PRELIMINARY DRAINAGE STUDY
(HYDROLOGY AND HYDRAULICS)
FOR
B.I.G. PATTERSON INDUSTRIAL
(PRELIMINARY ENGINEERING)

CASE #: PPT220024

Job Number 2121

April 13, 2022
Revised: August 23, 2022
Revised: May 4, 2023

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REVISION PAGE

May 4, 2023

This report presents revisions to the previous version of the drainage study, dated August 23, 2022, to address an outstanding (remaining) drainage related comment provided by Mr. Daniel Aguirre and Ms. Amy McNeill (Riverside County Flood Control Department). The comment is dated February 16, 2023. Provided below is the remaining comment, followed by a response by SDH & Associates, Inc.

1. Without an adequate outlet available for the site, flows leaving the site will need to be dissipated to help perpetuate the existing natural drainage patterns and conditions with respect to tributary drainage area, outlet points, and outlet conditions.

   After contacting Ms. Amy McNeill and Mr. Daniel Aguirre for further clarification on April 3, 2023, Ms. McNeill provided the following context for the comment: "To perpetuate the natural drainage path (sheet flow across Patterson Avenue), at minimum flows from PPT220024 need to get across Patterson Avenue to the east side and travel the existing sump location on the east side of Patterson and north of the railroad."

   In order to resolve this item, a conference call was held on April 26, 2023 with the County of Riverside Transportation Department (led by Mr. Benjie Cho) and Flood Control Department, along with the project applicants for PPT220024 (this project) and PPT220026 (offsite developer) to determine an acceptable/feasible drainage concept related to the Patterson Avenue street improvement. As an option, a concrete gutter concept was presented but the concept would not be acceptable to the Transportation Department. As a result of the discussion, the following drainage concept was discussed and found to be acceptable to all parties:

   - **Collect the drainage from PPT220024 (near the southeasterly area of the project) and convey it using a shallow culvert that would be structurally-designed such that the top of the culvert facility would be flush with the street surface and support traffic loading. The culvert is directed in a southeasterly direction and outlet onto the southwesterly corner of PPT220026 development (by LDC). Based on Benjie's recommendation, the**

culvert is to be designed with 150% of the anticipated the 100-year peak flow rate (bulking factor) for the offsite run-on flow portion. Mr. Benjie Cho clarified a couple options in terms of maintenance. If the proposed drainage facility is to be maintained by the Transportation Department, the outfall shall have a forebay concrete splash pad (~10' in length) with riprap (energy dissipater) along with additional 5' to 10' maintenance width. If the drainage facility is to be maintained privately, the forebay and additional maintenance width would not be necessary.

As a result of the discussion and the drainage concept summarized above, the following items have been revised/added in the preliminary drainage study.

- ☐ **<u>Section 3.3</u> – "Patterson Avenue – Drainage Crossing Concept" (Page 10) – A narrative summary discussion text has been incorporated.**
- ☐ **<u>Appendix B</u> – "Drainage Study Map for Bridge-Patterson (On-site Post-project)" – The on-site drainage study map has been revised to add supporting hydrologic data for the Patterson Avenue culvert sizing. It has been added under the "Hydrologic Summary" section on the exhibit. Also a relevant note has been added to the Patterson Avenue drainage culvert crossing concept.**
- ☐ **<u>Appendix D</u> – Preliminary Culvert Sizing – A supporting preliminary culvert sizing calculation (per normal depth) has been prepared and incorporated at the end of Appendix D. Based on our discussion, a shallow culvert facility, 6'(w)x1'(h), is proposed.**

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CASE #: PPT220024

REVISION PAGE

August 23, 2022

This report presents revisions to the previous version of the drainage study, dated April 13, 2022, to address the first review comments received from Mr. Daniel Aguirre (drainage study reviewer for the County of Riverside Flood Control Department). The comments were received via email on June 22, 2022. A conference call was held with Mr. Daniel Aguirre and Ms. Amy McNeil on July 12, 2022 to discuss the drainage study comments for further clarification. Based on the discussion, the drainage study has been revised accordingly and written responses to the two drainage study comments are provided below.

1. For the street discharge, County Transportation requires 100-year flow depth less than 9-in and velocity less than 1.5 fps across streets for the lower frequency storms. Please provide hydraulic calculations for the street capacity of Patterson Avenue to ensure that the proposed 100-year discharge of 25.6 CFS meets the County Transportation requirements.

   After the conference call with Mr. Daniel Aguirre and Ms. Amy McNeil on July 12, a follow-up coordination was made with the County of Riverside Transportation Department to confirm the above referenced criteria regarding the standard street discharge. Based on the criteria from the County of Riverside Transportation Department, the key check for street drainage, the normal depth in the street should be no more than 9 inches for the 100-year storm event. However, it was further clarified that the velocity requirement of 1.5 fps is pertaining to a situation where flows are conveyed across a street (i.e. – via cross-gutter, etc.), would not be applicable to flows along curb/gutter on one side of the street. The normal depth calculation was checked based on the anticipated contributing flow from Basin 100 (larger of the two between Basin 100 and Basin 200), and the street normal depth is approximately 6 inches, which is less than the 9 inch threshold/criteria for depth for the 100-year peak flow rate. A copy of the supporting street gutter capacity calculation is provided at the end of Appendix D for your reference. Therefore, this supporting document should satisfy this comment.

2. An analysis for how pre-development on-site flows will impact the site was not included in the Preliminary Hydrology Report. The hydrology report shall include a pre-development on-site runoff analysis using the District's Rational Method.

   As requested and a follow-up to our conference call, the drainage study has been revised to analyze the pre-project (existing) condition hydrology along with supporting pre-project drainage study map. The hydrologic data summary in Section 2.0 has been expanded to include the results (three summary tables) for pre-project condition, offsite run-on condition for on-site post-project, and on-site post-project condition. Associated exhibit and supporting calculations for each condition are also provided in Appendix B now. The revised drainage study should address this comment.

1.0 INTRODUCTION

1.1 Project Location

This drainage study presents preliminary engineering hydrologic and hydraulic analyses for the proposed Bridge Investment Group (B.I.G.) Patterson Industrial project (herein referred to as "the project"). The project is located on Patterson Avenue, in the unincorporated portion of the Riverside County, bounded by Patterson Avenue to the east, undeveloped parcels to the west and south and a developed parcel to the north. Refer to Figure 1.0 for a Vicinity Map of the project. Applicable Assessor Parcel Numbers (APNs) are 317-140-016 and 317-140-047.

1.2 Project Description

The site is approximately 5.2 acres (parcel gross area) with approximately 5.0 acres of on-site drainage area. The proposed warehouse building footprint is approximately 107,968 square feet and there will be a total of 82 parking spaces to be provided. The proposed impervious and pervious footprints within the drainage management area are approximately 192,973 square feet and 27,554 square feet, respectively. The project also includes frontage street improvements along frontage Patterson Avenue. This also includes minor improvement for the easterly frontage Patterson Avenue. In order to comply with the Riverside County drainage and water quality management requirements, the project also includes construction of permanent stormwater BMPs.

1.3 Drainage Characteristics

In the existing condition, most of the site is vacant with little to no vegetation (mostly dirt). Runoff from majority of the site, labeled as "Basin 100," surface-drains in a southeasterly direction via sheet-flow towards Patterson Avenue. The existing site expects some offsite run-on from the west and northwesterly parcels, as shown on the pre-project (existing) condition drainage study map located in Appendix B of this report. The anticipated offsite and on-site runoff from Basin 100 (approximately 12.2 acres, including offsite and on-site areas) drain in a southeasterly direction towards Patterson Avenue. It is our understanding that there is no existing storm drain for connection in the frontage street, Patterson Avenue. As such, runoff from the site drains (sheet-flows) southeasterly onto Patterson Avenue. The majority of the runoff from the project from Basin

100 appears to travel in southerly direction along Patterson Avenue. A smaller portion of the site near the northeasterly corner, labeled as "Basin 200" (approximately 0.4 acres) drains northeasterly to Patterson Avenue and it appears to drain northerly along Patterson Avenue towards Cajalco Road.

Based on the RCFC&WCD's Perris Valley Master Drainage Plan (MDP), runoff from the majority of the site (Basin 100) is within the MDP subarea "G-1" and intended (tabled) to eventually contribute to the MDP Lateral Line G-1 storm drain system further downstream, beginning just west of I-215. The MDP Lateral Line G-1 continues easterly and connects into the MDP Line G, which drains to the existing District's Perris Valley Storm Drain Channel by Morgan Street. The Perris Valley Storm Drain Channel eventually drains to Canyon Lake and then Lake Elsinore. A smaller portion of the site in the northeasterly corner (Basin 200) is intended to be part of the MDP subarea "E-8", which eventually drains to the MDP Lateral Line E-8 and then MDP Line E-8 along Ramona Expressway and discharges into Perris Valley Storm Drain Channel.

In the post-project condition, the drainage characteristics will be maintained similar as compared to the pre-project condition. To provide a complete picture of offsite and on-site drainage in the post-project condition, there are two drainage study maps in Appendix B: (1) Offsite Run-on Drainage Study Map (for post-project); and (2) On-site Post-project Drainage Study Map. The westerly and northwesterly offsite run-on will be collected by a network of proposed perimeter v-ditches and catch basins and conveyed/bypassed via proposed storm drain pipes along the northwesterly, westerly, and southerly edges of the project to a catch basin bubbler in the southeasterly landscape area and outlet to Patterson Avenue via a proposed sidewalk underdrain at the southeasterly corner of the site. The on-site runoff from Basin 100 (approximately 4.8 acres) will be directed to a proposed BMP located near the southeasterly corner of the project for flow attenuation and water quality treatment. The proposed BMP will consist of a combination of an underground storage facility (hard-bottom closed system) and a modular wetland system (MWS) for storm water quality treatment based on a volume-based approach. The on-site flows from Drainage Basin 100 will be attenuated based on the RCFC&WCD's increased runoff criteria and overflow and mitigated flows will be designed to be pumped (via a mechanical pump downstream of the storage/treatment system) to the southeasterly landscape/riprap area and drain in the southeasterly direction towards Patterson Avenue via the same sidewalk underdrain mentioned above. To be consistent with the

MDP Perris Valley document, the on-site runoff from Basin 200 (approximately 0.2 acres) will consist of pervious landscape areas (considered as "self-treating area") and drain to Patterson Avenue via a sidewalk underdrain. Since this drainage management area only includes a self-treating area and result in a slight reduction in drainage area as compared to the existing condition, a flood control detention or treatment BMP would not be necessary for Drainage Basin 200.

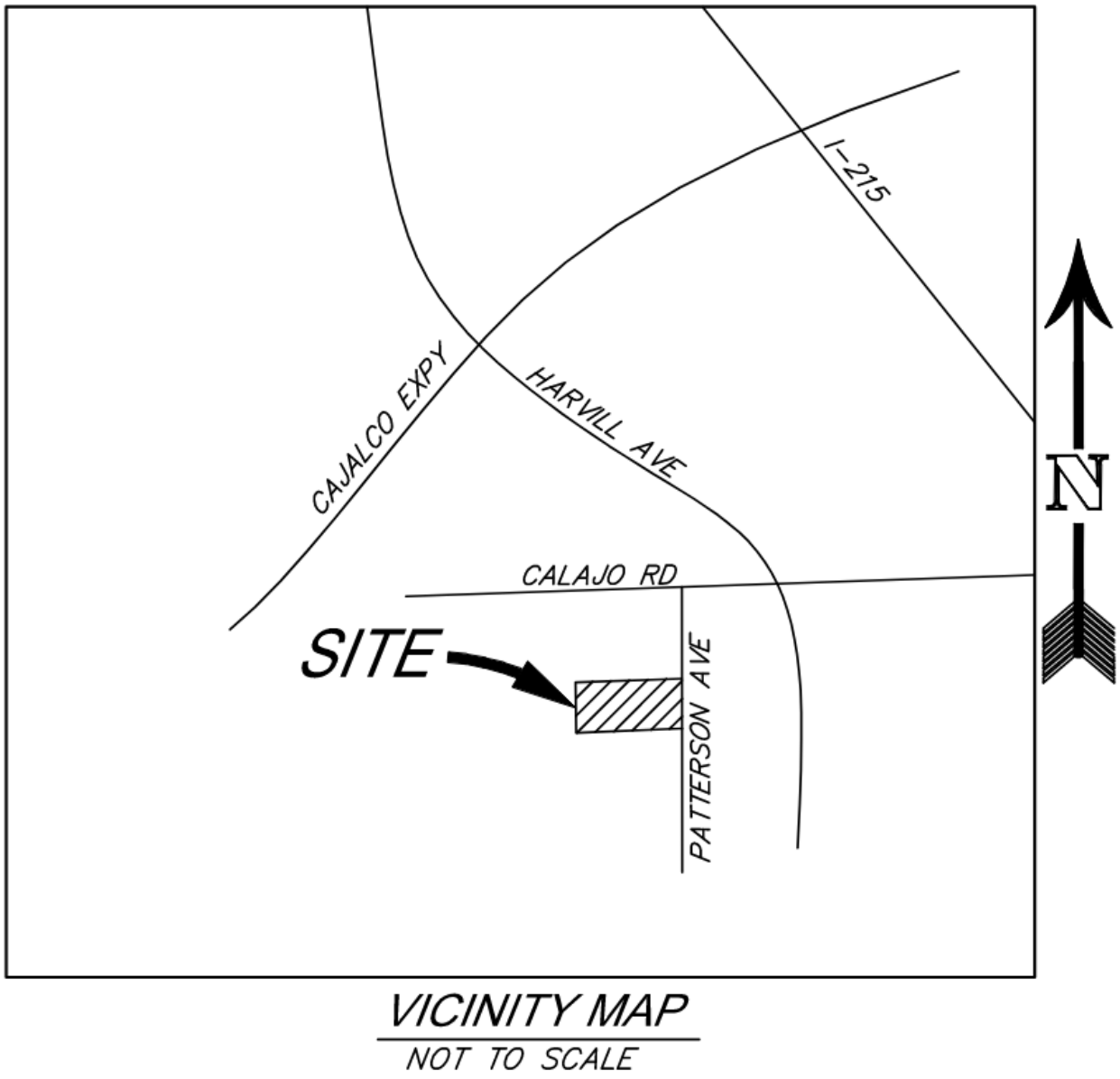
1.4 FEMA Flood Hazard Zone Information

The project is shown on the FEMA Flood Insurance Rate Map (FIRM) number 0065C1410G, effective August 18, 2008 and labeled as Zone X. No FEMA submittals are anticipated to be required for this project. For reference purpose, a copy of the FIRMette (reduced size) is included at the end of Appendix A.

1.6 Water Quality Management

In support of the preliminary site plan, a preliminary Water Quality Management Plan (WQMP) has been prepared for the project. The report is titled, "Preliminary Water Quality Management Plan for B.I.G. Patterson Industrial," with a revised date of August 23, 2021 (or any revisions thereafter), prepared by SDH & Associates, Inc. (Job Number 2121). The preliminary WQMP documents how the project addresses the requirements regarding permanent stormwater quality management, in accordance with the stormwater guidance document titled, "2010 Water Quality Management Plan for the Santa Ana Region of Riverside County."

Figure 1: Vicinity Map



2.0 HYDROLOGY

Preliminary hydrologic calculations were prepared in accordance with the Riverside County Flood Control and Water Conservation District - Hydrology Manual, dated April 1978 (manual) for preliminary on-site storm drain sizing purpose. The Advanced Engineering Software (AES) 2016 Rational Method Analysis (Version 23.0) program was used to perform the hydrologic analysis in this study.

The AES hydrologic model is developed by creating independent node-link models of each interior drainage basin and linking these sub-models together at confluence points. The program has the capability to perform calculations for 15 hydrologic processes. These processes are assigned code numbers that appear in the results. The code numbers and their significances are as follows:

Subarea Hydrologic Processes (Codes)

Code 1: Confluence analysis at a node
Code 2: Initial subarea analysis
Code 3: Pipe flow travel time (computer-estimated pipe sizes)
Code 4: Pipe flow travel time (user-specified pipe size)
Code 5: Trapezoidal channel travel time
Code 6: Street flow analysis through a subarea
Code 7: User-specified information at a node
Code 8: Addition of the subarea runoff to mainline
Code 9: V-Gutter flow through a subarea
Code 10: Copy main-stream data onto a memory bank
Code 11: Confluence a memory bank with the main-stream memory
Code 12: Clear a memory bank
Code 13: Clear the main-stream memory
Code 14: Copy a memory bank onto the main-stream memory
Code 15: Hydrologic data bank storage functions

In order to perform the hydrologic analysis; base information for the study area is required. This information includes the drainage facility locations and sizes, land uses, flow patterns, drainage basin boundaries, and topographic elevations. Compiled Hydrologic backup is included as Appendix A to this report.

Area

Drainage boundaries were delineated to distinguish areas with similar flow characteristics and hydrologic properties in order to determine peak flows at key points and facilitate hydraulic analyses. Drainage basin boundaries, flow patterns, and topographic elevations are shown on the hydrologic workmap for the site, included in Appendix B.

Time of Concentration/Intensity

The time of concentration was calculated using AES to determine the intensity for the 100-year storm events. The rainfall intensity was calculated in AES using the 10 and 60-minute intensity values for the project area using NOAA Atlas 14 Point Precipitation Frequency Estimates. An annotated chart has been included in Appendix A.

Runoff Coefficient

The runoff coefficients used for each minor basin were calculated by the AES software based on the user-specified information of the hydrologic soil group and the land use for each basin. The proposed land use information in each subdrainage area was used to estimate the anticipated runoff coefficient (as consistent with Plate D-5.6 of the Hydrology Manual).

Hydrologic soil group data is available for the site through the Natural Resource Conservation Service (NRCS) Web Soil Survey, showing the site consisting of Hydrologic Soil Groups “A” and “C”. For the purpose of hydrologic calculations for the proposed condition, Soil Group C has been applied. Supporting information is included with Appendix A of this report.

Topography

The onsite project specific topography consists of 1-foot contours on the NAVD-88 vertical datum, provided by Arrowhead Mapping Corp.

2.1 Hydrologic Results

The hydrologic results at key points of interest for the project are provided below and are divided into three (3) summary tables: Tables 2.1 (Pre-project/Existing Condition); Table 2.2 (Offsite Run-on for On-site Post-project); and Table 2.3 (On-site Post-project) thru 2.3. The pre-project, offsite run-on, and post-project drainage characteristics discussion were provided in Section 1.2 of this report.

Based on the RCFC & WCD's Master Drainage Plan for the Perris Valley Area Land Use Map, it is understood the project and its immediate vicinity including the applicable westerly/northwesterly offsite areas were originally zoned for "Single-family 1/2-acre Residential". Therefore, for the purpose of hydrologic analyses for the pre-project and offsite run-on conditions, the "Single-family ½-acre Residential" land use category was applied. Then for the on-site post-project condition, the "Commercial (Industrial)" land use category was applied. The detailed hydrologic calculation results via AES Rational Method software are provided in Appendix B of this report, following respective drainage conditions (i.e. – pre-project, offsite run-on for on-site post-project, and on-site post-project).

Table 2.1 – Pre-project (Existing) Hydrologic Data Summary (10-year & 100-year)

Key Drainage Node ID[3]	Pre-project Condition[1]		
	Total Area (Acres)	Peak Flow Rate, Q_{10} (cfs)[2]	Peak Flow Rate, Q_{100} (cfs)[2]
190 (Basin 100 - Including Offsite & On-site)	**12.2**	**14.4**	**26.6**
290 (Basin 200 – On-site)	**0.4**	**0.8**	**1.4**

Note:

1: Refer to Appendix A for supporting information.

2: "cfs"= cubic feet per second.

3: Refer to Appendix B for Offsite Drainage Study Map and associated supporting hydrologic calculations.

Table 2.2 – Offsite Run-on Hydrologic Data Summary for Post-project (10-year & 100-year)

Key Drainage Node ID[3]	Offsite Run-on Condition for On-site Post-project[1]		
	Total Area (Acres)	Peak Flow Rate, Q_{10} (cfs)[2]	Peak Flow Rate, Q_{100} (cfs)[2]
1010 (Westerly Offsite Run-on)	**6.5**	**8.2**	**15.0**
1020 (Northwesterly Offsite Run-on)	**1.0**	**1.3**	**2.4**
1030 (Northwesterly Offsite Run-on)	**0.1**	**0.2**	**0.4**

Table 2.3 – On-site Post-project Hydrologic Data Summary (10-year & 100-year)

Key Drainage Node ID[3]	On-site Post-project Condition[1]		
	Total Area (Acres)	Peak Flow Rate, Q_{10} (cfs)[2]	Peak Flow Rate, Q_{100} (cfs)[2]
105 (On-site Catch Basin - Surface)	1.0	1.8	3.1
115 (On-site Catch Basin - Surface)	0.5	1.0	1.7
135 (On-site Curb Cut - Surface)	0.7	1.2	2.1
140 (On-site Curb Cut - Surface)	0.1	0.2	0.3
Near 145 (On-site Curb Cut - Surface)	0.3	0.7	1.1
145 (On-site Catch Basin - Surface)	1.2	1.9	3.4
150 (Overall On-site Flow to Storage)	4.7	7.4	12.8
160 (Overall On-site Runoff)	4.8	7.5	13.1
1050 (Overall Offsite Run-on)	7.6	9.6	17.6
190 (Basin 100 - Drainage Outlet to Patterson Ave.)	**12.4**	**15.3**	**27.4**
290 (Basin 200 - Drainage Outlet to Patterson Ave.)	**0.2**	**0.4**	**0.6**

Note:

1: Refer to Appendix A for supporting information.

2: “cfs”= cubic feet per second.

3: Refer to Appendix B for Drainage Study Map

3.0 HYDRAULICS

3.1 Hydraulic Methodology and Criteria

The 10-year, 1-hour proposed peak flow rates determined using the Modified Rational Method (AES Rational Method) outputs are used to determine preliminary sizes for the on-site storm drain system.

3.2 Inlet Sizing

Inlet design calculations specific to the proposed surface catch basins (on-site and offsite) will be conducted during final engineering and calculation output will be incorporated in Appendix C. In the post-project condition, the on-site proposed private storm drain catch basins (inlets) will be designed to intercept, at a minimum, the 10-year, 1-hour peak flow rates.

3.3 Storm Drain Sizing

Preliminary storm drain sizing calculations were conducted in order to size the proposed on-site private storm drain pipes. The calculations were prepared using the 10-year, 1-hour peak flow rate output from the AES Rational Method and the Manning's equation along with a sizing bump-up factor (typically in the range of 15 to 30%) in an effort to account for potential hydraulic losses. Typically, this calculation approach is adequate for on-site private storm drain sizing. If necessary, a more detailed hydraulic calculation may be provided on a case-by-case basis during final engineering to validate the required storm drain sizes. A summary of relevant on-site storm drain sizing calculations is provided in Appendix D.

As indicated in Section 1.3, the westerly and northwesterly existing offsite run-on flows will be collected by a network of the proposed perimeter v-ditches and catch basins, and conveyed/bypassed via proposed storm drain pipes in a southeasterly direction towards Patterson Avenue. The proposed perimeter concrete v-ditches are expected to have 2:1 sides with depths ranging from 1.0 to 1.25 feet. Base on the normal depth calculations, the proposed v-ditches are designed with adequate capacity to convey the anticipated 10-year flow (with freeboard) as well as the 100-year flow. Supporting calculations are provided in Appendix D. Also, in response to comment, a street gutter capacity check was done and result is also incorporated in the Appendix.

Patterson Avenue – Drainage Crossing Concept

Separately, a conference call with the County of Riverside Transportation and Flood Control Departments, along with applicants for this project (PPT220024) and offsite development (PPT220026), was held on April 26, 2023 to determine an acceptable drainage concept related to Patterson Avenue street improvement. This is being done, at minimum, to convey flows from PPT220024 across Patterson Avenue to the east side and travel in order to maintain the natural drainage path. Based on the discussion, a shallow culvert crossing is expected to be provided underneath Patterson Avenue. Since it's a shallow facility and the top of the culvert will be flush with the street surface, the culvert facility is to be structurally designed to support traffic loading. Based on the preliminary takeoff calculation, a 6'(w) x 1'(h) culvert is to be provided at a 0.5% minimum slope. For the hydrology for this culvert sizing, the 100-year peak flow rate from the on-site development (PPT220024) and associated offsite run-on flow were added. As requested by the County Transportation Department, a 50% bulking factor was applied to the offsite run-on flow portion. A combined 100-year peak flow rate of 39.5 cfs was used for this culvert sizing. Additional supporting data are shown on the On-site Drainage Study exhibit (Hydrology Summary) in Appendix B. Supporting preliminary hydraulic calculation (per normal depth) has been prepared and is incorporated at the end of Appendix D.

4.0 FLOOD CONTROL ASSESSMENT

The project is expected to increase the peak flow rate as a result of the proposed improvements, specifically for Drainage Basin 100. As described in Section 1.0 of this report, the on-site runoff from Drainage Basin 100 will be directed to a proposed BMP located near the southeasterly corner of the project for flow attenuation and water quality treatment. The proposed BMP will consist of a combination of an underground storage facility (hard-bottom closed system) and a modular wetland system (MWS) for storm water quality treatment based on a volume-based approach. In order to address the RCFC&WCD's increased runoff criteria (and for the preliminary design purpose), the 10-year, 24-hour hydrograph volumes were determined using Hydrologic Modeling System (HEC-HMS) for both on-site pre-project condition and post-project condition, in order to estimate the delta volume ("required volume") for the underground storage facility. The mitigated flow as well as the overflow from the facility will be directed to a proposed mechanical pump downstream to outlet onto the southeasterly landscape/riprap area, prior to discharging the mitigated flows to Patterson Avenue via the aforementioned sidewalk underdrain. A summary of the preliminary detention calculation results (volume summary) is provided below in Table 4.1.

Table 4.1 – 10-yr, 24-hour Runoff Hydrograph Volume Summary (Basin 100)

Storm Event	Runoff Hydrograph Volume Summary (acre-feet)			
	Pre-project	Post-project	Delta	BMP Capacity[1]
10-year, 24-hour	0.55	1.07	0.52	0.59

Note:

1. "Delta" = post-project runoff volume – pre-project runoff volume.
2. The proposed underground storage facility is expected to have a volume capacity of approximately 0.59 acre-feet at the relative elevation of 5.50' in the storage facility. Above this elevation to the top of the system (relative elevation of ~7.17') are anticipated to be used for conveyance and freeboard.

Based on the global summary results from the HEC-HMS, the runoff volume difference between the pre-project condition and post-project condition is expected to be approximately 0.52 acre-feet. The proposed underground storage facility is expected to provide approximately 0.59 acre-feet up to the relative elevation of 5.50 feet. Therefore, it is expected that the proposed basin has adequate volume capacity to meet the Flood Increased Runoff Criteria. Supporting documentation from the HEC-HMS, along with pre-project and post-project workmaps as well as project-specific

precipitation data from NOAA Atlas 14, are included in Appendix E of this report. Separately, the westerly offsite run-on will be collected by a proposed perimeter v-ditch (and as-needed storm drain pipes) on the west and southerly edges of the project and conveyed around the site towards Patterson Avenue, discharged via a proposed sidewalk underdrain.

In an effort to remain consistent with the MDP Perris Valley document, runoff from the remaining northeasterly portion of the site (approximately 0.2 acres from Drainage Basin 200) will consist of landscape areas (considered as "self-treating area") and drain to Patterson Avenue via a sidewalk underdrain. Since this drainage management area only includes a self-treating area and result in a slight reduction in drainage area as compared to the existing condition, a flood control detention or treatment BMP would not be necessary for Drainage Basin 200.

As a note, the project is exempt from the hydrologic condition of concern (HCOC) requirements, as it is located within the Riverside County WAP HCOC Exemption area approved on April 20, 2017.

5.0 CONCLUSION

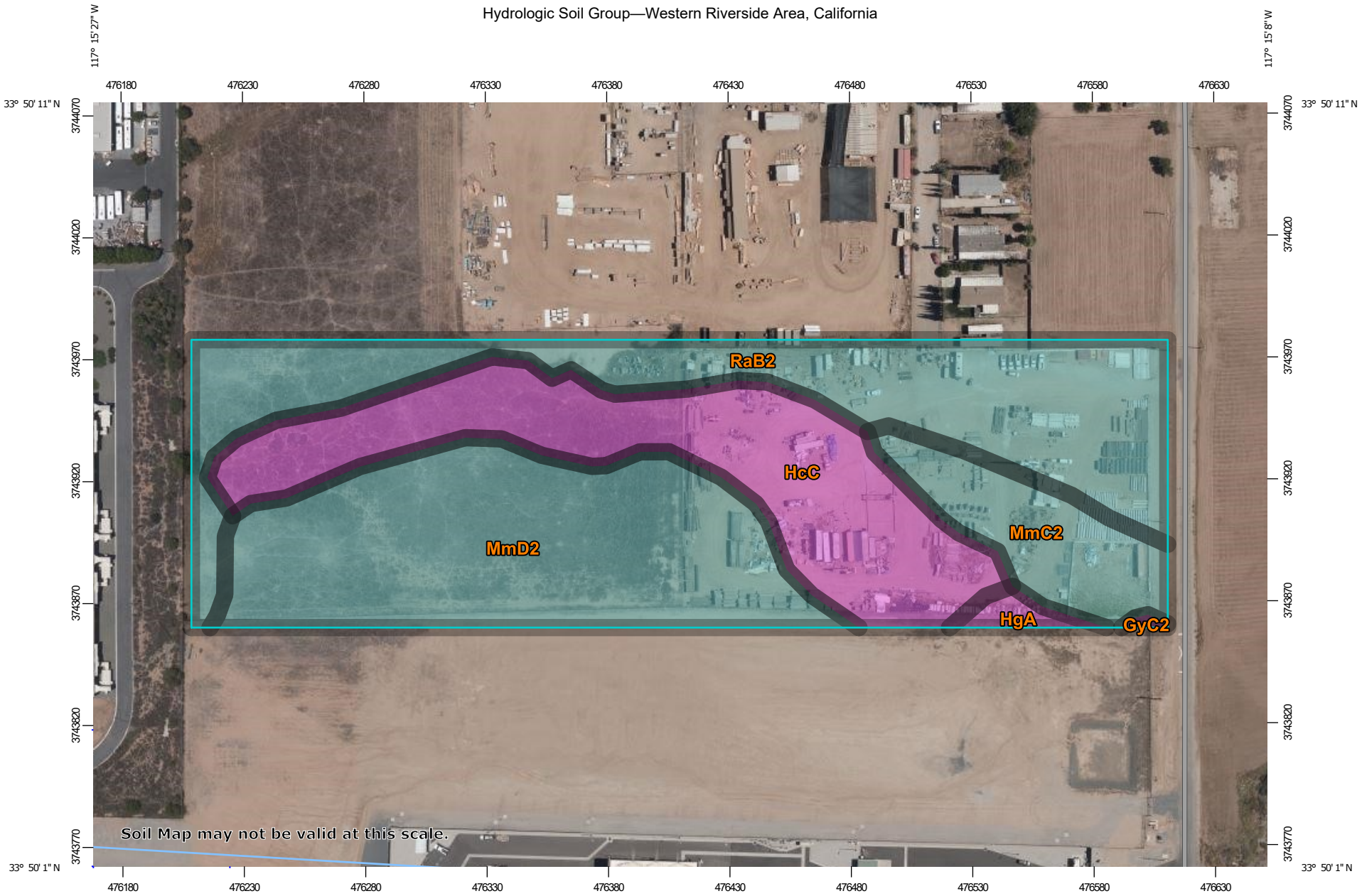
This drainage study presents preliminary hydrologic and hydraulic analyses for the proposed B.I.G. Patterson Industrial project. Hydrologic calculations were computed in accordance with the Riverside County Flood Control and Water Conservation District - Hydrology Manual, dated April 1978 (manual). The Advanced Engineering Software (AES) 2016 Rational Method Analysis (Version 23.0) program was used for the rational method modeling in this study. The peak discharge rates for the 10-year and 100-year storm events with 1-hour storm frequency have been determined for the project. The relevant peak flow rates were used to determine the preliminary onsite storm drain sizes. As indicated in Section 1.3, the westerly and northwesterly offsite run-on flows are expected to be picked up by a network of proposed perimeter v-ditches and catch basins and conveyed/bypassed via storm drain pipes around the site toward Patterson Avenue, in order to maintain the existing drainage characteristics. To support, preliminary hydraulic calculations were performed the proposed perimeter v-ditches and storm drain pipes for the purpose of collecting and conveying offsite bypass flow around the site. An on-site preliminary detention calculation using HEC-HMS has been prepared for Drainage Basin 100 for the 10-year, 24-hour storm event to show that adequate storage volume is provided in the proposed storage facility to be in conformance with the RCFC&WCD's increased runoff detention criteria. Drainage areas for Basin 200 will be reduced and primarily consist of landscape area (self-treating area); therefore, mitigation should not be required. In summary, no adverse impacts are anticipated to the downstream drainage facilities as a result of this project.

Appendix A

Hydrologic Backup Information

Includes:

1. Web Soil Survey Hydrologic Soil Group
2. NOAA Atlas 14 Annotated Rainfall Intensity Chart
3. FEMA FIRMette



Map Scale: 1:2,210 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 30 60 120 180

Feet
0 100 200 400 600

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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: Western Riverside Area, California
Survey Area Data: Version 14, Sep 13, 2021

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

Date(s) aerial images were photographed: May 25, 2019—Jun 25, 2019

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
GyC2	Greenfield sandy loam, 2 to 8 percent slopes, eroded	A	0.0	0.1%
HcC	Hanford coarse sandy loam, 2 to 8 percent slopes	A	3.2	27.2%
HgA	Hanford fine sandy loam, 0 to 2 percent slopes	A	0.1	1.1%
MmC2	Monserate sandy loam, 5 to 8 percent slopes, eroded	C	1.1	9.5%
MmD2	Monserate sandy loam, 8 to 15 percent slopes, eroded	C	3.8	32.2%
RaB2	Ramona sandy loam, 2 to 5 percent slopes, eroded	C	3.5	29.8%
Totals for Area of Interest			**11.8**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

SUPPORTING MATERIALS - NOAA ATALAS 14 - INTENSITY
10-YEAR AND 100-YEAR (10-MIN. & 60-MIN.)

NOAA Atlas 14, Volume 6, Version 2
Location name: Perris, California, USA*
Latitude: 33.8352°, Longitude: -117.2539°
Elevation: 1522.54 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**1.04** (0.876-1.27)	**1.46** (1.22-1.76)	**2.03** (1.69-2.46)	**2.52** (2.08-3.08)	**3.22** (2.57-4.08)	**3.78** (2.95-4.91)	**4.39** (3.34-5.83)	**5.04** (3.72-6.90)	**5.99** (4.24-8.56)	**6.76** (4.61-10.0)
10-min	**0.750** (0.630-0.906)	**1.05** (0.876-1.27)	**1.46** (1.21-1.76)	**1.81** (1.49-2.21)	**2.30** (1.84-2.92)	**2.71** (2.12-3.52)	**3.14** (2.39-4.18)	**3.62** (2.67-4.95)	**4.29** (3.03-6.13)	**4.85** (3.31-7.18)
15-min	**0.604** (0.508-0.732)	**0.844** (0.704-1.02)	**1.17** (0.976-1.42)	**1.46** (1.20-1.78)	**1.86** (1.48-2.36)	**2.19** (1.70-2.83)	**2.54** (1.93-3.37)	**2.92** (2.15-3.99)	**3.46** (2.44-4.94)	**3.91** (2.66-5.79)
30-min	**0.486** (0.406-0.588)	**0.678** (0.566-0.820)	**0.942** (0.784-1.14)	**1.17** (0.964-1.43)	**1.49** (1.19-1.89)	**1.75** (1.37-2.27)	**2.04** (1.55-2.70)	**2.34** (1.73-3.20)	**2.78** (1.96-3.97)	**3.13** (2.14-4.64)
60-min	**0.327** (0.274-0.395)	**0.456** (0.381-0.552)	**0.634** (0.528-0.769)	**0.786** (0.649-0.962)	**1.00** (0.800-1.27)	**1.18** (0.921-1.53)	**1.37** (1.04-1.82)	**1.57** (1.16-2.15)	**1.87** (1.32-2.67)	**2.11** (1.44-3.13)
2-hr	**0.246** (0.206-0.297)	**0.328** (0.274-0.397)	**0.440** (0.366-0.533)	**0.532** (0.440-0.652)	**0.663** (0.528-0.840)	**0.766** (0.598-0.992)	**0.874** (0.664-1.16)	**0.988** (0.729-1.35)	**1.15** (0.810-1.64)	**1.27** (0.869-1.89)
3-hr	**0.202** (0.169-0.244)	**0.266** (0.222-0.322)	**0.351** (0.293-0.427)	**0.422** (0.349-0.517)	**0.520** (0.415-0.659)	**0.597** (0.466-0.774)	**0.677** (0.514-0.900)	**0.760** (0.561-1.04)	**0.876** (0.619-1.25)	**0.967** (0.660-1.43)
6-hr	**0.143** (0.120-0.173)	**0.187** (0.156-0.226)	**0.243** (0.203-0.295)	**0.290** (0.239-0.355)	**0.354** (0.282-0.449)	**0.404** (0.315-0.523)	**0.454** (0.345-0.604)	**0.507** (0.374-0.694)	**0.579** (0.409-0.827)	**0.635** (0.433-0.941)
12-hr	**0.094** (0.079-0.114)	**0.123** (0.103-0.149)	**0.162** (0.135-0.196)	**0.193** (0.159-0.236)	**0.235** (0.188-0.298)	**0.268** (0.209-0.347)	**0.301** (0.229-0.401)	**0.336** (0.248-0.459)	**0.382** (0.270-0.546)	**0.419** (0.285-0.620)
24-hr	**0.061** (0.054-0.071)	**0.082** (0.073-0.095)	**0.109** (0.096-0.126)	**0.131** (0.115-0.153)	**0.161** (0.136-0.194)	**0.184** (0.153-0.226)	**0.208** (0.168-0.261)	**0.232** (0.183-0.300)	**0.264** (0.200-0.356)	**0.290** (0.212-0.404)
2-day	**0.035** (0.031-0.041)	**0.048** (0.043-0.056)	**0.065** (0.057-0.075)	**0.079** (0.069-0.092)	**0.098** (0.083-0.118)	**0.113** (0.094-0.139)	**0.128** (0.104-0.161)	**0.144** (0.113-0.186)	**0.165** (0.125-0.223)	**0.182** (0.134-0.254)
3-day	**0.025** (0.022-0.029)	**0.035** (0.031-0.040)	**0.047** (0.042-0.055)	**0.058** (0.050-0.067)	**0.072** (0.061-0.087)	**0.083** (0.069-0.102)	**0.095** (0.077-0.120)	**0.107** (0.085-0.139)	**0.124** (0.094-0.167)	**0.138** (0.101-0.192)
4-day	**0.020** (0.018-0.023)	**0.028** (0.025-0.032)	**0.038** (0.034-0.045)	**0.047** (0.041-0.055)	**0.059** (0.050-0.071)	**0.069** (0.057-0.085)	**0.079** (0.064-0.099)	**0.089** (0.070-0.115)	**0.104** (0.079-0.140)	**0.115** (0.084-0.161)
7-day	**0.013** (0.011-0.014)	**0.018** (0.016-0.020)	**0.024** (0.022-0.028)	**0.030** (0.026-0.035)	**0.038** (0.032-0.046)	**0.045** (0.037-0.055)	**0.051** (0.041-0.064)	**0.058** (0.046-0.075)	**0.068** (0.051-0.091)	**0.076** (0.055-0.105)
10-day	**0.009** (0.008-0.010)	**0.013** (0.011-0.015)	**0.018** (0.016-0.021)	**0.022** (0.019-0.026)	**0.028** (0.024-0.034)	**0.033** (0.028-0.041)	**0.038** (0.031-0.048)	**0.043** (0.034-0.056)	**0.051** (0.039-0.069)	**0.057** (0.042-0.079)
20-day	**0.005** (0.005-0.006)	**0.008** (0.007-0.009)	**0.011** (0.009-0.012)	**0.013** (0.012-0.016)	**0.017** (0.015-0.021)	**0.020** (0.017-0.025)	**0.024** (0.019-0.030)	**0.027** (0.021-0.035)	**0.032** (0.024-0.043)	**0.036** (0.027-0.051)
30-day	**0.004** (0.003-0.005)	**0.006** (0.005-0.007)	**0.008** (0.007-0.009)	**0.010** (0.009-0.012)	**0.013** (0.011-0.016)	**0.016** (0.013-0.019)	**0.019** (0.015-0.023)	**0.021** (0.017-0.028)	**0.026** (0.019-0.035)	**0.029** (0.021-0.041)
45-day	**0.003** (0.003-0.004)	**0.004** (0.004-0.005)	**0.006** (0.005-0.007)	**0.008** (0.007-0.009)	**0.010** (0.009-0.012)	**0.012** (0.010-0.015)	**0.015** (0.012-0.018)	**0.017** (0.013-0.022)	**0.021** (0.016-0.028)	**0.024** (0.017-0.033)
60-day	**0.003** (0.002-0.003)	**0.004** (0.003-0.004)	**0.005** (0.005-0.006)	**0.007** (0.006-0.008)	**0.009** (0.007-0.010)	**0.010** (0.009-0.013)	**0.012** (0.010-0.016)	**0.015** (0.011-0.019)	**0.018** (0.013-0.024)	**0.021** (0.015-0.029)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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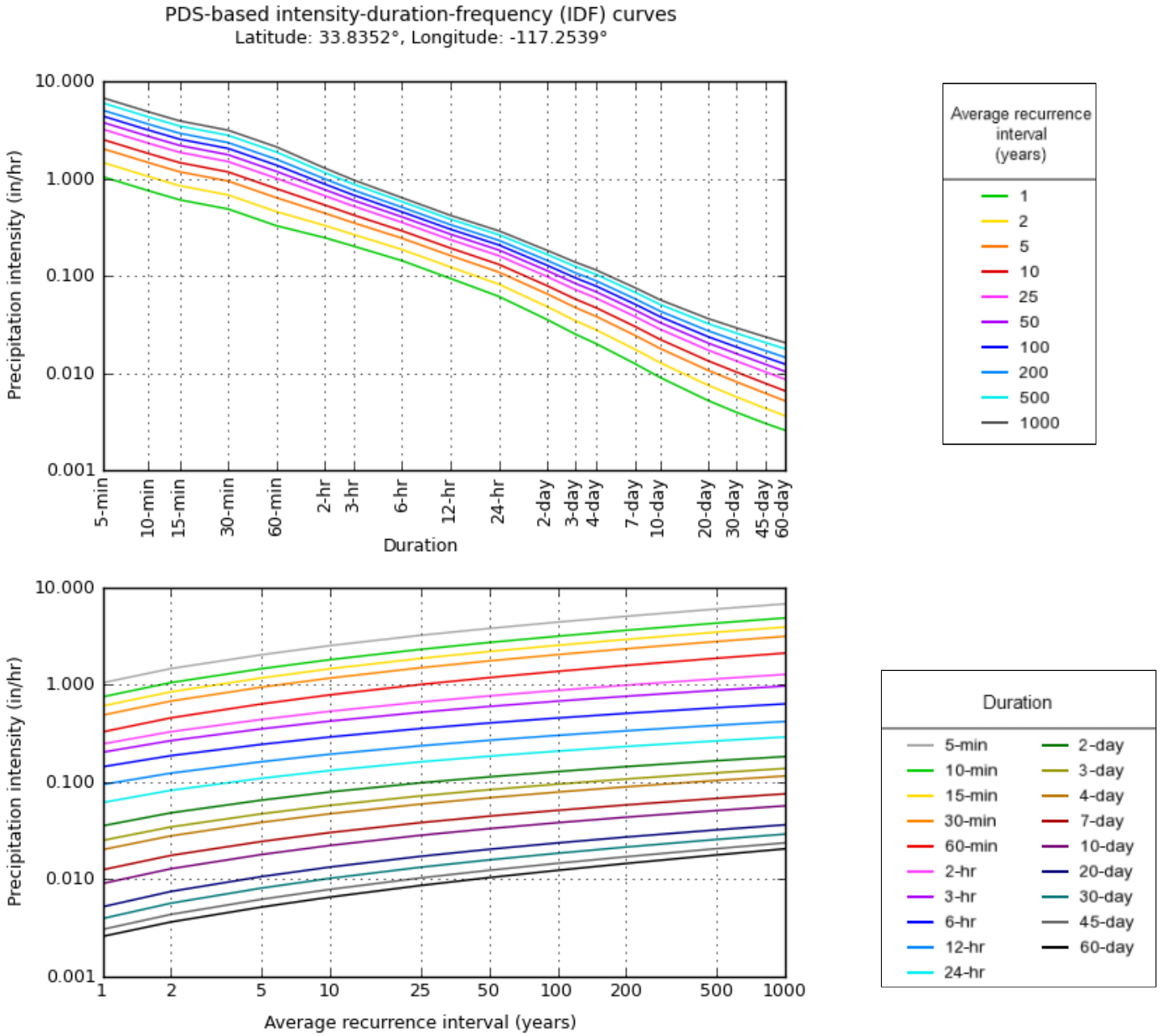
PF graphical



NOAA Atlas 14, Volume 6, Version 2

Created (GMT): Wed Jan 12 00:02:51 2022

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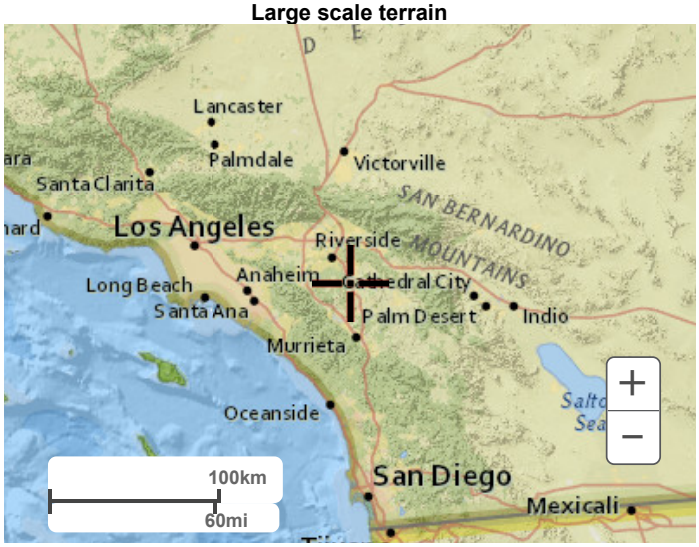
Maps & aerials

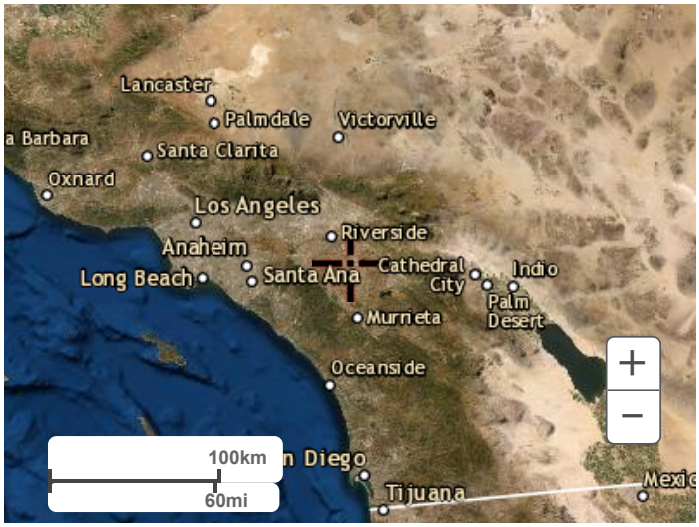
Small scale terrain

Large scale terrain



Large scale map

Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 11. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from U.S. Geological Survey Digital Orthophoto Quadrangles produced at a scale of 1:12,000 from photography dated 1994 or later.

This map may reflect more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

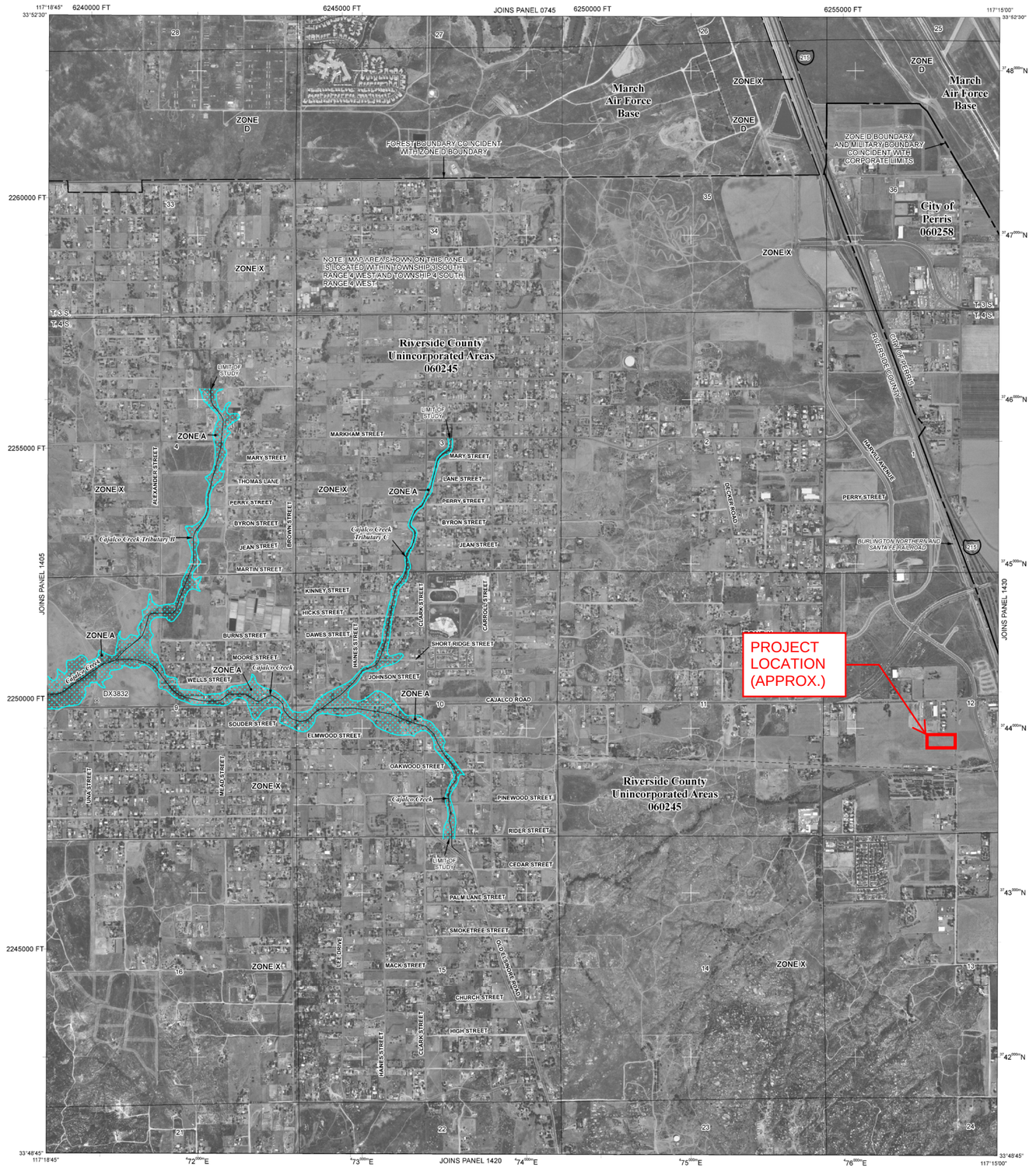
Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://msc.fema.gov.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov.

NOTE:
THE PROJECT IS SITUATED WITHIN FEMA ZONE X; THEREFORE, NO PROCESSING SHOULD BE REQUIRED THROUGH FEMA.



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% annual chance floodplain boundary
	0.2% annual chance floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

A — A	Cross section line
23 — 23	Transect line
87°07'45", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
3776000 N	1000-meter Universal Transverse Mercator grid values, zone 11N
600000 FT	5000-foot grid ticks: California State Plane coordinate system, zone VI (FIPSZONE 0406), Lambert Conformal Conic projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
August 28, 2008

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1410G

FIRM
FLOOD INSURANCE RATE MAP

RIVERSIDE COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 1410 OF 3805
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
PERRIS, CITY OF	060258	1410	G
RIVERSIDE COUNTY	060245	1410	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06065C1410G

EFFECTIVE DATE
AUGUST 28, 2008

Federal Emergency Management Agency

Appendix B

Modified Rational Method Results

Includes:

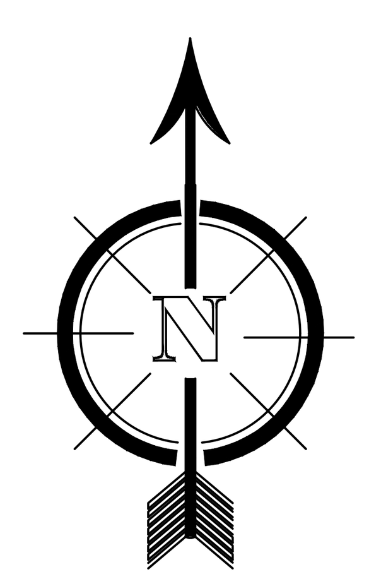
1. Pre-project Drainage Study Map (Offsite & On-site)
2. Pre-project AES Rational Method Output (10-year & 100-year)
3. Offsite Run-on Drainage Study Map for On-site Post-project
4. Offsite Run-on AES Rational Method Output for On-site Post-project (10-year & 100-year)
5. On-site Post-project Drainage Study Map
6. On-site Post-project AES Rational Method Output (10-year & 100-year)

GENERAL NOTES

1. REFERENCE – THE UNDERLYING TOPOGRAPHY USED FOR MOST OF THE "OFFSITE" PORTION ON THIS MAP IS BASED ON THE COUNTY OF RIVERSIDE 4-FT CONTOUR TOPOGRAPHY.
2. REFERENCE – THE UNDERLYING TOPOGRAPHY USED FOR THE "ON-SITE" PORTION ON THIS MAP (REMAINING PORTION) IS BASED ON THE PROJECT-SPECIFIC FLOWN 1-FT CONTOUR TOPOGRAPHY (BASED ON NAVD 88).
3. IN THE EXISTING CONDITION, MAJORITY OF THE SITE IS VACANT AND THERE IS LITTLE TO NO VEGETATION. RUNOFF FROM MAJORITY OF THE SITE SURFACE-DRAINS IN A SOUTHEASTERLY DIRECTION TO PATTERSON AVENUE. THE EXISTING SITE EXPECTS SOME OFFSITE RUN-ON FROM THE WEST AND NORTHWESTERLY PARCELS. WITH THE ANTICIPATED OFFSITE AND ON-SITE DRAINAGE AREAS, LABELED AS "BASIN 100", MAJORITY OF THE RUNOFF (APPROXIMATELY 12.2 ACRES, INCLUDING OFFSITE AND ON-SITE AREAS) DRAINS IN A SOUTHEASTERLY DIRECTION AND EVENTUALLY CONTRIBUTE TO THE RCFC&WCD'S MDP LATERAL LINE G-1 STARTING AT JUST WEST OF I-215. A SMALLER REMAINING PORTION OF THE SITE NEAR THE NORTHEASTERLY CORNER, LABELED AS "BASIN 200" (APPROXIMATELY 0.4 ACRE), DRAINS NORTHEASTERLY TO PATTERSON AVENUE AND IT APPEARS TO DRAIN NORTHERLY ALONG PATTERSON AVENUE.
4. BASED ON THE WEB SOIL SURVEY (ONLINE RESOURCE), THE PROJECT PREDOMINANTLY CONSISTS OF HYDROLOGIC SOIL GROUPS A AND C. FOR THE PURPOSE OF THE HYDROLOGIC ANALYSIS, SOIL GROUP C WAS UTILIZED FOR PERVIOUS AREAS. BASED ON THE SITE-SPECIFIC INFILTRATION TESTING BY THE GEOTECHNICAL ENGINEER, THE FIELD INFILTRATION RATE OF 0.3 INCH/HOUR WAS RECOMMENDED FOR THE PROPOSED BMP DESIGN ALONG WITH AN APPLICABLE FACTOR OF SAFETY. FOR STORM WATER QUALITY MANAGEMENT, PLEASE REFER TO A SEPARATE TECHNICAL DOCUMENT TITLED, "WATER QUALITY MANAGEMENT PLAN (WQMP) FOR B.I.G. PATTERSON INDUSTRIAL."
5. THE PROJECT IS SITUATED WITHIN THE FEMA ZONE X; THEREFORE, PROCESSING THROUGH FEMA IS NOT EXPECTED TO BE REQUIRED FOR THIS PROJECT.

LEGEND

TRACT BOUNDARY	
MAJOR DRAINAGE BOUNDARY	
SUB BASIN BOUNDARY	
DRAINAGE FLOW PATH	
DRAINAGE ACREAGE	X.XX AC.
BASIN NODE ID	XXX
POINT OF INTEREST (OFFSITE)	
PROPOSED STORM DRAIN	



0 25 50 100 150 200

SCALE 1"=50'

DRAINAGE STUDY MAP
FOR
BRIDGE I.G.-PATTERSON
(PRE-PROJECT)
CITY CASE #: PPT220024

JN 2121 REVISED: 8/23/2022

S:\SDH DRAWINGS\BRIDGE-PATTERSON\WR\PDRN Exhibit Pre.dwg 2022-08-24 - 11:32AM - SDH

NOT FOR CONSTRUCTION – EXHIBIT FOR DRAINAGE STUDY ONLY

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
       RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                  (RCFC&WCD)  1978 HYDROLOGY MANUAL
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                  (Rational Tabling Version 23.0)
              Release Date: 07/01/2016  License ID 1717

                         Analysis prepared by:

                         SDH & ASSOCIATES, INC.
                          27363 VIA INDUSTRIA
                           TEMECULA, CA 92590
                             (951) 683-3691

 ************************* DESCRIPTION OF STUDY *************************
* BRIDGE-PATTERSON (JN 2121)                                             *
* EXISTING CONDITION - OFFSITE & ON-SITE - 10-YEAR, 1HOUR STORM EVENT    *
* BASIN 100                                                              *
 **************************************************************************

  FILE NAME: BP1HE10.RAT
  TIME/DATE OF STUDY: 17:33 08/23/2022
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  1.810
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.786
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.140
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.370
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.4655341
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.4629036
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =   10.00   1-HOUR INTENSITY(INCH/HOUR) =   0.794
  SLOPE OF INTENSITY DURATION CURVE = 0.4655
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *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   20.0     15.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0160

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
```

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

+---------------------------------------------------------------------------+
| WESTERLY OFFSITE RUN-ON FLOW:                                             |
| FROM DRAINAGE NODE 1001 TO NODE 1010                                      |
|                                                                           |
+---------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE   1001.00 TO NODE   1010.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS SINGLE FAMILY(1/2 ACRE)
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   767.00
  UPSTREAM ELEVATION(FEET) =   1544.00
  DOWNSTREAM ELEVATION(FEET) =   1521.40
  ELEVATION DIFFERENCE(FEET) =     22.60
  TC = 0.422*[(  767.00**3)/(    22.60)]**.2 =   12.175
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.668
  SINGLE-FAMILY(1/2 ACRE LOT) RUNOFF COEFFICIENT = .7573
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      7.96
  TOTAL AREA(ACRES) =      6.30   TOTAL RUNOFF(CFS) =      7.96

****************************************************************************
  FLOW PROCESS FROM NODE   1010.00 TO NODE    190.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1521.40  DOWNSTREAM(FEET) =   1511.90
  CHANNEL LENGTH THRU SUBAREA(FEET) =   654.00   CHANNEL SLOPE =  0.0145
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.460
  SINGLE-FAMILY(1/2 ACRE LOT) RUNOFF COEFFICIENT = .7429
  SOIL CLASSIFICATION IS "C"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      11.16
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.70
  AVERAGE FLOW DEPTH(FEET) =   0.44   TRAVEL TIME(MIN.) =   4.04
  Tc(MIN.) =   16.21
  SUBAREA AREA(ACRES) =     5.90       SUBAREA RUNOFF(CFS) =    6.40
  TOTAL AREA(ACRES) =       12.2         PEAK FLOW RATE(CFS) =      14.36
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.50   FLOW VELOCITY(FEET/SEC.) =   2.87
  LONGEST FLOWPATH FROM NODE   1001.00 TO NODE    190.00 =    1421.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       12.2  TC(MIN.) =     16.21
  PEAK FLOW RATE(CFS)   =      14.36
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
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               Release Date: 07/01/2016  License ID 1717

                         Analysis prepared by:

                         SDH & ASSOCIATES, INC.
                          27363 VIA INDUSTRIA
                           TEMECULA, CA 92590
                             (951) 683-3691

 ************************* DESCRIPTION OF STUDY *************************
* BRIDGE-PATTERSON (JN 2121)                                             *
* EXISTING CONDITION - OFFSITE & ON-SITE - 100-YEAR, 1HOUR STORM EVENT   *
* BASIN 100                                                              *
 **************************************************************************

  FILE NAME: BP1HE00.RAT
  TIME/DATE OF STUDY: 17:07 08/23/2022
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  1.810
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.786
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.140
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.370
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.4655341
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.4629036
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.370
  SLOPE OF INTENSITY DURATION CURVE = 0.4629
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *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   20.0     15.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0160

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
```

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

+---------------------------------------------------------------------------+
| WESTERLY OFFSITE RUN-ON FLOW:                                             |
| FROM DRAINAGE NODE 1001 TO NODE 1010                                      |
|                                                                           |
+---------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE   1001.00 TO NODE   1010.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS SINGLE FAMILY(1/2 ACRE)
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   767.00
  UPSTREAM ELEVATION(FEET) =   1544.00
  DOWNSTREAM ELEVATION(FEET) =   1521.40
  ELEVATION DIFFERENCE(FEET) =     22.60
  TC = 0.422*[(  767.00**3)/(    22.60)]**.2 =   12.175
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.867
  SINGLE-FAMILY(1/2 ACRE LOT) RUNOFF COEFFICIENT = .8067
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =     14.57
  TOTAL AREA(ACRES) =      6.30   TOTAL RUNOFF(CFS) =     14.57

****************************************************************************
  FLOW PROCESS FROM NODE   1010.00 TO NODE    190.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1521.40  DOWNSTREAM(FEET) =   1511.90
  CHANNEL LENGTH THRU SUBAREA(FEET) =   654.00   CHANNEL SLOPE =  0.0145
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.552
  SINGLE-FAMILY(1/2 ACRE LOT) RUNOFF COEFFICIENT = .7973
  SOIL CLASSIFICATION IS "C"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      20.58
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.14
  AVERAGE FLOW DEPTH(FEET) =   0.60   TRAVEL TIME(MIN.) =   3.48
  Tc(MIN.) =   15.65
  SUBAREA AREA(ACRES) =     5.90       SUBAREA RUNOFF(CFS) =   12.00
  TOTAL AREA(ACRES) =       12.2         PEAK FLOW RATE(CFS) =      26.57
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.67   FLOW VELOCITY(FEET/SEC.) =   3.36
  LONGEST FLOWPATH FROM NODE   1001.00 TO NODE    190.00 =    1421.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       12.2  TC(MIN.) =     15.65
  PEAK FLOW RATE(CFS)   =      26.57
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
       RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
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        (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                   (Rational Tabling Version 23.0)
               Release Date: 07/01/2016  License ID 1717

                         Analysis prepared by:

                         SDH & ASSOCIATES, INC.
                          27363 VIA INDUSTRIA
                           TEMECULA, CA 92590
                             (951) 683-3691

 ************************* DESCRIPTION OF STUDY *************************
* BRIDGE-PATTERSON (JN 2121)                                             *
* EXISTING CONDITION - 10-YEAR, 1-HOUR STORM EVENT                       *
* BASIN 200                                                              *
 **************************************************************************

  FILE NAME: BP2HE10.RAT
  TIME/DATE OF STUDY: 17:40 08/23/2022
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  1.810
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.786
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.140
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.370
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.4655341
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.4629036
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =   10.00   1-HOUR INTENSITY(INCH/HOUR) =   0.794
  SLOPE OF INTENSITY DURATION CURVE = 0.4655
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *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   20.0     15.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0160

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
```

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

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    290.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS SINGLE FAMILY(1/2 ACRE)
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   505.00
  UPSTREAM ELEVATION(FEET) =   1523.50
  DOWNSTREAM ELEVATION(FEET) =     19.80
  ELEVATION DIFFERENCE(FEET) =   1503.70
  TC = 0.422*[(  505.00**3)/(  1503.70)]**.2 =    4.092
  COMPUTED TIME OF CONCENTRATION INCREASED TO 5 MIN.
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.524
  SINGLE-FAMILY(1/2 ACRE LOT) RUNOFF COEFFICIENT = .7964
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.80
  TOTAL AREA(ACRES) =      0.40   TOTAL RUNOFF(CFS) =      0.80
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.4  TC(MIN.) =      5.00
  PEAK FLOW RATE(CFS)   =       0.80
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
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                Release Date: 07/01/2016  License ID 1717

                          Analysis prepared by:

                          SDH & ASSOCIATES, INC.
                           27363 VIA INDUSTRIA
                            TEMECULA, CA 92590
                              (951) 683-3691

 ************************* DESCRIPTION OF STUDY *************************
* BRIDGE-PATTERSON (JN 2121)                                             *
* EXISTING CONDITION - 100-YEAR, 1-HOUR STORM EVENT                      *
* BASIN 200                                                              *
 **************************************************************************

  FILE NAME: BP2HE00.RAT
  TIME/DATE OF STUDY: 17:39 08/23/2022
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  1.810
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.786
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.140
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.370
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.4655341
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.4629036
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.370
  SLOPE OF INTENSITY DURATION CURVE = 0.4629
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *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   20.0     15.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0160

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
```
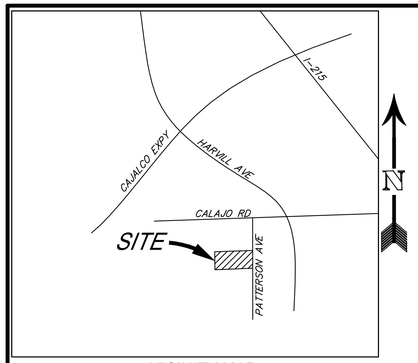

```
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    290.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS SINGLE FAMILY(1/2 ACRE)
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   505.00
  UPSTREAM ELEVATION(FEET) =   1523.50
  DOWNSTREAM ELEVATION(FEET) =     19.80
  ELEVATION DIFFERENCE(FEET) =   1503.70
  TC = 0.422*[(  505.00**3)/(  1503.70)]**.2 =    4.092
  COMPUTED TIME OF CONCENTRATION INCREASED TO 5 MIN.
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.328
  SINGLE-FAMILY(1/2 ACRE LOT) RUNOFF COEFFICIENT = .8343
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      1.44
  TOTAL AREA(ACRES) =      0.40   TOTAL RUNOFF(CFS) =      1.44
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.4  TC(MIN.) =      5.00
  PEAK FLOW RATE(CFS)   =       1.44
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```



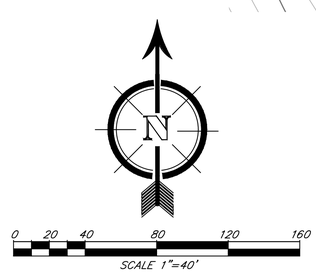
VICINITY MAP
NOT TO SCALE

GENERAL NOTES

1. REFERENCE – THE UNDERLYING TOPOGRAPHY USED FOR MOST OF THE "OFFSITE" PORTION ON THIS MAP IS BASED ON THE COUNTY OF RIVERSIDE 4-FT CONTOUR TOPOGRAPHY.
2. REFERENCE – THE UNDERLYING TOPOGRAPHY USED FOR THE "ON-SITE" PORTION ON THIS MAP (REMAINING PORTION) IS BASED ON THE PROJECT-SPECIFIC FLOWN 1-FT CONTOUR TOPOGRAPHY (BASED ON NAVD 88).
3. IN THE EXISTING CONDITION, MAJORITY OF THE SITE IS VACANT AND THERE IS LITTLE TO NO VEGETATION. RUNOFF FROM MAJORITY OF THE SITE SURFACE-DRAINS IN A SOUTHEASTERLY DIRECTION TO PATTERSON AVENUE. THE EXISTING SITE EXPECTS SOME OFFSITE RUN-ON FROM THE WEST AND NORTHWESTERLY PARCELS. WITH THE ANTICIPATED OFFSITE AND ON-SITE DRAINAGE AREAS, LABELED AS "BASIN 100", MAJORITY OF THE RUNOFF (APPROXIMATELY 12.2 ACRES, INCLUDING OFFSITE AND ON-SITE AREAS) DRAINS IN A SOUTHEASTERLY DIRECTION AND EVENTUALLY CONTRIBUTE TO THE RCFC&WCD'S MDP LATERAL LINE G-1 STARTING AT JUST WEST OF I-215. A SMALLER REMAINING PORTION OF THE SITE NEAR THE NORTHEASTERLY CORNER, LABELED AS "BASIN 200" (APPROXIMATELY 0.4 ACRE), DRAINS NORTHEASTERLY TO PATTERSON AVENUE AND IT APPEARS TO DRAIN NORTHERLY ALONG PATTERSON AVENUE.
4. THE POST-PROJECT DRAINAGE CHARACTERISTICS WILL BE MAINTAINED SIMILAR AS COMPARED TO THE PRE-PROJECT CONDITION. ON-SITE RUNOFF (APPROXIMATELY 4.8 ACRES FROM DRAINAGE BASIN 100) WILL BE CAPTURED VIA PROPOSED CATCH BASINS AND CONVEYED VIA PROPOSED STORM DRAIN PIPES TOWARDS A PROPOSED UNDERGROUND STORAGE FACILITY AND A PROPRIETARY MODULAR WETLAND SYSTEM (MWS) FOR MITIGATION PURPOSES, PRIOR TO DISCHARGING FLOWS TO PATTERSON AVENUE VIA A PROPOSED SIDEWALK UNDERDRAIN (VIA A MECHANICAL PUMP). THE WESTERLY AND NORTHWESTERLY OFFSITE FLOWS (A TOTAL OF APPROXIMATELY 7.6 ACRES) WILL BE COLLECTED VIA A NETWORK OF PERIMETER V-DITCHES AND CATCH BASINS AND CONVEYED VIA STORM DRAIN PIPES TO BYPASS THE OFFSITE FLOWS IN A SOUTHEASTERLY DIRECTION TO A CATCH BASIN BUBBLER IN THE SOUTHEASTERLY LANDSCAPE AREA, PRIOR TO DISCHARGING TO THE SAME BASIN 100 SIDEWALK UNDERDRAIN TO PATTERSON AVENUE. THE NORTHEASTERLY DRAINAGE AREA (APPROXIMATELY 0.2 ACRES FROM BASIN 200) IS CONSIDERED SELF-TREATING AREA AND DRAIN TO PATTERSON AVENUE VIA A PROPOSED SIDEWALK UNDERDRAIN. THE POST-PROJECT DRAINAGE AREAS FOR BASIN 100 (INCLUDING OFFSITE) AND BASIN 200 AT THE OUTLET LOCATIONS TO PATTERSON AVENUE ARE 12.2 ACRES AND 0.6 ACRES, RESPECTIVELY.
5. BASED ON THE WEB SOIL SURVEY (ONLINE RESOURCE), THE PROJECT PREDOMINANTLY CONSISTS OF HYDROLOGIC SOIL GROUPS A AND C. FOR THE PURPOSE OF THE HYDROLOGIC ANALYSIS, SOIL GROUP C WAS UTILIZED FOR PERVIOUS AREAS. BASED ON THE SITE-SPECIFIC INFILTRATION TESTING BY THE GEOTECHNICAL ENGINEER, THE FIELD INFILTRATION RATE OF 0.3 INCH/HOUR WAS RECOMMENDED FOR THE PROPOSED BMP DESIGN ALONG WITH AN APPLICABLE FACTOR OF SAFETY. FOR STORM WATER QUALITY MANAGEMENT, PLEASE REFER TO A SEPARATE TECHNICAL DOCUMENT TITLED, "WATER QUALITY MANAGEMENT PLAN (WQMP) FOR B.I.G. PATTERSON INDUSTRIAL."
6. THE PROJECT IS SITUATED WITHIN THE FEMA ZONE X; THEREFORE, PROCESSING THROUGH FEMA IS NOT EXPECTED TO BE REQUIRED FOR THIS PROJECT.

LEGEND

- TRACT BOUNDARY
- MAJOR DRAINAGE BOUNDARY
- SUB BASIN BOUNDARY
- DRAINAGE FLOW PATH
- DRAINAGE ACREAGE (X.XX AC.)
- BASIN NODE ID (XXX)
- POINT OF INTEREST (OFFSITE)
- PROPOSED STORM DRAIN



DRAINAGE STUDY MAP FOR BRIDGE I.G.-PATTERSON (OFFSITE RUN-ON FOR POST-PROJECT)

CITY CASE #: PPT220024

JN 2121 REVISED: 8/23/2022

S:\SDH DRAWINGS\BRIDGE-PATTERSON\WR\PDR\ Exhibit Post.dwg 2022-08-23 - 10:27AM - SDH

NOT FOR CONSTRUCTION – EXHIBIT FOR DRAINAGE STUDY ONLY

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**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                    (Rational Tabling Version 23.0)
                Release Date: 07/01/2016  License ID 1717

                          Analysis prepared by:

                          SDH & ASSOCIATES, INC.
                           27363 VIA INDUSTRIA
                            TEMECULA, CA 92590
                              (951) 683-3691

 ************************* DESCRIPTION OF STUDY *************************
* BRIDGE-PATTERSON (JN 2121)                                             *
* OFFSITE (EXISTING) - 10-YEAR, 1-HOUR STORM EVENT                       *
* BASIN 1000                                                             *
 **************************************************************************

  FILE NAME: BPO1TE10.RAT
  TIME/DATE OF STUDY: 10:41 08/23/2022
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  1.810
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.786
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.140
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.370
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.4655341
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.4629036
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =   10.00   1-HOUR INTENSITY(INCH/HOUR) =   0.794
  SLOPE OF INTENSITY DURATION CURVE = 0.4655
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *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   20.0     15.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0160

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
```

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

+---------------------------------------------------------------------------+
| WESTERLY OFFSITE RUN-ON FLOW:                                             |
| FROM DRAINAGE NODE 1001 TO NODE 1010                                      |
|                                                                           |
+---------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE   1001.00 TO NODE   1010.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS SINGLE FAMILY(1/2 ACRE)
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   767.00
  UPSTREAM ELEVATION(FEET) =   1544.00
  DOWNSTREAM ELEVATION(FEET) =   1521.40
  ELEVATION DIFFERENCE(FEET) =     22.60
  TC = 0.422*[(  767.00**3)/(    22.60)]**.2 =   12.175
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.668
  SINGLE-FAMILY(1/2 ACRE LOT) RUNOFF COEFFICIENT = .7573
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      8.21
  TOTAL AREA(ACRES) =      6.50   TOTAL RUNOFF(CFS) =      8.21

+---------------------------------------------------------------------------+
| NORTHWESTERLY OFFSITE RUN-ON FLOW:                                        |
| FROM DRAINAGE NODE 1011 TO NODE 1020                                      |
|                                                                           |
+---------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE   1011.00 TO NODE   1020.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS SINGLE FAMILY(1/2 ACRE)
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   508.00
  UPSTREAM ELEVATION(FEET) =   1532.00
  DOWNSTREAM ELEVATION(FEET) =   1524.00
  ELEVATION DIFFERENCE(FEET) =      8.00
  TC = 0.422*[(  508.00**3)/(     8.00)]**.2 =   11.703
```

```
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.699
  SINGLE-FAMILY(1/2 ACRE LOT) RUNOFF COEFFICIENT = .7592
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      1.29
  TOTAL AREA(ACRES) =      1.00   TOTAL RUNOFF(CFS) =      1.29
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.0  TC(MIN.) =     11.70
  PEAK FLOW RATE(CFS)   =       1.29
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
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                    (Rational Tabling Version 23.0)
                Release Date: 07/01/2016  License ID 1717

                          Analysis prepared by:

                          SDH & ASSOCIATES, INC.
                           27363 VIA INDUSTRIA
                            TEMECULA, CA 92590
                              (951) 683-3691

 ************************* DESCRIPTION OF STUDY *************************
* BRIDGE-PATTERSON (JN 2121)                                             *
* OFFSITE (EXISTING) - 100-YEAR, 1-HOUR STORM EVENT                      *
* BASIN 1000                                                             *
 **************************************************************************

  FILE NAME: BPO1TE00.RAT
  TIME/DATE OF STUDY: 10:40 08/23/2022
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  1.810
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.786
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.140
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.370
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.4655341
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.4629036
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.370
  SLOPE OF INTENSITY DURATION CURVE = 0.4629
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *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   20.0     15.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0160

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
```

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

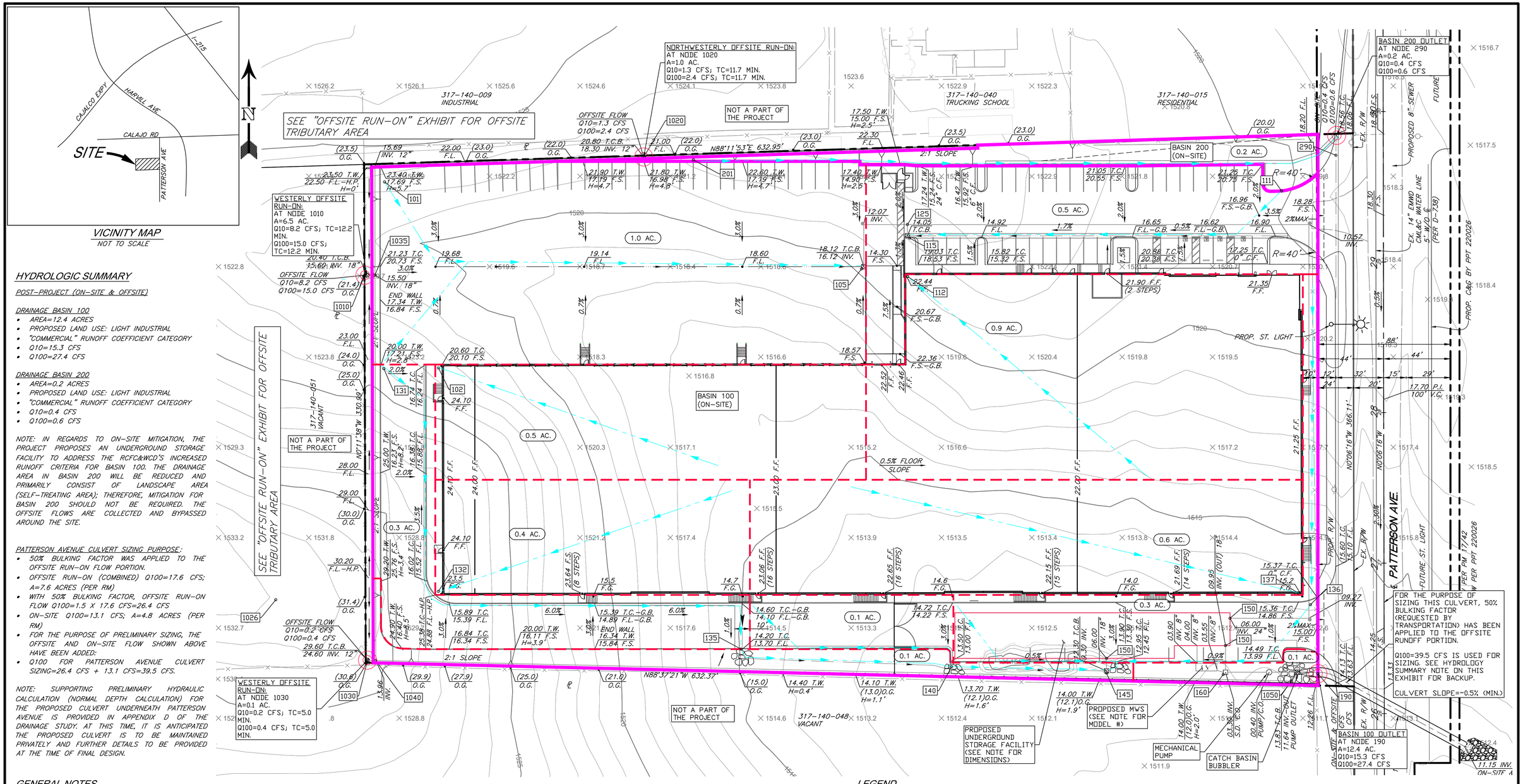
+---------------------------------------------------------------------------+
| WESTERLY OFFSITE RUN-ON FLOW:                                             |
| FROM DRAINAGE NODE 1001 TO NODE 1010                                      |
|                                                                           |
+---------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE   1001.00 TO NODE   1010.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS SINGLE FAMILY(1/2 ACRE)
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   767.00
  UPSTREAM ELEVATION(FEET) =   1544.00
  DOWNSTREAM ELEVATION(FEET) =   1521.40
  ELEVATION DIFFERENCE(FEET) =     22.60
  TC = 0.422*[(  767.00**3)/(    22.60)]**.2 =   12.175
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.867
  SINGLE-FAMILY(1/2 ACRE LOT) RUNOFF COEFFICIENT = .8067
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =     15.03
  TOTAL AREA(ACRES) =      6.50   TOTAL RUNOFF(CFS) =     15.03

+---------------------------------------------------------------------------+
| NORTHWESTERLY OFFSITE RUN-ON FLOW:                                        |
| FROM DRAINAGE NODE 1011 TO NODE 1020                                      |
|                                                                           |
+---------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE   1011.00 TO NODE   1020.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS SINGLE FAMILY(1/2 ACRE)
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   508.00
  UPSTREAM ELEVATION(FEET) =   1532.00
  DOWNSTREAM ELEVATION(FEET) =   1524.00
  ELEVATION DIFFERENCE(FEET) =      8.00
  TC = 0.422*[(  508.00**3)/(     8.00)]**.2 =   11.703
```

```
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.919
  SINGLE-FAMILY(1/2 ACRE LOT) RUNOFF COEFFICIENT = .8081
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      2.36
  TOTAL AREA(ACRES) =      1.00   TOTAL RUNOFF(CFS) =      2.36
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.0  TC(MIN.) =     11.70
  PEAK FLOW RATE(CFS)   =       2.36
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```



HYDROLOGIC SUMMARY

POST-PROJECT (ON-SITE & OFFSITE)

DRAINAGE BASIN 100

- AREA=12.4 ACRES
- PROPOSED LAND USE: LIGHT INDUSTRIAL
- "COMMERCIAL" RUNOFF COEFFICIENT CATEGORY
- Q10=15.3 CFS
- Q100=27.4 CFS

DRAINAGE BASIN 200

- AREA=0.2 ACRES
- PROPOSED LAND USE: LIGHT INDUSTRIAL
- "COMMERCIAL" RUNOFF COEFFICIENT CATEGORY
- Q10=0.4 CFS
- Q100=0.6 CFS

NOTE: IN REGARDS TO ON-SITE MITIGATION, THE PROJECT PROPOSES AN UNDERGROUND STORAGE FACILITY TO ADDRESS THE RCFC&WCD'S INCREASED RUNOFF CRITERIA FOR BASIN 100. THE DRAINAGE AREA IN BASIN 200 WILL BE REDUCED AND PRIMARILY CONSIST OF LANDSCAPE AREA (SELF-TREATING AREA); THEREFORE, MITIGATION FOR BASIN 200 SHOULD NOT BE REQUIRED. THE OFFSITE FLOWS ARE COLLECTED AND BYPASSED AROUND THE SITE.

PATTERSON AVENUE CULVERT SIZING PURPOSE:

- 50% BULKING FACTOR WAS APPLIED TO THE OFFSITE RUN-ON FLOW PORTION.
- OFFSITE RUN-ON (COMBINED) Q100=17.6 CFS; A=7.6 ACRES (PER RM)
- WITH 50% BULKING FACTOR, OFFSITE RUN-ON FLOW Q100=1.5 X 17.6 CFS=26.4 CFS
- ON-SITE Q100=13.1 CFS; A=4.8 ACRES (PER RM)
- FOR THE PURPOSE OF PRELIMINARY SIZING, THE OFFSITE AND ON-SITE FLOW SHOWN ABOVE HAVE BEEN ADDED:
- Q100 FOR PATTERSON AVENUE CULVERT SIZING=26.4 CFS + 13.1 CFS=39.5 CFS.

NOTE: SUPPORTING PRELIMINARY HYDRAULIC CALCULATION (NORMAL DEPTH CALCULATION) FOR THE PROPOSED CULVERT UNDERNEATH PATTERSON AVENUE IS PROVIDED IN APPENDIX D OF THE DRAINAGE STUDY. AT THIS TIME, IT IS ANTICIPATED THE PROPOSED CULVERT IS TO BE MAINTAINED PRIVATELY AND FURTHER DETAILS TO BE PROVIDED AT THE TIME OF FINAL DESIGN.

GENERAL NOTES

1. REFERENCE – THE UNDERLYING TOPOGRAPHY USED FOR MOST OF THE "OFFSITE" PORTION ON THIS MAP IS BASED ON THE COUNTY OF RIVERSIDE 4-FT CONTOUR TOPOGRAPHY.
2. REFERENCE – THE UNDERLYING TOPOGRAPHY USED FOR THE "ON-SITE" PORTION ON THIS MAP (REMAINING PORTION) IS BASED ON THE PROJECT-SPECIFIC FLOWN 1-FT CONTOUR TOPOGRAPHY (BASED ON NAVD 88).
3. IN THE EXISTING CONDITION, MAJORITY OF THE SITE IS VACANT AND THERE IS LITTLE TO NO VEGETATION. RUNOFF FROM MAJORITY OF THE SITE SURFACE-DRAINS IN A SOUTHEASTERLY DIRECTION TO PATTERSON AVENUE. THE EXISTING SITE EXPECTS SOME OFFSITE RUN-ON FROM THE WEST AND NORTHWESTERLY PARCELS. WITH THE ANTICIPATED OFFSITE AND ON-SITE DRAINAGE AREAS, LABELED AS "BASIN 100", MAJORITY OF THE RUNOFF (APPROXIMATELY 12.2 ACRES, INCLUDING OFFSITE AND ON-SITE AREAS) DRAINS IN A SOUTHEASTERLY DIRECTION AND EVENTUALLY CONTRIBUTE TO THE RCFC&WCD'S MDP LATERAL LINE G-1 STARTING AT JUST WEST OF I-215. A SMALLER REMAINING PORTION OF THE SITE NEAR THE NORTHEASTERLY CORNER, LABELED AS "BASIN 200" (APPROXIMATELY 0.4 ACRE), DRAINS NORTHEASTERLY TO PATTERSON AVENUE AND IT APPEARS TO DRAIN NORTHERLY ALONG PATTERSON AVENUE.
4. THE POST-PROJECT DRAINAGE CHARACTERISTICS WILL BE MAINTAINED SIMILAR AS COMPARED TO THE PRE-PROJECT CONDITION. ON-SITE RUNOFF (APPROXIMATELY 4.8 ACRES FROM DRAINAGE BASIN 100) WILL BE CAPTURED VIA PROPOSED CATCH BASINS AND CONVEYED VIA PROPOSED STORM DRAIN PIPES TOWARDS A PROPOSED UNDERGROUND STORAGE FACILITY AND A PROPRIETARY MODULAR WETLAND SYSTEM (MWS) FOR MITIGATION PURPOSES, PRIOR TO DISCHARGING FLOWS TO PATTERSON AVENUE VIA A PROPOSED SIDEWALK UNDERDRAIN (VIA A MECHANICAL PUMP). THE WESTERLY AND NORTHWESTERLY OFFSITE FLOWS (A TOTAL OF APPROXIMATELY 7.6 ACRES) WILL BE COLLECTED VIA A NETWORK OF PERIMETER V-DITCHES AND CATCH BASINS AND CONVEYED VIA STORM DRAIN PIPES TO BYPASS THE OFFSITE FLOWS IN A SOUTHEASTERLY DIRECTION TO A CATCH BASIN BUBBLER IN THE SOUTHEASTERLY LANDSCAPE AREA, PRIOR TO DISCHARGING TO THE SAME BASIN 100 SIDEWALK UNDERDRAIN TO PATTERSON AVENUE. THE NORTHEASTERLY DRAINAGE AREA (APPROXIMATELY 0.2 ACRES FROM BASIN 200) IS CONSIDERED SELF-TREATING AREA AND DRAIN TO PATTERSON AVENUE VIA A PROPOSED SIDEWALK UNDERDRAIN. THE POST-PROJECT DRAINAGE AREAS FOR BASIN 100 (INCLUDING OFFSITE) AND BASIN 200 AT THE OUTLET LOCATIONS TO PATTERSON AVENUE ARE 12.2 ACRES AND 0.6 ACRES, RESPECTIVELY.
5. BASED ON THE WEB SOIL SURVEY (ONLINE RESOURCE), THE PROJECT PREDOMINANTLY CONSISTS OF HYDROLOGIC SOIL GROUPS A AND C. FOR THE PURPOSE OF THE HYDROLOGIC ANALYSIS, SOIL GROUP C WAS UTILIZED FOR PERVIOUS AREAS. BASED ON THE SITE-SPECIFIC INFILTRATION TESTING BY THE GEOTECHNICAL ENGINEER, THE FIELD INFILTRATION RATE OF 0.3 INCH/HOUR WAS RECOMMENDED FOR THE PROPOSED BMP DESIGN ALONG WITH AN APPLICABLE FACTOR OF SAFETY. FOR STORM WATER QUALITY MANAGEMENT, PLEASE REFER TO A SEPARATE TECHNICAL DOCUMENT TITLED, "WATER QUALITY MANAGEMENT PLAN (WQMP) FOR B.I.G. PATTERSON INDUSTRIAL."
6. THE PROJECT IS SITUATED WITHIN THE FEMA ZONE X; THEREFORE, PROCESSING THROUGH FEMA IS NOT EXPECTED TO BE REQUIRED FOR THIS PROJECT.

LEGEND

- TRACT BOUNDARY
- MAJOR DRAINAGE BOUNDARY
- SUB BASIN BOUNDARY
- DRAINAGE FLOW PATH
- DRAINAGE ACREAGE (X.XX AC.)
- BASIN NODE ID (XXX)
- POINT OF INTEREST (OUTLET)
- PROPOSED STORM DRAIN
- PROPOSED UNDERGROUND STORAGE

N

0 15 30 60 90 120

SCALE 1"=30'

DRAINAGE STUDY MAP FOR BRIDGE I.G.-PATTERSON (ON-SITE POST-PROJECT) CITY CASE #: PPT220024

JN 2121 REVISED: 5/4/2023

S:\RBF DRAWINGS\BRIDGE-PATTERSON\MP\PDRL EXHIBIT Post.dwg 2023-05-03 - 9:23AM - RBH

NOT FOR CONSTRUCTION – EXHIBIT FOR DRAINAGE STUDY ONLY

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**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
       RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                  (RCFC&WCD)  1978 HYDROLOGY MANUAL
        (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                  (Rational Tabling Version 23.0)
              Release Date: 07/01/2016  License ID 1717

                        Analysis prepared by:

                        SDH & ASSOCIATES, INC.
                         27363 VIA INDUSTRIA
                          TEMECULA, CA 92590
                            (951) 683-3691

 ************************* DESCRIPTION OF STUDY *************************
* BRIDGE-PATTERSON (JN 2121)                                             *
* POST-PROJECT - ON-SITE & OFFSITE - 100-YEAR, 1-HOUR STORM EVENT        *
* BASIN 100                                                              *
 **************************************************************************

  FILE NAME: BP1HP10.RAT
  TIME/DATE OF STUDY: 16:58 08/24/2022
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  1.810
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.786
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.140
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.370
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.4655341
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.4629036
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =   10.00   1-HOUR INTENSITY(INCH/HOUR) =   0.794
  SLOPE OF INTENSITY DURATION CURVE = 0.4655
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *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   20.0     15.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0160

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
```

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

****************************************************************************
  FLOW PROCESS FROM NODE   1010.00 TO NODE   1010.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  12.20   RAIN INTENSITY(INCH/HOUR) =  1.67
  TOTAL AREA(ACRES) =     6.50   TOTAL RUNOFF(CFS) =      8.20

****************************************************************************
  FLOW PROCESS FROM NODE   1010.00 TO NODE   1035.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    15.80  DOWNSTREAM(FEET) =    15.50
  FLOW LENGTH(FEET) =     4.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.30
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.20
  PIPE TRAVEL TIME(MIN.) =   0.00    Tc(MIN.) =   12.20
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   1035.00 =       4.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1035.00 TO NODE   1035.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   12.20
  RAINFALL INTENSITY(INCH/HR) =   1.67
  TOTAL STREAM AREA(ACRES) =     6.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      8.20

****************************************************************************
  FLOW PROCESS FROM NODE   1020.00 TO NODE   1020.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  11.70   RAIN INTENSITY(INCH/HOUR) =  1.70
  TOTAL AREA(ACRES) =     1.00   TOTAL RUNOFF(CFS) =      1.30
```

```
****************************************************************************
  FLOW PROCESS FROM NODE   1020.00 TO NODE   1035.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    18.30  DOWNSTREAM(FEET) =    15.50
  FLOW LENGTH(FEET) =   250.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   4.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.45
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.30
  PIPE TRAVEL TIME(MIN.) =   0.94    Tc(MIN.) =   12.64
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   1035.00 =     250.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1035.00 TO NODE   1035.00 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.) =   12.64
  RAINFALL INTENSITY(INCH/HR) =   1.64
  TOTAL STREAM AREA(ACRES) =     1.00
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.30

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        8.20    12.20        1.666          6.50
      2        1.30    12.64        1.639          1.00

 **********************************WARNING***********************************
  IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
  ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
  WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ****************************************************************************

  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        9.46    12.20       1.666
      2        9.37    12.64       1.639
```

```
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       9.46   Tc(MIN.) =   12.20
  TOTAL AREA(ACRES) =        7.5
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   1035.00 =     250.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1035.00 TO NODE   1040.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    15.50  DOWNSTREAM(FEET) =    13.96
  FLOW LENGTH(FEET) =   256.00   MANNING'S N =  0.012
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.40
  (PIPE FLOW VELOCITY CORRESPONDING TO NORMAL-DEPTH FLOW
   AT DEPTH = 0.82 * DIAMETER)
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.46
  PIPE TRAVEL TIME(MIN.) =   0.79    Tc(MIN.) =   13.00
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   1040.00 =     506.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1040.00 TO NODE   1040.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   13.00
  RAINFALL INTENSITY(INCH/HR) =   1.62
  TOTAL STREAM AREA(ACRES) =     7.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.46

****************************************************************************
  FLOW PROCESS FROM NODE   1026.00 TO NODE   1030.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS SINGLE FAMILY(1/2 ACRE)
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    72.00
  UPSTREAM ELEVATION(FEET) =     32.80
  DOWNSTREAM ELEVATION(FEET) =     29.60
  ELEVATION DIFFERENCE(FEET) =      3.20
  TC = 0.422*[(   72.00**3)/(     3.20)]**.2 =    4.353
  COMPUTED TIME OF CONCENTRATION INCREASED TO 5 MIN.
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.524
  SINGLE-FAMILY(1/2 ACRE LOT) RUNOFF COEFFICIENT = .7964
```

```
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.20
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.20

****************************************************************************
  FLOW PROCESS FROM NODE   1030.00 TO NODE   1040.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    24.60  DOWNSTREAM(FEET) =    13.96
  FLOW LENGTH(FEET) =     4.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   0.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.38
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.20
  PIPE TRAVEL TIME(MIN.) =   0.00    Tc(MIN.) =    5.00
  LONGEST FLOWPATH FROM NODE   1026.00 TO NODE   1040.00 =      76.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1040.00 TO NODE   1040.00 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.) =    5.00
  RAINFALL INTENSITY(INCH/HR) =   2.52
  TOTAL STREAM AREA(ACRES) =     0.10
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.20

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        9.46    13.00        1.618          7.50
      2        0.20     5.00        2.523          0.10

 ********************************WARNING*********************************
  IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
  ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
  WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ************************************************************************

  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        3.84     5.00       2.523
      2        9.58    13.00       1.618

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       9.58   Tc(MIN.) =   13.00
  TOTAL AREA(ACRES) =        7.6
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   1040.00 =     506.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1040.00 TO NODE   1050.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    13.96  DOWNSTREAM(FEET) =    10.30
  FLOW LENGTH(FEET) =   608.00   MANNING'S N =  0.012
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.40
  (PIPE FLOW VELOCITY CORRESPONDING TO NORMAL-DEPTH FLOW
   AT DEPTH = 0.82 * DIAMETER)
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.58
  PIPE TRAVEL TIME(MIN.) =   1.88    Tc(MIN.) =   14.87
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   1050.00 =    1114.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1050.00 TO NODE    190.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     12.30  DOWNSTREAM(FEET) =     12.26
  CHANNEL LENGTH THRU SUBAREA(FEET) =    26.00   CHANNEL SLOPE =  0.0015
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       9.58
  FLOW VELOCITY(FEET/SEC.) =   2.71   FLOW DEPTH(FEET) =   0.92
  TRAVEL TIME(MIN.) =   0.16   Tc(MIN.) =   15.03
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE    190.00 =    1140.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    190.00 TO NODE    190.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    105.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   345.00
  UPSTREAM ELEVATION(FEET) =     17.70
  DOWNSTREAM ELEVATION(FEET) =     14.20
  ELEVATION DIFFERENCE(FEET) =      3.50
  TC = 0.303*[(  345.00**3)/(     3.50)]**.2 =    7.861
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.045
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8796
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      1.80
  TOTAL AREA(ACRES) =      1.00   TOTAL RUNOFF(CFS) =      1.80

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.045
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8796
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    0.50   SUBAREA RUNOFF(CFS) =    0.90
  TOTAL AREA(ACRES) =        1.5   TOTAL RUNOFF(CFS) =       2.70
  TC(MIN.) =    7.86

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    125.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    12.20  DOWNSTREAM(FEET) =    11.00
  FLOW LENGTH(FEET) =    55.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.88
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.70
  PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =    7.99
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    125.00 =     400.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    125.00 TO NODE    125.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.99
```

```
  RAINFALL INTENSITY(INCH/HR) =   2.03
  TOTAL STREAM AREA(ACRES) =     1.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.70

****************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    115.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   273.00
  UPSTREAM ELEVATION(FEET) =     18.70
  DOWNSTREAM ELEVATION(FEET) =     14.05
  ELEVATION DIFFERENCE(FEET) =      4.65
  TC = 0.303*[(  273.00**3)/(     4.65)]**.2 =    6.453
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.242
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8810
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.99
  TOTAL AREA(ACRES) =      0.50   TOTAL RUNOFF(CFS) =      0.99

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    115.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.242
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8810
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    0.90   SUBAREA RUNOFF(CFS) =    1.78
  TOTAL AREA(ACRES) =        1.4   TOTAL RUNOFF(CFS) =       2.76
  TC(MIN.) =    6.45

****************************************************************************
  FLOW PROCESS FROM NODE    115.00 TO NODE    125.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    11.55  DOWNSTREAM(FEET) =    11.00
  FLOW LENGTH(FEET) =     6.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   4.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.72
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.76
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =    6.46
  LONGEST FLOWPATH FROM NODE    111.00 TO NODE    125.00 =     279.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    125.00 TO NODE    125.00 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.) =    6.46
  RAINFALL INTENSITY(INCH/HR) =   2.24
  TOTAL STREAM AREA(ACRES) =     1.40
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.76

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        2.70     7.99        2.029          1.50
      2        2.76     6.46        2.240          1.40

 ********************************WARNING*********************************
  IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
  ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
  WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ************************************************************************

  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        4.95     6.46       2.240
      2        5.20     7.99       2.029

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       4.95   Tc(MIN.) =    6.46
  TOTAL AREA(ACRES) =        2.9
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    125.00 =     400.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    125.00 TO NODE    150.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    11.00  DOWNSTREAM(FEET) =     6.00
  FLOW LENGTH(FEET) =   580.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  24.0 INCH PIPE IS   7.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.57
  GIVEN PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
```

```
  PIPE-FLOW(CFS) =       4.95
  PIPE TRAVEL TIME(MIN.) =   1.74    Tc(MIN.) =    8.20
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    150.00 =     980.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    137.00 TO NODE    150.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.005
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8793
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    0.60   SUBAREA RUNOFF(CFS) =    1.06
  TOTAL AREA(ACRES) =        3.5   TOTAL RUNOFF(CFS) =       6.00
  TC(MIN.) =    8.20

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    150.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    131.00 TO NODE    135.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   400.00
  UPSTREAM ELEVATION(FEET) =     16.50
  DOWNSTREAM ELEVATION(FEET) =     13.70
  ELEVATION DIFFERENCE(FEET) =      2.80
  TC = 0.303*[(  400.00**3)/(     2.80)]**.2 =    8.982
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.922
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8786
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.51
  TOTAL AREA(ACRES) =      0.30   TOTAL RUNOFF(CFS) =      0.51

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    135.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.922
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8786
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    0.40   SUBAREA RUNOFF(CFS) =    0.68
```

```
  TOTAL AREA(ACRES) =        0.7   TOTAL RUNOFF(CFS) =       1.18
  TC(MIN.) =    8.98

****************************************************************************
  FLOW PROCESS FROM NODE    135.00 TO NODE    140.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     13.20  DOWNSTREAM(FEET) =     12.47
  CHANNEL LENGTH THRU SUBAREA(FEET) =   140.00   CHANNEL SLOPE =  0.0052
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.778
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8773
  SOIL CLASSIFICATION IS "C"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.26
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.43
  AVERAGE FLOW DEPTH(FEET) =   0.33   TRAVEL TIME(MIN.) =   1.63
  Tc(MIN.) =   10.61
  SUBAREA AREA(ACRES) =     0.10       SUBAREA RUNOFF(CFS) =    0.16
  TOTAL AREA(ACRES) =        0.8         PEAK FLOW RATE(CFS) =       1.34

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.34   FLOW VELOCITY(FEET/SEC.) =   1.47
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    140.00 =     540.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    140.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.778
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8773
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    0.10   SUBAREA RUNOFF(CFS) =    0.16
  TOTAL AREA(ACRES) =        0.9   TOTAL RUNOFF(CFS) =       1.49
  TC(MIN.) =   10.61

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    145.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     12.70  DOWNSTREAM(FEET) =     12.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   100.00   CHANNEL SLOPE =  0.0040
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       1.49
```

```
  FLOW VELOCITY(FEET/SEC.) =   1.37   FLOW DEPTH(FEET) =   0.39
  TRAVEL TIME(MIN.) =   1.22   Tc(MIN.) =   11.83
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    145.00 =     640.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    145.00 TO NODE    145.00 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.) =   11.83
  RAINFALL INTENSITY(INCH/HR) =   1.69
  TOTAL STREAM AREA(ACRES) =     0.90
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.49

****************************************************************************
  FLOW PROCESS FROM NODE    136.00 TO NODE    145.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   140.00
  UPSTREAM ELEVATION(FEET) =     14.50
  DOWNSTREAM ELEVATION(FEET) =     12.45
  ELEVATION DIFFERENCE(FEET) =      2.05
  TC = 0.303*[(  140.00**3)/(     2.05)]**.2 =    5.092
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.503
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8826
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.66
  TOTAL AREA(ACRES) =      0.30   TOTAL RUNOFF(CFS) =      0.66

****************************************************************************
  FLOW PROCESS FROM NODE    145.00 TO NODE    145.00 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.) =    5.09
  RAINFALL INTENSITY(INCH/HR) =   2.50
  TOTAL STREAM AREA(ACRES) =     0.30
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.66

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

```
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1        1.49    11.83        1.690          0.90
     2        0.66     5.09        2.503          0.30

 ********************************WARNING***********************************
  IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
  ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
  WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 **************************************************************************

  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        1.31     5.09       2.503
      2        1.94    11.83       1.690

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       1.94   Tc(MIN.) =   11.83
  TOTAL AREA(ACRES) =        1.2
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    145.00 =     640.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    145.00 TO NODE    150.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     9.30  DOWNSTREAM(FEET) =     6.00
  FLOW LENGTH(FEET) =     7.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.98
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.94
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =   11.84
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    150.00 =     647.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    150.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        1.94    11.84       1.690        1.20
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    150.00 =     647.00 FEET.
```

```
 ** MEMORY BANK #  2 CONFLUENCE DATA **
 STREAM     RUNOFF       Tc       INTENSITY     AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)   (ACRE)
     1        6.00      8.20        2.005        3.50
 LONGEST FLOWPATH FROM NODE    101.00 TO NODE    150.00 =     980.00 FEET.

 ****************************WARNING*************************************
 IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
 ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
 WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ************************************************************************

 ** PEAK FLOW RATE TABLE **
 STREAM    RUNOFF       Tc       INTENSITY
 NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1       7.35       8.20        2.005
     2       7.00      11.84        1.690

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       7.35   Tc(MIN.) =    8.20
 TOTAL AREA(ACRES) =        4.7

************************************************************************
 FLOW PROCESS FROM NODE    150.00 TO NODE    150.00 IS CODE =  12
------------------------------------------------------------------------
 >>>>>CLEAR MEMORY BANK # 2 <<<<<
========================================================================

************************************************************************
 FLOW PROCESS FROM NODE    150.00 TO NODE    160.00 IS CODE =  41
------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
========================================================================
 ELEVATION DATA: UPSTREAM(FEET) =     9.95  DOWNSTREAM(FEET) =     3.00
 FLOW LENGTH(FEET) =    29.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  24.0 INCH PIPE IS   4.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  20.35
 GIVEN PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       7.35
 PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    8.22
 LONGEST FLOWPATH FROM NODE    101.00 TO NODE    160.00 =    1009.00 FEET.

************************************************************************
 FLOW PROCESS FROM NODE    160.00 TO NODE    190.00 IS CODE =  51
------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
========================================================================
```

```
 ELEVATION DATA: UPSTREAM(FEET) =     12.30  DOWNSTREAM(FEET) =     12.16
 CHANNEL LENGTH THRU SUBAREA(FEET) =    25.00   CHANNEL SLOPE =  0.0056
 CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.984
 COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8791
 SOIL CLASSIFICATION IS "C"
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.44
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.43
 AVERAGE FLOW DEPTH(FEET) =   0.83   TRAVEL TIME(MIN.) =   0.17
 Tc(MIN.) =    8.39
 SUBAREA AREA(ACRES) =     0.10       SUBAREA RUNOFF(CFS) =    0.17
 TOTAL AREA(ACRES) =        4.8         PEAK FLOW RATE(CFS) =       7.52

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.84   FLOW VELOCITY(FEET/SEC.) =   2.45
 LONGEST FLOWPATH FROM NODE    101.00 TO NODE    190.00 =    1034.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    190.00 TO NODE    190.00 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        7.52     8.39       1.984        4.80
 LONGEST FLOWPATH FROM NODE    101.00 TO NODE    190.00 =    1034.00 FEET.

 ** MEMORY BANK #  1 CONFLUENCE DATA **
 STREAM     RUNOFF      Tc      INTENSITY     AREA
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1        9.58    15.03       1.512        7.60
 LONGEST FLOWPATH FROM NODE      0.00 TO NODE    190.00 =    1140.00 FEET.

****************************WARNING*********************************
 IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
 ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
 WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
********************************************************************

 ** PEAK FLOW RATE TABLE **
 STREAM    RUNOFF       Tc      INTENSITY
 NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1      12.87       8.39        1.984
     2      15.32      15.03        1.512

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      15.32   Tc(MIN.) =   15.03
```

```
  TOTAL AREA(ACRES) =       12.4

****************************************************************************
  FLOW PROCESS FROM NODE    190.00 TO NODE    190.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       12.4  TC(MIN.) =     15.03
  PEAK FLOW RATE(CFS)   =      15.32
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
       RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                  (RCFC&WCD)  1978 HYDROLOGY MANUAL
        (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                  (Rational Tabling Version 23.0)
              Release Date: 07/01/2016  License ID 1717

                         Analysis prepared by:

                         SDH & ASSOCIATES, INC.
                          27363 VIA INDUSTRIA
                           TEMECULA, CA 92590
                             (951) 683-3691

 ************************* DESCRIPTION OF STUDY *************************
* BRIDGE-PATTERSON (JN 2121)                                             *
* POST-PROJECT - ON-SITE & OFFSITE - 100-YEAR, 1-HOUR STORM EVENT        *
* BASIN 100                                                              *
 **************************************************************************

  FILE NAME: BP1HP00.RAT
  TIME/DATE OF STUDY: 16:58 08/24/2022
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  1.810
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.786
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.140
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.370
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.4655341
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.4629036
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.370
  SLOPE OF INTENSITY DURATION CURVE = 0.4629
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *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   20.0     15.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0160

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
```

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

****************************************************************************
  FLOW PROCESS FROM NODE   1010.00 TO NODE   1010.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  12.20   RAIN INTENSITY(INCH/HOUR) =  2.86
  TOTAL AREA(ACRES) =     6.50   TOTAL RUNOFF(CFS) =     15.00

****************************************************************************
  FLOW PROCESS FROM NODE   1010.00 TO NODE   1035.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    15.80  DOWNSTREAM(FEET) =    15.50
  FLOW LENGTH(FEET) =     4.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   9.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.78
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      15.00
  PIPE TRAVEL TIME(MIN.) =   0.00    Tc(MIN.) =   12.20
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   1035.00 =       4.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1035.00 TO NODE   1035.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   12.20
  RAINFALL INTENSITY(INCH/HR) =   2.86
  TOTAL STREAM AREA(ACRES) =     6.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     15.00

****************************************************************************
  FLOW PROCESS FROM NODE   1020.00 TO NODE   1020.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  11.70   RAIN INTENSITY(INCH/HOUR) =  2.92
  TOTAL AREA(ACRES) =     1.00   TOTAL RUNOFF(CFS) =      2.40
```

```
****************************************************************************
  FLOW PROCESS FROM NODE   1020.00 TO NODE   1035.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    18.30  DOWNSTREAM(FEET) =    15.50
  FLOW LENGTH(FEET) =   250.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.19
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.40
  PIPE TRAVEL TIME(MIN.) =   0.80    Tc(MIN.) =   12.50
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   1035.00 =     250.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1035.00 TO NODE   1035.00 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.) =   12.50
  RAINFALL INTENSITY(INCH/HR) =   2.83
  TOTAL STREAM AREA(ACRES) =     1.00
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.40

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       15.00    12.20        2.863          6.50
      2        2.40    12.50        2.832          1.00

 **********************************WARNING***********************************
  IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
  ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
  WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ****************************************************************************

  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       17.34    12.20       2.863
      2       17.23    12.50       2.832
```

```
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      17.34   Tc(MIN.) =   12.20
  TOTAL AREA(ACRES) =        7.5
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   1035.00 =     250.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1035.00 TO NODE   1040.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    15.50  DOWNSTREAM(FEET) =    13.96
  FLOW LENGTH(FEET) =   256.00   MANNING'S N =  0.012
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.40
  (PIPE FLOW VELOCITY CORRESPONDING TO NORMAL-DEPTH FLOW
   AT DEPTH = 0.82 * DIAMETER)
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      17.34
  PIPE TRAVEL TIME(MIN.) =   0.79    Tc(MIN.) =   12.99
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   1040.00 =     506.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1040.00 TO NODE   1040.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   12.99
  RAINFALL INTENSITY(INCH/HR) =   2.78
  TOTAL STREAM AREA(ACRES) =     7.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     17.34

****************************************************************************
  FLOW PROCESS FROM NODE   1026.00 TO NODE   1030.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS SINGLE FAMILY(1/2 ACRE)
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    72.00
  UPSTREAM ELEVATION(FEET) =     32.80
  DOWNSTREAM ELEVATION(FEET) =     29.60
  ELEVATION DIFFERENCE(FEET) =      3.20
  TC = 0.422*[(   72.00**3)/(     3.20)]**.2 =    4.353
  COMPUTED TIME OF CONCENTRATION INCREASED TO 5 MIN.
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.328
  SINGLE-FAMILY(1/2 ACRE LOT) RUNOFF COEFFICIENT = .8343
```

```
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.36
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.36

****************************************************************************
  FLOW PROCESS FROM NODE   1030.00 TO NODE   1040.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    24.60  DOWNSTREAM(FEET) =    13.96
  FLOW LENGTH(FEET) =     4.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   0.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  20.81
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.36
  PIPE TRAVEL TIME(MIN.) =   0.00    Tc(MIN.) =    5.00
  LONGEST FLOWPATH FROM NODE   1026.00 TO NODE   1040.00 =      76.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1040.00 TO NODE   1040.00 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.) =    5.00
  RAINFALL INTENSITY(INCH/HR) =   4.33
  TOTAL STREAM AREA(ACRES) =     0.10
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.36

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       17.34    12.99        2.781          7.50
      2        0.36     5.00        4.327          0.10

 ********************************WARNING*********************************
  IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
  ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
  WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ************************************************************************

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

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

```
      1        7.04     5.00       4.327
      2       17.57    12.99       2.781

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      17.57   Tc(MIN.) =   12.99
  TOTAL AREA(ACRES) =        7.6
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   1040.00 =     506.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1040.00 TO NODE   1050.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    13.96  DOWNSTREAM(FEET) =    10.30
  FLOW LENGTH(FEET) =   608.00   MANNING'S N =  0.012
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.40
  (PIPE FLOW VELOCITY CORRESPONDING TO NORMAL-DEPTH FLOW
   AT DEPTH = 0.82 * DIAMETER)
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      17.57
  PIPE TRAVEL TIME(MIN.) =   1.88    Tc(MIN.) =   14.87
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   1050.00 =    1114.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1050.00 TO NODE    190.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     12.30  DOWNSTREAM(FEET) =     12.26
  CHANNEL LENGTH THRU SUBAREA(FEET) =    26.00   CHANNEL SLOPE =  0.0015
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =      17.57
  FLOW VELOCITY(FEET/SEC.) =   3.17   FLOW DEPTH(FEET) =   1.24
  TRAVEL TIME(MIN.) =   0.14   Tc(MIN.) =   15.01
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE    190.00 =    1140.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    190.00 TO NODE    190.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    105.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   345.00
  UPSTREAM ELEVATION(FEET) =     17.70
  DOWNSTREAM ELEVATION(FEET) =     14.20
  ELEVATION DIFFERENCE(FEET) =      3.50
  TC = 0.303*[(  345.00**3)/(     3.50)]**.2 =    7.861
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.510
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8869
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      3.11
  TOTAL AREA(ACRES) =      1.00   TOTAL RUNOFF(CFS) =      3.11

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.510
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8869
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    0.50   SUBAREA RUNOFF(CFS) =    1.56
  TOTAL AREA(ACRES) =        1.5   TOTAL RUNOFF(CFS) =       4.67
  TC(MIN.) =    7.86

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    125.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    12.20  DOWNSTREAM(FEET) =    11.00
  FLOW LENGTH(FEET) =    55.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   8.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.74
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.67
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =    7.98
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    125.00 =     400.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    125.00 TO NODE    125.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.98
```

```
  RAINFALL INTENSITY(INCH/HR) =   3.49
  TOTAL STREAM AREA(ACRES) =     1.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.67

****************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    115.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   273.00
  UPSTREAM ELEVATION(FEET) =     18.70
  DOWNSTREAM ELEVATION(FEET) =     14.05
  ELEVATION DIFFERENCE(FEET) =      4.65
  TC = 0.303*[(  273.00**3)/(     4.65)]**.2 =    6.453
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.846
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8879
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      1.71
  TOTAL AREA(ACRES) =      0.50   TOTAL RUNOFF(CFS) =      1.71

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    115.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.846
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8879
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    0.90   SUBAREA RUNOFF(CFS) =    3.07
  TOTAL AREA(ACRES) =        1.4   TOTAL RUNOFF(CFS) =       4.78
  TC(MIN.) =    6.45

****************************************************************************
  FLOW PROCESS FROM NODE    115.00 TO NODE    125.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    11.55  DOWNSTREAM(FEET) =    11.00
  FLOW LENGTH(FEET) =     6.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.58
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.78
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =    6.46
  LONGEST FLOWPATH FROM NODE    111.00 TO NODE    125.00 =     279.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    125.00 TO NODE    125.00 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.) =    6.46
  RAINFALL INTENSITY(INCH/HR) =   3.84
  TOTAL STREAM AREA(ACRES) =     1.40
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.78

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        4.67     7.98        3.486          1.50
      2        4.78     6.46        3.844          1.40

 ********************************WARNING*********************************
  IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
  ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
  WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ************************************************************************

  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        8.56     6.46       3.844
      2        9.00     7.98       3.486

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       8.56   Tc(MIN.) =    6.46
  TOTAL AREA(ACRES) =        2.9
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    125.00 =     400.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    125.00 TO NODE    150.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    11.00  DOWNSTREAM(FEET) =     6.00
  FLOW LENGTH(FEET) =   580.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  10.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.47
  GIVEN PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
```

```
  PIPE-FLOW(CFS) =       8.56
  PIPE TRAVEL TIME(MIN.) =   1.49    Tc(MIN.) =    7.95
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    150.00 =     980.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    137.00 TO NODE    150.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.491
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8868
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    0.60   SUBAREA RUNOFF(CFS) =    1.86
  TOTAL AREA(ACRES) =        3.5   TOTAL RUNOFF(CFS) =      10.42
  TC(MIN.) =    7.95

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    150.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    131.00 TO NODE    135.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   400.00
  UPSTREAM ELEVATION(FEET) =     16.50
  DOWNSTREAM ELEVATION(FEET) =     13.70
  ELEVATION DIFFERENCE(FEET) =      2.80
  TC = 0.303*[(  400.00**3)/(     2.80)]**.2 =    8.982
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.300
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8862
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.88
  TOTAL AREA(ACRES) =      0.30   TOTAL RUNOFF(CFS) =      0.88

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    135.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.300
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8862
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    0.40   SUBAREA RUNOFF(CFS) =    1.17
```

```
  TOTAL AREA(ACRES) =        0.7   TOTAL RUNOFF(CFS) =       2.05
  TC(MIN.) =    8.98

****************************************************************************
  FLOW PROCESS FROM NODE    135.00 TO NODE    140.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     13.20  DOWNSTREAM(FEET) =     12.47
  CHANNEL LENGTH THRU SUBAREA(FEET) =   140.00   CHANNEL SLOPE =  0.0052
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.088
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8854
  SOIL CLASSIFICATION IS "C"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.18
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.69
  AVERAGE FLOW DEPTH(FEET) =   0.45   TRAVEL TIME(MIN.) =   1.38
  Tc(MIN.) =   10.37
  SUBAREA AREA(ACRES) =     0.10       SUBAREA RUNOFF(CFS) =    0.27
  TOTAL AREA(ACRES) =        0.8         PEAK FLOW RATE(CFS) =       2.32

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.46   FLOW VELOCITY(FEET/SEC.) =   1.72
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    140.00 =     540.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    140.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.088
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8854
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    0.10   SUBAREA RUNOFF(CFS) =    0.27
  TOTAL AREA(ACRES) =        0.9   TOTAL RUNOFF(CFS) =       2.59
  TC(MIN.) =   10.37

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    145.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     12.70  DOWNSTREAM(FEET) =     12.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   100.00   CHANNEL SLOPE =  0.0040
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       2.59
```

```
  FLOW VELOCITY(FEET/SEC.) =   1.60   FLOW DEPTH(FEET) =   0.53
  TRAVEL TIME(MIN.) =   1.04   Tc(MIN.) =   11.41
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    145.00 =     640.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    145.00 TO NODE    145.00 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.) =   11.41
  RAINFALL INTENSITY(INCH/HR) =   2.95
  TOTAL STREAM AREA(ACRES) =     0.90
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.59

****************************************************************************
  FLOW PROCESS FROM NODE    136.00 TO NODE    145.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   140.00
  UPSTREAM ELEVATION(FEET) =     14.50
  DOWNSTREAM ELEVATION(FEET) =     12.45
  ELEVATION DIFFERENCE(FEET) =      2.05
  TC = 0.303*[(  140.00**3)/(     2.05)]**.2 =    5.092
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.291
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8890
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      1.14
  TOTAL AREA(ACRES) =      0.30   TOTAL RUNOFF(CFS) =      1.14

****************************************************************************
  FLOW PROCESS FROM NODE    145.00 TO NODE    145.00 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.) =    5.09
  RAINFALL INTENSITY(INCH/HR) =   4.29
  TOTAL STREAM AREA(ACRES) =     0.30
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.14

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

```
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1        2.59    11.41        2.955          0.90
     2        1.14     5.09        4.291          0.30

 ********************************WARNING*************************************
  IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
  ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
  WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ****************************************************************************

  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        2.30     5.09       4.291
      2        3.38    11.41       2.955

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       3.38   Tc(MIN.) =   11.41
  TOTAL AREA(ACRES) =        1.2
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    145.00 =     640.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    145.00 TO NODE    150.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     9.30  DOWNSTREAM(FEET) =     6.00
  FLOW LENGTH(FEET) =     7.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  21.26
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.38
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =   11.41
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    150.00 =     647.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    150.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        3.38    11.41       2.954        1.20
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    150.00 =     647.00 FEET.
```

```
  ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM     RUNOFF       Tc       INTENSITY     AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)   (ACRE)
      1       10.42      7.95        3.491        3.50
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    150.00 =     980.00 FEET.

 ****************************WARNING*********************************
  IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
  ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
  WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ********************************************************************

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc       INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      12.78       7.95        3.491
      2      12.20      11.41        2.954

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      12.78   Tc(MIN.) =    7.95
  TOTAL AREA(ACRES) =        4.7

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    150.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    160.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     9.95  DOWNSTREAM(FEET) =     3.00
  FLOW LENGTH(FEET) =    29.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  24.0 INCH PIPE IS   5.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  23.95
  GIVEN PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.78
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    7.97
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    160.00 =    1009.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    190.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
```

```
 ELEVATION DATA: UPSTREAM(FEET) =     12.30  DOWNSTREAM(FEET) =     12.16
 CHANNEL LENGTH THRU SUBAREA(FEET) =    25.00   CHANNEL SLOPE =  0.0056
 CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.457
 COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8867
 SOIL CLASSIFICATION IS "C"
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      12.93
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.82
 AVERAGE FLOW DEPTH(FEET) =   1.09   TRAVEL TIME(MIN.) =   0.15
 Tc(MIN.) =    8.12
 SUBAREA AREA(ACRES) =     0.10       SUBAREA RUNOFF(CFS) =    0.31
 TOTAL AREA(ACRES) =        4.8         PEAK FLOW RATE(CFS) =      13.08

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  1.10   FLOW VELOCITY(FEET/SEC.) =   2.83
 LONGEST FLOWPATH FROM NODE    101.00 TO NODE    190.00 =    1034.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    190.00 TO NODE    190.00 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       13.08     8.12       3.457        4.80
 LONGEST FLOWPATH FROM NODE    101.00 TO NODE    190.00 =    1034.00 FEET.

 ** MEMORY BANK #  1 CONFLUENCE DATA **
 STREAM     RUNOFF      Tc      INTENSITY     AREA
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1       17.57    15.01       2.602        7.60
 LONGEST FLOWPATH FROM NODE      0.00 TO NODE    190.00 =    1140.00 FEET.

****************************WARNING*********************************
 IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
 ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
 WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
********************************************************************

 ** PEAK FLOW RATE TABLE **
 STREAM    RUNOFF       Tc      INTENSITY
 NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1      22.59       8.12        3.457
     2      27.42      15.01        2.602

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      27.42   Tc(MIN.) =   15.01
```

```
  TOTAL AREA(ACRES) =       12.4

****************************************************************************
  FLOW PROCESS FROM NODE    190.00 TO NODE    190.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       12.4  TC(MIN.) =     15.01
  PEAK FLOW RATE(CFS)   =      27.42
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
       RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                  (RCFC&WCD)  1978 HYDROLOGY MANUAL
        (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                  (Rational Tabling Version 23.0)
              Release Date: 07/01/2016  License ID 1717

                        Analysis prepared by:

                        SDH & ASSOCIATES, INC.
                         27363 VIA INDUSTRIA
                          TEMECULA, CA 92590
                            (951) 683-3691

 ************************* DESCRIPTION OF STUDY *************************
* BRIDGE-PATTERSON (JN 2121)                                             *
* POST-PROJECT - ON-SITE - 10-YEAR, 1-HOUR STORM EVENT                   *
* BASIN 200                                                              *
 **************************************************************************

  FILE NAME: BP2HP10.RAT
  TIME/DATE OF STUDY: 18:02 08/23/2022
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  1.810
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.786
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.140
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.370
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.4655341
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.4629036
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =   10.00   1-HOUR INTENSITY(INCH/HOUR) =   0.794
  SLOPE OF INTENSITY DURATION CURVE = 0.4655
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *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   20.0     15.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0160

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
```

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

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    290.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   420.00
  UPSTREAM ELEVATION(FEET) =     22.60
  DOWNSTREAM ELEVATION(FEET) =     18.00
  ELEVATION DIFFERENCE(FEET) =      4.60
  TC = 0.303*[(  420.00**3)/(     4.60)]**.2 =    8.375
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.985
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8791
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.35
  TOTAL AREA(ACRES) =      0.20   TOTAL RUNOFF(CFS) =      0.35
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.2  TC(MIN.) =      8.37
  PEAK FLOW RATE(CFS)   =       0.35
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
       RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                  (RCFC&WCD)  1978 HYDROLOGY MANUAL
        (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                  (Rational Tabling Version 23.0)
              Release Date: 07/01/2016  License ID 1717

                         Analysis prepared by:

                         SDH & ASSOCIATES, INC.
                          27363 VIA INDUSTRIA
                           TEMECULA, CA 92590
                             (951) 683-3691

 ************************* DESCRIPTION OF STUDY *************************
* BRIDGE-PATTERSON (JN 2121)                                             *
* POST-PROJECT - ON-SITE - 100-YEAR, 1-HOUR STORM EVENT                  *
* BASIN 200                                                              *
 **************************************************************************

  FILE NAME: BP2HP00.RAT
  TIME/DATE OF STUDY: 18:01 08/23/2022
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  1.810
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.786
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.140
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.370
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.4655341
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.4629036
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.370
  SLOPE OF INTENSITY DURATION CURVE = 0.4629
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *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   20.0     15.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0160

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
```

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

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    290.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   420.00
  UPSTREAM ELEVATION(FEET) =     22.60
  DOWNSTREAM ELEVATION(FEET) =     18.00
  ELEVATION DIFFERENCE(FEET) =      4.60
  TC = 0.303*[(  420.00**3)/(     4.60)]**.2 =    8.375
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.409
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8865
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.60
  TOTAL AREA(ACRES) =      0.20   TOTAL RUNOFF(CFS) =      0.60
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.2  TC(MIN.) =      8.37
  PEAK FLOW RATE(CFS)   =       0.60
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

Appendix C

Inlet Sizing

Note: Detailed onsite inlet calculations will be conducted during final engineering at the time of the final drainage study and will be incorporated in this Appendix.

Appendix D

Preliminary Storm Drain / Ditch Sizing

Includes:

1. On-site preliminary storm drain sizing
2. Offsite Perimeter V-ditch Sizing
3. Offsite Run-on Bypass Perimeter Storm Drain Sizing
4. Patterson Avenue drainage crossing concept – preliminary sizing

Bridge-Patterson
Job # 2121
Revised: 8/23/2022

Preliminary On-site Storm Drain Sizes

The purpose of this table is to provide an estimated preliminary pipe sizes to convey the anticipated 10-year peak flow rates with a preliminary sizing bump-up factor to account for potential head losses through the pipe.

Manning's n: 0.012 HDPE or equivalent

Preliminary Sizing Bump-up (%): 30

			Preliminary Sizes per Varying Slopes						
		Slope at:	0.2%		0.5%		1.0%		
Node ID's:	**Q_{10} (cfs[1])**	**Q_{100} with Sizing Factor (cfs[1])**	**Minimum Pipe Size[2] (feet)**	**Suggested Pipe Size (inches)**	**Minimum Pipe Size[2] (feet)**	**Suggested Pipe Size (inches)**	**Minimum Pipe Size [2] (feet)**	**Suggested Pipe Size (inches)**	**PRELIMINARY RECOMMENDATIONS[3]**
105 - 125	2.7	3.5	1.30	18"	1.10	18"	0.96	12"	**Use 12" HDPE @ 1.0% MIN.**
115 - 125	2.8	3.6	1.32	18"	1.11	18"	0.98	12"	**Use 12" HDPEs @ 1.0% MIN.**
125 - 150	5.0	6.5	1.64	24"	1.38	18"	1.21	18"	**Use 18" HDPEs @ 0.5% MIN.**
145 - 150	1.9	2.5	1.14	18"	0.96	12"	0.85	12"	**Use 18" HDPE @ 0.5% MIN.**
150 - 160	7.4	9.6	1.90	24"	1.60	24"	1.41	18"	**Use 18" HDPE @ 1.0% MIN.**

Channel Report

SUPPORTING CAPACITY CHECK FOR PERIMETER V-DITCH
(FOR OFFSITE FLOW COLLECTION/CONVEYANCE)

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Aug 25 2022

NODE 1010 - WESTERLY PERIMETER DITCH FOR OFFSITE FLOW (MIN. S=2.0%)

Triangular

Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 1.25
Invert Elev (ft)	= 100.00
Slope (%)	= 1.00
N-Value	= 0.018

Calculations

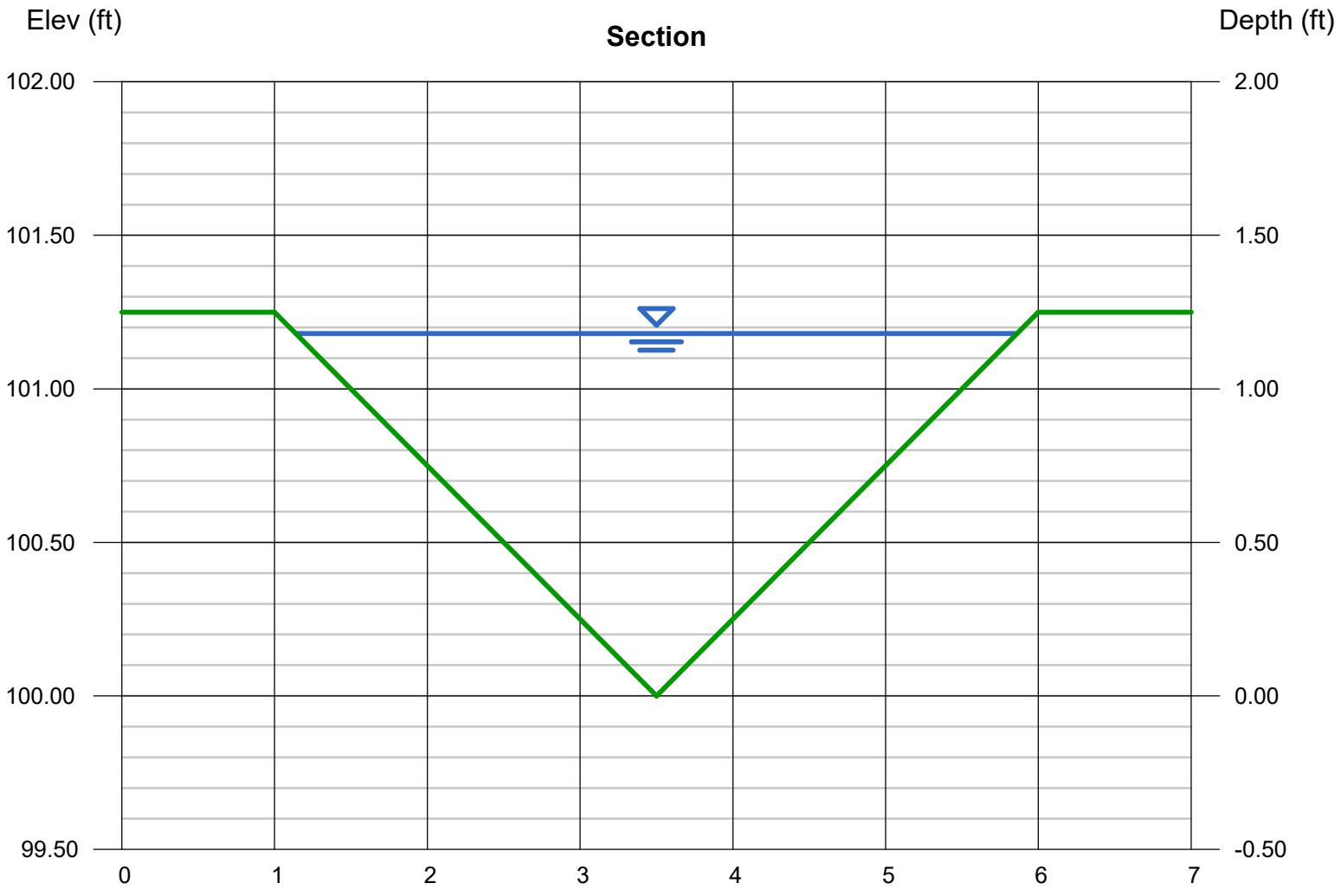
Compute by:	Known Q
Known Q (cfs)	= 15.00

Q100

Highlighted

Depth (ft)	= 1.18
Q (cfs)	= 15.00
Area (sqft)	= 2.78
Velocity (ft/s)	= 5.39
Wetted Perim (ft)	= 5.28
Crit Depth, Yc (ft)	= 1.25
Top Width (ft)	= 4.72
EGL (ft)	= 1.63

CONTAINED WITHIN THE V-DTICH. OK.



Channel Report

SUPPORTING CAPACITY CHECK FOR PERIMETER V-DITCH (FOR OFFSITE FLOW COLLECTION/CONVEYANCE)

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Aug 25 2022

NODE 1020 - NORTHWESTERLY PERIMETER DITCH FOR OFFSITE FLOW (MIN. S=1.5%)

Triangular

Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 100.00
Slope (%)	= 1.50
N-Value	= 0.018

Calculations

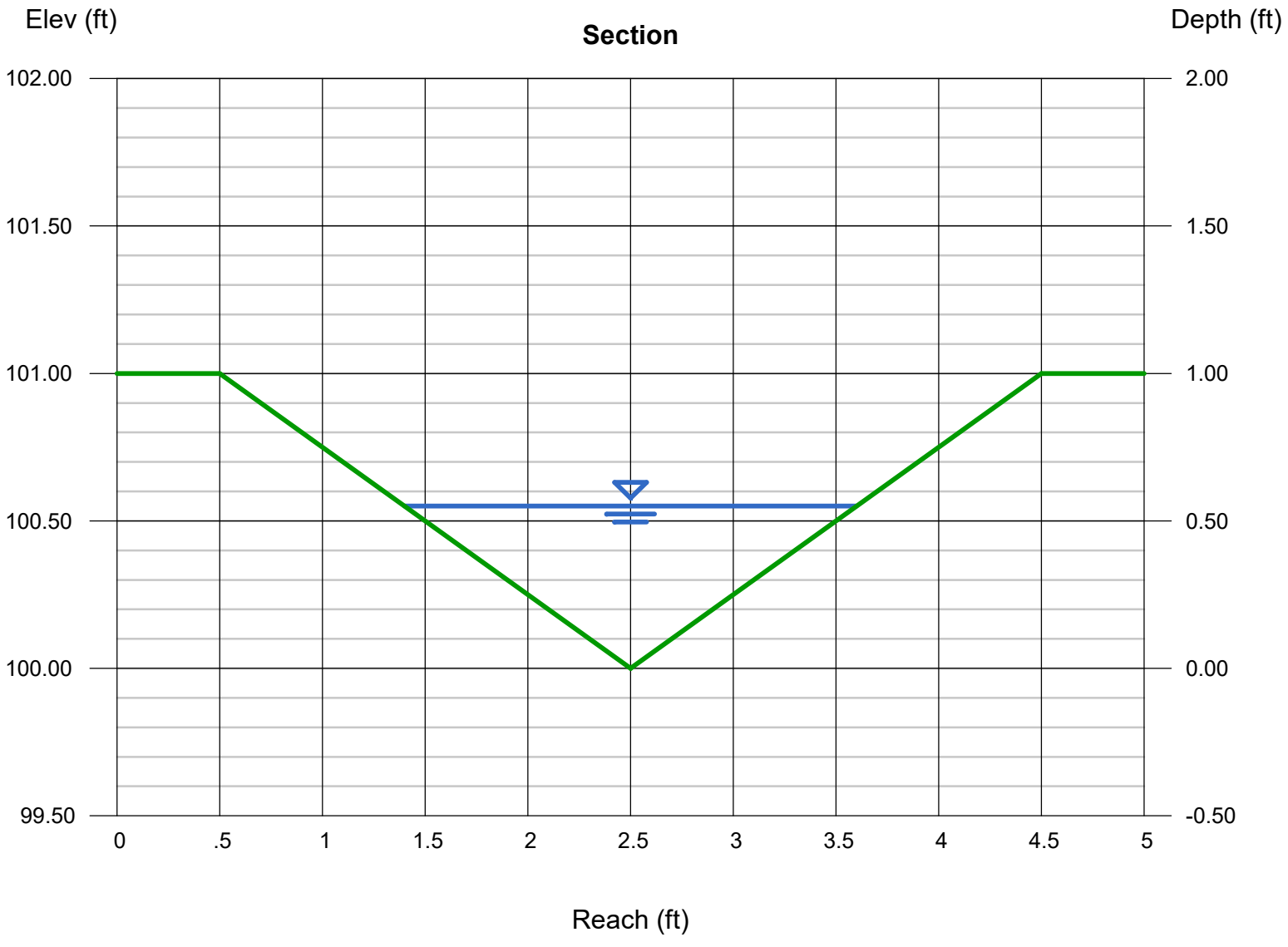
Compute by:	Known Q
Known Q (cfs)	= 2.40

Q100

Highlighted

Depth (ft)	= 0.55
Q (cfs)	= 2.400
Area (sqft)	= 0.60
Velocity (ft/s)	= 3.97
Wetted Perim (ft)	= 2.46
Crit Depth, Yc (ft)	= 0.62
Top Width (ft)	= 2.20
EGL (ft)	= 0.79

CONTAINED WITHIN THE V-DTICH. OK.



Channel Report

SUPPORTING CAPACITY CHECK FOR PERIMETER V-DITCH (FOR OFFSITE FLOW COLLECTION/CONVEYANCE)

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Aug 25 2022

NODE 1030 - WESTERLY PERIMETER DITCH FOR OFFSITE FLOW (MIN. S=1.0%)

Triangular

Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 100.00
Slope (%)	= 1.00
N-Value	= 0.018

Calculations

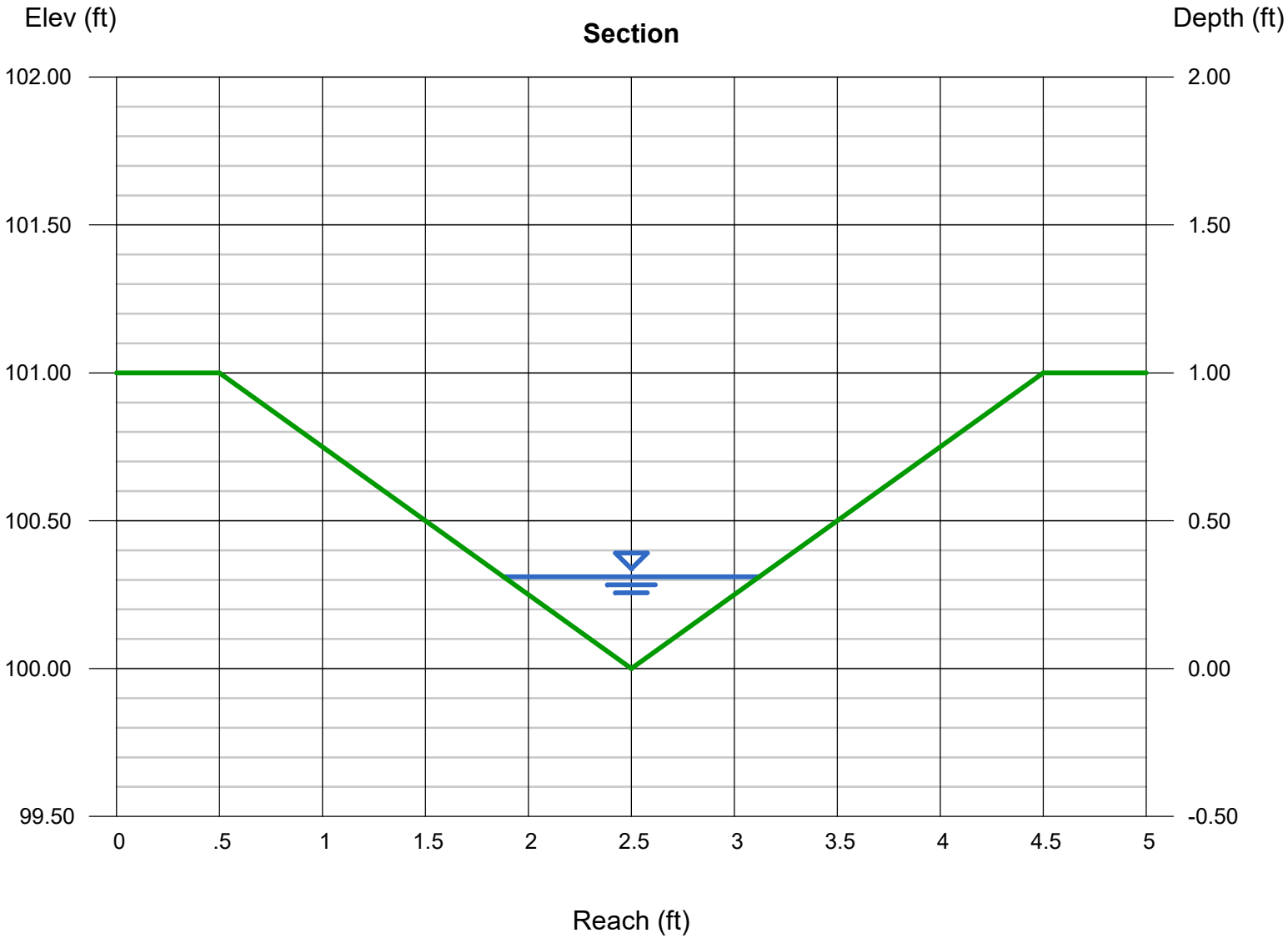
Compute by:	Known Q
Known Q (cfs)	= 0.40

Q100

Highlighted

Depth (ft)	= 0.31
Q (cfs)	= 0.400
Area (sqft)	= 0.19
Velocity (ft/s)	= 2.08
Wetted Perim (ft)	= 1.39
Crit Depth, Yc (ft)	= 0.31
Top Width (ft)	= 1.24
EGL (ft)	= 0.38

CONTAINED WITHIN THE V-DTICH. OK.



Bridge-Patterson
Job # 2121
Revised: 8/23/2022

Preliminary Perimeter Storm Drain Sizes for Conveying Offsite Flows

The purpose of this table is to provide an estimated preliminary pipe sizes to convey the anticipated 10-year peakoffsite flow rates with a preliminary sizing bump-up factor to account for potential head losses through the pipe.

Manning's n: 0.012 HDPE or equivalent

Preliminary Sizing Bump-up (%): 30

			Preliminary Sizes per Varying Slopes						
		Slope at:	0.2%		0.5%		1.0%		
Node ID's:	**Q_{10} (cfs[1])**	**Q_{100} with Sizing Factor (cfs[1])**	**Minimum Pipe Size[2] (feet)**	**Suggested Pipe Size (inches)**	**Minimum Pipe Size[2] (feet)**	**Suggested Pipe Size (inches)**	**Minimum Pipe Size [2] (feet)**	**Suggested Pipe Size (inches)**	**PRELIMINARY RECOMMENDATIONS[3]**
1010 - 1035	8.2	10.7	1.98	24"	1.67	24"	1.46	18"	**Use 18" HDPE @ 0.5% MIN.**
1020 - 1035	1.3	1.7	0.99	12"	0.83	10"	0.73	10"	**Use 12" HDPEs @ 0.5% MIN.**
1035 - 1040	9.5	12.4	2.09	30"	1.76	24"	1.55	24"	**Use 18" HDPEs @ 0.5% MIN.**
1030 - 1040	0.2	0.3	0.49	6"	0.41	6"	0.36	6"	**Use 12" HDPE @ 0.5% MIN.**
1040 - 1050	9.6	12.5	2.10	30"	1.77	24"	1.55	24"	**Use 18" HDPE @ 0.5% MIN.**

Channel Report

SUPPORTING STREET CAPACITY CHECK CALCULATION
(ALONG PATTERSON AVENUE - OUTLET FROM BASIN 100

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Aug 25 2022

Patterson Avenue - Street/Gutter Capacity Check (Normal Depth)

DEPTH=~6" < 9". OK.

Gutter

Cross Sl, Sx (ft/ft)	= 0.020
Cross Sl, Sw (ft/ft)	= 0.020
Gutter Width (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 1.00
N-Value	= 0.016

Highlighted

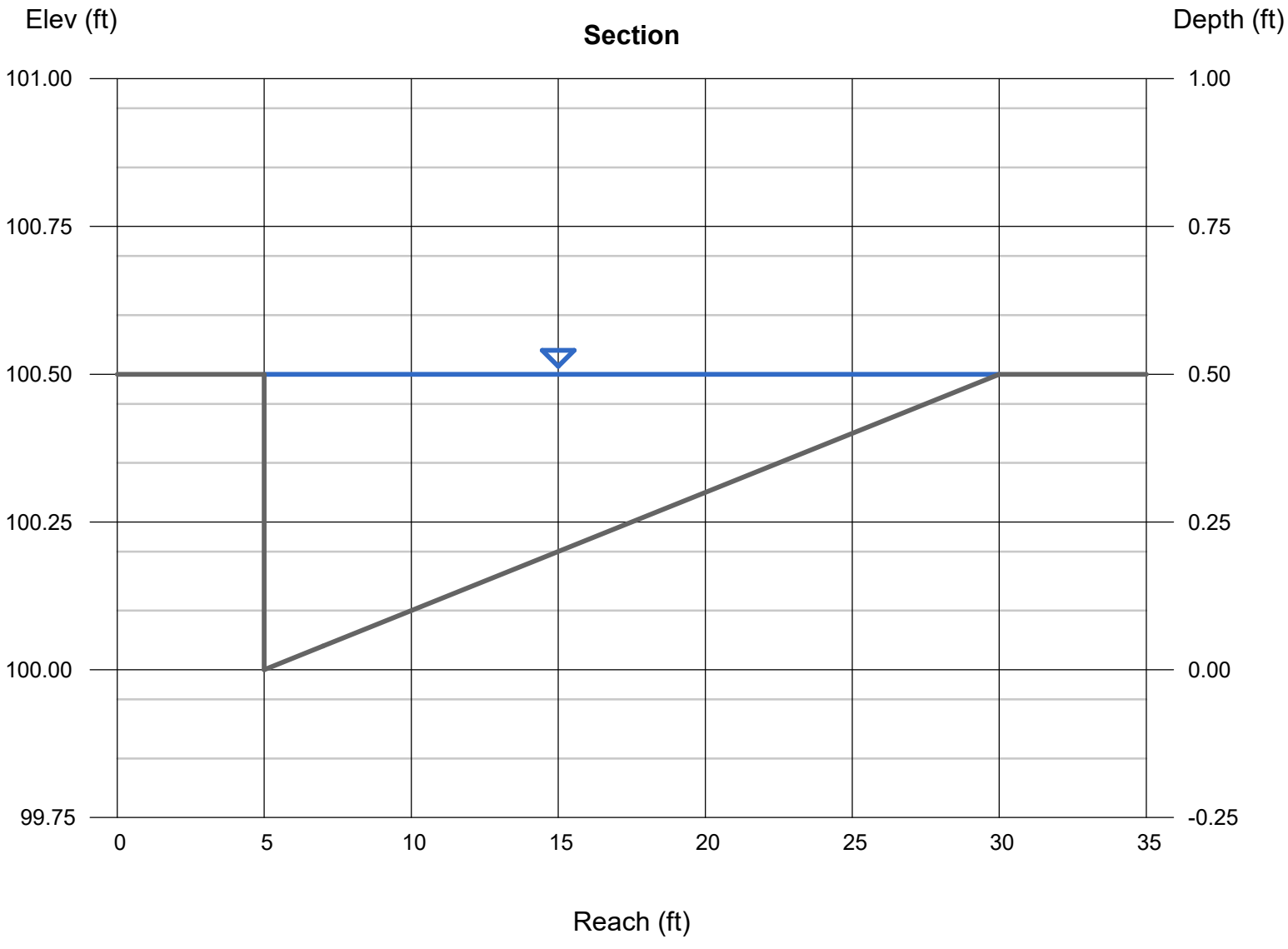
Depth (ft)	= 0.50
Q (cfs)	= 27.40
Area (sqft)	= 6.25
Velocity (ft/s)	= 4.38
Wetted Perim (ft)	= 25.50
Crit Depth, Yc (ft)	= 0.60
Spread Width (ft)	= 25.00
EGL (ft)	= 0.80

Calculations

Q100 FROM BASIN 100

Compute by:	Known Q
Known Q (cfs)	= 27.40

NOTE: THE OVERALL UN-DETAINED Q100 FROM BASIN 100 IS APPROXIMATEY 27.4 CFS; HOWEVER, IN REALITY, WITH INCIDENTAL ATTENUATION FOR LARGER STORM AND CONROLLED/PUMPED FLOW TO THE OUTLET LOCATION, THE ANTICIPATED Q100 MAY BE LESS THAN 27.4 CFS.



Channel Report

SUPPORTING MATERIAL - PATTERSON AVENUE - PRELIMINARY CULVERT SIZING
(w/ 50% BULKING INCORPORATED FOR THE OFFSITE FLOW PORTION)

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, May 3 2023

Patterson Avenue - Prelim. Culvert Sizing (w/ 50% Bulking for Offsite Flow Portion)

Rectangular

Bottom Width (ft)	= 6.00
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.50
N-Value	= 0.013

PER DISCUSSION WITH COUNTY TRANSPORTATION & FLOOD CONTROL ON 4/26/23, A SHALLOW CULVERT CROSSING (THAT IS TO BE STRUCTURALLY DESIGNED) WILL BE USED.

Calculations

Compute by:	Known Q
Known Q (cfs)	= 39.50

PLEASE REFER TO THE ON-SITE DRAINAGE STUDY EXHIBIT FOR HYDROLOGY SUMMARY.

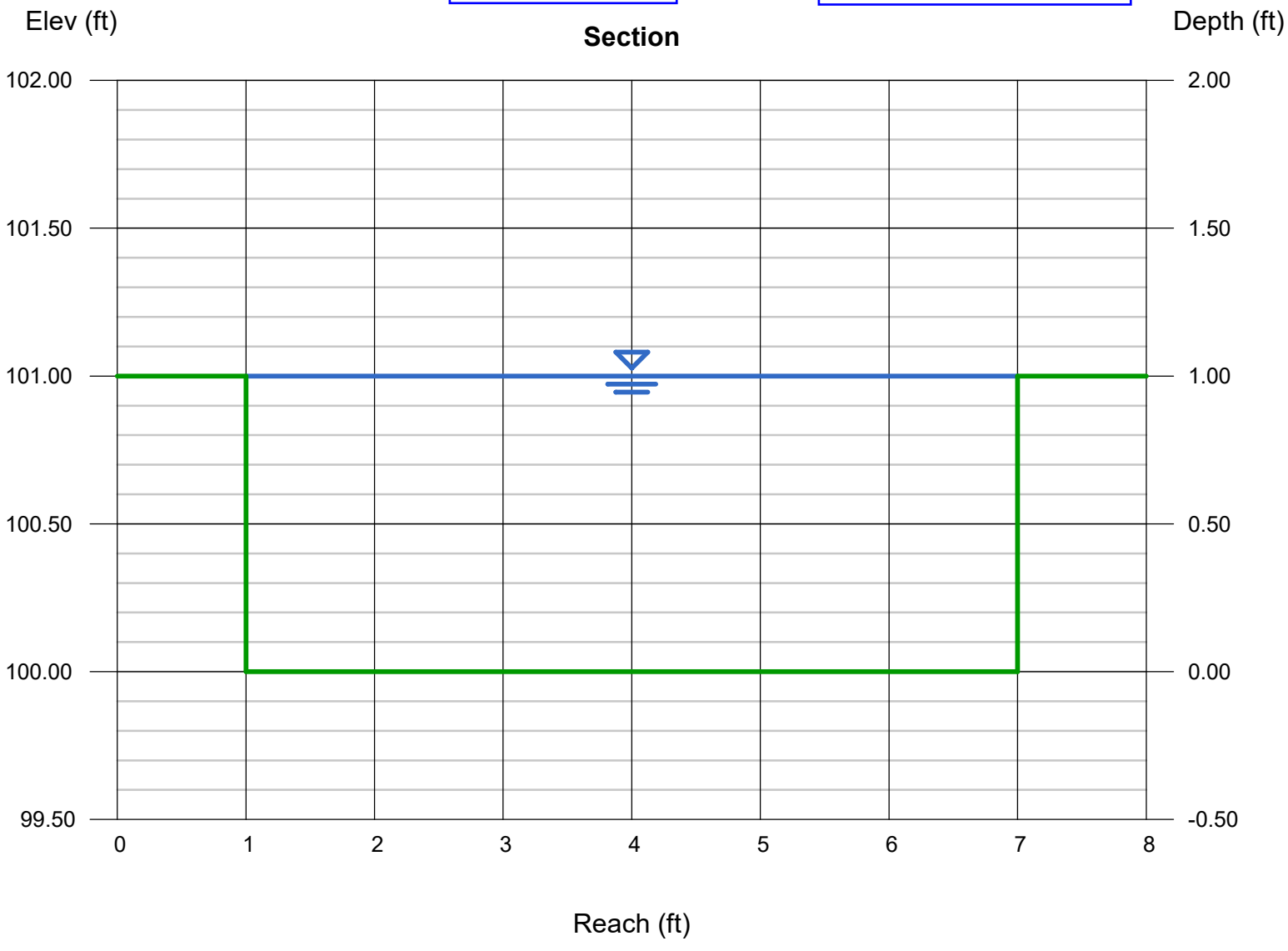
THIS INCLUDES ON-SITE FLOW (PPT220024) AND ASSOCIATED OFFSITE FLOW WITH 50% BULKING.

Highlighted

Depth (ft)	= 1.00
Q (cfs)	= 39.50
Area (sqft)	= 6.00
Velocity (ft/s)	= 6.58
Wetted Perim (ft)	= 8.00
Crit Depth, Yc (ft)	= 1.00
Top Width (ft)	= 6.00
EGL (ft)	= 1.67

RIPRAP (ENERGY DISSIPATER), EQUIVALENT TO "NO. 2 BACKING" (T=~1.0') WILL BE INCORPORATED AT THE CULVERT OUTFALL (WITHIN THE OFFSITE DEVELOPMENT AREA, PPT220026).

AT THIS TIME, IT IS ANTICIPATED THE PROPOSED CULVERT AND ASSOCIATED OUTFALL IS TO BE MAINTAINED PRIVATELY. FURTHER DETAILS TO BE PROVIDED AT THE TIME OF FINAL DESIGN.



Appendix E

Preliminary Detention Calculation

Includes:

1. HMS workmaps (pre-project and post-project)
2. NOAA Atlas 14 precipitation data
3. Proposed BMP typical section details
4. Proposed BMP rating curve information
5. HMS key volume summary / output
6. Pre-processor supporting materials (loss rate, effective rainfall, S-graph, PlateE.5-8)

BASIN 200
0.4 AC.

BASIN 200
L=280'
Lca=137'
ΔH=4.1'
n=0.02

BASIN 100
4.6 AC.

BASIN 100
L=684'
Lca=340'
ΔH=9.3'
n=0.02

℄ PATTERSON AVE.

NOTES:

1. THIS DRAINAGE STUDY MAP IS PREPARED IN SUPPORT OF THE ON-SITE PRELIMINARY HYDROLOGIC CALCULATIONS TO DETERMINE THE DELTA VOLUME FOR 10-YEAR, 24-HOUR STORM EVENT (BASED ON THE RCFC&WCD'S INCREASED RUNOFF CRITERIA). DETAILED HYDROLOGIC CALCULATIONS FOR THE REMAINING STORMS/DURATIONS (SUCH AS 2-YEAR, 5-YEAR, AND 10-YEAR STORM EVENTS FOR 1-HOUR, 3-HOUR, 6-HOUR, AND 24-HOUR DURATIONS) WILL BE CONDUCTED DURING THE FINAL ENGINEERING STAGE.
2. THE OVERALL ON-SITE DRAINAGE AREA IS APPROXIMATELY 5.0 ACRES. IN ORDER TO HAVE FAIR COMPARISON BETWEEN THE ON-SITE PRE-PROJECT AND POST-PROJECT CONDITIONS, THE OVERALL DRAINAGE AREA WAS MAINTAINED TO BE APPROXIMATELY 5.0 ACRES FOR BOTH CONDITIONS. IN THE PRE-PROJECT CONDITION, THE DRAINAGE AREA WAS SUBDIVIDED INTO 4.6 ACRES FOR BASIN 100 AND 0.4 ACRES FOR BASIN 200 WHILE HONORING THE UNDERLYING EXISTING TOPOGRAPHY TO SUBDIVIDE THE BOUNDARY. IN THE POST-PROJECT CONDITION, THE DRAINAGE AREA WAS SUBDIVIDED INTO 4.8 ACRES FOR BASIN 100 AND 0.2 ACRES FOR BASIN 200 BASED ON THE PROPOSED SITE LAYOUT BUT CLOSELY MAINTAINING THE RESPECTIVE AREA AS SIMILAR TO THE PRE-PROJECT CONDITION. THERE ARE OFFSITE RUN-ON AREAS FROM WEST AND NORTHWEST IN THE EXISTING CONDITION; HOWEVER, THE OFFSITE RUN-ON FLOWS WILL BE COLLECTED IN THE POST-PROJECT CONDITION VIA A NETWORK OF PERIMETER V-DITCHES AND CATCH BASINS AND CONVEYED/BYPASSED AROUND THE SITE VIA STORM DRAIN PIPES IN A SOUTHEASTERLY DIRECTION TO PATTERSON AVENUE TO THE SAME POINT OF INTEREST.
3. RUNOFF FROM BASIN 100 WILL BE DIRECTED IN A SOUTHEASTERLY DIRECTION TOWARDS A PROPOSED BEST MANAGEMENT PRACTICE (BMP) FOR FLOW ATTENUATION/MITIGATION AND WATER QUALITY TREATMENT PRIOR TO DISCHARGING DETAINED FLOWS AND OVERFLOW TO PATTERSON AVENUE VIA PROPOSED SIDEWALK UNDERDRAIN. RUNOFF FROM BASIN 200 ARE FROM ONLY LANDSCAPE SELF-TREATING AREA AND HAS BEEN REDUCED AS COMPARED TO THE PRE-PROJECT CONDITION DUE TO SLIGHT REDUCTION IN AREA. THEREFORE, DETENTION (MITIGATION) SHOULD NOT BE NECESSARY.
4. THE SITE IS SITUATED ON HYDROLOGIC SOIL GROUPS A AND C. FOR THE PURPOSE OF HYDROLOGIC CALCULATION SOIL GROUP C WAS USED IN THE CALCULATION.

LEGEND

- TRACT BOUNDARY
- MAJOR DRAINAGE BOUNDARY
- SUB BASIN BOUNDARY
- SURFACE FLOW PATH
- DRAINAGE ACREAGE — X.X AC.
- POINT OF INTEREST / DISCHARGE LOCATION
- CENTROID LOCATION

N

0 15 30 60 90 120
SCALE 1"=30'

PRELIMINARY HEC-HMS WORKMAP FOR BRIDGE-PATTERSON (PRE-PROJECT)

JN 2121 REVISED: 8/23/2022

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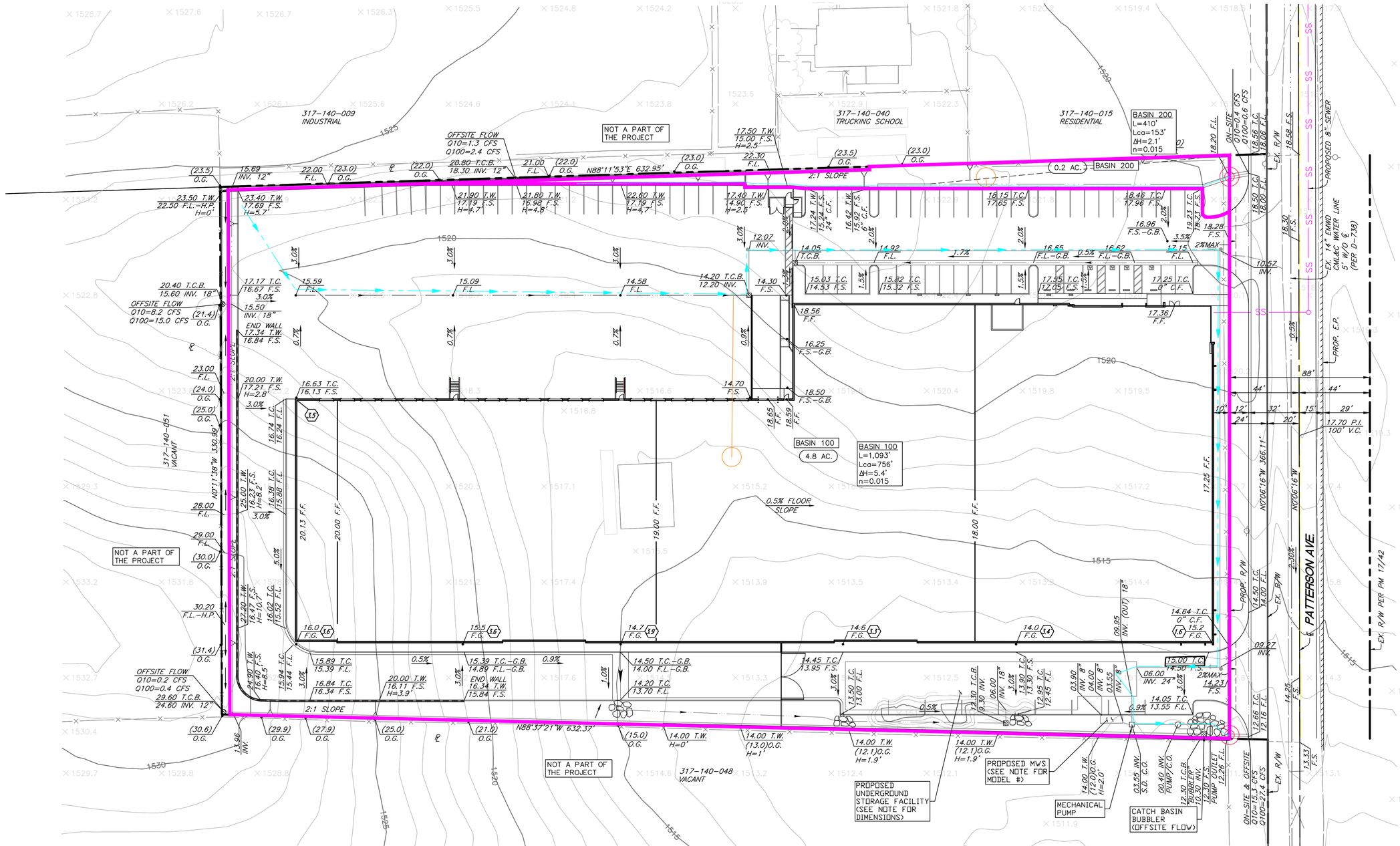

NOTES:

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- MAJOR DRAINAGE BOUNDARY
- SUB BASIN BOUNDARY
- SURFACE FLOW PATH
- DRAINAGE ACREAGE (X.X AC.)
- POINT OF INTEREST / DISCHARGE LOCATION
- CENTROID LOCATION

N

0 15 30 60 90 120

SCALE 1"=30'

PRELIMINARY HEC-HMS WORKMAP FOR BRIDGE-PATTERSON (POST-PROJECT)

JN 2121 REVISED: 8/23/2022

S:\SOH DRAWINGS\BRIDGE-PATTERSON\WR\HMS Exhibit Post.dwg 2022-08-24 - 12:00PM - SOH

NOT FOR CONSTRUCTION – EXHIBIT FOR PRELIMINARY DRAINAGE STUDY ONLY

SUPPORTING MATERIALS - NOAA ATLAS 14 PRECIPITATION 10-YEAR, 24-HOUR

NOAA Atlas 14, Volume 6, Version 2
Location name: Perris, California, USA*
Latitude: 33.8352°, Longitude: -117.2539°
Elevation: 1522.54 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.087** (0.073-0.106)	**0.122** (0.102-0.147)	**0.169** (0.141-0.205)	**0.210** (0.173-0.257)	**0.268** (0.214-0.340)	**0.315** (0.246-0.409)	**0.366** (0.278-0.486)	**0.420** (0.310-0.575)	**0.499** (0.353-0.713)	**0.563** (0.384-0.835)
10-min	**0.125** (0.105-0.151)	**0.175** (0.146-0.211)	**0.243** (0.202-0.294)	**0.301** (0.248-0.368)	**0.384** (0.306-0.487)	**0.452** (0.353-0.586)	**0.524** (0.399-0.697)	**0.603** (0.445-0.825)	**0.715** (0.505-1.02)	**0.808** (0.551-1.20)
15-min	**0.151** (0.127-0.183)	**0.211** (0.176-0.255)	**0.293** (0.244-0.356)	**0.364** (0.300-0.445)	**0.465** (0.370-0.589)	**0.547** (0.426-0.708)	**0.634** (0.482-0.843)	**0.729** (0.538-0.997)	**0.865** (0.611-1.24)	**0.977** (0.666-1.45)
30-min	**0.243** (0.203-0.294)	**0.339** (0.283-0.410)	**0.471** (0.392-0.571)	**0.584** (0.482-0.715)	**0.746** (0.594-0.945)	**0.877** (0.684-1.14)	**1.02** (0.774-1.35)	**1.17** (0.863-1.60)	**1.39** (0.981-1.98)	**1.57** (1.07-2.32)
60-min	**0.327** (0.274-0.395)	**0.456** (0.381-0.552)	**0.634** (0.528-0.769)	**0.786** (0.649-0.962)	**1.00** (0.800-1.27)	**1.18** (0.921-1.53)	**1.37** (1.04-1.82)	**1.57** (1.16-2.15)	**1.87** (1.32-2.67)	**2.11** (1.44-3.13)
2-hr	**0.492** (0.411-0.594)	**0.657** (0.548-0.794)	**0.879** (0.732-1.07)	**1.07** (0.879-1.30)	**1.33** (1.06-1.68)	**1.53** (1.20-1.99)	**1.75** (1.33-2.32)	**1.98** (1.46-2.70)	**2.29** (1.62-3.28)	**2.55** (1.74-3.78)
3-hr	**0.607** (0.508-0.734)	**0.799** (0.667-0.967)	**1.06** (0.879-1.28)	**1.27** (1.05-1.55)	**1.56** (1.25-1.98)	**1.79** (1.40-2.32)	**2.03** (1.55-2.70)	**2.28** (1.69-3.13)	**2.63** (1.86-3.76)	**2.91** (1.98-4.30)
6-hr	**0.858** (0.718-1.04)	**1.12** (0.932-1.35)	**1.46** (1.21-1.77)	**1.74** (1.43-2.13)	**2.12** (1.69-2.69)	**2.42** (1.89-3.13)	**2.72** (2.07-3.62)	**3.04** (2.24-4.16)	**3.47** (2.45-4.95)	**3.80** (2.59-5.63)
12-hr	**1.13** (0.947-1.37)	**1.49** (1.24-1.80)	**1.95** (1.62-2.36)	**2.32** (1.92-2.84)	**2.84** (2.26-3.59)	**3.23** (2.52-4.18)	**3.63** (2.76-4.83)	**4.05** (2.99-5.54)	**4.61** (3.26-6.58)	**5.04** (3.44-7.47)
24-hr	**1.48** (1.31-1.70)	**1.97** (1.74-2.28)	**2.62** (2.31-3.03)	**3.15** (2.75-3.67)	**3.87** (3.27-4.66)	**4.42** (3.67-5.43)	**4.98** (4.04-6.27)	**5.56** (4.38-7.20)	**6.35** (4.81-8.55)	**6.96** (5.10-9.70)
2-day	**1.70** (1.51-1.96)	**2.32** (2.05-2.67)	**3.13** (2.75-3.62)	**3.79** (3.32-4.43)	**4.71** (3.99-5.67)	**5.42** (4.49-6.66)	**6.15** (4.98-7.74)	**6.91** (5.44-8.94)	**7.94** (6.02-10.7)	**8.76** (6.42-12.2)
3-day	**1.81** (1.60-2.09)	**2.49** (2.20-2.87)	**3.39** (2.99-3.93)	**4.14** (3.62-4.84)	**5.18** (4.39-6.25)	**6.00** (4.98-7.38)	**6.84** (5.54-8.62)	**7.73** (6.09-10.00)	**8.95** (6.78-12.1)	**9.92** (7.26-13.8)
4-day	**1.94** (1.71-2.23)	**2.69** (2.37-3.10)	**3.69** (3.25-4.28)	**4.53** (3.96-5.29)	**5.69** (4.82-6.86)	**6.61** (5.48-8.13)	**7.56** (6.13-9.52)	**8.56** (6.75-11.1)	**9.96** (7.54-13.4)	**11.1** (8.10-15.4)
7-day	**2.11** (1.86-2.43)	**2.96** (2.62-3.42)	**4.11** (3.63-4.76)	**5.08** (4.44-5.93)	**6.42** (5.44-7.74)	**7.49** (6.21-9.21)	**8.60** (6.97-10.8)	**9.77** (7.70-12.6)	**11.4** (8.63-15.4)	**12.7** (9.30-17.7)
10-day	**2.17** (1.92-2.51)	**3.08** (2.72-3.56)	**4.32** (3.80-5.00)	**5.35** (4.68-6.25)	**6.81** (5.76-8.20)	**7.96** (6.60-9.79)	**9.16** (7.42-11.5)	**10.4** (8.23-13.5)	**12.2** (9.26-16.5)	**13.7** (10.00-19.0)
20-day	**2.51** (2.22-2.89)	**3.60** (3.19-4.16)	**5.12** (4.51-5.93)	**6.42** (5.61-7.49)	**8.27** (7.00-9.97)	**9.77** (8.10-12.0)	**11.4** (9.20-14.3)	**13.1** (10.3-16.9)	**15.5** (11.7-20.8)	**17.4** (12.8-24.3)
30-day	**2.85** (2.52-3.29)	**4.10** (3.62-4.73)	**5.86** (5.16-6.78)	**7.38** (6.45-8.62)	**9.60** (8.12-11.6)	**11.4** (9.47-14.0)	**13.4** (10.8-16.8)	**15.5** (12.2-20.0)	**18.5** (14.0-24.9)	**21.0** (15.4-29.3)
45-day	**3.30** (2.92-3.81)	**4.71** (4.16-5.44)	**6.74** (5.94-7.80)	**8.52** (7.45-9.94)	**11.2** (9.45-13.5)	**13.4** (11.1-16.5)	**15.8** (12.8-19.9)	**18.4** (14.5-23.9)	**22.3** (16.9-30.1)	**25.6** (18.7-35.7)
60-day	**3.73** (3.30-4.30)	**5.25** (4.64-6.07)	**7.48** (6.59-8.66)	**9.47** (8.27-11.0)	**12.5** (10.5-15.0)	**15.0** (12.4-18.5)	**17.8** (14.4-22.4)	**21.0** (16.5-27.1)	**25.6** (19.4-34.6)	**29.6** (21.7-41.3)

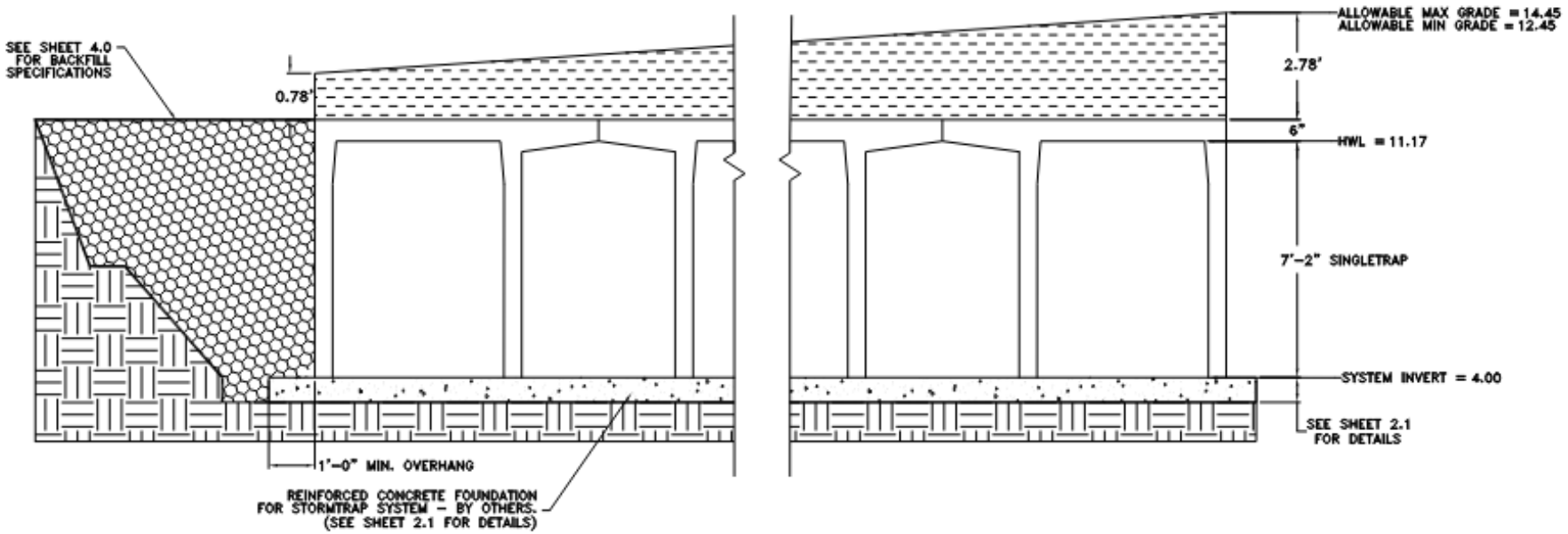
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical



7'-2" SINGLETRAP

Basin 100 (BMP 1) – Underground Storage Facility (StormTrap) – Section Detail

Bridge IG
JN 2121
4/12/2022

BMP 1: Stage-Storage-Discharge Rating Curve Summary

Proposed BMP Outletwork Detail

Basin Characteristics	
Effective Surface Area (ft2) =	5,215
System Depth (ft) =	7.17

Low-flow Orifice (Restrictor)	
Num. of orifices =	1
Orifice invert elevation (ft) =	0.0
Orifice diameter (in) =	4.00

Mid-flow Orifice (1st)	
Num. of orifices =	1
Orifice invert elevation (ft) =	2.0
Orifice diameter (in) =	4.0

Overflow Outlet	
Num. of orifices =	1
Orifice invert elevation (ft) =	5.5
Orifice diameter (in) =	18.00

Orifice/Weir Coefficient	
Orifice coefficient, Cg =	0.60
Weir coefficient, Cs =	3.0

Stage-Discharge Summary

Elevation (ft)	Discharge (cfs)
0.00	0.00
1.00	0.38
2.00	0.57
4.00	1.39
5.50	1.74
7.17	10.20

Stage-Storage Summary

Elevation (ft)	Area (sf)	Porosity	Effective Surface Area (sf)	Storage (Cumulative) (ac-ft)
0.00	5215	1.00	5215	0.000
1.00	5215	1.00	5215	0.107
2.00	5215	1.00	5215	0.214
4.00	5215	1.00	5215	0.428
5.50	5215	1.00	5215	0.589
7.17	5215	1.00	5215	0.768

NOTE: AT THE RELATIVE ELEVATION OF 5.5' IN THE UNDERGROUND STORAGE FACILITY, THE PROVIDED CAPACITY IS APPROXIMATELY 0.59 ACRE-FEET. THIS IS GREATER THAN THE REQUIRED 10-YEAR, 24-HOUR VOLUME OF ~0.52 ACRE-FEET (DELTA VOLUME). REFER TO THE HEC-HMS RESULT OUTPUT SUMMARY IN THIS APPENDIX.

SUPPORTING STAGE-STORAGE TABLE FROM STORMTRAP - SUPPORT THE RATING CURVE SUMMARY TABLE

StormTrap

March 29, 2022
Page 1 of 1

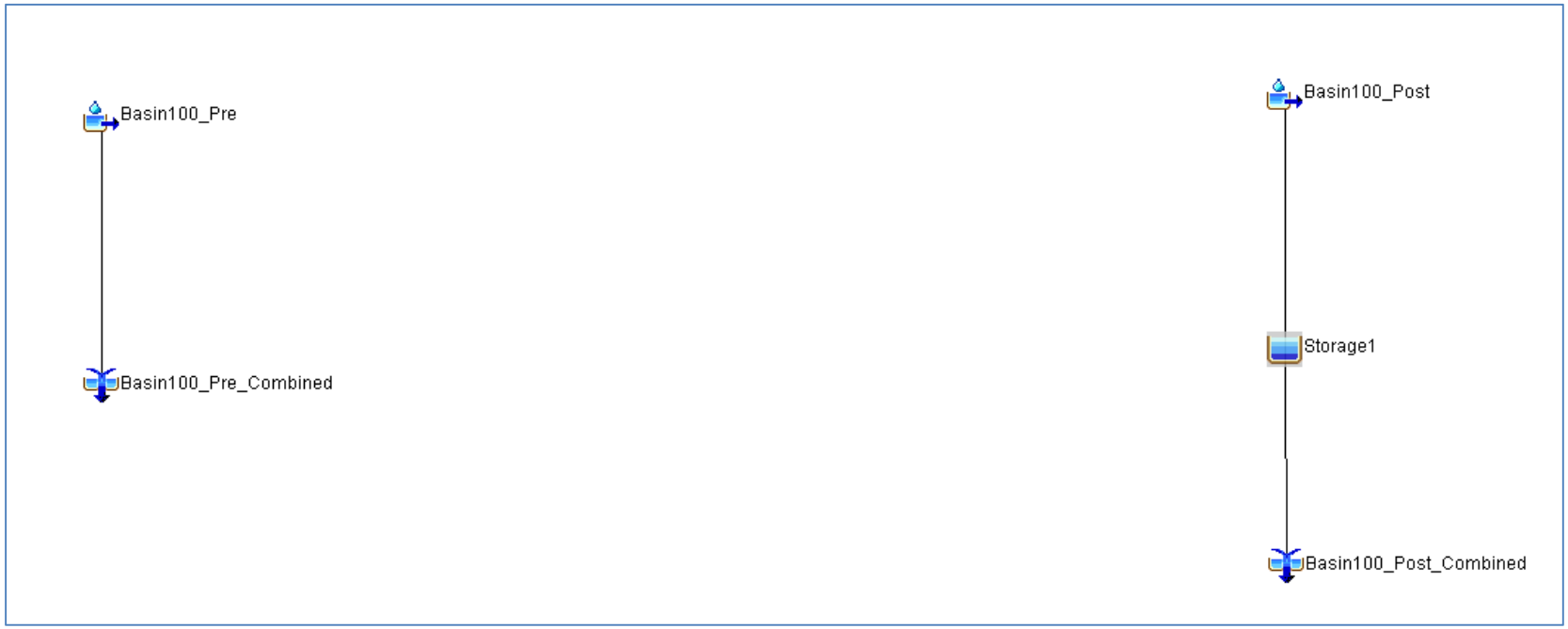
B.I.G.-PATTERSON - RIVERSIDE COUNTY, CA
STAGE STORAGE BREAKDOWN
7'-2" SingleTrap
TOTAL VOLUME: 33450.83 (C.F.)

Nobu Murakami
SDH & Associates, Inc.
27363 Via Industria
Temecula, CA 92590

Storage Height	Type I QTY	Type II QTY	Type III QTY	Type IV QTY	Type V QTY	Type VII QTY	SPIV 1 QTY	SPIV 2 QTY	SPIV 3 QTY	SPIV 4 QTY	SPIV 5 QTY	SPIV 6 QTY	SPIV 7 QTY	SPIV 8 QTY	SPIV 9 QTY	SPIV 10 QTY	Total Units	Stage Storage Elevation
	20	0	21	2	0	0	1	2	0	0	0	0	0	0	0	0	46	
																		System Invert 4.00
0.25	602.62	0.00	470.44	43.83	0.00	0.00	19.83	29.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,166.35	4.25
0.50	1,205.24	0.00	940.87	87.66	0.00	0.00	39.66	59.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2,332.69	4.50
0.75	1,807.87	0.00	1,411.31	131.49	0.00	0.00	59.49	88.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3,499.04	4.75
1.00	2,410.49	0.00	1,881.74	175.32	0.00	0.00	79.33	118.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4,665.39	5.00
1.25	3,013.11	0.00	2,352.18	219.15	0.00	0.00	99.16	148.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5,831.74	5.25
1.50	3,615.73	0.00	2,822.61	262.98	0.00	0.00	118.99	177.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6,998.08	5.50
1.75	4,218.35	0.00	3,293.05	306.81	0.00	0.00	138.82	207.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8,164.43	5.75
2.00	4,820.98	0.00	3,763.48	350.64	0.00	0.00	158.65	237.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9,330.78	6.00
2.25	5,423.60	0.00	4,233.92	394.47	0.00	0.00	178.48	266.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10,497.12	6.25
2.50	6,026.22	0.00	4,704.35	438.31	0.00	0.00	198.31	296.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,663.47	6.50
2.75	6,628.84	0.00	5,174.79	482.14	0.00	0.00	218.15	325.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12,829.82	6.75
3.00	7,231.46	0.00	5,645.22	525.97	0.00	0.00	237.98	355.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13,996.16	7.00
3.25	7,834.09	0.00	6,115.66	569.80	0.00	0.00	257.81	385.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15,162.51	7.25
3.50	8,436.71	0.00	6,586.09	613.63	0.00	0.00	277.64	414.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16,328.86	7.50
3.75	9,039.33	0.00	7,056.53	657.46	0.00	0.00	297.47	444.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17,495.21	7.75
4.00	9,641.95	0.00	7,526.96	701.29	0.00	0.00	317.30	474.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18,661.55	8.00
4.25	10,244.57	0.00	7,997.40	745.12	0.00	0.00	337.13	503.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19,827.90	8.25
4.50	10,847.20	0.00	8,467.83	788.95	0.00	0.00	356.96	533.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20,994.25	8.50
4.75	11,449.82	0.00	8,938.27	832.78	0.00	0.00	376.80	562.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22,160.59	8.75
5.00	12,052.44	0.00	9,408.70	876.61	0.00	0.00	396.63	592.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23,326.94	9.00
5.25	12,655.06	0.00	9,879.14	920.44	0.00	0.00	416.46	622.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24,493.29	9.25
5.50	13,257.68	0.00	10,349.57	964.27	0.00	0.00	436.29	651.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25,659.63	9.50
5.68	13,686.22	0.00	10,684.10	995.44	0.00	0.00	450.39	672.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26,489.04	9.68
5.75	13,860.31	0.00	10,820.01	1,008.10	0.00	0.00	456.12	681.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26,825.98	9.75
6.00	14,462.93	0.00	11,290.44	1,051.93	0.00	0.00	475.95	711.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	27,992.33	10.00
6.25	15,065.55	0.00	11,760.88	1,095.76	0.00	0.00	495.78	740.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29,158.68	10.25
6.50	15,668.17	0.00	12,231.31	1,139.59	0.00	0.00	515.62	770.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30,325.02	10.50
6.75	16,270.79	0.00	12,701.75	1,183.42	0.00	0.00	535.45	799.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31,491.37	10.75
7.00	16,873.42	0.00	13,172.18	1,227.26	0.00	0.00	555.28	829.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32,657.72	11.00
7.17	17,283.20	0.00	13,492.08	1,257.06	0.00	0.00	568.76	849.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33,450.83	11.17

PHONE 815 941 4549
FAX 331 318 5347
WEB www.stormtrap.com
EMAIL info@stormtrap.com
1287 Windham Parkway
Romeoville, Illinois 60446

BASIN 100 – HEC-HMS - SCHEMATIC



BASIN 100 – OVERALL RUNOFF VOLUME & PEAK FLOW MITIGATION SUMMARY

Project: BP_Basin100 Simulation Run: 10yr 24hr

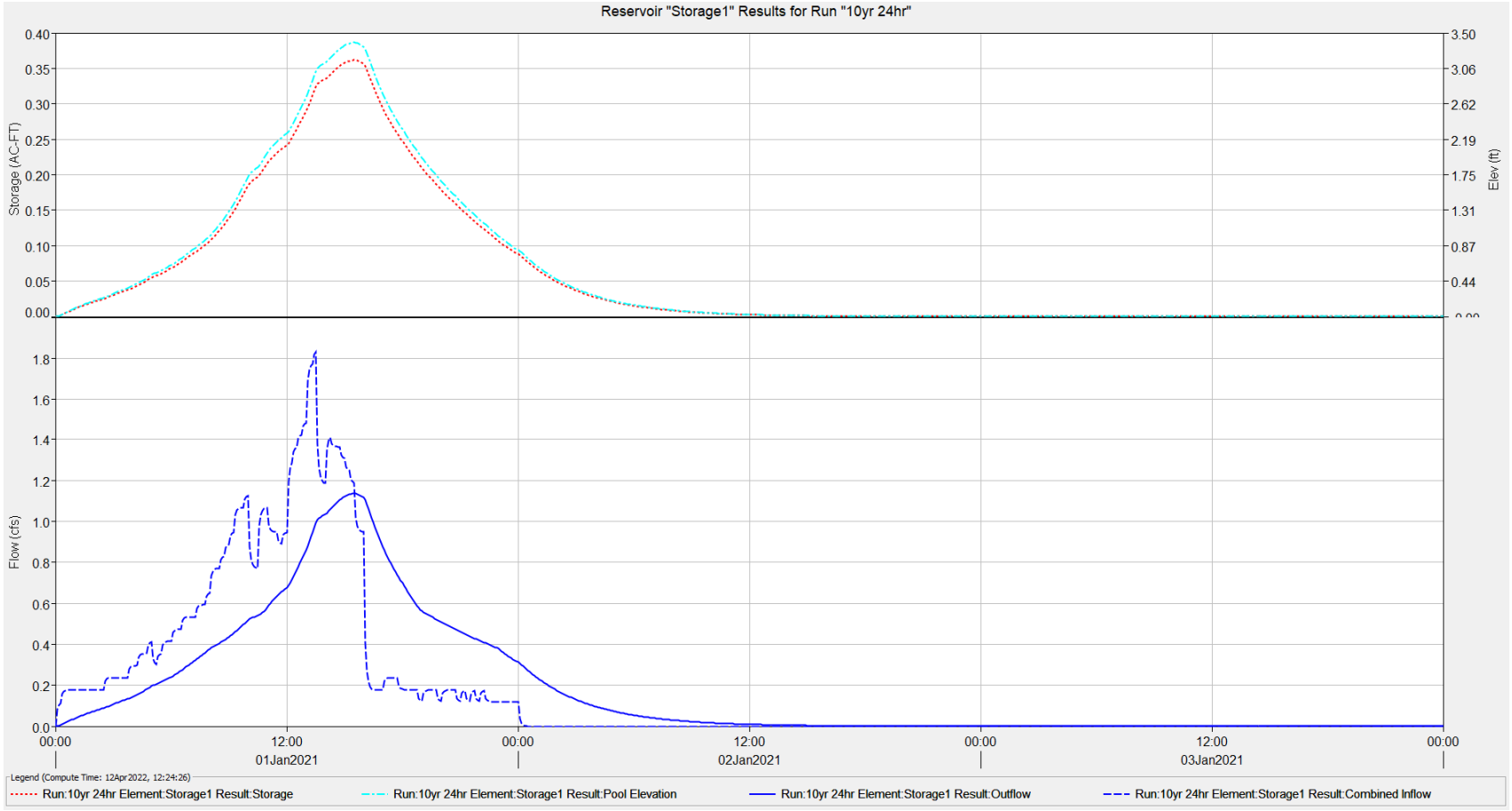
Start of Run: 01Jan2021, 00:00 Basin Model: Basin100
End of Run: 04Jan2021, 00:00 Meteorologic Model: 10yr24hr
Compute Time: 12Apr2022, 12:24:26 Control Specifications: 72 hours

Show Elements: All Elements Volume Units: IN ACRE-FT Sorting: Hydrologic

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (ACRE-FT)
Basin100_Post	0.007656	1.8	01Jan2021, 13:30	1.07
Storage1	0.007656	1.1	01Jan2021, 15:30	1.07
Basin100_Post_Comb...	0.007656	1.1	01Jan2021, 15:30	1.07
Basin100_Pre	0.007344	1.5	01Jan2021, 13:25	0.55
Basin100_Pre_Combi...	0.007344	1.5	01Jan2021, 13:25	0.55

Note: The runoff volume difference between the pre-project condition and post-project condition is approximately 0.52 acre-feet. The proposed underground storage facility is expected to provide approximately 0.59 acre-feet of volume at relative elevation of 5.50'. The basin is expected to have 1' minimum freeboard above this elevation. Therefore, this provides adequate volume for 10-year, 24-hour storm event and should meet the District's Increased Flood Criteria. During final engineering, the sizing will be refined with more detailed calculations.

BASIN 100 – STAGE/STORAGE CURVE & HYDROGRAPH SUMMARY



HEC HMS Preprocessor

User Manual
Contact Project Planning **(951) 955-1200**

Watershed Area 0.007344 sq mi

1 Hour Storm	*3 Hour Storm*	*6 Hour Storm*	*24 Hour Storm*
Point Precipitation in.	Point Precipitation in.	Point Precipitation in.	Point Precipitation 3.15 in.
Areal Adjustment Factor %	Areal Adjustment Factor %	Areal Adjustment Factor %	Areal Adjustment Factor 100 %
Adjusted Point Precipitation	Adjusted Point Precipitation	Adjusted Point Precipitation	Adjusted Point Precipitation 3.15
Slope of Rainfall Intensity - Duration Curve			

Lag Time Calculator

Basin Factor - n	0.025	
Length along longest watercourse - L	689	ft
Length along longest watercourse measured upstream to a point opposite the centroid of the area - Lca	340	ft
Elevation Difference	9.3	ft
Lag Time	**0.043**	**hr**
40% Lag Time	1	min

Run

Loss Rate Data Effective Rainfall S-Graphs

(•) Average Adjusted Loss Rate Calculator (Plate E-2.1) ( ) Average Adjusted Loss Rate (Manual Entry)

Add Loss Rate Values

AMC Condition: II

Soil Group / Cover Type View Chart	RI Number	Perv. Area Infiltrn Rate (in/hr)	Land Use	Imp. Area Decimal %	Adj.Infiltrn Rate (in/hr)	Area (acres)		
-							Add	

Soil Group / Cover Type	RI Number	Perv. Area Infiltrn Rate (in/hr)	Land Use	Imp. Area Decimal %	Adj.Infiltrn Rate (in/hr)	Area (acres)	Area/ Total Area	Ave. Adj. Rate (in/hr)
Barren N/A C	91	0.11700	Natural or Agriculture (0)	0	0.117	4.7	1	0.117 X
					Total area =	4.7		
							Average Soil Loss =	0.117

HEC HMS Preprocessor

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Watershed Area 0.007344 sq mi

1 Hour Storm		*3 Hour Storm*		*6 Hour Storm*		*24 Hour Storm*	
Point Precipitation	in.	Point Precipitation	in.	Point Precipitation	in.	Point Precipitation	3.15 in.
Areal Adjustment Factor	%	Areal Adjustment Factor	%	Areal Adjustment Factor	%	Areal Adjustment Factor	100 %
Adjusted Point Precipitation		Adjusted Point Precipitation		Adjusted Point Precipitation		Adjusted Point Precipitation	3.15
Slope of Rainfall Intensity - Duration Curve							

Lag Time Calculator

Basin Factor - n	0.025	
Length along longest watercourse - L	689	ft
Length along longest watercourse measured upstream to a point opposite the centroid of the area - Lca	340	ft
Elevation Difference	9.3	ft
Lag Time	**0.043**	**hr**
40% Lag Time	1	min

Run

Loss Rate Data Effective Rainfall S-Graphs

Unit Time Period 5 min (Use interval less than 40% of lag time)
Low Loss 90 %
Fm (Percentage of F) (24-hour Storm Only) 50 % (Typically 50-75%)

Run

1 Hour

Unit Time	Effective Rainfall (inches)

3 Hour

Unit Time	Effective Rainfall (inches)

6 Hour

Unit Time	Effective Rainfall (inches)

24 Hour

Unit Time	Effective Rainfall (inches)
00:05	0
00:10	0
00:15	0
00:20	0
00:25	0
00:30	0
00:35	0
00:40	0
00:45	0
00:50	0
00:55	0
01:00	0
01:05	0
01:10	0
01:15	0
01:20	0
01:25	0
01:30	0
01:35	0
01:40	0
01:45	0
01:50	0
01:55	0
02:00	0
02:05	0
02:10	0
02:15	0
02:20	0
02:25	0
02:30	0
02:35	0.001
02:40	0.001
02:45	0.001
02:50	0.001
02:55	0.001
03:00	0.001
03:05	0.001

03:10	0.001
03:15	0.001
03:20	0.001
03:25	0.001
03:30	0.001
03:35	0.001
03:40	0.001
03:45	0.001
03:50	0.001
03:55	0.001
04:00	0.001
04:05	0.001
04:10	0.001
04:15	0.001
04:20	0.001
04:25	0.001
04:30	0.001
04:35	0.001
04:40	0.001
04:45	0.001
04:50	0.001
04:55	0.001
05:00	0.001
05:05	0.001
05:10	0.001
05:15	0.001
05:20	0.001
05:25	0.001
05:30	0.001
05:35	0.001
05:40	0.001
05:45	0.001
05:50	0.001
05:55	0.001
06:00	0.001
06:05	0.001
06:10	0.001
06:15	0.001
06:20	0.001
06:25	0.001
06:30	0.001

06:35	0.001
06:40	0.001
06:45	0.001
06:50	0.001
06:55	0.001
07:00	0.001
07:05	0.001
07:10	0.001
07:15	0.001
07:20	0.001
07:25	0.001
07:30	0.001
07:35	0.001
07:40	0.001
07:45	0.001
07:50	0.002
07:55	0.002
08:00	0.002
08:05	0.004
08:10	0.004
08:15	0.004
08:20	0.004
08:25	0.004
08:30	0.005
08:35	0.006
08:40	0.006
08:45	0.006
08:50	0.007
08:55	0.007
09:00	0.007
09:05	0.009
09:10	0.009
09:15	0.009
09:20	0.01
09:25	0.01
09:30	0.011
09:35	0.012
09:40	0.012
09:45	0.012
09:50	0.013
09:55	0.013

10:00	0.013
10:05	0.006
10:10	0.006
10:15	0.006
10:20	0.006
10:25	0.006
10:30	0.006
10:35	0.011
10:40	0.011
10:45	0.011
10:50	0.011
10:55	0.011
11:00	0.011
11:05	0.01
11:10	0.01
11:15	0.01
11:20	0.01
11:25	0.01
11:30	0.01
11:35	0.009
11:40	0.009
11:45	0.009
11:50	0.01
11:55	0.01
12:00	0.01
12:05	0.017
12:10	0.017
12:15	0.017
12:20	0.018
12:25	0.018
12:30	0.019
12:35	0.02
12:40	0.021
12:45	0.021
12:50	0.022
12:55	0.022
13:00	0.022
13:05	0.027
13:10	0.027
13:15	0.027

13:25	0.027
13:30	0.027
13:35	0.016
13:40	0.016
13:45	0.016
13:50	0.016
13:55	0.016
14:00	0.016
14:05	0.02
14:10	0.02
14:15	0.02
14:20	0.019
14:25	0.02
14:30	0.02
14:35	0.02
14:40	0.02
14:45	0.02
14:50	0.018
14:55	0.018
15:00	0.019
15:05	0.018
15:10	0.018
15:15	0.018
15:20	0.017
15:25	0.017
15:30	0.017
15:35	0.012
15:40	0.013
15:45	0.013
15:50	0.013
15:55	0.013
16:00	0.013
16:05	0
16:10	0
16:15	0
16:20	0
16:25	0
16:30	0
16:35	0
16:40	0
16:45	0

16:50	0
16:55	0
17:00	0
17:05	0.001
17:10	0.001
17:15	0.001
17:20	0.001
17:25	0.001
17:30	0.001
17:35	0.001
17:40	0.001
17:45	0.001
17:50	0
17:55	0
18:00	0
18:05	0
18:10	0
18:15	0
18:20	0
18:25	0
18:30	0
18:35	0
18:40	0
18:45	0
18:50	0
18:55	0
19:00	0
19:05	0
19:10	0
19:15	0
19:20	0
19:25	0
19:30	0
19:35	0
19:40	0
19:45	0
19:50	0
19:55	0
20:00	0
20:05	0
20:10	0

20:15	0
20:20	0
20:25	0
20:30	0
20:35	0
20:40	0
20:45	0
20:50	0
20:55	0
21:00	0
21:05	0
21:10	0
21:15	0
21:20	0
21:25	0
21:30	0
21:35	0
21:40	0
21:45	0
21:50	0
21:55	0
22:00	0
22:05	0
22:10	0
22:15	0
22:20	0
22:25	0
22:30	0
22:35	0
22:40	0
22:45	0
22:50	0
22:55	0
23:00	0
23:05	0
23:10	0
23:15	0
23:20	0
23:25	0
23:30	0

23:40	0
23:45	0
23:50	0
23:55	0
00:00	0

HEC HMS Preprocessor

User Manual
Contact Project Planning **(951) 955-1200**

Watershed Area 0.007344 sq mi

1 Hour Storm

Point Precipitation in.
Areal Adjustment Factor %
Adjusted Point Precipitation
Slope of Rainfall Intensity - Duration Curve

3 Hour Storm

Point Precipitation in.
Areal Adjustment Factor %
Adjusted Point Precipitation

6 Hour Storm

Point Precipitation in.
Areal Adjustment Factor %
Adjusted Point Precipitation

24 Hour Storm

Point Precipitation 3.15 in.
Areal Adjustment Factor 100 %
Adjusted Point Precipitation 3.15

Lag Time Calculator

Basin Factor - n	0.025	
Length along longest watercourse - L	689	ft
Length along longest watercourse measured upstream to a point opposite the centroid of the area - Lca	340	ft
Elevation Difference	9.3	ft
Lag Time	**0.043**	**hr**
40% Lag Time	1	min

Run

Loss Rate Data Effective Rainfall S-Graphs

Run S Graphs

S-Graph 1		S-Graph 2		S-Graph 3		S-Graph 4	
Type:	Mountain	Type:	Valley	Type:	Foothill	Type:	Desert
Weight %		Weight %		Weight %		Weight %	

S-Graph Combined	
Type:	Combined
Weight %	

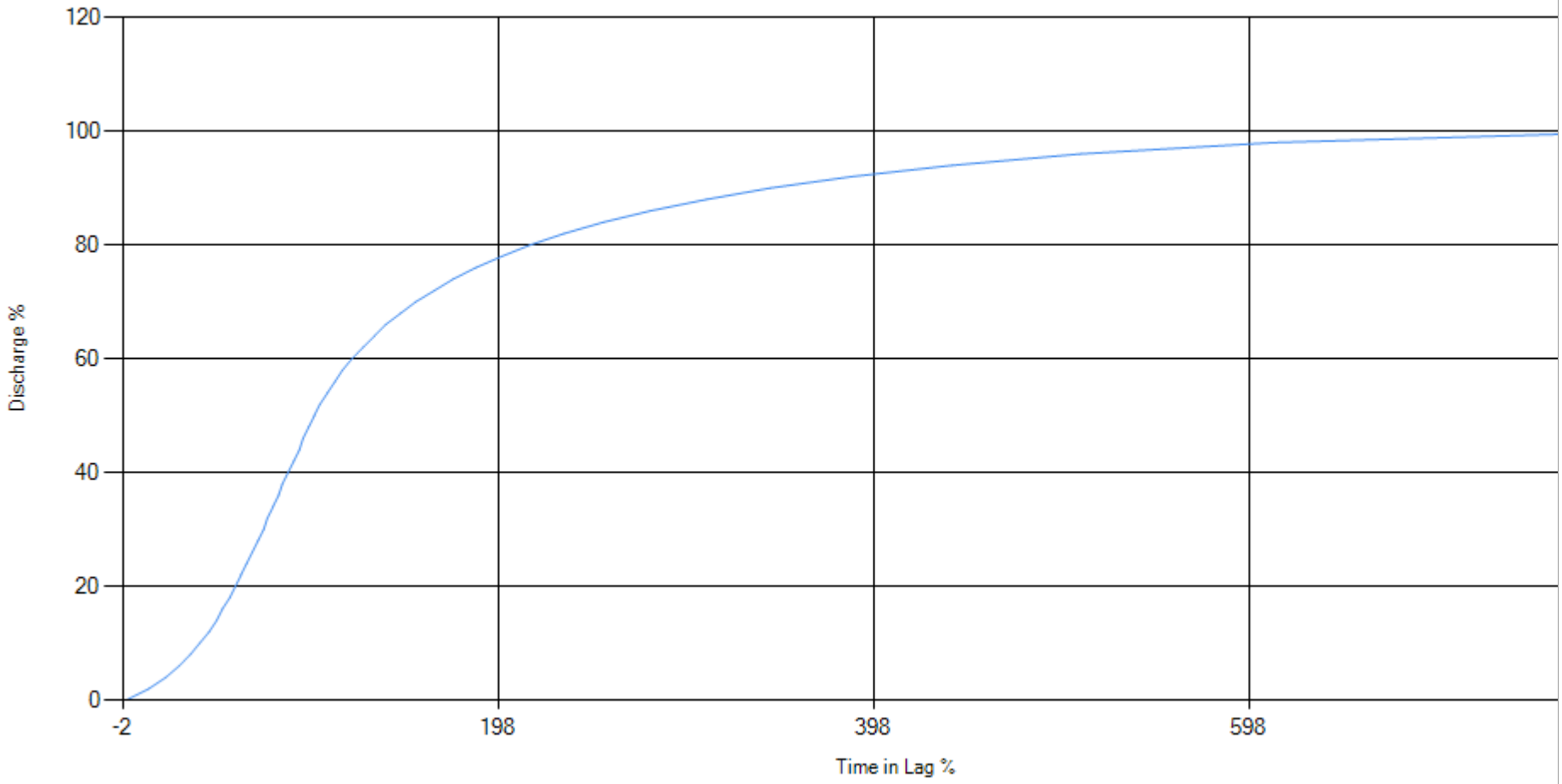
			100				
Time in Percent of Lag	Discharge (percent)	Time in Percent of Lag	Discharge (percent)	Time in Percent of Lag	Discharge (percent)	Time in Percent of Lag	Discharge (percent)
0	0	0	0	0	0	0	0
0	2	12	2	0	2	0	2
0	4	21	4	0	4	0	4
0	6	28	6	0	6	0	6
0	8	34	8	0	8	0	8
0	10	39	10	0	10	0	10
0	12	44	12	0	12	0	12
0	14	48	14	0	14	0	14
0	16	51	16	0	16	0	16
0	18	55	18	0	18	0	18
0	20	58	20	0	20	0	20
0	22	61	22	0	22	0	22
0	24	64	24	0	24	0	24
0	26	67	26	0	26	0	26
0	28	70	28	0	28	0	28
0	30	73	30	0	30	0	30
0	32	75	32	0	32	0	32
0	34	78	34	0	34	0	34
0	36	81	36	0	36	0	36
0	38	83	38	0	38	0	38
0	40	86	40	0	40	0	40
0	42	89	42	0	42	0	42
0	44	92	44	0	44	0	44
0	46	94	46	0	46	0	46
0	48	97	48	0	48	0	48
0	50	100	50	0	50	0	50
0	52	103	52	0	52	0	52
0	54	107	54	0	54	0	54
0	56	111	56	0	56	0	56
0	58	115	58	0	58	0	58
0	60	120	60	0	60	0	60
0	62	126	62	0	62	0	62
0	64	132	64	0	64	0	64
0	66	138	66	0	66	0	66
0	68	146	68	0	68	0	68
0	70	154	70	0	70	0	70
0	72	164	72	0	72	0	72
0	74	174	74	0	74	0	74
0	76	186	76	0	76	0	76
0	78	200	78	0	78	0	78
0	80	215	80	0	80	0	80
0	82	233	82	0	82	0	82
0	84	254	84	0	84	0	84
0	86	279	86	0	86	0	86
0	88	309	88	0	88	0	88
0	90	343	90	0	90	0	90
0	92	386	92	0	92	0	92
0	94	440	94	0	94	0	94

Time in Percent of Lag	Discharge (percent)
0	0
12	2
21	4
28	6
34	8
39	10
44	12
48	14
51	16
55	18
58	20
61	22
64	24
67	26
70	28
73	30
75	32
78	34
81	36
83	38
86	40
89	42
92	44
94	46
97	48
100	50
103	52
107	54
111	56
115	58
120	60
126	62
132	64
138	66
146	68
154	70
164	72
174	74
186	76
200	78
215	80
233	82
254	84
279	86
309	88
343	90
386	92
440	94
508	96

0	96	508	96	0	96	0	96
0	98	611	98	0	98	0	98
0	100	820	100	0	100	0	100

611	98
820	100

S-Graph Combined



HEC HMS Preprocessor

User Manual
Contact Project Planning **(951) 955-1200**

Watershed Area 0.007656 sq mi

1 Hour Storm		3 Hour Storm		6 Hour Storm		24 Hour Storm	
Point Precipitation	in.	Point Precipitation	in.	Point Precipitation	in.	Point Precipitation	3.15 in.
Areal Adjustment Factor	%	Areal Adjustment Factor	%	Areal Adjustment Factor	%	Areal Adjustment Factor	100 %
Adjusted Point Precipitation		Adjusted Point Precipitation		Adjusted Point Precipitation		Adjusted Point Precipitation	3.15
Slope of Rainfall Intensity - Duration Curve							

Lag Time Calculator

Basin Factor - n	0.015	
Length along longest watercourse - L	1148	ft
Length along longest watercourse measured upstream to a point opposite the centroid of the area - Lca	814	ft
Elevation Difference	5.5	ft
Lag Time	**0.054**	**hr**
40% Lag Time	1.3	min

Run

Loss Rate Data Effective Rainfall S-Graphs

(●) Average Adjusted Loss Rate Calculator (Plate E-2.1) ( ) Average Adjusted Loss Rate (Manual Entry)

Add Loss Rate Values

AMC Condition: II

Soil Group / Cover Type View Chart	RI Number	Perv. Area Infiltrn Rate (in/hr)	Land Use	Imp. Area Decimal %	Adj.Infiltrn Rate (in/hr)	Area (acres)		
-							Add	

Soil Group / Cover Type	RI Number	Perv. Area Infiltrn Rate (in/hr)	Land Use	Imp. Area Decimal %	Adj.Infiltrn Rate (in/hr)	Area (acres)	Area/ Total Area	Ave. Adj. Rate (in/hr)
Urban Landscaping Good C	69	0.37300	Commercial, Downtown Business or Industrial (90)	90	0.071	4.9	1	0.071 X
					Total area =	4.9		
							Average Soil Loss =	0.071

HEC HMS Preprocessor

User Manual
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Watershed Area 0.007656 sq mi

1 Hour Storm		*3 Hour Storm*		*6 Hour Storm*		*24 Hour Storm*	
Point Precipitation	in.	Point Precipitation	in.	Point Precipitation	in.	Point Precipitation	3.15 in.
Areal Adjustment Factor	%	Areal Adjustment Factor	%	Areal Adjustment Factor	%	Areal Adjustment Factor	100 %
Adjusted Point Precipitation		Adjusted Point Precipitation		Adjusted Point Precipitation		Adjusted Point Precipitation	3.15
Slope of Rainfall Intensity - Duration Curve							

Lag Time Calculator

Basin Factor - n	0.015	
Length along longest watercourse - L	1148	ft
Length along longest watercourse measured upstream to a point opposite the centroid of the area - Lca	814	ft
Elevation Difference	5.5	ft
Lag Time	**0.054**	**hr**
40% Lag Time	1.3	min

Run

Loss Rate Data Effective Rainfall S-Graphs

Unit Time Period 5 min (Use interval less than 40% of lag time)

Low Loss 17 %

Fm (Percentage of F) (24-hour Storm Only) 50 % (Typically 50-75%)

Run

1 Hour

Unit Time	Effective Rainfall (inches)

3 Hour

Unit Time	Effective Rainfall (inches)

6 Hour

Unit Time	Effective Rainfall (inches)

24 Hour

Unit Time	Effective Rainfall (inches)
00:05	0.002
00:10	0.002
00:15	0.002
00:20	0.003
00:25	0.003
00:30	0.003
00:35	0.003
00:40	0.003
00:45	0.003
00:50	0.003
00:55	0.003
01:00	0.003
01:05	0.003
01:10	0.003
01:15	0.003
01:20	0.003
01:25	0.003
01:30	0.003
01:35	0.003
01:40	0.003
01:45	0.003
01:50	0.003
01:55	0.003
02:00	0.003
02:05	0.003
02:10	0.003
02:15	0.003
02:20	0.003
02:25	0.003
02:30	0.003
02:35	0.004
02:40	0.004
02:45	0.004
02:50	0.004
02:55	0.004
03:00	0.004
03:05	0.004

03:10	0.004
03:15	0.004
03:20	0.004
03:25	0.004
03:30	0.004
03:35	0.004
03:40	0.004
03:45	0.004
03:50	0.005
03:55	0.005
04:00	0.005
04:05	0.005
04:10	0.005
04:15	0.005
04:20	0.006
04:25	0.006
04:30	0.006
04:35	0.006
04:40	0.006
04:45	0.006
04:50	0.007
04:55	0.007
05:00	0.007
05:05	0.005
05:10	0.005
05:15	0.005
05:20	0.006
05:25	0.006
05:30	0.006
05:35	0.007
05:40	0.007
05:45	0.007
05:50	0.007
05:55	0.007
06:00	0.007
06:05	0.008
06:10	0.008
06:15	0.008
06:20	0.008
06:25	0.008
06:30	0.008

06:35	0.009
06:40	0.009
06:45	0.009
06:50	0.009
06:55	0.009
07:00	0.009
07:05	0.009
07:10	0.009
07:15	0.009
07:20	0.01
07:25	0.01
07:30	0.01
07:35	0.01
07:40	0.01
07:45	0.01
07:50	0.011
07:55	0.011
08:00	0.011
08:05	0.013
08:10	0.013
08:15	0.013
08:20	0.013
08:25	0.013
08:30	0.013
08:35	0.014
08:40	0.014
08:45	0.014
08:50	0.015
08:55	0.015
09:00	0.015
09:05	0.016
09:10	0.016
09:15	0.016
09:20	0.018
09:25	0.018
09:30	0.018
09:35	0.018
09:40	0.018
09:45	0.018
09:50	0.019
09:55	0.019

10:00	0.019
10:05	0.013
10:10	0.013
10:15	0.013
10:20	0.013
10:25	0.013
10:30	0.013
10:35	0.018
10:40	0.018
10:45	0.018
10:50	0.018
10:55	0.018
11:00	0.018
11:05	0.016
11:10	0.016
11:15	0.016
11:20	0.016
11:25	0.016
11:30	0.016
11:35	0.015
11:40	0.015
11:45	0.015
11:50	0.016
11:55	0.016
12:00	0.016
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12:15	0.022
12:20	0.023
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12:35	0.024
12:40	0.024
12:45	0.024
12:50	0.025
12:55	0.025
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13:05	0.03
13:10	0.03
13:15	0.03
13:20	0.03

13:25	0.031
13:30	0.031
13:35	0.02
13:40	0.02
13:45	0.02
13:50	0.02
13:55	0.02
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14:05	0.024
14:10	0.024
14:15	0.024
14:20	0.023
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14:30	0.023
14:35	0.023
14:40	0.023
14:45	0.023
14:50	0.022
14:55	0.022
15:00	0.022
15:05	0.021
15:10	0.021
15:15	0.021
15:20	0.02
15:25	0.02
15:30	0.02
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15:50	0.016
15:55	0.016
16:00	0.016
16:05	0.003
16:10	0.003
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16:20	0.003
16:25	0.003
16:30	0.003
16:35	0.003
16:40	0.003
16:45	0.003

16:50	0.003
16:55	0.003
17:00	0.003
17:05	0.004
17:10	0.004
17:15	0.004
17:20	0.004
17:25	0.004
17:30	0.004
17:35	0.004
17:40	0.004
17:45	0.004
17:50	0.003
17:55	0.003
18:00	0.003
18:05	0.003
18:10	0.003
18:15	0.003
18:20	0.003
18:25	0.003
18:30	0.003
18:35	0.003
18:40	0.003
18:45	0.003
18:50	0.002
18:55	0.002
19:00	0.002
19:05	0.003
19:10	0.003
19:15	0.003
19:20	0.003
19:25	0.003
19:30	0.003
19:35	0.003
19:40	0.003
19:45	0.003
19:50	0.002
19:55	0.002
20:00	0.002
20:05	0.003
20:10	0.003

20:15	0.003
20:20	0.003
20:25	0.003
20:30	0.003
20:35	0.003
20:40	0.003
20:45	0.003
20:50	0.002
20:55	0.002
21:00	0.002
21:05	0.003
21:10	0.003
21:15	0.003
21:20	0.002
21:25	0.002
21:30	0.002
21:35	0.003
21:40	0.003
21:45	0.003
21:50	0.002
21:55	0.002
22:00	0.002
22:05	0.003
22:10	0.003
22:15	0.003
22:20	0.002
22:25	0.002
22:30	0.002
22:35	0.002
22:40	0.002
22:45	0.002
22:50	0.002
22:55	0.002
23:00	0.002
23:05	0.002
23:10	0.002
23:15	0.002
23:20	0.002
23:25	0.002
23:30	0.002
23:35	0.002

23:40	0.002
23:45	0.002
23:50	0.002
23:55	0.002
00:00	0.002

HEC HMS Preprocessor

User Manual
Contact Project Planning **(951) 955-1200**

Watershed Area 0.0177 sq mi

1 Hour Storm

Point Precipitation 0.789 in.
Areal Adjustment Factor 100 %
Adjusted Point Precipitation 0.79
Slope of Rainfall Intensity - Duration Curve 0.48

3 Hour Storm

Point Precipitation 1.27 in.
Areal Adjustment Factor 100 %
Adjusted Point Precipitation 1.27

6 Hour Storm

Point Precipitation 1.75 in.
Areal Adjustment Factor 100 %
Adjusted Point Precipitation 1.75

24 Hour Storm

Point Precipitation 3.20 in.
Areal Adjustment Factor 100 %
Adjusted Point Precipitation 3.2

Lag Time Calculator

Basin Factor - n	0.015	
Length along longest watercourse - L	1152	ft
Length along longest watercourse measured upstream to a point opposite the centroid of the area - Lca	696	ft
Elevation Difference	27	ft
Lag Time	**0.037**	**hr**
40% Lag Time	0.9	min

Run

Loss Rate Data Effective Rainfall S-Graphs

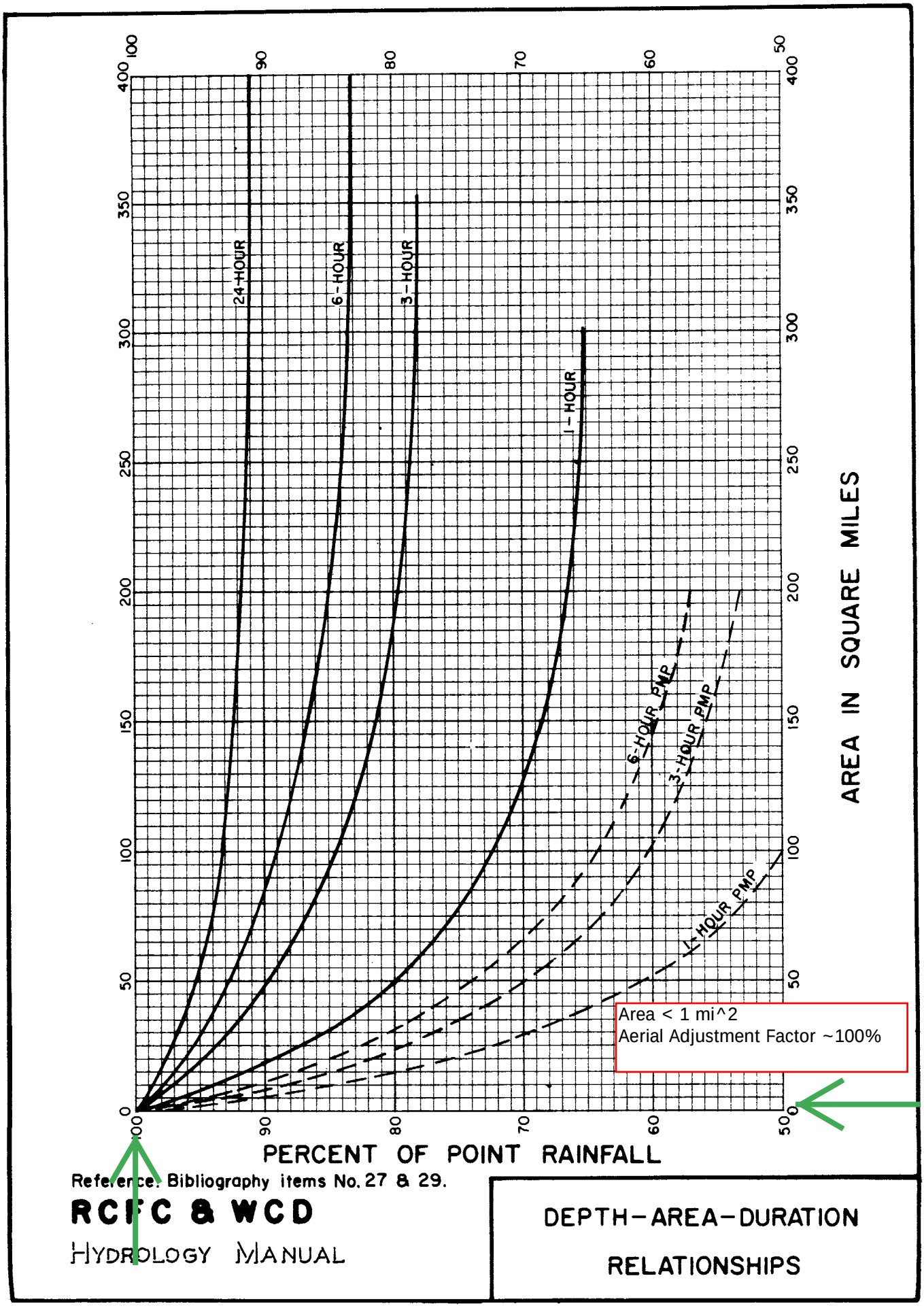
Run S Graphs

S-Graph 1		S-Graph 2		S-Graph 3		S-Graph 4	
Type:	Mountain	Type:	Valley	Type:	Foothill	Type:	Desert
Weight %		Weight %	100	Weight %		Weight %	
Time in Percent of Lag	Discharge (percent)	Time in Percent of Lag	Discharge (percent)	Time in Percent of Lag	Discharge (percent)	Time in Percent of Lag	Discharge (percent)
0	0	0	0	0	0	0	0
0	2	12	2	0	2	0	2
0	4	21	4	0	4	0	4
0	6	28	6	0	6	0	6
0	8	34	8	0	8	0	8
0	10	39	10	0	10	0	10
0	12	44	12	0	12	0	12
0	14	48	14	0	14	0	14
0	16	51	16	0	16	0	16
0	18	55	18	0	18	0	18

S-Graph Combined	
Type:	Combined
Weight %	
Time in Percent of Lag	Discharge (percent)
0	0
12	2
21	4
28	6
34	8
39	10
44	12
48	14
51	16

0	20	58	20	0	20	0	20	55	18
0	22	61	22	0	22	0	22	58	20
0	24	64	24	0	24	0	24	61	22
0	26	67	26	0	26	0	26	64	24
0	28	70	28	0	28	0	28	67	26
0	30	73	30	0	30	0	30	70	28
0	32	75	32	0	32	0	32	73	30
0	34	78	34	0	34	0	34	75	32
0	36	81	36	0	36	0	36	78	34
0	38	83	38	0	38	0	38	81	36
0	40	86	40	0	40	0	40	83	38
0	42	89	42	0	42	0	42	86	40
0	44	92	44	0	44	0	44	89	42
0	46	94	46	0	46	0	46	92	44
0	48	97	48	0	48	0	48	94	46
0	50	100	50	0	50	0	50	97	48
0	52	103	52	0	52	0	52	100	50
0	54	107	54	0	54	0	54	103	52
0	56	111	56	0	56	0	56	107	54
0	58	115	58	0	58	0	58	111	56
0	60	120	60	0	60	0	60	115	58
0	62	126	62	0	62	0	62	120	60
0	64	132	64	0	64	0	64	126	62
0	66	138	66	0	66	0	66	132	64
0	68	146	68	0	68	0	68	138	66
0	70	154	70	0	70	0	70	146	68
0	72	164	72	0	72	0	72	154	70
0	74	174	74	0	74	0	74	164	72
0	76	186	76	0	76	0	76	174	74
0	78	200	78	0	78	0	78	186	76
0	80	215	80	0	80	0	80	200	78
0	82	233	82	0	82	0	82	215	80
0	84	254	84	0	84	0	84	233	82
0	86	279	86	0	86	0	86	254	84
0	88	309	88	0	88	0	88	279	86
0	90	343	90	0	90	0	90	309	88
0	92	386	92	0	92	0	92	343	90
0	94	440	94	0	94	0	94	386	92
0	96	508	96	0	96	0	96	440	94
0	98	611	98	0	98	0	98	508	96
0	100	820	100	0	100	0	100	611	98
								820	100

S-Graph Combined



Area < 1 mi^2
Aerial Adjustment Factor ~100%

Reference: Bibliography items No. 27 & 29.

RCFC & WCD

HYDROLOGY MANUAL

DEPTH-AREA-DURATION RELATIONSHIPS

PLATE E-5.8