERENCE(FEET) =      0.70
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.660
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.570
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.41

****************************************************************************
  FLOW PROCESS FROM NODE    236.00 TO NODE    226.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  890.60  DOWNSTREAM ELEVATION(FEET) =  863.10
  STREET LENGTH(FEET) =   700.67   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 17.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.81
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
    HALFSTREET FLOOD WIDTH(FEET) =    8.91
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.18
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.27
  STREET FLOW TRAVEL TIME(MIN.) =   2.80   Tc(MIN.) =    9.46
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.240
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6300
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.630
  SUBAREA AREA(ACRES) =    2.04      SUBAREA RUNOFF(CFS) =    6.73
  TOTAL AREA(ACRES) =        2.1        PEAK FLOW RATE(CFS) =       7.06
```

```
  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.36   HALFSTREET FLOOD WIDTH(FEET) =  11.57
  FLOW VELOCITY(FEET/SEC.) =  4.85   DEPTH*VELOCITY(FT*FT/SEC.) =   1.73
  LONGEST FLOWPATH FROM NODE    234.00 TO NODE    226.00 =     765.74 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    226.00 TO NODE    226.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.46
  RAINFALL INTENSITY(INCH/HR) =   5.24
  TOTAL STREAM AREA(ACRES) =     2.14
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.06

****************************************************************************
  FLOW PROCESS FROM NODE    228.00 TO NODE    230.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6300
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    57.61
  UPSTREAM ELEVATION(FEET) =    888.20
  DOWNSTREAM ELEVATION(FEET) =    887.60
  ELEVATION DIFFERENCE(FEET) =      0.60
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.335
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.785
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.43

****************************************************************************
  FLOW PROCESS FROM NODE    230.00 TO NODE    224.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  887.60  DOWNSTREAM ELEVATION(FEET) =  863.10
  STREET LENGTH(FEET) =   491.10   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 17.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
```

```
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.08
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.28
    HALFSTREET FLOOD WIDTH(FEET) =    7.66
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.37
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.22
  STREET FLOW TRAVEL TIME(MIN.) =   1.87   Tc(MIN.) =    8.21
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.742
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6300
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.630
  SUBAREA AREA(ACRES) =    1.46      SUBAREA RUNOFF(CFS) =    5.28
  TOTAL AREA(ACRES) =        1.6        PEAK FLOW RATE(CFS) =       5.64

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) =  10.01
  FLOW VELOCITY(FEET/SEC.) =  5.04   DEPTH*VELOCITY(FT*FT/SEC.) =   1.64
  LONGEST FLOWPATH FROM NODE    228.00 TO NODE    224.00 =     548.71 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    224.00 TO NODE    226.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   853.50  DOWNSTREAM(FEET) =   852.86
  FLOW LENGTH(FEET) =    30.40   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.67
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.64
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =    8.27
  LONGEST FLOWPATH FROM NODE    228.00 TO NODE    226.00 =     579.11 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    226.00 TO NODE    226.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.27
  RAINFALL INTENSITY(INCH/HR) =   5.71
  TOTAL STREAM AREA(ACRES) =     1.56
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.64
```

```
  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       10.25     6.62        6.596          4.00
      2        7.06     9.46        5.240          2.14
      3        5.64     8.27        5.712          1.56

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       19.71     6.62       6.596
      2       20.70     8.27       5.712
      3       20.38     9.46       5.240

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      20.70   Tc(MIN.) =    8.27
  TOTAL AREA(ACRES) =        7.7
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    226.00 =    2212.96 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    226.00 TO NODE    240.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   852.86  DOWNSTREAM(FEET) =   844.00
  FLOW LENGTH(FEET) =   141.87   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.76
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      20.70
  PIPE TRAVEL TIME(MIN.) =   0.15    Tc(MIN.) =    8.42
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    240.00 =    2354.83 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    240.00 TO NODE    240.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.646
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5616
  SUBAREA AREA(ACRES) =    0.49   SUBAREA RUNOFF(CFS) =    0.97
  TOTAL AREA(ACRES) =        8.2   TOTAL RUNOFF(CFS) =     25.97
  TC(MIN.) =    8.42
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    240.00 TO NODE    240.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  12.42   RAIN INTENSITY(INCH/HOUR) =  4.40
  TOTAL AREA(ACRES) =     8.19   TOTAL RUNOFF(CFS) =     12.95

****************************************************************************
  FLOW PROCESS FROM NODE    240.00 TO NODE    242.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   840.50  DOWNSTREAM(FEET) =   839.20
  FLOW LENGTH(FEET) =   121.83   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.22
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.95
  PIPE TRAVEL TIME(MIN.) =   0.28    Tc(MIN.) =   12.70
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    242.00 =    2476.66 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    124.00 TO NODE    242.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.332
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3592
  SUBAREA AREA(ACRES) =    0.50   SUBAREA RUNOFF(CFS) =    0.76
  TOTAL AREA(ACRES) =        8.7   TOTAL RUNOFF(CFS) =      13.52
  TC(MIN.) =   12.70

****************************************************************************
  FLOW PROCESS FROM NODE    242.00 TO NODE    244.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   839.20  DOWNSTREAM(FEET) =   762.00
  FLOW LENGTH(FEET) =   294.26   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  24.40
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.52
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =   12.90
```

```
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    244.00 =    2770.92 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    244.00 TO NODE    300.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    762.00  DOWNSTREAM(FEET) =    748.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   272.23   CHANNEL SLOPE =  0.0514
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =      13.52
  FLOW VELOCITY(FEET/SEC.) =   5.71   FLOW DEPTH(FEET) =   0.70
  TRAVEL TIME(MIN.) =   0.79   Tc(MIN.) =   13.70
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    300.00 =    3043.15 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    300.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   13.70
  RAINFALL INTENSITY(INCH/HR) =   4.13
  TOTAL STREAM AREA(ACRES) =     8.69
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     13.52

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    122.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    62.60
  UPSTREAM ELEVATION(FEET) =    860.00
  DOWNSTREAM ELEVATION(FEET) =    840.00
  ELEVATION DIFFERENCE(FEET) =     20.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.958
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.25
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.25

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    300.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
```

```
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    840.00  DOWNSTREAM(FEET) =    748.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   433.46   CHANNEL SLOPE =  0.2122
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.972
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.84
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.47
  AVERAGE FLOW DEPTH(FEET) =   0.24   TRAVEL TIME(MIN.) =   1.12
  Tc(MIN.) =    6.07
  SUBAREA AREA(ACRES) =     2.93       SUBAREA RUNOFF(CFS) =    7.15
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        3.0         PEAK FLOW RATE(CFS) =       7.37

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.35   FLOW VELOCITY(FEET/SEC.) =   7.91
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    300.00 =     496.06 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    300.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.07
  RAINFALL INTENSITY(INCH/HR) =   6.97
  TOTAL STREAM AREA(ACRES) =     3.02
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.37

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    118.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    86.33
  UPSTREAM ELEVATION(FEET) =    880.00
  DOWNSTREAM ELEVATION(FEET) =    860.00
  ELEVATION DIFFERENCE(FEET) =     20.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.823
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.165
  SUBAREA RUNOFF(CFS) =      0.25
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.25

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

```
 FLOW PROCESS FROM NODE    118.00 TO NODE    300.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    860.00  DOWNSTREAM(FEET) =    748.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   448.14   CHANNEL SLOPE =  0.2499
 CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
 MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   2.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.406
 USER-SPECIFIED RUNOFF COEFFICIENT = .3500
 S.C.S. CURVE NUMBER (AMC II) =  88
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.60
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.77
 AVERAGE FLOW DEPTH(FEET) =   0.22   TRAVEL TIME(MIN.) =   1.10
 Tc(MIN.) =    6.93
 SUBAREA AREA(ACRES) =     2.98       SUBAREA RUNOFF(CFS) =    6.68
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
 TOTAL AREA(ACRES) =        3.1         PEAK FLOW RATE(CFS) =       6.91

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.32   FLOW VELOCITY(FEET/SEC.) =   8.31
 LONGEST FLOWPATH FROM NODE    116.00 TO NODE    300.00 =     534.47 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    300.00 TO NODE    300.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
 TIME OF CONCENTRATION(MIN.) =    6.93
 RAINFALL INTENSITY(INCH/HR) =   6.41
 TOTAL STREAM AREA(ACRES) =     3.08
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.91

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       13.52    13.70        4.127          8.69
     2        7.37     6.07        6.972          3.02
     3        6.91     6.93        6.406          3.08

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  3 STREAMS.

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc      INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       19.42     6.07       6.972
```

```
      2       20.51     6.93       6.406
      3       22.33    13.70       4.127

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      22.33   Tc(MIN.) =   13.70
  TOTAL AREA(ACRES) =       14.8
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    300.00 =    3043.15 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    402.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   122.16
  UPSTREAM ELEVATION(FEET) =    897.40
  DOWNSTREAM ELEVATION(FEET) =    896.10
  ELEVATION DIFFERENCE(FEET) =      1.30
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.158
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    60.64
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.62
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.62

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    404.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  896.10  DOWNSTREAM ELEVATION(FEET) =  855.71
  STREET LENGTH(FEET) =   913.21   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 17.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.33
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
```

```
    STREET FLOW DEPTH(FEET) =  0.36
    HALFSTREET FLOOD WIDTH(FEET) =   11.49
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.09
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.81
  STREET FLOW TRAVEL TIME(MIN.) =   2.99   Tc(MIN.) =    6.15
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.920
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  SUBAREA AREA(ACRES) =    2.21      SUBAREA RUNOFF(CFS) =   13.30
  TOTAL AREA(ACRES) =        2.3        PEAK FLOW RATE(CFS) =      13.85

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.42   HALFSTREET FLOOD WIDTH(FEET) =  14.85
  FLOW VELOCITY(FEET/SEC.) =  5.96   DEPTH*VELOCITY(FT*FT/SEC.) =   2.52
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    404.00 =    1035.37 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    404.00 TO NODE    410.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   847.00  DOWNSTREAM(FEET) =   846.70
  FLOW LENGTH(FEET) =    26.50   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.48
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.85
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    6.20
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    410.00 =    1061.87 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    410.00 TO NODE    410.00 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.) =    6.20
  RAINFALL INTENSITY(INCH/HR) =   6.88
  TOTAL STREAM AREA(ACRES) =     2.30
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     13.85

****************************************************************************
  FLOW PROCESS FROM NODE    406.00 TO NODE    408.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
```

```
  USER-SPECIFIED RUNOFF COEFFICIENT = .6300
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    95.00
  UPSTREAM ELEVATION(FEET) =    892.20
  DOWNSTREAM ELEVATION(FEET) =    891.20
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.746
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.79
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.516
  SUBAREA RUNOFF(CFS) =      0.45
  TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.45

****************************************************************************
  FLOW PROCESS FROM NODE    408.00 TO NODE    410.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  891.20  DOWNSTREAM ELEVATION(FEET) =  855.71
  STREET LENGTH(FEET) =   512.65   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 17.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.98
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.27
    HALFSTREET FLOOD WIDTH(FEET) =    6.96
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.95
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.31
  STREET FLOW TRAVEL TIME(MIN.) =   1.73   Tc(MIN.) =    8.47
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.625
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6300
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.630
  SUBAREA AREA(ACRES) =    1.42      SUBAREA RUNOFF(CFS) =    5.03
  TOTAL AREA(ACRES) =        1.5        PEAK FLOW RATE(CFS) =       5.42

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.31   HALFSTREET FLOOD WIDTH(FEET) =   9.15
```

```
  FLOW VELOCITY(FEET/SEC.) =  5.68   DEPTH*VELOCITY(FT*FT/SEC.) =   1.76
  LONGEST FLOWPATH FROM NODE    406.00 TO NODE    410.00 =     607.65 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    410.00 TO NODE    410.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.47
  RAINFALL INTENSITY(INCH/HR) =   5.62
  TOTAL STREAM AREA(ACRES) =     1.53
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.42

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       13.85     6.20        6.877          2.30
      2        5.42     8.47        5.625          1.53

  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       17.82     6.20       6.877
      2       16.75     8.47       5.625

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      17.82   Tc(MIN.) =    6.20
  TOTAL AREA(ACRES) =        3.8
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    410.00 =    1061.87 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    410.00 TO NODE    422.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   846.70  DOWNSTREAM(FEET) =   844.40
  FLOW LENGTH(FEET) =   124.98   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.56
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      17.82
  PIPE TRAVEL TIME(MIN.) =   0.22    Tc(MIN.) =    6.42
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    422.00 =    1186.85 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    422.00 TO NODE    422.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.42
  RAINFALL INTENSITY(INCH/HR) =   6.73
  TOTAL STREAM AREA(ACRES) =     3.83
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     17.82

****************************************************************************
  FLOW PROCESS FROM NODE    416.00 TO NODE    418.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6300
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    56.53
  UPSTREAM ELEVATION(FEET) =    890.00
  DOWNSTREAM ELEVATION(FEET) =    863.00
  ELEVATION DIFFERENCE(FEET) =     27.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.953
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.55
  TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.55

****************************************************************************
  FLOW PROCESS FROM NODE    418.00 TO NODE    420.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  863.00  DOWNSTREAM ELEVATION(FEET) =  854.14
  STREET LENGTH(FEET) =   712.23   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 17.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      4.33
```

```
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.37
    HALFSTREET FLOOD WIDTH(FEET) =   12.04
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.76
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.01
  STREET FLOW TRAVEL TIME(MIN.) =   4.30   Tc(MIN.) =    7.25
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.218
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6300
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.630
  SUBAREA AREA(ACRES) =    1.89      SUBAREA RUNOFF(CFS) =    7.40
  TOTAL AREA(ACRES) =        2.0        PEAK FLOW RATE(CFS) =       7.83

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.43   HALFSTREET FLOOD WIDTH(FEET) =  15.24
  FLOW VELOCITY(FEET/SEC.) =  3.21   DEPTH*VELOCITY(FT*FT/SEC.) =   1.38
  LONGEST FLOWPATH FROM NODE    416.00 TO NODE    420.00 =     768.76 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    420.00 TO NODE    422.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   848.50  DOWNSTREAM(FEET) =   844.40
  FLOW LENGTH(FEET) =    36.37   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.45
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.83
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    7.29
  LONGEST FLOWPATH FROM NODE    416.00 TO NODE    422.00 =     805.13 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    422.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.197
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5945
  SUBAREA AREA(ACRES) =    0.29   SUBAREA RUNOFF(CFS) =    0.63
  TOTAL AREA(ACRES) =        2.3   TOTAL RUNOFF(CFS) =       8.44
  TC(MIN.) =    7.29

****************************************************************************
  FLOW PROCESS FROM NODE    422.00 TO NODE    422.00 IS CODE =   1
----------------------------------------------------------------------------
```

```
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.29
  RAINFALL INTENSITY(INCH/HR) =   6.20
  TOTAL STREAM AREA(ACRES) =     2.29
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      8.44

****************************************************************************
  FLOW PROCESS FROM NODE    424.00 TO NODE    426.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6300
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    38.98
  UPSTREAM ELEVATION(FEET) =    890.00
  DOWNSTREAM ELEVATION(FEET) =    864.80
  ELEVATION DIFFERENCE(FEET) =     25.20
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.452
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE    426.00 TO NODE    428.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
==============================================================================
  UPSTREAM ELEVATION(FEET) =  864.80  DOWNSTREAM ELEVATION(FEET) =  853.94
  STREET LENGTH(FEET) =   845.24   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 17.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.57
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.39
    HALFSTREET FLOOD WIDTH(FEET) =   13.21
```

```
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.99
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.17
  STREET FLOW TRAVEL TIME(MIN.) =   4.71   Tc(MIN.) =    7.16
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.267
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6300
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.630
  SUBAREA AREA(ACRES) =    2.52      SUBAREA RUNOFF(CFS) =    9.95
  TOTAL AREA(ACRES) =        2.6        PEAK FLOW RATE(CFS) =      10.34

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.47   HALFSTREET FLOOD WIDTH(FEET) =  16.96
  FLOW VELOCITY(FEET/SEC.) =  3.45   DEPTH*VELOCITY(FT*FT/SEC.) =   1.61
  LONGEST FLOWPATH FROM NODE    424.00 TO NODE    428.00 =     884.22 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    428.00 TO NODE    422.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   846.00  DOWNSTREAM(FEET) =   844.40
  FLOW LENGTH(FEET) =     4.50   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  25.24
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.34
  PIPE TRAVEL TIME(MIN.) =   0.00    Tc(MIN.) =    7.17
  LONGEST FLOWPATH FROM NODE    424.00 TO NODE    422.00 =     888.72 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    422.00 TO NODE    422.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.17
  RAINFALL INTENSITY(INCH/HR) =   6.27
  TOTAL STREAM AREA(ACRES) =     2.62
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     10.34

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       17.82     6.42        6.726          3.83
      2        8.44     7.29        6.197          2.29
      3       10.34     7.17        6.266          2.62
```

```
  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       34.52     6.42       6.726
      2       35.24     7.17       6.266
      3       35.08     7.29       6.197

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      35.24   Tc(MIN.) =    7.17
  TOTAL AREA(ACRES) =        8.7
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    422.00 =    1186.85 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    422.00 TO NODE    436.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   851.10  DOWNSTREAM(FEET) =   842.68
  FLOW LENGTH(FEET) =   571.76   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  21.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.22
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      35.24
  PIPE TRAVEL TIME(MIN.) =   0.93    Tc(MIN.) =    8.10
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    436.00 =    1758.61 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    436.00 TO NODE    436.00 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.) =    8.10
  RAINFALL INTENSITY(INCH/HR) =   5.79
  TOTAL STREAM AREA(ACRES) =     8.74
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     35.24

****************************************************************************
  FLOW PROCESS FROM NODE    430.00 TO NODE    432.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6300
  S.C.S. CURVE NUMBER (AMC II) =  88
```

```
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    97.45
  UPSTREAM ELEVATION(FEET) =    856.00
  DOWNSTREAM ELEVATION(FEET) =    855.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.783
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.39
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.493
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.41

****************************************************************************
  FLOW PROCESS FROM NODE    432.00 TO NODE    436.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  855.00  DOWNSTREAM ELEVATION(FEET) =  849.56
  STREET LENGTH(FEET) =   406.58   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 17.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.90
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.29
    HALFSTREET FLOOD WIDTH(FEET) =    8.29
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.36
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.69
  STREET FLOW TRAVEL TIME(MIN.) =   2.87   Tc(MIN.) =    9.65
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.172
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6300
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.630
  SUBAREA AREA(ACRES) =    0.91      SUBAREA RUNOFF(CFS) =    2.96
  TOTAL AREA(ACRES) =        1.0        PEAK FLOW RATE(CFS) =       3.29

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =  10.55
  FLOW VELOCITY(FEET/SEC.) =  2.67   DEPTH*VELOCITY(FT*FT/SEC.) =   0.90
  LONGEST FLOWPATH FROM NODE    430.00 TO NODE    436.00 =     504.03 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    436.00 TO NODE    436.00 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.) =    9.65
  RAINFALL INTENSITY(INCH/HR) =   5.17
  TOTAL STREAM AREA(ACRES) =     1.01
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.29

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       35.24     8.10        5.791          8.74
      2        3.29     9.65        5.172          1.01

  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       38.00     8.10       5.791
      2       34.76     9.65       5.172

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      38.00   Tc(MIN.) =    8.10
  TOTAL AREA(ACRES) =        9.8
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    436.00 =    1758.61 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    436.00 TO NODE    446.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   842.35  DOWNSTREAM(FEET) =   842.00
  FLOW LENGTH(FEET) =    35.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  24.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.03
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      38.00
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    8.16
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    446.00 =    1793.61 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    446.00 TO NODE    446.00 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.) =    8.16
  RAINFALL INTENSITY(INCH/HR) =   5.76
  TOTAL STREAM AREA(ACRES) =     9.75
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     38.00

****************************************************************************
  FLOW PROCESS FROM NODE    438.00 TO NODE    440.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6300
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    76.92
  UPSTREAM ELEVATION(FEET) =    862.80
  DOWNSTREAM ELEVATION(FEET) =    862.00
  ELEVATION DIFFERENCE(FEET) =      0.80
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.763
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.60
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.505
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.41

****************************************************************************
  FLOW PROCESS FROM NODE    440.00 TO NODE    446.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  862.00  DOWNSTREAM ELEVATION(FEET) =  849.56
  STREET LENGTH(FEET) =   499.39   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 17.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.95
```

```
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
    HALFSTREET FLOOD WIDTH(FEET) =    8.76
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.34
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.01
  STREET FLOW TRAVEL TIME(MIN.) =   2.50   Tc(MIN.) =    9.26
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.312
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6300
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.630
  SUBAREA AREA(ACRES) =    1.51      SUBAREA RUNOFF(CFS) =    5.05
  TOTAL AREA(ACRES) =        1.6        PEAK FLOW RATE(CFS) =       5.39

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.35   HALFSTREET FLOOD WIDTH(FEET) =  11.41
  FLOW VELOCITY(FEET/SEC.) =  3.79   DEPTH*VELOCITY(FT*FT/SEC.) =   1.34
  LONGEST FLOWPATH FROM NODE    438.00 TO NODE    446.00 =     576.31 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    446.00 TO NODE    446.00 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.) =    9.26
  RAINFALL INTENSITY(INCH/HR) =   5.31
  TOTAL STREAM AREA(ACRES) =     1.61
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.39

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       38.00     8.16        5.761          9.75
      2        5.39     9.26        5.312          1.61

  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       42.75     8.16       5.761
      2       40.43     9.26       5.312

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      42.75   Tc(MIN.) =    8.16
  TOTAL AREA(ACRES) =       11.4
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    446.00 =    1793.61 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    446.00 TO NODE    502.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   841.67  DOWNSTREAM(FEET) =   841.38
  FLOW LENGTH(FEET) =    26.50   MANNING'S N =  0.013
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  22.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.85
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      42.75
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    8.21
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    502.00 =    1820.11 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    502.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.741
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6525
  SUBAREA AREA(ACRES) =    0.71   SUBAREA RUNOFF(CFS) =    1.43
  TOTAL AREA(ACRES) =       12.1   TOTAL RUNOFF(CFS) =      45.21
  TC(MIN.) =    8.21

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    502.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  13.21   RAIN INTENSITY(INCH/HOUR) =  4.22
  TOTAL AREA(ACRES) =    12.07   TOTAL RUNOFF(CFS) =     28.13

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    448.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   841.38  DOWNSTREAM(FEET) =   838.12
  FLOW LENGTH(FEET) =   237.62   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.65
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      28.13
  PIPE TRAVEL TIME(MIN.) =   0.41    Tc(MIN.) =   13.62
```

```
 LONGEST FLOWPATH FROM NODE    400.00 TO NODE    448.00 =    2057.73 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    448.00 TO NODE    448.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.141
 USER-SPECIFIED RUNOFF COEFFICIENT = .3500
 S.C.S. CURVE NUMBER (AMC II) =  88
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.5421
 SUBAREA AREA(ACRES) =    0.61   SUBAREA RUNOFF(CFS) =    0.88
 TOTAL AREA(ACRES) =       12.7   TOTAL RUNOFF(CFS) =      28.46
 TC(MIN.) =   13.62

****************************************************************************
 FLOW PROCESS FROM NODE    448.00 TO NODE    450.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   838.12  DOWNSTREAM(FEET) =   836.12
 FLOW LENGTH(FEET) =   199.81   MANNING'S N =  0.013
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  21.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   8.42
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      28.46
 PIPE TRAVEL TIME(MIN.) =   0.40    Tc(MIN.) =   14.02
 LONGEST FLOWPATH FROM NODE    400.00 TO NODE    450.00 =    2257.54 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    450.00 TO NODE    450.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.066
 USER-SPECIFIED RUNOFF COEFFICIENT = .3500
 S.C.S. CURVE NUMBER (AMC II) =  88
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.5295
 SUBAREA AREA(ACRES) =    0.89   SUBAREA RUNOFF(CFS) =    1.27
 TOTAL AREA(ACRES) =       13.6   TOTAL RUNOFF(CFS) =      29.21
 TC(MIN.) =   14.02

****************************************************************************
 FLOW PROCESS FROM NODE    450.00 TO NODE    452.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   836.12  DOWNSTREAM(FEET) =   794.00
 FLOW LENGTH(FEET) =   278.06   MANNING'S N =  0.013
```

```
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  24.11
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      29.21
  PIPE TRAVEL TIME(MIN.) =   0.19    Tc(MIN.) =   14.21
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    452.00 =    2535.60 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    452.00 TO NODE    600.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    794.00  DOWNSTREAM(FEET) =    787.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =    57.76   CHANNEL SLOPE =  0.1125
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =      29.21
  FLOW VELOCITY(FEET/SEC.) =   9.42   FLOW DEPTH(FEET) =   0.84
  TRAVEL TIME(MIN.) =   0.10   Tc(MIN.) =   14.31
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    600.00 =    2593.36 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    600.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   14.31
  RAINFALL INTENSITY(INCH/HR) =   4.01
  TOTAL STREAM AREA(ACRES) =    13.57
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     29.21

****************************************************************************
  FLOW PROCESS FROM NODE    504.00 TO NODE    506.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   105.25
  UPSTREAM ELEVATION(FEET) =    854.00
  DOWNSTREAM ELEVATION(FEET) =    828.00
  ELEVATION DIFFERENCE(FEET) =     26.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =   100.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.833
```

```
  SUBAREA RUNOFF(CFS) =      0.24
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.24

****************************************************************************
  FLOW PROCESS FROM NODE    506.00 TO NODE    600.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    828.00  DOWNSTREAM(FEET) =    787.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   277.28   CHANNEL SLOPE =  0.1461
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.043
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.92
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.51
  AVERAGE FLOW DEPTH(FEET) =   0.12   TRAVEL TIME(MIN.) =   1.32
  Tc(MIN.) =    7.58
  SUBAREA AREA(ACRES) =     0.64       SUBAREA RUNOFF(CFS) =    1.35
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        0.7         PEAK FLOW RATE(CFS) =       1.57

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.16   FLOW VELOCITY(FEET/SEC.) =   4.30
  LONGEST FLOWPATH FROM NODE    504.00 TO NODE    600.00 =     382.53 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    600.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.58
  RAINFALL INTENSITY(INCH/HR) =   6.04
  TOTAL STREAM AREA(ACRES) =     0.74
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.57

****************************************************************************
  FLOW PROCESS FROM NODE    508.00 TO NODE    510.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    66.63
  UPSTREAM ELEVATION(FEET) =    880.00
  DOWNSTREAM ELEVATION(FEET) =    848.00
  ELEVATION DIFFERENCE(FEET) =     32.00
```

```
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.115
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.789
  SUBAREA RUNOFF(CFS) =      0.27
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.27

****************************************************************************
  FLOW PROCESS FROM NODE    510.00 TO NODE    600.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    848.00  DOWNSTREAM(FEET) =    787.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1600.24   CHANNEL SLOPE =  0.0378
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.154
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      21.50
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.81
  AVERAGE FLOW DEPTH(FEET) =   0.95   TRAVEL TIME(MIN.) =   4.59
  Tc(MIN.) =    9.70
  SUBAREA AREA(ACRES) =    22.85       SUBAREA RUNOFF(CFS) =   41.22
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       23.0         PEAK FLOW RATE(CFS) =      41.40

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.30   FLOW VELOCITY(FEET/SEC.) =   6.91
  LONGEST FLOWPATH FROM NODE    508.00 TO NODE    600.00 =    1666.87 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    512.00 TO NODE    600.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.154
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.88   SUBAREA RUNOFF(CFS) =    1.59
  TOTAL AREA(ACRES) =       23.8   TOTAL RUNOFF(CFS) =      42.99
  TC(MIN.) =    9.70

****************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    600.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
```

```
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.70
  RAINFALL INTENSITY(INCH/HR) =   5.15
  TOTAL STREAM AREA(ACRES) =    23.83
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     42.99

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       29.21    14.31        4.011         13.57
      2        1.57     7.58        6.043          0.74
      3       42.99     9.70        5.154         23.83

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       50.63     7.58       6.043
      2       64.13     9.70       5.154
      3       63.71    14.31       4.011

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      64.13   Tc(MIN.) =    9.70
  TOTAL AREA(ACRES) =       38.1
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    600.00 =    2593.36 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    700.00 TO NODE    702.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   213.54
  UPSTREAM ELEVATION(FEET) =    850.00
  DOWNSTREAM ELEVATION(FEET) =    844.48
  ELEVATION DIFFERENCE(FEET) =      5.52
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.627
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    75.85
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.72
  TOTAL AREA(ACRES) =      0.25   TOTAL RUNOFF(CFS) =      1.72
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    702.00 TO NODE    704.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   840.00  DOWNSTREAM(FEET) =   838.92
  FLOW LENGTH(FEET) =    29.73   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.68
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.72
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =    2.70
  LONGEST FLOWPATH FROM NODE    700.00 TO NODE    704.00 =     243.27 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    704.00 TO NODE    704.00 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.) =    2.70
  RAINFALL INTENSITY(INCH/HR) =   7.90
  TOTAL STREAM AREA(ACRES) =     0.25
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.72

****************************************************************************
  FLOW PROCESS FROM NODE    706.00 TO NODE    708.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   257.40
  UPSTREAM ELEVATION(FEET) =    850.00
  DOWNSTREAM ELEVATION(FEET) =    844.48
  ELEVATION DIFFERENCE(FEET) =      5.52
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.714
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    71.45
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.31
  TOTAL AREA(ACRES) =      0.19   TOTAL RUNOFF(CFS) =      1.31

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

```
  FLOW PROCESS FROM NODE    710.00 TO NODE    708.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6323
  SUBAREA AREA(ACRES) =    0.16   SUBAREA RUNOFF(CFS) =    0.44
  TOTAL AREA(ACRES) =        0.3   TOTAL RUNOFF(CFS) =       1.75
  TC(MIN.) =    2.71

****************************************************************************
  FLOW PROCESS FROM NODE    708.10 TO NODE    708.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3400
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5531
  SUBAREA AREA(ACRES) =    0.13   SUBAREA RUNOFF(CFS) =    0.35
  TOTAL AREA(ACRES) =        0.5   TOTAL RUNOFF(CFS) =       2.10
  TC(MIN.) =    2.71

****************************************************************************
  FLOW PROCESS FROM NODE    708.00 TO NODE    704.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   840.00  DOWNSTREAM(FEET) =   838.92
  FLOW LENGTH(FEET) =    12.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.75
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.10
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    2.73
  LONGEST FLOWPATH FROM NODE    706.00 TO NODE    704.00 =     269.40 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    704.00 TO NODE    704.00 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.) =    2.73
  RAINFALL INTENSITY(INCH/HR) =   7.90
  TOTAL STREAM AREA(ACRES) =     0.48
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.10

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        1.72     2.70        7.904          0.25
      2        2.10     2.73        7.904          0.48

  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        3.79     2.70       7.904
      2        3.82     2.73       7.904

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       3.82   Tc(MIN.) =    2.73
  TOTAL AREA(ACRES) =        0.7
  LONGEST FLOWPATH FROM NODE    706.00 TO NODE    704.00 =     269.40 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    96.76
  UPSTREAM ELEVATION(FEET) =    980.00
  DOWNSTREAM ELEVATION(FEET) =    970.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.164
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.906
  SUBAREA RUNOFF(CFS) =      0.24
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.24

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    104.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    970.00  DOWNSTREAM(FEET) =    720.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   876.89   CHANNEL SLOPE =  0.2851
```

```
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.666
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.05
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.60
  AVERAGE FLOW DEPTH(FEET) =   0.19   TRAVEL TIME(MIN.) =   2.21
  Tc(MIN.) =    8.38
  SUBAREA AREA(ACRES) =     2.80       SUBAREA RUNOFF(CFS) =    5.55
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        2.9         PEAK FLOW RATE(CFS) =       5.75

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.28   FLOW VELOCITY(FEET/SEC.) =   8.11
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =     973.65 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    304.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    72.47
  UPSTREAM ELEVATION(FEET) =    848.00
  DOWNSTREAM ELEVATION(FEET) =    822.00
  ELEVATION DIFFERENCE(FEET) =     26.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.335
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.581
  SUBAREA RUNOFF(CFS) =      0.29
  TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.29

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    306.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    822.00  DOWNSTREAM(FEET) =    770.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   253.00   CHANNEL SLOPE =  0.2055
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.919
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.08
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.19
  AVERAGE FLOW DEPTH(FEET) =   0.17   TRAVEL TIME(MIN.) =   0.81
  Tc(MIN.) =    6.15
```

```
  SUBAREA AREA(ACRES) =     1.47       SUBAREA RUNOFF(CFS) =    3.56
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        1.6         PEAK FLOW RATE(CFS) =       3.83

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.24   FLOW VELOCITY(FEET/SEC.) =   6.45
  LONGEST FLOWPATH FROM NODE    302.00 TO NODE    306.00 =     325.47 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.6  TC(MIN.) =      6.15
  PEAK FLOW RATE(CFS)   =       3.83
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

CHAPTER 4

HYDROLOGIC SOIL GROUP

Hydrologic Soil Group—San Diego County Area, California
(Renzulli Soil Map)

Map Scale: 1:3,130 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 45 90 180 270

Feet: 0 150 300 600 900

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

Streams and Canals

Transportation

Rails
Interstate Highways
US Routes
Major Roads
Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 15, May 27, 2020

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

Date(s) aerial images were photographed: Aug 22, 2018—Aug 31, 2018

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
RfF	Redding cobbly loam, dissected, 15 to 50 percent slopes	D	40.0	98.5%
Rm	Riverwash	D	0.6	1.5%
Totals for Area of Interest			**40.6**	**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

CHAPTER 5

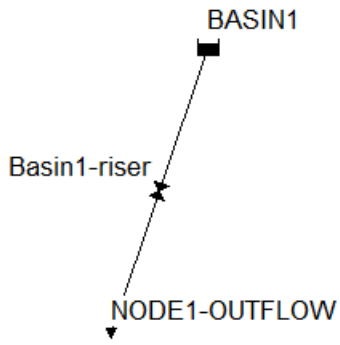
DETENTION ANALYSIS & CALCULATIONS

RENZULLI ESTATES												
DMA ID	Total Area (sft)	Runoff Coefficient	DCV	BMP ID (biofiltration basin)	Required Biofiltration area (sf)	Provided biofiltration area (sf)	WQ ponding Depth (inch)*	LID orifice (in)	HMP WSE (FT)*	100 year WSE (FT)*	Basin Depth (ft)*	FreeBoard (ft)*
DMA 1	357035.39	0.49	8,645	BF-1-1	5275.12	5600	6	1.00	4.00	4.22	6	1.78
DMA 2	526248.25	0.55	14,257	BF-1-2	8699.07	9200	6	1.50	3.45	3.98	6	2.02
DMA 3	15302.16	0.41	306	BF-3-3	FTBSIB-4-6	N/A						
DMA 4	10728.65	0.46	245	BF-3-4	FTBSIB-4-4	N/A						

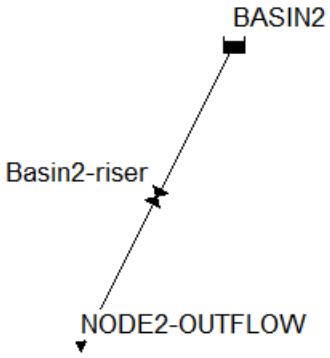
*Depth Measured from Basin bottom Elevation

HMP ID	Sub-Drain Orifice Diameter	Bottom Orifice	Mid Orifice	Top orifice	Emergency Weir (inside dimensions)
BF-1-1	6"	1" @ 0.50'	One 0.75" @ 1.75'	One 3" @ 2.5'	2'x3' @ 4.2'
BF-1-2	6"	1.5" @ 0.50'	One 1.5" @2.0'	One 3" @ 2.5'	2'x3 '@ 3.6'

Note: DMA 3 & 4 meet the HMP flow control requirement when measured at POC-1
BF-1-1 has been sized to provide additional hydromodification flow control and mitigate impact from the DMA 3&4. Refer to HMP analysis



BASIN BF-1-1
DETENTION MODEL

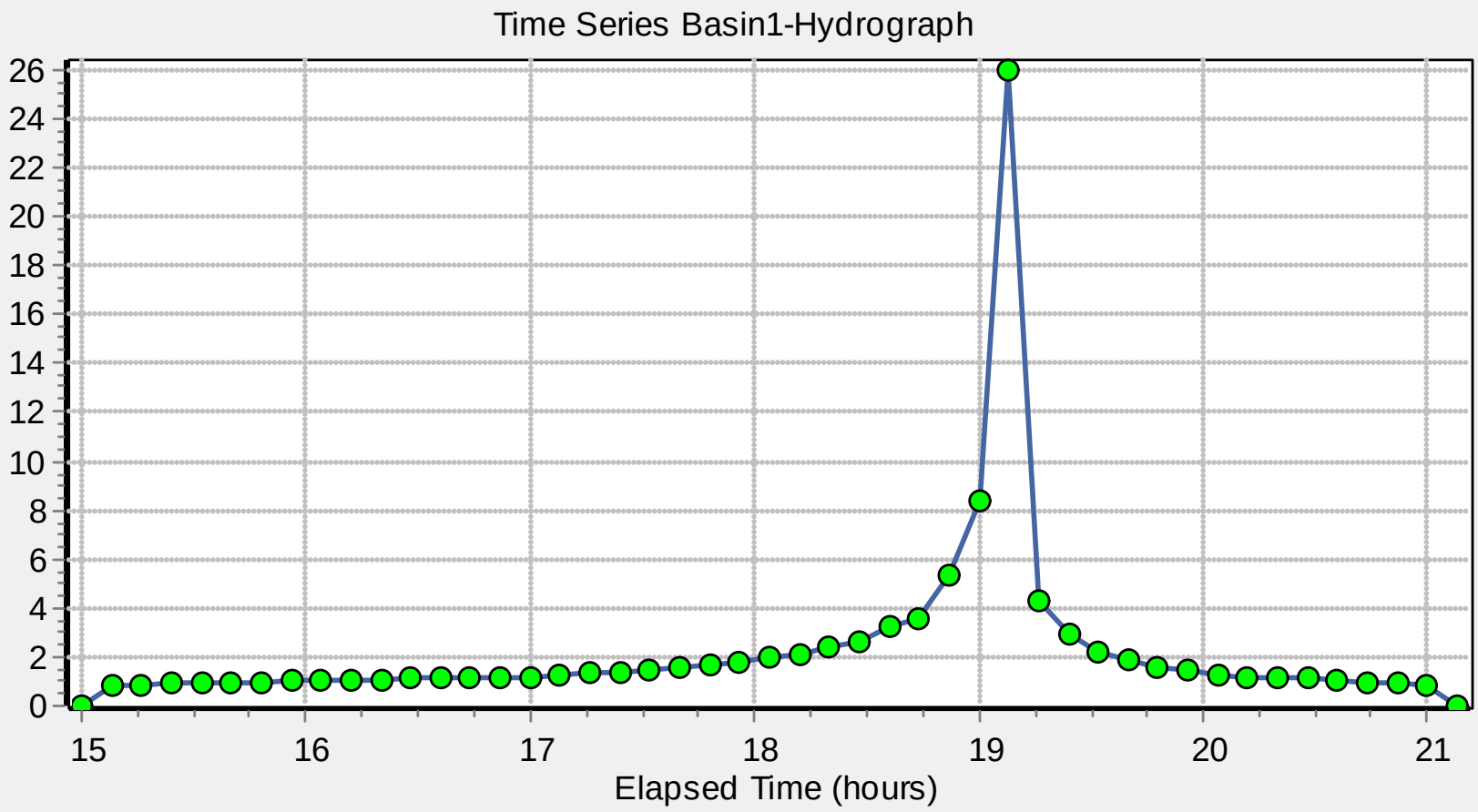


BASIN BF-1-2
DETENTION MODEL

RATIONAL METHOD HYDROGRAPH PROG RAM
COPYRIGHT 1992, 2001 RICK ENGIN EERING COMPANY
RUN DATE 10/02/23
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 8 MIN.
6 HOUR RAINFALL 3 INCHES
BASIN AREA 8.19 ACRES
RUNOFF COEFFICIENT 0.5616
PEAK DISCHARGE 25.97 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 8	DISCHARGE (CFS) = 0.8
TIME (MIN) = 16	DISCHARGE (CFS) = 0.8
TIME (MIN) = 24	DISCHARGE (CFS) = 0.9
TIME (MIN) = 32	DISCHARGE (CFS) = 0.9
TIME (MIN) = 40	DISCHARGE (CFS) = 0.9
TIME (MIN) = 48	DISCHARGE (CFS) = 0.9
TIME (MIN) = 56	DISCHARGE (CFS) = 1
TIME (MIN) = 64	DISCHARGE (CFS) = 1
TIME (MIN) = 72	DISCHARGE (CFS) = 1
TIME (MIN) = 80	DISCHARGE (CFS) = 1
TIME (MIN) = 88	DISCHARGE (CFS) = 1.1
TIME (MIN) = 96	DISCHARGE (CFS) = 1.1
TIME (MIN) = 104	DISCHARGE (CFS) = 1.2
TIME (MIN) = 112	DISCHARGE (CFS) = 1.2
TIME (MIN) = 120	DISCHARGE (CFS) = 1.2
TIME (MIN) = 128	DISCHARGE (CFS) = 1.3
TIME (MIN) = 136	DISCHARGE (CFS) = 1.4
TIME (MIN) = 144	DISCHARGE (CFS) = 1.4
TIME (MIN) = 152	DISCHARGE (CFS) = 1.5
TIME (MIN) = 160	DISCHARGE (CFS) = 1.6
TIME (MIN) = 168	DISCHARGE (CFS) = 1.7
TIME (MIN) = 176	DISCHARGE (CFS) = 1.8
TIME (MIN) = 184	DISCHARGE (CFS) = 2
TIME (MIN) = 192	DISCHARGE (CFS) = 2.1
TIME (MIN) = 200	DISCHARGE (CFS) = 2.4
TIME (MIN) = 208	DISCHARGE (CFS) = 2.6
TIME (MIN) = 216	DISCHARGE (CFS) = 3.2
TIME (MIN) = 224	DISCHARGE (CFS) = 3.6
TIME (MIN) = 232	DISCHARGE (CFS) = 5.3
TIME (MIN) = 240	DISCHARGE (CFS) = 8.4
TIME (MIN) = 248	DISCHARGE (CFS) = 25.97
TIME (MIN) = 256	DISCHARGE (CFS) = 4.3
TIME (MIN) = 264	DISCHARGE (CFS) = 2.9
TIME (MIN) = 272	DISCHARGE (CFS) = 2.2
TIME (MIN) = 280	DISCHARGE (CFS) = 1.9
TIME (MIN) = 288	DISCHARGE (CFS) = 1.6
TIME (MIN) = 296	DISCHARGE (CFS) = 1.5
TIME (MIN) = 304	DISCHARGE (CFS) = 1.3
TIME (MIN) = 312	DISCHARGE (CFS) = 1.2
TIME (MIN) = 320	DISCHARGE (CFS) = 1.1
TIME (MIN) = 328	DISCHARGE (CFS) = 1.1
TIME (MIN) = 336	DISCHARGE (CFS) = 1
TIME (MIN) = 344	DISCHARGE (CFS) = 0.9
TIME (MIN) = 352	DISCHARGE (CFS) = 0.9
TIME (MIN) = 360	DISCHARGE (CFS) = 0.8
TIME (MIN) = 368	DISCHARGE (CFS) = 0

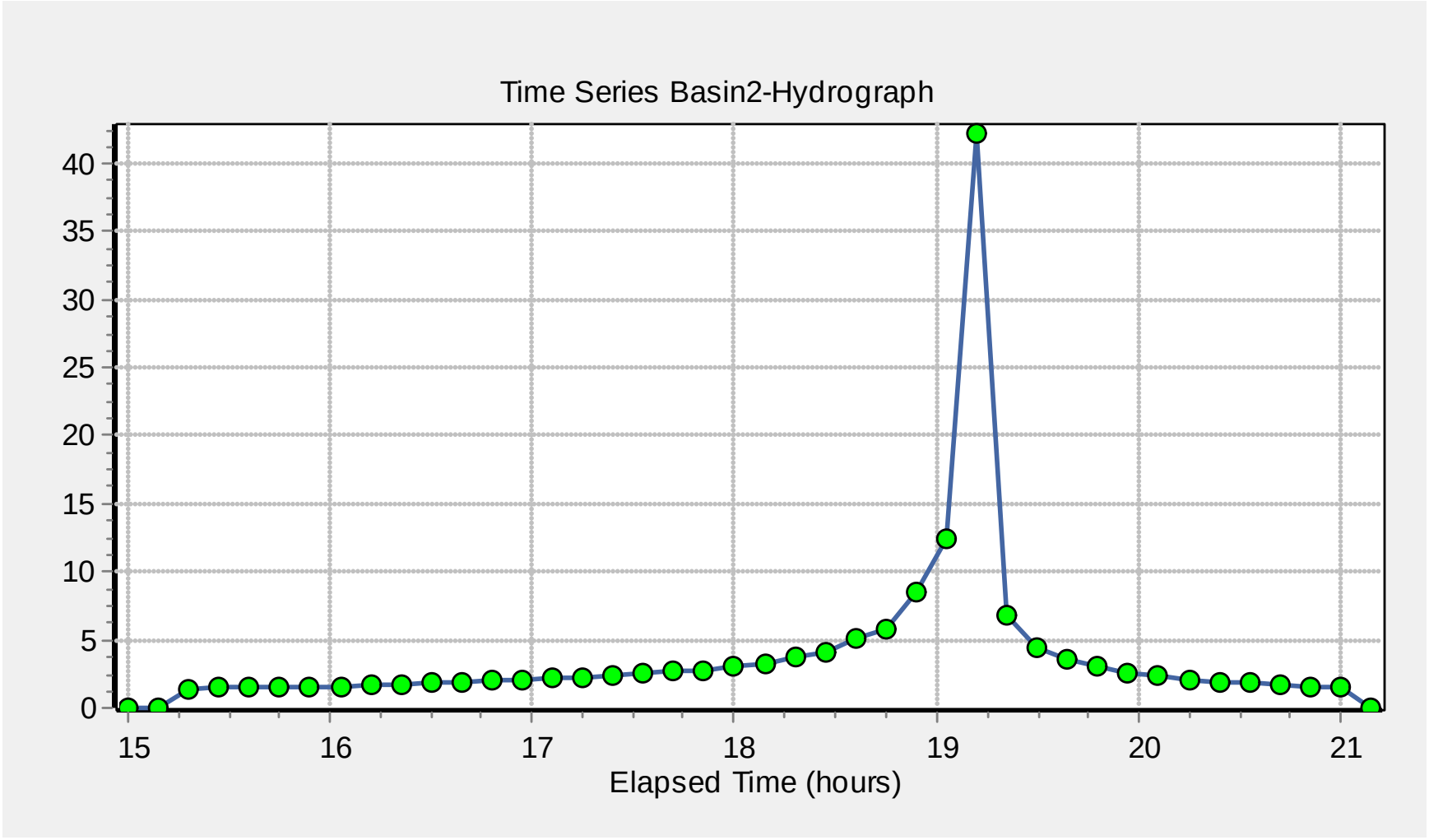
Renzulli Estates



RATIONAL METHOD HYDROGRAPH PROGRAM
COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY
RUN DATE 10/02/2023
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 8 MIN.
6 HOUR RAINFALL 3 INCHES
BASIN AREA 12.07 ACRES
RUNOFF COEFFICIENT 0.6462
PEAK DISCHARGE 45.21 CFS

TIME (MIN) = 0	DISCHARGE (CFS) =	0
TIME (MIN) = 8	DISCHARGE (CFS) =	1.4
TIME (MIN) = 16	DISCHARGE (CFS) =	1.4
TIME (MIN) = 24	DISCHARGE (CFS) =	1.5
TIME (MIN) = 32	DISCHARGE (CFS) =	1.5
TIME (MIN) = 40	DISCHARGE (CFS) =	1.5
TIME (MIN) = 48	DISCHARGE (CFS) =	1.6
TIME (MIN) = 56	DISCHARGE (CFS) =	1.6
TIME (MIN) = 64	DISCHARGE (CFS) =	1.7
TIME (MIN) = 72	DISCHARGE (CFS) =	1.7
TIME (MIN) = 80	DISCHARGE (CFS) =	1.8
TIME (MIN) = 88	DISCHARGE (CFS) =	1.8
TIME (MIN) = 96	DISCHARGE (CFS) =	1.9
TIME (MIN) = 104	DISCHARGE (CFS) =	2
TIME (MIN) = 112	DISCHARGE (CFS) =	2
TIME (MIN) = 120	DISCHARGE (CFS) =	2.1
TIME (MIN) = 128	DISCHARGE (CFS) =	2.2
TIME (MIN) = 136	DISCHARGE (CFS) =	2.3
TIME (MIN) = 144	DISCHARGE (CFS) =	2.4
TIME (MIN) = 152	DISCHARGE (CFS) =	2.6
TIME (MIN) = 160	DISCHARGE (CFS) =	2.7
TIME (MIN) = 168	DISCHARGE (CFS) =	2.9
TIME (MIN) = 176	DISCHARGE (CFS) =	3
TIME (MIN) = 184	DISCHARGE (CFS) =	3.4
TIME (MIN) = 192	DISCHARGE (CFS) =	3.6
TIME (MIN) = 200	DISCHARGE (CFS) =	4.1
TIME (MIN) = 208	DISCHARGE (CFS) =	4.5
TIME (MIN) = 216	DISCHARGE (CFS) =	5.4
TIME (MIN) = 224	DISCHARGE (CFS) =	6.2
TIME (MIN) = 232	DISCHARGE (CFS) =	9.1
TIME (MIN) = 240	DISCHARGE (CFS) =	13.6
TIME (MIN) = 248	DISCHARGE (CFS) =	45.21
TIME (MIN) = 256	DISCHARGE (CFS) =	7.3
TIME (MIN) = 264	DISCHARGE (CFS) =	4.9
TIME (MIN) = 272	DISCHARGE (CFS) =	3.8
TIME (MIN) = 280	DISCHARGE (CFS) =	3.2
TIME (MIN) = 288	DISCHARGE (CFS) =	2.8
TIME (MIN) = 296	DISCHARGE (CFS) =	2.5
TIME (MIN) = 304	DISCHARGE (CFS) =	2.3
TIME (MIN) = 312	DISCHARGE (CFS) =	2.1
TIME (MIN) = 320	DISCHARGE (CFS) =	1.9
TIME (MIN) = 328	DISCHARGE (CFS) =	1.8
TIME (MIN) = 336	DISCHARGE (CFS) =	1.7
TIME (MIN) = 344	DISCHARGE (CFS) =	1.6
TIME (MIN) = 352	DISCHARGE (CFS) =	1.5
TIME (MIN) = 360	DISCHARGE (CFS) =	1.5
TIME (MIN) = 368	DISCHARGE (CFS) =	0

Renzulli Estates



RENZULLI ESTATES Stage Storage					
BF-1-1					
depth	area	area (ac)	elevation	volume (cf)	volume (acft)
0.00	5600	0.129	718.9	0	
0.05	5645	0.130	718.95	281.1	0.006454
0.10	5690	0.131	719	564.5	0.012959
0.15	5735	0.132	719.05	850.1	0.019516
0.20	5780	0.133	719.1	1138.0	0.026125
0.25	5825	0.134	719.15	1428.2	0.032786
0.30	5870	0.135	719.2	1720.5	0.039498
0.35	5915	0.136	719.25	2015.2	0.046262
0.40	5960	0.137	719.3	2312.1	0.053078
0.45	6005	0.138	719.35	2611.2	0.059946
0.50	6051	0.139	719.4	2912.6	0.066865
0.55	6096	0.140	719.45	3216.3	0.073836
0.60	6141	0.141	719.5	3522.2	0.080858
0.65	6186	0.142	719.55	3830.3	0.087932
0.70	6231	0.143	719.6	4140.7	0.095058
0.75	6276	0.144	719.65	4453.4	0.102236
0.80	6321	0.145	719.7	4768.3	0.109466
0.85	6366	0.146	719.75	5085.5	0.116747
0.90	6411	0.147	719.8	5404.9	0.12408
0.95	6456	0.148	719.85	5726.6	0.131464
1.00	6501	0.149	719.9	6050.5	0.1389
1.05	6549	0.150	719.95	6376.7	0.14639
1.10	6597	0.151	720	6705.4	0.153935
1.15	6645	0.153	720.05	7036.4	0.161534
1.20	6693	0.154	720.1	7369.9	0.169189
1.25	6741	0.155	720.15	7705.7	0.176899
1.30	6789	0.156	720.2	8044.0	0.184664
1.35	6837	0.157	720.25	8384.6	0.192484
1.40	6885	0.158	720.3	8727.6	0.200359
1.45	6933	0.159	720.35	9073.0	0.208289
1.50	6981	0.160	720.4	9420.9	0.216274
1.55	7028	0.161	720.45	9771.1	0.224314
1.60	7076	0.162	720.5	10123.7	0.232409
1.65	7124	0.164	720.55	10478.7	0.240559
1.70	7172	0.165	720.6	10836.2	0.248764
1.75	7220	0.166	720.65	11196.0	0.257024
1.80	7268	0.167	720.7	11558.2	0.265339
1.85	7316	0.168	720.75	11922.8	0.27371
1.90	7364	0.169	720.8	12289.8	0.282135
1.95	7412	0.170	720.85	12659.2	0.290615
2.00	7460	0.171	720.9	13031.0	0.299151
2.05	7511	0.172	720.95	13405.3	0.307743
2.10	7562	0.174	721	13782.1	0.316393
2.15	7612	0.175	721.05	14161.4	0.325101
2.20	7663	0.176	721.1	14543.3	0.333868
2.25	7714	0.177	721.15	14927.7	0.342693
2.30	7765	0.178	721.2	15314.7	0.351577
2.35	7815	0.179	721.25	15704.2	0.360518
2.40	7866	0.181	721.3	16096.2	0.369518
2.45	7917	0.182	721.35	16490.8	0.378576
2.50	7968	0.183	721.4	16887.9	0.387692
2.55	8018	0.184	721.45	17287.5	0.396867
2.60	8069	0.185	721.5	17689.7	0.4061
2.65	8120	0.186	721.55	18094.4	0.415391
2.70	8171	0.188	721.6	18501.7	0.42474
2.75	8221	0.189	721.65	18911.5	0.434148
2.80	8272	0.190	721.7	19323.8	0.443613
2.85	8323	0.191	721.75	19738.7	0.453137
2.90	8374	0.192	721.8	20156.1	0.46272
2.95	8424	0.193	721.85	20576.0	0.47236
3.00	8475	0.195	721.9	20998.5	0.482059
3.05	8529	0.196	721.9	21423.6	0.491818

depth	area	area (ac)	elevation	volume (cf)	volume (acft)
3.10	8582	0.197	722.0	21851.4	0.501638
3.15	8636	0.198	722.0	22281.8	0.51152
3.20	8689	0.199	722.1	22714.9	0.521463
3.25	8743	0.201	722.1	23150.7	0.531468
3.30	8797	0.202	722.2	23589.2	0.541534
3.35	8850	0.203	722.2	24030.4	0.551662
3.40	8904	0.204	722.3	24474.3	0.561852
3.45	8957	0.206	722.3	24920.8	0.572103
3.50	9011	0.207	722.4	25370.0	0.582415
3.55	9065	0.208	722.4	25821.9	0.592789
3.60	9118	0.209	722.5	26276.5	0.603225
3.65	9172	0.211	722.5	26733.7	0.613722
3.70	9225	0.212	722.6	27193.6	0.62428
3.75	9279	0.213	722.6	27656.2	0.6349
3.80	9333	0.214	722.7	28121.5	0.645582
3.85	9386	0.215	722.7	28589.5	0.656325
3.90	9440	0.217	722.8	29060.2	0.667129
3.95	9493	0.218	722.8	29533.5	0.677996
4.00	9547	0.219	722.9	30009.5	0.688923
4.05	9603	0.220	722.9	30488.3	0.699914
4.10	9660	0.222	723.0	30969.8	0.71097
4.15	9716	0.223	723.0	31454.2	0.72209
4.20	9773	0.224	723.1	31941.5	0.733275
4.25	9829	0.226	723.1	32431.5	0.744525
4.30	9885	0.227	723.2	32924.4	0.755839
4.35	9942	0.228	723.2	33420.0	0.767219
4.40	9998	0.230	723.3	33918.5	0.778663
4.45	10055	0.231	723.3	34419.9	0.790171
4.50	10111	0.232	723.4	34924.0	0.801745
4.55	10167	0.233	723.4	35431.0	0.813383
4.60	10224	0.235	723.5	35940.7	0.825086
4.65	10280	0.236	723.5	36453.3	0.836854
4.70	10337	0.237	723.6	36968.8	0.848686
4.75	10393	0.239	723.6	37487.0	0.860583
4.80	10449	0.240	723.7	38008.1	0.872545
4.85	10506	0.241	723.7	38531.9	0.884572
4.90	10562	0.242	723.8	39058.6	0.896663
4.95	10619	0.244	723.8	39588.2	0.908819
5.00	10675	0.245	723.9	40120.5	0.92104
5.05	10734	0.246	723.9	40655.7	0.933327
5.10	10793	0.248	724.0	41193.9	0.945682
5.15	10853	0.249	724.0	41735.1	0.958105
5.20	10912	0.251	724.1	42279.2	0.970596
5.25	10971	0.252	724.1	42826.3	0.983155
5.30	11030	0.253	724.2	43376.3	0.995782
5.35	11089	0.255	724.2	43929.3	1.008477
5.40	11149	0.256	724.3	44485.2	1.02124
5.45	11208	0.257	724.3	45044.1	1.034071
5.50	11267	0.259	724	45606	1
5.55	11326	0.260	724.4	46170.8	1.059936
5.60	11385	0.261	724.5	46738.6	1.072971
5.65	11445	0.263	724.5	47309.4	1.086074
5.70	11504	0.264	724.6	47883.1	1.099244
5.75	11563	0.265	724.6	48459.8	1.112483
5.80	11622	0.267	724.7	49039.4	1.125789
5.85	11681	0.268	724.7	49622.0	1.139164
5.90	11741	0.270	724.8	50207.5	1.152606
5.95	11800	0.271	724.8	50796.0	1.166116
6.00	11859	0.272	725	51388	1

RENZULLI ESTATES BF 1-1

Discharge vs Elevation Table

Bottom orifice diameter:	1 "	Top orifice diameter:	3 "
Number:	1	Number:	1
Cg-low:	0.61	Cg-low:	0.61
invert elev:	0.50 ft	invert elev:	2.50 ft
Middle orifice diameter:	0.75 "	Emergency weir:	
number of orif:	1	Invert:	4.20 ft
Cg-middle:	0.61	Weir Length (ft)	10.00 ft
invert elev:	1.75 ft	Riser Box LxW	2x3

h	H/D-low	H/D-mid	H/D-top	H/D-peak	Qlow-orif	Qlow-weir	Qtot-low	Qmid-orif	Qmid-weir	Qtot-med	Qtop-orif	Qtop-weir	Qtot-top	Qpeak-top	Qtot
(ft)	-	-	-	-	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.55	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.002
0.60	1.20	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.006
0.65	1.80	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.009
0.70	2.40	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.011
0.75	3.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.012
0.80	3.60	0.00	0.00	0.00	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.014
0.85	4.20	0.00	0.00	0.00	0.01	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.015
0.90	4.80	0.00	0.00	0.00	0.02	0.07	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.016
0.95	5.40	0.00	0.00	0.00	0.02	0.16	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.017
1.00	6.00	0.00	0.00	0.00	0.02	0.34	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.018
1.05	6.60	0.00	0.00	0.00	0.02	0.65	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.019
1.10	7.20	0.00	0.00	0.00	0.02	1.15	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.020
1.15	7.80	0.00	0.00	0.00	0.02	1.92	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.021
1.20	8.40	0.00	0.00	0.00	0.02	3.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.022
1.25	9.00	0.00	0.00	0.00	0.02	4.60	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.022
1.30	9.60	0.00	0.00	0.00	0.02	6.74	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.023
1.35	10.20	0.00	0.00	0.00	0.02	9.61	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.024
1.40	10.80	0.00	0.00	0.00	0.02	13.38	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.025
1.45	11.40	0.00	0.00	0.00	0.03	18.22	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.025
1.50	12.00	0.00	0.00	0.00	0.03	24.36	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.026
1.55	12.60	0.00	0.00	0.00	0.03	32.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.027
1.60	13.20	0.00	0.00	0.00	0.03	41.50	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.027
1.65	13.80	0.00	0.00	0.00	0.03	53.07	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.028
1.70	14.40	0.00	0.00	0.00	0.03	67.08	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.029
1.75	15.00	0.00	0.00	0.00	0.03	83.87	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.029
1.80	15.60	0.80	0.00	0.00	0.03	103.84	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.032
1.85	16.20	1.60	0.00	0.00	0.03	127.43	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.034
1.90	16.80	2.40	0.00	0.00	0.03	155.09	0.03	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.036
1.95	17.40	3.20	0.00	0.00	0.03	187.34	0.03	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.038
2.00	18.00	4.00	0.00	0.00	0.03	224.72	0.03	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.039
2.05	18.60	4.80	0.00	0.00	0.03	267.80	0.03	0.01	0.03	0.01	0.00	0.00	0.00	0.00	0.041
2.10	19.20	5.60	0.00	0.00	0.03	317.23	0.03	0.01	0.10	0.01	0.00	0.00	0.00	0.00	0.042
2.15	19.80	6.40	0.00	0.00	0.03	373.67	0.03	0.01	0.26	0.01	0.00	0.00	0.00	0.00	0.043
2.20	20.40	7.20	0.00	0.00	0.03	437.84	0.03	0.01	0.56	0.01	0.00	0.00	0.00	0.00	0.044
2.25	21.00	8.00	0.00	0.00	0.03	510.51	0.03	0.01	1.09	0.01	0.00	0.00	0.00	0.00	0.045
2.30	21.60	8.80	0.00	0.00	0.04	592.48	0.04	0.01	1.96	0.01	0.00	0.00	0.00	0.00	0.046
2.35	22.20	9.60	0.00	0.00	0.04	684.63	0.04	0.01	3.28	0.01	0.00	0.00	0.00	0.00	0.047
2.40	22.80	10.40	0.00	0.00	0.04	787.87	0.04	0.01	5.24	0.01	0.00	0.00	0.00	0.00	0.048
2.45	23.40	11.20	0.00	0.00	0.04	903.17	0.04	0.01	8.02	0.01	0.00	0.00	0.00	0.00	0.049
2.50	24.00	12.00	0.00	0.00	0.04	1031.55	0.04	0.01	11.86	0.01	0.00	0.00	0.00	0.00	0.050
2.55	24.60	12.80	0.20	0.00	0.04	1174.09	0.04	0.01	17.03	0.01	0.00	0.00	0.00	0.00	0.055
2.60	25.20	13.60	0.40	0.00	0.04	1331.93	0.04	0.01	23.85	0.01	0.00	0.02	0.02	0.00	0.068
2.65	25.80	14.40	0.60	0.00	0.04	1506.26	0.04	0.01	32.68	0.01	0.04	0.03	0.03	0.00	0.086
2.70	26.40	15.20	0.80	0.00	0.04	1698.35	0.04	0.01	43.92	0.01	0.07	0.06	0.06	0.00	0.109
2.75	27.00	16.00	1.00	0.00	0.04	1909.52	0.04	0.01	58.04	0.01	0.08	0.08	0.08	0.00	0.136
2.80	27.60	16.80	1.20	0.00	0.04	2141.14	0.04	0.02	75.55	0.02	0.10	0.11	0.10	0.00	0.156
2.85	28.20	17.60	1.40	0.00	0.04	2394.66	0.04	0.02	97.04	0.02	0.11	0.13	0.11	0.00	0.170
2.90	28.80	18.40	1.60	0.00	0.04	2671.61	0.04	0.02	123.13	0.02	0.13	0.16	0.13	0.00	0.183
2.95	29.40	19.20	1.80	0.00	0.04	2973.56	0.04	0.02	154.54	0.02	0.14	0.18	0.14	0.00	0.195
3.00	30.00	20.00	2.00	0.00	0.04	3302.17	0.04	0.02	192.01	0.02	0.15	0.20	0.15	0.00	0.206
3.05	30.60	20.80	2.20	0.00	0.04	3659.16	0.04	0.02	236.40	0.02	0.16	0.21	0.16	0.00	0.216
3.10	31.20	21.60	2.40	0.00	0.04	4046.33	0.04	0.02	288.62	0.02	0.17	0.22	0.17	0.00	0.226
3.15	31.80	22.40	2.60	0.00	0.04	4465.55	0.04	0.02	349.65	0.02	0.17	0.22	0.17	0.00	0.235
3.20	32.40	23.20	2.80	0.00	0.04	4918.76	0.04	0.02	420.56	0.02	0.18	0.22	0.18	0.00	0.244
3.25	33.00	24.00	3.00	0.00	0.04	5408.00	0.04	0.02	502.51	0.02	0.19	0.22	0.19	0.00	0.252
3.30	33.60	24.80	3.20	0.00	0.04	5935.36	0.04	0.02	596.72	0.02	0.20	0.22	0.20	0.00	0.260
3.35	34.20	25.60	3.40	0.00	0.04	6503.02	0.04	0.02	704.52	0.02	0.20	0.24	0.20	0.00	0.268
3.40	34.80	26.40	3.60	0.00	0.05	7113.25	0.05	0.02	827.33	0.02	0.21	0.26	0.21	0.00	0.276
3.45	35.40	27.20	3.80	0.00	0.05	7768.41	0.05	0.02	966.67	0.02	0.22	0.30	0.22	0.00	0.283
3.50	36.00	28.00	4.00	0.00	0.05	8470.91	0.05	0.02	1124.14	0.02	0.22	0.37	0.22	0.00	0.290
3.55	36.60	28.80	4.20	0.00	0.05	9223.28	0.05	0.02	1301.45	0.02	0.23	0.47	0.23	0.00	0.297
3.60	37.20	29.60	4.40	0.00	0.05	10028.13	0.05	0.02	1500.42	0.02	0.24	0.62	0.24	0.00	0.304
3.65	37.80	30.40	4.60	0.00	0.05	10888.14	0.05	0.02	1722.96	0.02	0.24	0.83	0.24	0.00	0.311
3.70	38.40	31.20	4.80	0.00	0.05	11806.11	0.05	0.02	1971.13	0.02	0.25	1.12	0.25	0.00	0.317
3.75	39.00	32.00	5.00	0.00	0.05	12784.92	0.05	0.02	2247.05	0.02	0.25	1.49	0.25	0.00	0.324
3.80	39.60	32.80	5.20	0.00	0.05	13827.53	0.05	0.02	2552.99	0.02	0.26	1.96	0.26	0.00	0.330
3.85	40.20	33.60	5.40	0.00	0.05	14937.02	0.05	0.02	2891.34	0.02	0.27	2.57	0.27	0.00	0.336
3.90	40.80	34.40	5.60	0.00	0.05	16116.54	0.05	0.02	3264.61	0.02	0.27	3.32	0.27	0.00	0.342
3.95	41.40	35.20	5.80	0.00	0.05	17369.36	0.05	0.02	3675.41	0.02	0.28	4.24	0.28	0.00	0.348
4.00	42.00	36.00	6.00	0.00	0.05	18698.83	0.05	0.02	4126.51	0.02	0.28	5.36	0.28	0.00	0.354
4.05	42.60	36.80	6.20	0.00	0.05	20108.43	0.05	0.02	4620.81	0.02	0.29	6.70	0.29	0.00	0.359
4.10	43.20	37.60	6.40	0.00	0.05	21601.72	0.05	0.02	5161.32	0.02	0.29	8.31	0.29	0.00	0.365
4.15	43.80	38.40	6.60	0.00	0.05	23182.36	0.05	0.02	5751.22	0.02	0.30	10.20	0.30	0.00	0.371

h (ft)	H/D-low -	H/D-mid -	H/D-top -	H/D-peak -	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qtop-orif (cfs)	Qtop-weir (cfs)	Qtot-top (cfs)	Qpeak-top (cfs)	Qtot (cfs)
4.20	44.40	39.20	6.80	0.00	0.05	24854.13	0.05	0.02	6393.81	0.02	0.30	12.42	0.30	0.00	0.376
4.25	45.00	40.00	7.00	0.06	0.05	26620.91	0.05	0.02	7092.54	0.02	0.31	15.00	0.31	0.37	0.754
4.30	45.60	40.80	7.20	0.12	0.05	28486.69	0.05	0.02	7851.00	0.02	0.31	17.99	0.31	1.05	1.440
4.35	46.20	41.60	7.40	0.18	0.05	30455.58	0.05	0.02	8672.94	0.02	0.32	21.43	0.32	1.93	2.326
4.40	46.80	42.40	7.60	0.24	0.05	32531.79	0.05	0.02	9562.27	0.02	0.32	25.37	0.32	2.98	3.375
4.45	47.40	43.20	7.80	0.30	0.05	34719.63	0.05	0.02	10523.04	0.02	0.32	29.87	0.32	4.16	4.564
4.50	48.00	44.00	8.00	0.36	0.05	37023.56	0.05	0.02	11559.47	0.02	0.33	34.96	0.33	5.47	5.879
4.55	48.60	44.80	8.20	0.42	0.05	39448.12	0.05	0.02	12675.94	0.02	0.33	40.72	0.33	6.90	7.307
4.60	49.20	45.60	8.40	0.48	0.05	41997.99	0.05	0.03	13876.99	0.03	0.34	47.20	0.34	8.42	8.841
4.65	49.80	46.40	8.60	0.54	0.05	44677.97	0.05	0.03	15167.33	0.03	0.34	54.47	0.34	10.05	10.474
4.70	50.40	47.20	8.80	0.60	0.05	47492.96	0.05	0.03	16551.86	0.03	0.35	62.59	0.35	11.77	12.200
4.75	51.00	48.00	9.00	0.66	0.05	50448.01	0.05	0.03	18035.63	0.03	0.35	71.64	0.35	13.58	14.014
4.80	51.60	48.80	9.20	0.72	0.06	53548.26	0.06	0.03	19623.88	0.03	0.35	81.69	0.35	15.48	15.912
4.85	52.20	49.60	9.40	0.78	0.06	56799.02	0.06	0.03	21322.03	0.03	0.36	92.82	0.36	17.45	17.891
4.90	52.80	50.40	9.60	0.84	0.06	60205.68	0.06	0.03	23135.69	0.03	0.36	105.11	0.36	19.50	19.947
4.95	53.40	51.20	9.80	0.90	0.06	63773.78	0.06	0.03	25070.64	0.03	0.37	118.66	0.37	21.63	22.078
5.00	54.00	52.00	10.00	0.96	0.06	67509.00	0.06	0.03	27132.87	0.03	0.37	133.55	0.37	23.83	24.281
5.05	54.60	52.80	10.20	1.02	0.06	71417.13	0.06	0.03	29328.55	0.03	0.37	149.88	0.37	26.10	26.554
5.10	55.20	53.60	10.40	1.08	0.06	75504.11	0.06	0.03	31664.05	0.03	0.38	167.75	0.38	28.43	28.894
5.15	55.80	54.40	10.60	1.14	0.06	79776.00	0.06	0.03	34145.95	0.03	0.38	187.26	0.38	30.83	31.301
5.20	56.40	55.20	10.80	1.20	0.06	84239.00	0.06	0.03	36781.02	0.03	0.39	208.52	0.39	33.30	33.771
5.25	57.00	56.00	11.00	1.26	0.06	88899.46	0.06	0.03	39576.23	0.03	0.39	231.66	0.39	35.83	36.304
5.30	57.60	56.80	11.20	1.32	0.06	93763.84	0.06	0.03	42538.77	0.03	0.39	256.77	0.39	38.42	38.897
5.35	58.20	57.60	11.40	1.38	0.06	98838.78	0.06	0.03	45676.05	0.03	0.40	284.00	0.40	41.07	41.550
5.40	58.80	58.40	11.60	1.44	0.06	104131.02	0.06	0.03	48995.68	0.03	0.40	313.47	0.40	43.77	44.262
5.45	59.40	59.20	11.80	1.50	0.06	109647.47	0.06	0.03	52505.48	0.03	0.40	345.31	0.40	46.54	47.030
5.50	60.00	60.00	12.00	1.56	0.06	115395.17	0.06	0.03	56213.52	0.03	0.41	379.66	0.41	49.36	49.854
5.55	60.60	60.80	12.20	1.62	0.06	121381.33	0.06	0.03	60128.07	0.03	0.41	416.66	0.41	52.23	52.733
5.60	61.20	61.60	12.40	1.68	0.06	127613.27	0.06	0.03	64257.64	0.03	0.41	456.47	0.41	55.16	55.665
5.65	61.80	62.40	12.60	1.74	0.06	134098.49	0.06	0.03	68610.95	0.03	0.42	499.23	0.42	58.14	58.651
5.70	62.40	63.20	12.80	1.80	0.06	140844.63	0.06	0.03	73196.99	0.03	0.42	545.12	0.42	61.18	61.688
5.75	63.00	64.00	13.00	1.86	0.06	147859.48	0.06	0.03	78024.94	0.03	0.42	594.29	0.42	64.26	64.776
5.80	63.60	64.80	13.20	1.92	0.06	155150.98	0.06	0.03	83104.27	0.03	0.43	646.91	0.43	67.39	67.914
5.85	64.20	65.60	13.40	1.98	0.06	162727.25	0.06	0.03	88444.65	0.03	0.43	703.17	0.43	70.58	71.101
5.90	64.80	66.40	13.60	2.04	0.06	170596.52	0.06	0.03	94056.02	0.03	0.43	763.25	0.43	73.81	74.338
5.95	65.40	67.20	13.80	2.10	0.06	178767.23	0.06	0.03	99948.55	0.03	0.44	827.33	0.44	77.09	77.621
6.00	66.00	68.00	14.00	2.16	0.06	187247.94	0.06	0.03	106132.69	0.03	0.44	895.62	0.44	80.42	80.953

BF-1-1		$Q_{Sub\ Drain}$=	0.0488	cfs
Elevation	Q_{AVG} (CFS)	DV (CF)	DT (HR)	Total T
0.00	0.049	281.1	1.600	84.94
0.05	0.049	283.4	1.613	83.34
0.10	0.049	285.6	1.626	81.73
0.15	0.049	287.9	1.639	80.11
0.20	0.049	290.1	1.652	78.47
0.25	0.049	292.4	1.664	76.82
0.30	0.049	294.6	1.677	75.15
0.35	0.049	296.9	1.690	73.47
0.40	0.049	299.1	1.703	71.78
0.45	0.049	301.4	1.716	70.08
0.50	0.049	303.7	1.691	68.37
0.55	0.051	305.9	1.600	66.67
0.60	0.055	308.2	1.517	65.07
0.65	0.058	310.4	1.474	63.56
0.70	0.059	312.7	1.443	62.08
0.75	0.061	314.9	1.418	60.64
0.80	0.062	317.2	1.398	59.22
0.85	0.064	319.4	1.382	57.82
0.90	0.065	321.7	1.368	56.44
0.95	0.066	323.9	1.356	55.07
1.00	0.067	326.2	1.345	53.72
1.05	0.068	328.6	1.337	52.37
1.10	0.069	331.0	1.329	51.04
1.15	0.070	333.4	1.322	49.71
1.20	0.070	335.8	1.316	48.38
1.25	0.071	338.2	1.311	47.07
1.30	0.072	340.6	1.306	45.76
1.35	0.073	343.0	1.302	44.45
1.40	0.074	345.4	1.299	43.15
1.45	0.074	347.8	1.295	41.85
1.50	0.075	350.2	1.292	40.55
1.55	0.076	352.6	1.290	39.26
1.60	0.076	355.0	1.288	37.97
1.65	0.077	357.4	1.286	36.68
1.70	0.078	359.8	1.284	35.40
1.75	0.078	362.2	1.268	34.11
1.80	0.080	364.6	1.237	32.85
1.85	0.083	367.0	1.211	31.61
1.90	0.085	369.4	1.195	30.40
1.95	0.087	371.8	1.182	29.20
2.00	0.088	374.3	1.172	28.02
2.05	0.089	376.8	1.163	26.85
2.10	0.091	379.3	1.155	25.69
2.15	0.092	381.9	1.149	24.53
2.20	0.093	384.4	1.143	23.38
2.25	0.094	387.0	1.137	22.24
2.30	0.095	389.5	1.133	21.10
2.35	0.096	392.0	1.128	19.97
2.40	0.097	394.6	1.124	18.84
2.45	0.098	397.1	1.121	17.72
2.50	0.099	399.6	1.095	16.60
2.55	0.104	402.2	1.014	15.50

BF-1-1		$Q_{Sub\ Drain}$=	0.0488	cfs
Elevation	Q_{AVG} (CFS)	DV (CF)	DT (HR)	Total T
2.60	0.116	404.7	0.894	14.49
2.65	0.135	407.3	0.771	13.59
2.70	0.158	409.8	0.664	12.82
2.75	0.184	412.3	0.589	12.16
2.80	0.205	414.9	0.544	11.57
2.85	0.219	417.4	0.515	11.03
2.90	0.232	419.9	0.491	10.51
2.95	0.243	422.5	0.471	10.02
3.00	0.254	425.1	0.455	9.55
3.05	0.265	427.8	0.441	9.09
3.10	0.274	430.4	0.429	8.65
3.15	0.284	433.1	0.418	8.22
3.20	0.292	435.8	0.408	7.81
3.25	0.301	438.5	0.399	7.40
3.30	0.309	441.2	0.392	7.00
3.35	0.317	443.8	0.384	6.61
3.40	0.325	446.5	0.378	6.22
3.45	0.332	449.2	0.372	5.84
3.50	0.339	451.9	0.366	5.47
3.55	0.346	454.6	0.361	5.11
3.60	0.353	457.2	0.356	4.75
3.65	0.360	459.9	0.352	4.39
3.70	0.366	462.6	0.348	4.04
3.75	0.373	465.3	0.344	3.69
3.80	0.379	468.0	0.340	3.35
3.85	0.385	470.6	0.337	3.00
3.90	0.391	473.3	0.334	2.67
3.95	0.397	476.0	0.331	2.33
4.00	0.403	478.8	0.328	2.00
4.05	0.408	481.6	0.325	1.68
4.10	0.414	484.4	0.323	1.35
4.15	0.419	487.2	0.321	1.03
4.20	0.425	490.0	0.222	0.71
4.25	0.802	492.9	0.120	0.48
4.30	1.488	495.7	0.071	0.36
4.35	2.375	498.5	0.048	0.29
4.40	3.424	501.3	0.035	0.25
4.45	4.613	504.1	0.027	0.21
4.50	5.927	507.0	0.021	0.18
4.55	7.356	509.8	0.017	0.16
4.60	8.890	512.6	0.015	0.15
4.65	10.523	515.4	0.013	0.13
4.70	12.248	518.2	0.011	0.12
4.75	14.063	521.1	0.010	0.11
4.80	15.961	523.9	0.009	0.10
4.85	17.940	526.7	0.008	0.09
4.90	19.996	529.5	0.007	0.08
4.95	22.127	532.3	0.006	0.07
5.00	24.330	535.2	0.006	0.07
5.05	26.603	538.2	0.005	0.06
5.10	28.943	541.2	0.005	0.06
5.15	31.349	544.1	0.005	0.05
5.20	33.820	547.1	0.004	0.05
5.25	36.352	550.0	0.004	0.04
5.30	38.946	553.0	0.004	0.04

BF-1-1		$Q_{Sub\ Drain}$=	0.0488	cfs
Elevation	Q_{AVG} (CFS)	DV (CF)	DT (HR)	Total T
5.35	41.599	556.0	0.004	0.04
5.40	44.310	558.9	0.003	0.03
5.45	47.079	561.9	0.003	0.03
5.50	49.903	564.8	0.003	0.03
5.55	52.782	567.8	0.003	0.02
5.60	55.714	570.8	0.003	0.02
5.65	58.699	573.7	0.003	0.02
5.70	61.737	576.7	0.003	0.01
5.75	64.825	579.6	0.002	0.01
5.80	67.963	582.6	0.002	0.01
5.85	71.150	585.6	0.002	0.01
5.90	74.386	588.5	0.002	0.00
5.95	77.670	591.5	0.002	0.00
6.00	81.001			

RENZULLI ESTATES Stage Storage			
BF-1-2			
depth	area	volume (cf)	volume (acft)
0.00	9200	0	
0.05	9274	461.8	0.010602
0.10	9347	927.4	0.021289
0.15	9421	1396.6	0.032061
0.20	9495	1869.5	0.042917
0.25	9569	2346.1	0.053858
0.30	9642	2826.3	0.064884
0.35	9716	3310.3	0.075994
0.40	9790	3797.9	0.087188
0.45	9863	4289.2	0.098467
0.50	9937	4784.2	0.109831
0.55	10011	5282.9	0.12128
0.60	10084	5785.3	0.132813
0.65	10158	6291.4	0.14443
0.70	10232	6801.1	0.156132
0.75	10306	7314.6	0.167919
0.80	10379	7831.7	0.179791
0.85	10453	8352.5	0.191747
0.90	10527	8877.0	0.203787
0.95	10600	9405.1	0.215912
1.00	10674	9937.0	0.228122
1.05	10751	10472.6	0.240418
1.10	10827	11012.1	0.252802
1.15	10904	11555.3	0.265274
1.20	10980	12102.4	0.277833
1.25	11057	12653.3	0.290481
1.30	11133	13208.1	0.303216
1.35	11210	13766.7	0.316039
1.40	11286	14329.1	0.32895
1.45	11363	14895.3	0.341949
1.50	11440	15465.4	0.355036
1.55	11516	16039.3	0.368211
1.60	11593	16617.0	0.381473
1.65	11669	17198.5	0.394824
1.70	11746	17783.9	0.408262
1.75	11822	18373.1	0.421788
1.80	11899	18966.1	0.435402
1.85	11975	19563.0	0.449104
1.90	12052	20163.7	0.462894
1.95	12128	20768.2	0.476771
2.00	12205	21376.5	0.490737
2.05	12284	21988.7	0.504792
2.10	12364	22604.9	0.518938
2.15	12443	23225.1	0.533175
2.20	12523	23849.3	0.547504
2.25	12602	24477.4	0.561923
2.30	12681	25109.5	0.576434
2.35	12761	25745.5	0.591036
2.40	12840	26385.5	0.605729
2.45	12920	27029.5	0.620513
2.50	12999	27677.5	0.635388
2.55	13078	28329.4	0.650354
2.60	13158	28985.3	0.665412
2.65	13237	29645.2	0.68056
2.70	13317	30309.1	0.6958
2.75	13396	30976.9	0.711131
2.80	13475	31648.7	0.726553
2.85	13555	32324.4	0.742066
2.90	13634	33004.1	0.757671
2.95	13714	33687.8	0.773366
3.00	13793	34375.5	0.789153
3.05	13875	35067.2	0.805032

depth	area	volume (cf)	volume (acft)
3.10	13957	35763.0	0.821006
3.15	14040	36462.9	0.837074
3.20	14122	37167.0	0.853236
3.25	14204	37875.1	0.869493
3.30	14286	38587.4	0.885844
3.35	14368	39303.7	0.90229
3.40	14451	40024.2	0.91883
3.45	14533	40748.8	0.935464
3.50	14615	41477.5	0.952192
3.55	14697	42210.3	0.969015
3.60	14779	42947.2	0.985933
3.65	14862	43688.2	1.002944
3.70	14944	44433.4	1.02005
3.75	15026	45182.6	1.03725
3.80	15108	45936.0	1.054545
3.85	15190	46693.4	1.071934
3.90	15273	47455.0	1.089417
3.95	15355	48220.7	1.106995
4.00	15437	48990.5	1.124667
4.05	15522	49764.5	1.142435
4.10	15607	50542.7	1.160301
4.15	15692	51325.2	1.178264
4.20	15777	52111.9	1.196325
4.25	15862	52902.9	1.214484
4.30	15947	53698.1	1.23274
4.35	16032	54497.6	1.251094
4.40	16117	55301.4	1.269545
4.45	16202	56109.4	1.288094
4.50	16288	56921.6	1.306741
4.55	16373	57738.1	1.325485
4.60	16458	58558.9	1.344327
4.65	16543	59383.9	1.363266
4.70	16628	60213.1	1.382304
4.75	16713	61046.7	1.401438
4.80	16798	61884.4	1.420671
4.85	16883	62726.4	1.440001
4.90	16968	63572.7	1.459428
4.95	17053	64423.2	1.478954
5.00	17138	65278.0	1.498577
5.05	17226	66137.1	1.518299
5.10	17314	67000.6	1.538122
5.15	17402	67868.5	1.558046
5.20	17489	68740.7	1.57807
5.25	17577	69617.4	1.598196
5.30	17665	70498.5	1.618422
5.35	17753	71383.9	1.638749
5.40	17841	72273.8	1.659177
5.45	17929	73168.0	1.679706
5.50	18017	74067	2
5.55	18104	74969.6	1.721066
5.60	18192	75877.1	1.741898
5.65	18280	76788.9	1.76283
5.70	18368	77705.1	1.783863
5.75	18456	78625.7	1.804997
5.80	18544	79550.6	1.826231
5.85	18631	80480.0	1.847567
5.90	18719	81413.8	1.869003
5.95	18807	82351.9	1.890541
6.00	18895	83295	2

RENZULLI ESTATES BF 1-2

Discharge vs Elevation Table

Bottom orifice diameter:	1.5 "	Top orifice diameter:	3 "
Number:	1	Number:	1
Cg-low:	0.61	Cg-low:	0.61
invert elev:	0.50 ft	invert elev:	2.50 ft
Middle orifice diameter:	1.5 "	Emergency weir:	
number of orif:	1	Invert:	3.60 ft
Cg-middle:	0.61	Weir Length (ft)	10.00 ft
invert elev:	2.00 ft	Riser Box LxW	2x3

h (ft)	H/D-low -	H/D-mid -	H/D-top -	H/D-peak -	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qtop-orif (cfs)	Qtop-weir (cfs)	Qtot-top (cfs)	Qpeak-top (cfs)	Qtot (cfs)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.55	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.003
0.60	0.80	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.010
0.65	1.20	0.00	0.00	0.00	0.02	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.018
0.70	1.60	0.00	0.00	0.00	0.02	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.022
0.75	2.00	0.00	0.00	0.00	0.03	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.026
0.80	2.40	0.00	0.00	0.00	0.03	0.04	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.029
0.85	2.80	0.00	0.00	0.00	0.03	0.04	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.032
0.90	3.20	0.00	0.00	0.00	0.03	0.04	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.035
0.95	3.60	0.00	0.00	0.00	0.04	0.05	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.037
1.00	4.00	0.00	0.00	0.00	0.04	0.07	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.040
1.05	4.40	0.00	0.00	0.00	0.04	0.11	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.042
1.10	4.80	0.00	0.00	0.00	0.04	0.20	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.044
1.15	5.20	0.00	0.00	0.00	0.05	0.35	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.046
1.20	5.60	0.00	0.00	0.00	0.05	0.59	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.048
1.25	6.00	0.00	0.00	0.00	0.05	0.95	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.050
1.30	6.40	0.00	0.00	0.00	0.05	1.47	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.052
1.35	6.80	0.00	0.00	0.00	0.05	2.19	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.053
1.40	7.20	0.00	0.00	0.00	0.05	3.18	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.055
1.45	7.60	0.00	0.00	0.00	0.06	4.49	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.057
1.50	8.00	0.00	0.00	0.00	0.06	6.18	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.058
1.55	8.40	0.00	0.00	0.00	0.06	8.34	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.060
1.60	8.80	0.00	0.00	0.00	0.06	11.06	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.061
1.65	9.20	0.00	0.00	0.00	0.06	14.44	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.063
1.70	9.60	0.00	0.00	0.00	0.06	18.58	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.064
1.75	10.00	0.00	0.00	0.00	0.07	23.61	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.065
1.80	10.40	0.00	0.00	0.00	0.07	29.65	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.067
1.85	10.80	0.00	0.00	0.00	0.07	36.86	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.068
1.90	11.20	0.00	0.00	0.00	0.07	45.39	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.069
1.95	11.60	0.00	0.00	0.00	0.07	55.41	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.071
2.00	12.00	0.00	0.00	0.00	0.07	67.11	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.072
2.05	12.40	0.40	0.00	0.00	0.07	80.69	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.076
2.10	12.80	0.80	0.00	0.00	0.07	96.36	0.07	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.084
2.15	13.20	1.20	0.00	0.00	0.08	114.36	0.08	0.02	0.02	0.02	0.00	0.00	0.00	0.00	0.093
2.20	13.60	1.60	0.00	0.00	0.08	134.92	0.08	0.02	0.03	0.02	0.00	0.00	0.00	0.00	0.099
2.25	14.00	2.00	0.00	0.00	0.08	158.32	0.08	0.03	0.03	0.03	0.00	0.00	0.00	0.00	0.104
2.30	14.40	2.40	0.00	0.00	0.08	184.84	0.08	0.03	0.04	0.03	0.00	0.00	0.00	0.00	0.108
2.35	14.80	2.80	0.00	0.00	0.08	214.77	0.08	0.03	0.04	0.03	0.00	0.00	0.00	0.00	0.113
2.40	15.20	3.20	0.00	0.00	0.08	248.43	0.08	0.03	0.04	0.03	0.00	0.00	0.00	0.00	0.116
2.45	15.60	3.60	0.00	0.00	0.08	286.15	0.08	0.04	0.05	0.04	0.00	0.00	0.00	0.00	0.120
2.50	16.00	4.00	0.00	0.00	0.08	328.30	0.08	0.04	0.07	0.04	0.00	0.00	0.00	0.00	0.123
2.55	16.40	4.40	0.20	0.00	0.08	375.25	0.08	0.04	0.11	0.04	0.00	0.00	0.00	0.00	0.131
2.60	16.80	4.80	0.40	0.00	0.09	427.39	0.09	0.04	0.20	0.04	0.00	0.02	0.02	0.00	0.146
2.65	17.20	5.20	0.60	0.00	0.09	485.14	0.09	0.05	0.35	0.05	0.04	0.03	0.03	0.00	0.166
2.70	17.60	5.60	0.80	0.00	0.09	548.94	0.09	0.05	0.59	0.05	0.07	0.06	0.06	0.00	0.192
2.75	18.00	6.00	1.00	0.00	0.09	619.25	0.09	0.05	0.95	0.05	0.08	0.08	0.08	0.00	0.220
2.80	18.40	6.40	1.20	0.00	0.09	696.55	0.09	0.05	1.47	0.05	0.10	0.11	0.10	0.00	0.242
2.85	18.80	6.80	1.40	0.00	0.09	781.35	0.09	0.05	2.19	0.05	0.11	0.13	0.11	0.00	0.258
2.90	19.20	7.20	1.60	0.00	0.09	874.19	0.09	0.05	3.18	0.05	0.13	0.16	0.13	0.00	0.273
2.95	19.60	7.60	1.80	0.00	0.09	975.61	0.09	0.06	4.49	0.06	0.14	0.18	0.14	0.00	0.286
3.00	20.00	8.00	2.00	0.00	0.09	1086.19	0.09	0.06	6.18	0.06	0.15	0.20	0.15	0.00	0.299
3.05	20.40	8.40	2.20	0.00	0.09	1206.55	0.09	0.06	8.34	0.06	0.16	0.21	0.16	0.00	0.311
3.10	20.80	8.80	2.40	0.00	0.10	1337.31	0.10	0.06	11.06	0.06	0.17	0.22	0.17	0.00	0.322
3.15	21.20	9.20	2.60	0.00	0.10	1479.13	0.10	0.06	14.44	0.06	0.17	0.22	0.17	0.00	0.333
3.20	21.60	9.60	2.80	0.00	0.10	1632.69	0.10	0.06	18.58	0.06	0.18	0.22	0.18	0.00	0.344
3.25	22.00	10.00	3.00	0.00	0.10	1798.71	0.10	0.07	23.61	0.07	0.19	0.22	0.19	0.00	0.354
3.30	22.40	10.40	3.20	0.00	0.10	1977.93	0.10	0.07	29.65	0.07	0.20	0.22	0.20	0.00	0.364
3.35	22.80	10.80	3.40	0.00	0.10	2171.11	0.10	0.07	36.86	0.07	0.20	0.24	0.20	0.00	0.373
3.40	23.20	11.20	3.60	0.00	0.10	2379.06	0.10	0.07	45.39	0.07	0.21	0.26	0.21	0.00	0.382
3.45	23.60	11.60	3.80	0.00	0.10	2602.61	0.10	0.07	55.41	0.07	0.22	0.30	0.22	0.00	0.391
3.50	24.00	12.00	4.00	0.00	0.10	2842.60	0.10	0.07	67.11	0.07	0.22	0.37	0.22	0.00	0.400
3.55	24.40	12.40	4.20	0.00	0.10	3099.94	0.10	0.07	80.69	0.07	0.23	0.47	0.23	0.00	0.408
3.60	24.80	12.80	4.40	0.00	0.10	3375.54	0.10	0.07	96.36	0.07	0.24	0.62	0.24	0.00	0.416
3.65	25.20	13.20	4.60	0.06	0.11	3670.36	0.11	0.08	114.36	0.08	0.24	0.83	0.24	0.37	0.797
3.70	25.60	13.60	4.80	0.12	0.11	3985.37	0.11	0.08	134.92	0.08	0.25	1.12	0.25	1.05	1.485
3.75	26.00	14.00	5.00	0.18	0.11	4321.61	0.11	0.08	158.32	0.08	0.25	1.49	0.25	1.93	2.375
3.80	26.40	14.40	5.20	0.24	0.11	4680.11	0.11	0.08	184.84	0.08	0.26	1.96	0.26	2.98	3.426
3.85	26.80	14.80	5.40	0.30	0.11	5061.97	0.11	0.08	214.77	0.08	0.27	2.57	0.27	4.16	4.618
3.90	27.20	15.20	5.60	0.36	0.11	5468.31	0.11	0.08	248.43	0.08	0.27	3.32	0.27	5.47	5.934
3.95	27.60	15.60	5.80	0.42	0.11	5900.28	0.11	0.08	286.15	0.08	0.28	4.24	0.28	6.90	7.365
4.00	28.00	16.00	6.00	0.48	0.11	6359.08	0.11	0.08	328.30	0.08	0.28	5.36	0.28	8.42	8.901
4.05	28.40	16.40	6.20	0.54	0.11	6845.93	0.11	0.08	375.25	0.08	0.29	6.70	0.29	10.05	10.536
4.10	28.80	16.80	6.40	0.60	0.11	7362.10	0.11	0.09	427.39	0.09	0.29	8.31	0.29	11.77	12.264
4.15	29.20	17.20	6.60	0.66	0.11	7908.88	0.11	0.09	485.14	0.09	0.30	10.20	0.30	13.58	14.080

h (ft)	H/D-low -	H/D-mid -	H/D-top -	H/D-peak -	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qtop-orif (cfs)	Qtop-weir (cfs)	Qtot-top (cfs)	Qpeak-top (cfs)	Qtot (cfs)
4.20	29.60	17.60	6.80	0.72	0.11	8487.63	0.11	0.09	548.94	0.09	0.30	12.42	0.30	15.48	15.980
4.25	30.00	18.00	7.00	0.78	0.12	9099.71	0.12	0.09	619.25	0.09	0.31	15.00	0.31	17.45	17.961
4.30	30.40	18.40	7.20	0.84	0.12	9746.55	0.12	0.09	696.55	0.09	0.31	17.99	0.31	19.50	20.020
4.35	30.80	18.80	7.40	0.90	0.12	10429.61	0.12	0.09	781.35	0.09	0.32	21.43	0.32	21.63	22.152
4.40	31.20	19.20	7.60	0.96	0.12	11150.37	0.12	0.09	874.19	0.09	0.32	25.37	0.32	23.83	24.357
4.45	31.60	19.60	7.80	1.02	0.12	11910.39	0.12	0.09	975.61	0.09	0.32	29.87	0.32	26.10	26.632
4.50	32.00	20.00	8.00	1.08	0.12	12711.23	0.12	0.09	1086.19	0.09	0.33	34.96	0.33	28.43	28.974
4.55	32.40	20.40	8.20	1.14	0.12	13554.52	0.12	0.09	1206.55	0.09	0.33	40.72	0.33	30.83	31.382
4.60	32.80	20.80	8.40	1.20	0.12	14441.92	0.12	0.10	1337.31	0.10	0.34	47.20	0.34	33.30	33.854
4.65	33.20	21.20	8.60	1.26	0.12	15375.13	0.12	0.10	1479.13	0.10	0.34	54.47	0.34	35.83	36.388
4.70	33.60	21.60	8.80	1.32	0.12	16355.92	0.12	0.10	1632.69	0.10	0.35	62.59	0.35	38.42	38.984
4.75	34.00	22.00	9.00	1.38	0.12	17386.06	0.12	0.10	1798.71	0.10	0.35	71.64	0.35	41.07	41.639
4.80	34.40	22.40	9.20	1.44	0.12	18467.40	0.12	0.10	1977.93	0.10	0.35	81.69	0.35	43.77	44.351
4.85	34.80	22.80	9.40	1.50	0.12	19601.82	0.12	0.10	2171.11	0.10	0.36	92.82	0.36	46.54	47.121
4.90	35.20	23.20	9.60	1.56	0.13	20791.25	0.13	0.10	2379.06	0.10	0.36	105.11	0.36	49.36	49.947
4.95	35.60	23.60	9.80	1.62	0.13	22037.66	0.13	0.10	2602.61	0.10	0.37	118.66	0.37	52.23	52.827
5.00	36.00	24.00	10.00	1.68	0.13	23343.08	0.13	0.10	2842.60	0.10	0.37	133.55	0.37	55.16	55.761
5.05	36.40	24.40	10.20	1.74	0.13	24709.57	0.13	0.10	3099.94	0.10	0.37	149.88	0.37	58.14	58.748
5.10	36.80	24.80	10.40	1.80	0.13	26139.24	0.13	0.10	3375.54	0.10	0.38	167.75	0.38	61.18	61.787
5.15	37.20	25.20	10.60	1.86	0.13	27634.27	0.13	0.11	3670.36	0.11	0.38	187.26	0.38	64.26	64.876
5.20	37.60	25.60	10.80	1.92	0.13	29196.86	0.13	0.11	3985.37	0.11	0.39	208.52	0.39	67.39	68.016
5.25	38.00	26.00	11.00	1.98	0.13	30829.27	0.13	0.11	4321.61	0.11	0.39	231.66	0.39	70.58	71.205
5.30	38.40	26.40	11.20	2.04	0.13	32533.83	0.13	0.11	4680.11	0.11	0.39	256.77	0.39	73.81	74.442
5.35	38.80	26.80	11.40	2.10	0.13	34312.88	0.13	0.11	5061.97	0.11	0.40	284.00	0.40	77.09	77.728
5.40	39.20	27.20	11.60	2.16	0.13	36168.85	0.13	0.11	5468.31	0.11	0.40	313.47	0.40	80.42	81.060
5.45	39.60	27.60	11.80	2.22	0.13	38104.20	0.13	0.11	5900.28	0.11	0.40	345.31	0.40	83.79	84.439
5.50	40.00	28.00	12.00	2.28	0.13	40121.45	0.13	0.11	6359.08	0.11	0.41	379.66	0.41	87.21	87.864
5.55	40.40	28.40	12.20	2.34	0.13	42223.16	0.13	0.11	6845.93	0.11	0.41	416.66	0.41	90.68	91.334
5.60	40.80	28.80	12.40	2.40	0.13	44411.96	0.13	0.11	7362.10	0.11	0.41	456.47	0.41	94.19	94.849
5.65	41.20	29.20	12.60	2.46	0.14	46690.52	0.14	0.11	7908.88	0.11	0.42	499.23	0.42	97.74	98.408
5.70	41.60	29.60	12.80	2.52	0.14	49061.58	0.14	0.11	8487.63	0.11	0.42	545.12	0.42	101.34	102.010
5.75	42.00	30.00	13.00	2.58	0.14	51527.93	0.14	0.12	9099.71	0.12	0.42	594.29	0.42	104.98	105.656
5.80	42.40	30.40	13.20	2.64	0.14	54092.39	0.14	0.12	9746.55	0.12	0.43	646.91	0.43	108.66	109.344
5.85	42.80	30.80	13.40	2.70	0.14	56757.87	0.14	0.12	10429.61	0.12	0.43	703.17	0.43	112.39	113.074
5.90	43.20	31.20	13.60	2.76	0.14	59527.33	0.14	0.12	11150.37	0.12	0.43	763.25	0.43	116.15	116.846
5.95	43.60	31.60	13.80	2.82	0.14	62403.77	0.14	0.12	11910.39	0.12	0.44	827.33	0.44	119.96	120.659
6.00	44.00	32.00	14.00	2.88	0.14	65390.26	0.14	0.12	12711.23	0.12	0.44	895.62	0.44	123.81	124.512

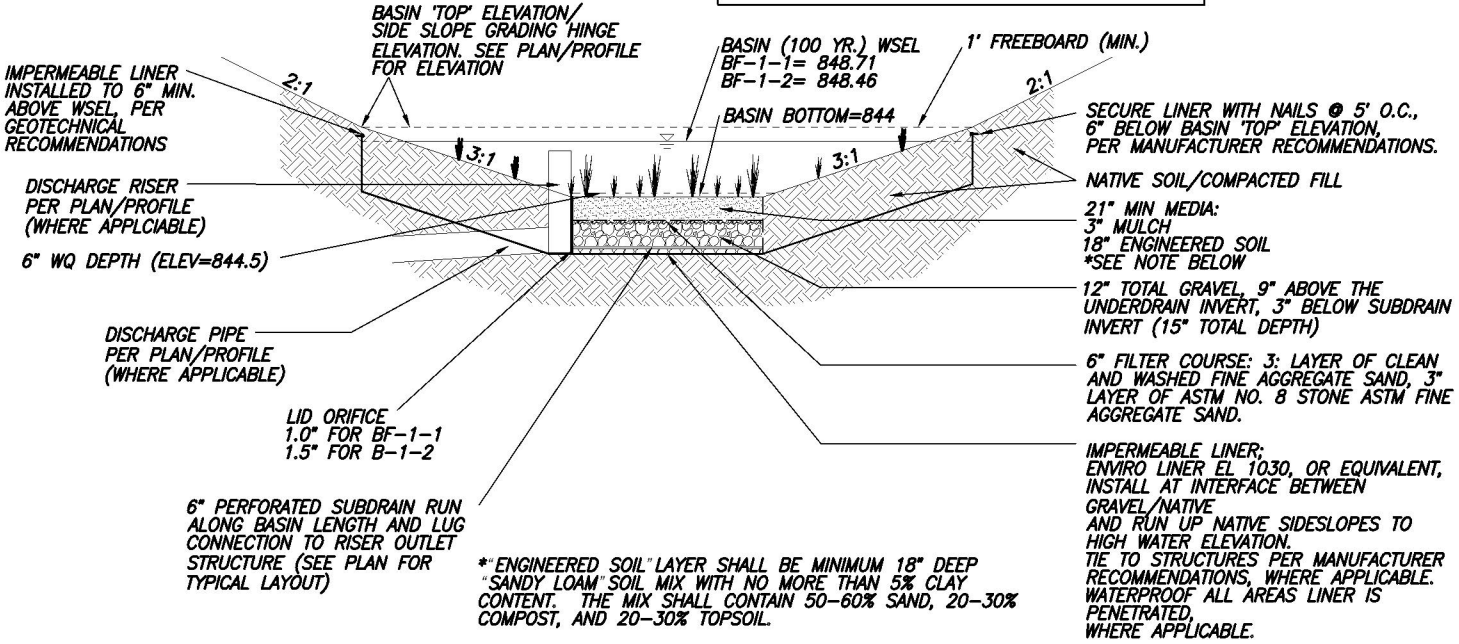
BF-1-2		$Q_{Sub\ Drain}$=	0.1096	cfs
Elevation	Q_{AVG} (CFS)	DV (CF)	DT (HR)	Total T
0.00	0.110	-7135139.3	1.500	151.56
-717.90	0.110	533.9	1.353	150.06
-717.85	0.110	10142.9	25.707	148.71
-716.90	0.110	533.8	1.353	123.00
-716.85	0.110	533.8	1.353	121.65
-716.80	0.110	533.8	1.000	120.30
-716.75	0.110	533.8	1.353	119.30
-716.70	0.110	533.8	2.000	117.94
-716.65	0.110	533.8	1.353	115.94
-716.60	0.110	533.8	1.353	114.59
-716.55	0.110	533.7	1.336	113.24
-716.50	0.112	533.7	1.279	111.90
-716.45	0.119	533.7	1.201	110.62
-716.40	0.127	533.7	1.144	109.42
-716.35	0.132	533.7	1.109	108.28
-716.30	0.136	533.7	1.080	107.17
-716.25	0.139	533.7	1.056	106.09
-716.20	0.142	533.7	1.036	105.03
-716.15	0.144	533.7	1.017	104.00
-716.10	0.147	533.7	1.001	102.98
-716.05	0.149	535.6	0.989	101.98
-716.00	0.152	539.4	0.982	100.99
-715.95	0.154	543.3	0.976	100.01
-715.90	0.156	547.1	0.970	99.03
-715.85	0.158	550.9	0.966	98.06
-715.80	0.159	554.8	0.961	97.10
-715.75	0.161	558.6	0.957	96.14
-715.70	0.163	562.4	0.954	95.18
-715.65	0.165	566.2	0.951	94.23
-715.60	0.166	570.1	0.948	93.27
-715.55	0.168	573.9	0.946	92.33
-715.50	0.169	577.7	0.944	91.38
-715.45	0.171	581.5	0.942	90.44
-715.40	0.172	585.4	0.940	89.49
-715.35	0.174	589.2	0.939	88.55
-715.30	0.175	593.0	0.937	87.62
-715.25	0.176	596.9	0.936	86.68
-715.20	0.178	600.7	0.935	85.74
-715.15	0.179	604.5	0.934	84.81
-715.10	0.180	608.3	0.934	83.87
-715.05	0.182	612.2	0.926	82.94
-715.00	0.186	616.2	0.902	82.01
-714.95	0.194	620.2	0.868	81.11
-714.90	0.203	624.1	0.842	80.24
-714.85	0.209	628.1	0.826	79.40
-714.80	0.214	632.1	0.813	78.58
-714.75	0.218	636.1	0.803	77.76
-714.70	0.222	640.0	0.794	76.96
-714.65	0.226	644.0	0.786	76.17
-714.60	0.230	648.0	0.778	75.38
-714.55	0.233	651.9	0.765	74.60

BF-1-2		$Q_{Sub\ Drain}$=	0.1096	cfs
Elevation	Q_{AVG} (CFS)	DV (CF)	DT (HR)	Total T
-714.50	0.240	655.9	0.735	73.84
-714.45	0.255	659.9	0.690	73.10
-714.40	0.276	663.8	0.639	72.41
-714.35	0.301	667.8	0.588	71.77
-714.30	0.329	671.8	0.548	71.18
-714.25	0.352	675.8	0.522	70.64
-714.20	0.368	679.7	0.503	70.11
-714.15	0.382	683.7	0.488	69.61
-714.10	0.396	687.7	0.475	69.12
-714.05	0.409	691.7	0.463	68.65
-714.00	0.421	695.8	0.453	68.18
-713.95	0.432	699.9	0.444	67.73
-713.90	0.443	704.0	0.436	67.29
-713.85	0.453	708.1	0.429	66.85
-713.80	0.464	712.3	0.422	66.42
-713.75	0.473	716.4	0.416	66.00
-713.70	0.483	720.5	0.411	65.58
-713.65	0.492	724.6	0.406	65.17
-713.60	0.501	728.7	0.401	64.77
-713.55	0.509	732.8	0.396	64.37
-713.50	0.518	736.9	0.392	63.97
-713.45	0.526	741.0	0.287	63.58
-713.40	0.906	745.1	0.165	63.29
-713.35	1.595	749.2	0.102	63.12
-713.30	2.484	753.4	0.070	63.02
-713.25	3.536	757.5	0.051	62.95
-713.20	4.727	761.6	0.039	62.90
-713.15	6.044	765.7	0.031	62.86
-713.10	7.474	769.8	0.026	62.83
-713.05	9.011	774.0	0.022	62.80
-713.00	10.646	778.2	0.019	62.78
-712.95	12.374	782.5	0.016	62.76
-712.90	14.190	786.7	0.014	62.75
-712.85	16.090	791.0	0.013	62.73
-712.80	18.071	795.2	0.012	62.72
-712.75	20.129	799.5	0.010	62.71
-712.70	22.262	803.7	0.010	62.70
-712.65	24.467	808.0	0.009	62.69
-712.60	26.741	812.2	0.008	62.68
-712.55	29.084	816.5	0.007	62.67
-712.50	31.492	820.8	0.007	62.66
-712.45	33.964	825.0	0.007	62.66
-712.40	36.498	829.3	0.006	62.65
-712.35	39.093	833.5	0.006	62.65
-712.30	41.748	837.8	0.005	62.64
-712.25	44.461	842.0	0.005	62.63
-712.20	47.231	846.3	0.005	62.63
-712.15	50.057	850.5	0.005	62.62
-712.10	52.937	854.8	0.004	62.62
-712.05	55.871	12918798.7	62.557	62.62
5.05	58.858	944.6	0.004	0.06

BF-1-2		$Q_{Sub\ Drain}$=	0.1096	cfs
Elevation	Q_{AVG} (CFS)	DV (CF)	DT (HR)	Total T
5.10	61.896	944.6	0.004	0.05
5.15	64.986	944.6	0.004	0.05
5.20	68.125	944.7	0.004	0.05
5.25	71.314	944.7	0.004	0.04
5.30	74.552	944.7	0.003	0.04
5.35	77.837	944.7	0.003	0.03
5.40	81.170	944.7	0.003	0.03
5.45	84.549	944.7	0.003	0.03
5.50	87.974	944.7	0.003	0.03
5.55	91.444	944.7	0.003	0.02
5.60	94.959	944.7	0.003	0.02
5.65	98.517	944.7	0.003	0.02
5.70	102.120	944.7	0.003	0.01
5.75	105.765	944.7	0.002	0.01
5.80	109.454	944.7	0.002	0.01
5.85	113.184	944.7	0.002	0.01
5.90	116.955	944.7	0.002	0.00
5.95	120.768	944.7	0.002	0.00
6.00	124.622			

BIOFILTRATION DETAILS

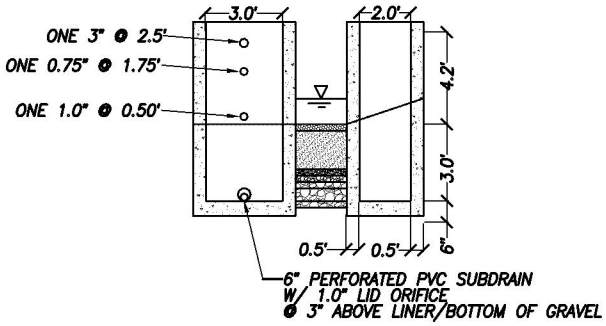
	100 YEAR WSE	HMP WSE	WQ WSE
BF-1-1	848.71	848.50	844.50
BF-1-2	848.46	847.95	844.50



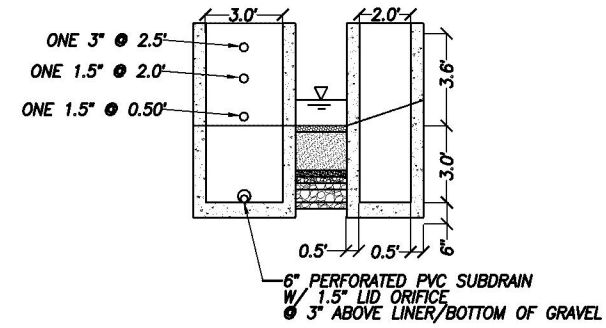
SOIL SECTION FOR WATER QUALITY/HYDROMODIFICATION BIOFILTRATION BASIN

NOT TO SCALE

PRIVATE BIOFILTRATION BASIN BF-1-1

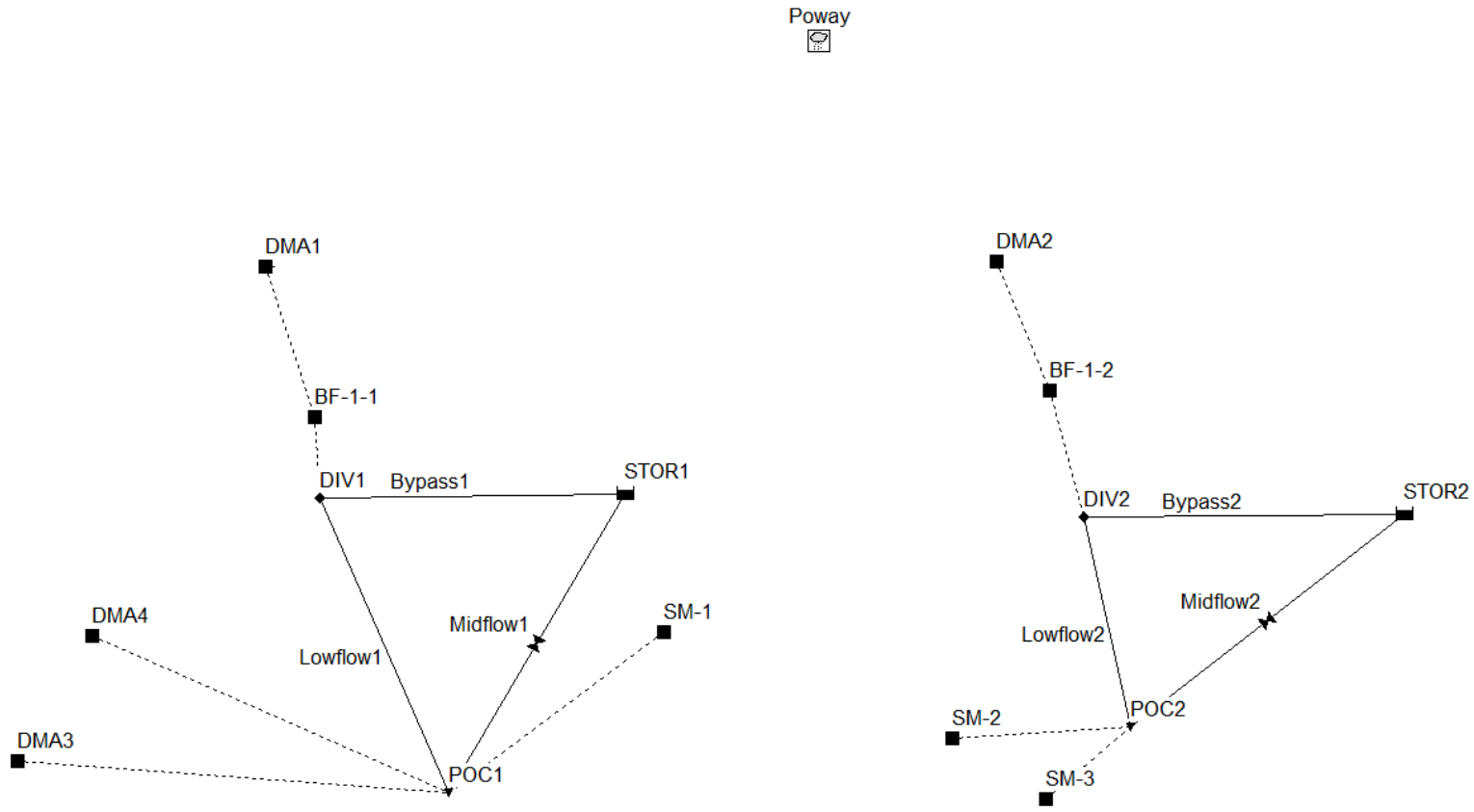


PRIVATE BIOFILTRATION BASIN BF-1-2



BIOFILTRATION BASIN RISER DETAIL FOR BF-1-1 & BF-1-2

NOT TO SCALE


Poway
DMA1
BF-1-1
DIV1
Bypass1
STOR1
DMA4
Midflow1
SM-1
Lowflow1
DMA3
POC1
DMA2
BF-1-2
DIV2
Bypass2
STOR2
Midflow2
Lowflow2
SM-2
POC2
SM-3

```
[TITLE]
;;Project Title/Notes
Renzulli Estates
HMP Modeling
Post-development Condition


[OPTIONS]
;;Option             Value
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           04/10/1962
START_TIME           15:00:00
REPORT_START_DATE    04/10/1962
REPORT_START_TIME    15:00:00
END_DATE             05/23/2008
END_TIME             15:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         12.557
MAX_TRIALS           8
HEAD_TOLERANCE       0.005
```

```
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
MONTHLY          0.05   0.09   0.13   0.19   0.25   0.29   0.3    0.27   0.21   0.14   0.08   0.05
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- ------ ------ ----------
;Renzulli Estates
Poway            VOLUME    1:00     1.0      TIMESERIES TS-Poway

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  SnowPack

;;-------------- ---------------- ---------------- -------- -------- -------- -------- --------
----------------
DMA1             Poway            BF-1-1           8.07     42.6     245      8.22     0

DMA4             Poway            POC1             0.2463   45.6     50       2.34     0

DMA3             Poway            POC1             .35      38.3     60       1.98     0

DMA2             Poway            BF-1-2           11.87    56.5     150      2.83     0

BF-1-1           Poway            DIV1             0.1286   0        60       0.01     0

BF-1-2           Poway            DIV2             .2112    0        61       0.01     0

SM-1             Poway            POC1             3.19     0        393      50       0

SM-2             Poway            POC2             0.61     25       89       50       0

SM-3             Poway            POC2             5.18     25       61       8.08     0
```

```
[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
DMA1             0.012      0.10       0.05       0.1        25         OUTLET
DMA4             0.012      0.10       0.05       0.1        25         OUTLET
DMA3             0.012      0.10       0.05       0.1        25         OUTLET
DMA2             0.012      0.10       0.05       0.1        25         OUTLET
BF-1-1           0.012      0.10       0.05       0.1        25         OUTLET
BF-1-2           0.012      0.10       0.05       0.1        25         OUTLET
SM-1             0.012      0.10       0.05       0.1        25         OUTLET
SM-2             0.012      0.10       0.05       0.1        25         OUTLET
SM-3             0.012      0.10       0.05       0.1        25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    Ksat       IMD
;;-------------- ---------- ---------- ----------
DMA1             9          0.01875    0.3
DMA4             9          0.01875    0.3
DMA3             9          0.01875    0.3
DMA2             9          0.01875    0.3
BF-1-1           1.5        0.3        0.33
BF-1-2           1.5        0.3        0.33
SM-1             9          0.01875    0.3
SM-2             9          .01875     0.3
SM-3             9          0.01875    0.3

[LID_CONTROLS]
;;Name           Type/Layer Parameters
;;-------------- ---------- ----------
BF-1-1           BC
BF-1-1           SURFACE    6.24       0.0        0.0        0          5
BF-1-1           SOIL       24         0.4        0.2        0.1        5          5          1.5
BF-1-1           STORAGE    15         0.67       0          0
BF-1-1           DRAIN      0.0585     0.5        3          6          0          0

BF-1-2           BC
BF-1-2           SURFACE    6.24       0.0        0          1.0        5
BF-1-2           SOIL       24         0.4        0.2        0.1        5          5          1.5
BF-1-2           STORAGE    15         0.67       0.05       0
```

```
BF-1-2           DRAIN      0.0801     0.5        3          6          0          0

[LID_USAGE]
;;Subcatchment   LID Process      Number  Area       Width      InitSat    FromImp    ToPerv     RptFile
             DrainTo          FromPerv
;;-------------- ---------------- ------- ---------- ---------- ---------- ---------- ----------
----------------------- --------------- ----------
BF-1-1           BF-1-1           1       5600       0          0          100        0          *
             *                100
BF-1-2           BF-1-2           1       9200       0          0          100        0          *
             *                0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
POC1             0          FREE                        NO
POC2             0          FREE                        NO
NODE1-OUTFLOW    0          FREE                        NO
NODE2-OUTFLOW    0          FREE                        NO

[DIVIDERS]
;;Name           Elevation  Diverted Link    Type       Parameters
;;-------------- ---------- ---------------- ---------- ----------
DIV1             0          ByPASS1          CUTOFF     0.0488     0          0          0          0

DIV2             0          Bypass2          CUTOFF     0.1096     0          0          0          0


[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape      Curve Name/Params            N/A      Fevap
Psi      Ksat     IMD
;;-------------- -------- ---------- ---------- ---------- ---------------------------- -------- --------
       -------- --------
STOR1            0        5.5        0          TABULAR    HMP-1                        0        0
STOR2            0        5          0          TABULAR    HMP-2                        0        0
BASIN1           0        5.5        0          TABULAR    HMP-1                        0        0
BASIN2           0        5          0          TABULAR    HMP-2                        0        0

[CONDUITS]
;;Name           From Node        To Node          Length     Roughness  InOffset   OutOffset  InitFlow
```

```
MaxFlow
;;-------------- ---------------- --------------- ---------- ---------- ---------- ---------- ----------
----------
Bypass1          DIV1             STOR1            400        0.01       0          0          0          0

Lowflow1         DIV1             POC1             100        0.013      0          0          0          0

Bypass2          DIV2             STOR2            400        0.01       0          0          0          0

Lowflow2         DIV2             POC2             100        0.013      0          0          0          0


[OUTLETS]
;;Name           From Node        To Node          Offset     Type            QTable/Qcoeff    Qexpon
Gated
;;-------------- ---------------- --------------- ---------- --------------- ---------------- ----------
--------
Midflow1         STOR1            POC1             0          TABULAR/DEPTH   BF-1-1-Riser                NO

Midflow2         STOR2            POC2             0          TABULAR/DEPTH   BF-1-2-Riser                NO

Basin1-riser     BASIN1           NODE1-OUTFLOW    0          TABULAR/DEPTH   BF-1-1-Riser                NO

Basin2-riser     BASIN2           NODE2-OUTFLOW    0          TABULAR/DEPTH   BF-1-2-Riser                NO


[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4      Barrels    Culvert
;;-------------- ------------ ---------------- ---------- ---------- ---------- ---------- ----------
Bypass1          DUMMY        0                0          0          0          1
Lowflow1         DUMMY        0                0          0          0          1
Bypass2          DUMMY        0                0          0          0          1
Lowflow2         DUMMY        0                0          0          0          1

[INFLOWS]
;;Node           Constituent      Time Series      Type     Mfactor  Sfactor  Baseline Pattern
;;-------------- ---------------- ---------------- -------- -------- -------- -------- --------
BASIN1           FLOW             Basin1-Hydrograph FLOW     1.0      1.0
BASIN2           FLOW             Basin2-Hydrograph FLOW     1.0      1.0
```

```
[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
BF-1-1-Riser     Rating     0.00       0.000
BF-1-1-Riser                0.05       0.002
BF-1-1-Riser                0.10       0.006
BF-1-1-Riser                0.15       0.009
BF-1-1-Riser                0.20       0.011
BF-1-1-Riser                0.25       0.012
BF-1-1-Riser                0.30       0.014
BF-1-1-Riser                0.35       0.015
BF-1-1-Riser                0.40       0.016
BF-1-1-Riser                0.45       0.017
BF-1-1-Riser                0.50       0.018
BF-1-1-Riser                0.55       0.019
BF-1-1-Riser                0.60       0.020
BF-1-1-Riser                0.65       0.021
BF-1-1-Riser                0.70       0.022
BF-1-1-Riser                0.75       0.022
BF-1-1-Riser                0.80       0.023
BF-1-1-Riser                0.85       0.024
BF-1-1-Riser                0.90       0.025
BF-1-1-Riser                0.95       0.025
BF-1-1-Riser                1.00       0.026
BF-1-1-Riser                1.05       0.027
BF-1-1-Riser                1.10       0.027
BF-1-1-Riser                1.15       0.028
BF-1-1-Riser                1.20       0.029
BF-1-1-Riser                1.25       0.029
BF-1-1-Riser                1.30       0.032
BF-1-1-Riser                1.35       0.034
BF-1-1-Riser                1.40       0.036
BF-1-1-Riser                1.45       0.038
BF-1-1-Riser                1.50       0.039
BF-1-1-Riser                1.55       0.041
BF-1-1-Riser                1.60       0.042
BF-1-1-Riser                1.65       0.043
BF-1-1-Riser                1.70       0.044
BF-1-1-Riser                1.75       0.045
BF-1-1-Riser                1.80       0.046
```

BF-1-1-Riser	1.85	0.047
BF-1-1-Riser	1.90	0.048
BF-1-1-Riser	1.95	0.049
BF-1-1-Riser	2.00	0.050
BF-1-1-Riser	2.05	0.055
BF-1-1-Riser	2.10	0.068
BF-1-1-Riser	2.15	0.086
BF-1-1-Riser	2.20	0.109
BF-1-1-Riser	2.25	0.136
BF-1-1-Riser	2.30	0.156
BF-1-1-Riser	2.35	0.170
BF-1-1-Riser	2.40	0.183
BF-1-1-Riser	2.45	0.195
BF-1-1-Riser	2.50	0.206
BF-1-1-Riser	2.55	0.216
BF-1-1-Riser	2.60	0.226
BF-1-1-Riser	2.65	0.235
BF-1-1-Riser	2.70	0.244
BF-1-1-Riser	2.75	0.252
BF-1-1-Riser	2.80	0.260
BF-1-1-Riser	2.85	0.268
BF-1-1-Riser	2.90	0.276
BF-1-1-Riser	2.95	0.283
BF-1-1-Riser	3.00	0.290
BF-1-1-Riser	3.05	0.297
BF-1-1-Riser	3.10	0.304
BF-1-1-Riser	3.15	0.311
BF-1-1-Riser	3.20	0.317
BF-1-1-Riser	3.25	0.324
BF-1-1-Riser	3.30	0.330
BF-1-1-Riser	3.35	0.336
BF-1-1-Riser	3.40	0.342
BF-1-1-Riser	3.45	0.348
BF-1-1-Riser	3.50	0.354
BF-1-1-Riser	3.55	0.359
BF-1-1-Riser	3.60	0.365
BF-1-1-Riser	3.65	0.371
BF-1-1-Riser	3.70	0.376
BF-1-1-Riser	3.75	0.754
BF-1-1-Riser	3.80	1.440

```
BF-1-1-Riser                3.85        2.326
BF-1-1-Riser                3.90        3.375
BF-1-1-Riser                3.95        4.564
BF-1-1-Riser                4.00        5.879
BF-1-1-Riser                4.05        7.307
BF-1-1-Riser                4.10        8.841
BF-1-1-Riser                4.15        10.474
BF-1-1-Riser                4.20        12.200
BF-1-1-Riser                4.25        14.014
BF-1-1-Riser                4.30        15.912
BF-1-1-Riser                4.35        17.891
BF-1-1-Riser                4.40        19.947
BF-1-1-Riser                4.45        22.078
BF-1-1-Riser                4.50        24.281
BF-1-1-Riser                4.55        26.554
BF-1-1-Riser                4.60        28.894
BF-1-1-Riser                4.65        31.301
BF-1-1-Riser                4.70        33.771
BF-1-1-Riser                4.75        36.304
BF-1-1-Riser                4.80        38.897
BF-1-1-Riser                4.85        41.550
BF-1-1-Riser                4.90        44.262
BF-1-1-Riser                4.95        47.030
BF-1-1-Riser                5.00        49.854
BF-1-1-Riser                5.05        52.733
BF-1-1-Riser                5.10        55.665
BF-1-1-Riser                5.15        58.651
BF-1-1-Riser                5.20        61.688
BF-1-1-Riser                5.25        64.776
BF-1-1-Riser                5.30        67.914
BF-1-1-Riser                5.35        71.101
BF-1-1-Riser                5.40        74.338
BF-1-1-Riser                5.45        77.621
BF-1-1-Riser                5.50        80.953
;
BF-1-2-Riser     Rating     0.00        0.000
BF-1-2-Riser                0.05        0.003
BF-1-2-Riser                0.10        0.010
BF-1-2-Riser                0.15        0.018
BF-1-2-Riser                0.20        0.022
```

BF-1-2-Riser	0.25	0.026
BF-1-2-Riser	0.30	0.029
BF-1-2-Riser	0.35	0.032
BF-1-2-Riser	0.40	0.035
BF-1-2-Riser	0.45	0.037
BF-1-2-Riser	0.50	0.040
BF-1-2-Riser	0.55	0.042
BF-1-2-Riser	0.60	0.044
BF-1-2-Riser	0.65	0.046
BF-1-2-Riser	0.70	0.048
BF-1-2-Riser	0.75	0.050
BF-1-2-Riser	0.80	0.052
BF-1-2-Riser	0.85	0.053
BF-1-2-Riser	0.90	0.055
BF-1-2-Riser	0.95	0.057
BF-1-2-Riser	1.00	0.058
BF-1-2-Riser	1.05	0.060
BF-1-2-Riser	1.10	0.061
BF-1-2-Riser	1.15	0.063
BF-1-2-Riser	1.20	0.064
BF-1-2-Riser	1.25	0.065
BF-1-2-Riser	1.30	0.067
BF-1-2-Riser	1.35	0.068
BF-1-2-Riser	1.40	0.069
BF-1-2-Riser	1.45	0.071
BF-1-2-Riser	1.50	0.072
BF-1-2-Riser	1.55	0.076
BF-1-2-Riser	1.60	0.084
BF-1-2-Riser	1.65	0.093
BF-1-2-Riser	1.70	0.099
BF-1-2-Riser	1.75	0.104
BF-1-2-Riser	1.80	0.108
BF-1-2-Riser	1.85	0.113
BF-1-2-Riser	1.90	0.116
BF-1-2-Riser	1.95	0.120
BF-1-2-Riser	2.00	0.123
BF-1-2-Riser	2.05	0.131
BF-1-2-Riser	2.10	0.146
BF-1-2-Riser	2.15	0.166
BF-1-2-Riser	2.20	0.192

BF-1-2-Riser	2.25	0.220
BF-1-2-Riser	2.30	0.242
BF-1-2-Riser	2.35	0.258
BF-1-2-Riser	2.40	0.273
BF-1-2-Riser	2.45	0.286
BF-1-2-Riser	2.50	0.299
BF-1-2-Riser	2.55	0.311
BF-1-2-Riser	2.60	0.322
BF-1-2-Riser	2.65	0.333
BF-1-2-Riser	2.70	0.344
BF-1-2-Riser	2.75	0.354
BF-1-2-Riser	2.80	0.364
BF-1-2-Riser	2.85	0.373
BF-1-2-Riser	2.90	0.382
BF-1-2-Riser	2.95	0.391
BF-1-2-Riser	3.00	0.400
BF-1-2-Riser	3.05	0.408
BF-1-2-Riser	3.10	0.416
BF-1-2-Riser	3.15	0.797
BF-1-2-Riser	3.20	1.485
BF-1-2-Riser	3.25	2.375
BF-1-2-Riser	3.30	3.426
BF-1-2-Riser	3.35	4.618
BF-1-2-Riser	3.40	5.934
BF-1-2-Riser	3.45	7.365
BF-1-2-Riser	3.50	8.901
BF-1-2-Riser	3.55	10.536
BF-1-2-Riser	3.60	12.264
BF-1-2-Riser	3.65	14.080
BF-1-2-Riser	3.70	15.980
BF-1-2-Riser	3.75	17.961
BF-1-2-Riser	3.80	20.020
BF-1-2-Riser	3.85	22.152
BF-1-2-Riser	3.90	24.357
BF-1-2-Riser	3.95	26.632
BF-1-2-Riser	4.00	28.974
BF-1-2-Riser	4.05	31.382
BF-1-2-Riser	4.10	33.854
BF-1-2-Riser	4.15	36.388
BF-1-2-Riser	4.20	38.984

```
BF-1-2-Riser                4.25       41.639
BF-1-2-Riser                4.30       44.351
BF-1-2-Riser                4.35       47.121
BF-1-2-Riser                4.40       49.947
BF-1-2-Riser                4.45       52.827
BF-1-2-Riser                4.50       55.761
BF-1-2-Riser                4.55       58.748
BF-1-2-Riser                4.60       61.787
BF-1-2-Riser                4.65       64.876
BF-1-2-Riser                4.70       68.016
BF-1-2-Riser                4.75       71.205
BF-1-2-Riser                4.80       74.442
BF-1-2-Riser                4.85       77.728
BF-1-2-Riser                4.90       81.060
BF-1-2-Riser                4.95       84.439
BF-1-2-Riser                5.00       87.864
BF-1-2-Riser                5.05       91.334
BF-1-2-Riser                5.10       94.849
BF-1-2-Riser                5.15       98.408
BF-1-2-Riser                5.20       102.010
BF-1-2-Riser                5.25       105.656
BF-1-2-Riser                5.30       109.344
BF-1-2-Riser                5.35       113.074
BF-1-2-Riser                5.40       116.846
BF-1-2-Riser                5.45       120.659
BF-1-2-Riser                5.50       124.512
;
;BF-1-1 Storage Curve
HMP-1             Storage   0.00       6051
HMP-1                       0.05       6096
HMP-1                       0.10       6141
HMP-1                       0.15       6186
HMP-1                       0.20       6231
HMP-1                       0.25       6276
HMP-1                       0.30       6321
HMP-1                       0.35       6366
HMP-1                       0.40       6411
HMP-1                       0.45       6456
HMP-1                       0.50       6501
HMP-1                       0.55       6549
```

HMP-1	0.60	6597
HMP-1	0.65	6645
HMP-1	0.70	6693
HMP-1	0.75	6741
HMP-1	0.80	6789
HMP-1	0.85	6837
HMP-1	0.90	6885
HMP-1	0.95	6933
HMP-1	1.00	6981
HMP-1	1.05	7028
HMP-1	1.10	7076
HMP-1	1.15	7124
HMP-1	1.20	7172
HMP-1	1.25	7220
HMP-1	1.30	7268
HMP-1	1.35	7316
HMP-1	1.40	7364
HMP-1	1.45	7412
HMP-1	1.50	7460
HMP-1	1.55	7511
HMP-1	1.60	7562
HMP-1	1.65	7612
HMP-1	1.70	7663
HMP-1	1.75	7714
HMP-1	1.80	7765
HMP-1	1.85	7815
HMP-1	1.90	7866
HMP-1	1.95	7917
HMP-1	2.00	7968
HMP-1	2.05	8018
HMP-1	2.10	8069
HMP-1	2.15	8120
HMP-1	2.20	8171
HMP-1	2.25	8221
HMP-1	2.30	8272
HMP-1	2.35	8323
HMP-1	2.40	8374
HMP-1	2.45	8424
HMP-1	2.50	8475
HMP-1	2.55	8529

HMP-1	2.60	8582
HMP-1	2.65	8636
HMP-1	2.70	8689
HMP-1	2.75	8743
HMP-1	2.80	8797
HMP-1	2.85	8850
HMP-1	2.90	8904
HMP-1	2.95	8957
HMP-1	3.00	9011
HMP-1	3.05	9065
HMP-1	3.10	9118
HMP-1	3.15	9172
HMP-1	3.20	9225
HMP-1	3.25	9279
HMP-1	3.30	9333
HMP-1	3.35	9386
HMP-1	3.40	9440
HMP-1	3.45	9493
HMP-1	3.50	9547
HMP-1	3.55	9603
HMP-1	3.60	9660
HMP-1	3.65	9716
HMP-1	3.70	9773
HMP-1	3.75	9829
HMP-1	3.80	9885
HMP-1	3.85	9942
HMP-1	3.90	9998
HMP-1	3.95	10055
HMP-1	4.00	10111
HMP-1	4.05	10167
HMP-1	4.10	10224
HMP-1	4.15	10280
HMP-1	4.20	10337
HMP-1	4.25	10393
HMP-1	4.30	10449
HMP-1	4.35	10506
HMP-1	4.40	10562
HMP-1	4.45	10619
HMP-1	4.50	10675
HMP-1	4.55	10734

```
HMP-1                       4.60       10793
HMP-1                       4.65       10853
HMP-1                       4.70       10912
HMP-1                       4.75       10971
HMP-1                       4.80       11030
HMP-1                       4.85       11089
HMP-1                       4.90       11149
HMP-1                       4.95       11208
HMP-1                       5.00       11267
HMP-1                       5.05       11326
HMP-1                       5.10       11385
HMP-1                       5.15       11445
HMP-1                       5.20       11504
HMP-1                       5.25       11563
HMP-1                       5.30       11622
HMP-1                       5.35       11681
HMP-1                       5.40       11741
HMP-1                       5.45       11800
HMP-1                       5.50       11859
;
;BF-1-2 Storage Curve
HMP-2            Storage    0.00       9937
HMP-2                       0.05       10011
HMP-2                       0.10       10084
HMP-2                       0.15       10158
HMP-2                       0.20       10232
HMP-2                       0.25       10306
HMP-2                       0.30       10379
HMP-2                       0.35       10453
HMP-2                       0.40       10527
HMP-2                       0.45       10600
HMP-2                       0.50       10674
HMP-2                       0.55       10751
HMP-2                       0.60       10827
HMP-2                       0.65       10904
HMP-2                       0.70       10980
HMP-2                       0.75       11057
HMP-2                       0.80       11133
HMP-2                       0.85       11210
HMP-2                       0.90       11286
```

HMP-2	0.95	11363
HMP-2	1.00	11440
HMP-2	1.05	11516
HMP-2	1.10	11593
HMP-2	1.15	11669
HMP-2	1.20	11746
HMP-2	1.25	11822
HMP-2	1.30	11899
HMP-2	1.35	11975
HMP-2	1.40	12052
HMP-2	1.45	12128
HMP-2	1.50	12205
HMP-2	1.55	12284
HMP-2	1.60	12364
HMP-2	1.65	12443
HMP-2	1.70	12523
HMP-2	1.75	12602
HMP-2	1.80	12681
HMP-2	1.85	12761
HMP-2	1.90	12840
HMP-2	1.95	12920
HMP-2	2.00	12999
HMP-2	2.05	13078
HMP-2	2.10	13158
HMP-2	2.15	13237
HMP-2	2.20	13317
HMP-2	2.25	13396
HMP-2	2.30	13475
HMP-2	2.35	13555
HMP-2	2.40	13634
HMP-2	2.45	13714
HMP-2	2.50	13793
HMP-2	2.55	13875
HMP-2	2.60	13957
HMP-2	2.65	14040
HMP-2	2.70	14122
HMP-2	2.75	14204
HMP-2	2.80	14286
HMP-2	2.85	14368
HMP-2	2.90	14451

HMP-2	2.95	14533
HMP-2	3.00	14615
HMP-2	3.05	14697
HMP-2	3.10	14779
HMP-2	3.15	14862
HMP-2	3.20	14944
HMP-2	3.25	15026
HMP-2	3.30	15108
HMP-2	3.35	15190
HMP-2	3.40	15273
HMP-2	3.45	15355
HMP-2	3.50	15437
HMP-2	3.55	15522
HMP-2	3.60	15607
HMP-2	3.65	15692
HMP-2	3.70	15777
HMP-2	3.75	15862
HMP-2	3.80	15947
HMP-2	3.85	16032
HMP-2	3.90	16117
HMP-2	3.95	16202
HMP-2	4.00	16288
HMP-2	4.05	16373
HMP-2	4.10	16458
HMP-2	4.15	16543
HMP-2	4.20	16628
HMP-2	4.25	16713
HMP-2	4.30	16798
HMP-2	4.35	16883
HMP-2	4.40	16968
HMP-2	4.45	17053
HMP-2	4.50	17138
HMP-2	4.55	17226
HMP-2	4.60	17314
HMP-2	4.65	17402
HMP-2	4.70	17489
HMP-2	4.75	17577
HMP-2	4.80	17665
HMP-2	4.85	17753
HMP-2	4.90	17841

```
HMP-2                      4.95       17929
HMP-2                      5.00       18017
HMP-2                      5.05       18104
HMP-2                      5.10       18192
HMP-2                      5.15       18280
HMP-2                      5.20       18368
HMP-2                      5.25       18456
HMP-2                      5.30       18544
HMP-2                      5.35       18631
HMP-2                      5.40       18719
HMP-2                      5.45       18807
HMP-2                      5.50       18895
```

```
[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
Basin1-Hydrograph 4/10/1962  15:00      0
Basin1-Hydrograph 4/10/1962  15:08      0.8
Basin1-Hydrograph 4/10/1962  15:16      0.8
Basin1-Hydrograph 4/10/1962  15:24      0.9
Basin1-Hydrograph 4/10/1962  15:32      0.9
Basin1-Hydrograph 4/10/1962  15:40      0.9
Basin1-Hydrograph 4/10/1962  15:48      0.9
Basin1-Hydrograph 4/10/1962  15:56      1
Basin1-Hydrograph 4/10/1962  16:04      1
Basin1-Hydrograph 4/10/1962  16:12      1
Basin1-Hydrograph 4/10/1962  16:20      1
Basin1-Hydrograph 4/10/1962  16:28      1.1
Basin1-Hydrograph 4/10/1962  16:36      1.1
Basin1-Hydrograph 4/10/1962  16:44      1.2
Basin1-Hydrograph 4/10/1962  16:52      1.2
Basin1-Hydrograph 4/10/1962  17:00      1.2
Basin1-Hydrograph 4/10/1962  17:08      1.3
Basin1-Hydrograph 4/10/1962  17:16      1.4
Basin1-Hydrograph 4/10/1962  17:24      1.4
Basin1-Hydrograph 4/10/1962  17:32      1.5
Basin1-Hydrograph 4/10/1962  17:40      1.6
Basin1-Hydrograph 4/10/1962  17:48      1.7
Basin1-Hydrograph 4/10/1962  17:56      1.8
Basin1-Hydrograph 4/10/1962  18:04      2
```

```
Basin1-Hydrograph 4/10/1962  18:12      2.1
Basin1-Hydrograph 4/10/1962  18:20      2.4
Basin1-Hydrograph 4/10/1962  18:28      2.6
Basin1-Hydrograph 4/10/1962  18:36      3.2
Basin1-Hydrograph 4/10/1962  18:44      3.6
Basin1-Hydrograph 4/10/1962  18:52      5.3
Basin1-Hydrograph 4/10/1962  19:00      8.4
Basin1-Hydrograph 4/10/1962  19:08      25.97
Basin1-Hydrograph 4/10/1962  19:16      4.3
Basin1-Hydrograph 4/10/1962  19:24      2.9
Basin1-Hydrograph 4/10/1962  19:32      2.2
Basin1-Hydrograph 4/10/1962  19:40      1.9
Basin1-Hydrograph 4/10/1962  19:48      1.6
Basin1-Hydrograph 4/10/1962  19:56      1.5
Basin1-Hydrograph 4/10/1962  20:04      1.3
Basin1-Hydrograph 4/10/1962  20:12      1.2
Basin1-Hydrograph 4/10/1962  20:20      1.1
Basin1-Hydrograph 4/10/1962  20:28      1.1
Basin1-Hydrograph 4/10/1962  20:36      1
Basin1-Hydrograph 4/10/1962  20:44      0.9
Basin1-Hydrograph 4/10/1962  20:52      0.9
Basin1-Hydrograph 4/10/1962  21:00      0.8
Basin1-Hydrograph 4/10/1962  21:08      0
;
TS-Poway         FILE "R:\1207\Hyd\SWMP\TM\ARCHIVE\CALCS\HMP\poway.dat"
;
Basin2-Hydrograph 4/10/1962  15:00      0
Basin2-Hydrograph 4/10/1962  15:08      1.4
Basin2-Hydrograph 4/10/1962  15:16      1.4
Basin2-Hydrograph 4/10/1962  15:24      1.5
Basin2-Hydrograph 4/10/1962  15:32      1.5
Basin2-Hydrograph 4/10/1962  15:40      1.5
Basin2-Hydrograph 4/10/1962  15:48      1.6
Basin2-Hydrograph 4/10/1962  15:56      1.6
Basin2-Hydrograph 4/10/1962  16:04      1.7
Basin2-Hydrograph 4/10/1962  16:12      1.7
Basin2-Hydrograph 4/10/1962  16:20      1.8
Basin2-Hydrograph 4/10/1962  16:28      1.8
Basin2-Hydrograph 4/10/1962  16:36      1.9
Basin2-Hydrograph 4/10/1962  16:44      2
```

```
Basin2-Hydrograph 4/10/1962  16:52      2
Basin2-Hydrograph 4/10/1962  17:00      2.1
Basin2-Hydrograph 4/10/1962  17:08      2.2
Basin2-Hydrograph 4/10/1962  17:16      2.3
Basin2-Hydrograph 4/10/1962  17:24      2.4
Basin2-Hydrograph 4/10/1962  17:32      2.6
Basin2-Hydrograph 4/10/1962  17:40      2.7
Basin2-Hydrograph 4/10/1962  17:48      2.9
Basin2-Hydrograph 4/10/1962  17:56      3
Basin2-Hydrograph 4/10/1962  18:04      3.4
Basin2-Hydrograph 4/10/1962  18:12      3.6
Basin2-Hydrograph 4/10/1962  18:20      4.1
Basin2-Hydrograph 4/10/1962  18:28      4.5
Basin2-Hydrograph 4/10/1962  18:36      5.4
Basin2-Hydrograph 4/10/1962  18:44      6.2
Basin2-Hydrograph 4/10/1962  18:52      9.1
Basin2-Hydrograph 4/10/1962  19:00      13.6
Basin2-Hydrograph 4/10/1962  19:08      45.21
Basin2-Hydrograph 4/10/1962  19:16      7.3
Basin2-Hydrograph 4/10/1962  19:24      4.9
Basin2-Hydrograph 4/10/1962  19:32      3.8
Basin2-Hydrograph 4/10/1962  19:40      3.2
Basin2-Hydrograph 4/10/1962  19:48      2.8
Basin2-Hydrograph 4/10/1962  19:56      2.5
Basin2-Hydrograph 4/10/1962  20:04      2.3
Basin2-Hydrograph 4/10/1962  20:12      2.1
Basin2-Hydrograph 4/10/1962  20:20      1.9
Basin2-Hydrograph 4/10/1962  20:28      1.8
Basin2-Hydrograph 4/10/1962  20:36      1.7
Basin2-Hydrograph 4/10/1962  20:44      1.6
Basin2-Hydrograph 4/10/1962  20:52      1.5
Basin2-Hydrograph 4/10/1962  21:00      1.5
Basin2-Hydrograph 4/10/1962  21:08      0

[REPORT]
;;Reporting Options
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL
```

```
[TAGS]

[MAP]
DIMENSIONS 0.000 0.000 10000.000 10000.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC1             890.411            2139.094
POC2             5526.870           2592.202
NODE1-OUTFLOW    1981.114           -1712.386
NODE2-OUTFLOW    5200.170           -1592.845
DIV1             5.269              4151.739
DIV2             5210.748           4014.752
STOR1            2081.138           4172.813
STOR2            7381.454           4035.827
BASIN1           2495.697           -180.723
BASIN2           6016.797           23.896

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
DMA1             -305.109           5724.020
DMA1             -305.109           5724.020
DMA1             -399.945           5724.020
DMA1             -399.945           5724.020
DMA1             -399.945           5724.020
DMA4             -1543.730          3213.909
DMA3             -2049.526          2360.379
DMA2             4610.116           5753.425
BF-1-1           -26.344            4699.684
BF-1-2           4974.182           4879.518
SM-1             2349.676           3237.743
SM-2             4311.532           2512.909
SM-3             4948.365           2099.828
```

```
[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
Poway            3419.389           7249.737
```

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.014)
--------------------------------------------------------------

Renzulli Estates
HMP Modeling
Post-development Condition

WARNING 04: minimum elevation drop used for Conduit Bypass1
WARNING 04: minimum elevation drop used for Conduit Lowflow1
WARNING 04: minimum elevation drop used for Conduit Bypass2
WARNING 04: minimum elevation drop used for Conduit Lowflow2

***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Flow Routing Method ...... KINWAVE
Starting Date ............ 04/10/1962 15:00:00
Ending Date .............. 05/23/2008 15:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 01:00:00
Wet Time Step ............ 00:15:00
Dry Time Step ............ 04:00:00
Routing Time Step ........ 60.00 sec
```

Runoff Quantity Continuity	Volume acre-feet	Depth inches
Initial LID Storage	0.068	0.027
Total Precipitation	1388.756	558.180
Evaporation Loss	168.499	67.725
Infiltration Loss	661.935	266.050
Surface Runoff	323.901	130.185
LID Drainage	241.323	96.994
Final Storage	0.156	0.063
Continuity Error (%)	-0.503	

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	565.222	184.186
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	3.103	1.011
External Outflow	568.278	185.182
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.008	

Highest Flow Instability Indexes

All links are stable.

Routing Time Step Summary

```
  *************************
  Minimum Time Step           :    60.00 sec
  Average Time Step           :    60.00 sec
  Maximum Time Step           :    60.00 sec
  Percent in Steady State     :     0.00
  Average Iterations per Step :     1.00
  Percent Not Converging      :     0.00


  *************************
  Subcatchment Runoff Summary
  *************************


-----------------------------------------------------------------------------------------------------
------------------
                            Total      Total      Total      Total     Imperv       Perv      Total
Total     Peak  Runoff
                           Precip      Runon       Evap      Infil     Runoff     Runoff     Runoff
Runoff   Runoff   Coeff
  Subcatchment                in         in         in         in         in         in         in    10^6
gal      CFS

-----------------------------------------------------------------------------------------------------
------------------
  DMA1                     558.18       0.00      57.75     240.49     197.00      66.67     263.67
57.78     5.98   0.472
  DMA4                     558.18       0.00      57.54     222.77     214.00      69.82     283.83
1.90     0.19   0.508
  DMA3                     558.18       0.00      52.38     253.62     179.61      77.73     257.34
2.45     0.27   0.461
  DMA2                     558.18       0.00      74.99     187.62     253.30      44.14     297.44
95.87     7.84   0.533
  BF-1-1                   558.18   16545.30     961.53       0.00       0.00       0.00   16135.22
56.34     5.99   0.943
  BF-1-2                   558.18   16716.59     804.40    2210.68       0.00       0.00   14259.23
81.77     7.85   0.825
  SM-1                     558.18       0.00      23.42     407.78       0.00     130.97     130.97
11.34     2.48   0.235
  SM-2                     558.18       0.00      40.98     305.08     118.66      99.87     218.53
```

```
3.62     0.48   0.392
  SM-3                    558.18       0.00      46.34     323.94     114.85      75.32     190.17
26.75     2.88   0.341


  ***********************
  LID Performance Summary
  ***********************


-------------------------------------------------------------------------------------------------------
--------
                                        Total      Evap     Infil   Surface    Drain    Initial     Final
Continuity
                                      Inflow      Loss      Loss   Outflow   Outflow   Storage   Storage
    Error
  Subcatchment      LID Control            in        in        in        in        in        in        in
       %

-------------------------------------------------------------------------------------------------------
--------
  BF-1-1            BF-1-1           17103.48    961.88      0.00   7328.79   8812.26      2.40      2.83
    0.00
  BF-1-2            BF-1-2           17274.77    804.42   2210.73   5911.70   8347.85      2.40      2.63
   -0.00

  ******************
  Node Depth Summary
  ******************

  ---------------------------------------------------------------------------
                                Average  Maximum  Maximum  Time of Max    Reported
                                  Depth    Depth      HGL   Occurrence   Max Depth
  Node                 Type        Feet     Feet     Feet  days hr:min        Feet
  ---------------------------------------------------------------------------
  POC1                 OUTFALL     0.00     0.00     0.00     0  00:00        0.00
  POC2                 OUTFALL     0.00     0.00     0.00     0  00:00        0.00
  NODE1-OUTFLOW        OUTFALL     0.00     0.00     0.00     0  00:00        0.00
  NODE2-OUTFLOW        OUTFALL     0.00     0.00     0.00     0  00:00        0.00
  DIV1                 DIVIDER     0.00     0.00     0.00     0  00:00        0.00
```

DIV2	DIVIDER	0.00	0.00	0.00	0	00:00	0.00
STOR1	STORAGE	0.06	4.00	4.00	6525	09:17	3.97
STOR2	STORAGE	0.04	3.45	3.45	6525	09:19	3.39
BASIN1	STORAGE	0.00	4.22	4.22	0	04:14	3.81
BASIN2	STORAGE	0.00	3.98	3.98	0	04:13	3.28

100 year peak flow detention.
Max. Detention depth, 0.5' WQ ponding excluded.

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days	hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
POC1	OUTFALL	2.95	8.06	6525	09:01	15.7	72	0.000
POC2	OUTFALL	3.36	9.35	6525	09:07	30.4	112	0.000
NODE1-OUTFLOW	OUTFALL	0.00	12.95	0	04:14	0	0.372	0.000
NODE2-OUTFLOW	OUTFALL	0.00	28.13	0	04:13	0	0.636	0.000
DIV1	DIVIDER	5.99	5.99	6525	09:16	56.3	56.3	0.000
DIV2	DIVIDER	7.85	7.85	6525	09:16	81.8	81.8	0.000
STOR1	STORAGE	0.00	5.94	6525	09:16	0	25.6	0.023
STOR2	STORAGE	0.00	7.74	6525	09:16	0	33.9	0.020
BASIN1	STORAGE	25.97	25.97	0	04:09	0.373	0.373	0.247
BASIN2	STORAGE	45.21	45.21	0	04:09	0.638	0.638	0.218

100 year storage

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
STOR1	0.373	1	0	0	31.987	66	6525 09:17	5.80
STOR2	0.416	1	0	0	43.424	63	6525 09:18	7.32
BASIN1	0.004	0	0	0	34.307	71	0 04:14	12.95
BASIN2	0.005	0	0	0	51.874	75	0 04:13	28.13

100 year storage

****
Outfall Loading Summary
****

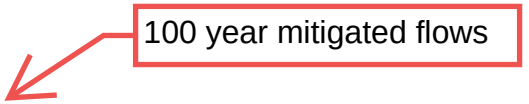
Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
POC1	14.58	0.05	8.06	72.026
POC2	11.63	0.09	9.35	112.134
NODE1-OUTFLOW	0.06	0.06	12.95	0.372
NODE2-OUTFLOW	0.05	0.11	28.13	0.636
System	6.58	0.30	28.13	185.168

100 year attenuated flows

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
Bypass1	DUMMY	5.94	6525 09:16			
Lowflow1	DUMMY	0.05	305 04:03			
Bypass2	DUMMY	7.74	6525 09:16			

Lowflow2	DUMMY	0.11	2881	04:21
Midflow1	DUMMY	5.80	6525	09:17
Midflow2	DUMMY	7.32	6525	09:19
Basin1-riser	DUMMY	12.95	0	04:14
Basin2-riser	DUMMY	28.13	0	04:13



****
Conduit Surcharge Summary
****

No conduits were surcharged.

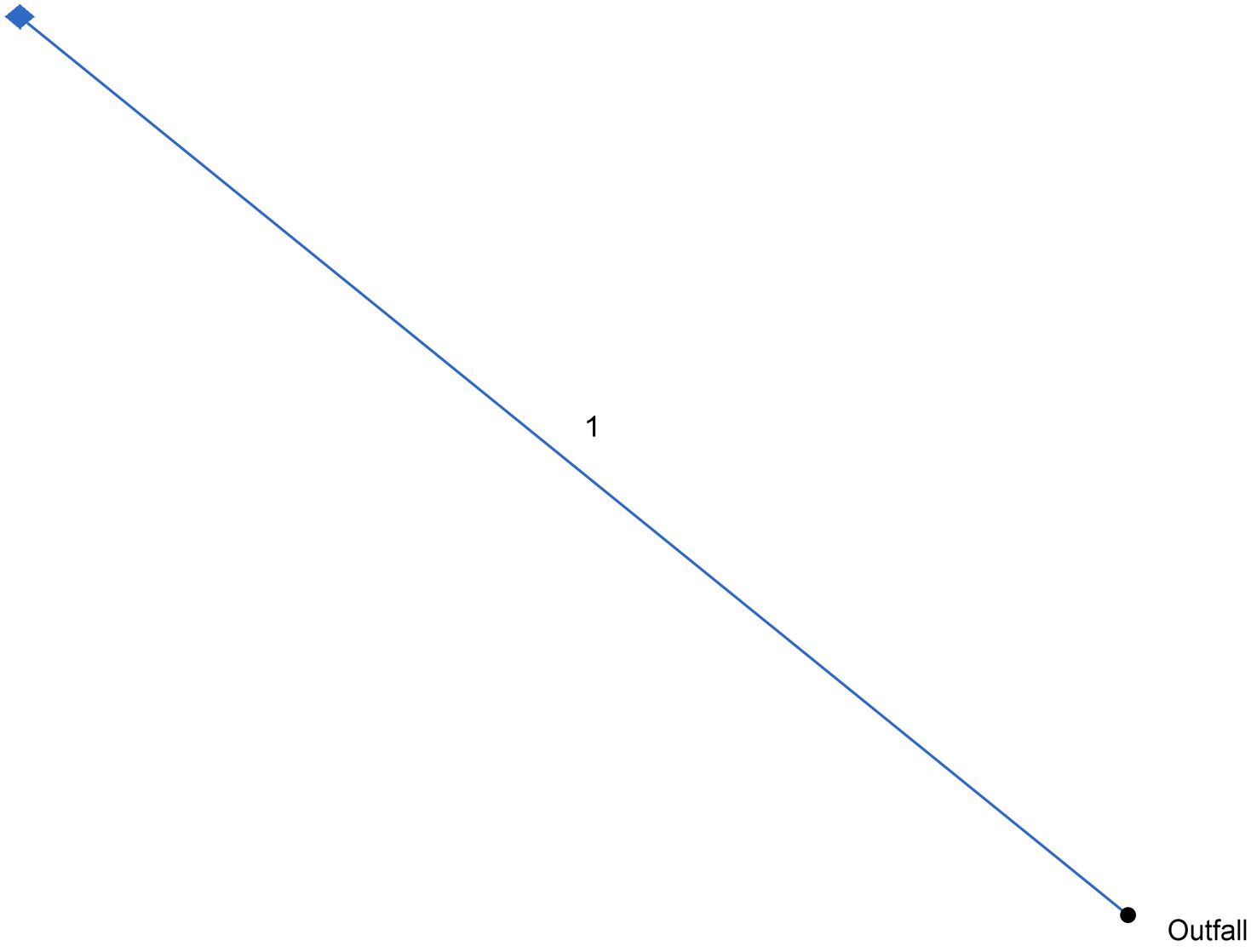
Analysis begun on: Fri Oct 6 11:57:02 2023
Analysis ended on: Fri Oct 6 11:57:31 2023
Total elapsed time: 00:00:29

CHAPTER 6
HYDRAULICS DESIGN

CHAPTER 6
HYDRAULICS DESIGN

6.1 – Storm Drain Analysis

Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan



Project File: Free Outfall-pipe node 242 to POC 1.stm	Number of lines: 1	Date: 2/7/2024

MyReport

Line No.	Line ID	Line Length (ft)	Line Size (in)	Line Type	Flow Rate (cfs)	Invert Dn (ft)	Invert Up (ft)	Line Slope (%)	HGL Dn (ft)	HGL Up (ft)	Depth Dn (ft)	Depth Up (ft)	Jump Loc (ft)	Jump Len (ft)	HGL Jmp Dn (ft)	HGL Jmp Up (ft)	Vel Dn (ft/s)	Vel Up (ft/s)	n-val Pipe	
1	To Node 244	291.300	18	Cir	13.52	760.30	839.00	27.02	761.80	840.37 j	1.50	1.37**	29.13	6.84	769.54	770.59	7.65	8.00	0.012	

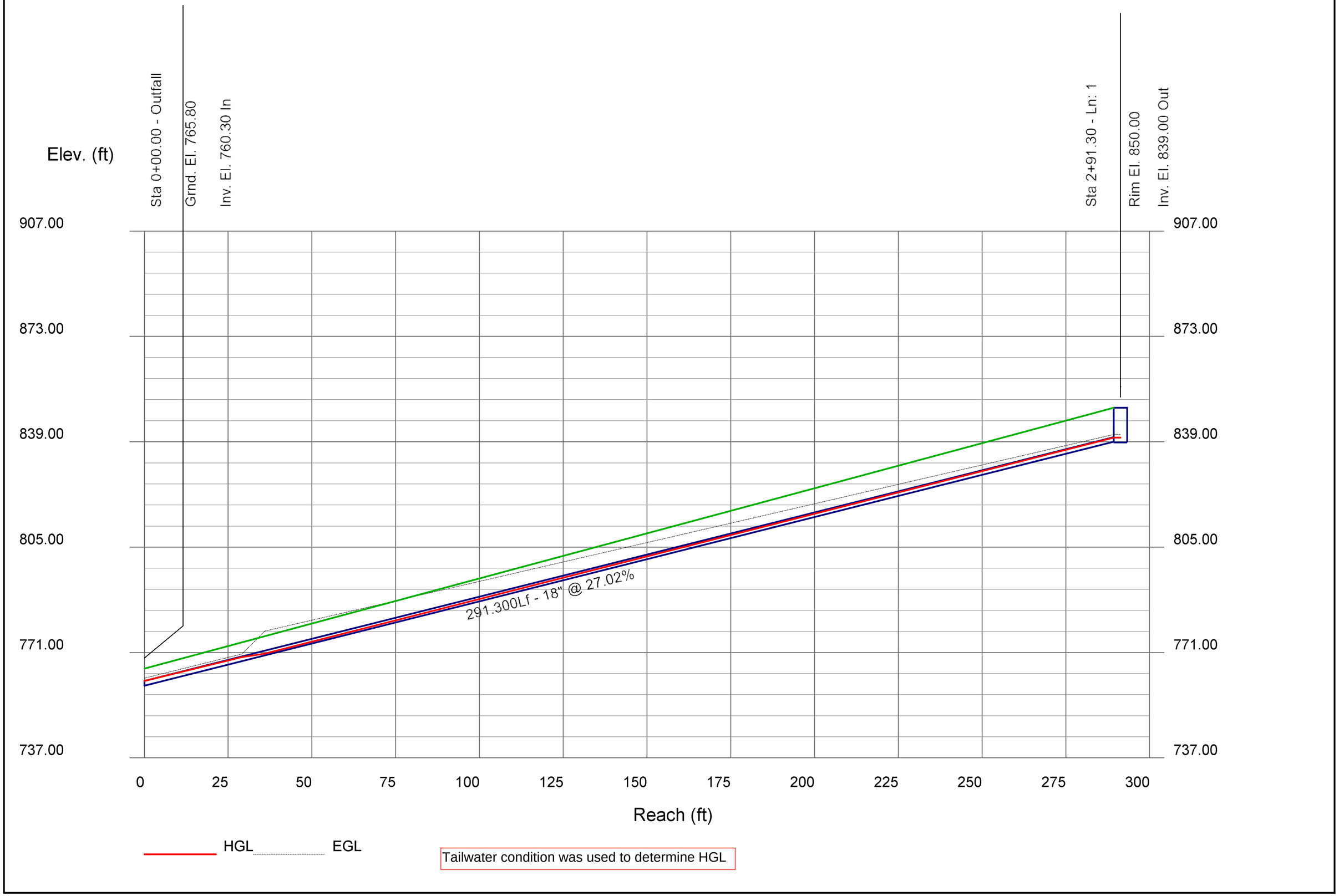
Tailwater condition

Project File: Free Outfall-pipe node 242 to POC 1.stm	Number of lines: 1	Date: 2/7/2024

NOTES: ** Critical depth

Storm Sewer Profile

Proj. file: Free Outfall-pipe node 242 to POC 1.stm



MyReport

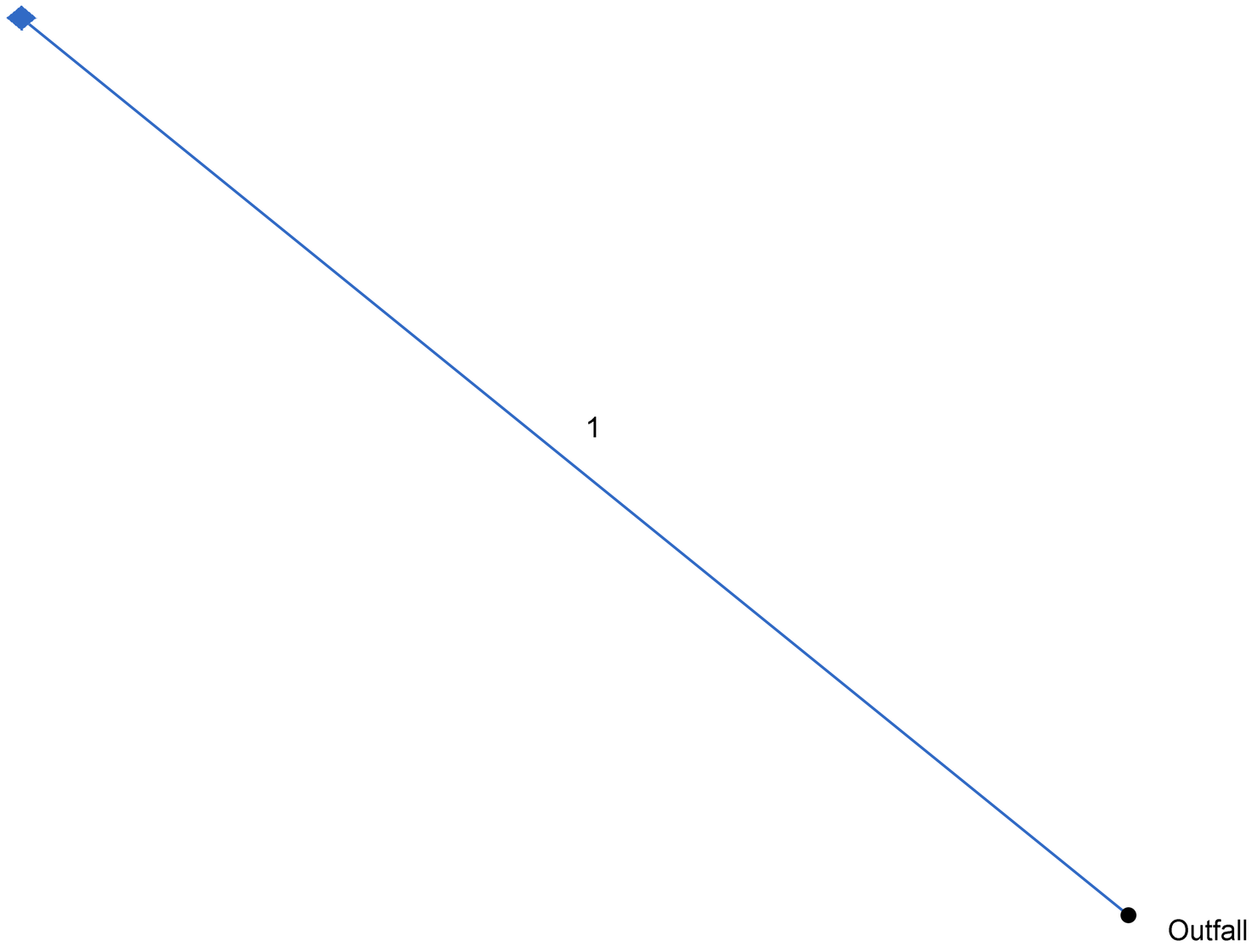
Line No.	Line ID	Line Length (ft)	Line Size (in)	Line Type	Flow Rate (cfs)	Invert Dn (ft)	Invert Up (ft)	Line Slope (%)	HGL Dn (ft)	HGL Up (ft)	Depth Dn (ft)	Depth Up (ft)	Jump Loc (ft)	Jump Len (ft)	HGL Jmp Dn (ft)	HGL Jmp Up (ft)	Vel Dn (ft/s)	Vel Up (ft/s)	n-val Pipe
1	To Node 244	291.300	18	Cir	13.52	760.30	839.00	27.02	760.79	840.37	0.49	1.37**	....	....	....	....	27.11	8.00	0.012

Free outfall condition Input to the impact basin (velocity dissipator)

Project File: Free Outfall-pipe node 242 to POC 1.stm	Number of lines: 1	Date: 2/7/2024

NOTES: ** Critical depth

Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan



Project File: pipe node 452.stm	Number of lines: 1	Date: 2/7/2024

MyReport

Line No.	Line ID	Line Length (ft)	Line Size (in)	Line Type	Flow Rate (cfs)	Invert Dn (ft)	Invert Up (ft)	Line Slope (%)	HGL Dn (ft)	HGL Up (ft)	Depth Dn (ft)	Depth Up (ft)	Jump Loc (ft)	Jump Len (ft)	HGL Jmp Dn (ft)	HGL Jmp Up (ft)	Vel Dn (ft/s)	Vel Up (ft/s)	n-val Pipe	
1	To Node 452	292.000	18	Cir	29.21	792.00	830.00	13.01	793.50	831.49 j	1.50	1.49**	29.20	7.46	797.29	797.91	16.53	16.54	0.012	

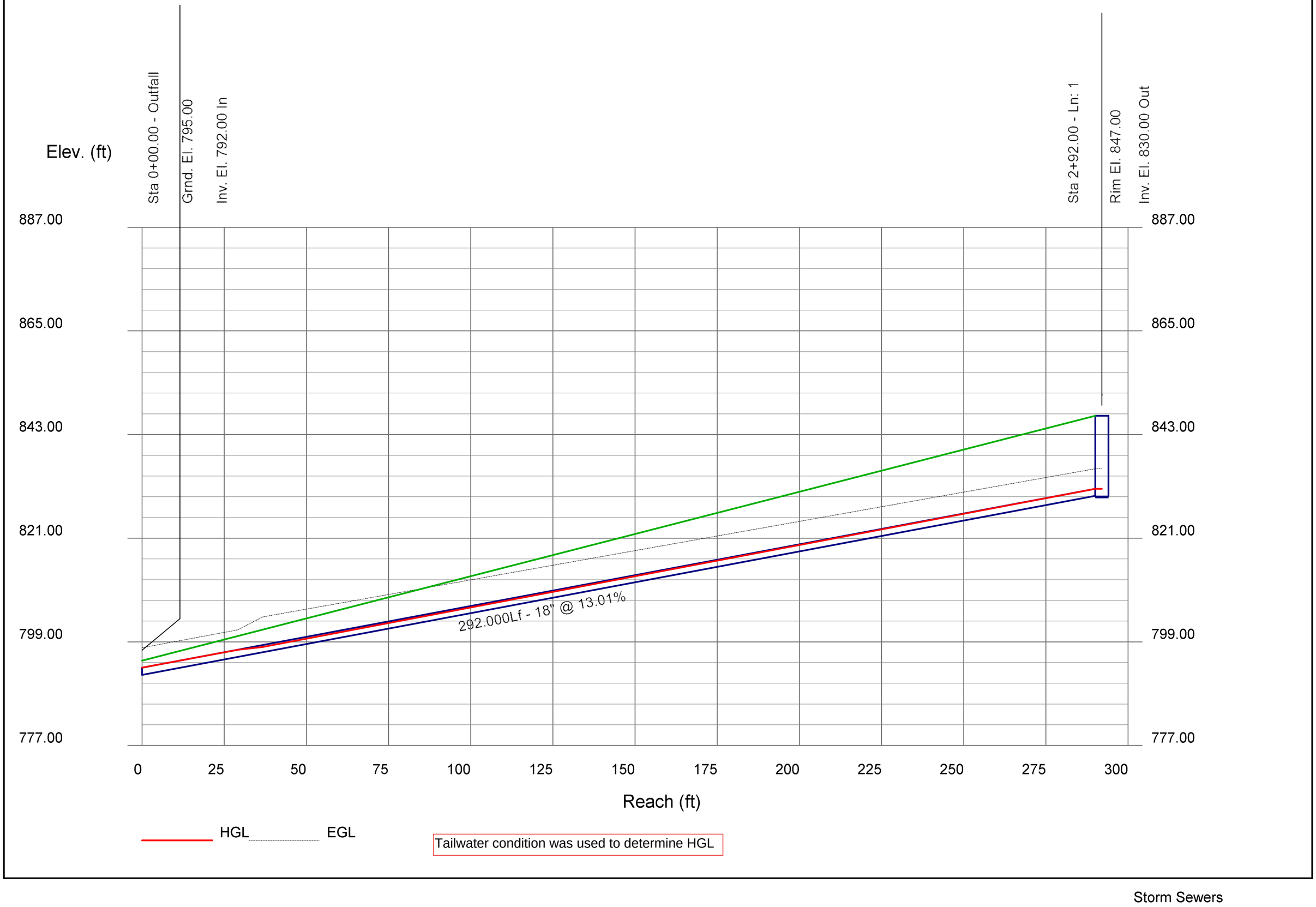
Tailwater condition

Project File: pipe node 452.stm	Number of lines: 1	Date: 2/7/2024

NOTES: ** Critical depth

Storm Sewer Profile

Proj. file: pipe node 452.stm



MyReport

Line No.	Line ID	Line Length (ft)	Line Size (in)	Line Type	Flow Rate (cfs)	Invert Dn (ft)	Invert Up (ft)	Line Slope (%)	HGL Dn (ft)	HGL Up (ft)	Depth Dn (ft)	Depth Up (ft)	Jump Loc (ft)	Jump Len (ft)	HGL Jmp Dn (ft)	HGL Jmp Up (ft)	Vel Dn (ft/s)	Vel Up (ft/s)	n-val Pipe
1	To Node 452	292.000	18	Cir	29.21	792.00	830.00	13.01	792.94	831.49	0.94	1.49**	....	....	....	....	25.21	16.54	0.012

Free outfall condition Input to the impact basin (velocity dissipator)

Project File: pipe node 452.stm	Number of lines: 1	Date: 2/7/2024

NOTES: ** Critical depth

CHAPTER 6
HYDRAULICS DESIGN
6.2 – Brow Ditch sizing

BROW DITCH RATING TABLE*			
Brow Ditch Size	Min. Slope %	Max. Capacity (cfs)	Flow Depth (ft)
2' x 1'	1	3.1	0.5
	2	4.4	0.5
	3	5.4	0.5
	4	6.3	0.5
	5	7.0	0.5
	6	7.7	0.5
	7	8.3	0.5
	8	8.9	0.5
	9	9.4	0.5
	10	9.9	0.5
	50	22.1	0.5
2.5'X 1.25'	1	8.1	0.75
	2	11.4	0.75
	3	13.9	0.75
	4	16.1	0.75
	5	18.0	0.75
	6	19.7	0.75
	7	21.3	0.75
	8	22.8	0.75
	9	24.1	0.75
	10	25.5	0.75
	50	56.9	0.75
3' x 1.5'	1	16.2	1.00
	2	22.9	1.00
	3	28.0	1.00
	4	32.3	1.00
	5	36.1	1.00
	6	39.6	1.00
	7	42.8	1.00
	8	45.7	1.00
	9	48.5	1.00
	10	51.1	1.00
	50	114.3	1.00
3.5' x 1.75'	2	39.2	1.25
	3	48.1	1.25
	4	55.5	1.25
	5	62.1	1.25
	6	38.0	1.25
	7	73.4	1.25
	8	78.5	1.25
	9	83.3	1.25
	10	87.8	1.25
	50	196.2	1.25
4' x 2'	1	43.2	1.50
	2	61.1	1.50
	3	74.8	1.50
	4	86.3	1.50
	5	96.5	1.50
	6	105.7	1.50
	7	114.2	1.50
	8	122.1	1.50
	9	129.5	1.50
	10	136.5	1.50
	50	305.2	1.50

*The rating table determined the size based on the brow ditch slope and flow carrying capacity while allowing 6" of freeboard for the Type B brow ditch.

MODIFIEDB ROW DITCH RATING TABLE*			
Brow Ditch Size	Min. Slope %	Max. Capacity (cfs)	Flow Depth (ft)
1' x 0.5'	1	0.48	0.25
	2	0.70	0.25
	3	0.85	0.25
	4	0.99	0.25
	5	1.01	0.25
	6	1.21	0.25
	7	1.30	0.25
	8	1.39	0.25
	9	1.48	0.25
	10	1.56	0.25
	50	3.48	0.25
1' x 0.5'	1	1.79	0.5
	2	2.54	0.5
	3	3.11	0.5
	4	3.59	0.5
	5	4.01	0.5
	6	4.39	0.5
	7	4.75	0.5
	8	5.07	0.5
	9	5.38	0.5
	10	5.67	0.5
	50	12.68	0.5

Brow ditch sizing was determined by using the biggest flow of all the ditches, considering the worst case scenario which will be a 1% slope.

Node 107-108 Q100=2.28 cfs

CHAPTER 6
HYDRAULICS DESIGN

6.3 – Energy Dissipator- Impact Basin Design & Inlet Control. Calculations for headwall.

Renzulli Estates

Node 244

ENERGY DISSIPATOR - IMPACT BASIN CALCULATIONS

Ref: U.S. Department of Transportation, Federal Highway Administration, Hydraulic Design of Energy Dissipators for Culverts & Channels, Hydraulic Engineering Circular No. 14, 1975

Given : Q = 13.5 cfs
d = 18 " RCP
W_w = 4 pcf
V_o = 27.1 fps (from storm drain hydraulic analysis)
y_o = 0.49 ft. (from storm drain hydraulic analysis)

Then : A = 0.5 sq. ft.
y_e = 0.5 ft.
Fr = 6.76
H_o = 11.9 ft.

From Figure VIII-C-2: H_o / W = 2.5
W = 4.76 ft.

For full pipe flow: A = 1.8 sq. ft.
V_f = 7.65 fps
H_v = 0.91 ft.

IMPACT = $H_v \times W_w$
= 3.64 psf < 225 psf for W= 4.0 feet; OK

Therefore: Use basin width, W = 4.0 feet
length of riprap = 4 x d = 6 feet

Size riprap based on velocity over end sill:

weir eqn: $Q = CLH^{1.5}$; C = 3.3 per Table 5-3 of King's Handbook

$H = (Q/CL)^{2/3}$
H = 1.02 feet

Then : A = 4 sq. ft.
v = 3.33 fps

See riprap sizing spreadsheet for sizing based upon this velocity.

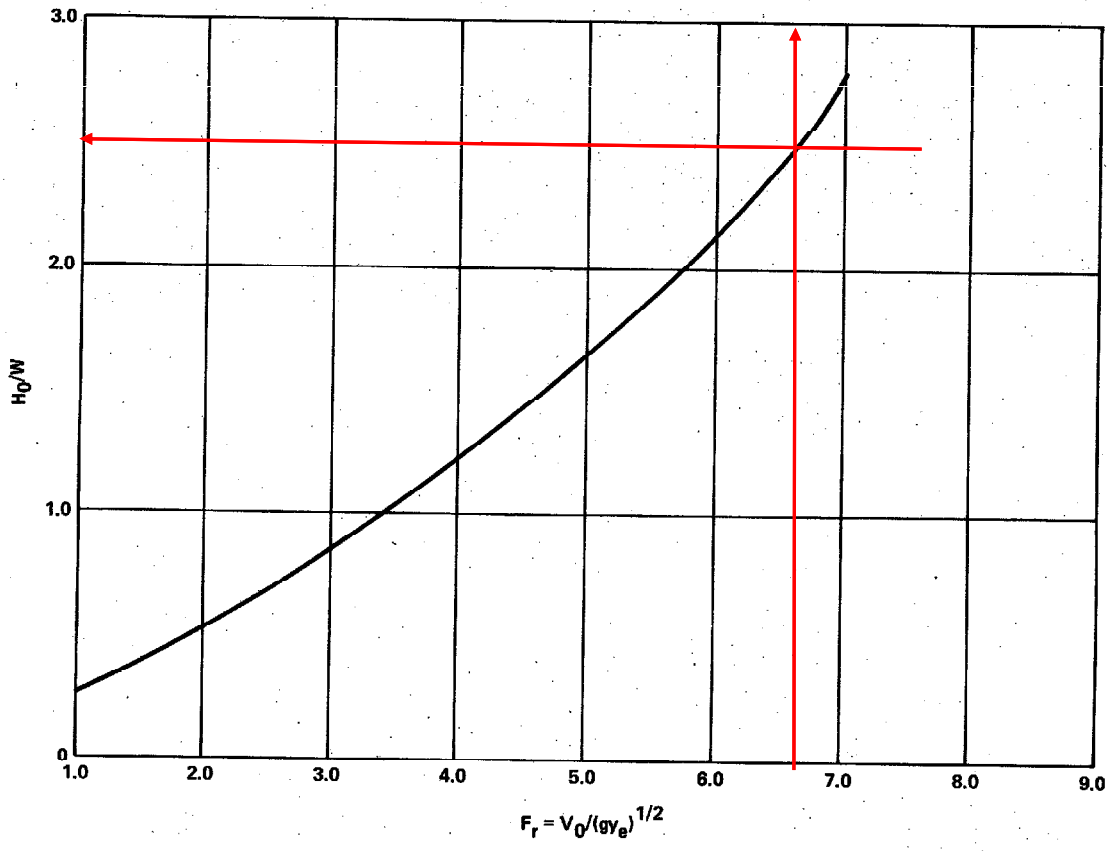


FIGURE VIII–C–2. DESIGN CURVE – BAFFLE WALL DISSIPATOR

Renzulli Estates

Node 452

ENERGY DISSIPATOR - IMPACT BASIN CALCULATIONS

Ref: U.S. Department of Transportation, Federal Highway Administration, Hydraulic Design of Energy Dissipators for Culverts & Channels, Hydraulic Engineering Circular No. 14, 1975

Given : Q = 29.2 cfs
d = 18 " RCP
W_w = 4 pcf
V_o = 27.1 fps (from storm drain hydraulic analysis)
y_o = 0.94 ft. (from storm drain hydraulic analysis)

Then : A = 1.08 sq. ft.
y_e = 0.73 ft.
Fr = 5.58
H_o = 12.1 ft.

From Figure VIII-C-2: H_o / W = 1.9
W = 6.39 ft.

For full pipe flow: A = 1.8 sq. ft.
V_f = 16.5 fps
H_v = 4.24 ft.

IMPACT = $H_v \times W_w$
= 17 psf < 225 psf for W= 4.0 feet; OK

Therefore: Use basin width, W = 4.0 feet
length of riprap = 4 x d = 6 feet

Size riprap based on velocity over end sill:

weir eqn: $Q = CLH^{1.5}$; C = 3.3 per Table 5-3 of King's Handbook

$H = (Q/CL)^{2/3}$
H = 1.7 feet

Then : A = 7 sq. ft.
v = 4.3 fps

See riprap sizing spreadsheet for sizing based upon this velocity.

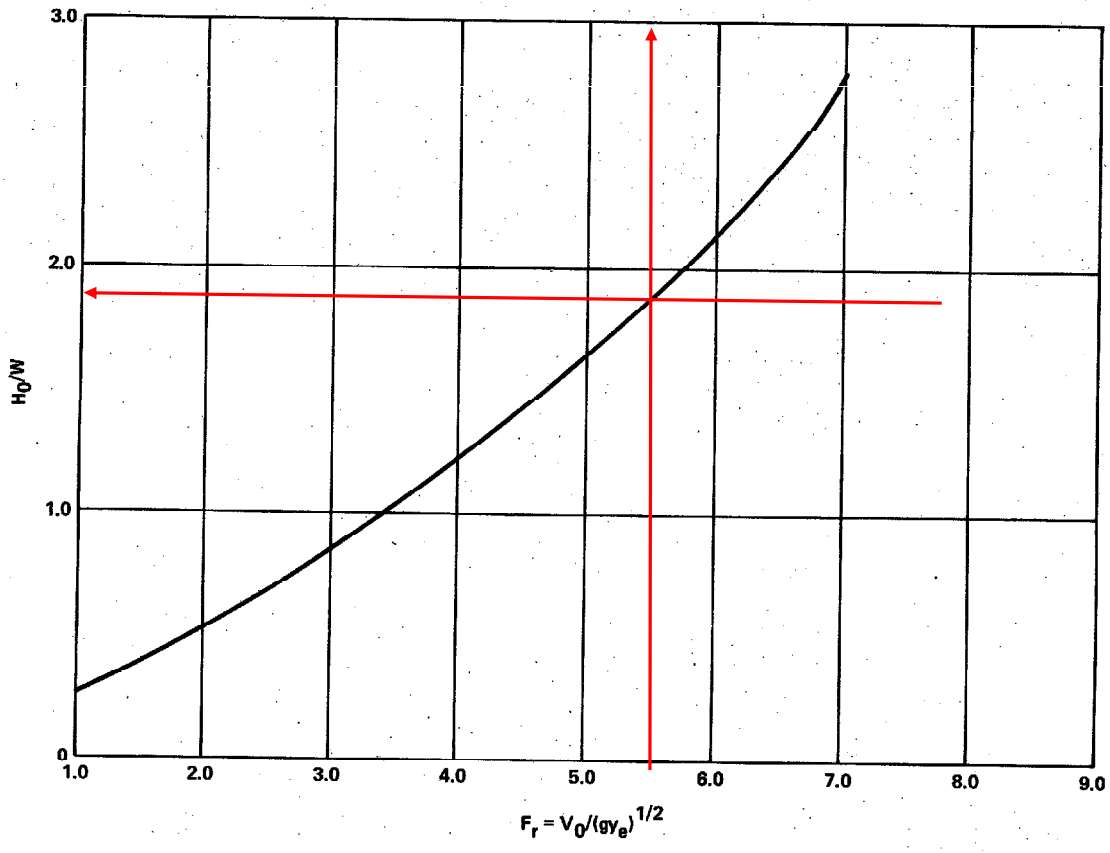
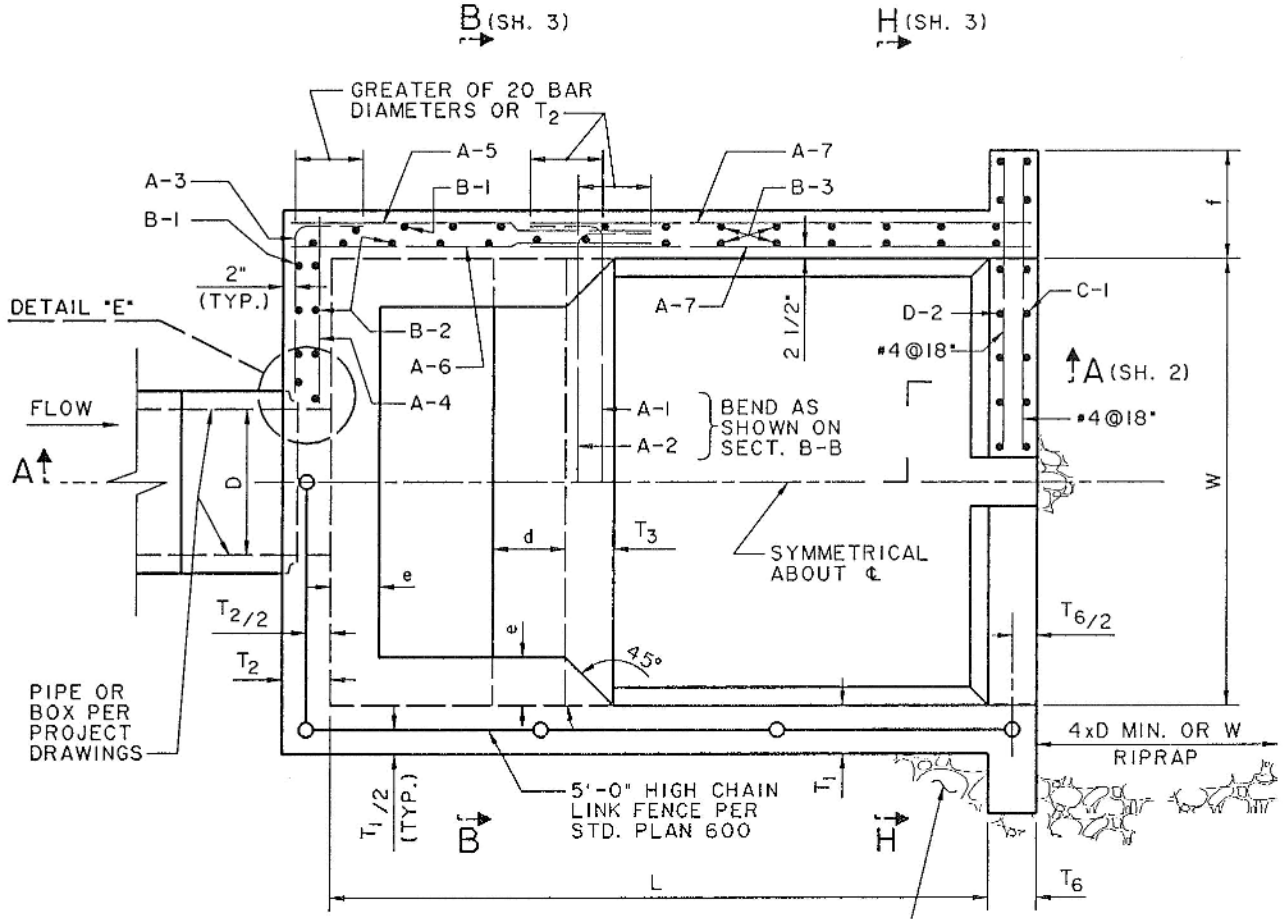
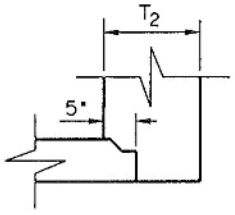


FIGURE VIII–C–2. DESIGN CURVE – BAFFLE WALL DISSIPATOR

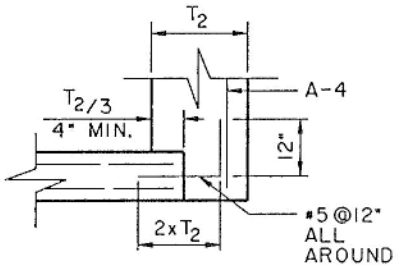


PLAN

RIPRAP, BACKFILL. RETAINING WALL OR WING WALL PER PROJECT DRAWINGS



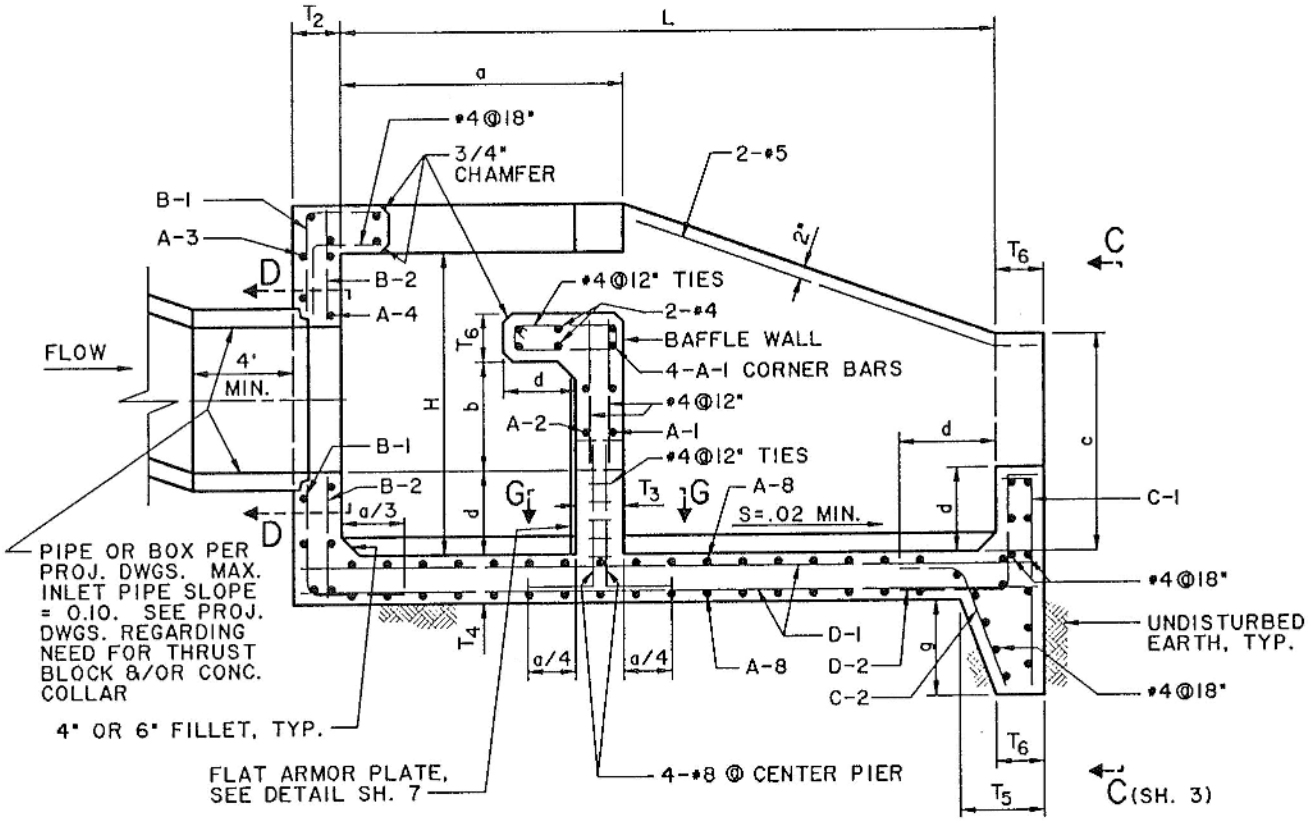
RCP (TYP.)



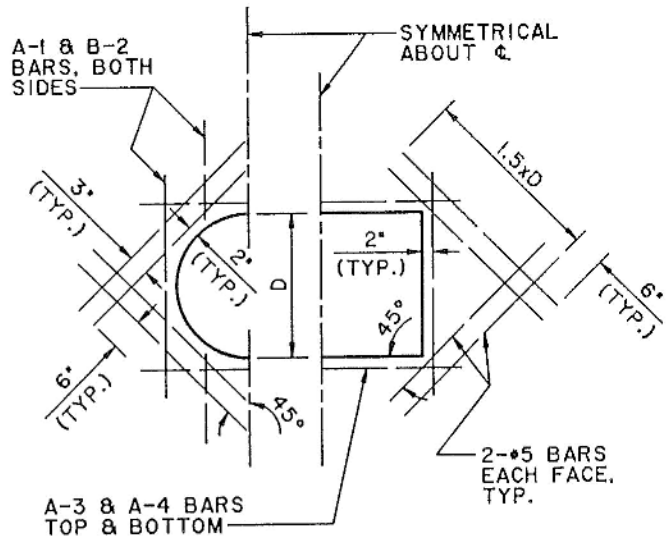
RCB (TYP.)

DETAIL "E"

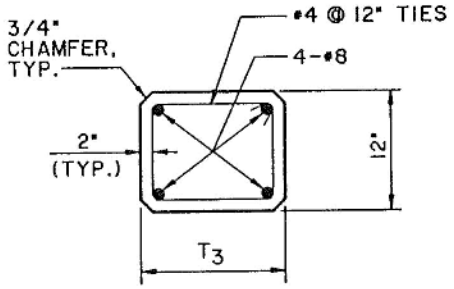
AMERICAN PUBLIC WORKS ASSOCIATION – SOUTHERN CALIFORNIA CHAPTER		
PROMULGATED BY THE APWA-AGC JOINT COOPERATIVE COMMITTEE 1993	**ENERGY DISSIPATOR - IMPACT BASIN WITH VERTICAL BAFFLE WALL** USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN **384-0** SHEET 1 OF 8



SECTION A-A



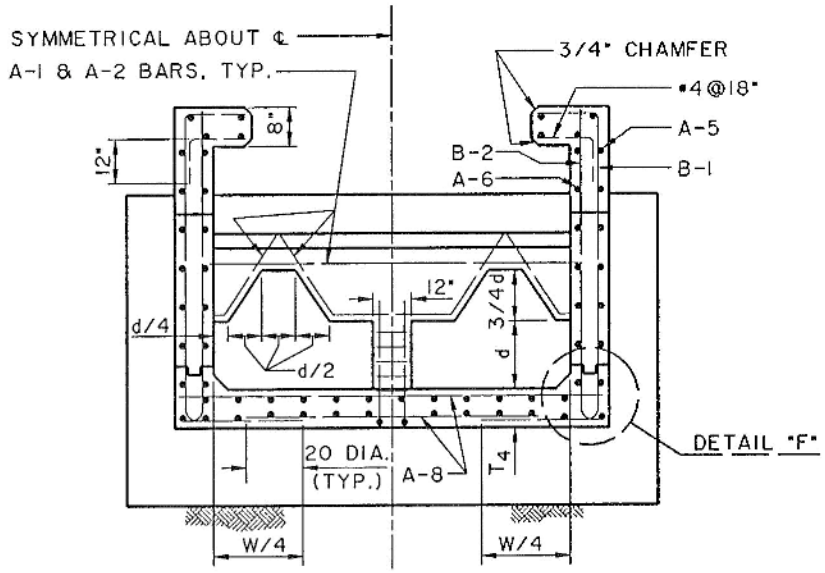
SECTION D-D



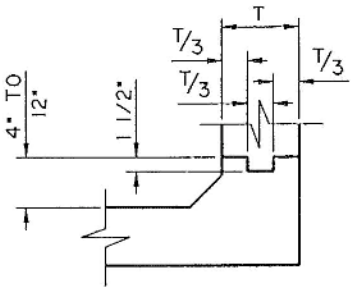
NOTE:
FLAT ARMOR PLATE NOT SHOWN.

SECTION G-G

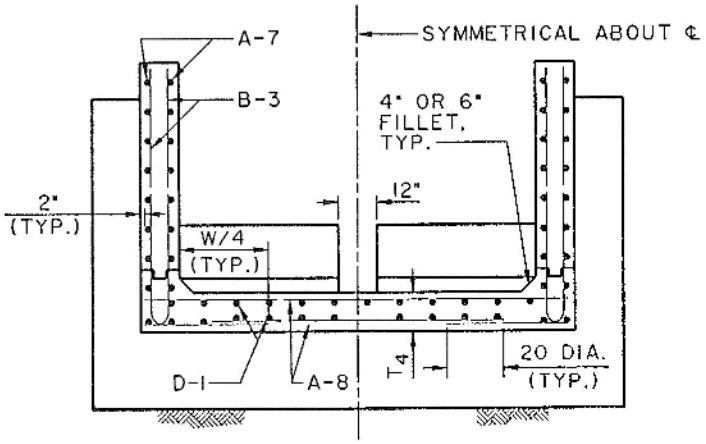
AMERICAN PUBLIC WORKS ASSOCIATION – SOUTHERN CALIFORNIA CHAPTER	STANDARD PLAN
ENERGY DISSIPATOR – IMPACT BASIN WITH VERTICAL BAFFLE WALL	**384-0**
	SHEET 2 OF 8



SECTION B-B (SH. 1)

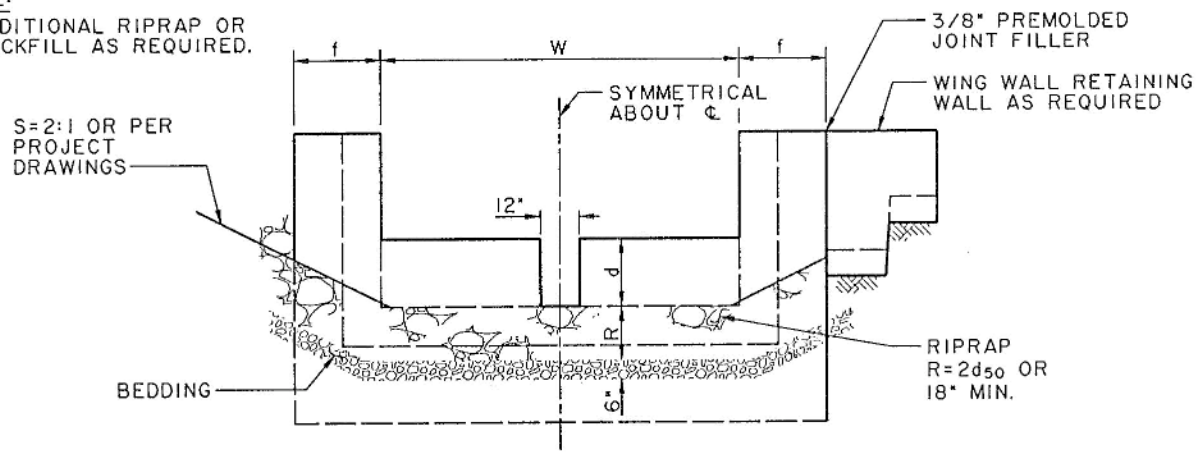


DETAIL "F"



SECTION H-H (SH. 1)

NOTE:
ADDITIONAL RIPRAP OR BACKFILL AS REQUIRED.



SECTION C-C (SH. 2)

AMERICAN PUBLIC WORKS ASSOCIATION – SOUTHERN CALIFORNIA CHAPTER	STANDARD PLAN
ENERGY DISSIPATOR – IMPACT BASIN WITH VERTICAL BAFFLE WALL	**384-0**
	SHEET 3 OF 8

BASIN WIDTH W = 4'				
DIMENSIONS		REINFORCING STEEL		
		DESIGNATION	SIZE & SPACING WORKING STRESS	SIZE & SPACING STRENGTH DESIGN
H	3'	A-1	#4 @12"	#4 @12"
L	5'-6"	A-2	#4 @12"	#4 @12"
a	2'	A-3	#4 @18"	#4 @18"
b	1'-6"	A-4	#4 @18"	#4 @18"
c	2'	A-5	#4 @18"	#4 @18"
d	8"	A-6	#4 @12"	#4 @12"
e	4"	A-7	#4 @12"	#4 @12"
f	2'	A-8	#4 @12"	#4 @12"
g	3"	B-1	#4 @12"	#4 @12"
T_1	8"	B-2	#4 @12"	#4 @12"
T_2	8"	B-3	#4 @12"	#4 @12"
T_3	8"	C-1	#4 @18"	#4 @18"
T_4	8"	C-2	#4 @18"	#4 @18"
T_5	9"	D-1	#4 @12"	#4 @12"
T_6	9"	D-2	#4 @18"	#4 @18"
DESIGN LOADS		IMPACT = 225 PSF		

BASIN WIDTH W = 6'				
DIMENSIONS		REINFORCING STEEL		
		DESIGNATION	SIZE & SPACING WORKING STRESS	SIZE & SPACING STRENGTH DESIGN
H	4'-6"	A-1	#4 @12"	#4 @12"
L	8'	A-2	#4 @12"	#4 @12"
a	3'	A-3	#4 @18"	#4 @18"
b	2'-3"	A-4	#4 @18"	#4 @18"
c	3'	A-5	#4 @18"	#4 @18"
d	1'	A-6	#4 @12"	#4 @12"
e	6"	A-7	#4 @12"	#4 @12"
f	2'	A-8	#4 @12"	#4 @12"
g	3'	B-1	#4 @12"	#4 @12"
T_1	8"	B-2	#4 @12"	#4 @12"
T_2	8"	B-3	#4 @12"	#4 @12"
T_3	8"	C-1	#4 @18"	#4 @18"
T_4	8"	C-2	#4 @18"	#4 @18"
T_5	9"	D-1	#4 @12"	#4 @12"
T_6	9"	D-2	#4 @18"	#4 @18"
DESIGN LOADS		IMPACT = 300 PSF		

BASIN WIDTH W = 8'				
DIMENSIONS		REINFORCING STEEL		
		DESIGNATION	SIZE & SPACING WORKING STRESS	SIZE & SPACING STRENGTH DESIGN
H	6'	A-1	#5 @12"	#4 @12"
L	11'	A-2	#5 @12"	#4 @12"
a	4'	A-3	#4 @18"	#4 @18"
b	3'	A-4	#4 @18"	#4 @18"
c	4'	A-5	#4 @18"	#4 @18"
d	1'-4"	A-6	#5 @12"	#4 @12"
e	8"	A-7	#4 @12"	#4 @12"
f	2'	A-8	#4 @12"	#4 @12"
g	3'	B-1	#4 @12"	#4 @12"
T_1	8"	B-2	#4 @12"	#4 @12"
T_2	8"	B-3	#4 @12"	#4 @12"
T_3	8"	C-1	#4 @18"	#4 @18"
T_4	8"	C-2	#4 @18"	#4 @18"
T_5	9"	D-1	#4 @12"	#4 @12"
T_6	9"	D-2	#4 @18"	#4 @18"
DESIGN LOADS		IMPACT = 375 PSF		

BASIN WIDTH W = 10'				
DIMENSIONS		REINFORCING STEEL		
		DESIGNATION	SIZE & SPACING WORKING STRESS	SIZE & SPACING STRENGTH DESIGN
H	7'-6"	A-1	#6 @12"	#5 @12"
L	13'-6"	A-2	#7 @12"	#6 @12"
a	5'	A-3	#4 @18"	#4 @18"
b	3'-9"	A-4	#4 @18"	#4 @18"
c	5'	A-5	#4 @18"	#4 @18"
d	1'-8"	A-6	#7 @12"	#6 @12"
e	10"	A-7	#5 @14"	#5 @14"
f	2'	A-8	#5 @11"	#4 @12"
g	4'	B-1	#4 @12"	#4 @12"
T_1	8"	B-2	#4 @12"	#4 @12"
T_2	8"	B-3	#6 @18"	#6 @18"
T_3	8"	C-1	#4 @18"	#4 @18"
T_4	8"	C-2	#4 @18"	#4 @18"
T_5	9"	D-1	#4 @12"	#4 @12"
T_6	9"	D-2	#4 @18"	#4 @18"
DESIGN LOADS		IMPACT = 450 PSF		

BASIN WIDTH W = 12'				
DIMENSIONS		REINFORCING STEEL		
		DESIGNATION	SIZE & SPACING WORKING STRESS	SIZE & SPACING STRENGTH DESIGN
H	9'	A-1	#9 @18"	#6 @12"
L	16'	A-2	#9 @18"	#6 @12"
a	6'	A-3	#4 @18"	#4 @18"
b	4'-6"	A-4	#4 @18"	#4 @18"
c	6'	A-5	#4 @18"	#4 @18"
d	2'	A-6	#8 @12"	#7 @12"
e	12"	A-7	#5 @12"	#5 @12"
f	2'-6"	A-8	#7 @12"	#5 @12"
g	5'	B-1	#4 @12"	#4 @12"
T_1	9"	B-2	#4 @12"	#4 @12"
T_2	8"	B-3	#5 @12"	#5 @12"
T_3	10"	C-1	#4 @18"	#4 @18"
T_4	8"	C-2	#4 @18"	#4 @18"
T_5	9"	D-1	#4 @12"	#4 @12"
T_6	9"	D-2	#4 @18"	#4 @18"
DESIGN LOADS		IMPACT = 525 PSF		

BASIN WIDTH W = 14'				
DIMENSIONS		REINFORCING STEEL		
		DESIGNATION	SIZE & SPACING WORKING STRESS	SIZE & SPACING STRENGTH DESIGN
H	10'-6"	A-1	#8 @12"	#8 @18"
L	18'-6"	A-2	#8 @12"	#8 @18"
a	7'	A-3	#4 @12"	#4 @18"
b	5'-3"	A-4	#4 @18"	#4 @18"
c	7'	A-5	#4 @12"	#4 @18"
d	2'-4"	A-6	#9 @12"	#8 @12"
e	1'-2"	A-7	#5 @10"	#5 @10"
f	3'	A-8	#8 @12"	#6 @11"
g	5'-6"	B-1	#4 @12"	#4 @12"
T_1	10"	B-2	#4 @12"	#4 @12"
T_2	10"	B-3	#6 @15"	#6 @15"
T_3	12"	C-1	#4 @18"	#4 @18"
T_4	8.5"	C-2	#4 @18"	#4 @18"
T_5	9"	D-1	#4 @12"	#4 @12"
T_6	9"	D-2	#4 @18"	#4 @18"
DESIGN LOADS		IMPACT = 600 PSF		

NOTES:
1. BASIN FULL + IMPACT ON BAFFLE WALL.
2. BASIN FULL + 1/2 IMPACT ON THE OTHER WALLS.
3. STRENGTH DESIGN: LIVE LOAD FACTOR = 1.7
   DEAD LOAD FACTOR = 1.4

AMERICAN PUBLIC WORKS ASSOCIATION – SOUTHERN CALIFORNIA CHAPTER

ENERGY DISSIPATOR – IMPACT BASIN WITH VERTICAL BAFFLE WALL

STANDARD PLAN
384-0
SHEET 4 OF 8

Figure 4-3

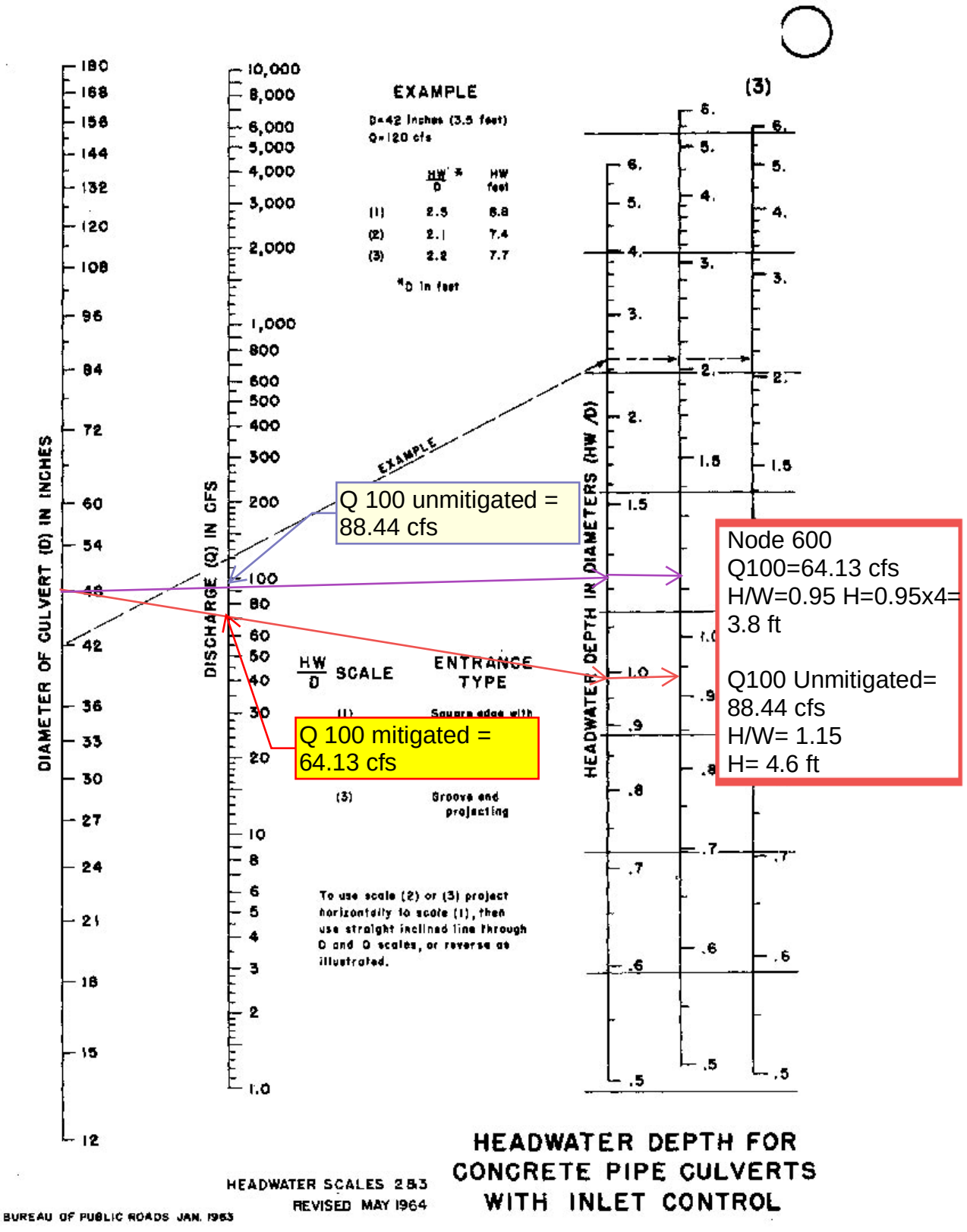


Figure 4-3 Sample Inlet Control Nomograph

CHAPTER 6
HYDRAULICS DESIGN

6.4 – Channel/Drop Structure Design HEC-RAS

PROPOSED CHANNEL HYDRAULIC ANALYSIS

In this study, we have utilized the Hydrologic Engineering Center – River Analysis System (HEC-RAS) version 6.3.1 program. The primary purpose of employing this model is to calculate key parameters such as water surface elevation and velocity in the proposed channel. Additionally, it helps in determining the limits of the proposed riprap at the drop structure.

For our analysis, we opted for HEC-RAS 1D steady flow modeling due to its robust accuracy and efficient computing capabilities. We applied this 1D modeling approach at all relevant crossings. These locations involve the channel flowing perpendicular to the proposed drop structures, allowing us to accurately model flow and water surface elevation changes while maintaining a short computing time.

6.1 HEC-RAS 1D Modeling

In this analysis, we based our calculations on the 100-year flow data from the AES proposed unmitigated condition analysis. To account for the channel improvements and riprap design, we assigned Manning's n values as follows: 0.04 for the grouted riprap area, 0.06 for the existing slope that will remain on the left side of the channel, characterized by dense trees and brushes, and 0.035 for the proposed channel and slopes.

6.2 Analysis Summary

Our analysis indicates that in the proposed scenario, the channel velocity remains below 5 ft/sec at all cross-sections. However, it ranges from 5.27 to 5.35 ft/sec where the grouted riprap is proposed (cross-sections 263 to 232 and 197 to162).

The drop structures were designed in accordance with the City Drainage Design Manual - Section 7.11.

For a more detailed overview, please refer to the following table and figures illustrating the channel's behavior after the riprap application.

Equation 7-23. Bed Shear Stress Calculation

Calculation 1

$$\tau_0 = \gamma RS$$

Calculation 2

$$\tau_0 = (1/8)\rho f_0 V^2$$

where:

τ_0	=	shear stress (lb/ft^2)
γ	=	specific weight of water (62.4 lb/ft^3)
R	=	hydraulic radius (ft)
S	=	energy slope (ft/ft)
ρ	=	density of water (lb/ft^3)
f_0	=	Darcy-Weisbach friction factor
V	=	mean flow velocity (ft/s)

Equation 7–23 is usually the simplest to utilize. The diameter of the largest particle moving is then determined by Equation 7–24.

Equation 7-24. Diameter of Largest Particle Moving Calculation

$$D = \tau_0 / (0.047(S_S - 1)\gamma)$$

where:

D	=	diameter of the sediment (ft)
S_S	=	specific gravity of sediment
0.047	=	recommended value of Shields' parameter

7.10.8 Other Channel Scour Considerations

Additional channel erosion and scour conditions such as anti-dune trough depth, channel bend scour, channel contraction scour, and local scour at abutments, piers, etc. might have significant design implications for an alluvial channel. FHWA HEC-18, "Evaluating Scour at Bridges," and several other references listed for Chapter 7 in the reference section of this Manual offer several references for more detailed discussion of these considerations.

7.11 Design Procedures: Channel Grade Control and Drop Structures

The design of stable open channels (rigid and alluvial) often requires the use of channel drop and/or grade control structures to control the longitudinal slope of channels to keep design velocities within the acceptable limits.

Channel grade control and drop structures presented in this Section shall only be used when the inflow channel condition is subcritical (FR <1.0). If the inflow channel condition is super critical (FR >1.0), an energy dissipator or stilling basin shall be used instead (see Chapter 8).

Channel grade control and drop structures may be constructed of many types of materials, including concrete, riprap, grouted riprap, gabions, sheet piles, or other materials. The selection of material and type of grade control depends in part on their hydraulic limitations (see Table 7–11 for typical hydraulic limitations), aesthetic considerations, and other site conditions such as presence of abrasive sediment bed load. This Section presents minimum design criteria and charts to aid in the design of sloping grouted boulder grade control structure. The reference section of this Manual provides several references for channel drop and energy dissipation design with detailed information available on other types of structures.

Table 7-11. Channel Drop Structures

Description	Upstream Flow Regime	Max. Drop Height (ft)	Max. Unit Discharge	Max. Inflow Velocity (ft/s)	Upstream Cross-Section
Sloping Riprap Drop Structure	Subcritical	10	35	7	Trapezoidal
Vertical Riprap Drop Structure	Subcritical	3	35	7	Trapezoidal
Straight Drop Structure	Subcritical	8	n/a	n/a	Rectangular
USBR Type IX Baffled Apron	Subcritical	n/a	60	n/a	Rectangular

The effectiveness of grade control and drop structures is dependent on many factors, including discharges, tailwater depths, and type of structures. The structures also must function over a wide range of discharges. Therefore, it is important to confirm performance during events smaller than the maximum design flow. This may be accomplished by evaluating flows of specific more frequent storm events (e.g., 10-year, 2-year, etc.), or testing successive fractions (e.g., one-half, one-quarter, and further if necessary) of the design flow. However, only calculations for the full design flow are required to be submitted for review.

7.11.1 Sloping Grouted Boulder Drop Structure

Sloping grouted boulder drop structures have gained popularity due to their design aesthetic and successful field application. Figure 7–18 illustrates a typical sloping grouted boulder drop structure. The sloping grouted boulder drop is designed to operate as a hydraulic jump dissipator, although some energy loss is incurred due to the roughness of the grouted rock slope. The quality of rock used and proper grouting procedure are very important to the structural integrity. The main design objectives are to maintain structural integrity and to contain erosive turbulence within the downstream basin.

Figure 7-18. Example of Sloping Grouted Boulder Drop Structure

Grouted boulder drops must be constructed of uniform size boulders grouted in place through the approach, sloping face, basin, and exit areas of the drop. Figure 7–19 illustrates the general configuration of the sloping grouted boulder drop structure, and Tables 7–12 and 7–13 summarize the design parameters for the drop structure.

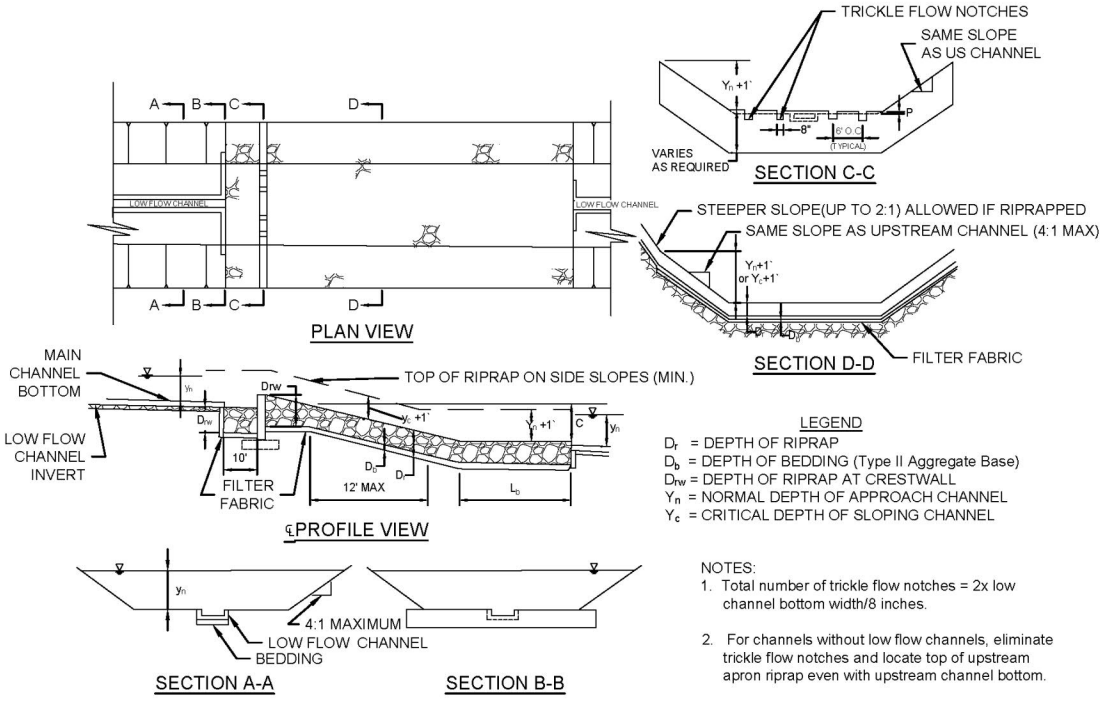


Figure 7-19. Grouted Riprap Drop Structure (for Illustration Only)

Table 7-12. Sloping Riprap Channel Drop Design Chart – Part 1

Max. Unit Discharge (cfs/ft)	Max. Allowable Chute Slope (S_o)		Downstream Apron Length (L_b) (ft)
	¼ Ton Riprap	Grouted Riprap	
0-15	7H:1V	4H:1V	15
15-20	8H:1V	5H:1V	20
20-25	10H:1V	6H:1V	20
25-30	12H:1V	7H:1V	25
30-35	13H:1V	8H:1V	25
> 35	Structure Not Allowed for Unit Discharges > 35 cfs/ft		
Incoming Velocity	Riprap Apron Thickness (D_r)		
	(ft)	(ft)	
V ≤ 5 ft/s	1.75	2.6	
V > 5 ft/s	2.0	3.0	
	Riprap Apron Thickness at Crest (D_{rw})		
	(ft)	(ft)	
	1.5 D_r	1.25 D_r	

Table 7-13. Sloping Riprap Channel Drop Design Chart – Part 2

Channel Bottom Width (b)	Crest Wall Elevation (P)		
	$Y_N \leq 4$ ft	$Y_N > 4$ ft	
		$V_N \leq 5$ ft	$V_N > 5$ ft/s
(ft)	(ft)	(ft)	(ft)
≤ 20	0.1	0.2	0.2
20-60	0.1	0.4	0.2
60-100	0.1	0.5	0.3
> 100	0.2	0.5	0.3

7.11.1.1 Approach Apron

The grouted boulder drop structure has a 10-foot trapezoidal riprap approach section immediately upstream of its crest. The approach apron is provided to protect against the increasing velocities and turbulence that result as the water approaches the sloping portion of the drop structure. The width of the approach apron and the side slopes should match the upstream channel, and the height of grouted boulder channel sides shall be equal to the depth of water in the upstream channel plus the required freeboard as described in Section 7.2.7.

A concrete cutoff wall shall be placed at the top of the slope and on the upstream side of the approach apron to reduce or eliminate seepage and piping through the structure (Figure 7–19). The depth of the cutoff wall shall be at least 1 foot and extend the full depth of the riprap layer. Depending on the soil type and hydraulic forces acting on the drop structure, the cutoff wall may need to be deeper to lengthen the seepage flow path.

7.11.1.2 Drop

The slope of the drop structure shall not be steeper than 4H:1V (Table 7–12). Slopes flatter than 4H:1V usually increase expense, but some improvement in appearance may be gained. The side slopes and bottom width of the drop shall be the same as the upstream channel. The grouted boulders shall extend up the side slopes a height of the tailwater depth plus freeboard as projected from the downstream channel or the critical depth plus 1 foot, whichever is greater.

7.11.1.3 Exit Apron

The exit apron is necessary to minimize any erosion that may occur due to secondary currents. The bottom width and side slopes of the exit apron shall be the same as the downstream channel. The apron sides shall extend to a height equal to the tailwater depth plus the required freeboard. Table 7–12 provides the length of the exit apron (L_b).

7.11.1.4 Drainage

Drop structure shall include appropriate structural analysis and analysis of geotechnical factors such as seepage. Weep drains should be considered for seepage and uplift control. A continuous manifold is preferred over a "point" system for weep drainage of a drop structure, as it provides more complete interception of subsurface drainage. Weep systems requires special attention during construction. The boulders can crush the pipes and alignment of the pipes between the boulders can be difficult. Flexible outlet pipes shall be used to allow alignment of the pipes around the boulders when necessary.

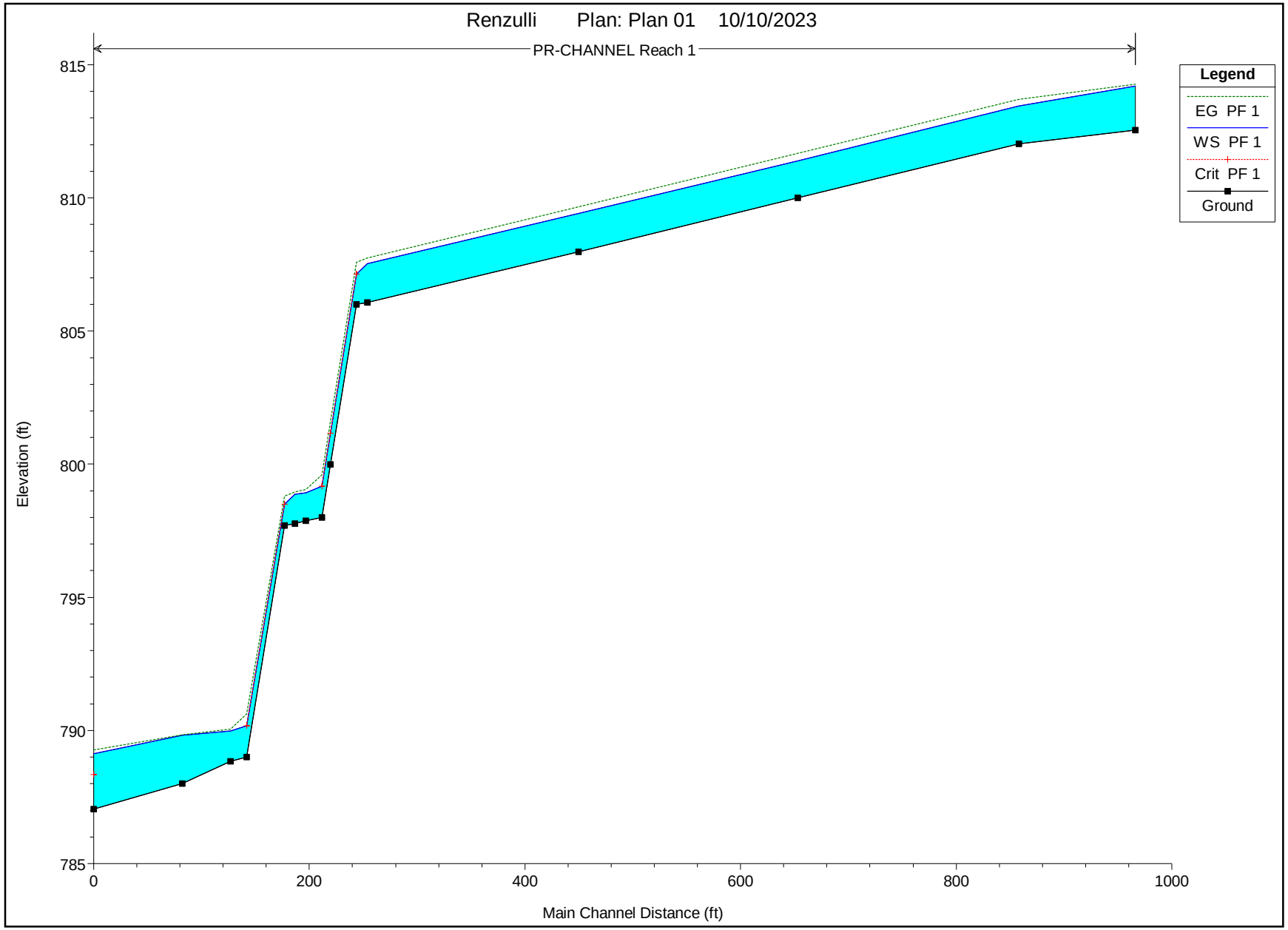
7.11.2 Drop Structures Used for Grade Control

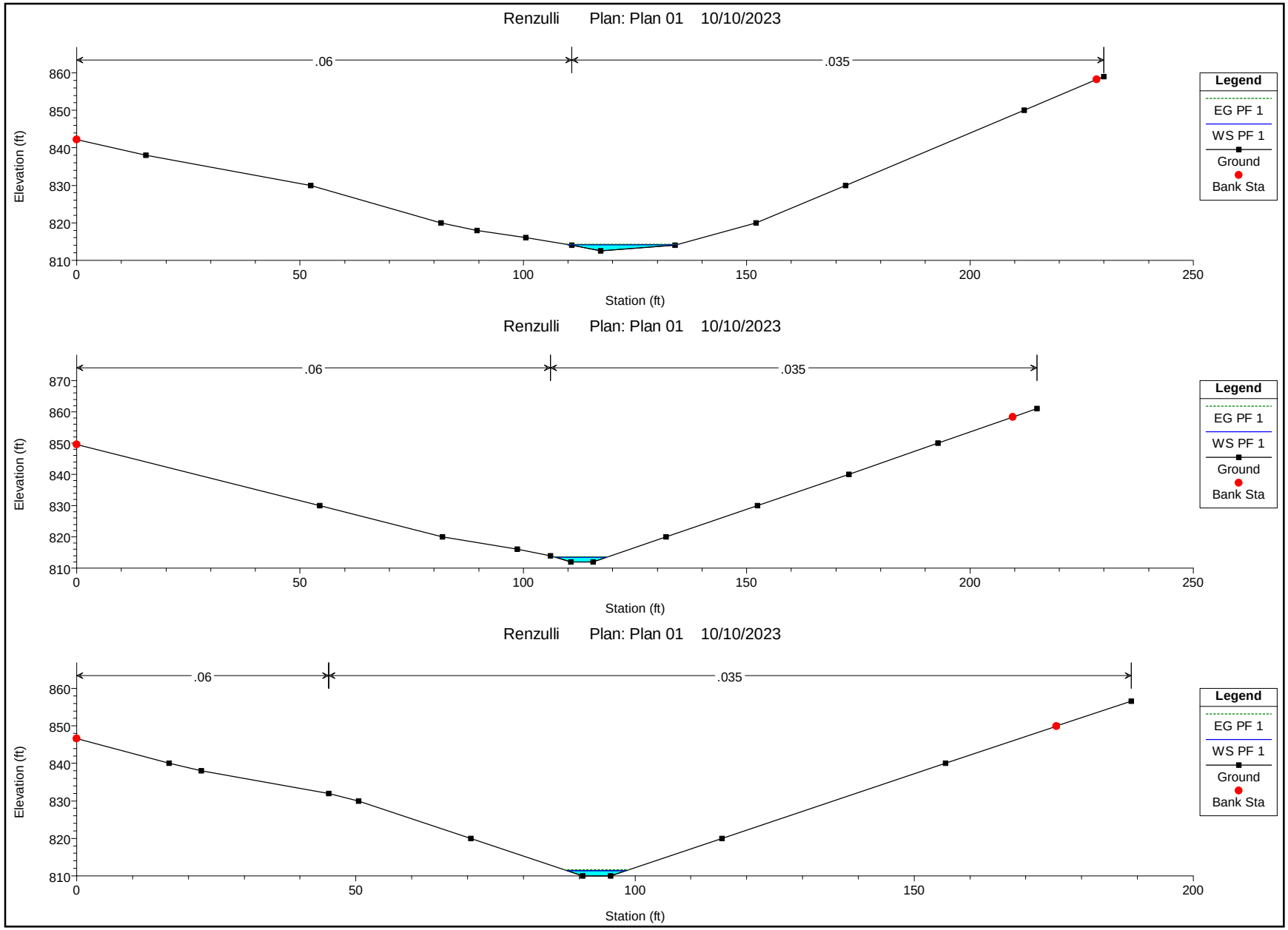
The natural topographic slope of a project reach can often be too steep for a stable alluvial channel or particular engineered channel design. In these cases, the grouted sloping boulder drop structure and other drop structure designs can used as grade control structures to limit longitudinal slope of a channel.

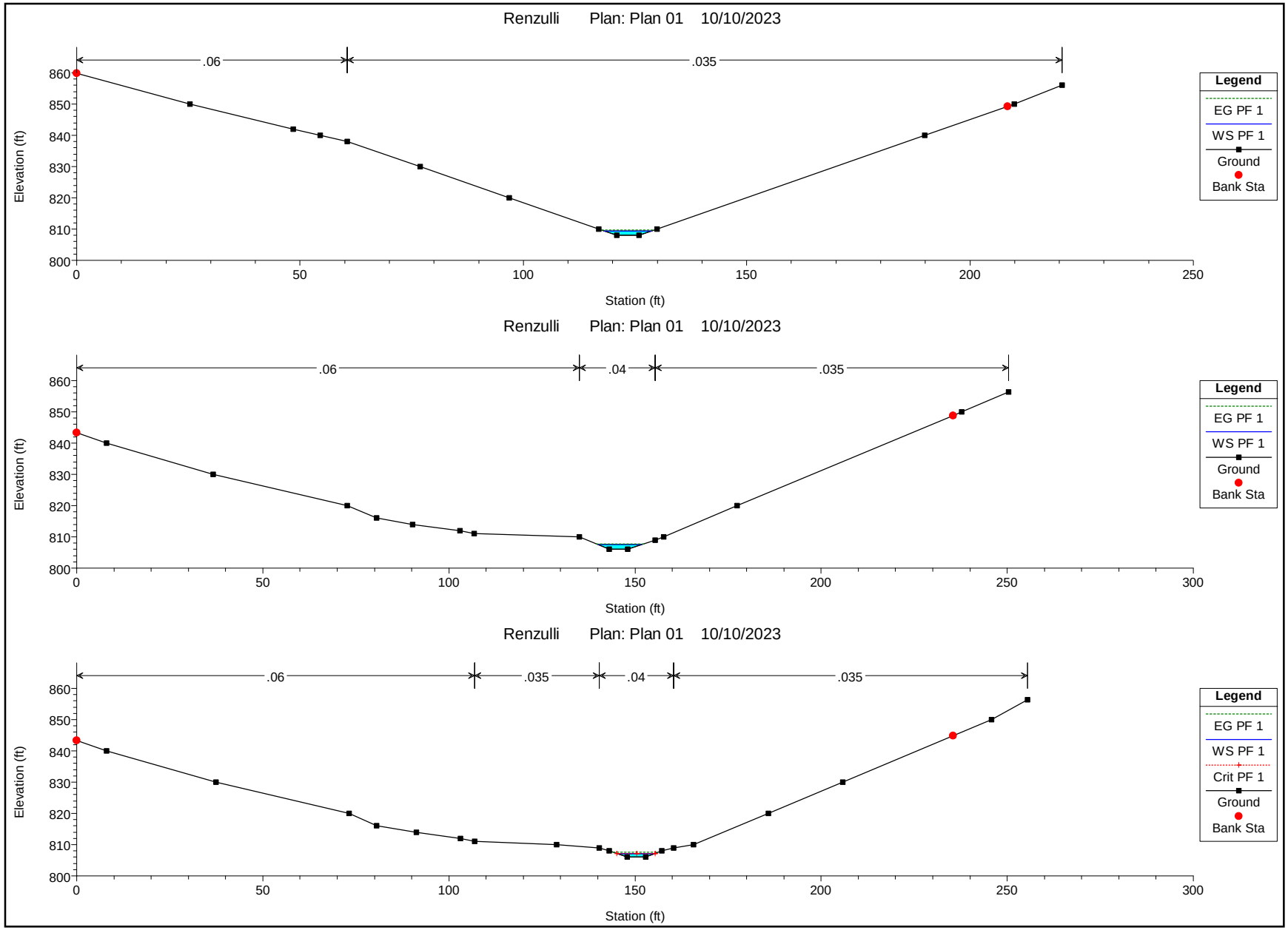
The basic design procedure for grade control structures starts with the determination of a stable slope and configuration for the channel. For alluvial channels, the analysis should include discharges from the full floodplain flow to the dominant discharge. Section 7.9.5 explains the dominant or channel-forming discharge, and it is more fully explained in sediment transport texts such as Simons, Li and Associates (1982). The spacing of the grade control structures is based on the difference in slope between the natural topographic and projected stable slope.

HEC-RAS Plan: Proposed-100 River: PR-CHANNEL Reach: Reach 1 Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	979	PF 1	46.00	812.55	814.20		814.27	0.003293	2.13	21.58	24.77	0.40
Reach 1	871	PF 1	46.00	812.03	813.45		813.70	0.009282	4.01	11.47	11.19	0.70
Reach 1	666	PF 1	46.00	810.00	811.39		811.67	0.010485	4.25	10.83	10.57	0.74
Reach 1	463	PF 1	46.00	807.97	809.41		809.67	0.009318	4.08	11.28	10.67	0.70
Reach 1	273	PF 1	46.00	806.07	807.54		807.75	0.010170	3.73	12.34	11.82	0.64
Reach 1	263	PF 1	46.00	806.00	807.14	807.14	807.58	0.026496	5.27	8.73	10.25	1.01
Reach 1	239	PF 1	46.00	800.00	801.16	801.16	801.61	0.026470	5.35	8.60	9.79	1.01
Reach 1	232	PF 1	46.00	798.00	799.16	799.16	799.61	0.026317	5.34	8.61	9.79	1.00
Reach 1	217	PF 1	46.00	797.87	798.93		799.05	0.007067	2.69	17.09	21.14	0.53
Reach 1	207	PF 1	46.00	797.77	798.87		798.96	0.008433	2.45	18.81	25.38	0.50
Reach 1	197	PF 1	46.00	797.70	798.50	798.50	798.80	0.028984	4.38	10.51	18.13	1.01
Reach 1	162	PF 1	46.00	789.00	790.17	790.17	790.62	0.026271	5.35	8.60	9.71	1.00
Reach 1	147	PF 1	46.00	788.85	789.98		790.05	0.004924	2.18	21.07	28.47	0.45
Reach 1	99	PF 1	46.00	788.00	789.81		789.85	0.003833	1.44	32.02	34.25	0.26
Reach 1	14	PF 1	88.44	787.05	789.13	788.35	789.28	0.010002	3.11	28.47	17.96	0.43


Renzulli Plan: Plan 01 10/10/2023
PR-CHANNEL Reach 1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
815
810
805
800
795
790
785
0
200
400
600
800
1000
Main Channel Distance (ft)


Renzulli Plan: Plan 01 10/10/2023
.06
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Renzulli Plan: Plan 01 10/10/2023
.06
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Renzulli Plan: Plan 01 10/10/2023
.06
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta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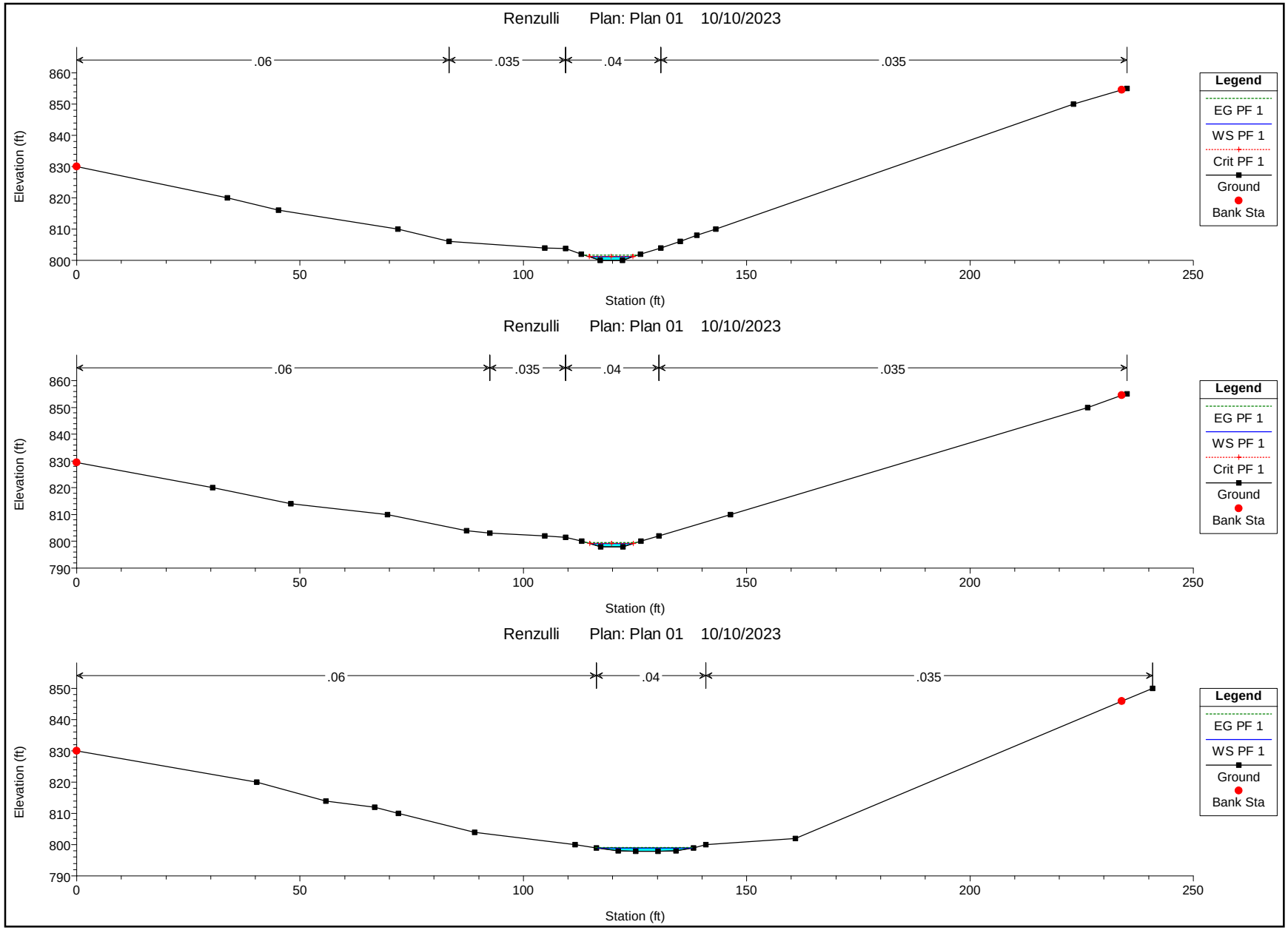
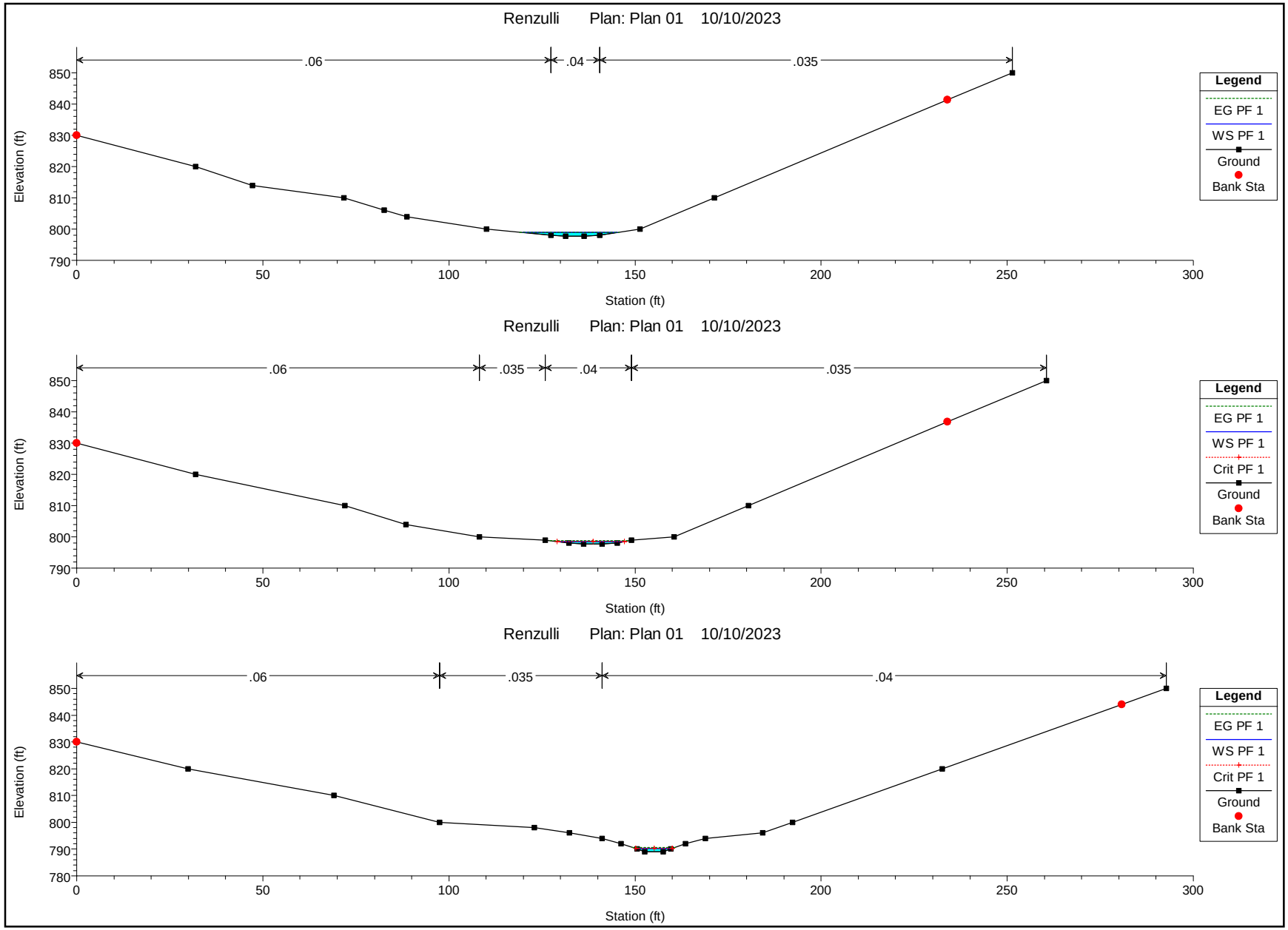
.06
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Renzulli Plan: Plan 01 10/10/2023
.06
.04
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Renzulli Plan: Plan 01 10/10/2023
.06
.035
.04
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta


Renzulli Plan: Plan 01 10/10/2023
.06
.035
.04
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Renzulli Plan: Plan 01 10/10/2023
.06
.035
.04
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Renzulli Plan: Plan 01 10/10/2023
.06
.04
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta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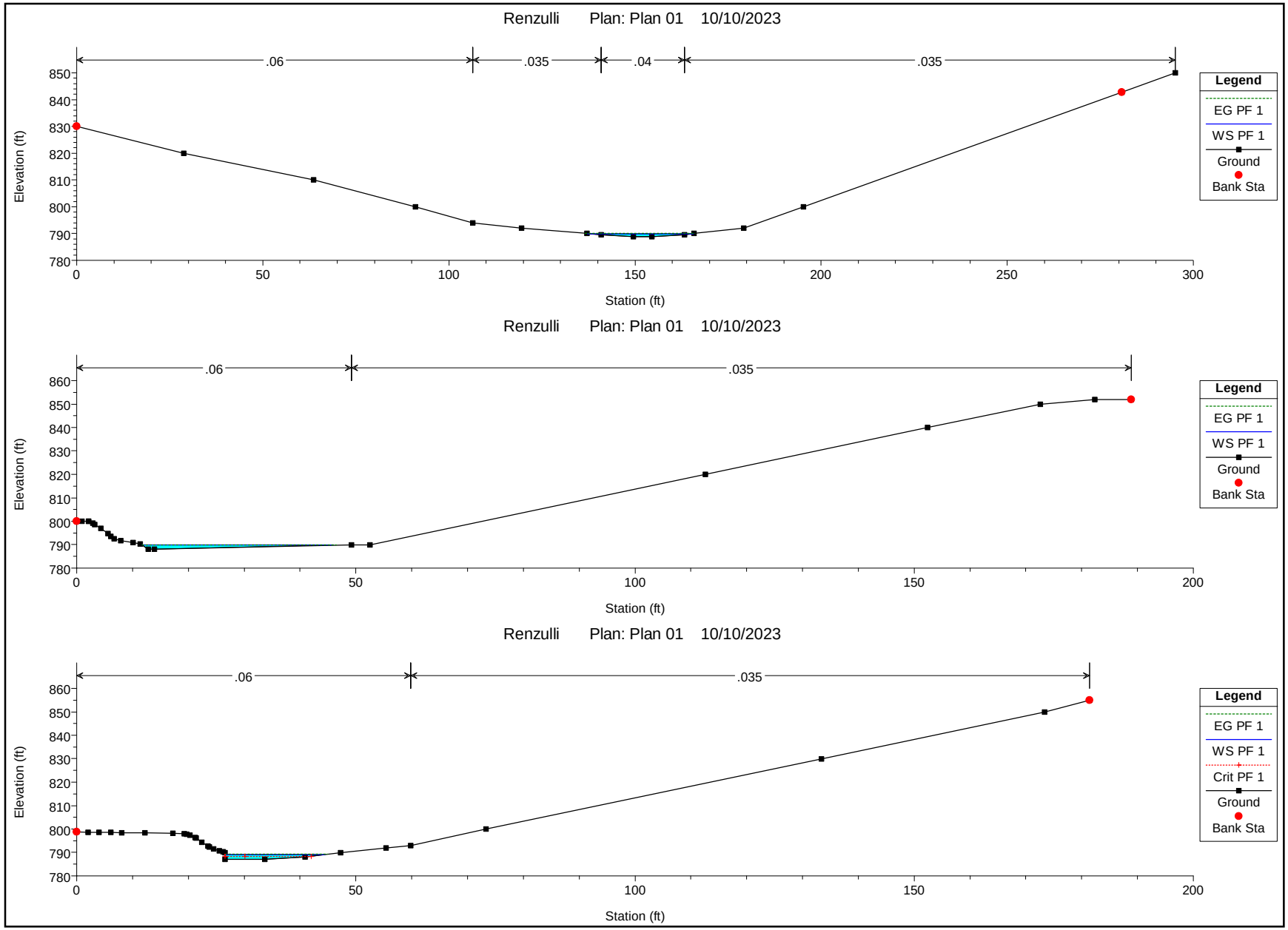
.06
.04
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Renzulli Plan: Plan 01 10/10/2023
.06
.035
.04
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Renzulli Plan: Plan 01 10/10/2023
.06
.035
.04
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta


Renzulli Plan: Plan 01 10/10/2023
.06
.035
.04
.035
Elevation (ft)
850
840
830
820
810
800
790
780
0
50
100
150
200
250
300
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Renzulli Plan: Plan 01 10/10/2023
.06
.035
Elevation (ft)
860
850
840
830
820
810
800
790
780
0
50
100
150
200
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Renzulli Plan: Plan 01 10/10/2023
.06
.035
Elevation (ft)
860
850
840
830
820
810
800
790
780
0
50
100
150
200
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta

HEC-RAS HEC-RAS 6.3.1 September 2022
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
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PROJECT DATA
Project Title: Renzulli
Project File : Renzulli.prj
Run Date and Time: 10/10/2023 1:34:14 PM

Project in English units

PLAN DATA

Plan Title: Plan 01
Plan File : r:\1207\Hyd\DR\TM\CALCS\HEC-RAS\Renzulli.p01

Geometry Title: Proposed Channel
Geometry File : r:\1207\Hyd\DR\TM\CALCS\HEC-RAS\Renzulli.g01

Flow Title : Flow 03
Flow File : r:\1207\Hyd\DR\TM\CALCS\HEC-RAS\Renzulli.f03

Plan Summary Information:
Number of: Cross Sections = 15 Multiple Openings = 0
Culverts = 0 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: Flow 03
Flow File : r:\1207\Hyd\DR\TM\CALCS\HEC-RAS\Renzulli.f03

Flow Data (cfs)

River	Reach	RS	PF 1
PR-CHANNEL	Reach 1	979	46

PR-CHANNEL	Reach 1	14	88.44	

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
PR-CHANNEL	Reach 1	PF 1		Normal S = 0.01

GEOMETRY DATA

Geometry Title: Proposed Channel
Geometry File : r:\1207\Hyd\DR\TM\CALCS\HEC-RAS\Renzulli.g01

CROSS SECTION

RIVER: PR-CHANNEL
REACH: Reach 1 RS: 979

INPUT
Description:
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	842.26	15.5	838	52.39	830	81.54	820	89.6	818
100.55	816	110.89	814	117.26	812.55	134.01	814	152.11	820
172.11	830	212.11	850	228.4	858.227	229.93	859		

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.06	110.89	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	228.4	107.9	107.9	.1	.3

CROSS SECTION

RIVER: PR-CHANNEL
REACH: Reach 1 RS: 871

INPUT
Description:
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	849.58	54.37	830	81.84	820	98.6	816	106.06	814
110.63	812.03	115.63	812.03	131.96	820	152.45	830	172.93	840
192.87	850	209.6	858.301	215.04	861				

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.06	106.06	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	209.6	205.4	205.4	.1	.3

CROSS SECTION

RIVER: PR-CHANNEL
REACH: Reach 1 RS: 666

INPUT
Description:
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

```
       0  846.64   16.52     840   22.32     838   45.11     832   50.52     830
   70.58     820    90.6     810    95.6     810  115.58     820  155.58     840
   175.5  849.96  175.58     850   188.9   856.6

Manning's n Values        num=       2
     Sta   n Val     Sta   n Val
       0     .06   45.11    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0   175.5            203.1   203.1   203.1             .1       .3

CROSS SECTION


RIVER: PR-CHANNEL
REACH: Reach 1            RS: 463

INPUT
Description:
Station Elevation Data    num=      15
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  859.82   25.34     850   48.49     842   54.51     840   60.53     838
   76.88     830   96.88     820   116.9     810  120.91  807.97  125.91  807.97
   129.9     810  189.88     840   208.4 849.255  209.89     850  220.66  856.11

Manning's n Values        num=       2
     Sta   n Val     Sta   n Val
       0     .06   60.53    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0   208.4           195.92  195.92  195.92             .1       .3

CROSS SECTION


RIVER: PR-CHANNEL
REACH: Reach 1            RS: 273

INPUT
Description:
Station Elevation Data    num=      17
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  843.29       8     840   36.62     830   72.62     820   80.52     816
    90.3     814  103.02     812  106.73     811  135.08     810     143  806.07
     148  806.07  155.46   808.9  157.72     810  177.47     820   235.5 848.856
   237.8     850  250.42  856.31

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06  135.08     .04  155.46    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0   235.5              10      10      10             .1       .3

CROSS SECTION


RIVER: PR-CHANNEL
REACH: Reach 1            RS: 263

INPUT
Description:
Station Elevation Data    num=      21
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  843.29       8     840   37.37     830    73.2     820   80.52     816
   91.32     814  103.04     812  106.88     811  128.99     810  140.38     809
  143.05     808  147.89     806   152.9     806  157.22     808  160.42     809
  165.78     810  185.78     820  205.78     830   235.5 844.841  245.83     850
   255.4  856.31
```

```
Manning's n Values        num=       4
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06  106.88    .035  140.38     .04  160.42    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0   235.5            24.03   24.03   24.03             .1       .3

CROSS SECTION


RIVER: PR-CHANNEL
REACH: Reach 1            RS: 239

INPUT
Description:
Station Elevation Data    num=      18
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0     830   33.72     820   45.15     816   71.88     810   83.32     806
  104.82     804  109.41  803.75     113     802  117.19     800  122.19     800
  126.24     802  130.75     804  135.12     806  138.85     808  143.12     810
  223.12     850     234 854.537  235.11     855

Manning's n Values        num=       4
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   83.32    .035  109.41     .04  130.75    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0     234               8       8       8             .1       .3

CROSS SECTION


RIVER: PR-CHANNEL
REACH: Reach 1            RS: 232

INPUT
Description:
Station Elevation Data    num=      17
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0   829.5   30.48     820   47.94     814   69.54     810   87.32     804
   92.51     803  104.83     802  109.51   801.5  113.09     800  117.28     798
  122.28     798  126.32     800  130.36     802  146.32     810  226.32     850
     234 854.546  235.11     855

Manning's n Values        num=       4
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   92.51    .035  109.51     .04  130.36    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0     234              15      15      15             .1       .3

CROSS SECTION


RIVER: PR-CHANNEL
REACH: Reach 1            RS: 217

INPUT
Description:
Station Elevation Data    num=      17
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0     830   40.26     820   55.79     814   66.73     812   71.98     810
   89.05     804  111.63     800  116.36     799  121.21     798  125.12  797.87
  130.12  797.87  134.21     798  138.09     799  140.87     800  160.88     802
     234 845.894  240.84     850

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
```

```
       0     .06  116.36     .04  140.87    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0     234               10      10      10             .1       .3

CROSS SECTION


RIVER: PR-CHANNEL
REACH: Reach 1            RS: 207

INPUT
Description:
Station Elevation Data    num=      15
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0     830      32     820   47.19     814   71.83     810   82.57     806
   88.74     804  110.05     800  127.37     798  131.37  797.77  136.37  797.77
  140.48     798  151.38     800  171.38     810     234  841.31  251.38     850

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06  127.37     .04  140.48    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0     234               10      10      10             .1       .3

CROSS SECTION


RIVER: PR-CHANNEL
REACH: Reach 1            RS: 197

INPUT
Description:
Station Elevation Data    num=      15
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0     830    31.9     820   72.07     810   88.42     804   108.2     800
  125.86     799  132.21     798  136.21   797.7  141.21   797.7  145.21     798
  149.09     799  160.49     800  180.49     810     234 836.755  260.49     850

Manning's n Values        num=       4
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   108.2    .035  125.86     .04  149.09    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0     234            34.8    34.8    34.8             .1       .3

CROSS SECTION


RIVER: PR-CHANNEL
REACH: Reach 1            RS: 162

INPUT
Description:
Station Elevation Data    num=      19
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0     830   29.94     820   69.14     810   97.53     800  122.93     798
  132.35     796  141.19     794  146.24     792   150.6     790   152.6     789
   157.6     789   159.6     790   163.6     792  168.89     794   184.3     796
   192.3     800  232.59     820   280.8 844.045  292.74     850

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   97.53    .035  141.19     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0   280.8               15      15      15             .1       .3
```

CROSS SECTION

RIVER: PR-CHANNEL
REACH: Reach 1 RS: 147

INPUT
Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	830	28.76	820	63.69	810	90.99	800	106.39	794
119.5	792	137.06	790	140.89	789.5	149.52	788.85	154.52	788.85
163.27	789.5	165.8	790	179.19	792	195.19	800	280.8	842.805
295.19	850								

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.06	106.39	.035	140.89	.04	163.27	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	280.8	45	45	.1	.3

CROSS SECTION

RIVER: PR-CHANNEL
REACH: Reach 1 RS: 99

INPUT
Description:
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	800.08	.9	800.03	2.1	800	2.1	799.94	2.9	799.1
3.2	798.62	4.3	796.89	5.6	794.66	6.1	793.52	6.7	792.46
7.9	791.66	10.1	790.81	11.4	790.31	12.84	788	13.9	788
49.25	790	52.55	790	112.56	820	152.43	840	172.57	850
182.32	852	188.9079	852						

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.06	49.25	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	188.9079	82	82	.1	.3

CROSS SECTION

RIVER: PR-CHANNEL
REACH: Reach 1 RS: 14

INPUT
Description:
Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	798.76	2	798.67	4	798.62	6.1	798.53	8.1	798.47
12.2	798.3	17.2	798.16	19.3	798.03	19.7	797.76	20.3	797.32
21.2	796.4	21.4	796.16	22.4	794.39	23.5	792.69	23.8	792.32
24.5	791.5	25.5	790.65	26.2	790.26	26.53	790	26.53	787.05
33.72	787.05	40.93	788	47.26	790	55.37	792	59.8	793
73.34	800	133.35	830	173.36	850	181.4112	855		

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.06	59.8	.035

Bank Sta: Left	Right	Coeff Contr.	Expan.
0	181.4112	.1	.3

SUMMARY OF MANNING'S N VALUES

River:PR-CHANNEL

Reach	River Sta.	n1	n2	n3	n4
Reach 1	979	.06	.035		
Reach 1	871	.06	.035		
Reach 1	666	.06	.035		
Reach 1	463	.06	.035		
Reach 1	273	.06	.04	.035	
Reach 1	263	.06	.035	.04	.035
Reach 1	239	.06	.035	.04	.035
Reach 1	232	.06	.035	.04	.035
Reach 1	217	.06	.04	.035	
Reach 1	207	.06	.04	.035	
Reach 1	197	.06	.035	.04	.035
Reach 1	162	.06	.035	.04	
Reach 1	147	.06	.035	.04	.035
Reach 1	99	.06	.035		
Reach 1	14	.06	.035		

SUMMARY OF REACH LENGTHS

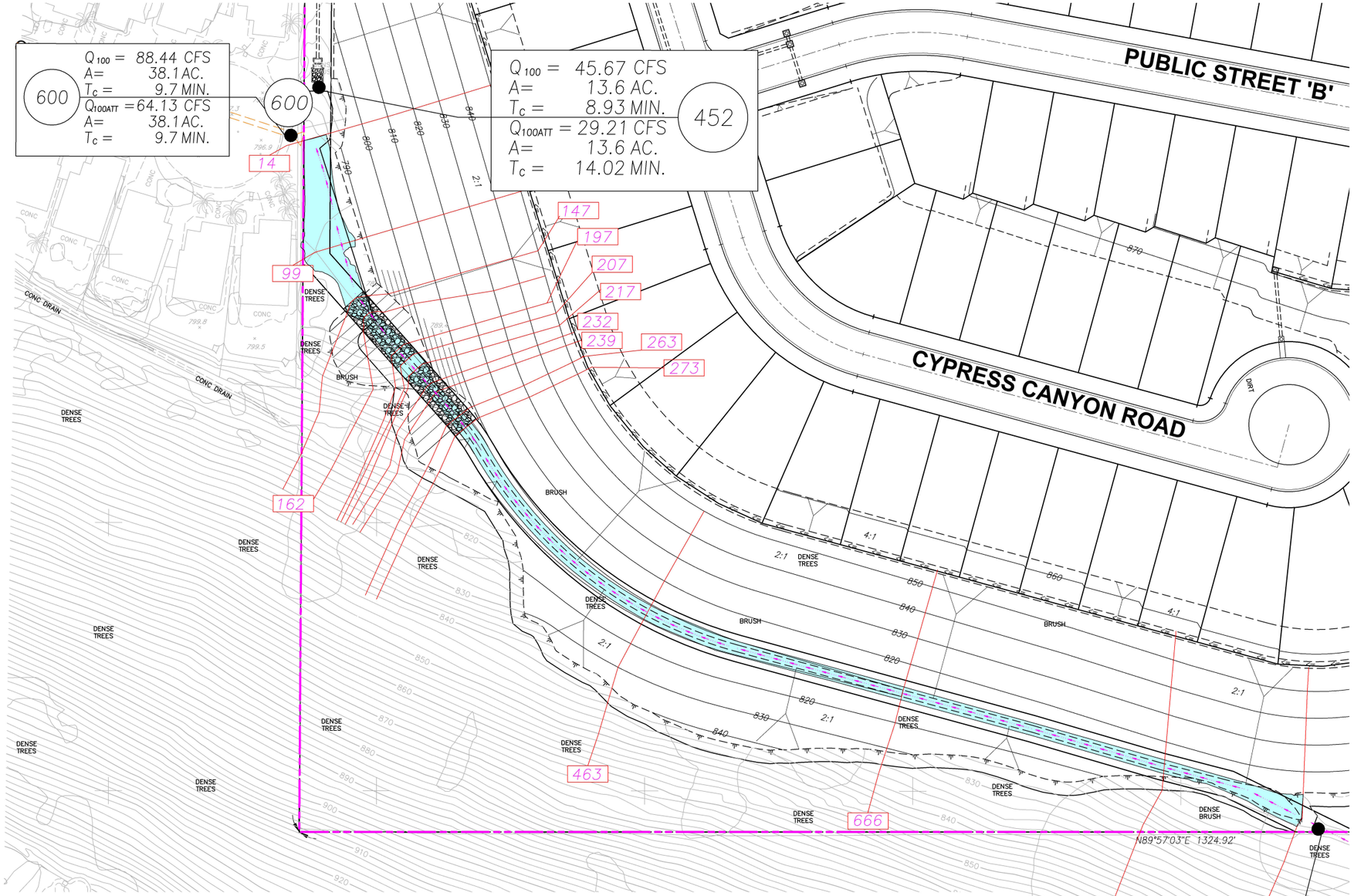
River: PR-CHANNEL

Reach	River Sta.	Left	Channel	Right
Reach 1	979	107.9	107.9	107.9
Reach 1	871	205.4	205.4	205.4
Reach 1	666	203.1	203.1	203.1
Reach 1	463	195.92	195.92	195.92
Reach 1	273	10	10	10
Reach 1	263	24.03	24.03	24.03
Reach 1	239	8	8	8
Reach 1	232	15	15	15
Reach 1	217	10	10	10
Reach 1	207	10	10	10
Reach 1	197	34.8	34.8	34.8
Reach 1	162	15	15	15
Reach 1	147	45	45	45
Reach 1	99	82	82	82
Reach 1	14			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: PR-CHANNEL

Reach	River Sta.	Contr.	Expan.
Reach 1	979	.1	.3
Reach 1	871	.1	.3
Reach 1	666	.1	.3
Reach 1	463	.1	.3
Reach 1	273	.1	.3
Reach 1	263	.1	.3
Reach 1	239	.1	.3
Reach 1	232	.1	.3
Reach 1	217	.1	.3
Reach 1	207	.1	.3
Reach 1	197	.1	.3

Reach 1	162	.1	.3
Reach 1	147	.1	.3
Reach 1	99	.1	.3
Reach 1	14	.1	.3



HEC-RAS Plan: Proposed-100 River: PR-CHANNEL Reach: Reach 1 Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	979	PF 1	46.00	812.55	814.20		814.27	0.003293	2.13	21.58	24.77	0.40
Reach 1	871	PF 1	46.00	812.03	813.45		813.70	0.009282	4.01	11.47	11.19	0.70
Reach 1	666	PF 1	46.00	810.00	811.39		811.67	0.010485	4.25	10.83	10.57	0.74
Reach 1	463	PF 1	46.00	807.97	809.41		809.67	0.009318	4.08	11.28	10.67	0.70
Reach 1	273	PF 1	46.00	806.07	807.54		807.75	0.010170	3.73	12.34	11.82	0.64
Reach 1	263	PF 1	46.00	806.00	807.14	807.14	807.58	0.026496	5.27	8.73	10.25	1.01
Reach 1	239	PF 1	46.00	800.00	801.16	801.16	801.61	0.026470	5.35	8.60	9.79	1.01
Reach 1	232	PF 1	46.00	798.00	799.16	799.16	799.61	0.026317	5.34	8.61	9.79	1.00
Reach 1	217	PF 1	46.00	797.87	798.93		799.05	0.007067	2.69	17.09	21.14	0.53
Reach 1	207	PF 1	46.00	797.77	798.87		798.96	0.008433	2.45	18.81	25.38	0.50
Reach 1	197	PF 1	46.00	797.70	798.50	798.50	798.80	0.028984	4.38	10.51	18.13	1.01
Reach 1	162	PF 1	46.00	789.00	790.17	790.17	790.62	0.026271	5.35	8.60	9.71	1.00
Reach 1	147	PF 1	46.00	788.85	789.98		790.05	0.004924	2.18	21.07	28.47	0.45
Reach 1	99	PF 1	46.00	788.00	789.81		789.85	0.003833	1.44	32.02	34.25	0.26
Reach 1	14	PF 1	88.44	787.05	789.13	788.35	789.28	0.010002	3.11	28.47	17.96	0.43

PEAK FLOW FROM NODE 508 TO 600
INCLUDES THE OFFSITE FLOWS

TO 600 Q_{100} = 45.67 CFS
A= 13.57 AC.
T_c = 9.19 MIN.

LEGEND

- PROJECT BOUNDARY
- CHANNEL CENTER LINE
- OUTFALL LOCATION
- XXX — HEC-RAS CROSS SECTIONS
- EXISTING STORM DRAIN
- PROPOSED STORM DRAIN
- WSE 100-YEAR EVENT

100 0 100 200 300
SCALE 1" = 100'

PREPARED BY:
HUNSAKER & ASSOCIATES SAN DIEGO, INC
PLANNING 9707 Waples Street
ENGINEERING San Diego, Ca. 92121
SURVEYING PH(858)558-4500 FX(858)558-1414

PROPOSED CHANNEL
HEC-RAS EXHIBIT

RENZULLI ESTATES

CITY OF SAN DIEGO, CALIFORNIA

MAP 1 OF 1

W.O.# 3622-0002

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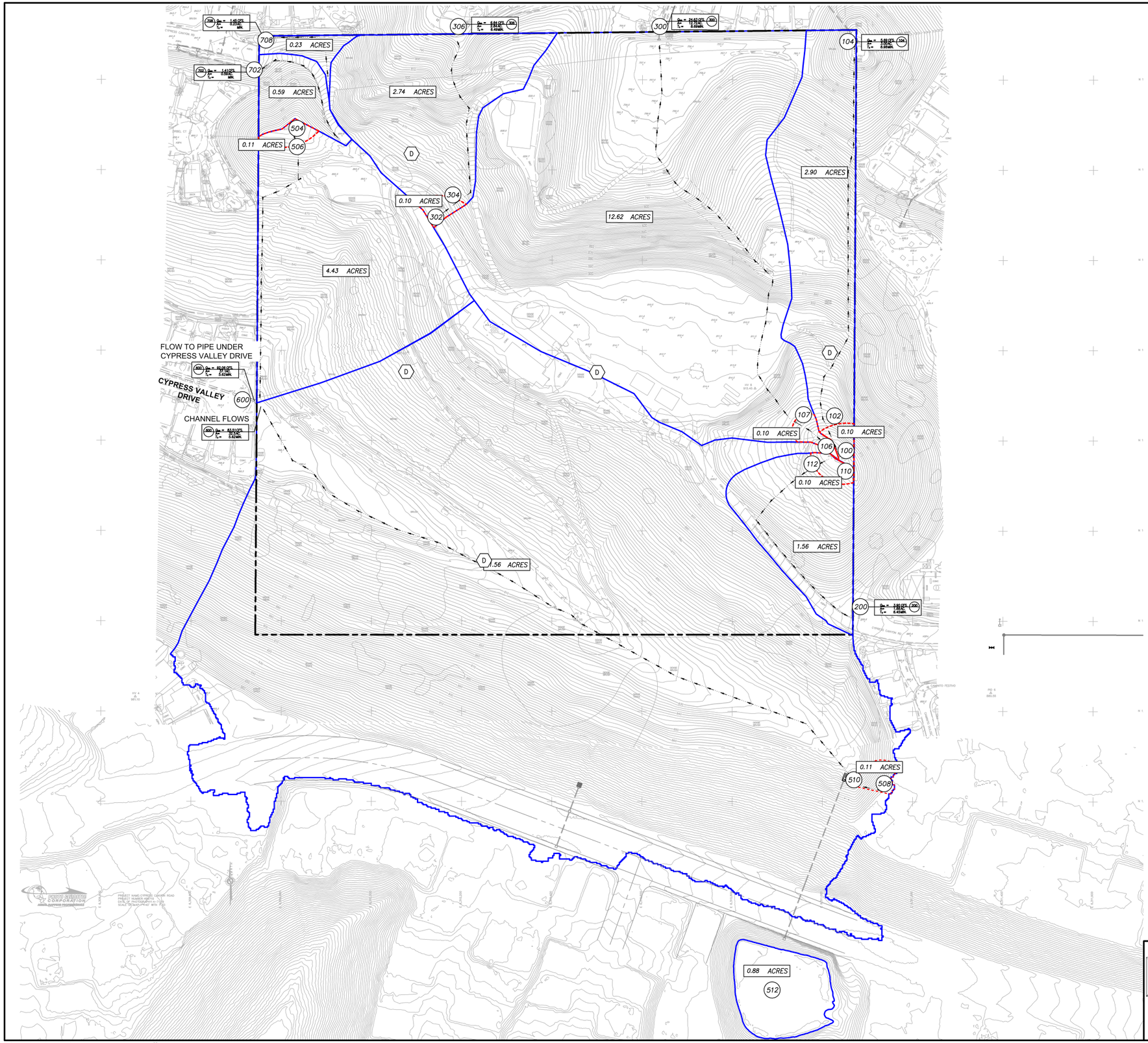
CHAPTER 7
HYDROLOGY MAPS



LEGEND

- PROJECT BOUNDARY
- DRAINAGE BOUNDARY
- INITIAL SUBAREA
- FLOW DIRECTION
- XX.XX ACRES — AREA
- D — HYDROLOGIC SOIL TYPE
- XXX — NODE NUMBER

100 0 100 200 300
SCALE 1"= 100'

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SURVEYING PH(858)558-4500 FX(858)558-1414

EXISTING
DRAINAGE MAP

RENZULLI ESTATES

CITY OF SAN DIEGO, CALIFORNIA

MAP 1 OF 1

W.O.# 3622-0002

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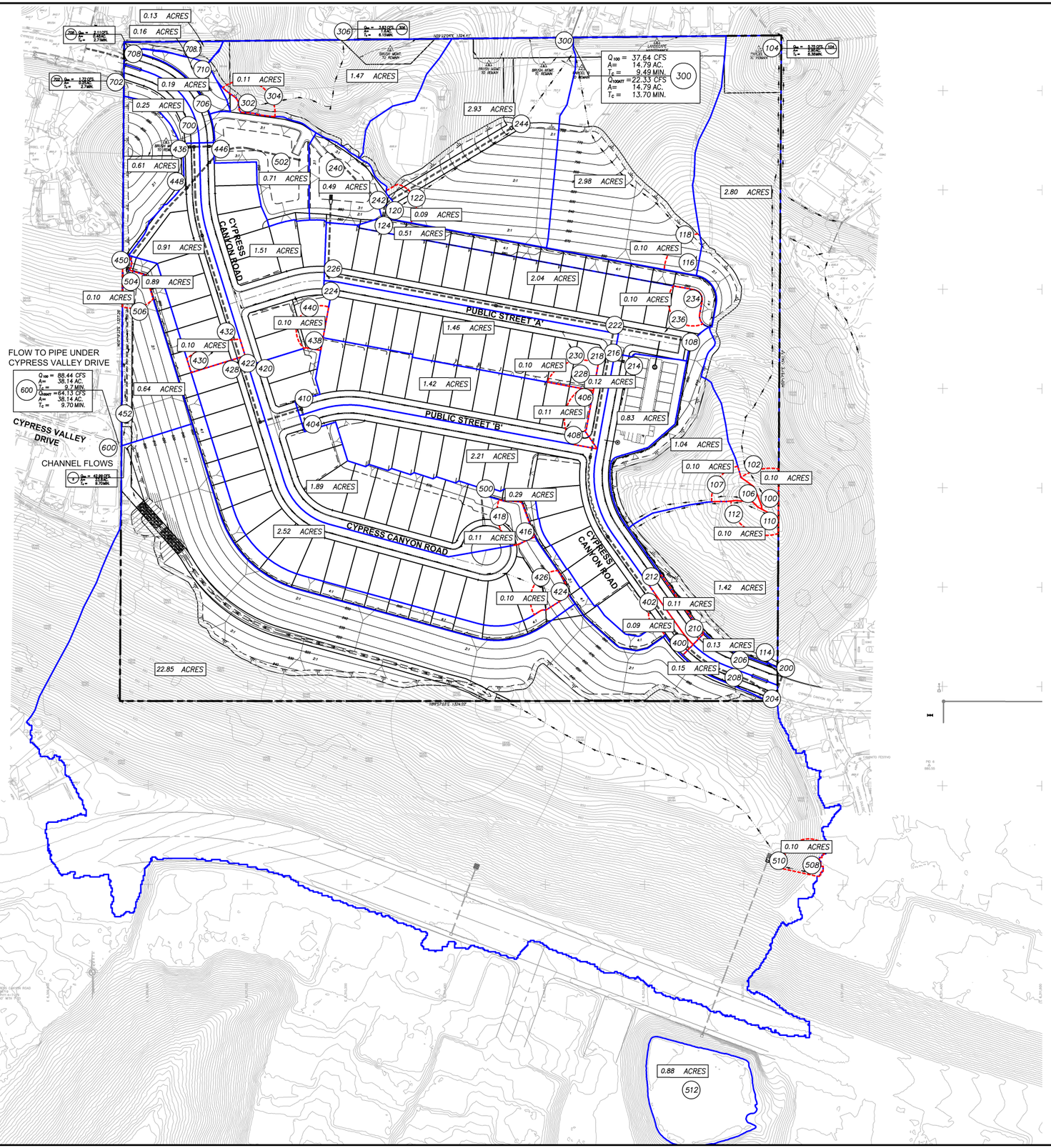

LEGEND

- PROJECT BOUNDARY
- DRAINAGE BOUNDARY
- INITIAL SUBAREA
- FLOW DIRECTION
- XX.XX ACRES — AREA
- D — HYDROLOGIC SOIL TYPE
- XXX — NODE NUMBER

100 0 100 200 300
SCALE 1" = 100'

PREPARED BY:

HUNSAKER & ASSOCIATES SAN DIEGO, INC

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ENGINEERING San Diego, Ca 92121
SURVEYING PH(858)558-4500 FX(858)558-1414

PROPOSED
DRAINAGE MAP

RENZULLI ESTATES

CITY OF SAN DIEGO, CALIFORNIA

MAP 1 OF 1

W.O.# 3622-0002

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LEGEND

- PROJECT BOUNDARY
- DRAINAGE BOUNDARY
- INITIAL SUBAREA
- FLOW DIRECTION
- XX.XX ACRES — AREA
- D — HYDROLOGIC SOIL TYPE
- XXX — NODE NUMBER

100 0 100 200 300
SCALE 1" = 100'

PREPARED BY:

HUNSAKER & ASSOCIATES
SAN DIEGO, INC

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SURVEYING PH(858)558-4500- FX(858)558-1414

PROPOSED
STORM DRAIN EXHIBIT

RENZULLI ESTATES

CITY OF SAN DIEGO, CALIFORNIA

W.O.# 3622-0002

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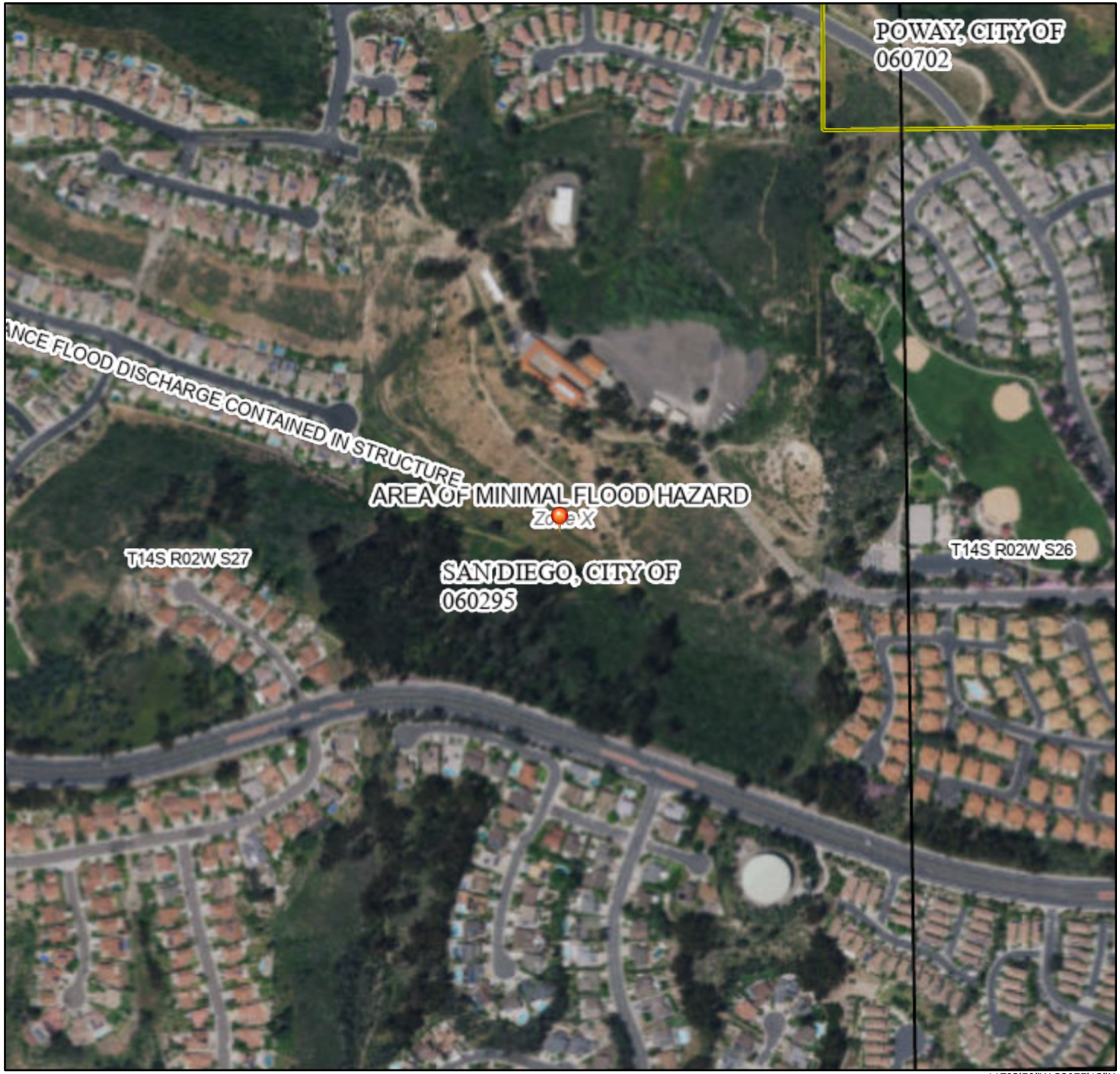
CHAPTER 8
FEMA FLOODPLAIN MAP

National Flood Hazard Layer FIRMette

FEMA

117°4'28"W 32°55'43"N



117°3'50"W 32°55'13"N

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

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

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

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 10/6/2023 at 8:10 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

APPENDIX A
REFERENCE: AS-BUILT STORM DRAIN INFORMATION

Existing outfalls to Channel