

**PRELIMINARY DRAINAGE STUDY
(HYDROLOGY AND HYDRAULICS)
FOR
MESA LINDA LOGISTICS CENTER
(PRELIMINARY ENGINEERING)**

CITY CASE #: CUP22-00004

SDH Job Number 2127

February 7, 2022

Revised: June 24, 2022

Revised: August 11, 2022

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Exp. 09/30/2023



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REVISION PAGE

August 11, 2022

This report presents revisions to the previous version of the drainage study, dated June 24, 2022, to address the second engineering division review comments for CUP22-00004, received from Mr. Mark McKinley of the City of Hesperia in the form of comment letter, dated July 26, 2022. There is only one outstanding comment remaining (Comment Item #1) from the Engineering Division. In order to address this outstanding comment #1 and as directed by Mr. McKinley via email on 8/4/22, the project's site plan has been revised to provide a perimeter rectangular concrete channel along the southerly edge of the project to intercept and convey the potential southerly offsite run-on flow. This drainage study was revised to provide the supporting offsite hydrologic and hydraulic calculations for the proposed perimeter concrete channel. This drainage facility is being provided to address the potential flow during an "interim" condition in case the project goes in first prior to the southerly offsite development (by others). It is understood that the southerly development is planning to ultimately outlet their flow towards frontage streets (east and west at two locations). When the offsite development takes place, the offsite run-on to the project would be eliminated or significantly reduced. In either scenario, this drainage facility is expected to address the potential offsite run-on flow condition. The facility is designed to drain easterly to a depressed gravel basin near the southeasterly corner to help dissipate energy and overflow would outlet towards Mesa Linda via a sidewalk underdrain.

**PRELIMINARY DRAINAGE STUDY
(HYDROLOGY AND HYDRAULICS)
FOR
NEWCASTLE-HESPERIA
(PRELIMINARY ENGINEERING)
CITY CASE #: CUP22-00004**

REVISION PAGE

June 24, 2022

This report presents revisions to the previous version of the drainage study, dated February 7, 2022, to address the first engineering division review comments for CUP22-00004, received from Mr. Mark McKinley of the City of Hesperia in the form of comment letter on March 10, 2022. The plan review comment letter is dated March 9, 2022. A conference call was held with Mr. Mark McKinley on March 24, 2022 to discuss the engineering comments (including the preliminary grading plan and drainage study comments) for further clarification. Most of the requested items (Items #1 thru #9) were previously shown on the preliminary grading plan but it became apparent that Mr. McKinley reviewed the architectural site plan but not preliminary grading plan. The direction from the discussion was to submit the revised grading plan those comments should be cleared.

Separately, we had subsequent conference calls with Mr. McKinley and Mr. Michael Thornton on 4/12 and 4/26 to discuss the drainage concept/approach for the project. Based on the discussions, in lieu of the underground mitigation facility with pump/bubbler system, it was directed that the site plan to be revised to show an aboveground basin concept and drainage outlet via gravity flow. Based on the direction, the drainage study (hydrology and hydraulics report) and preliminary grading plan have been revised to show a combination of an aboveground infiltration basin with a drywell system and a supplemental underground storage facility near the northeasterly edge of the project in order to provide the required mitigation volume for the 100-year, 24-hour storm while allowing the mitigated flows to outlet the basin via gravity flow towards the frontage streets (Mesa Linda St. / Sultanta St.).

The drainage study has been revised accordingly based on the discussions and City direction. Written responses to the drainage study comments are provided in a separate comment letter PDF file for reviewer's use and reference. The PDF with the responses are submitted along with the revised drainage study.

1.0 INTRODUCTION

1.1 Project Description

This drainage study presents preliminary hydrologic and hydraulic analyses for the proposed Mesa Linda Logistics project, also known as Newcastle-Hesperia (herein referred to as “the project”). The project is located in the City of Hesperia, bounded by Sultana Street to the north, Mesa Linda to the east, Lassen Road to the west, and existing parcels to the south. Refer to Figure 1.0 for a Vicinity Map of the project. The APN’s are 3064-581-02 and 3064-581-03.

1.2 Project Features

The overall project parcel consists of approximately 18.2 acres with an overall drainage management area of approximately 17.5 acres. The proposed improvements will consist of a tilt-up warehouse building (Buildings 1) totaling approximately 405,900 square feet, associated parking areas, sidewalks, and landscape areas. 180 auto parking stalls are anticipated to be required and the project will provide the minimum required stall counts. The project will also provide 55 dock loading positions and 56 trailer parking stalls. Approximately 16% of the site will be dedicated to landscape areas. In order to comply with the San Bernardino County storm water quality management requirements, the project also includes construction of permanent stormwater BMPs near the northeasterly area of the project.

1.3 Drainage Characteristics

In the existing condition, the site consists of an open/undeveloped space with very little vegetation. The site generally drains in a northeasterly direction onto Sultana Street and northerly existing parcels. There appears to be an offsite run-on from the southerly parcels (APN’s 3064-581-04- and 3064-581-05). It is our understanding from our research that the southerly offsite parcels (APN’s 3064-581-04 and 3064-581-05) are expected to be developed by others and based on their preliminary development concept, it appears the new development is planning to direct overflows towards Mesa Linda Street and Lassen Road. Based on this preliminary concept, it appears southerly offsite run-on to the project will be significantly reduced. It is also understood that there is no existing public storm drain along Sultana Street or Mesa Linda Street. It is currently unknown as to whether a new public storm drain pipe will be constructed along Sultana Street or Mesa Linda

Street in the near future for possible storm drain connection from the project. Runoff from the project drains in a northeasterly direction and eventually contributes to the Mojave River.

In the post-project condition, the drainage characteristics will be maintained as similar to the pre-project condition. Runoff from the site will be collected via a proposed on-site private storm drain system (including catch basins and storm drain pipes) and conveyed in the northeasterly direction to a proposed storm water management system. The proposed storm water management system will consist of a combination of an underground storage facility (for detention storage purpose) and a proprietary Modular Wetland System (for treatment purpose) along with a low-flow mechanical pump (for outlet purpose). This proposed system should address the requirements of the Mojave River Watershed Water Quality Management Plan (WQMP) as well as the San Bernardino County Flood Control. Overflow from the proposed facility will be directed towards Mesa Linda Street via a storm drain pipe and sidewalk underdrain. From this point, runoff will be conveyed in northerly direction as similar to the existing condition.

Separately, there is a technical report titled, “Victorville Master Plan of Drainage (MPD) for Oro Grande Wash and Adjacent Watersheds That Are Tributary to the Mojave River,” dated March 1992, prepared by Williamson & Schmid. According to Volume II of the aforementioned MPD and on PDF Page 177, there is an exhibit titled, “Comprehensive Storm Drain Plan Line A-10-02 Sheet 1 of 1,” showing a proposed 63-inch RCP and 66-inch RCP (labeled as Line A-10-02) along what appears to be Mesa Linda Street, downstream of the project. Based on conference call discussion with the City of Hesperia Engineering Department (Mr. Michael Thornton and Mr. Mark McKinley) on April 12, 2022 and subsequently on April 26, 2022, it was understood that the City of Hesperia currently does not have plan/mechanism to construct this public MPD storm drain along the downstream stretch of Mesa Linda Street (at least in the near future). It is also understood that there may be downstream a development(s) that concurrently being processed with the City (downstream of the project along Mesa Linda) but it appears that they are not planning to provide downstream MDP storm drain along Mesa Linda. As a result of this discussion, the direction for this project is to provide an on-site flood control mitigation through a combination of an aboveground basin with drywell system and supplemental underground storage, and then outlet mitigated flows to the frontage streets (Mesa Linda Street / Sultana Street) via gravity flow. In the future, if the downstream MPD storm drain along Mesa Linda was constructed either by the City or

downstream development, then the project's outlet configuration from the proposed basin could be retrofitted to potentially connect into the future downstream storm drain.

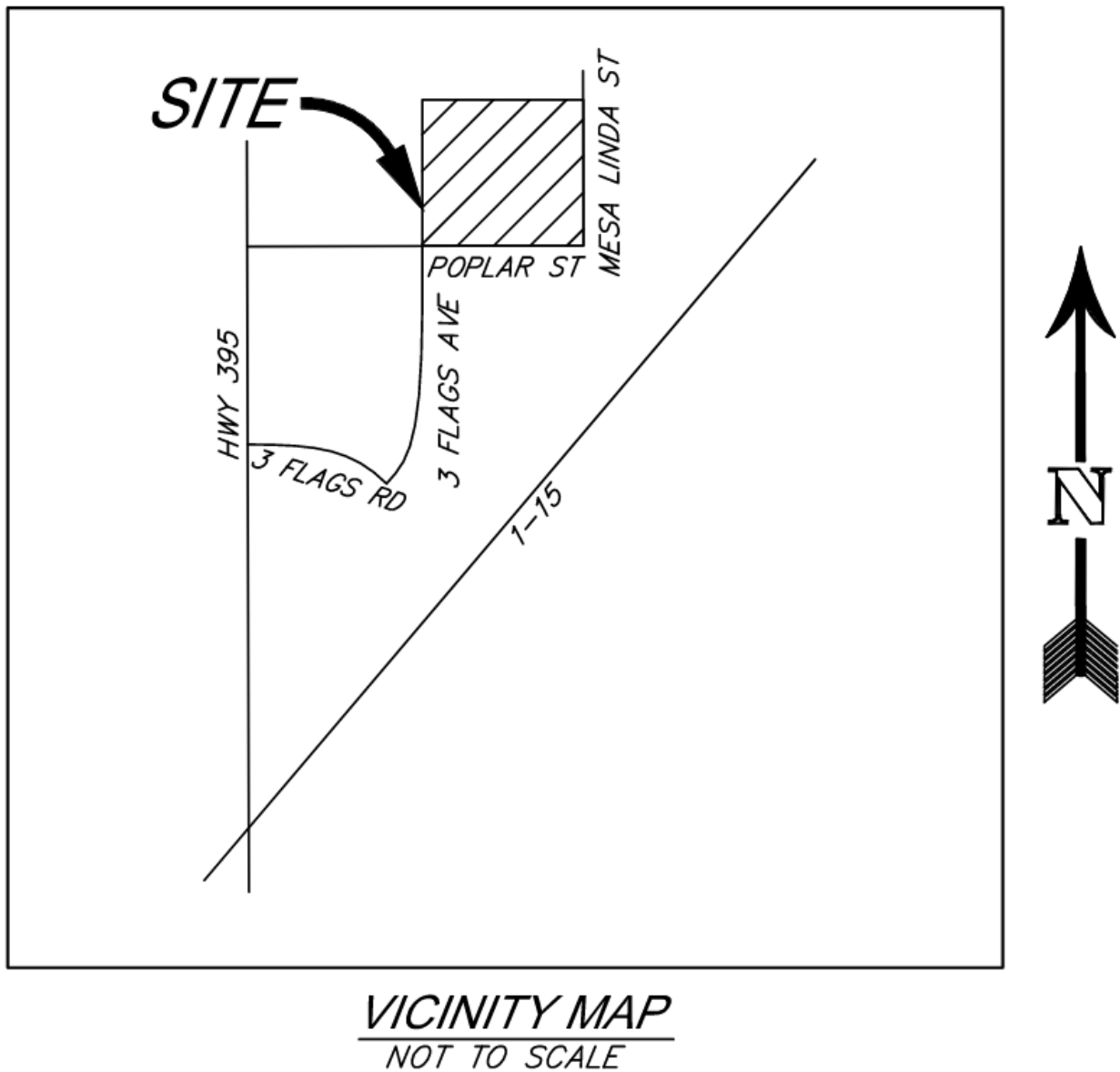
1.4 FEMA Flood Hazard Zone Information

The water courses around the project have been identified by the Federal Emergency Management Agency (FEMA) as Zone X. The project is shown on the FEMA Flood Insurance Rate Map (FIRM) number 06071C6475H, effective August 28, 2008. The proposed project will be situated within Zone X. Therefore, processing through FEMA is not 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, utilizing the City of Hesperia WQMP template. The report is titled, "Mojave River Watershed Water Quality Management Plan for Newcastle-Hesperia," with a revised date of June 24, 2022 (and any revision thereafter), prepared by SDH & Associates, Inc. (Job Number 2127). The preliminary WQMP documents how the project addresses the requirements of the permanent stormwater quality management, in accordance with the Mojave River Watershed Technical Guidance Document for Water Quality Management Plans, dated April 4, 2016.

Figure 1: Vicinity Map



2.0 HYDROLOGY

Preliminary hydrologic calculations were prepared in accordance with the guidance document title, "San Bernardino County Hydrology Manual," dated August 1986, for preliminary on-site storm drain sizing purpose. The Hydrowin 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 as well as to determine peak flows at confluence points, existing and proposed storm drain facilities, and to 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 the AES for the 10-year and 100-year storm events for each of the subareas, based on the project-specific intensity data from the NOAA Atlas 14 entered into the AES. A supporting 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-entered information of the hydrologic soil group and the land use for each basin. The percentage of impervious area (i.e. land use) in each subdrainage area was used to determine the land use entered within AES per Plate D-5.6 of the Hydrology Manual. Supporting information for parameters assigned to AES calculations is included with Appendix A of this report.

Hydrologic soil group data is available for the site through the Natural Resource Conservation Service (NRCS) Web Soil Survey, showing the site consisting primarily of type “A” soil. For the purpose of hydrologic calculations, soil type “A” has been applied for pervious areas. Supporting hydrologic soil maps for on-site and offsite are provided in Appendix A.

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 (On-site)

The hydrologic results at key points of interest for the project can be found in Table 2.1. The summary shows the hydrologic results at the proposed on-site catch basin locations (key catch basin locations) and overall on-site peak flow at the project discharge (outlet) locations. The detailed hydrologic calculation results are located in Appendix B of this report.

Table 2.1 – On-site Hydrologic Data Summary (10-year & 100-year)

Key Drainage Node ID ³	On-site Post-project ¹		
	Total Area (Acres)	Peak Flow Rate, Q ₁₀ (cfs) ²	Peak Flow Rate, Q ₁₀₀ (cfs) ²
105 (On-site Catch Basin - Surface)	1.2	2.6	4.5
125 (On-site – Discharge Location)	2.5	4.7	8.0
135 (On-site Catch Basin - Surface)	2.2	4.2	7.2
145 (On-site Catch Basin - Surface)	1.4	2.7	4.6
149 (On-site Catch Basin - Surface)	2.2	4.6	7.9
155 (On-site Catch Basin - Surface)	0.6	1.2	2.1
165 (On-site Flow into Basin)	10.1	18.3	31.5
172 (On-site Curb Opening - Surface)	1.1	2.0	3.3
173 (On-site Catch Basin - Surface)	2.1	3.4	5.9
174 (On-site Catch Basin - Surface)	1.3	2.6	4.4
175 (On-site Catch Basin - Surface)	2.0	3.6	6.1
176 (On-site Catch Basin - Surface)	1.4	2.1	3.6
180 (On-site Flow into Basin Overall)	17.4	27.7	48.2
190 (On-site Outlet Location)	17.5	27.7	48.2
190 (On-site Outlet Location)	Note:	The above un-detained flows at Node 190 are expected to be detained to pre-project levels. Refer to Section 4.0 for more details.	

Note:

1: Refer to Appendix A for supporting information.

2: “cfs”= cubic feet per second.

3: Refer to Appendix B for Drainage Study Map

2.2 Hydrologic Results (Southerly Offsite)

In the existing condition, there is an offsite run-on flow from south of the project. The offsite watershed (drainage) boundary was delineated based on the available UGSG topography, aerial imagery (from Civil 3D Online Map Aerial, as of August 2022), and Google street view. The boundary is approximated but it should provide fair representation of the contributing offsite drainage for peak flow estimate. The offsite hydrology (peak flow rates for 10-year and 100-year) were estimated based on approximately “50% impervious” surfaces which is fair representation of the existing impervious footprint within the upstream offsite drainage area. The “50% impervious” is equivalent to “5-7 Dwelling/Acre” for the land use category per the San Bernardino County Hydrology Manual and that was modeled as part of the hydrologic calculation for peak flow estimates. The offsite hydrologic results are summarized below in Table 2.2 and supporting hydrologic calculation results (AES outputs) are provided in Appendix B, following the on-site hydrologic results.

It is understood that the offsite southerly parcel is currently processing a development application with the City and their plan may be to outlet their flows onto the frontage streets (east and west). Ultimately, once the southerly offsite development takes place, the southerly offsite run-on may be eliminated or reduced. At the point, there may not be a need for the proposed perimeter drainage infrastructure but this is provided in case the project goes in first prior to the southerly offsite development and this would address an “interim” drainage condition (i.e. – potential southerly offsite run-on).

Table 2.2 –Offsite Hydrologic Data Summary (10-year & 100-year)

Key Drainage Node ID ³	Existing Offsite (Southerly Offsite) ¹		
	Total Area (Acres)	Peak Flow Rate, Q ₁₀ (cfs) ²	Peak Flow Rate, Q ₁₀₀ (cfs) ²
1050 (Southerly Offsite Run-on – Approx.)	101	69	165

Note:

1: Refer to Appendix A for supporting information. The supporting NRCS hydrologic soil group information for the offsite area is also included in the Appendix.

2: “cfs”= cubic feet per second.

3: Refer to Appendix B for Drainage Study Map Existing Offsite

3.0 HYDRAULICS

3.1 Hydraulic Methodology and Criteria

The 10-year and 100-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 calculation specific to the proposed on-site private catch basins and BMP/flood control facility overflow outlet will be conducted during final engineering and calculation output will be incorporated in Appendix C. In the post-project condition, the proposed on-site storm drain catch basins (inlets) will be designed to intercept, at a minimum, the 10-year, 1-hour peak flow rates. There are a few sump inlet (grate inlet) locations onsite and the grate inlet will be designed to accommodate the local tributary peak flows. If there were bypass flow at the proposed on-grade catch basins, the bypass flows are expected to be captured by downstream sump catch basins. The proposed basin spillway will be sized based on the 100-year un-detained peak flow rate.

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. A summary of preliminary on-site storm drain sizing calculations is provided in Appendix D.

Separately, as a solution for the "interim" drainage condition, in case this project goes in first prior to the southerly offsite development, the project provides a southerly perimeter rectangular concrete channel to intercept and convey the southerly offsite run-on flows. Based on the hydrologic estimate, the project plans to provide a rectangular concrete channel with the following dimension:

B=5'; D=3.5'; S=0.5% (min.). This channel drains easterly to a gravel basin near the southeasterly corner of the site and overflow is designed to outlet via sidewalk underdrain towards Mesa Linda Street. This facility is sized to convey the potential 100-year offsite run-on flow from south. A supporting hydraulic calculation for this perimeter drainage facility is provided in Appendix D.

4.0 FLOOD CONTROL ASSESSMENT

The project is expected to increase the peak flow rate as a result of the proposed improvements. The project is proposing to provide a combination of an aboveground infiltration basin with drywell system and a supplemental underground storage facility near the easterly edge of the project to address the requirements of the flood control mitigation, as well as the storm water quality management and hydromodification management. The storm water quality and hydromodification management requirements are addressed in a separate WQMP report. The storm water quality low-flows will be infiltrated via the proposed infiltration basin bottom and drywell system. For the higher flows for flood control purpose, the proposed infiltration basin will have an outlet mechanism near the northerly edge of the basin (i.e. – restricted pipes underneath the proposed overflow concrete spillway structure) to allow the mitigated flows towards the frontage streets (Mesa Linda Street / Sultanta Street). The overflow from the underground storage facility will be directed towards the frontage streets via the proposed overflow concrete spillway structure. Preliminary flood control attenuation calculations have been performed for the 100-year, 24-hour storm event, as requested by the City of Hesperia Engineering Department. This flood control mitigation analysis has been done in accordance with the San Bernardino County Hydrology and Detention criteria. The effective depth of the proposed infiltration basin and the supplemental underground storage facility is approximately 4 feet. This combination of the infiltration basin and supplemental underground storage has been sized to provide the required flood control volume for the 100-year, 24-hour storm event. Also, as requested by the City of Hesperia, the proposed mitigation facility is expected to drain the storm water runoff in approximately 24 hours so that it would be ready for next storms and minimize potential flooding concern in frontage streets. A summary of the preliminary detention calculation results (volume summary) is provided below in Table 4.1.

Table 4.1 –Detention Calculation Summary

Basin ID	Peak Flow Rate Comparison at Point of Interest (cfs ¹)				
	Pre-project “Q25”	Pre-project “90% of Q25”	Post-project – Q100 Un-detained	Post-project – Q100 Detained	Q100 (Det.) < 90% of Q25 ?
Basin 100	30.2	27.2	38.9	25.6	Yes - OK

Note:

1: “cfs”= cubic feet per second.

2: Refer to Appendix E for supporting materials.

Based on the flood control detention calculations and as shown on the summary table above, the project has demonstrated through the flood control detention calculations that the 100-year post-project un-detained peak flow rates will be detained back to 90% of the 25-year pre-project peak flow rates (or less) via the proposed mitigation facilities (a combination of the aboveground infiltration basin with drywell system and supplemental underground storage facility). Therefore, the proposed mitigation for this project will be consistent with the San Bernardino County flood control mitigation/detention criteria. Supporting documentation, 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.

5.0 CONCLUSION

This drainage study presents preliminary hydrologic and hydraulic analyses for the proposed Mesa Linda Logistics Center project in the City of Hesperia. Hydrologic calculations were computed in accordance with the San Bernardino County Hydrology Manual, dated August 1986 (guidance document). The peak discharge rates for the 10-year and 100-year, 1-hour storm events have been determined for the project using the Advanced Engineering Software (AES) 2016 Rational Method Analysis (Version 23.0). The relevant peak flow rates were used to determine the preliminary onsite private storm drain sizes. In an effort to intercept and convey the southerly offsite run-on flow, the project plans to provide a perimeter rectangular concrete channel along the southerly edge of the site into a gravel basin near the southeasterly area of the site prior to discharging the offsite flow towards Mesa Linda Street via sidewalk underdrain. This perimeter channel is provided for an “interim condition” in case this project goes in prior to the southerly offsite development. It is understood that the southerly offsite is planning to outlet their flow onto frontage streets and ultimately the project will expect very minimal offsite flow from the southerly parcel.

The project proposes a combination of an aboveground infiltration basin with drywell system and a supplemental underground storage facility near the easterly edge of the project to address the requirements of the flood control mitigation, storm water quality management and hydromodification management. Low-flows will be infiltration via the proposed infiltration basin bottom and drywell system. The higher flows will be mitigated and outlet through restricted pipes underneath the proposed spillway structure towards the frontage streets (Mesa Linda Street / Sultana Street). Overflow from the underground system will be directed towards the frontage streets via a proposed concrete spillway. In summary, with the proposed mitigation mentioned above, the drainage characteristics will be maintained and no adverse impacts are anticipated to the downstream drainage facilities.

Appendix A

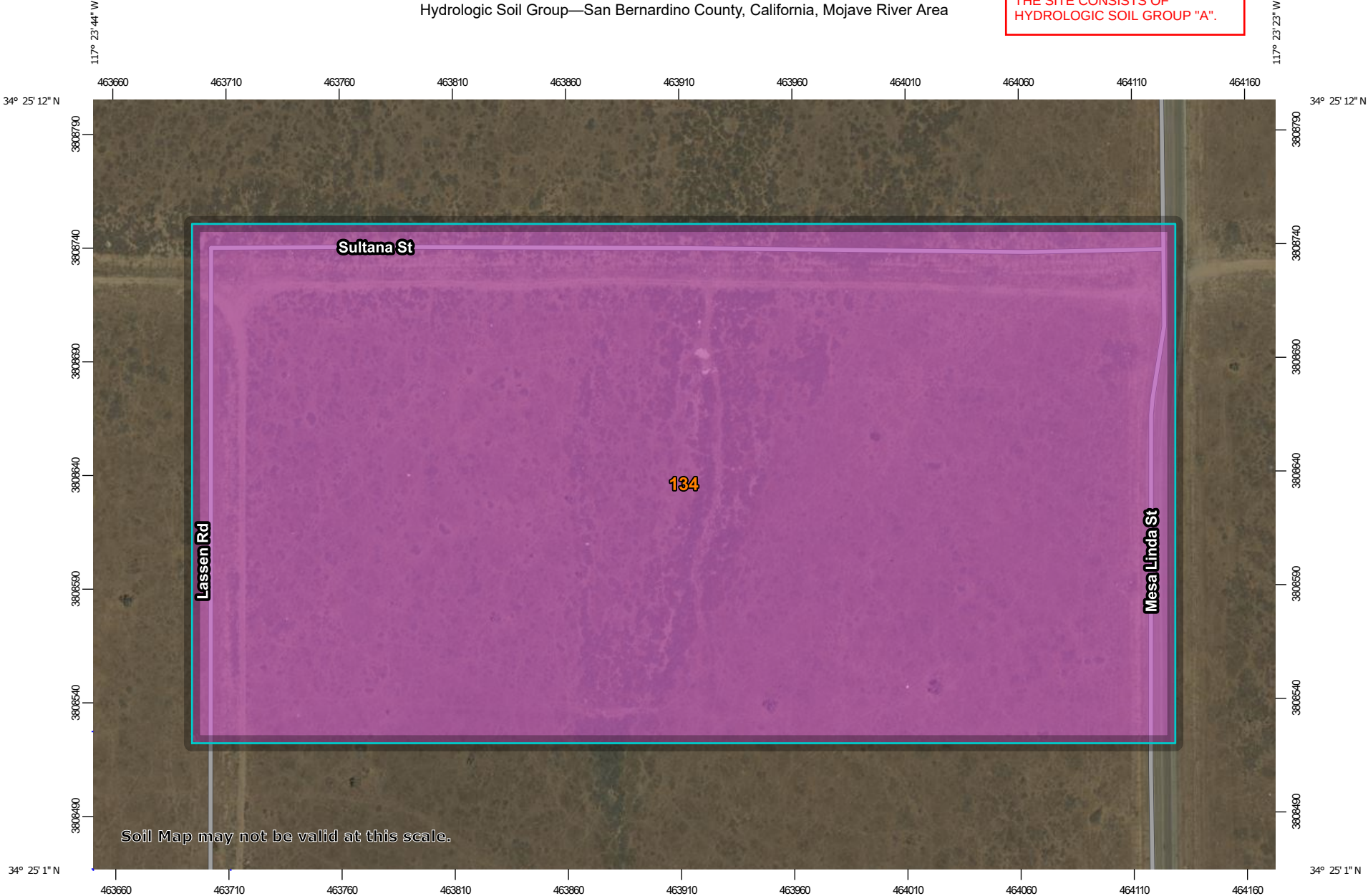
Hydrologic Backup Information

Includes:

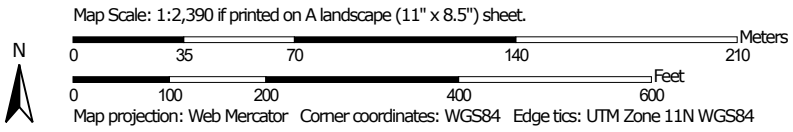
1. Web Soil Survey Hydrologic Soil Group (On-site and Offsite)
2. NOAA Atlas 14 Annotated Rainfall Intensity Chart
3. FEMA FIRMette

Hydrologic Soil Group—San Bernardino County, California, Mojave River Area

SUPPORTING MATERIALS -
HYDROLOGIC SOILS GROUP
THE SITE CONSISTS OF
HYDROLOGIC SOIL GROUP "A".



Soil Map may not be valid at this scale.



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available

Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: San Bernardino County, California, Mojave River Area
 Survey Area Data: Version 13, 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: Jun 26, 2019—Jul 8, 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
134	HESPERIA LOAMY FINE SAND, 2 TO 5 PERCENT SLOPES	A	24.6	100.0%
Totals for Area of Interest			24.6	100.0%

Description

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

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

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

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

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

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

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

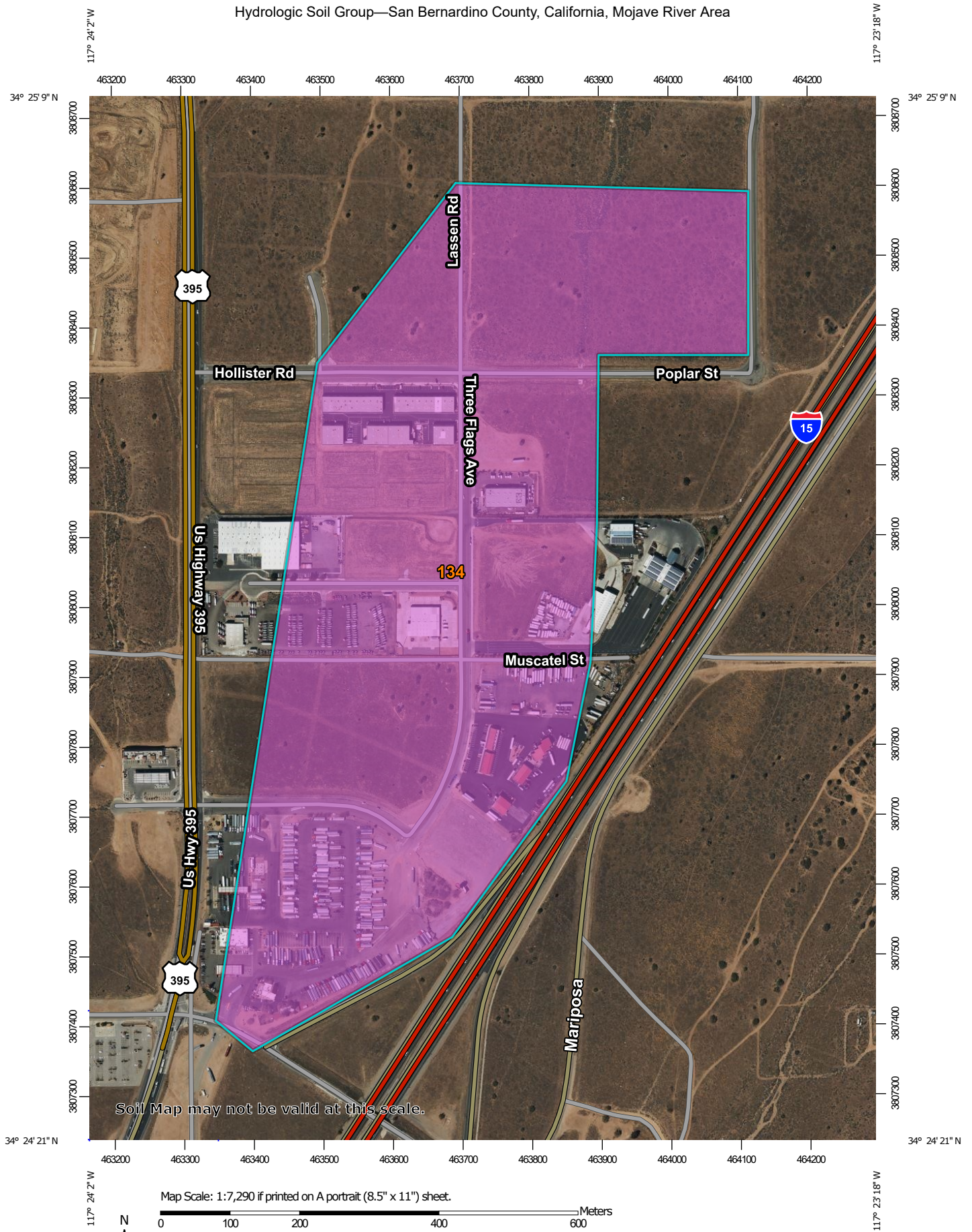
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Hydrologic Soil Group—San Bernardino County, California, Mojave River Area



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available

Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: San Bernardino County, California, Mojave River Area

Survey Area Data: Version 13, 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: Mar 27, 2021—May 24, 2021

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
134	HESPERIA LOAMY FINE SAND, 2 TO 5 PERCENT SLOPES	A	126.1	100.0%
Totals for Area of Interest			126.1	100.0%

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



NOAA Atlas 14, Volume 6, Version 2
Location name: Hesperia, California, USA*
Latitude: 34.4186°, Longitude: -117.3924°
Elevation: 3594.25 ft**

* source: ESRI Maps

** source: USGS



SUPPORTING MATERIALS -
NOAA ATLAS 14 -
INTENSITY
10-YEAR, 25-YEAR, AND
100-YEAR

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 (0.864-1.27)	1.49 (1.22-1.81)	2.06 (1.70-2.53)	2.54 (2.08-3.14)	3.20 (2.53-4.09)	3.72 (2.88-4.85)	4.25 (3.20-5.68)	4.80 (3.53-6.60)	5.57 (3.92-7.98)	6.17 (4.20-9.14)
10-min	0.750 (0.618-0.912)	1.06 (0.882-1.30)	1.48 (1.22-1.81)	1.82 (1.49-2.25)	2.30 (1.82-2.93)	2.66 (2.06-3.47)	3.04 (2.30-4.07)	3.44 (2.53-4.73)	3.98 (2.81-5.72)	4.42 (3.01-6.56)
15-min	0.604 (0.500-0.736)	0.856 (0.708-1.05)	1.19 (0.984-1.46)	1.47 (1.20-1.82)	1.85 (1.46-2.36)	2.15 (1.66-2.80)	2.45 (1.85-3.28)	2.77 (2.04-3.81)	3.22 (2.26-4.61)	3.56 (2.42-5.29)
30-min	0.456 (0.378-0.556)	0.648 (0.536-0.792)	0.902 (0.742-1.10)	1.11 (0.908-1.37)	1.40 (1.11-1.79)	1.62 (1.26-2.12)	1.85 (1.40-2.48)	2.09 (1.54-2.88)	2.43 (1.71-3.48)	2.69 (1.83-3.99)
60-min	0.323 (0.267-0.394)	0.458 (0.379-0.560)	0.637 (0.525-0.781)	0.785 (0.642-0.970)	0.989 (0.782-1.26)	1.15 (0.888-1.50)	1.31 (0.990-1.75)	1.48 (1.09-2.04)	1.72 (1.21-2.46)	1.90 (1.30-2.82)
2-hr	0.236 (0.196-0.288)	0.320 (0.265-0.392)	0.434 (0.358-0.532)	0.530 (0.434-0.654)	0.664 (0.525-0.848)	0.770 (0.596-1.00)	0.881 (0.666-1.18)	0.998 (0.734-1.37)	1.16 (0.820-1.67)	1.30 (0.882-1.92)
3-hr	0.198 (0.165-0.242)	0.265 (0.219-0.324)	0.356 (0.294-0.437)	0.433 (0.354-0.535)	0.541 (0.428-0.692)	0.629 (0.487-0.820)	0.720 (0.544-0.963)	0.818 (0.601-1.13)	0.957 (0.674-1.37)	1.07 (0.728-1.59)
6-hr	0.142 (0.117-0.173)	0.188 (0.155-0.229)	0.251 (0.207-0.307)	0.305 (0.249-0.376)	0.381 (0.302-0.487)	0.444 (0.344-0.579)	0.510 (0.385-0.682)	0.581 (0.427-0.800)	0.684 (0.482-0.981)	0.769 (0.523-1.14)
12-hr	0.092 (0.076-0.112)	0.125 (0.103-0.153)	0.170 (0.140-0.208)	0.209 (0.170-0.258)	0.263 (0.208-0.337)	0.308 (0.238-0.402)	0.355 (0.268-0.475)	0.406 (0.299-0.559)	0.480 (0.338-0.688)	0.540 (0.368-0.802)
24-hr	0.063 (0.056-0.072)	0.088 (0.078-0.101)	0.122 (0.108-0.141)	0.151 (0.133-0.176)	0.193 (0.164-0.233)	0.227 (0.188-0.279)	0.263 (0.213-0.331)	0.301 (0.237-0.390)	0.357 (0.270-0.481)	0.402 (0.294-0.562)
2-day	0.036 (0.032-0.042)	0.051 (0.045-0.058)	0.071 (0.062-0.082)	0.088 (0.077-0.103)	0.113 (0.096-0.136)	0.133 (0.111-0.164)	0.155 (0.126-0.196)	0.179 (0.141-0.232)	0.214 (0.162-0.289)	0.242 (0.177-0.339)
3-day	0.026 (0.023-0.030)	0.036 (0.032-0.042)	0.051 (0.045-0.059)	0.063 (0.055-0.074)	0.081 (0.069-0.098)	0.096 (0.080-0.118)	0.113 (0.091-0.142)	0.130 (0.103-0.169)	0.156 (0.118-0.210)	0.177 (0.130-0.248)
4-day	0.021 (0.019-0.024)	0.029 (0.026-0.034)	0.041 (0.036-0.047)	0.051 (0.045-0.060)	0.066 (0.056-0.079)	0.078 (0.065-0.096)	0.091 (0.074-0.115)	0.106 (0.083-0.137)	0.127 (0.096-0.171)	0.144 (0.105-0.202)
7-day	0.013 (0.012-0.015)	0.019 (0.016-0.021)	0.026 (0.023-0.030)	0.032 (0.028-0.038)	0.041 (0.035-0.050)	0.049 (0.041-0.060)	0.057 (0.046-0.072)	0.066 (0.052-0.086)	0.079 (0.060-0.107)	0.090 (0.066-0.126)
10-day	0.010 (0.009-0.012)	0.014 (0.012-0.016)	0.019 (0.017-0.022)	0.024 (0.021-0.028)	0.031 (0.026-0.037)	0.036 (0.030-0.045)	0.042 (0.034-0.053)	0.049 (0.038-0.063)	0.058 (0.044-0.079)	0.066 (0.048-0.093)
20-day	0.006 (0.005-0.007)	0.008 (0.007-0.010)	0.011 (0.010-0.013)	0.014 (0.012-0.017)	0.018 (0.015-0.022)	0.021 (0.018-0.026)	0.025 (0.020-0.031)	0.029 (0.023-0.037)	0.034 (0.026-0.047)	0.039 (0.029-0.055)
30-day	0.005 (0.004-0.005)	0.006 (0.006-0.007)	0.009 (0.008-0.010)	0.011 (0.010-0.013)	0.014 (0.012-0.017)	0.017 (0.014-0.020)	0.019 (0.016-0.024)	0.022 (0.018-0.029)	0.027 (0.020-0.036)	0.030 (0.022-0.042)
45-day	0.004 (0.003-0.004)	0.005 (0.005-0.006)	0.007 (0.006-0.008)	0.009 (0.007-0.010)	0.011 (0.009-0.013)	0.013 (0.011-0.016)	0.015 (0.012-0.019)	0.017 (0.013-0.022)	0.020 (0.015-0.028)	0.023 (0.017-0.033)
60-day	0.003 (0.003-0.004)	0.004 (0.004-0.005)	0.006 (0.005-0.007)	0.007 (0.006-0.008)	0.009 (0.008-0.011)	0.010 (0.009-0.013)	0.012 (0.010-0.015)	0.014 (0.011-0.018)	0.017 (0.013-0.023)	0.019 (0.014-0.027)

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

National Flood Hazard Layer FIRMette



117°23'48"W 34°25'22"N



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

0 250 500 1,000 1,500 2,000 Feet 1:6,000

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

117°23'11"W 34°24'53"N

Legend

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

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



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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **10/20/2021 at 12:45 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

Appendix B

Modified Rational Method Results

Includes:

1. Post-project Drainage Study Map
2. Post-project AES Rational Method Output (10-year & 100-year)
3. Existing Offsite Drainage Study Map (Southerly Offsite)
4. Offsite AES Rational Method Output (10-year & 100-year)

\\S:\DWG\DRAWINGS\NEWCASTLE-HESPERIA\122524.dwg 2022-06-23 12:25PM - DBH

NOTES:

1. THIS DRAINAGE STUDY MAP IS PREPARED IN SUPPORT OF THE ON-SITE PRELIMINARY HYDROLOGIC CALCULATIONS AND STORM DRAIN SIZING.
2. THE SITE IS SITUATED ON HYDROLOGIC SOIL GROUPS A. FOR THE PURPOSE OF HYDROLOGIC CALCULATION, SOIL GROUP A WAS USED IN THE CALCULATION FOR THE PERVIOUS AREAS.
3. AS SIMILAR TO THE EXISTING CONDITION DRAINAGE CHARACTERISTICS, RUNOFF FROM THE PROPOSED DEVELOPMENT WILL BE DIRECTED IN A NORTHEASTERLY DIRECTION TOWARDS A PROPOSED STORM WATER MANAGEMENT SYSTEM FOR FLOOD CONTROL MITIGATION AND WATER QUALITY TREATMENT PURPOSES PRIOR TO OUTLETING TOWARDS SULTANA STREET / MESA LINDA STREET. THE PROPOSED STORM WATER MANAGEMENT SYSTEM WILL INCLUDE A COMBINATION OF AN ABOVEGROUND INFILTRATION BASIN WITH DRYWELL AND A SUPPLEMENTAL UNDERGROUND STORAGE TO ADDRESS REQUIREMENTS OF THE STORM WATER QUALITY MANAGEMENT, HYDROLOGIC CONDITION OF CONCERN (HYDROMODIFICATION), AND FLOOD CONTROL MITIGATION. FROM THE PROJECT OUTLET POINT, RUNOFF WILL BE CONVEYED IN A NORTHEASTERLY DIRECTION IN A SIMILAR FASHION AS THE EXISTING CONDITION AND EVENTUALLY DISCHARGE INTO THE MOJAVE RIVER. THE OVERALL PARCEL AREA IS APPROXIMATELY 18.2 ACRES WITH APPROXIMATELY 17.5 ACRES OF ON-SITE DRAINAGE MANAGEMENT. IN THE EXISTING CONDITION, THERE MAY BE MINOR OFFSITE RUN-ON FROM THE SOUTHERLY PARCELS; HOWEVER, BASED ON OUR UNDERSTANDING, THE SOUTHERLY OFFSITE PARCELS ARE TO BE DEVELOPED BY OTHERS AND THEIR PRELIMINARY SITE PLAN APPEARS TO SHOW THE OVERFLOW WILL BE DIRECTED TOWARDS THE TWO FRONTAGE STREETS (MESA LINDA STREET AND LASSEN ROAD). THEREFORE, OFFSITE RUN-ON ALONG THE SOUTHERLY EDGE IS EXPECTED TO BE INSIGNIFICANT. HOWEVER, TO ADDRESS POTENTIAL CONCERN, THE PROJECT PROPOSES A CONCRETE V-DITCH ALONG THE SOUTHERLY EDGE OF THE PROJECT AND OUTLET TO MESA LINDA STREET.
4. THE PROJECT IS SITUATED WITHIN "ZONE X" BASED ON THE FEMA FLOOD INSURANCE MAP NUMBER 06071C6475H, EFFECTIVE AUGUST 28, 2008. THEREFORE, NO FEMA SUBMITTAL/PROCESSING ARE EXPECTED FOR THIS PROJECT.

LEGEND

TRACT BOUNDARY

MAJOR DRAINAGE BOUNDARY

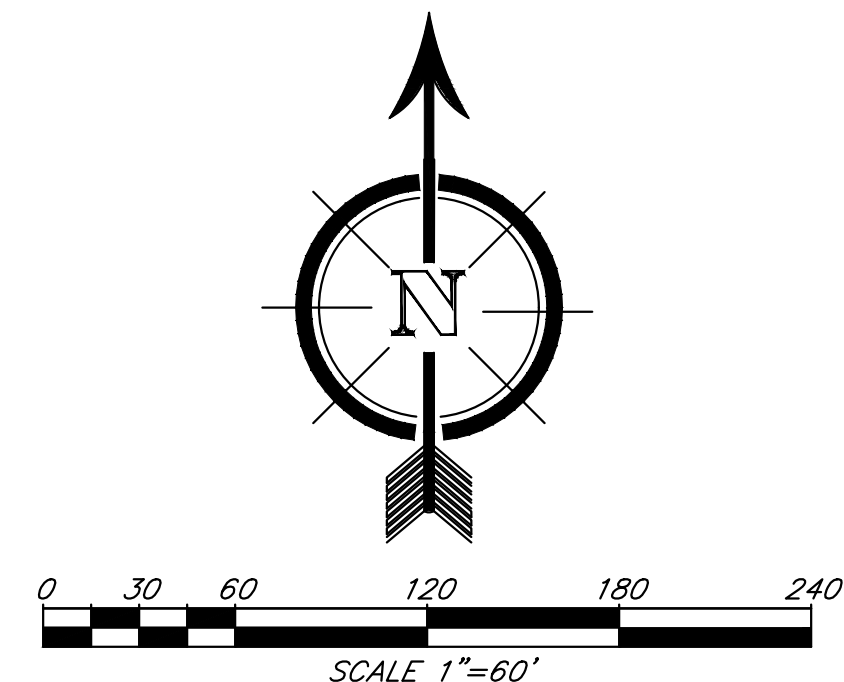
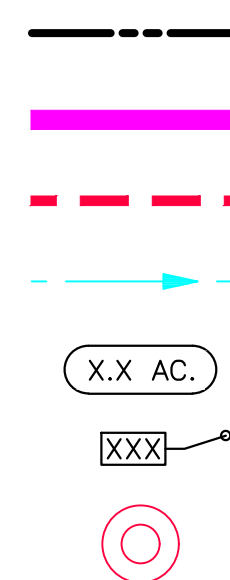
SUB BASIN BOUNDARY

SURFACE FLOW PATH

DRAINAGE ACREAGE

BASIN NODE ID

DISCHARGE LOCATION



**DRAINAGE STUDY MAP
FOR
NEWCASTLE-HESPERIA
(POST-PROJECT)**

JN 2127

REVISED: 6/24/2022

NOT FOR CONSTRUCTION – EXHIBIT FOR PRELIMINARY DRAINAGE STUDY ONLY

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
(c) Copyright 1983-2016 Advanced Engineering Software (aes)
Ver. 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 *****
* NEWCASTLE-HESPERIA (CITY OF HESPERIA) *
* POST-PROJECT CONDITION: 10-YEAR STORM EVENT *
* BASIN 100 *

FILE NAME: NH1HP10.RAT
TIME/DATE OF STUDY: 11:00 06/23/2022

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

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
USER-DEFINED TABLED RAINFALL USED

NUMBER OF [TIME,INTENSITY] DATA PAIRS = 5

- 1) 5.00; 2.540
- 2) 10.00; 1.820
- 3) 15.00; 1.470
- 4) 30.00; 1.110
- 5) 60.00; 0.785

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT- / PARK- SIDE / SIDE / WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH LIP HIKE (FT) (FT) (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.50	1.50 0.0312 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.*
 *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 101.00 TO NODE 105.00 IS CODE = 21

>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 105.00
 ELEVATION DATA: UPSTREAM(FEET) = 99.10 DOWNSTREAM(FEET) = 91.40

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$

SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 5.000

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.540

SUBAREA T_c AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	T_c (MIN.)
COMMERCIAL	A	0.70	0.98	0.100	32	5.00
COMMERCIAL	A	0.50	0.98	0.100	32	5.00

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.97

SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.100

SUBAREA RUNOFF(CFS) = 2.64

TOTAL AREA(ACRES) = 1.20 PEAK FLOW RATE(CFS) = 2.64

FLOW PROCESS FROM NODE 105.00 TO NODE 120.00 IS CODE = 41

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 88.86 DOWNSTREAM(FEET) = 87.23
 FLOW LENGTH(FEET) = 3.00 MANNING'S N = 0.012
 DEPTH OF FLOW IN 18.0 INCH PIPE IS 2.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 20.75
 GIVEN PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 2.64
 PIPE TRAVEL TIME(MIN.) = 0.00 T_c (MIN.) = 5.00
 LONGEST FLOWPATH FROM NODE 101.00 TO NODE 120.00 = 108.00 FEET.

FLOW PROCESS FROM NODE 120.00 TO NODE 130.00 IS CODE = 41

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 87.23 DOWNSTREAM(FEET) = 85.74
 FLOW LENGTH(FEET) = 307.00 MANNING'S N = 0.012
 DEPTH OF FLOW IN 18.0 INCH PIPE IS 7.4 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 3.87
 GIVEN PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 2.64
 PIPE TRAVEL TIME(MIN.) = 1.32 Tc(MIN.) = 6.32
 LONGEST FLOWPATH FROM NODE 101.00 TO NODE 130.00 = 415.00 FEET.

FLOW PROCESS FROM NODE 130.00 TO NODE 130.00 IS CODE = 1

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

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 6.32
 RAINFALL INTENSITY(INCH/HR) = 2.35
 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.97
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 1.20
 TOTAL STREAM AREA(ACRES) = 1.20
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 2.64

FLOW PROCESS FROM NODE 121.00 TO NODE 125.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 332.00
 ELEVATION DATA: UPSTREAM(FEET) = 92.50 DOWNSTREAM(FEET) = 88.80

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 7.619
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.163
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.40	0.98	0.100	32	7.62
COMMERCIAL	A	1.10	0.98	0.100	32	7.62

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 4.65
 TOTAL AREA(ACRES) = 2.50 PEAK FLOW RATE(CFS) = 4.65

FLOW PROCESS FROM NODE 125.00 TO NODE 130.00 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 86.30 DOWNSTREAM(FEET) = 85.74
 FLOW LENGTH(FEET) = 11.50 MANNING'S N = 0.012
 DEPTH OF FLOW IN 18.0 INCH PIPE IS 5.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 10.45
 GIVEN PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 4.65
 PIPE TRAVEL TIME(MIN.) = 0.02 Tc(MIN.) = 7.64
 LONGEST FLOWPATH FROM NODE 121.00 TO NODE 130.00 = 343.50 FEET.

FLOW PROCESS FROM NODE 130.00 TO NODE 130.00 IS CODE = 1

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

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 7.64
 RAINFALL INTENSITY(INCH/HR) = 2.16
 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 2.50
 TOTAL STREAM AREA(ACRES) = 2.50
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 4.65

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	2.64	6.32	2.349	0.97(0.10)	0.10	1.2	101.00
2	4.65	7.64	2.160	0.98(0.10)	0.10	2.5	121.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	6.84	6.32	2.349	0.97(0.10)	0.10	3.3	101.00
2	7.06	7.64	2.160	0.98(0.10)	0.10	3.7	121.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 7.06 Tc(MIN.) = 7.64
 EFFECTIVE AREA(ACRES) = 3.70 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 3.7
 LONGEST FLOWPATH FROM NODE 101.00 TO NODE 130.00 = 415.00 FEET.

FLOW PROCESS FROM NODE 130.00 TO NODE 140.00 IS CODE = 41

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-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 85.74 DOWNSTREAM(FEET) = 84.42
FLOW LENGTH(FEET) = 265.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 18.0 INCH PIPE IS 13.7 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.89
GIVEN PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 7.06
PIPE TRAVEL TIME(MIN.) = 0.90 Tc(MIN.) = 8.54
LONGEST FLOWPATH FROM NODE 101.00 TO NODE 140.00 = 680.00 FEET.

*****
FLOW PROCESS FROM NODE 140.00 TO NODE 140.00 IS CODE = 1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 8.54
RAINFALL INTENSITY(INCH/HR) = 2.03
AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 3.70
TOTAL STREAM AREA(ACRES) = 3.70
PEAK FLOW RATE(CFS) AT CONFLUENCE = 7.06

*****
FLOW PROCESS FROM NODE 131.00 TO NODE 135.00 IS CODE = 21
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 314.00
ELEVATION DATA: UPSTREAM(FEET) = 91.80 DOWNSTREAM(FEET) = 87.47

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 7.141
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.232
SUBAREA Tc AND LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 1.30 0.98 0.100 32 7.14
COMMERCIAL A 0.90 0.98 0.100 32 7.14
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 4.23
TOTAL AREA(ACRES) = 2.20 PEAK FLOW RATE(CFS) = 4.23

```

FLOW PROCESS FROM NODE 135.00 TO NODE 140.00 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 84.97 DOWNSTREAM(FEET) = 84.42
FLOW LENGTH(FEET) = 11.50 MANNING'S N = 0.012
DEPTH OF FLOW IN 18.0 INCH PIPE IS 5.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 10.10
GIVEN PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 4.23
PIPE TRAVEL TIME(MIN.) = 0.02 Tc(MIN.) = 7.16
LONGEST FLOWPATH FROM NODE 131.00 TO NODE 140.00 = 325.50 FEET.

FLOW PROCESS FROM NODE 140.00 TO NODE 140.00 IS CODE = 1

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

=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 7.16
RAINFALL INTENSITY(INCH/HR) = 2.23
AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 2.20
TOTAL STREAM AREA(ACRES) = 2.20
PEAK FLOW RATE(CFS) AT CONFLUENCE = 4.23

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	6.84	7.23	2.219	0.97(0.10)	0.10	3.3	101.00
1	7.06	8.54	2.030	0.98(0.10)	0.10	3.7	121.00
2	4.23	7.16	2.229	0.98(0.10)	0.10	2.2	131.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	11.03	7.16	2.229	0.97(0.10)	0.10	5.4	131.00
2	11.04	7.23	2.219	0.97(0.10)	0.10	5.5	101.00
3	10.89	8.54	2.030	0.98(0.10)	0.10	5.9	121.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 11.04 Tc(MIN.) = 7.23
EFFECTIVE AREA(ACRES) = 5.47 AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 5.9
LONGEST FLOWPATH FROM NODE 101.00 TO NODE 140.00 = 680.00 FEET.

FLOW PROCESS FROM NODE 140.00 TO NODE 146.00 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 84.42 DOWNSTREAM(FEET) = 83.11
FLOW LENGTH(FEET) = 262.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 24.0 INCH PIPE IS 14.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.61
GIVEN PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 11.04
PIPE TRAVEL TIME(MIN.) = 0.78 Tc(MIN.) = 8.01
LONGEST FLOWPATH FROM NODE 101.00 TO NODE 146.00 = 942.00 FEET.

FLOW PROCESS FROM NODE 146.00 TO NODE 146.00 IS CODE = 1

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

=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 8.01
RAINFALL INTENSITY(INCH/HR) = 2.11
AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.97
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 5.47
TOTAL STREAM AREA(ACRES) = 5.90
PEAK FLOW RATE(CFS) AT CONFLUENCE = 11.04

FLOW PROCESS FROM NODE 141.00 TO NODE 145.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 314.00
ELEVATION DATA: UPSTREAM(FEET) = 90.30 DOWNSTREAM(FEET) = 86.17

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 7.208
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.222

SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.40	0.98	0.100	32	7.21

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 2.68
 TOTAL AREA(ACRES) = 1.40 PEAK FLOW RATE(CFS) = 2.68

FLOW PROCESS FROM NODE 145.00 TO NODE 146.00 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 83.17 DOWNSTREAM(FEET) = 83.11
 FLOW LENGTH(FEET) = 11.50 MANNING'S N = 0.012
 DEPTH OF FLOW IN 18.0 INCH PIPE IS 7.3 INCHES
 PIPE-FLOW VELOCITY(Feet/Sec.) = 4.00
 GIVEN PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 2.68
 PIPE TRAVEL TIME(MIN.) = 0.05 Tc(MIN.) = 7.26
 LONGEST FLOWPATH FROM NODE 141.00 TO NODE 146.00 = 325.50 FEET.

FLOW PROCESS FROM NODE 146.00 TO NODE 146.00 IS CODE = 1

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

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 7.26
 RAINFALL INTENSITY(INCH/HR) = 2.22
 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 1.40
 TOTAL STREAM AREA(ACRES) = 1.40
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 2.68

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	11.03	7.94	2.117	0.97(0.10)	0.10	5.4	131.00
1	11.04	8.01	2.107	0.97(0.10)	0.10	5.5	101.00
1	10.89	9.32	1.918	0.98(0.10)	0.10	5.9	121.00
2	2.68	7.26	2.215	0.98(0.10)	0.10	1.4	141.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO

CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	13.25	7.26	2.215	0.98(0.10)	0.10	6.4	141.00
2	13.58	7.94	2.117	0.97(0.10)	0.10	6.8	131.00
3	13.58	8.01	2.107	0.97(0.10)	0.10	6.9	101.00
4	13.20	9.32	1.918	0.98(0.10)	0.10	7.3	121.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 13.58 Tc(MIN.) = 8.01
 EFFECTIVE AREA(ACRES) = 6.87 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 7.3
 LONGEST FLOWPATH FROM NODE 101.00 TO NODE 146.00 = 942.00 FEET.

FLOW PROCESS FROM NODE 146.00 TO NODE 150.00 IS CODE = 41

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(Feet) = 83.11 DOWNSTREAM(Feet) = 80.00
 FLOW LENGTH(Feet) = 46.00 MANNING'S N = 0.012
 DEPTH OF FLOW IN 24.0 INCH PIPE IS 7.7 INCHES
 PIPE-FLOW VELOCITY(Feet/Sec.) = 15.51
 GIVEN PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 13.58
 PIPE TRAVEL TIME(MIN.) = 0.05 Tc(MIN.) = 8.06
 LONGEST FLOWPATH FROM NODE 101.00 TO NODE 150.00 = 988.00 FEET.

FLOW PROCESS FROM NODE 150.00 TO NODE 150.00 IS CODE = 1

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

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 8.06
 RAINFALL INTENSITY(INCH/HR) = 2.10
 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.97
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 6.87
 TOTAL STREAM AREA(ACRES) = 7.30
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 13.58

FLOW PROCESS FROM NODE 148.00 TO NODE 149.00 IS CODE = 21

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

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 169.00
ELEVATION DATA: UPSTREAM(FEET) = 88.40 DOWNSTREAM(FEET) = 86.52

$T_c = K * [(LENGTH^{**} 3.00) / (ELEVATION\ CHANGE)]^{**0.20}$

SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 5.818

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.422

SUBAREA T_c AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	T_c (MIN.)
COMMERCIAL	A	0.70	0.98	0.100	32	5.82
COMMERCIAL	A	1.50	0.98	0.100	32	5.82

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.100

SUBAREA RUNOFF(CFS) = 4.60

TOTAL AREA(ACRES) = 2.20 PEAK FLOW RATE(CFS) = 4.60

FLOW PROCESS FROM NODE 149.00 TO NODE 150.00 IS CODE = 41

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 84.00 DOWNSTREAM(FEET) = 80.00

FLOW LENGTH(FEET) = 15.00 MANNING'S N = 0.012

DEPTH OF FLOW IN 18.0 INCH PIPE IS 3.5 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 19.05

GIVEN PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 4.60

PIPE TRAVEL TIME(MIN.) = 0.01 T_c (MIN.) = 5.83

LONGEST FLOWPATH FROM NODE 148.00 TO NODE 150.00 = 184.00 FEET.

FLOW PROCESS FROM NODE 150.00 TO NODE 150.00 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.) = 5.83

RAINFALL INTENSITY(INCH/HR) = 2.42

AREA-AVERAGED F_m (INCH/HR) = 0.10

AREA-AVERAGED F_p (INCH/HR) = 0.97

AREA-AVERAGED A_p = 0.10

EFFECTIVE STREAM AREA(ACRES) = 2.20

TOTAL STREAM AREA(ACRES) = 2.20

PEAK FLOW RATE(CFS) AT CONFLUENCE = 4.60

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	13.25	7.31	2.208	0.98(0.10)	0.10	6.4	141.00
1	13.58	7.99	2.110	0.97(0.10)	0.10	6.8	131.00
1	13.58	8.06	2.100	0.97(0.10)	0.10	6.9	101.00
1	13.20	9.37	1.911	0.98(0.10)	0.10	7.3	121.00
2	4.60	5.83	2.420	0.97(0.10)	0.10	2.2	148.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	16.24	5.83	2.420	0.97(0.10)	0.10	7.3	148.00
2	17.43	7.31	2.208	0.98(0.10)	0.10	8.6	141.00
3	17.57	7.99	2.110	0.97(0.10)	0.10	9.0	131.00
4	17.55	8.06	2.100	0.97(0.10)	0.10	9.1	101.00
5	16.79	9.37	1.911	0.98(0.10)	0.10	9.5	121.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 17.57 Tc(MIN.) = 7.99
EFFECTIVE AREA(ACRES) = 9.04 AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 9.5
LONGEST FLOWPATH FROM NODE 101.00 TO NODE 150.00 = 988.00 FEET.

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) = 80.00 DOWNSTREAM(FEET) = 79.00
FLOW LENGTH(FEET) = 16.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 24.0 INCH PIPE IS 9.1 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 16.20
GIVEN PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 17.57
PIPE TRAVEL TIME(MIN.) = 0.02 Tc(MIN.) = 8.00
LONGEST FLOWPATH FROM NODE 101.00 TO NODE 160.00 = 1004.00 FEET.

FLOW PROCESS FROM NODE 160.00 TO NODE 160.00 IS CODE = 51

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

```

=====
ELEVATION DATA: UPSTREAM(FEET) = 78.00 DOWNSTREAM(FEET) = 77.90
CHANNEL LENGTH THRU SUBAREA(FEET) = 346.00 CHANNEL SLOPE = 0.0003
CHANNEL BASE(FEET) = 72.00 "Z" FACTOR = 0.000
MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 4.00
CHANNEL FLOW THRU SUBAREA(CFS) = 17.57
FLOW VELOCITY(FEET/SEC.) = 0.77 FLOW DEPTH(FEET) = 0.32
TRAVEL TIME(MIN.) = 7.46 Tc(MIN.) = 15.46
LONGEST FLOWPATH FROM NODE 101.00 TO NODE 160.00 = 1350.00 FEET.

*****
FLOW PROCESS FROM NODE 160.00 TO NODE 160.00 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.) = 15.46
RAINFALL INTENSITY(INCH/HR) = 1.46
AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.97
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 9.04
TOTAL STREAM AREA(ACRES) = 9.50
PEAK FLOW RATE(CFS) AT CONFLUENCE = 17.57

*****
FLOW PROCESS FROM NODE 151.00 TO NODE 152.00 IS CODE = 21
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 70.00
ELEVATION DATA: UPSTREAM(FEET) = 88.00 DOWNSTREAM(FEET) = 87.30

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.000
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.540
SUBAREA Tc AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS  Tc
    LAND USE          GROUP  (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL             A      0.20    0.98    0.100    32    5.00
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 0.44
TOTAL AREA(ACRES) = 0.20 PEAK FLOW RATE(CFS) = 0.44

*****
FLOW PROCESS FROM NODE 152.00 TO NODE 155.00 IS CODE = 51
-----

```

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 87.30 DOWNSTREAM(FEET) = 86.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 123.00 CHANNEL SLOPE = 0.0106
CHANNEL BASE(FEET) = 2.50 "Z" FACTOR = 3.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 1.25
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.339

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	0.40	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 0.84

TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 1.47

AVERAGE FLOW DEPTH(FEET) = 0.19 TRAVEL TIME(MIN.) = 1.40

Tc(MIN.) = 6.40

SUBAREA AREA(ACRES) = 0.40 SUBAREA RUNOFF(CFS) = 0.81

EFFECTIVE AREA(ACRES) = 0.60 AREA-AVERAGED Fm(INCH/HR) = 0.10

AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.10

TOTAL AREA(ACRES) = 0.6 PEAK FLOW RATE(CFS) = 1.21

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.23 FLOW VELOCITY(FEET/SEC.) = 1.63

LONGEST FLOWPATH FROM NODE 151.00 TO NODE 155.00 = 193.00 FEET.

FLOW PROCESS FROM NODE 155.00 TO NODE 160.00 IS CODE = 41

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 83.00 DOWNSTREAM(FEET) = 79.00

FLOW LENGTH(FEET) = 3.00 MANNING'S N = 0.012

DEPTH OF FLOW IN 18.0 INCH PIPE IS 1.3 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 22.43

GIVEN PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 1.21

PIPE TRAVEL TIME(MIN.) = 0.00 Tc(MIN.) = 6.40

LONGEST FLOWPATH FROM NODE 151.00 TO NODE 160.00 = 196.00 FEET.

FLOW PROCESS FROM NODE 160.00 TO NODE 160.00 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.) = 6.40
 RAINFALL INTENSITY(INCH/HR) = 2.34
 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.97
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 0.60
 TOTAL STREAM AREA(ACRES) = 0.60
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 1.21

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	16.24	13.53	1.573	0.97(0.10)	0.10	7.3	148.00
1	17.43	14.84	1.481	0.98(0.10)	0.10	8.6	141.00
1	17.57	15.46	1.459	0.97(0.10)	0.10	9.0	131.00
1	17.55	15.54	1.457	0.97(0.10)	0.10	9.1	101.00
1	16.79	17.01	1.422	0.98(0.10)	0.10	9.5	121.00
2	1.21	6.40	2.338	0.97(0.10)	0.10	0.6	151.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	12.88	6.40	2.338	0.97(0.10)	0.10	4.0	151.00
2	17.04	13.53	1.573	0.97(0.10)	0.10	7.9	148.00
3	18.18	14.84	1.481	0.98(0.10)	0.10	9.2	141.00
4	18.31	15.46	1.459	0.97(0.10)	0.10	9.6	131.00
5	18.29	15.54	1.457	0.97(0.10)	0.10	9.7	101.00
6	17.50	17.01	1.422	0.98(0.10)	0.10	10.1	121.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 18.31 Tc(MIN.) = 15.46
 EFFECTIVE AREA(ACRES) = 9.64 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 10.1
 LONGEST FLOWPATH FROM NODE 101.00 TO NODE 160.00 = 1350.00 FEET.

FLOW PROCESS FROM NODE 160.00 TO NODE 165.00 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 77.90 DOWNSTREAM(FEET) = 77.80
 FLOW LENGTH(FEET) = 38.00 MANNING'S N = 0.012
 DEPTH OF FLOW IN 36.0 INCH PIPE IS 18.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 5.02
 GIVEN PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 18.31
PIPE TRAVEL TIME(MIN.) = 0.13 Tc(MIN.) = 15.59
LONGEST FLOWPATH FROM NODE 101.00 TO NODE 165.00 = 1388.00 FEET.

FLOW PROCESS FROM NODE 165.00 TO NODE 180.00 IS CODE = 51

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 77.80 DOWNSTREAM(FEET) = 77.40
CHANNEL LENGTH THRU SUBAREA(FEET) = 175.00 CHANNEL SLOPE = 0.0023
CHANNEL BASE(FEET) = 30.00 "Z" FACTOR = 2.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 4.00
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.404

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
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NATURAL GOOD COVER

"GRASS"	A	0.50	0.94	1.000	38
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SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.94

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000

TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 18.41

TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 1.34

AVERAGE FLOW DEPTH(FEET) = 0.45 TRAVEL TIME(MIN.) = 2.18

Tc(MIN.) = 17.77

SUBAREA AREA(ACRES) = 0.50 SUBAREA RUNOFF(CFS) = 0.21

EFFECTIVE AREA(ACRES) = 10.14 AREA-AVERAGED Fm(INCH/HR) = 0.14

AREA-AVERAGED Fp(INCH/HR) = 0.96 AREA-AVERAGED Ap = 0.14

TOTAL AREA(ACRES) = 10.6 PEAK FLOW RATE(CFS) = 18.31

NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.44 FLOW VELOCITY(FEET/SEC.) = 1.35

LONGEST FLOWPATH FROM NODE 101.00 TO NODE 180.00 = 1563.00 FEET.

FLOW PROCESS FROM NODE 180.00 TO NODE 180.00 IS CODE = 10

>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<

FLOW PROCESS FROM NODE 171.00 TO NODE 172.00 IS CODE = 21

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

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 467.00

ELEVATION DATA: UPSTREAM(FEET) = 96.70 DOWNSTREAM(FEET) = 90.00

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
 SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 8.303$
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.064
 SUBAREA T_c AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN	T_c (MIN.)
COMMERCIAL	A	1.10	0.98	0.100	32	8.30

 SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.97$
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.100$
 SUBAREA RUNOFF(CFS) = 1.95
 TOTAL AREA(ACRES) = 1.10 PEAK FLOW RATE(CFS) = 1.95

FLOW PROCESS FROM NODE 172.00 TO NODE 173.00 IS CODE = 51

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

ELEVATION DATA: UPSTREAM(FEET) = 89.50 DOWNSTREAM(FEET) = 85.30
 CHANNEL LENGTH THRU SUBAREA(FEET) = 203.00 CHANNEL SLOPE = 0.0207
 CHANNEL BASE(FEET) = 3.75 "Z" FACTOR = 3.000
 MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 1.25
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.867
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
COMMERCIAL	A	1.00	0.98	0.100	32

 SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.98$
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.100$
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 2.75
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 2.48
 AVERAGE FLOW DEPTH(FEET) = 0.25 TRAVEL TIME(MIN.) = 1.37
 $T_c(MIN.) = 9.67$
 SUBAREA AREA(ACRES) = 1.00 SUBAREA RUNOFF(CFS) = 1.59
 EFFECTIVE AREA(ACRES) = 2.10 AREA-AVERAGED $F_m(INCH/HR) = 0.10$
 AREA-AVERAGED $F_p(INCH/HR) = 0.97$ AREA-AVERAGED $A_p = 0.10$
 TOTAL AREA(ACRES) = 2.1 PEAK FLOW RATE(CFS) = 3.35

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) = 0.27 FLOW VELOCITY(FEET/SEC.) = 2.70
 LONGEST FLOWPATH FROM NODE 171.00 TO NODE 173.00 = 670.00 FEET.

FLOW PROCESS FROM NODE 173.00 TO NODE 174.00 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 83.25 DOWNSTREAM(FEET) = 80.40

FLOW LENGTH(FEET) = 246.00 MANNING'S N = 0.012
 DEPTH OF FLOW IN 18.0 INCH PIPE IS 6.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 5.68
 GIVEN PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 3.35
 PIPE TRAVEL TIME(MIN.) = 0.72 Tc(MIN.) = 10.39
 LONGEST FLOWPATH FROM NODE 171.00 TO NODE 174.00 = 916.00 FEET.

FLOW PROCESS FROM NODE 174.00 TO NODE 174.00 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.) = 10.39
 RAINFALL INTENSITY(INCH/HR) = 1.79
 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.97
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 2.10
 TOTAL STREAM AREA(ACRES) = 2.10
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 3.35

FLOW PROCESS FROM NODE 173.00 TO NODE 174.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 243.00
 ELEVATION DATA: UPSTREAM(FEET) = 85.30 DOWNSTREAM(FEET) = 82.50

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 6.680
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.298
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.30	0.98	0.100	32	6.68

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 2.57
 TOTAL AREA(ACRES) = 1.30 PEAK FLOW RATE(CFS) = 2.57

FLOW PROCESS FROM NODE 174.00 TO NODE 174.00 IS CODE = 1

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

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=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 6.68
RAINFALL INTENSITY(INCH/HR) = 2.30
AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 1.30
TOTAL STREAM AREA(ACRES) = 1.30
PEAK FLOW RATE(CFS) AT CONFLUENCE = 2.57

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** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	3.35	10.39	1.793	0.97(0.10)	0.10	2.1	171.00
2	2.57	6.68	2.298	0.98(0.10)	0.10	1.3	173.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	5.37	6.68	2.298	0.98(0.10)	0.10	2.6	173.00
2	5.33	10.39	1.793	0.98(0.10)	0.10	3.4	171.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

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PEAK FLOW RATE(CFS) = 5.37    Tc(MIN.) = 6.68
EFFECTIVE AREA(ACRES) = 2.65    AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.98    AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 3.4
LONGEST FLOWPATH FROM NODE 171.00 TO NODE 174.00 = 916.00 FEET.

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*****
FLOW PROCESS FROM NODE 174.00 TO NODE 175.00 IS CODE = 41
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>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====

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ELEVATION DATA: UPSTREAM(FEET) = 80.40    DOWNSTREAM(FEET) = 77.90
FLOW LENGTH(FEET) = 374.00    MANNING'S N = 0.012
DEPTH OF FLOW IN 18.0 INCH PIPE IS 10.1 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.24
GIVEN PIPE DIAMETER(INCH) = 18.00    NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 5.37
PIPE TRAVEL TIME(MIN.) = 1.19    Tc(MIN.) = 7.87
LONGEST FLOWPATH FROM NODE 171.00 TO NODE 175.00 = 1290.00 FEET.

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FLOW PROCESS FROM NODE 175.00 TO NODE 175.00 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.) = 7.87
RAINFALL INTENSITY(INCH/HR) = 2.13
AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 2.65
TOTAL STREAM AREA(ACRES) = 3.40
PEAK FLOW RATE(CFS) AT CONFLUENCE = 5.37

FLOW PROCESS FROM NODE 174.00 TO NODE 175.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 373.00
ELEVATION DATA: UPSTREAM(FEET) = 82.50 DOWNSTREAM(FEET) = 78.80

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 8.171
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.083
SUBAREA T_c AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	T_c (MIN.)
COMMERCIAL	A	2.00	0.98	0.100	32	8.17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 3.57
TOTAL AREA(ACRES) = 2.00 PEAK FLOW RATE(CFS) = 3.57

FLOW PROCESS FROM NODE 175.00 TO NODE 175.00 IS CODE = 1

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

=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 8.17
RAINFALL INTENSITY(INCH/HR) = 2.08
AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 2.00

TOTAL STREAM AREA(ACRES) = 2.00
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 3.57

**** CONFLUENCE DATA ****

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	5.37	7.87	2.127	0.98(0.10)	0.10	2.6	173.00
1	5.33	11.59	1.709	0.98(0.10)	0.10	3.4	171.00
2	3.57	8.17	2.083	0.98(0.10)	0.10	2.0	174.00

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

**** PEAK FLOW RATE TABLE ****

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	8.88	7.87	2.127	0.98(0.10)	0.10	4.6	173.00
2	8.94	8.17	2.083	0.98(0.10)	0.10	4.7	174.00
3	8.23	11.59	1.709	0.98(0.10)	0.10	5.4	171.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 8.94 Tc(MIN.) = 8.17
 EFFECTIVE AREA(ACRES) = 4.71 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 5.4
 LONGEST FLOWPATH FROM NODE 171.00 TO NODE 175.00 = 1290.00 FEET.

FLOW PROCESS FROM NODE 175.00 TO NODE 176.00 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 77.90 DOWNSTREAM(FEET) = 77.80
 FLOW LENGTH(FEET) = 230.00 MANNING'S N = 0.012
 ASSUME FULL-FLOWING PIPELINE
 PIPE-FLOW VELOCITY(FEET/SEC.) = 1.45
 (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) = 8.94
 PIPE TRAVEL TIME(MIN.) = 2.64 Tc(MIN.) = 10.81
 LONGEST FLOWPATH FROM NODE 171.00 TO NODE 176.00 = 1520.00 FEET.

FLOW PROCESS FROM NODE 176.00 TO NODE 176.00 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.) = 10.81
RAINFALL INTENSITY(INCH/HR) = 1.76
AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 4.71
TOTAL STREAM AREA(ACRES) = 5.40
PEAK FLOW RATE(CFS) AT CONFLUENCE = 8.94

FLOW PROCESS FROM NODE 175.00 TO NODE 176.00 IS CODE = 21

>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 228.00
ELEVATION DATA: UPSTREAM(FEET) = 79.00 DOWNSTREAM(FEET) = 78.80

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.900
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.757
SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.40	0.98	0.100	32	10.90

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 2.09
TOTAL AREA(ACRES) = 1.40 PEAK FLOW RATE(CFS) = 2.09

FLOW PROCESS FROM NODE 176.00 TO NODE 176.00 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.) = 10.90
RAINFALL INTENSITY(INCH/HR) = 1.76
AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 1.40
TOTAL STREAM AREA(ACRES) = 1.40
PEAK FLOW RATE(CFS) AT CONFLUENCE = 2.09

** CONFLUENCE DATA **

STREAM	Q	Tc	Intensity	Fp(Fm)	Ap	Ae	HEADWATER
--------	---	----	-----------	--------	----	----	-----------

NUMBER	(CFS)	(MIN.)	(INCH/HR)	(INCH/HR)		(ACRES)	NODE
1	8.88	10.51	1.784	0.98(0.10)	0.10	4.6	173.00
1	8.94	10.81	1.763	0.98(0.10)	0.10	4.7	174.00
1	8.23	14.23	1.524	0.98(0.10)	0.10	5.4	171.00
2	2.09	10.90	1.757	0.98(0.10)	0.10	1.4	175.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	10.93	10.51	1.784	0.98(0.10)	0.10	5.9	173.00
2	11.02	10.81	1.763	0.98(0.10)	0.10	6.1	174.00
3	11.01	10.90	1.757	0.98(0.10)	0.10	6.1	175.00
4	10.03	14.23	1.524	0.98(0.10)	0.10	6.8	171.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 11.02 Tc(MIN.) = 10.81
EFFECTIVE AREA(ACRES) = 6.10 AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 6.8
LONGEST FLOWPATH FROM NODE 171.00 TO NODE 176.00 = 1520.00 FEET.

FLOW PROCESS FROM NODE 176.00 TO NODE 177.00 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 77.80 DOWNSTREAM(FEET) = 77.40
FLOW LENGTH(FEET) = 72.00 MANNING'S N = 0.012
ASSUME FULL-FLOWING PIPELINE
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.19
(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) = 11.02
PIPE TRAVEL TIME(MIN.) = 0.23 Tc(MIN.) = 11.04
LONGEST FLOWPATH FROM NODE 171.00 TO NODE 177.00 = 1592.00 FEET.

FLOW PROCESS FROM NODE 177.00 TO NODE 180.00 IS CODE = 51

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 77.50 DOWNSTREAM(FEET) = 77.40
CHANNEL LENGTH THRU SUBAREA(FEET) = 25.00 CHANNEL SLOPE = 0.0040
CHANNEL BASE(FEET) = 10.00 "Z" FACTOR = 2.000

MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 4.00
 CHANNEL FLOW THRU SUBAREA(CFS) = 11.02
 FLOW VELOCITY(FEET/SEC.) = 1.91 FLOW DEPTH(FEET) = 0.52
 TRAVEL TIME(MIN.) = 0.22 Tc(MIN.) = 11.26
 LONGEST FLOWPATH FROM NODE 171.00 TO NODE 180.00 = 1617.00 FEET.

FLOW PROCESS FROM NODE 180.00 TO NODE 180.00 IS CODE = 11

>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<

** MAIN STREAM CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	10.93	10.97	1.752	0.98(0.10)	0.10	5.9	173.00
2	11.02	11.26	1.732	0.97(0.10)	0.10	6.1	174.00
3	11.01	11.35	1.725	0.98(0.10)	0.10	6.1	175.00
4	10.03	14.69	1.492	0.98(0.10)	0.10	6.8	171.00

LONGEST FLOWPATH FROM NODE 171.00 TO NODE 180.00 = 1617.00 FEET.

** MEMORY BANK # 1 CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	12.88	9.01	1.963	0.95(0.19)	0.20	4.5	151.00
2	17.04	15.88	1.449	0.96(0.15)	0.15	8.4	148.00
3	18.18	17.13	1.419	0.96(0.14)	0.15	9.7	141.00
4	18.31	17.77	1.404	0.96(0.14)	0.14	10.1	131.00
5	18.29	17.85	1.402	0.96(0.14)	0.14	10.2	101.00
6	17.50	19.34	1.366	0.96(0.14)	0.14	10.6	121.00

LONGEST FLOWPATH FROM NODE 101.00 TO NODE 180.00 = 1563.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	23.01	9.01	1.963	0.96(0.14)	0.15	9.4	151.00
2	25.00	10.97	1.752	0.96(0.14)	0.14	11.6	173.00
3	25.26	11.26	1.732	0.96(0.14)	0.14	11.9	174.00
4	25.31	11.35	1.725	0.96(0.14)	0.14	12.0	175.00
5	26.34	14.69	1.492	0.96(0.13)	0.13	14.5	171.00
6	26.76	15.88	1.449	0.97(0.13)	0.13	15.2	148.00
7	27.68	17.13	1.419	0.97(0.12)	0.13	16.5	141.00
8	27.70	17.77	1.404	0.97(0.12)	0.13	16.9	131.00
9	27.66	17.85	1.402	0.97(0.12)	0.13	17.0	101.00
10	26.62	19.34	1.366	0.97(0.12)	0.13	17.4	121.00

TOTAL AREA(ACRES) = 17.4

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 27.70 Tc(MIN.) = 17.769
 EFFECTIVE AREA(ACRES) = 16.94 AREA-AVERAGED Fm(INCH/HR) = 0.12

AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.13
 TOTAL AREA(ACRES) = 17.4
 LONGEST FLOWPATH FROM NODE 171.00 TO NODE 180.00 = 1617.00 FEET.

FLOW PROCESS FROM NODE 180.00 TO NODE 180.00 IS CODE = 12

>>>>>CLEAR MEMORY BANK # 1 <<<<<

=====

FLOW PROCESS FROM NODE 180.00 TO NODE 190.00 IS CODE = 41

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 77.90 DOWNSTREAM(FEET) = 77.10
 FLOW LENGTH(FEET) = 44.00 MANNING'S N = 0.012
 DEPTH OF FLOW IN 30.0 INCH PIPE IS 14.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 11.50
 GIVEN PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 27.70
 PIPE TRAVEL TIME(MIN.) = 0.06 Tc(MIN.) = 17.83
 LONGEST FLOWPATH FROM NODE 171.00 TO NODE 190.00 = 1661.00 FEET.

FLOW PROCESS FROM NODE 190.00 TO NODE 190.00 IS CODE = 81

>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 17.83

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.402

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
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NATURAL GOOD COVER

"GRASS"	A	0.10	0.94	1.000	38
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SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.94

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000

SUBAREA AREA(ACRES) = 0.10 SUBAREA RUNOFF(CFS) = 0.04

EFFECTIVE AREA(ACRES) = 17.04 AREA-AVERAGED Fm(INCH/HR) = 0.13

AREA-AVERAGED Fp(INCH/HR) = 0.96 AREA-AVERAGED Ap = 0.13

TOTAL AREA(ACRES) = 17.5 PEAK FLOW RATE(CFS) = 27.70

NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 17.5 TC(MIN.) = 17.83

EFFECTIVE AREA(ACRES) = 17.04 AREA-AVERAGED Fm(INCH/HR) = 0.13

AREA-AVERAGED Fp(INCH/HR) = 0.96 AREA-AVERAGED Ap = 0.132

PEAK FLOW RATE(CFS) = 27.70

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	23.01	9.08	1.953	0.96(0.15)	0.16	9.5	151.00
2	25.00	11.03	1.748	0.96(0.14)	0.15	11.7	173.00
3	25.26	11.33	1.727	0.96(0.14)	0.15	12.0	174.00
4	25.31	11.42	1.721	0.96(0.14)	0.15	12.1	175.00
5	26.34	14.75	1.487	0.96(0.13)	0.14	14.6	171.00
6	26.76	15.95	1.447	0.96(0.13)	0.14	15.3	148.00
7	27.68	17.20	1.417	0.96(0.13)	0.13	16.6	141.00
8	27.70	17.83	1.402	0.96(0.13)	0.13	17.0	131.00
9	27.66	17.91	1.400	0.96(0.13)	0.13	17.1	101.00
10	26.62	19.41	1.364	0.96(0.13)	0.13	17.5	121.00

=====
 =====
 END OF RATIONAL METHOD ANALYSIS



RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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Analysis prepared by:

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***** DESCRIPTION OF STUDY *****
* NEWCASTLE-HESPERIA (CITY OF HESPERIA) *
* POST-PROJECT CONDITION: 100-YEAR STORM EVENT *
* BASIN 100 *

FILE NAME: NH1HP00.RAT
TIME/DATE OF STUDY: 11:01 06/23/2022

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

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
USER-DEFINED TABLED RAINFALL USED

NUMBER OF [TIME,INTENSITY] DATA PAIRS = 5

1) 5.00; 4.250
2) 10.00; 3.040
3) 15.00; 2.450
4) 30.00; 1.850
5) 60.00; 1.310

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH LIP HIKE (FT) (FT) (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.50	1.50 0.0312 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.*

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 101.00 TO NODE 105.00 IS CODE = 21

>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 105.00
ELEVATION DATA: UPSTREAM(FEET) = 99.10 DOWNSTREAM(FEET) = 91.40

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$

SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 5.000

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.250

SUBAREA T_c AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN	T_c (MIN.)
COMMERCIAL	A	0.70	0.74	0.100	52	5.00
COMMERCIAL	A	0.50	0.74	0.100	52	5.00

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.74

SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.100

SUBAREA RUNOFF(CFS) = 4.51

TOTAL AREA(ACRES) = 1.20 PEAK FLOW RATE(CFS) = 4.51

FLOW PROCESS FROM NODE 105.00 TO NODE 120.00 IS CODE = 41

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 88.86 DOWNSTREAM(FEET) = 87.23
FLOW LENGTH(FEET) = 3.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 18.0 INCH PIPE IS 2.9 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 24.34
GIVEN PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 4.51
PIPE TRAVEL TIME(MIN.) = 0.00 T_c (MIN.) = 5.00
LONGEST FLOWPATH FROM NODE 101.00 TO NODE 120.00 = 108.00 FEET.

FLOW PROCESS FROM NODE 120.00 TO NODE 130.00 IS CODE = 41

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 87.23 DOWNSTREAM(FEET) = 85.74
FLOW LENGTH(FEET) = 307.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 18.0 INCH PIPE IS 10.0 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 4.45
 GIVEN PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 4.51
 PIPE TRAVEL TIME(MIN.) = 1.15 Tc(MIN.) = 6.15
 LONGEST FLOWPATH FROM NODE 101.00 TO NODE 130.00 = 415.00 FEET.

FLOW PROCESS FROM NODE 130.00 TO NODE 130.00 IS CODE = 1

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

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 6.15
 RAINFALL INTENSITY(INCH/HR) = 3.97
 AREA-AVERAGED Fm(INCH/HR) = 0.07
 AREA-AVERAGED Fp(INCH/HR) = 0.74
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 1.20
 TOTAL STREAM AREA(ACRES) = 1.20
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 4.51

FLOW PROCESS FROM NODE 121.00 TO NODE 125.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 332.00
 ELEVATION DATA: UPSTREAM(FEET) = 92.50 DOWNSTREAM(FEET) = 88.80

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 7.619
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.616
 SUBAREA Tc AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.40	0.74	0.100	52	7.62
COMMERCIAL	A	1.10	0.74	0.100	52	7.62

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.74
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 7.97
 TOTAL AREA(ACRES) = 2.50 PEAK FLOW RATE(CFS) = 7.97

FLOW PROCESS FROM NODE 125.00 TO NODE 130.00 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 86.30 DOWNSTREAM(FEET) = 85.74
 FLOW LENGTH(FEET) = 11.50 MANNING'S N = 0.012
 DEPTH OF FLOW IN 18.0 INCH PIPE IS 7.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 12.13
 GIVEN PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 7.97
 PIPE TRAVEL TIME(MIN.) = 0.02 Tc(MIN.) = 7.64
 LONGEST FLOWPATH FROM NODE 121.00 TO NODE 130.00 = 343.50 FEET.

FLOW PROCESS FROM NODE 130.00 TO NODE 130.00 IS CODE = 1

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

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 7.64
 RAINFALL INTENSITY(INCH/HR) = 3.61
 AREA-AVERAGED Fm(INCH/HR) = 0.07
 AREA-AVERAGED Fp(INCH/HR) = 0.74
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 2.50
 TOTAL STREAM AREA(ACRES) = 2.50
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 7.97

**** CONFLUENCE DATA ****

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	4.51	6.15	3.971	0.74(0.07)	0.10	1.2	101.00
2	7.97	7.64	3.612	0.74(0.07)	0.10	2.5	121.00

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

**** PEAK FLOW RATE TABLE ****

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	11.58	6.15	3.971	0.74(0.07)	0.10	3.2	101.00
2	12.06	7.64	3.612	0.74(0.07)	0.10	3.7	121.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 12.06 Tc(MIN.) = 7.64
 EFFECTIVE AREA(ACRES) = 3.70 AREA-AVERAGED Fm(INCH/HR) = 0.07
 AREA-AVERAGED Fp(INCH/HR) = 0.74 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 3.7
 LONGEST FLOWPATH FROM NODE 101.00 TO NODE 130.00 = 415.00 FEET.

FLOW PROCESS FROM NODE 130.00 TO NODE 140.00 IS CODE = 41

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>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 85.74 DOWNSTREAM(FEET) = 84.42
FLOW LENGTH(FEET) = 265.00 MANNING'S N = 0.012
ASSUME FULL-FLOWING PIPELINE
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.91
(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) = 12.06
PIPE TRAVEL TIME(MIN.) = 0.90 Tc(MIN.) = 8.53
LONGEST FLOWPATH FROM NODE 101.00 TO NODE 140.00 = 680.00 FEET.

*****
FLOW PROCESS FROM NODE 140.00 TO NODE 140.00 IS CODE = 1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 8.53
RAINFALL INTENSITY(INCH/HR) = 3.39
AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.74
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 3.70
TOTAL STREAM AREA(ACRES) = 3.70
PEAK FLOW RATE(CFS) AT CONFLUENCE = 12.06

*****
FLOW PROCESS FROM NODE 131.00 TO NODE 135.00 IS CODE = 21
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 314.00
ELEVATION DATA: UPSTREAM(FEET) = 91.80 DOWNSTREAM(FEET) = 87.47

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 7.141
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.732
SUBAREA Tc AND LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 1.30 0.74 0.100 52 7.14
COMMERCIAL A 0.90 0.74 0.100 52 7.14
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.74
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

```

SUBAREA RUNOFF(CFS) = 7.24
TOTAL AREA(ACRES) = 2.20 PEAK FLOW RATE(CFS) = 7.24

FLOW PROCESS FROM NODE 135.00 TO NODE 140.00 IS CODE = 41

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 84.97 DOWNSTREAM(FEET) = 84.42
FLOW LENGTH(FEET) = 11.50 MANNING'S N = 0.012
DEPTH OF FLOW IN 18.0 INCH PIPE IS 6.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 11.74
GIVEN PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 7.24
PIPE TRAVEL TIME(MIN.) = 0.02 Tc(MIN.) = 7.16
LONGEST FLOWPATH FROM NODE 131.00 TO NODE 140.00 = 325.50 FEET.

FLOW PROCESS FROM NODE 140.00 TO NODE 140.00 IS CODE = 1

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

=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 7.16
RAINFALL INTENSITY(INCH/HR) = 3.73
AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.74
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 2.20
TOTAL STREAM AREA(ACRES) = 2.20
PEAK FLOW RATE(CFS) AT CONFLUENCE = 7.24

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	11.58	7.05	3.753	0.74(0.07)	0.10	3.2	101.00
1	12.06	8.53	3.395	0.74(0.07)	0.10	3.7	121.00
2	7.24	7.16	3.728	0.74(0.07)	0.10	2.2	131.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	18.77	7.05	3.753	0.74(0.07)	0.10	5.4	101.00
2	18.86	7.16	3.728	0.74(0.07)	0.10	5.4	131.00

3 18.65 8.53 3.395 0.74(0.07) 0.10 5.9 121.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 18.86 Tc(MIN.) = 7.16
EFFECTIVE AREA(ACRES) = 5.45 AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.74 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 5.9
LONGEST FLOWPATH FROM NODE 101.00 TO NODE 140.00 = 680.00 FEET.

FLOW PROCESS FROM NODE 140.00 TO NODE 146.00 IS CODE = 41

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(Feet) = 84.42 DOWNSTREAM(Feet) = 83.11
FLOW LENGTH(Feet) = 262.00 MANNING'S N = 0.012
ASSUME FULL-FLOWING PIPELINE
PIPE-FLOW VELOCITY(Feet/Sec.) = 5.96
(PIPE FLOW VELOCITY CORRESPONDING TO NORMAL-DEPTH FLOW
AT DEPTH = 0.82 * DIAMETER)
GIVEN PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 18.86
PIPE TRAVEL TIME(MIN.) = 0.73 Tc(MIN.) = 7.89
LONGEST FLOWPATH FROM NODE 101.00 TO NODE 146.00 = 942.00 FEET.

FLOW PROCESS FROM NODE 146.00 TO NODE 146.00 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.) = 7.89
RAINFALL INTENSITY(INCH/HR) = 3.55
AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.74
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 5.45
TOTAL STREAM AREA(ACRES) = 5.90
PEAK FLOW RATE(CFS) AT CONFLUENCE = 18.86

FLOW PROCESS FROM NODE 141.00 TO NODE 145.00 IS CODE = 21

>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(Feet) = 314.00
ELEVATION DATA: UPSTREAM(Feet) = 90.30 DOWNSTREAM(Feet) = 86.17

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
 SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 7.208$
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.716
 SUBAREA T_c AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN	T_c (MIN.)
COMMERCIAL	A	1.40	0.74	0.100	52	7.21

 SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.74$
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.100$
 SUBAREA RUNOFF(CFS) = 4.59
 TOTAL AREA(ACRES) = 1.40 PEAK FLOW RATE(CFS) = 4.59

FLOW PROCESS FROM NODE 145.00 TO NODE 146.00 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

=====
 ELEVATION DATA: UPSTREAM(Feet) = 83.17 DOWNSTREAM(Feet) = 83.11
 FLOW LENGTH(Feet) = 11.50 MANNING'S N = 0.012
 DEPTH OF FLOW IN 18.0 INCH PIPE IS 9.9 INCHES
 PIPE-FLOW VELOCITY(Feet/Sec.) = 4.59
 GIVEN PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 4.59
 PIPE TRAVEL TIME(MIN.) = 0.04 $T_c(MIN.) = 7.25$
 LONGEST FLOWPATH FROM NODE 141.00 TO NODE 146.00 = 325.50 FEET.

FLOW PROCESS FROM NODE 146.00 TO NODE 146.00 IS CODE = 1

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

=====
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 7.25
 RAINFALL INTENSITY(INCH/HR) = 3.71
 AREA-AVERAGED $F_m(INCH/HR) = 0.07$
 AREA-AVERAGED $F_p(INCH/HR) = 0.74$
 AREA-AVERAGED $A_p = 0.10$
 EFFECTIVE STREAM AREA(ACRES) = 1.40
 TOTAL STREAM AREA(ACRES) = 1.40
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 4.59

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	T_c (MIN.)	Intensity (INCH/HR)	$F_p(F_m)$ (INCH/HR)	A_p	A_e (ACRES)	HEADWATER NODE
1	18.77	7.78	3.576	0.74(0.07)	0.10	5.4	101.00
1	18.86	7.89	3.551	0.74(0.07)	0.10	5.4	131.00

1	18.65	9.27	3.217	0.74(0.07)	0.10	5.9	121.00
2	4.59	7.25	3.705	0.74(0.07)	0.10	1.4	141.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	22.71	7.25	3.705	0.74(0.07)	0.10	6.4	141.00
2	23.19	7.78	3.576	0.74(0.07)	0.10	6.8	101.00
3	23.25	7.89	3.551	0.74(0.07)	0.10	6.8	131.00
4	22.62	9.27	3.217	0.74(0.07)	0.10	7.3	121.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 23.25 Tc(MIN.) = 7.89
EFFECTIVE AREA(ACRES) = 6.85 AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.74 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 7.3
LONGEST FLOWPATH FROM NODE 101.00 TO NODE 146.00 = 942.00 FEET.

FLOW PROCESS FROM NODE 146.00 TO NODE 150.00 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(Feet) = 83.11 DOWNSTREAM(Feet) = 80.00
FLOW LENGTH(Feet) = 46.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 24.0 INCH PIPE IS 10.3 INCHES
PIPE-FLOW VELOCITY(Feet/Sec.) = 17.98
GIVEN PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 23.25
PIPE TRAVEL TIME(MIN.) = 0.04 Tc(MIN.) = 7.93
LONGEST FLOWPATH FROM NODE 101.00 TO NODE 150.00 = 988.00 FEET.

FLOW PROCESS FROM NODE 150.00 TO NODE 150.00 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.) = 7.93
RAINFALL INTENSITY(INCH/HR) = 3.54
AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.74
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 6.85
TOTAL STREAM AREA(ACRES) = 7.30

PEAK FLOW RATE(CFS) AT CONFLUENCE = 23.25

FLOW PROCESS FROM NODE 148.00 TO NODE 149.00 IS CODE = 21

>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 169.00
ELEVATION DATA: UPSTREAM(FEET) = 88.40 DOWNSTREAM(FEET) = 86.52

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$

SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 5.818

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.052

SUBAREA T_c AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	T_c (MIN.)
COMMERCIAL	A	0.70	0.74	0.100	52	5.82
COMMERCIAL	A	1.50	0.74	0.100	52	5.82

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.74

SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.100

SUBAREA RUNOFF(CFS) = 7.88

TOTAL AREA(ACRES) = 2.20 PEAK FLOW RATE(CFS) = 7.88

FLOW PROCESS FROM NODE 149.00 TO NODE 150.00 IS CODE = 41

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 84.00 DOWNSTREAM(FEET) = 80.00
FLOW LENGTH(FEET) = 15.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 18.0 INCH PIPE IS 4.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 22.29
GIVEN PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 7.88
PIPE TRAVEL TIME(MIN.) = 0.01 T_c (MIN.) = 5.83
LONGEST FLOWPATH FROM NODE 148.00 TO NODE 150.00 = 184.00 FEET.

FLOW PROCESS FROM NODE 150.00 TO NODE 150.00 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.) = 5.83
RAINFALL INTENSITY(INCH/HR) = 4.05
AREA-AVERAGED F_m (INCH/HR) = 0.07

AREA-AVERAGED F_p (INCH/HR) = 0.74
 AREA-AVERAGED A_p = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 2.20
 TOTAL STREAM AREA(ACRES) = 2.20
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 7.88

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	22.71	7.29	3.695	0.74(0.07)	0.10	6.4	141.00
1	23.19	7.83	3.566	0.74(0.07)	0.10	6.8	101.00
1	23.25	7.93	3.540	0.74(0.07)	0.10	6.8	131.00
1	22.62	9.31	3.207	0.74(0.07)	0.10	7.3	121.00
2	7.88	5.83	4.049	0.74(0.07)	0.10	2.2	148.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	27.81	5.83	4.049	0.74(0.07)	0.10	7.3	148.00
2	29.89	7.29	3.695	0.74(0.07)	0.10	8.6	141.00
3	30.11	7.83	3.566	0.74(0.07)	0.10	9.0	101.00
4	30.12	7.93	3.540	0.74(0.07)	0.10	9.0	131.00
5	28.82	9.31	3.207	0.74(0.07)	0.10	9.5	121.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 30.12 Tc(MIN.) = 7.93
 EFFECTIVE AREA(ACRES) = 9.05 AREA-AVERAGED F_m (INCH/HR) = 0.07
 AREA-AVERAGED F_p (INCH/HR) = 0.74 AREA-AVERAGED A_p = 0.10
 TOTAL AREA(ACRES) = 9.5
 LONGEST FLOWPATH FROM NODE 101.00 TO NODE 150.00 = 988.00 FEET.

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) = 80.00 DOWNSTREAM(FEET) = 79.00
 FLOW LENGTH(FEET) = 16.00 MANNING'S N = 0.012
 DEPTH OF FLOW IN 24.0 INCH PIPE IS 12.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 18.65
 GIVEN PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 30.12
 PIPE TRAVEL TIME(MIN.) = 0.01 Tc(MIN.) = 7.95
 LONGEST FLOWPATH FROM NODE 101.00 TO NODE 160.00 = 1004.00 FEET.

FLOW PROCESS FROM NODE 160.00 TO NODE 160.00 IS CODE = 51

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

ELEVATION DATA: UPSTREAM(FEET) = 78.00 DOWNSTREAM(FEET) = 77.90
CHANNEL LENGTH THRU SUBAREA(FEET) = 346.00 CHANNEL SLOPE = 0.0003
CHANNEL BASE(FEET) = 72.00 "Z" FACTOR = 0.000
MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 4.00
CHANNEL FLOW THRU SUBAREA(CFS) = 30.12
FLOW VELOCITY(FEET/SEC.) = 0.96 FLOW DEPTH(FEET) = 0.44
TRAVEL TIME(MIN.) = 6.03 Tc(MIN.) = 13.98
LONGEST FLOWPATH FROM NODE 101.00 TO NODE 160.00 = 1350.00 FEET.

FLOW PROCESS FROM NODE 160.00 TO NODE 160.00 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.) = 13.98
RAINFALL INTENSITY(INCH/HR) = 2.57
AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.74
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 9.05
TOTAL STREAM AREA(ACRES) = 9.50
PEAK FLOW RATE(CFS) AT CONFLUENCE = 30.12

FLOW PROCESS FROM NODE 151.00 TO NODE 152.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 70.00
ELEVATION DATA: UPSTREAM(FEET) = 88.00 DOWNSTREAM(FEET) = 87.30

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.000

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.250

SUBAREA Tc AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	0.20	0.74	0.100	52	5.00

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.74

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

SUBAREA RUNOFF(CFS) = 0.75

TOTAL AREA(ACRES) = 0.20 PEAK FLOW RATE(CFS) = 0.75

FLOW PROCESS FROM NODE 152.00 TO NODE 155.00 IS CODE = 51

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

ELEVATION DATA: UPSTREAM(FEET) = 87.30 DOWNSTREAM(FEET) = 86.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 123.00 CHANNEL SLOPE = 0.0106
CHANNEL BASE(FEET) = 2.50 "Z" FACTOR = 3.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 1.25
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.966

SUBAREA LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	0.40	0.74	0.100	52

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.74
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.45
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 1.75
AVERAGE FLOW DEPTH(FEET) = 0.25 TRAVEL TIME(MIN.) = 1.17
Tc(MIN.) = 6.17
SUBAREA AREA(ACRES) = 0.40 SUBAREA RUNOFF(CFS) = 1.40
EFFECTIVE AREA(ACRES) = 0.60 AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.74 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 0.6 PEAK FLOW RATE(CFS) = 2.10

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.31 FLOW VELOCITY(FEET/SEC.) = 1.98
LONGEST FLOWPATH FROM NODE 151.00 TO NODE 155.00 = 193.00 FEET.

FLOW PROCESS FROM NODE 155.00 TO NODE 160.00 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====

ELEVATION DATA: UPSTREAM(FEET) = 83.00 DOWNSTREAM(FEET) = 79.00
FLOW LENGTH(FEET) = 3.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 18.0 INCH PIPE IS 1.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 26.50
GIVEN PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 2.10
PIPE TRAVEL TIME(MIN.) = 0.00 Tc(MIN.) = 6.17
LONGEST FLOWPATH FROM NODE 151.00 TO NODE 160.00 = 196.00 FEET.

FLOW PROCESS FROM NODE 160.00 TO NODE 160.00 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.) = 6.17
RAINFALL INTENSITY(INCH/HR) = 3.97
AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.74
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 0.60
TOTAL STREAM AREA(ACRES) = 0.60
PEAK FLOW RATE(CFS) AT CONFLUENCE = 2.10

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	27.81	12.04	2.800	0.74(0.07)	0.10	7.3	148.00
1	29.89	13.31	2.650	0.74(0.07)	0.10	8.6	141.00
1	30.11	13.88	2.582	0.74(0.07)	0.10	9.0	101.00
1	30.12	13.98	2.570	0.74(0.07)	0.10	9.0	131.00
1	28.82	15.44	2.432	0.74(0.07)	0.10	9.5	121.00
2	2.10	6.17	3.966	0.74(0.07)	0.10	0.6	151.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	22.47	6.17	3.966	0.74(0.07)	0.10	4.4	151.00
2	29.28	12.04	2.800	0.74(0.07)	0.10	7.9	148.00
3	31.28	13.31	2.650	0.74(0.07)	0.10	9.2	141.00
4	31.47	13.88	2.582	0.74(0.07)	0.10	9.6	101.00
5	31.47	13.98	2.570	0.74(0.07)	0.10	9.6	131.00
6	30.10	15.44	2.432	0.74(0.07)	0.10	10.1	121.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 31.47 Tc(MIN.) = 13.98
EFFECTIVE AREA(ACRES) = 9.65 AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.74 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 10.1
LONGEST FLOWPATH FROM NODE 101.00 TO NODE 160.00 = 1350.00 FEET.

FLOW PROCESS FROM NODE 160.00 TO NODE 165.00 IS CODE = 41

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 77.90 DOWNSTREAM(FEET) = 77.80

FLOW LENGTH(FEET) = 38.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 36.0 INCH PIPE IS 26.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.62
GIVEN PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 31.47
PIPE TRAVEL TIME(MIN.) = 0.11 Tc(MIN.) = 14.09
LONGEST FLOWPATH FROM NODE 101.00 TO NODE 165.00 = 1388.00 FEET.

FLOW PROCESS FROM NODE 165.00 TO NODE 180.00 IS CODE = 51

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

ELEVATION DATA: UPSTREAM(FEET) = 77.80 DOWNSTREAM(FEET) = 77.40
CHANNEL LENGTH THRU SUBAREA(FEET) = 175.00 CHANNEL SLOPE = 0.0023
CHANNEL BASE(FEET) = 30.00 "Z" FACTOR = 2.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 4.00
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.416

SUBAREA LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
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NATURAL GOOD COVER

"GRASS"	A	0.50	0.66	1.000	58
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SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.66

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000

TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 31.86

TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 1.66

AVERAGE FLOW DEPTH(FEET) = 0.62 TRAVEL TIME(MIN.) = 1.76

Tc(MIN.) = 15.85

SUBAREA AREA(ACRES) = 0.50 SUBAREA RUNOFF(CFS) = 0.79

EFFECTIVE AREA(ACRES) = 10.15 AREA-AVERAGED Fm(INCH/HR) = 0.10

AREA-AVERAGED Fp(INCH/HR) = 0.71 AREA-AVERAGED Ap = 0.14

TOTAL AREA(ACRES) = 10.6 PEAK FLOW RATE(CFS) = 31.47

NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.61 FLOW VELOCITY(FEET/SEC.) = 1.64

LONGEST FLOWPATH FROM NODE 101.00 TO NODE 180.00 = 1563.00 FEET.

FLOW PROCESS FROM NODE 180.00 TO NODE 180.00 IS CODE = 10

>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<

FLOW PROCESS FROM NODE 171.00 TO NODE 172.00 IS CODE = 21

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

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 467.00
ELEVATION DATA: UPSTREAM(FEET) = 96.70 DOWNSTREAM(FEET) = 90.00

$T_c = K * [(LENGTH^{.3}) / (ELEVATION\ CHANGE)]^{.2}$
SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 8.303
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.451
SUBAREA T_c AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN	T_c (MIN.)
COMMERCIAL	A	1.10	0.74	0.100	52	8.30

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.74
SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.100
SUBAREA RUNOFF(CFS) = 3.34
TOTAL AREA(ACRES) = 1.10 PEAK FLOW RATE(CFS) = 3.34

FLOW PROCESS FROM NODE 172.00 TO NODE 173.00 IS CODE = 51

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 89.50 DOWNSTREAM(FEET) = 85.30
CHANNEL LENGTH THRU SUBAREA(FEET) = 203.00 CHANNEL SLOPE = 0.0207
CHANNEL BASE(FEET) = 3.75 "Z" FACTOR = 3.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 1.25
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.178
SUBAREA LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
COMMERCIAL	A	1.00	0.74	0.100	52

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.74
SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.100
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 4.74
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 3.00
AVERAGE FLOW DEPTH(FEET) = 0.33 TRAVEL TIME(MIN.) = 1.13
 T_c (MIN.) = 9.43
SUBAREA AREA(ACRES) = 1.00 SUBAREA RUNOFF(CFS) = 2.79
EFFECTIVE AREA(ACRES) = 2.10 AREA-AVERAGED F_m (INCH/HR) = 0.07
AREA-AVERAGED F_p (INCH/HR) = 0.74 AREA-AVERAGED A_p = 0.10
TOTAL AREA(ACRES) = 2.1 PEAK FLOW RATE(CFS) = 5.87

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.38 FLOW VELOCITY(FEET/SEC.) = 3.19
LONGEST FLOWPATH FROM NODE 171.00 TO NODE 173.00 = 670.00 FEET.

FLOW PROCESS FROM NODE 173.00 TO NODE 174.00 IS CODE = 41

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 83.25 DOWNSTREAM(FEET) = 80.40
FLOW LENGTH(FEET) = 246.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 18.0 INCH PIPE IS 9.1 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 6.59
GIVEN PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 5.87
PIPE TRAVEL TIME(MIN.) = 0.62 Tc(MIN.) = 10.05
LONGEST FLOWPATH FROM NODE 171.00 TO NODE 174.00 = 916.00 FEET.

FLOW PROCESS FROM NODE 174.00 TO NODE 174.00 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.) = 10.05
RAINFALL INTENSITY(INCH/HR) = 3.03
AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.74
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 2.10
TOTAL STREAM AREA(ACRES) = 2.10
PEAK FLOW RATE(CFS) AT CONFLUENCE = 5.87

FLOW PROCESS FROM NODE 173.00 TO NODE 174.00 IS CODE = 21

>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 243.00
ELEVATION DATA: UPSTREAM(FEET) = 85.30 DOWNSTREAM(FEET) = 82.50

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 6.680
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.843
SUBAREA Tc AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.30	0.74	0.100	52	6.68

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.74
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 4.41
TOTAL AREA(ACRES) = 1.30 PEAK FLOW RATE(CFS) = 4.41

FLOW PROCESS FROM NODE 174.00 TO NODE 174.00 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.) = 6.68
RAINFALL INTENSITY(INCH/HR) = 3.84
AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.74
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 1.30
TOTAL STREAM AREA(ACRES) = 1.30
PEAK FLOW RATE(CFS) AT CONFLUENCE = 4.41

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	5.87	10.05	3.034	0.74(0.07)	0.10	2.1	171.00
2	4.41	6.68	3.843	0.74(0.07)	0.10	1.3	173.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	9.37	6.68	3.843	0.74(0.07)	0.10	2.7	173.00
2	9.33	10.05	3.034	0.74(0.07)	0.10	3.4	171.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 9.37 Tc(MIN.) = 6.68
EFFECTIVE AREA(ACRES) = 2.70 AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.74 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 3.4
LONGEST FLOWPATH FROM NODE 171.00 TO NODE 174.00 = 916.00 FEET.

FLOW PROCESS FROM NODE 174.00 TO NODE 175.00 IS CODE = 41

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 80.40 DOWNSTREAM(FEET) = 77.90
FLOW LENGTH(FEET) = 374.00 MANNING'S N = 0.012
ASSUME FULL-FLOWING PIPELINE
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.69
(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) = 9.37
 PIPE TRAVEL TIME(MIN.) = 1.10 Tc(MIN.) = 7.78
 LONGEST FLOWPATH FROM NODE 171.00 TO NODE 175.00 = 1290.00 FEET.

FLOW PROCESS FROM NODE 175.00 TO NODE 175.00 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.) = 7.78
 RAINFALL INTENSITY(INCH/HR) = 3.58
 AREA-AVERAGED Fm(INCH/HR) = 0.07
 AREA-AVERAGED Fp(INCH/HR) = 0.74
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 2.70
 TOTAL STREAM AREA(ACRES) = 3.40
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 9.37

FLOW PROCESS FROM NODE 174.00 TO NODE 175.00 IS CODE = 21

 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 373.00
 ELEVATION DATA: UPSTREAM(FEET) = 82.50 DOWNSTREAM(FEET) = 78.80

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 8.171
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.483
 SUBAREA Tc AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.00	0.74	0.100	52	8.17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.74
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 6.14
 TOTAL AREA(ACRES) = 2.00 PEAK FLOW RATE(CFS) = 6.14

FLOW PROCESS FROM NODE 175.00 TO NODE 175.00 IS CODE = 1

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

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MIN.) = 8.17
 RAINFALL INTENSITY(INCH/HR) = 3.48
 AREA-AVERAGED Fm(INCH/HR) = 0.07
 AREA-AVERAGED Fp(INCH/HR) = 0.74
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 2.00
 TOTAL STREAM AREA(ACRES) = 2.00
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 6.14

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	9.37	7.78	3.578	0.74(0.07)	0.10	2.7	173.00
1	9.33	11.15	2.904	0.74(0.07)	0.10	3.4	171.00
2	6.14	8.17	3.483	0.74(0.07)	0.10	2.0	174.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	15.38	7.78	3.578	0.74(0.07)	0.10	4.6	173.00
2	15.50	8.17	3.483	0.74(0.07)	0.10	4.8	174.00
3	14.42	11.15	2.904	0.74(0.07)	0.10	5.4	171.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 15.50 Tc(MIN.) = 8.17
 EFFECTIVE AREA(ACRES) = 4.78 AREA-AVERAGED Fm(INCH/HR) = 0.07
 AREA-AVERAGED Fp(INCH/HR) = 0.74 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 5.4
 LONGEST FLOWPATH FROM NODE 171.00 TO NODE 175.00 = 1290.00 FEET.

FLOW PROCESS FROM NODE 175.00 TO NODE 176.00 IS CODE = 41

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 77.90 DOWNSTREAM(FEET) = 77.80
 FLOW LENGTH(FEET) = 230.00 MANNING'S N = 0.012
 ASSUME FULL-FLOWING PIPELINE
 PIPE-FLOW VELOCITY(FEET/SEC.) = 1.45
 (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) = 15.50
 PIPE TRAVEL TIME(MIN.) = 2.64 Tc(MIN.) = 10.81
 LONGEST FLOWPATH FROM NODE 171.00 TO NODE 176.00 = 1520.00 FEET.

FLOW PROCESS FROM NODE 176.00 TO NODE 176.00 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.) = 10.81
RAINFALL INTENSITY(INCH/HR) = 2.94
AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.74
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 4.78
TOTAL STREAM AREA(ACRES) = 5.40
PEAK FLOW RATE(CFS) AT CONFLUENCE = 15.50

FLOW PROCESS FROM NODE 175.00 TO NODE 176.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 228.00
ELEVATION DATA: UPSTREAM(FEET) = 79.00 DOWNSTREAM(FEET) = 78.80

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 10.900
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.934
SUBAREA T_c AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	T_c (MIN.)
COMMERCIAL	A	1.40	0.74	0.100	52	10.90

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.74
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 3.60
TOTAL AREA(ACRES) = 1.40 PEAK FLOW RATE(CFS) = 3.60

FLOW PROCESS FROM NODE 176.00 TO NODE 176.00 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.) = 10.90
RAINFALL INTENSITY(INCH/HR) = 2.93
AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.74
AREA-AVERAGED Ap = 0.10

EFFECTIVE STREAM AREA(ACRES) = 1.40
 TOTAL STREAM AREA(ACRES) = 1.40
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 3.60

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	15.38	10.42	2.991	0.74(0.07)	0.10	4.6	173.00
1	15.50	10.81	2.944	0.74(0.07)	0.10	4.8	174.00
1	14.42	13.79	2.593	0.74(0.07)	0.10	5.4	171.00
2	3.60	10.90	2.934	0.74(0.07)	0.10	1.4	175.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	18.89	10.42	2.991	0.74(0.07)	0.10	5.9	173.00
2	19.09	10.81	2.944	0.74(0.07)	0.10	6.2	174.00
3	19.08	10.90	2.934	0.74(0.07)	0.10	6.2	175.00
4	17.60	13.79	2.593	0.74(0.07)	0.10	6.8	171.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 19.09 Tc(MIN.) = 10.81
 EFFECTIVE AREA(ACRES) = 6.17 AREA-AVERAGED Fm(INCH/HR) = 0.07
 AREA-AVERAGED Fp(INCH/HR) = 0.74 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 6.8
 LONGEST FLOWPATH FROM NODE 171.00 TO NODE 176.00 = 1520.00 FEET.

FLOW PROCESS FROM NODE 176.00 TO NODE 177.00 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 77.80 DOWNSTREAM(FEET) = 77.40
 FLOW LENGTH(FEET) = 72.00 MANNING'S N = 0.012
 ASSUME FULL-FLOWING PIPELINE
 PIPE-FLOW VELOCITY(FEET/SEC.) = 5.19
 (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) = 19.09
 PIPE TRAVEL TIME(MIN.) = 0.23 Tc(MIN.) = 11.04
 LONGEST FLOWPATH FROM NODE 171.00 TO NODE 177.00 = 1592.00 FEET.

FLOW PROCESS FROM NODE 177.00 TO NODE 180.00 IS CODE = 51

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

```
=====
ELEVATION DATA: UPSTREAM(FEET) =    77.50  DOWNSTREAM(FEET) =    77.40
CHANNEL LENGTH THRU SUBAREA(FEET) =    25.00  CHANNEL SLOPE =    0.0040
CHANNEL BASE(FEET) =    10.00  "Z" FACTOR =    2.000
MANNING'S FACTOR =    0.030  MAXIMUM DEPTH(FEET) =    4.00
CHANNEL FLOW THRU SUBAREA(CFS) =    19.09
FLOW VELOCITY(FEET/SEC.) =    2.29  FLOW DEPTH(FEET) =    0.73
TRAVEL TIME(MIN.) =    0.18  Tc(MIN.) =    11.23
LONGEST FLOWPATH FROM NODE    171.00 TO NODE    180.00 =    1617.00 FEET.
```

FLOW PROCESS FROM NODE 180.00 TO NODE 180.00 IS CODE = 11

>>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<

** MAIN STREAM CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	18.89	10.83	2.942	0.74(0.07)	0.10	5.9	173.00
2	19.09	11.23	2.895	0.74(0.07)	0.10	6.2	174.00
3	19.08	11.31	2.885	0.74(0.07)	0.10	6.2	175.00
4	17.60	14.21	2.543	0.74(0.07)	0.10	6.8	171.00

LONGEST FLOWPATH FROM NODE 171.00 TO NODE 180.00 = 1617.00 FEET.

** MEMORY BANK # 1 CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	22.47	8.29	3.455	0.70(0.13)	0.19	4.9	151.00
2	29.28	13.96	2.573	0.71(0.11)	0.15	8.4	148.00
3	31.28	15.18	2.443	0.71(0.10)	0.15	9.7	141.00
4	31.47	15.75	2.420	0.71(0.10)	0.14	10.1	101.00
5	31.47	15.85	2.416	0.71(0.10)	0.14	10.1	131.00
6	30.10	17.34	2.357	0.71(0.10)	0.14	10.6	121.00

LONGEST FLOWPATH FROM NODE 101.00 TO NODE 180.00 = 1563.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	39.50	8.29	3.455	0.71(0.11)	0.15	9.4	151.00
2	44.41	10.83	2.942	0.72(0.10)	0.14	12.4	173.00
3	45.09	11.23	2.895	0.72(0.10)	0.14	12.9	174.00
4	45.18	11.31	2.885	0.72(0.10)	0.14	13.0	175.00
5	47.00	13.96	2.573	0.72(0.09)	0.13	15.2	148.00
6	47.28	14.21	2.543	0.72(0.09)	0.13	15.5	171.00
7	48.16	15.18	2.443	0.72(0.09)	0.13	16.5	141.00
8	48.18	15.75	2.420	0.72(0.09)	0.13	16.9	101.00
9	48.16	15.85	2.416	0.72(0.09)	0.13	16.9	131.00

10 46.36 17.34 2.357 0.72(0.09) 0.13 17.4 121.00
TOTAL AREA(ACRES) = 17.4

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 48.18 Tc(MIN.) = 15.749
EFFECTIVE AREA(ACRES) = 16.88 AREA-AVERAGED Fm(INCH/HR) = 0.09
AREA-AVERAGED Fp(INCH/HR) = 0.72 AREA-AVERAGED Ap = 0.13
TOTAL AREA(ACRES) = 17.4
LONGEST FLOWPATH FROM NODE 171.00 TO NODE 180.00 = 1617.00 FEET.

FLOW PROCESS FROM NODE 180.00 TO NODE 180.00 IS CODE = 12

>>>>>CLEAR MEMORY BANK # 1 <<<<<

FLOW PROCESS FROM NODE 180.00 TO NODE 190.00 IS CODE = 41

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 77.90 DOWNSTREAM(FEET) = 77.10
FLOW LENGTH(FEET) = 44.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 30.0 INCH PIPE IS 21.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 12.98
GIVEN PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 48.18
PIPE TRAVEL TIME(MIN.) = 0.06 Tc(MIN.) = 15.81
LONGEST FLOWPATH FROM NODE 171.00 TO NODE 190.00 = 1661.00 FEET.

FLOW PROCESS FROM NODE 190.00 TO NODE 190.00 IS CODE = 81

>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 15.81
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.418
SUBAREA LOSS RATE DATA(AMC III):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
NATURAL GOOD COVER
"GRASS" A 0.10 0.66 1.000 58
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.66
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
SUBAREA AREA(ACRES) = 0.10 SUBAREA RUNOFF(CFS) = 0.16
EFFECTIVE AREA(ACRES) = 16.98 AREA-AVERAGED Fm(INCH/HR) = 0.09
AREA-AVERAGED Fp(INCH/HR) = 0.72 AREA-AVERAGED Ap = 0.13
TOTAL AREA(ACRES) = 17.5 PEAK FLOW RATE(CFS) = 48.18
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 17.5 TC(MIN.) = 15.81
 EFFECTIVE AREA(ACRES) = 16.98 AREA-AVERAGED Fm(INCH/HR)= 0.09
 AREA-AVERAGED Fp(INCH/HR) = 0.72 AREA-AVERAGED Ap = 0.132
 PEAK FLOW RATE(CFS) = 48.18

** PEAK FLOW RATE TABLE **

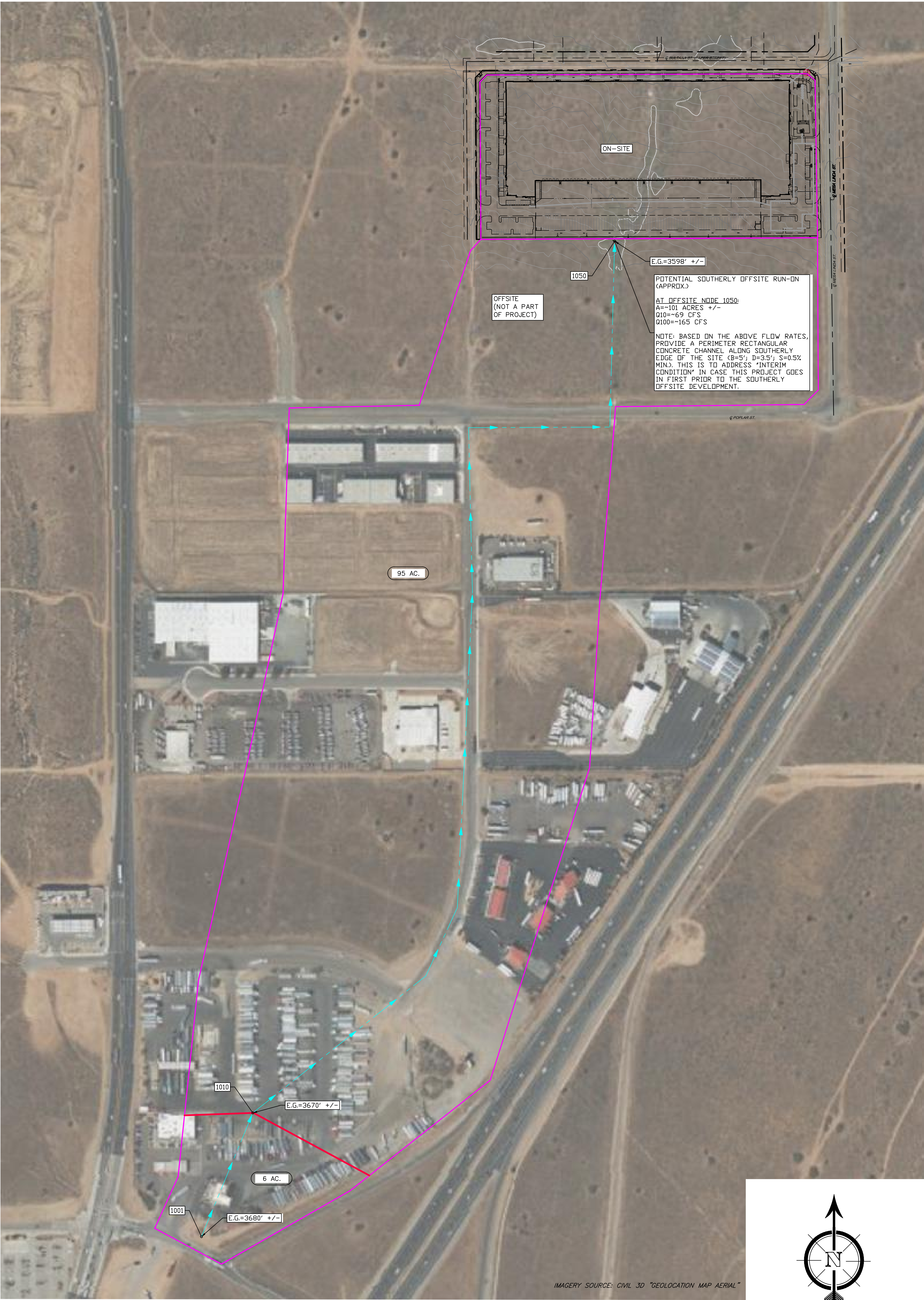
STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	39.50	8.34	3.441	0.71(0.11)	0.16	9.5	151.00
2	44.41	10.89	2.935	0.71(0.10)	0.15	12.5	173.00
3	45.09	11.28	2.889	0.71(0.10)	0.14	13.0	174.00
4	45.18	11.37	2.878	0.71(0.10)	0.14	13.1	175.00
5	47.00	14.02	2.566	0.72(0.10)	0.14	15.3	148.00
6	47.28	14.27	2.537	0.72(0.10)	0.13	15.6	171.00
7	48.16	15.24	2.440	0.72(0.10)	0.13	16.6	141.00
8	48.18	15.81	2.418	0.72(0.09)	0.13	17.0	101.00
9	48.16	15.91	2.414	0.72(0.09)	0.13	17.0	131.00
10	46.36	17.39	2.354	0.72(0.09)	0.13	17.5	121.00

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END OF RATIONAL METHOD ANALYSIS

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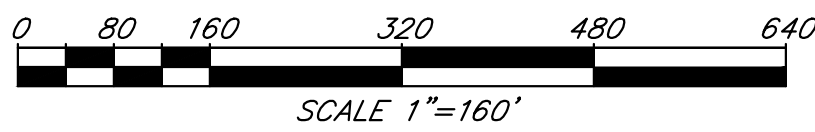


NOTES:

1. THIS OFFSITE DRAINAGE STUDY MAP IS PREPARED TO ESTIMATE POTENTIAL SOUTHERLY OFFSITE RUN-ON THAT MAY BE CONTRIBUTING TO THE PROJECT. THE ESTIMATED FLOW RATES ARE USED TO PROVIDE RECOMMENDED DRAINAGE FACILITY FOR OFFSITE RUN-ON CONVEYANCE AS AN "INTERIM CONDITION" IN CASE THE PROJECT GOES IN FIRST PRIOR TO THE SOUTHERLY OFFSITE DEVELOPMENT.
2. THE OFFSITE WATERSHED (DRAINAGE) BOUNDARY WAS DELINEATED AND IT IS APPROXIMATE BASED ON THE AVAILABLE USGS TOPOGRAPHY, AERIAL IMAGERY (AS OF AUGUST 2022), AND GOOGLE STREET VIEWS.
3. THE OFFSITE HYDROLOGY (PEAK FLOW RATES FOR 10-YEAR AND 100-YEAR) WERE ESTIMATED BASED ON APPROXIMATELY "50% IMPERVIOUS" SURFACES WHICH IS FAIR REPRESENTATION WITHIN THE UPSTREAM OFFSITE DRAINAGE AREA BASED ON THE AVAILABLE RESOURCES AS OF AUGUST 2022. THE "50% IMPERVIOUS" IS EQUIVALENT TO "5-7 DWELLINGS/ACRE" FOR THE LAND USE CATEGORY PER THE SAN BERNARDINO COUNTY HYDROLOGY MANUAL AND THAT WAS MODELED AS PART OF THE HYDROLOGIC CALCULATION FOR PEAK FLOW ESTIMATES.
4. THE OFFSITE DRAINAGE BOUNDARY PRIMARILY CONSISTS OF HYDROLOGIC SOIL GROUPS A BASED ON WEB SOIL SURVEY (ONLINE RESOURCES). FOR THE PURPOSE OF HYDROLOGIC CALCULATION, SOIL GROUP A WAS USED IN THE CALCULATION FOR THE PERVIOUS AREAS.

LEGEND

- TRACT BOUNDARY
- MAJOR DRAINAGE BOUNDARY
- SUB BASIN BOUNDARY
- SURFACE FLOW PATH
- DRAINAGE ACREAGE
- BASIN NODE ID
- DISCHARGE LOCATION



OFFSITE DRAINAGE STUDY MAP
FOR
NEWCASTLE-HESPERIA
(OFFSITE EXISTING)
CITY CASE #: CUP22-00004
JN 2127
REVISED: 8/11/2022

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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Ver. 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 *****

* NEWCASTLE-HESPERIA (CITY OF HESPERIA) *
* OFFSITE PRE-PROJECT CONDITION: 10-YEAR STORM EVENT *
* BASIN 1000 *

FILE NAME: NH1T010.RAT
TIME/DATE OF STUDY: 10:59 08/10/2022

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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--*TIME-OF-CONCENTRATION MODEL*--

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
USER-DEFINED TABLED RAINFALL USED

NUMBER OF [TIME,INTENSITY] DATA PAIRS = 5

1) 5.00; 2.540
2) 10.00; 1.820
3) 15.00; 1.470
4) 30.00; 1.110
5) 60.00; 0.785

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT- / PARK- SIDE / SIDE / WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH LIP HIKE (FT) (FT) (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.50	1.50 0.0312 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.*

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1001.00 TO NODE 1010.00 IS CODE = 21

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

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 500.00

ELEVATION DATA: UPSTREAM(FEET) = 3680.00 DOWNSTREAM(FEET) = 3670.00

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$

SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 10.217

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.805

SUBAREA T_c AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	T_c (MIN.)
-------------------------------	-------------------	-----------------	-----------------	-----------------	-----------	-----------------

RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	6.00	0.98	0.500	32	10.22

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.500

SUBAREA RUNOFF(CFS) = 7.11

TOTAL AREA(ACRES) = 6.00 PEAK FLOW RATE(CFS) = 7.11

FLOW PROCESS FROM NODE 1010.00 TO NODE 1050.00 IS CODE = 51

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

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

ELEVATION DATA: UPSTREAM(FEET) = 3670.00 DOWNSTREAM(FEET) = 3598.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 3515.00 CHANNEL SLOPE = 0.0205

CHANNEL BASE(FEET) = 10.00 "Z" FACTOR = 10.000

MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 5.00

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.245

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
-------------------------------	-------------------	-----------------	-----------------	-----------------	-----------

RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	95.00	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.500

TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 41.16

TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 4.14

AVERAGE FLOW DEPTH(FEET) = 0.62 TRAVEL TIME(MIN.) = 14.14

T_c (MIN.) = 24.36

SUBAREA AREA(ACRES) = 95.00 SUBAREA RUNOFF(CFS) = 64.80

EFFECTIVE AREA(ACRES) = 101.00 AREA-AVERAGED F_m (INCH/HR) = 0.49

AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED A_p = 0.50
TOTAL AREA(ACRES) = 101.0 PEAK FLOW RATE(CFS) = 68.90

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.80 FLOW VELOCITY(FEET/SEC.) = 4.75

LONGEST FLOWPATH FROM NODE 1001.00 TO NODE 1050.00 = 4015.00 FEET.

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 101.0 TC(MIN.) = 24.36

EFFECTIVE AREA(ACRES) = 101.00 AREA-AVERAGED F_m (INCH/HR)= 0.49

AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED A_p = 0.500

PEAK FLOW RATE(CFS) = 68.90

=====

END OF RATIONAL METHOD ANALYSIS



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Analysis prepared by:

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

***** DESCRIPTION OF STUDY *****
* NEWCASTLE-HESPERIA (CITY OF HESPERIA) *
* OFFSITE PRE-PROJECT CONDITION: 100-YEAR STORM EVENT *
* BASIN 1000 *

FILE NAME: NH1T000.RAT
TIME/DATE OF STUDY: 17:51 08/09/2022

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

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
USER-DEFINED TABLED RAINFALL USED

NUMBER OF [TIME,INTENSITY] DATA PAIRS = 5

1) 5.00; 4.250
2) 10.00; 3.040
3) 15.00; 2.450
4) 30.00; 1.850
5) 60.00; 1.310

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT- / PARK- SIDE / SIDE / WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH LIP HIKE (FT) (FT) (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	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.*

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1001.00 TO NODE 1010.00 IS CODE = 21

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

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 500.00

ELEVATION DATA: UPSTREAM(FEET) = 3680.00 DOWNSTREAM(FEET) = 3670.00

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$

SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 10.217

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.014

SUBAREA T_c AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	T_c (MIN.)
RESIDENTIAL						

"5-7 DWELLINGS/ACRE"	A	6.00	0.74	0.500	52	10.22
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SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.74

SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.500

SUBAREA RUNOFF(CFS) = 14.27

TOTAL AREA(ACRES) = 6.00 PEAK FLOW RATE(CFS) = 14.27

FLOW PROCESS FROM NODE 1010.00 TO NODE 1050.00 IS CODE = 51

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

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

ELEVATION DATA: UPSTREAM(FEET) = 3670.00 DOWNSTREAM(FEET) = 3598.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 3515.00 CHANNEL SLOPE = 0.0205

CHANNEL BASE(FEET) = 10.00 "Z" FACTOR = 10.000

MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 5.00

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.190

SUBAREA LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
RESIDENTIAL					

"5-7 DWELLINGS/ACRE"	A	95.00	0.74	0.500	52
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SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.74

SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.500

TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 93.64

TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 5.19

AVERAGE FLOW DEPTH(FEET) = 0.93 TRAVEL TIME(MIN.) = 11.30

T_c (MIN.) = 21.51

SUBAREA AREA(ACRES) = 95.00 SUBAREA RUNOFF(CFS) = 155.48

EFFECTIVE AREA(ACRES) = 101.00 AREA-AVERAGED F_m (INCH/HR) = 0.37

AREA-AVERAGED Fp(INCH/HR) = 0.74 AREA-AVERAGED Ap = 0.50
TOTAL AREA(ACRES) = 101.0 PEAK FLOW RATE(CFS) = 165.30

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 1.23 FLOW VELOCITY(FEET/SEC.) = 6.06

LONGEST FLOWPATH FROM NODE 1001.00 TO NODE 1050.00 = 4015.00 FEET.

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 101.0 TC(MIN.) = 21.51

EFFECTIVE AREA(ACRES) = 101.00 AREA-AVERAGED Fm(INCH/HR)= 0.37

AREA-AVERAGED Fp(INCH/HR) = 0.74 AREA-AVERAGED Ap = 0.500

PEAK FLOW RATE(CFS) = 165.30

=====

END OF RATIONAL METHOD ANALYSIS



Appendix C

Inlet Sizing

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

Appendix D

Preliminary Storm Drain Sizing

Includes:

1. Preliminary on-site storm drain sizing summary
2. Southerly Perimeter Rectangular Concrete Channel Sizing

Preliminary Storm Drain Size

The purpose of this table is to provide an estimated on-site private storm drain pipe sizes (based on normal depth using Manning's equation) to convey the anticipated 10-year peak flow rates with a sizing bump-up factor to account for potential head losses through the pipes.

Manning's n: **0.012** HDPE or equivalent

Preliminary Sizing Bump-up (%): **30**

Slope at:			Preliminary Sizes per Varying Slopes						
			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)	<u>PRELIMINARY</u> <u>RECOMMENDATIONS</u> ³
105 - 120	2.6	3.4	1.29	18"	1.08	18"	0.95	12"	Use 18" HDPE @ 0.5% MIN.
120 - 130	2.6	3.4	1.29	18"	1.08	18"	0.95	12"	Use 18" HDPE @ 0.5% MIN.
125 - 130	4.7	6.1	1.60	24"	1.35	18"	1.19	18"	Use 18" HDPE @ 0.5% MIN.
130 - 140	7.1	9.2	1.87	24"	1.58	24"	1.39	18"	Use 24" HDPE @ 0.5% MIN.
135 - 140	4.2	5.5	1.54	24"	1.30	18"	1.14	18"	Use 18" HDPE @ 0.5% MIN.
140 - 146	11.0	14.3	2.21	30"	1.86	24"	1.63	24"	Use 24" HDPE @ 0.5% MIN.
145 - 146	2.7	3.5	1.30	18"	1.10	18"	0.96	12"	Use 18" HDPE @ 0.5% MIN.
146 - 150	13.6	17.7	2.39	30"	2.01	24"	1.77	24"	Use 24" HDPE @ 0.5% MIN.
149 - 150	4.6	6.0	1.59	24"	1.34	18"	1.18	18"	Use 18" HDPE @ 0.5% MIN.
150 - 160	17.6	22.9	2.63	36"	2.22	30"	1.95	24"	Use 30" HDPE @ 0.5% MIN.
155 - 160	1.2	1.6	0.96	12"	0.81	10"	0.71	10"	Use 12" HDPE @ 0.5% MIN.
160 - 165	18.3	23.8	2.67	36"	2.25	30"	1.98	24"	Use 30" HDPE @ 0.5% MIN.
173 - 174	3.4	4.4	1.42	18"	1.20	18"	1.05	18"	Use 2-12" HDPE @ 0.5% MIN.
174 - 175	5.4	7.0	1.69	24"	1.42	18"	1.25	18"	Use 2-12" HDPE @ 0.5% MIN.
175 - 176	8.9	11.6	2.04	30"	1.72	24"	1.51	18"	Use 2-12" HDPE @ 0.5% MIN.
176 - 177	11.0	14.3	2.21	30"	1.86	24"	1.63	24"	Use 2-12" HDPE @ 0.5% MIN.
190 (Outlet)	27.7	36.0	3.12	42"	2.63	36"	2.31	30"	Concrete Spillway for Overflow

Note:

- "cfs" = cubic feet per second.
- Minimum pipe sizes are calculated using the Manning's equation (normal depth) and are based on the flow rates with "bump up factor" to account for potential head losses through the storm drain pipes.
- The on-site storm drain systems are private and the normal depth calculations should suffice for pipe sizing purpose.
The recommendations may differ slightly for some pipes from what the pipe sizing summary table indicate above but it provides the minimum required sizes for all the on-site storm drain segments.

Channel Report

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

Wednesday, Aug 10 2022

CONCRETE PERIMETER DITCH SIZE FOR SOUTHERLY OFFSITE RUN-ON (Q10)

Rectangular

Bottom Width (ft) = 5.00

Total Depth (ft) = 3.50

Invert Elev (ft) = 100.00

Slope (%) = 0.50

N-Value = 0.013

Calculations

Compute by: Known Q

Known Q (cfs) = 69.00

Highlighted

Depth (ft) = 1.70

Q (cfs) = 69.00

Area (sqft) = 8.50

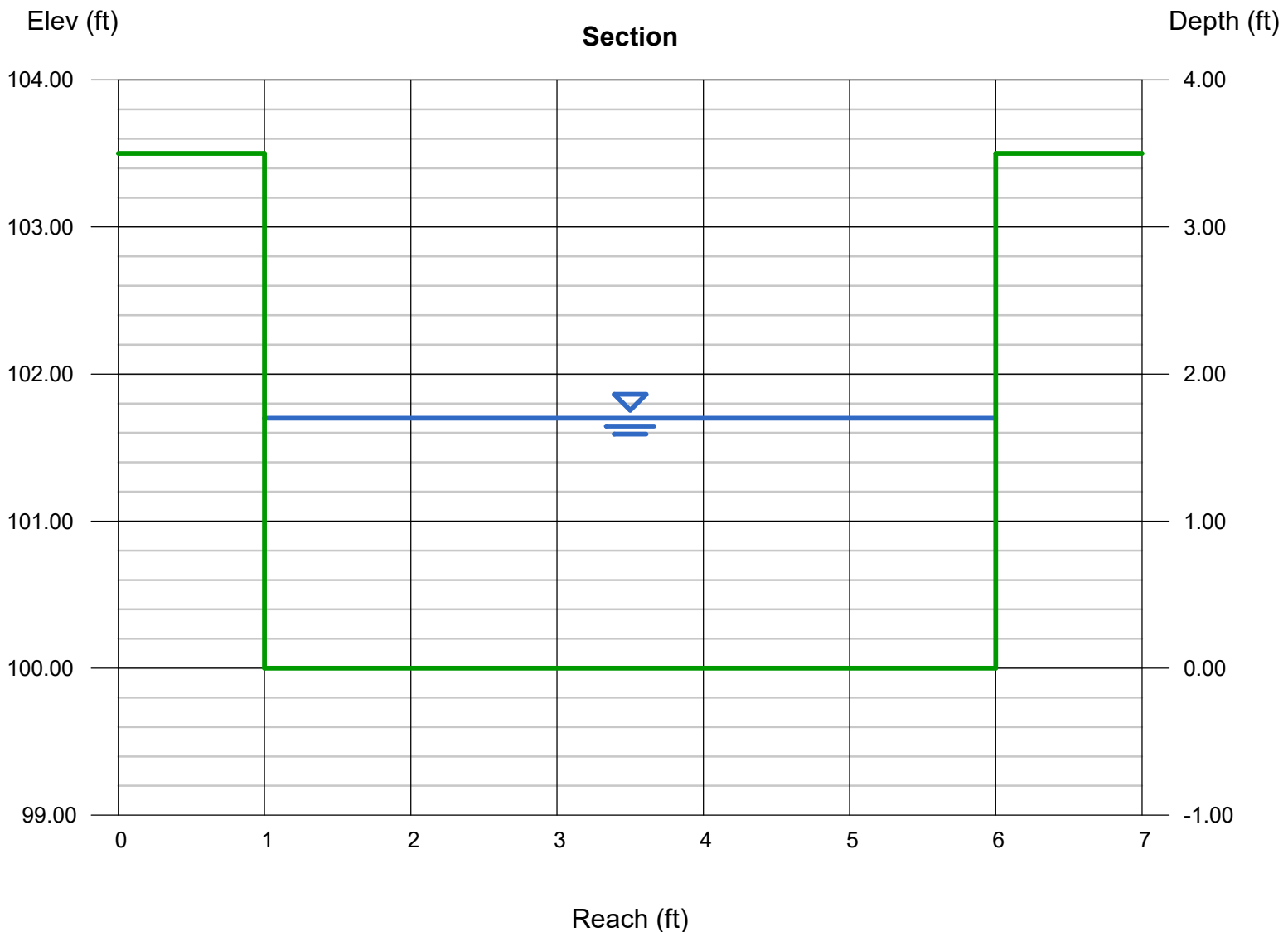
Velocity (ft/s) = 8.12

Wetted Perim (ft) = 8.40

Crit Depth, Yc (ft) = 1.81

Top Width (ft) = 5.00

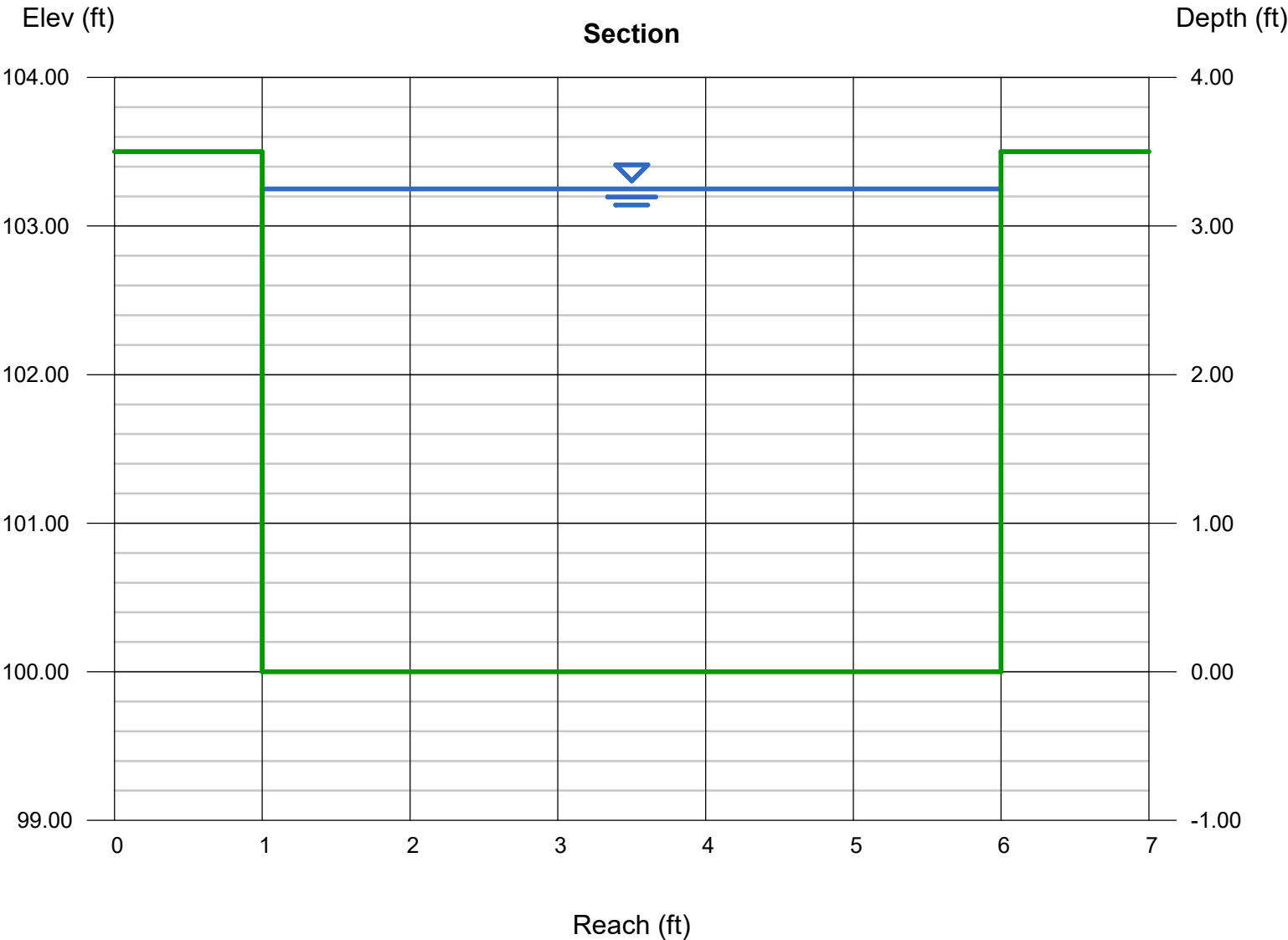
EGL (ft) = 2.72



Channel Report

CONCRETE PERIMETER DITCH SIZE FOR SOUTHERLY OFFSITE RUN-ON (Q100)

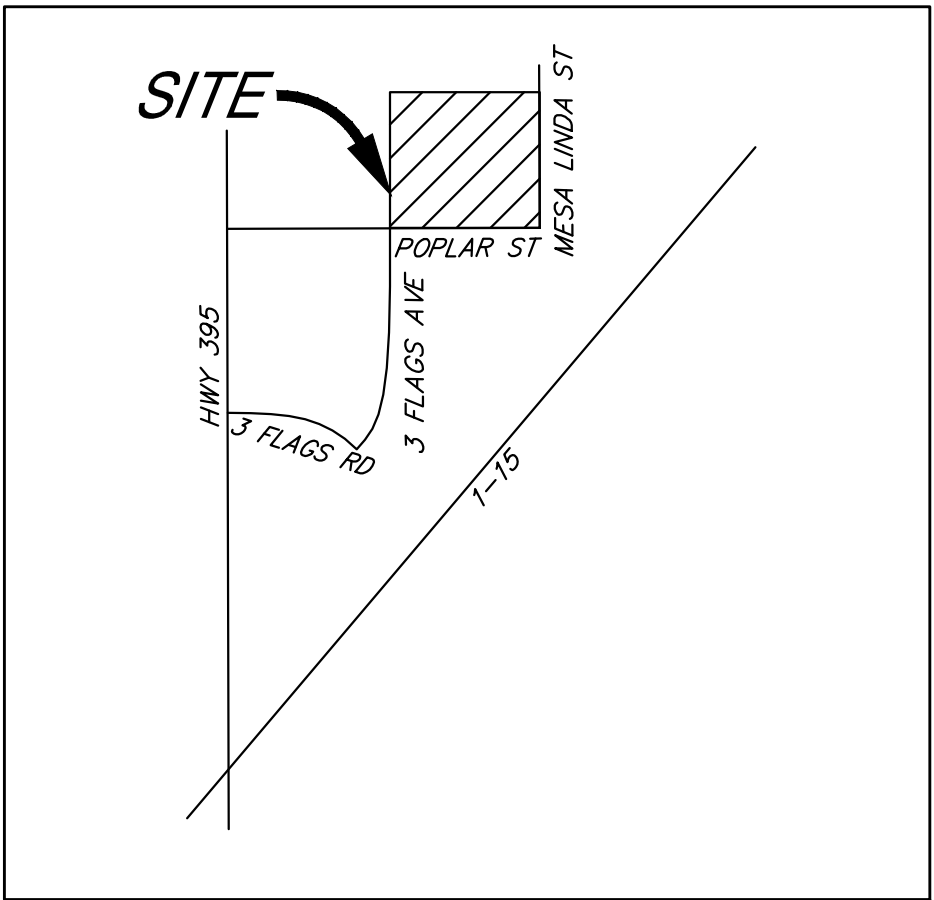
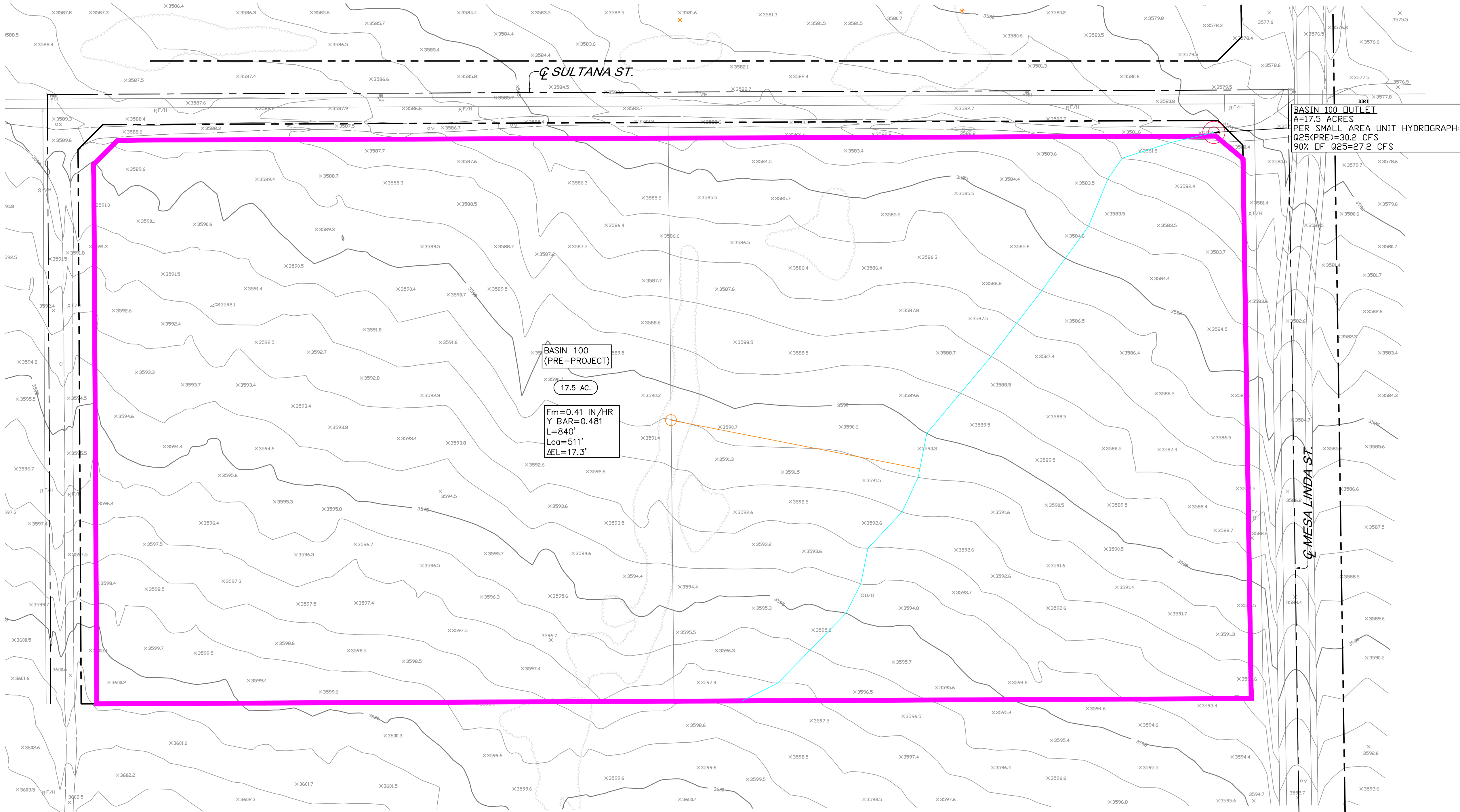
Rectangular		Highlighted	
Bottom Width (ft)	= 5.00	Depth (ft)	= 3.25
Total Depth (ft)	= 3.50	Q (cfs)	= 165.00
		Area (sqft)	= 16.25
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 10.15
Slope (%)	= 0.50	Wetted Perim (ft)	= 11.50
N-Value	= 0.013	Crit Depth, Yc (ft)	= 3.24
		Top Width (ft)	= 5.00
		EGL (ft)	= 4.85
Calculations			
Compute by:	Known Q		
Known Q (cfs)	= 165.00		



Appendix E

Detention Calculation

Note: Preliminary detention calculations have been prepared and associated output results are incorporated in this Appendix.



VICINITY MAP
NOT TO SCALE

NOTES:

1. THIS WORKMAP IS PREPARED IN SUPPORT OF THE ON-SITE DETENTION CALCULATION. DETAILED DETENTION CALCULATIONS HAVE BEEN PREPARED AND PROVIDED IN APPENDIX E OF THE DRAINAGE STUDY.
2. THE SITE IS SITUATED ON HYDROLOGIC SOIL GROUPS A. FOR THE PURPOSE OF HYDROLOGIC CALCULATION, SOIL GROUP A WAS USED IN THE CALCULATION FOR THE PERVIOUS AREAS.
3. AS SIMILAR TO THE EXISTING CONDITION DRAINAGE CHARACTERISTICS, RUNOFF FROM THE PROPOSED DEVELOPMENT WILL BE DIRECTED IN A NORTHEASTERLY DIRECTION TOWARDS A PROPOSED STORM WATER MANAGEMENT SYSTEM FOR FLOOD CONTROL MITIGATION AND WATER QUALITY TREATMENT PURPOSES PRIOR TO OUTLETING TOWARDS SULTANA STREET / MESA LINDA STREET. THE PROPOSED STORM WATER MANAGEMENT SYSTEM WILL INCLUDE A COMBINATION OF AN ABOVEGROUND INFILTRATION BASIN WITH DRYWELL AND A SUPPLEMENTAL UNDERGROUND STORAGE TO ADDRESS REQUIREMENTS OF THE STORM WATER QUALITY MANAGEMENT, HYDROLOGIC CONDITION OF CONERN (HYDROMODIFICATION), AND FLOOD CONTROL MITIGATION. FROM THE PROJECT OUTLET POINT, RUNOFF WILL BE CONVEYED IN A NORTHEASTERLY DIRECTION IN A SIMILAR FASHION AS THE EXISTING CONDITION AND EVENTUALLY DISCHARGE INTO THE MOJAVE RIVER. THE OVERALL PARCEL AREA IS APPROXIMATELY 18.2 ACRES WITH APPROXIMATELY 17.5 ACRES OF ON-SITE DRAINAGE MANAGEMENT. IN THE EXISTING CONDITION, THERE MAY BE MINOR OFFSITE RUN-ON FROM THE SOUTHERLY PARCELS; HOWEVER, BASED ON OUR UNDERSTANDING, THE SOUTHERLY OFFSITE PARCELS ARE TO BE DEVELOPED BY OTHERS AND THEIR PRELIMINARY SITE PLAN APPEARS TO SHOW THE OVERFLOW WILL BE DIRECTED TOWARDS THE TWO FRONTAGE STREETS (MESA LINDA STREET AND LASSEN ROAD). THEREFORE, OFFSITE RUN-ON ALONG THE SOUTHERLY EDGE IS EXPECTED TO BE INSIGNIFICANT. HOWEVER, TO ADDRESS POTENTIAL CONCERN, THE PROJECT PROPOSES A CONCRETE V-DITCH ALONG THE SOUTHERLY EDGE OF THE PROJECT AND OUTLET TO MESA LINDA STREET.
4. THE PROJECT IS SITUATED WITHIN "ZONE X" BASED ON THE FEMA FLOOD INSURANCE MAP NUMBER 06071C6475H, EFFECTIVE AUGUST 28, 2008. THEREFORE, NO FEMA SUBMITTAL/PROCESSING ARE EXPECTED FOR THIS PROJECT.

LEGEND

TRACT BOUNDARY

MAJOR DRAINAGE BOUNDARY

SUB BASIN BOUNDARY

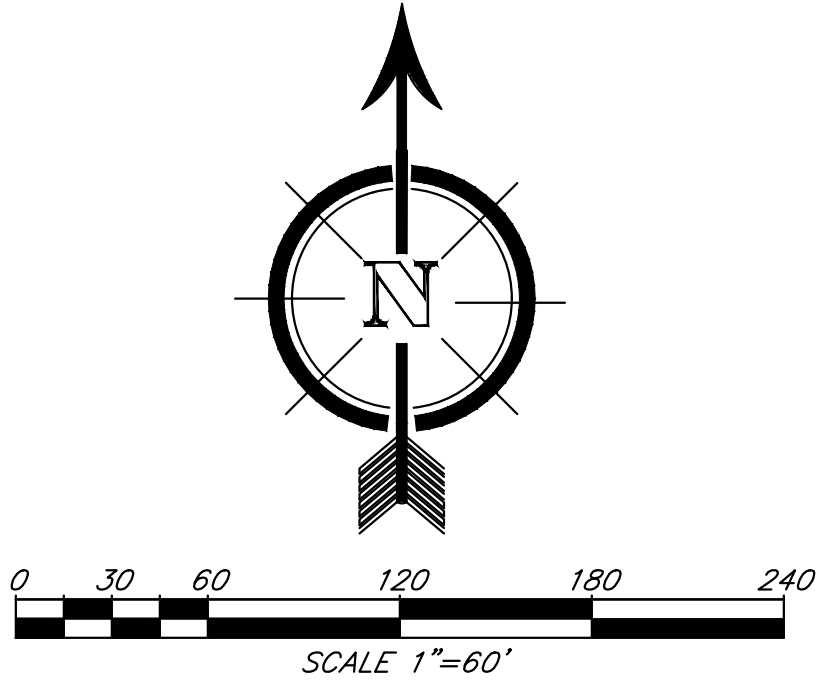
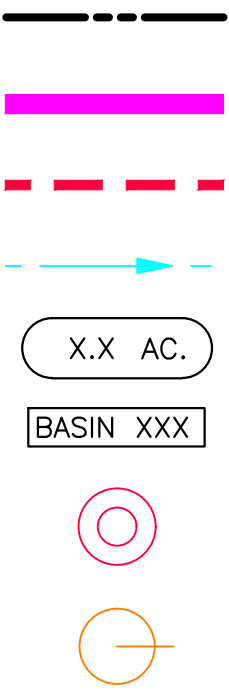
DRAINAGE FLOW PATH

DRAINAGE ACREAGE

BASIN NODE ID

POINT OF INTEREST

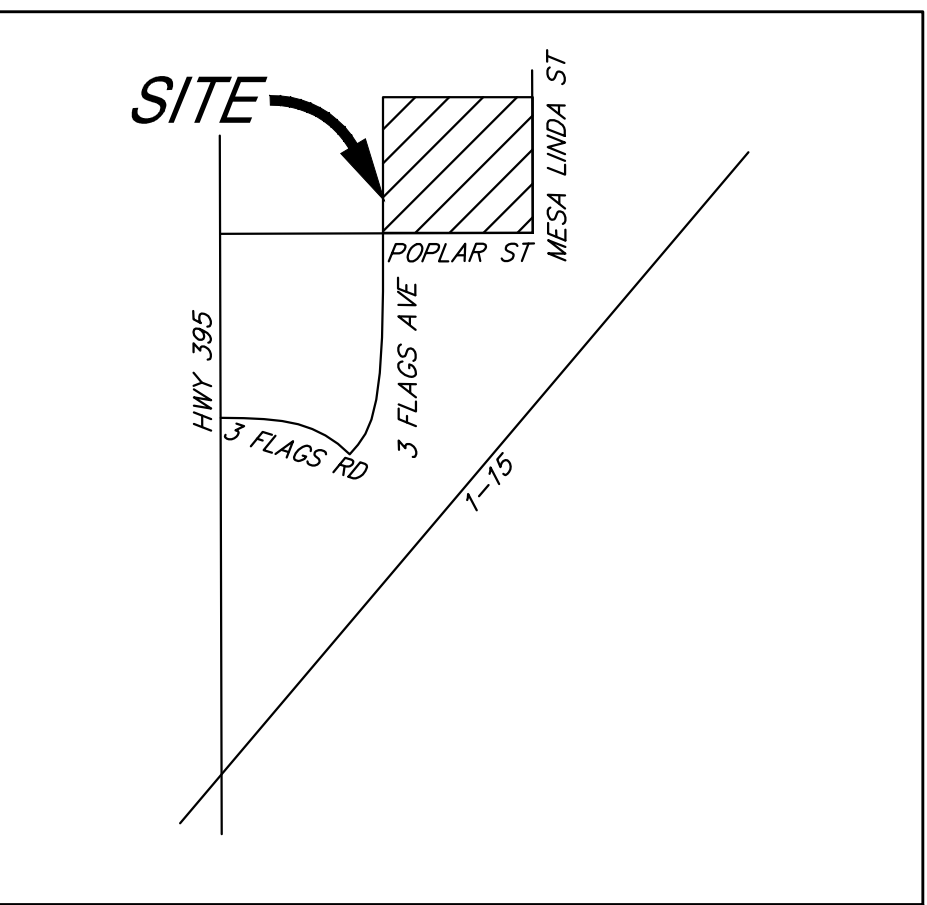
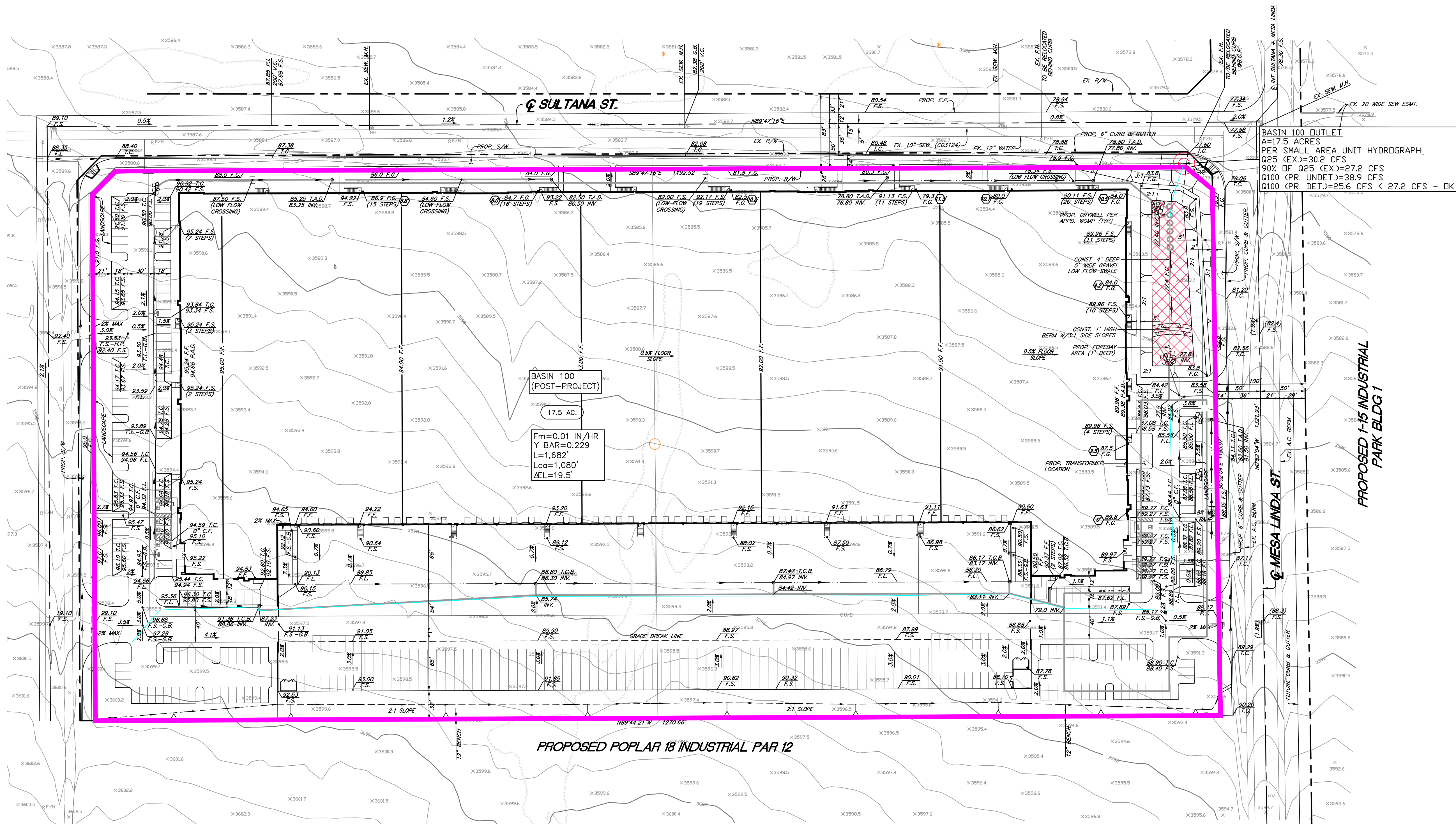
CENTROID LOCATION



SMALL AREA UNIT HYDROGRAPH
WORKMAP
FOR
NEWCASTLE-HESPERIA
(PRE-PROJECT)
CITY CASE #: CUP22-00004

JN 2127

REVISED: 6/24/2022



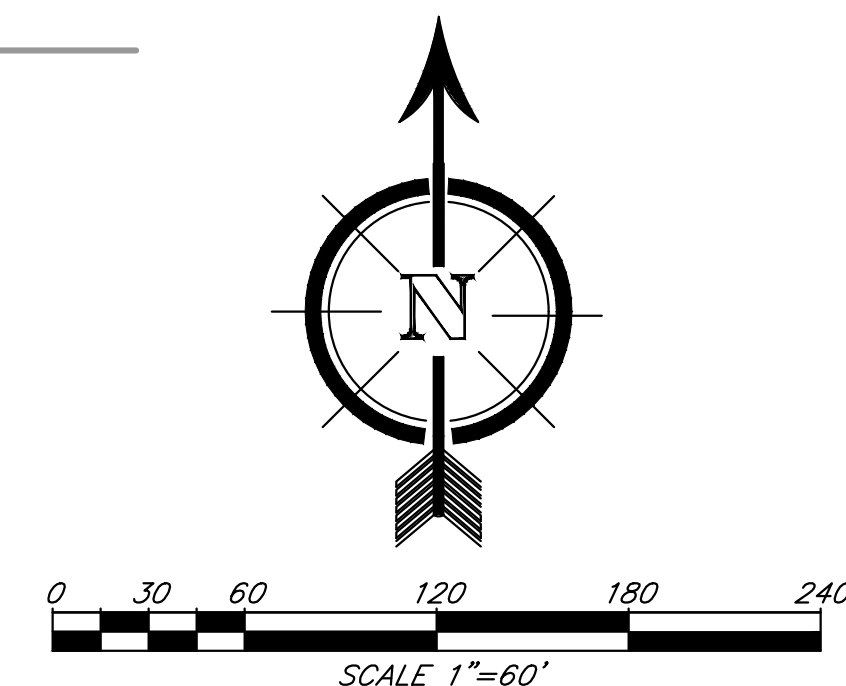
VICINITY MAP
NOT TO SCALE

NOTES:

1. THIS WORKMAP IS PREPARED IN SUPPORT OF THE ON-SITE DETENTION CALCULATION. DETAILED DETENTION CALCULATIONS HAVE BEEN PREPARED AND PROVIDED IN APPENDIX E OF THE DRAINAGE STUDY.
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4. THE PROJECT IS SITUATED WITHIN "ZONE X" BASED ON THE FEMA FLOOD INSURANCE MAP NUMBER 06071C6475H, EFFECTIVE AUGUST 28, 2008. THEREFORE, NO FEMA SUBMITTAL/PROCESSING ARE EXPECTED FOR THIS PROJECT.

LEGEND

- | | | | |
|---|-----------|----------------------------------|-----|
| TRACT BOUNDARY | --- | SUPPLEMENTAL UNDERGROUND STORAGE | □ |
| MAJOR DRAINAGE BOUNDARY | --- | PROPOSED STORM DRAIN | --- |
| SUB BASIN BOUNDARY | --- | | |
| DRAINAGE FLOW PATH | --- | | |
| DRAINAGE ACREAGE | X.X AC. | | |
| BASIN NODE ID | BASIN XXX | | |
| POINT OF INTEREST | ○ | | |
| CENTROID LOCATION | ⊕ | | |
| PROPOSED ABOVEGROUND INFILTRATION BASIN | ⊗ | | |



SMALL AREA UNIT HYDROGRAPH
WORKMAP
FOR
NEWCASTLE-HESPERIA
(POST-PROJECT)
CITY CASE #: CUP22-00004

JN 2127

REVISED: 6/24/2022



NOAA Atlas 14, Volume 6, Version 2
Location name: Hesperia, California, USA*
Latitude: 34.4186°, Longitude: -117.3924°
Elevation: 3594.25 ft**

* source: ESRI Maps

** source: USGS



**SUPPORTING MATERIALS -
 NOAA ATLAS 14 -
 PRECIPITATION
 100-YEAR, 24-HOUR &
 25-YEAR, 24-HOUR**

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 (0.072-0.106)	0.124 (0.102-0.151)	0.172 (0.142-0.211)	0.212 (0.173-0.262)	0.267 (0.211-0.341)	0.310 (0.240-0.404)	0.354 (0.267-0.473)	0.400 (0.294-0.550)	0.464 (0.327-0.665)	0.514 (0.350-0.762)
10-min	0.125 (0.103-0.152)	0.177 (0.147-0.217)	0.247 (0.203-0.302)	0.304 (0.248-0.375)	0.383 (0.303-0.489)	0.444 (0.344-0.579)	0.507 (0.383-0.678)	0.573 (0.421-0.788)	0.664 (0.468-0.953)	0.736 (0.501-1.09)
15-min	0.151 (0.125-0.184)	0.214 (0.177-0.262)	0.298 (0.246-0.366)	0.367 (0.300-0.454)	0.463 (0.366-0.591)	0.537 (0.416-0.700)	0.613 (0.463-0.820)	0.693 (0.509-0.953)	0.804 (0.566-1.15)	0.890 (0.606-1.32)
30-min	0.228 (0.189-0.278)	0.324 (0.268-0.396)	0.451 (0.371-0.552)	0.555 (0.454-0.686)	0.699 (0.553-0.893)	0.811 (0.628-1.06)	0.927 (0.700-1.24)	1.05 (0.769-1.44)	1.21 (0.855-1.74)	1.35 (0.915-2.00)
60-min	0.323 (0.267-0.394)	0.458 (0.379-0.560)	0.637 (0.525-0.781)	0.785 (0.642-0.970)	0.989 (0.782-1.26)	1.15 (0.888-1.50)	1.31 (0.990-1.75)	1.48 (1.09-2.04)	1.72 (1.21-2.46)	1.90 (1.30-2.82)
2-hr	0.473 (0.391-0.577)	0.641 (0.530-0.784)	0.869 (0.716-1.07)	1.06 (0.867-1.31)	1.33 (1.05-1.70)	1.54 (1.19-2.01)	1.76 (1.33-2.36)	2.00 (1.47-2.75)	2.33 (1.64-3.34)	2.59 (1.76-3.85)
3-hr	0.596 (0.494-0.728)	0.797 (0.659-0.974)	1.07 (0.882-1.31)	1.30 (1.06-1.61)	1.63 (1.29-2.08)	1.89 (1.46-2.46)	2.16 (1.63-2.89)	2.46 (1.81-3.38)	2.87 (2.02-4.12)	3.21 (2.19-4.77)
6-hr	0.849 (0.702-1.04)	1.12 (0.929-1.37)	1.50 (1.24-1.84)	1.82 (1.49-2.25)	2.28 (1.81-2.92)	2.66 (2.06-3.47)	3.05 (2.31-4.08)	3.48 (2.56-4.79)	4.10 (2.89-5.87)	4.60 (3.13-6.83)
12-hr	1.11 (0.918-1.35)	1.51 (1.24-1.84)	2.05 (1.69-2.51)	2.51 (2.05-3.10)	3.17 (2.51-4.06)	3.71 (2.87-4.84)	4.28 (3.23-5.72)	4.90 (3.60-6.73)	5.78 (4.07-8.29)	6.51 (4.43-9.66)
24-hr	1.50 (1.33-1.73)	2.11 (1.87-2.43)	2.93 (2.59-3.39)	3.63 (3.18-4.24)	4.64 (3.93-5.58)	5.45 (4.52-6.70)	6.31 (5.11-7.94)	7.23 (5.70-9.37)	8.56 (6.47-11.6)	9.65 (7.05-13.5)
2-day	1.73 (1.54-2.00)	2.43 (2.15-2.80)	3.40 (3.00-3.93)	4.23 (3.70-4.93)	5.43 (4.60-6.54)	6.41 (5.32-7.88)	7.46 (6.04-9.40)	8.61 (6.78-11.1)	10.3 (7.76-13.9)	11.6 (8.50-16.3)
3-day	1.86 (1.65-2.14)	2.61 (2.31-3.00)	3.65 (3.22-4.21)	4.55 (3.98-5.30)	5.86 (4.96-7.05)	6.94 (5.76-8.53)	8.10 (6.56-10.2)	9.37 (7.38-12.1)	11.2 (8.49-15.2)	12.8 (9.33-17.8)
4-day	2.00 (1.78-2.31)	2.81 (2.49-3.24)	3.93 (3.47-4.54)	4.91 (4.30-5.72)	6.33 (5.36-7.62)	7.50 (6.22-9.22)	8.76 (7.10-11.0)	10.1 (7.99-13.1)	12.2 (9.20-16.4)	13.9 (10.1-19.4)
7-day	2.25 (1.99-2.59)	3.13 (2.77-3.61)	4.36 (3.85-5.04)	5.42 (4.75-6.32)	6.97 (5.90-8.39)	8.24 (6.84-10.1)	9.62 (7.79-12.1)	11.1 (8.76-14.4)	13.3 (10.1-18.0)	15.1 (11.1-21.2)
10-day	2.40 (2.13-2.77)	3.34 (2.95-3.85)	4.63 (4.09-5.35)	5.75 (5.04-6.70)	7.37 (6.25-8.88)	8.71 (7.23-10.7)	10.1 (8.22-12.8)	11.7 (9.24-15.2)	14.0 (10.6-18.9)	15.9 (11.6-22.2)
20-day	2.89 (2.56-3.32)	3.99 (3.53-4.60)	5.52 (4.87-6.38)	6.84 (5.99-7.97)	8.74 (7.41-10.5)	10.3 (8.56-12.7)	12.0 (9.72-15.1)	13.8 (10.9-17.9)	16.5 (12.5-22.3)	18.8 (13.7-26.3)
30-day	3.40 (3.02-3.92)	4.68 (4.14-5.40)	6.45 (5.69-7.45)	7.96 (6.98-9.28)	10.2 (8.61-12.2)	12.0 (9.93-14.7)	13.9 (11.3-17.5)	16.1 (12.7-20.8)	19.2 (14.5-25.9)	21.8 (15.9-30.5)
45-day	4.06 (3.60-4.67)	5.51 (4.88-6.35)	7.51 (6.63-8.68)	9.24 (8.09-10.8)	11.7 (9.95-14.1)	13.8 (11.4-17.0)	16.0 (13.0-20.2)	18.5 (14.6-23.9)	22.1 (16.7-29.8)	25.1 (18.4-35.1)
60-day	4.63 (4.11-5.33)	6.19 (5.48-7.14)	8.34 (7.37-9.64)	10.2 (8.93-11.9)	12.9 (10.9-15.5)	15.1 (12.5-18.6)	17.5 (14.2-22.0)	20.2 (15.9-26.1)	24.1 (18.2-32.6)	27.5 (20.1-38.4)

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

SMALL AREA UNIT HYDROGRAPHY MODEL - SUPPORTING HYDROLOGIC PARAMETERS

DRAINAGE BASIN 100

100-year, 24-hour Storm Event

Rainfall Data per NOAA Atals 14

100-yr, 24-hour - P24 (inches)	6.31
25-year, 24-hour - P24 (inches)	4.64

PRE-PROJECT

Storm Return Frequency (year)	25	
Tributary Area (acres)	17.5	
% Impervious	0%	
Antecedent Moisture Content (AMC)	II	<i>per Section C.5</i>
NRCS Soil Group	A	
Land Cover Type	Barren	
CN (Composite based on % Impervious)	78	<i>CN=78 for Barren</i>
Pervious Area Fraction, a_p	1.00	
Infiltration Rate for Pervious Area, F_p (in/hr)	0.41	<i>per Figure C-6</i>
Maximum Loss Rate, F_m (in/hr)	0.41	<i>per Section C.6.5: $F_m = a_p F_p$</i>
S	2.82	<i>per Section 6.1: $S=(1000/CN)-10$</i>
I_a	0.564	<i>per Section 6.1: $I_a=0.2S$</i>
24-hr Storm Runoff Yield Fraction, Y	0.519	<i>per Section 6.2: $Y_j=(P24-I_a)^2/(P24-I_a+S)P24$</i>
Catchment Low Loss Fraction, $\bar{Y}$	0.481	<i>per Section C.6.3: $\bar{Y}=1-Y$</i>

POST-PROJECT

Storm Return Frequency (year)	100	
Tributary Area (acres)	17.5	
% Impervious	84%	
Antecedent Moisture Content (AMC)	III	<i>per Section C.5</i>
NRCS Soil Group	A	
Land Cover Type	Industrial	
CN (Composite based on % Impervious)	87	<i>CN=32 for Commercial Landscaping; CN=98 for paved surfaces</i>
Pervious Area Fraction, a_p	0.16	
Infiltration Rate for Pervious Area, F_p (in/hr)	0.09	<i>per Figure C-6</i>
Maximum Loss Rate, F_m (in/hr)	0.01	<i>per Section C.6.5: $F_m = a_p F_p$</i>
S	1.44	<i>per Section 6.1: $S=(1000/CN)-10$</i>
I_a	0.287	<i>per Section 6.1: $I_a=0.2S$</i>
24-hr Storm Runoff Yield Fraction, Y	0.771	<i>per Section 6.2: $Y_j=(P24-I_a)^2/(P24-I_a+S)P24$</i>
Catchment Low Loss Fraction, $\bar{Y}$	0.229	<i>per Section C.6.3: $\bar{Y}=1-Y$</i>

Curve (I) Numbers of Hydrologic Soil-Cover Complexes For Pervious Areas-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group			
		A	B	C	D
<u>NATURAL COVERS -</u>					
Barren (Rockland, eroded and graded land)		78	86	91	93
Chaparral, Broadleaf (Manzonita, ceanothus and scrub oak)	Poor	53	70	80	85
	Fair	40	63	75	81
	Good	31	57	71	78
Chaparral, Narrowleaf (Chamise and redshank)	Poor	71	82	88	91
	Fair	55	72	81	86
Grass, Annual or Perennial	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Meadows or Cienegas (Areas with seasonally high water table, principal vegetation is sod forming grass)	Poor	63	77	85	88
	Fair	51	70	80	84
	Good	30	58	71	78
Open Brush (Soft wood shrubs - buckwheat, sage, etc.)	Poor	62	76	84	88
	Fair	46	66	77	83
	Good	41	63	75	81
Woodland (Coniferous or broadleaf trees predominate. Canopy density is at least 50 percent.)	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	25	55	70	77
Woodland, Grass (Coniferous or broadleaf trees with canopy density from 20 to 50 percent)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
<u>URBAN COVERS -</u>					
Residential or Commercial Landscaping (Lawn, shrubs, etc.)	Good	32	56	69	75
Turf (Irrigated and mowed grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
<u>AGRICULTURAL COVERS -</u>					
Fallow (Land plowed but not tilled or seeded)		77	86	91	94

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

**CURVE NUMBERS
FOR
PERVIOUS AREAS**

Curve (I) Numbers of Hydrologic Soil-Cover Complexes For Pervious Areas-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group			
		A	B	C	D
<u>AGRICULTURAL COVERS</u> (Continued)					
Legumes, Close Seeded (Alfalfa, sweetclover, timothy, etc.)	Poor	66	77	85	89
	Good	58	72	81	85
Orchards, Evergreen (Citrus, avocados, etc.)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
Pasture, Dryland (Annual grasses)	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Pasture, Irrigated (Legumes and perennial grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
Row Crops (Field crops - tomatoes, sugar beets, etc.)	Poor	72	81	88	91
	Good	67	78	85	89
Small grain (Wheat, oats, barley, etc.)	Poor	65	76	84	88
	Good	63	75	83	87

Notes:

- All curve numbers are for Antecedent Moisture Condition (AMC) II.
- Quality of cover definitions:

 Poor-Heavily grazed, regularly burned areas, or areas of high burn potential. Less than 50 percent of the ground surface is protected by plant cover or brush and tree canopy.

 Fair-Moderate cover with 50 percent to 75 percent of the ground surface protected.

 Good-Heavy or dense cover with more than 75 percent of the ground surface protected.
- See Figure C-2 for definition of cover types.

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

**CURVE NUMBERS
FOR
PERVIOUS AREAS**

ACTUAL IMPERVIOUS COVER

Land Use (1)	Range-Percent	Recommended Value For Average Conditions-Percent (2)
Natural or Agriculture	0 - 0	0
Public Park	10 - 25	15
School	30 - 50	40
Single Family Residential: (3)		
2.5 acre lots	5 - 15	10
1 acre lots	10 - 25	20
2 dwellings/acre	20 - 40	30
3-4 dwellings/acre	30 - 50	40
5-7 dwellings/acre	35 - 55	50
8-10 dwellings/acre	50 - 70	60
More than 10 dwellings/acre	65 - 90	80
Multiple Family Residential:		
Condominiums	45 - 70	65
Apartments	65 - 90	80
Mobile Home Park	60 - 85	75
Commercial, Downtown Business or Industrial	80 - 100	90

Notes:

1. Land use should be based on ultimate development of the watershed. Long range master plans for the County and incorporated cities should be reviewed to insure reasonable land use assumptions.
2. Recommended values are based on average conditions which may not apply to a particular study area. The percentage impervious may vary greatly even on comparable sized lots due to differences in dwelling size, improvements, etc. Landscape practices should also be considered as it is common in some areas to use ornamental gravels underlain by impervious plastic materials in place of lawns and shrubs. A field investigation of a study area shall always be made, and a review of aerial photos, where available, may assist in estimating the percentage of impervious cover in developed areas.
3. For typical equestrian subdivisions increase impervious area 5 percent over the values recommended in the table above.

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

**ACTUAL IMPERVIOUS COVER
FOR
DEVELOPED AREAS**

C.6.1. Estimation of Initial Abstraction (Ia)

The initial abstraction (Ia) for an area is a function of land use, treatment, and condition; interception; infiltration; depression storage; and antecedent soil moisture. An estimate for Ia is given by the SCS as

$$Ia = 0.2S \quad (C.1)$$

where S is an estimate of total soil capacity given by

$$S = \frac{1000}{CN} - 10 \quad (C.2)$$

where CN is the area curve number.

C.6.2. Estimation of Storm Runoff Yield

Given the CN for a subarea A_j , the corresponding 24-hour storm runoff yield fraction, Y_j , is estimated by

$$Y_j = \frac{(P_{24} - Ia)^2}{(P_{24} - Ia + S)P_{24}} \quad (C.3)$$

where

$$\begin{aligned} Y_j &= \text{24-hour storm runoff yield fraction for subarea } A_j \\ P_{24} &= \text{24-hour storm rainfall} \\ Ia &= \text{initial abstraction from (C.1)} \\ S &= \text{see (C.2)} \end{aligned}$$

It is noted that should Ia be greater than P_{24} in (C.3), then Y_j is defined to be zero. In this manual, the notation Y and Y_j will represent the runoff yield fraction, rather than the volume of runoff.

If the area under study contains several (say m) CN designations, then the yield, Y, for the total area must represent the net effect of the several curve

numbers. By weighting each of the subarea yield values according to the respective areas,

$$Y = (Y_1 A_1 + \dots + Y_m A_m) / (A_1 + A_2 + \dots + A_m) \quad (C.4)$$

where each Y_j follows from (C.3).

C.6.3. Low Loss Rate, F^*

In design storm runoff hydrograph studies, the following formula is used to estimate that portion of rainfall to be attributed to watershed losses:

$$\bar{Y} = 1 - Y \quad (C.5)$$

where

$$\begin{aligned} \bar{Y} &= \text{catchment low loss fraction} \\ Y &= \text{catchment 24-hour storm runoff yield} \\ &\quad \text{fraction computed from (C.4)} \end{aligned}$$

Using the low loss fraction, $\bar{Y}$, the corresponding low loss rate, F^* , is given by

$$F^* = \bar{Y} \cdot I \quad (C.6)$$

where I is the rainfall intensity and F^* has units of inches/hour. Use of F^* enables the design storm 24-hour storm runoff yield to approximate the yield values obtained from the CN approach (see Figure C-5).

C.6.4. Infiltration Rates

Soil infiltration rates have been estimated for each of the soil groups by laboratory studies and measurements. These measurements show that an initially dry soil will have an associated infiltration rate which essentially decreases with time as the soil becomes wetted. As the soil is subjected to continual heavy rainfall, this infiltration rate approaches a minimum (usually within about 30 minutes) which represents the infiltration capacity of the soil.

When sufficient stream gauge information is available, infiltration rates for unit hydrograph hydrology can be estimated from a study of rainfall-runoff relationships of major storms. Where such data is not available, infiltration rates for pervious areas as a function of CN can be estimated using Figures C-3 and C-6. Loss rates for pervious areas estimated from the Figure C-6 curves are generally consistent with values developed from rainfall-runoff reconstitution studies in San Bernardino County watersheds.

C.6.5. Estimation of Catchment Maximum Loss Rates, F_m

The infiltration rate selected from Figure C-6 applies to the pervious area fraction of the watershed. The infiltration rate assumed for an impervious surface is 0.0 inch/hour. The maximum loss rate, F_m , for a catchment is therefore given by

$$F_m = a_p F_p \quad (C.7)$$

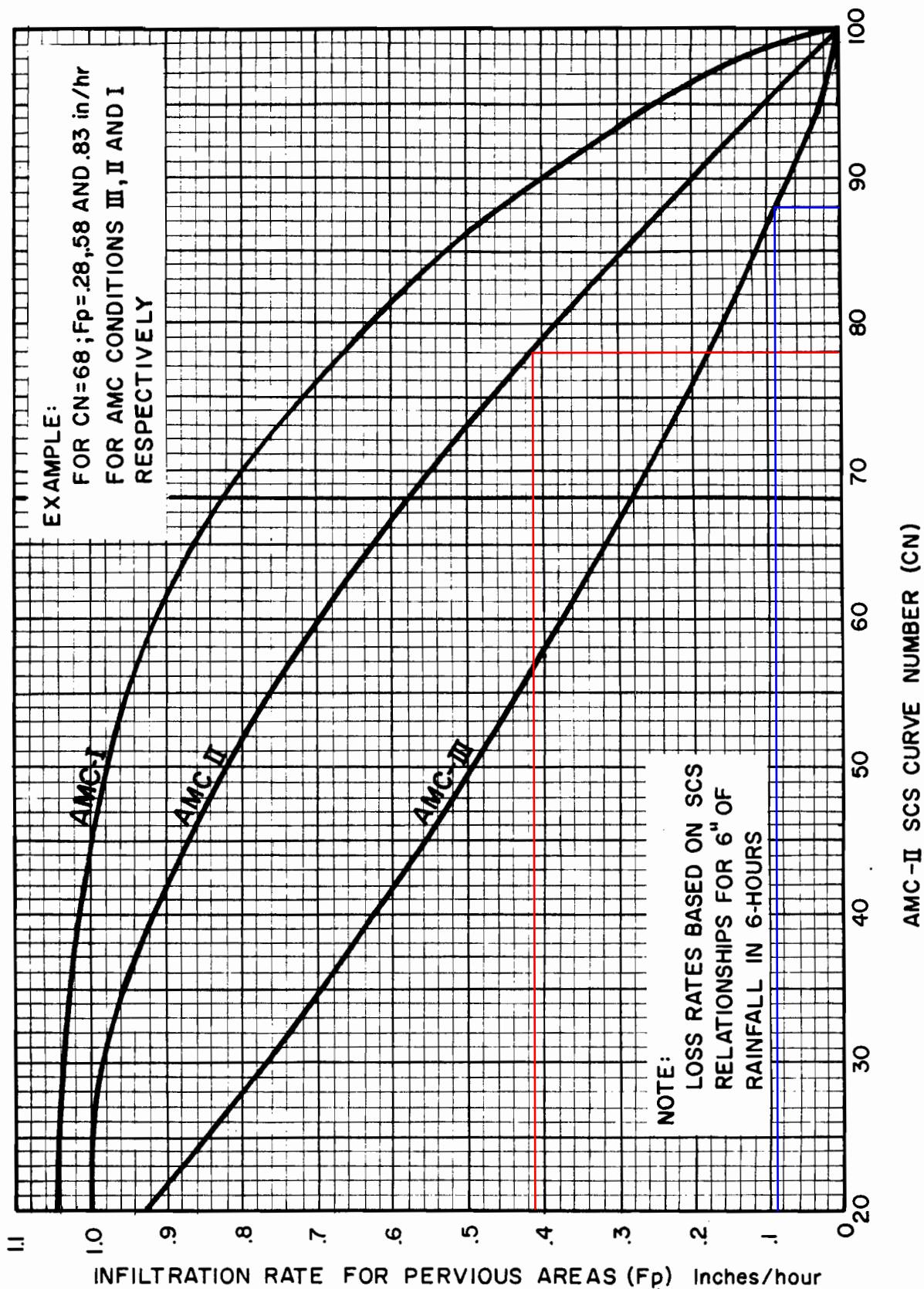
where a_p is the pervious area fraction, and F_p is the infiltration rate for the pervious area.

Should a catchment contain several F_p values, the composite F_m value is determined as a simple area average of the several F_m values. Table C.2 provides F_m values for a wide range of cover types and soil groups.

C.6.6. Design Storm Loss Rates

In design storm runoff hydrograph studies, a 24-hour duration storm pattern is used to develop the time distribution of effective rainfall over the watershed. The effective rainfall quantities are determined by subtracting the watershed losses from the design storm rainfall.

The loss rate used for a particular catchment is a combination of the maximum loss rate F_m and the low loss rate F^* . F^* is used as the loss rate unless F^* exceeds F_m , in which case F_m is used as the loss rate. That is, F_m serves as the maximum loss rate. Typically in 100-year storm studies, F^* serves as the loss rate for the entire storm pattern except for the most



SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

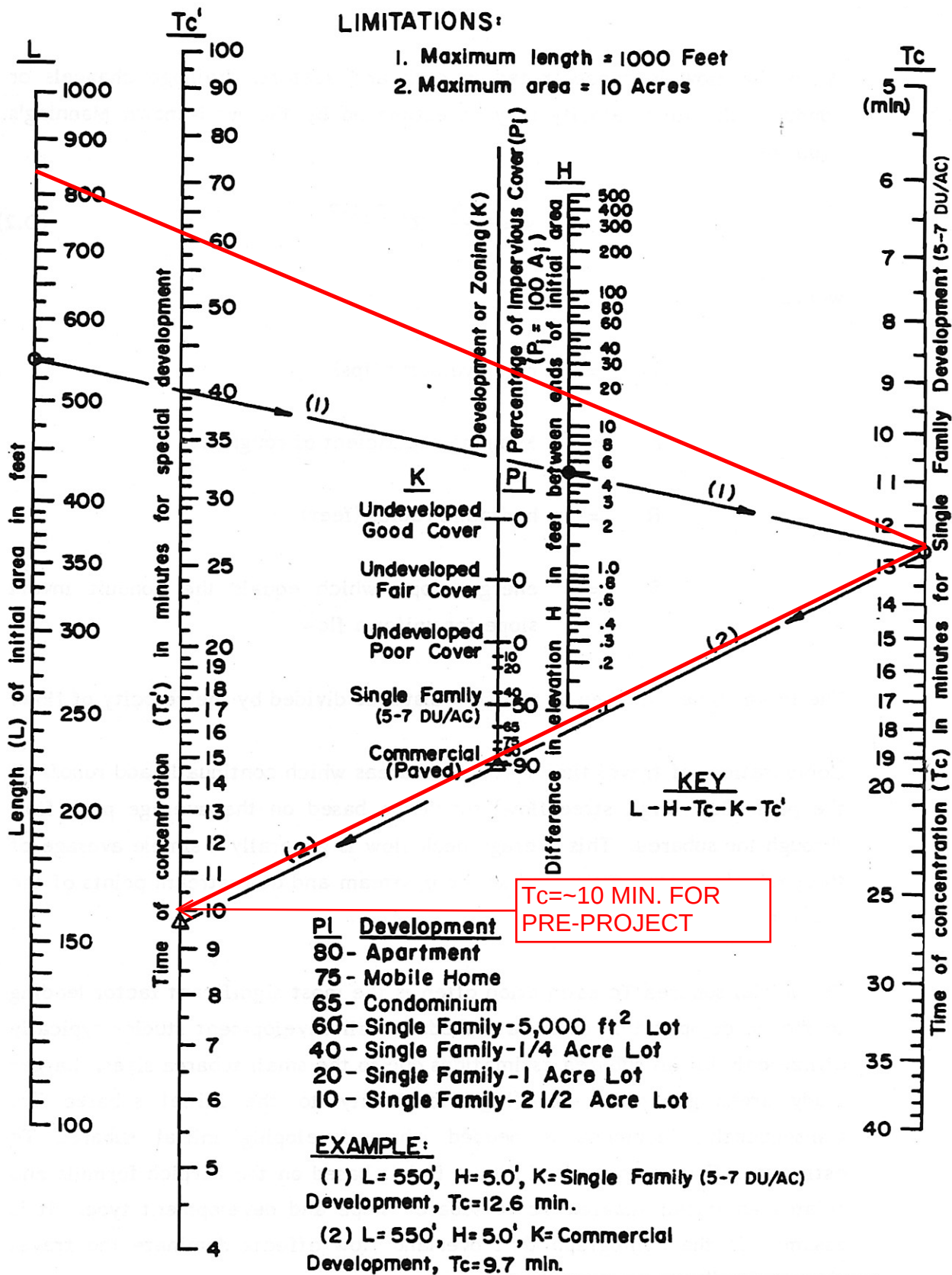
**INFILTRATION RATE FOR
PERVIOUS AREAS VERSUS
SCS CURVE NUMBERS**

TABLE C.2. Fm (in/hr) VALUES
FOR TYPICAL COVER TYPES

<u>COVER TYPE</u>	<u>SOIL GROUP</u>				
	$A_p^{(1)}$	A	B	C	D
NATURAL:					
Barren	1.0	0.41	0.27	0.18	0.14
Row Crops (good)	1.0	0.59	0.41	0.29	0.22
Grass (fair)	1.0	0.82	0.56	0.40	0.31
Orchards (fair)	1.0	0.88	0.62	0.43	0.34
Woodland (fair)	1.0	0.95	0.69	0.50	0.40
URBAN:					
Residential (1 DU/AC)	0.80	0.78	0.60	0.45	0.37
Residential (2 DU/AC)	0.70	0.68	0.53	0.39	0.32
Residential (4 DU/AC)	0.60	0.58	0.45	0.34	0.28
Residential (10 DU/AC)	0.40	0.39	0.30	0.22	0.18
Condominium	0.35	0.34	0.26	0.20	0.16
Mobile Home Park	0.25	0.24	0.19	0.14	0.12
Apartments	0.20	0.19	0.15	0.11	0.09
Commercial/Industrial	0.10	0.10	0.08	0.06	0.05

NOTES:

- (1) Recommended a_p values from Figure C-4
- (2) AMC II assumed for all Fm values
- (3) CN values obtained from Figure C-3
- (4) DU/AC=dwelling unit per acre



SAN BERNARDINO COUNTY
 HYDROLOGY MANUAL

**TIME OF CONCENTRATION
 NOMOGRAPH
 FOR INITIAL SUBAREA**

SMALL AREA UNIT HYDROGRAPH MODEL

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Analysis prepared by:

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TEMECULA, CA 92590
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Problem Descriptions:

NEWCASTLE-HESPERIA (CITY OF HESPERIA)
25-YEAR STORM EVENT - PRE-PROJECT
BASIN 100

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA(ACRES) = 17.50
SOIL-LOSS RATE, F_m , (INCH/HR) = 0.410
LOW LOSS FRACTION = 0.481
TIME OF CONCENTRATION(MIN.) = 10.00
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
USER SPECIFIED RAINFALL VALUES ARE USED
RETURN FREQUENCY(YEARS) = 25
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.27
30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.70
1-HOUR POINT RAINFALL VALUE(INCHES) = 0.99
3-HOUR POINT RAINFALL VALUE(INCHES) = 1.63
6-HOUR POINT RAINFALL VALUE(INCHES) = 2.28
24-HOUR POINT RAINFALL VALUE(INCHES) = 4.64

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 3.31
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 3.46

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	10.0	20.0	30.0	40.0
-----------------	----------------	------------	----	------	------	------	------

0.17	0.0056	0.81	Q	.	.	.	.
0.33	0.0168	0.81	Q	.	.	.	.

0.50	0.0280	0.82	Q	.	.	.	.
0.67	0.0393	0.82	Q	.	.	.	.
0.83	0.0507	0.83	Q	.	.	.	.
1.00	0.0621	0.83	Q	.	.	.	.
1.17	0.0736	0.84	Q	.	.	.	.
1.33	0.0852	0.84	Q	.	.	.	.
1.50	0.0968	0.85	Q	.	.	.	.
1.67	0.1085	0.85	Q	.	.	.	.
1.83	0.1203	0.86	Q	.	.	.	.
2.00	0.1321	0.86	Q	.	.	.	.
2.17	0.1440	0.87	Q	.	.	.	.
2.33	0.1559	0.87	Q	.	.	.	.
2.50	0.1679	0.88	Q	.	.	.	.
2.67	0.1800	0.88	Q	.	.	.	.
2.83	0.1922	0.89	Q	.	.	.	.
3.00	0.2044	0.89	Q	.	.	.	.
3.17	0.2168	0.90	Q	.	.	.	.
3.33	0.2292	0.90	Q	.	.	.	.
3.50	0.2416	0.91	Q	.	.	.	.
3.67	0.2542	0.91	Q	.	.	.	.
3.83	0.2668	0.92	Q	.	.	.	.
4.00	0.2796	0.93	Q	.	.	.	.
4.17	0.2924	0.93	Q	.	.	.	.
4.33	0.3053	0.94	Q	.	.	.	.
4.50	0.3182	0.95	Q	.	.	.	.
4.67	0.3313	0.95	Q	.	.	.	.
4.83	0.3445	0.96	Q	.	.	.	.
5.00	0.3577	0.97	Q	.	.	.	.
5.17	0.3711	0.97	Q	.	.	.	.
5.33	0.3846	0.98	Q	.	.	.	.
5.50	0.3981	0.99	Q	.	.	.	.
5.67	0.4118	0.99	Q	.	.	.	.
5.83	0.4256	1.01	.Q	.	.	.	.
6.00	0.4394	1.01	.Q	.	.	.	.
6.17	0.4534	1.02	.Q	.	.	.	.
6.33	0.4675	1.03	.Q	.	.	.	.
6.50	0.4818	1.04	.Q	.	.	.	.
6.67	0.4961	1.04	.Q	.	.	.	.
6.83	0.5106	1.06	.Q	.	.	.	.
7.00	0.5252	1.06	.Q	.	.	.	.
7.17	0.5399	1.08	.Q	.	.	.	.
7.33	0.5548	1.08	.Q	.	.	.	.
7.50	0.5698	1.10	.Q	.	.	.	.
7.67	0.5849	1.10	.Q	.	.	.	.
7.83	0.6002	1.12	.Q	.	.	.	.
8.00	0.6156	1.12	.Q	.	.	.	.
8.17	0.6312	1.14	.Q	.	.	.	.
8.33	0.6470	1.15	.Q	.	.	.	.
8.50	0.6629	1.16	.Q	.	.	.	.
8.67	0.6790	1.17	.Q	.	.	.	.

8.83	0.6952	1.19	.Q	.	.	.	.
9.00	0.7117	1.20	.Q	.	.	.	.
9.17	0.7283	1.22	.Q	.	.	.	.
9.33	0.7451	1.23	.Q	.	.	.	.
9.50	0.7621	1.25	.Q	.	.	.	.
9.67	0.7794	1.26	.Q	.	.	.	.
9.83	0.7968	1.28	.Q	.	.	.	.
10.00	0.8145	1.29	.Q	.	.	.	.
10.17	0.8324	1.31	.Q	.	.	.	.
10.33	0.8506	1.32	.Q	.	.	.	.
10.50	0.8690	1.35	.Q	.	.	.	.
10.67	0.8877	1.36	.Q	.	.	.	.
10.83	0.9067	1.39	.Q	.	.	.	.
11.00	0.9259	1.41	.Q	.	.	.	.
11.17	0.9455	1.44	.Q	.	.	.	.
11.33	0.9654	1.45	.Q	.	.	.	.
11.50	0.9856	1.49	.Q	.	.	.	.
11.67	1.0062	1.50	.Q	.	.	.	.
11.83	1.0272	1.54	.Q	.	.	.	.
12.00	1.0485	1.56	.Q	.	.	.	.
12.17	1.0697	1.51	.Q	.	.	.	.
12.33	1.0907	1.54	.Q	.	.	.	.
12.50	1.1122	1.59	.Q	.	.	.	.
12.67	1.1342	1.61	.Q	.	.	.	.
12.83	1.1568	1.67	.Q	.	.	.	.
13.00	1.1800	1.70	.Q	.	.	.	.
13.17	1.2038	1.76	.Q	.	.	.	.
13.33	1.2283	1.80	.Q	.	.	.	.
13.50	1.2536	1.87	.Q	.	.	.	.
13.67	1.2797	1.92	.Q	.	.	.	.
13.83	1.3067	2.01	. Q	.	.	.	.
14.00	1.3348	2.06	. Q	.	.	.	.
14.17	1.3631	2.05	. Q	.	.	.	.
14.33	1.3919	2.12	. Q	.	.	.	.
14.50	1.4221	2.27	. Q	.	.	.	.
14.67	1.4540	2.36	. Q	.	.	.	.
14.83	1.4881	2.58	. Q	.	.	.	.
15.00	1.5245	2.71	. Q	.	.	.	.
15.17	1.5641	3.04	. Q	.	.	.	.
15.33	1.6075	3.26	. Q	.	.	.	.
15.50	1.6591	4.23	. Q	.	.	.	.
15.67	1.7205	4.68	. Q	.	.	.	.
15.83	1.7989	6.71	. Q	.	.	.	.
16.00	1.9144	10.06	. Q	.	.	.	.
16.17	2.1913	30.16	.	.	Q	.	.
16.33	2.4356	5.31	. Q	.	.	.	.
16.50	2.4964	3.52	. Q	.	.	.	.
16.67	2.5404	2.86	. Q	.	.	.	.
16.83	2.5771	2.46	. Q	.	.	.	.
17.00	2.6092	2.19	. Q	.	.	.	.

Q25=30.2 CFS
90% OF Q25=27.2 CFS

17.17	2.6389	2.12	. Q	.	.	.	.
17.33	2.6670	1.96	.Q	.	.	.	.
17.50	2.6931	1.83	.Q	.	.	.	.
17.67	2.7177	1.73	.Q	.	.	.	.
17.83	2.7409	1.64	.Q	.	.	.	.
18.00	2.7629	1.56	.Q	.	.	.	.
18.17	2.7845	1.58	.Q	.	.	.	.
18.33	2.8059	1.52	.Q	.	.	.	.
18.50	2.8265	1.47	.Q	.	.	.	.
18.67	2.8464	1.42	.Q	.	.	.	.
18.83	2.8657	1.38	.Q	.	.	.	.
19.00	2.8844	1.34	.Q	.	.	.	.
19.17	2.9025	1.30	.Q	.	.	.	.
19.33	2.9202	1.27	.Q	.	.	.	.
19.50	2.9374	1.24	.Q	.	.	.	.
19.67	2.9543	1.21	.Q	.	.	.	.
19.83	2.9707	1.18	.Q	.	.	.	.
20.00	2.9868	1.16	.Q	.	.	.	.
20.17	3.0026	1.13	.Q	.	.	.	.
20.33	3.0180	1.11	.Q	.	.	.	.
20.50	3.0331	1.09	.Q	.	.	.	.
20.67	3.0480	1.07	.Q	.	.	.	.
20.83	3.0626	1.05	.Q	.	.	.	.
21.00	3.0769	1.03	.Q	.	.	.	.
21.17	3.0910	1.02	.Q	.	.	.	.
21.33	3.1049	1.00	Q	.	.	.	.
21.50	3.1186	0.98	Q	.	.	.	.
21.67	3.1321	0.97	Q	.	.	.	.
21.83	3.1453	0.96	Q	.	.	.	.
22.00	3.1584	0.94	Q	.	.	.	.
22.17	3.1713	0.93	Q	.	.	.	.
22.33	3.1840	0.92	Q	.	.	.	.
22.50	3.1966	0.91	Q	.	.	.	.
22.67	3.2090	0.89	Q	.	.	.	.
22.83	3.2212	0.88	Q	.	.	.	.
23.00	3.2333	0.87	Q	.	.	.	.
23.17	3.2453	0.86	Q	.	.	.	.
23.33	3.2571	0.85	Q	.	.	.	.
23.50	3.2688	0.84	Q	.	.	.	.
23.67	3.2803	0.83	Q	.	.	.	.
23.83	3.2918	0.83	Q	.	.	.	.
24.00	3.3031	0.82	Q	.	.	.	.
24.17	3.3087	0.00	Q	.	.	.	.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
 (Note: 100% of Peak Flow Rate estimate assumed to have
 an instantaneous time duration)

Percentile of Estimated

Duration

Peak Flow Rate	(minutes)
=====	=====
0%	1440.0
10%	90.0
20%	30.0
30%	20.0
40%	10.0
50%	10.0
60%	10.0
70%	10.0
80%	10.0
90%	10.0

SMALL AREA UNIT HYDROGRAPH MODEL

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Ver. 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

Problem Descriptions:

NEWCASTLE-HESPERIA (CITY OF HESPERIA)
100-YEAR STORM EVENT - POST-PROJECT
BASIN 100

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA(ACRES) = 17.50
SOIL-LOSS RATE, F_m , (INCH/HR) = 0.010
LOW LOSS FRACTION = 0.229
TIME OF CONCENTRATION(MIN.) = 16.00
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
USER SPECIFIED RAINFALL VALUES ARE USED
RETURN FREQUENCY(YEARS) = 100
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.35
30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.93
1-HOUR POINT RAINFALL VALUE(INCHES) = 1.31
3-HOUR POINT RAINFALL VALUE(INCHES) = 2.16
6-HOUR POINT RAINFALL VALUE(INCHES) = 3.05
24-HOUR POINT RAINFALL VALUE(INCHES) = 6.31

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 7.90
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 1.30

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	10.0	20.0	30.0	40.0
-----------------	----------------	------------	----	------	------	------	------

0.27	0.0223	2.02	. Q	.	.	.	.
0.53	0.0669	2.03	. Q	.	.	.	.

0.80	0.1119	2.06	. Q	.	.	.	.
1.07	0.1574	2.07	. Q	.	.	.	.
1.33	0.2032	2.09	. Q	.	.	.	.
1.60	0.2495	2.11	. Q	.	.	.	.
1.87	0.2962	2.13	. Q	.	.	.	.
2.13	0.3433	2.15	. Q	.	.	.	.
2.40	0.3909	2.17	. Q	.	.	.	.
2.67	0.4390	2.19	. Q	.	.	.	.
2.93	0.4876	2.22	. Q	.	.	.	.
3.20	0.5366	2.23	. Q	.	.	.	.
3.47	0.5862	2.27	. Q	.	.	.	.
3.73	0.6363	2.28	. Q	.	.	.	.
4.00	0.6870	2.32	. Q	.	.	.	.
4.27	0.7382	2.33	. Q	.	.	.	.
4.53	0.7900	2.37	. Q	.	.	.	.
4.80	0.8424	2.39	. Q	.	.	.	.
5.07	0.8954	2.43	. Q	.	.	.	.
5.33	0.9491	2.45	. Q	.	.	.	.
5.60	1.0034	2.49	. Q	.	.	.	.
5.87	1.0584	2.51	. Q	.	.	.	.
6.13	1.1142	2.55	. Q	.	.	.	.
6.40	1.1707	2.58	. Q	.	.	.	.
6.67	1.2280	2.62	. Q	.	.	.	.
6.93	1.2861	2.65	. Q	.	.	.	.
7.20	1.3450	2.70	. Q	.	.	.	.
7.47	1.4049	2.73	. Q	.	.	.	.
7.73	1.4656	2.79	. Q	.	.	.	.
8.00	1.5273	2.82	. Q	.	.	.	.
8.27	1.5901	2.88	. Q	.	.	.	.
8.53	1.6539	2.91	. Q	.	.	.	.
8.80	1.7188	2.98	. Q	.	.	.	.
9.07	1.7849	3.02	. Q	.	.	.	.
9.33	1.8522	3.09	. Q	.	.	.	.
9.60	1.9209	3.14	. Q	.	.	.	.
9.87	1.9909	3.22	. Q	.	.	.	.
10.13	2.0625	3.27	. Q	.	.	.	.
10.40	2.1356	3.37	. Q	.	.	.	.
10.67	2.2104	3.42	. Q	.	.	.	.
10.93	2.2870	3.53	. Q	.	.	.	.
11.20	2.3656	3.59	. Q	.	.	.	.
11.47	2.4463	3.73	. Q	.	.	.	.
11.73	2.5292	3.80	. Q	.	.	.	.
12.00	2.6146	3.96	. Q	.	.	.	.
12.27	2.7016	3.93	. Q	.	.	.	.
12.53	2.7892	4.02	. Q	.	.	.	.
12.80	2.8790	4.13	. Q	.	.	.	.
13.07	2.9725	4.36	. Q	.	.	.	.
13.33	3.0702	4.50	. Q	.	.	.	.
13.60	3.1728	4.81	. Q	.	.	.	.
13.87	3.2809	4.99	. Q	.	.	.	.

14.13	3.3944	5.31	.	Q	.	.	.	.
14.40	3.5102	5.20	.	Q	.	.	.	.
14.67	3.6321	5.86	.	Q	.	.	.	.
14.93	3.7659	6.28	.	Q	.	.	.	.
15.20	3.9175	7.47	.	Q	.	.	.	.
15.47	4.0920	8.36	.	Q	.	.	.	.
15.73	4.3221	12.52	.	.	Q	.	.	.
16.00	4.6510	17.33	.	.	.	Q	.	.
16.27	5.2706	38.90	.	.	.	.	Q	.
16.53	5.8128	10.30	.	.	Q	.	.	.
16.80	6.0013	6.81	.	Q	.	.	.	.
17.07	6.1370	5.50	.	Q	.	.	.	.
17.33	6.2549	5.20	.	Q	.	.	.	.
17.60	6.3634	4.65	.	Q	.	.	.	.
17.87	6.4613	4.24	.	Q	.	.	.	.
18.13	6.5513	3.92	.	Q	.	.	.	.
18.40	6.6371	3.87	.	Q	.	.	.	.
18.67	6.7202	3.66	.	Q	.	.	.	.
18.93	6.7988	3.48	.	Q	.	.	.	.
19.20	6.8736	3.32	.	Q	.	.	.	.
19.47	6.9452	3.18	.	Q	.	.	.	.
19.73	7.0139	3.06	.	Q	.	.	.	.
20.00	7.0800	2.95	.	Q	.	.	.	.
20.27	7.1438	2.85	.	Q	.	.	.	.
20.53	7.2056	2.76	.	Q	.	.	.	.
20.80	7.2654	2.67	.	Q	.	.	.	.
21.07	7.3235	2.60	.	Q	.	.	.	.
21.33	7.3800	2.53	.	Q	.	.	.	.
21.60	7.4351	2.47	.	Q	.	.	.	.
21.87	7.4888	2.41	.	Q	.	.	.	.
22.13	7.5412	2.35	.	Q	.	.	.	.
22.40	7.5924	2.30	.	Q	.	.	.	.
22.67	7.6425	2.25	.	Q	.	.	.	.
22.93	7.6916	2.20	.	Q	.	.	.	.
23.20	7.7397	2.16	.	Q	.	.	.	.
23.47	7.7868	2.12	.	Q	.	.	.	.
23.73	7.8331	2.08	.	Q	.	.	.	.
24.00	7.8785	2.04	.	Q	.	.	.	.
24.27	7.9010	0.00	Q	.	.	.	.	.

Q100 (UNDETAINED)
=38.9 CFS

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated
Peak Flow Rate

Duration
(minutes)

=====

=====

0%

1440.0

10%

384.0

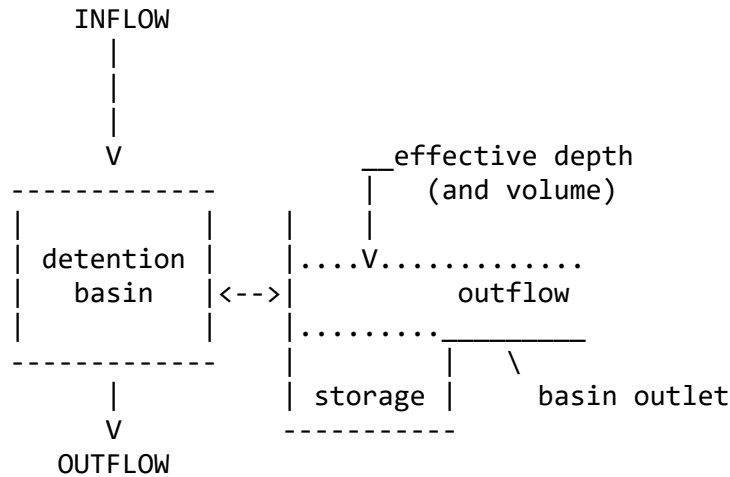
20%	80.0
30%	48.0
40%	32.0
50%	16.0
60%	16.0
70%	16.0
80%	16.0
90%	16.0

Problem Descriptions:
 NEWCASTLE-HESPERIA (CITY OF HESPERIA)
 100-YEAR STORM EVENT - POST-PROJECT
 BASIN 100

=====

FLOW-THROUGH DETENTION BASIN MODEL

SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
 CONSTANT HYDROGRAPH TIME UNIT(MINUTES) = 16.000
 DEAD STORAGE(AF) = 0.00
 SPECIFIED DEAD STORAGE(AF) FILLED = 0.00
 ASSUMED INITIAL DEPTH(FEET) IN STORAGE BASIN = 0.00



DEPTH-VS.-STORAGE AND DEPTH-VS.-DISCHARGE INFORMATION:

TOTAL NUMBER OF BASIN DEPTH INFORMATION ENTRIES = 6

*BASIN-DEPTH	STORAGE	OUTFLOW	**BASIN-DEPTH	STORAGE	OUTFLOW	*
*(FEET)	(ACRE-FEET)	(CFS)	*(FEET)	(ACRE-FEET)	(CFS)	*
* 0.000	0.000	0.000	** 1.000	0.887	0.430	*
* 2.000	1.796	0.430	** 4.000	3.683	4.390	*
* 5.000	3.960	52.050	** 6.400	4.387	179.730	*

BASIN STORAGE, OUTFLOW AND DEPTH ROUTING VALUES:

INTERVAL NUMBER	DEPTH (FEET)	{S-O*DT/2} (ACRE- FEET)	{S+O*DT/2} (ACRE- FEET)
1	0.00	0.00000	0.00000
2	1.00	0.88226	0.89174
3	2.00	1.79126	1.80074
4	4.00	3.63463	3.73137
5	5.00	3.38645	4.53355
6	6.40	2.40650	6.36750

WHERE S=STORAGE(AF);O=OUTFLOW(AF/MIN.);DT=UNIT INTERVAL(MIN.)

DETENTION BASIN ROUTING RESULTS:

NOTE: COMPUTED BASIN DEPTH, OUTFLOW, AND STORAGE QUANTITIES
OCCUR AT THE GIVEN TIME. BASIN INFLOW VALUES REPRESENT THE
AVERAGE INFLOW DURING THE RECENT HYDROGRAPH UNIT INTERVAL.

TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	EFFECTIVE DEPTH(FT)	OUTFLOW (CFS)	EFFECTIVE VOLUME(AF)
0.267	0.000	2.02	0.05	0.01	0.044
0.533	0.000	2.03	0.10	0.03	0.088
0.800	0.000	2.06	0.15	0.05	0.132
1.067	0.000	2.07	0.20	0.07	0.176
1.333	0.000	2.09	0.25	0.10	0.220
1.600	0.000	2.11	0.30	0.12	0.264
1.867	0.000	2.13	0.35	0.14	0.308
2.133	0.000	2.15	0.40	0.16	0.352
2.400	0.000	2.17	0.45	0.18	0.396
2.667	0.000	2.19	0.50	0.20	0.440
2.933	0.000	2.22	0.55	0.22	0.484
3.200	0.000	2.23	0.59	0.25	0.527
3.467	0.000	2.27	0.64	0.27	0.571
3.733	0.000	2.28	0.69	0.29	0.615
4.000	0.000	2.32	0.74	0.31	0.660
4.267	0.000	2.33	0.79	0.33	0.704
4.533	0.000	2.37	0.84	0.35	0.748
4.800	0.000	2.39	0.89	0.37	0.793
5.067	0.000	2.43	0.94	0.40	0.837
5.333	0.000	2.45	0.99	0.42	0.882
5.600	0.000	2.49	1.04	0.43	0.927
5.867	0.000	2.51	1.09	0.43	0.973
6.133	0.000	2.55	1.15	0.43	1.020
6.400	0.000	2.58	1.20	0.43	1.067
6.667	0.000	2.62	1.25	0.43	1.116
6.933	0.000	2.65	1.31	0.43	1.164
7.200	0.000	2.70	1.36	0.43	1.214
7.467	0.000	2.73	1.42	0.43	1.265
7.733	0.000	2.79	1.47	0.43	1.317
8.000	0.000	2.82	1.53	0.43	1.370
8.267	0.000	2.88	1.59	0.43	1.424

8.533	0.000	2.91	1.65	0.43	1.478
8.800	0.000	2.98	1.71	0.43	1.534
9.067	0.000	3.02	1.77	0.43	1.591
9.333	0.000	3.09	1.84	0.43	1.650
9.600	0.000	3.14	1.91	0.43	1.710
9.867	0.000	3.22	1.97	0.43	1.771
10.133	0.000	3.27	2.04	0.47	1.833
10.400	0.000	3.37	2.10	0.57	1.895
10.667	0.000	3.42	2.17	0.70	1.955
10.933	0.000	3.53	2.23	0.83	2.014
11.200	0.000	3.59	2.29	0.95	2.073
11.467	0.000	3.73	2.36	1.07	2.131
11.733	0.000	3.80	2.42	1.19	2.189
12.000	0.000	3.96	2.48	1.31	2.247
12.267	0.000	3.93	2.54	1.43	2.302
12.533	0.000	4.02	2.59	1.55	2.356
12.800	0.000	4.13	2.65	1.66	2.411
13.067	0.000	4.36	2.71	1.78	2.468
13.333	0.000	4.50	2.77	1.90	2.525
13.600	0.000	4.81	2.84	2.02	2.586
13.867	0.000	4.99	2.90	2.15	2.649
14.133	0.000	5.31	2.97	2.29	2.715
14.400	0.000	5.20	3.04	2.42	2.777
14.667	0.000	5.86	3.12	2.56	2.849
14.933	0.000	6.28	3.20	2.72	2.928
15.200	0.000	7.47	3.31	2.91	3.028
15.467	0.000	8.36	3.43	3.14	3.143
15.733	0.000	12.52	3.64	3.47	3.343
16.000	0.000	17.33	3.95	3.98	3.637
16.267	0.000	38.90	4.89	25.60	3.930
16.533	0.000	10.30	3.91	25.56	3.594
16.800	0.000	6.81	3.97	4.26	3.650
17.067	0.000	5.50	3.99	4.35	3.676
17.333	0.000	5.20	4.01	4.69	3.687
17.600	0.000	4.65	4.00	4.78	3.684
17.867	0.000	4.24	4.00	4.46	3.679
18.133	0.000	3.92	3.99	4.37	3.669
18.400	0.000	3.87	3.97	4.35	3.659
18.667	0.000	3.66	3.96	4.32	3.644
18.933	0.000	3.48	3.94	4.29	3.626
19.200	0.000	3.32	3.92	4.25	3.606
19.467	0.000	3.18	3.89	4.20	3.583
19.733	0.000	3.06	3.87	4.15	3.559
20.000	0.000	2.95	3.84	4.10	3.533
20.267	0.000	2.85	3.81	4.05	3.507
20.533	0.000	2.76	3.78	3.99	3.479
20.800	0.000	2.67	3.75	3.93	3.452
21.067	0.000	2.60	3.73	3.88	3.424
21.333	0.000	2.53	3.70	3.82	3.395
21.600	0.000	2.47	3.66	3.76	3.367

Q100 (DETAINED)=25.6 CFS

THIS DETAINED FLOW IS
EQUAL TO OR LESS THAN
THE 90% OF Q25
PRE-PROJECT;
THEREFORE, OK.

21.867	0.000	2.41	3.63	3.70	3.338
22.133	0.000	2.35	3.60	3.64	3.310
22.400	0.000	2.30	3.57	3.58	3.282
22.667	0.000	2.25	3.55	3.52	3.254
22.933	0.000	2.20	3.52	3.46	3.226
23.200	0.000	2.16	3.49	3.40	3.199
23.467	0.000	2.12	3.46	3.35	3.172
23.733	0.000	2.08	3.43	3.29	3.145
24.000	0.000	2.04	3.40	3.23	3.119
24.267	0.000	0.00	3.33	3.13	3.050
24.533	0.000	0.00	3.26	2.99	2.984
24.800	0.000	0.00	3.19	2.86	2.921
25.067	0.000	0.00	3.13	2.73	2.861
25.333	0.000	0.00	3.07	2.60	2.803
25.600	0.000	0.00	3.01	2.49	2.749
25.867	0.000	0.00	2.95	2.37	2.696
26.133	0.000	0.00	2.90	2.27	2.646
26.400	0.000	0.00	2.85	2.16	2.599
26.667	0.000	0.00	2.80	2.07	2.553
26.933	0.000	0.00	2.76	1.97	2.510
27.200	0.000	0.00	2.71	1.88	2.468
27.467	0.000	0.00	2.67	1.80	2.428
27.733	0.000	0.00	2.63	1.72	2.391
28.000	0.000	0.00	2.59	1.64	2.354
28.267	0.000	0.00	2.56	1.57	2.320
28.533	0.000	0.00	2.52	1.49	2.287
28.800	0.000	0.00	2.49	1.43	2.256
29.067	0.000	0.00	2.46	1.36	2.225
29.333	0.000	0.00	2.42	1.30	2.197
29.600	0.000	0.00	2.40	1.24	2.169
29.867	0.000	0.00	2.37	1.19	2.143
30.133	0.000	0.00	2.34	1.13	2.118
30.400	0.000	0.00	2.32	1.08	2.094
30.667	0.000	0.00	2.29	1.03	2.072
30.933	0.000	0.00	2.27	0.99	2.050
31.200	0.000	0.00	2.25	0.94	2.029
31.467	0.000	0.00	2.23	0.90	2.009
31.733	0.000	0.00	2.21	0.86	1.991
32.000	0.000	0.00	2.19	0.82	1.972
32.267	0.000	0.00	2.17	0.78	1.955
32.533	0.000	0.00	2.15	0.75	1.939
32.800	0.000	0.00	2.13	0.71	1.923
33.067	0.000	0.00	2.12	0.68	1.908
33.333	0.000	0.00	2.10	0.65	1.894
33.600	0.000	0.00	2.09	0.62	1.880
33.867	0.000	0.00	2.08	0.59	1.867
34.133	0.000	0.00	2.06	0.57	1.855
34.400	0.000	0.00	2.05	0.54	1.843
34.667	0.000	0.00	2.04	0.52	1.831
34.933	0.000	0.00	2.03	0.49	1.820

35.200	0.000	0.00	2.01	0.47	1.810
35.467	0.000	0.00	2.00	0.45	1.800
35.733	0.000	0.00	1.99	0.43	1.791
36.000	0.000	0.00	1.98	0.43	1.781
36.267	0.000	0.00	1.97	0.43	1.772
36.533	0.000	0.00	1.96	0.43	1.762
36.800	0.000	0.00	1.95	0.43	1.753
37.067	0.000	0.00	1.94	0.43	1.743
37.333	0.000	0.00	1.93	0.43	1.734
37.600	0.000	0.00	1.92	0.43	1.724
37.867	0.000	0.00	1.91	0.43	1.715
38.133	0.000	0.00	1.90	0.43	1.705
38.400	0.000	0.00	1.89	0.43	1.696
38.667	0.000	0.00	1.88	0.43	1.686
38.933	0.000	0.00	1.87	0.43	1.677
39.200	0.000	0.00	1.86	0.43	1.667
39.467	0.000	0.00	1.85	0.43	1.658
39.733	0.000	0.00	1.84	0.43	1.648
40.000	0.000	0.00	1.83	0.43	1.639
40.267	0.000	0.00	1.82	0.43	1.629
40.533	0.000	0.00	1.81	0.43	1.620
40.800	0.000	0.00	1.80	0.43	1.610
41.067	0.000	0.00	1.79	0.43	1.601
41.333	0.000	0.00	1.78	0.43	1.592
41.600	0.000	0.00	1.76	0.43	1.582
41.867	0.000	0.00	1.75	0.43	1.573
42.133	0.000	0.00	1.74	0.43	1.563
42.400	0.000	0.00	1.73	0.43	1.554
42.667	0.000	0.00	1.72	0.43	1.544
42.933	0.000	0.00	1.71	0.43	1.535
43.200	0.000	0.00	1.70	0.43	1.525
43.467	0.000	0.00	1.69	0.43	1.516
43.733	0.000	0.00	1.68	0.43	1.506
44.000	0.000	0.00	1.67	0.43	1.497
44.267	0.000	0.00	1.66	0.43	1.487
44.533	0.000	0.00	1.65	0.43	1.478
44.800	0.000	0.00	1.64	0.43	1.468
45.067	0.000	0.00	1.63	0.43	1.459
45.333	0.000	0.00	1.62	0.43	1.449
45.600	0.000	0.00	1.61	0.43	1.440
45.867	0.000	0.00	1.60	0.43	1.430
46.133	0.000	0.00	1.59	0.43	1.421
46.400	0.000	0.00	1.58	0.43	1.411
46.667	0.000	0.00	1.57	0.43	1.402
46.933	0.000	0.00	1.56	0.43	1.393
47.200	0.000	0.00	1.55	0.43	1.383
47.467	0.000	0.00	1.54	0.43	1.374
47.733	0.000	0.00	1.52	0.43	1.364
48.000	0.000	0.00	1.51	0.43	1.355
48.267	0.000	0.00	1.50	0.43	1.345

DRAWDOWN TIME BACKUP:

TIME TO PEAK @ 16.3 HRS.
TIME TO RECEDE DOWN TO
0.43 CFS, WHICH IS AT THE
BOTTOM OF THE BASIN
(PER INFILTRATION RATES)
@ 35.7 HRS.

DRAWDOWN TIME = 35.7
HRS - 16.3 HRS = 19.4 HRS <
24 HRS; THEREFORE, OK.

48.533	0.000	0.00	1.49	0.43	1.336
48.800	0.000	0.00	1.48	0.43	1.326
49.067	0.000	0.00	1.47	0.43	1.317
49.333	0.000	0.00	1.46	0.43	1.307
49.600	0.000	0.00	1.45	0.43	1.298
49.867	0.000	0.00	1.44	0.43	1.288
50.133	0.000	0.00	1.43	0.43	1.279
50.400	0.000	0.00	1.42	0.43	1.269
50.667	0.000	0.00	1.41	0.43	1.260
50.933	0.000	0.00	1.40	0.43	1.250
51.200	0.000	0.00	1.39	0.43	1.241
51.467	0.000	0.00	1.38	0.43	1.231
51.733	0.000	0.00	1.37	0.43	1.222
52.000	0.000	0.00	1.36	0.43	1.212
52.267	0.000	0.00	1.35	0.43	1.203
52.533	0.000	0.00	1.34	0.43	1.194
52.800	0.000	0.00	1.33	0.43	1.184
53.067	0.000	0.00	1.32	0.43	1.175
53.333	0.000	0.00	1.31	0.43	1.165
53.600	0.000	0.00	1.30	0.43	1.156
53.867	0.000	0.00	1.29	0.43	1.146
54.133	0.000	0.00	1.27	0.43	1.137
54.400	0.000	0.00	1.26	0.43	1.127
54.667	0.000	0.00	1.25	0.43	1.118
54.933	0.000	0.00	1.24	0.43	1.108
55.200	0.000	0.00	1.23	0.43	1.099
55.467	0.000	0.00	1.22	0.43	1.089
55.733	0.000	0.00	1.21	0.43	1.080
56.000	0.000	0.00	1.20	0.43	1.070
56.267	0.000	0.00	1.19	0.43	1.061
56.533	0.000	0.00	1.18	0.43	1.051
56.800	0.000	0.00	1.17	0.43	1.042
57.067	0.000	0.00	1.16	0.43	1.032
57.333	0.000	0.00	1.15	0.43	1.023
57.600	0.000	0.00	1.14	0.43	1.013
57.867	0.000	0.00	1.13	0.43	1.004
58.133	0.000	0.00	1.12	0.43	0.995
58.400	0.000	0.00	1.11	0.43	0.985
58.667	0.000	0.00	1.10	0.43	0.976
58.933	0.000	0.00	1.09	0.43	0.966
59.200	0.000	0.00	1.08	0.43	0.957
59.467	0.000	0.00	1.07	0.43	0.947
59.733	0.000	0.00	1.06	0.43	0.938
60.000	0.000	0.00	1.05	0.43	0.928
60.267	0.000	0.00	1.03	0.43	0.919
60.533	0.000	0.00	1.02	0.43	0.909
60.800	0.000	0.00	1.01	0.43	0.900
61.067	0.000	0.00	1.00	0.43	0.890
61.333	0.000	0.00	0.99	0.43	0.881
61.600	0.000	0.00	0.98	0.42	0.871

61.867	0.000	0.00	0.97	0.42	0.862
62.133	0.000	0.00	0.96	0.42	0.853
62.400	0.000	0.00	0.95	0.41	0.844
62.667	0.000	0.00	0.94	0.41	0.835
62.933	0.000	0.00	0.93	0.40	0.826
63.200	0.000	0.00	0.92	0.40	0.817
63.467	0.000	0.00	0.91	0.39	0.809
63.733	0.000	0.00	0.90	0.39	0.800
64.000	0.000	0.00	0.89	0.39	0.792
64.267	0.000	0.00	0.88	0.38	0.783
64.533	0.000	0.00	0.87	0.38	0.775
64.800	0.000	0.00	0.86	0.37	0.767
65.067	0.000	0.00	0.86	0.37	0.758
65.333	0.000	0.00	0.85	0.37	0.750
65.600	0.000	0.00	0.84	0.36	0.742
65.867	0.000	0.00	0.83	0.36	0.735
66.133	0.000	0.00	0.82	0.35	0.727
66.400	0.000	0.00	0.81	0.35	0.719
66.667	0.000	0.00	0.80	0.35	0.711
66.933	0.000	0.00	0.79	0.34	0.704
67.200	0.000	0.00	0.79	0.34	0.696
67.467	0.000	0.00	0.78	0.34	0.689
67.733	0.000	0.00	0.77	0.33	0.682
68.000	0.000	0.00	0.76	0.33	0.674
68.267	0.000	0.00	0.75	0.33	0.667
68.533	0.000	0.00	0.74	0.32	0.660
68.800	0.000	0.00	0.74	0.32	0.653
69.067	0.000	0.00	0.73	0.31	0.646
69.333	0.000	0.00	0.72	0.31	0.639
69.600	0.000	0.00	0.71	0.31	0.632
69.867	0.000	0.00	0.71	0.30	0.626
70.133	0.000	0.00	0.70	0.30	0.619
70.400	0.000	0.00	0.69	0.30	0.613
70.667	0.000	0.00	0.68	0.30	0.606
70.933	0.000	0.00	0.68	0.29	0.600
71.200	0.000	0.00	0.67	0.29	0.593
71.467	0.000	0.00	0.66	0.29	0.587
71.733	0.000	0.00	0.65	0.28	0.581
72.000	0.000	0.00	0.65	0.28	0.575
72.267	0.000	0.00	0.64	0.28	0.568
72.533	0.000	0.00	0.63	0.27	0.562
72.800	0.000	0.00	0.63	0.27	0.556
73.067	0.000	0.00	0.62	0.27	0.550
73.333	0.000	0.00	0.61	0.27	0.545
73.600	0.000	0.00	0.61	0.26	0.539
73.867	0.000	0.00	0.60	0.26	0.533
74.133	0.000	0.00	0.59	0.26	0.527
74.400	0.000	0.00	0.59	0.25	0.522
74.667	0.000	0.00	0.58	0.25	0.516
74.933	0.000	0.00	0.58	0.25	0.511

75.200	0.000	0.00	0.57	0.25	0.505
75.467	0.000	0.00	0.56	0.24	0.500
75.733	0.000	0.00	0.56	0.24	0.495
76.000	0.000	0.00	0.55	0.24	0.489
76.267	0.000	0.00	0.55	0.24	0.484
76.533	0.000	0.00	0.54	0.23	0.479
76.800	0.000	0.00	0.53	0.23	0.474
77.067	0.000	0.00	0.53	0.23	0.469
77.333	0.000	0.00	0.52	0.23	0.464
77.600	0.000	0.00	0.52	0.22	0.459
77.867	0.000	0.00	0.51	0.22	0.454
78.133	0.000	0.00	0.51	0.22	0.449
78.400	0.000	0.00	0.50	0.22	0.445
78.667	0.000	0.00	0.50	0.21	0.440
78.933	0.000	0.00	0.49	0.21	0.435
79.200	0.000	0.00	0.49	0.21	0.431
79.467	0.000	0.00	0.48	0.21	0.426
79.734	0.000	0.00	0.48	0.21	0.421
80.000	0.000	0.00	0.47	0.20	0.417
80.267	0.000	0.00	0.47	0.20	0.413
80.534	0.000	0.00	0.46	0.20	0.408
80.800	0.000	0.00	0.46	0.20	0.404
81.067	0.000	0.00	0.45	0.19	0.400
81.334	0.000	0.00	0.45	0.19	0.395
81.600	0.000	0.00	0.44	0.19	0.391
81.867	0.000	0.00	0.44	0.19	0.387
82.134	0.000	0.00	0.43	0.19	0.383
82.400	0.000	0.00	0.43	0.18	0.379
82.667	0.000	0.00	0.42	0.18	0.375
82.934	0.000	0.00	0.42	0.18	0.371
83.200	0.000	0.00	0.41	0.18	0.367
83.467	0.000	0.00	0.41	0.18	0.363
83.734	0.000	0.00	0.40	0.17	0.359
84.000	0.000	0.00	0.40	0.17	0.355
84.267	0.000	0.00	0.40	0.17	0.351
84.534	0.000	0.00	0.39	0.17	0.348
84.800	0.000	0.00	0.39	0.17	0.344
85.067	0.000	0.00	0.38	0.17	0.340
85.334	0.000	0.00	0.38	0.16	0.337
85.600	0.000	0.00	0.38	0.16	0.333
85.867	0.000	0.00	0.37	0.16	0.330
86.134	0.000	0.00	0.37	0.16	0.326
86.400	0.000	0.00	0.36	0.16	0.323
86.667	0.000	0.00	0.36	0.16	0.319
86.934	0.000	0.00	0.36	0.15	0.316
87.200	0.000	0.00	0.35	0.15	0.312
87.467	0.000	0.00	0.35	0.15	0.309
87.734	0.000	0.00	0.34	0.15	0.306
88.000	0.000	0.00	0.34	0.15	0.303
88.267	0.000	0.00	0.34	0.15	0.299

88.534	0.000	0.00	0.33	0.14	0.296
88.800	0.000	0.00	0.33	0.14	0.293
89.067	0.000	0.00	0.33	0.14	0.290
89.334	0.000	0.00	0.32	0.14	0.287
89.600	0.000	0.00	0.32	0.14	0.284
89.867	0.000	0.00	0.32	0.14	0.281
90.134	0.000	0.00	0.31	0.14	0.278
90.400	0.000	0.00	0.31	0.13	0.275
90.667	0.000	0.00	0.31	0.13	0.272
90.934	0.000	0.00	0.30	0.13	0.269
91.200	0.000	0.00	0.30	0.13	0.266
91.467	0.000	0.00	0.30	0.13	0.263
91.734	0.000	0.00	0.29	0.13	0.261
92.000	0.000	0.00	0.29	0.13	0.258
92.267	0.000	0.00	0.29	0.12	0.255
92.534	0.000	0.00	0.28	0.12	0.252
92.800	0.000	0.00	0.28	0.12	0.250
93.067	0.000	0.00	0.28	0.12	0.247
93.334	0.000	0.00	0.28	0.12	0.244
93.600	0.000	0.00	0.27	0.12	0.242
93.867	0.000	0.00	0.27	0.12	0.239
94.134	0.000	0.00	0.27	0.12	0.237
94.400	0.000	0.00	0.26	0.11	0.234
94.667	0.000	0.00	0.26	0.11	0.232
94.934	0.000	0.00	0.26	0.11	0.229
95.200	0.000	0.00	0.26	0.11	0.227
95.467	0.000	0.00	0.25	0.11	0.224
95.734	0.000	0.00	0.25	0.11	0.222
96.000	0.000	0.00	0.25	0.11	0.220
96.267	0.000	0.00	0.24	0.11	0.217
96.534	0.000	0.00	0.24	0.10	0.215
96.800	0.000	0.00	0.24	0.10	0.213
97.067	0.000	0.00	0.24	0.10	0.210
97.334	0.000	0.00	0.23	0.10	0.208
97.600	0.000	0.00	0.23	0.10	0.206
97.867	0.000	0.00	0.23	0.10	0.204
98.134	0.000	0.00	0.23	0.10	0.202
98.400	0.000	0.00	0.22	0.10	0.199
98.667	0.000	0.00	0.22	0.10	0.197
98.934	0.000	0.00	0.22	0.10	0.195
99.200	0.000	0.00	0.22	0.09	0.193
99.467	0.000	0.00	0.22	0.09	0.191
99.734	0.000	0.00	0.21	0.09	0.189
100.000	0.000	0.00	0.21	0.09	0.187
100.267	0.000	0.00	0.21	0.09	0.185
100.534	0.000	0.00	0.21	0.09	0.183
100.800	0.000	0.00	0.20	0.09	0.181
101.067	0.000	0.00	0.20	0.09	0.179
101.334	0.000	0.00	0.20	0.09	0.177
101.600	0.000	0.00	0.20	0.09	0.175

101.867	0.000	0.00	0.20	0.08	0.174
102.134	0.000	0.00	0.19	0.08	0.172
102.400	0.000	0.00	0.19	0.08	0.170
102.667	0.000	0.00	0.19	0.08	0.168
102.934	0.000	0.00	0.19	0.08	0.166
103.200	0.000	0.00	0.19	0.08	0.165
103.467	0.000	0.00	0.18	0.08	0.163
103.734	0.000	0.00	0.18	0.08	0.161
104.000	0.000	0.00	0.18	0.08	0.159
104.267	0.000	0.00	0.18	0.08	0.158
104.534	0.000	0.00	0.18	0.08	0.156
104.801	0.000	0.00	0.17	0.08	0.154
105.067	0.000	0.00	0.17	0.07	0.153
105.334	0.000	0.00	0.17	0.07	0.151
105.601	0.000	0.00	0.17	0.07	0.150
105.867	0.000	0.00	0.17	0.07	0.148
106.134	0.000	0.00	0.16	0.07	0.146
106.401	0.000	0.00	0.16	0.07	0.145
106.667	0.000	0.00	0.16	0.07	0.143
106.934	0.000	0.00	0.16	0.07	0.142
107.201	0.000	0.00	0.16	0.07	0.140
107.467	0.000	0.00	0.16	0.07	0.139
107.734	0.000	0.00	0.15	0.07	0.137
108.001	0.000	0.00	0.15	0.07	0.136
108.267	0.000	0.00	0.15	0.07	0.134
108.534	0.000	0.00	0.15	0.06	0.133
108.801	0.000	0.00	0.15	0.06	0.132
109.067	0.000	0.00	0.15	0.06	0.130
109.334	0.000	0.00	0.15	0.06	0.129
109.601	0.000	0.00	0.14	0.06	0.127
109.867	0.000	0.00	0.14	0.06	0.126
110.134	0.000	0.00	0.14	0.06	0.125
110.401	0.000	0.00	0.14	0.06	0.123
110.667	0.000	0.00	0.14	0.06	0.122
110.934	0.000	0.00	0.14	0.06	0.121
111.201	0.000	0.00	0.13	0.06	0.119
111.467	0.000	0.00	0.13	0.06	0.118
111.734	0.000	0.00	0.13	0.06	0.117
112.001	0.000	0.00	0.13	0.06	0.116
112.267	0.000	0.00	0.13	0.06	0.114
112.534	0.000	0.00	0.13	0.06	0.113
112.801	0.000	0.00	0.13	0.05	0.112
113.067	0.000	0.00	0.12	0.05	0.111
113.334	0.000	0.00	0.12	0.05	0.110
113.601	0.000	0.00	0.12	0.05	0.109
113.867	0.000	0.00	0.12	0.05	0.107
114.134	0.000	0.00	0.12	0.05	0.106
114.401	0.000	0.00	0.12	0.05	0.105
114.667	0.000	0.00	0.12	0.05	0.104
114.934	0.000	0.00	0.12	0.05	0.103

115.201	0.000	0.00	0.11	0.05	0.102
115.467	0.000	0.00	0.11	0.05	0.101
115.734	0.000	0.00	0.11	0.05	0.100
116.001	0.000	0.00	0.11	0.05	0.099
116.267	0.000	0.00	0.11	0.05	0.098
116.534	0.000	0.00	0.11	0.05	0.096
116.801	0.000	0.00	0.11	0.05	0.095
117.067	0.000	0.00	0.11	0.05	0.094
117.334	0.000	0.00	0.11	0.05	0.093
117.601	0.000	0.00	0.10	0.05	0.092
117.867	0.000	0.00	0.10	0.04	0.091
118.134	0.000	0.00	0.10	0.04	0.090
118.401	0.000	0.00	0.10	0.04	0.090
118.667	0.000	0.00	0.10	0.04	0.089
118.934	0.000	0.00	0.10	0.04	0.088
119.201	0.000	0.00	0.10	0.04	0.087
119.467	0.000	0.00	0.10	0.04	0.086
119.734	0.000	0.00	0.10	0.04	0.085
120.001	0.000	0.00	0.09	0.04	0.084
120.267	0.000	0.00	0.09	0.04	0.083
120.534	0.000	0.00	0.09	0.04	0.082
120.801	0.000	0.00	0.09	0.04	0.081
121.067	0.000	0.00	0.09	0.04	0.080
121.334	0.000	0.00	0.09	0.04	0.080
121.601	0.000	0.00	0.09	0.04	0.079
121.867	0.000	0.00	0.09	0.04	0.078
122.134	0.000	0.00	0.09	0.04	0.077
122.401	0.000	0.00	0.09	0.04	0.076
122.667	0.000	0.00	0.09	0.04	0.075
122.934	0.000	0.00	0.08	0.04	0.075
123.201	0.000	0.00	0.08	0.04	0.074
123.467	0.000	0.00	0.08	0.04	0.073
123.734	0.000	0.00	0.08	0.04	0.072
124.001	0.000	0.00	0.08	0.03	0.072
124.267	0.000	0.00	0.08	0.03	0.071
124.534	0.000	0.00	0.08	0.03	0.070
124.801	0.000	0.00	0.08	0.03	0.069
125.067	0.000	0.00	0.08	0.03	0.069
125.334	0.000	0.00	0.08	0.03	0.068
125.601	0.000	0.00	0.08	0.03	0.067
125.867	0.000	0.00	0.07	0.03	0.066
126.134	0.000	0.00	0.07	0.03	0.066
126.401	0.000	0.00	0.07	0.03	0.065
126.667	0.000	0.00	0.07	0.03	0.064
126.934	0.000	0.00	0.07	0.03	0.064
127.201	0.000	0.00	0.07	0.03	0.063
127.467	0.000	0.00	0.07	0.03	0.062
127.734	0.000	0.00	0.07	0.03	0.062
128.001	0.000	0.00	0.07	0.03	0.061
128.267	0.000	0.00	0.07	0.03	0.060

128.534	0.000	0.00	0.07	0.03	0.060
128.801	0.000	0.00	0.07	0.03	0.059
129.067	0.000	0.00	0.07	0.03	0.058
129.334	0.000	0.00	0.07	0.03	0.058
129.601	0.000	0.00	0.06	0.03	0.057
129.867	0.000	0.00	0.06	0.03	0.057
130.134	0.000	0.00	0.06	0.03	0.056
130.401	0.000	0.00	0.06	0.03	0.055
130.667	0.000	0.00	0.06	0.03	0.055
130.934	0.000	0.00	0.06	0.03	0.054
131.201	0.000	0.00	0.06	0.03	0.054
131.467	0.000	0.00	0.06	0.03	0.053
131.734	0.000	0.00	0.06	0.03	0.052
132.001	0.000	0.00	0.06	0.03	0.052
132.267	0.000	0.00	0.06	0.03	0.051
132.534	0.000	0.00	0.06	0.02	0.051
132.801	0.000	0.00	0.06	0.02	0.050
133.067	0.000	0.00	0.06	0.02	0.050
133.334	0.000	0.00	0.06	0.02	0.049
133.601	0.000	0.00	0.05	0.02	0.049
133.867	0.000	0.00	0.05	0.02	0.048
134.134	0.000	0.00	0.05	0.02	0.048
134.401	0.000	0.00	0.05	0.02	0.047
134.667	0.000	0.00	0.05	0.02	0.047
134.934	0.000	0.00	0.05	0.02	0.046
135.201	0.000	0.00	0.05	0.02	0.046
135.467	0.000	0.00	0.05	0.02	0.045
135.734	0.000	0.00	0.05	0.02	0.045
136.001	0.000	0.00	0.05	0.02	0.044
136.267	0.000	0.00	0.05	0.02	0.044
136.534	0.000	0.00	0.05	0.02	0.043
136.801	0.000	0.00	0.05	0.02	0.043
137.067	0.000	0.00	0.05	0.02	0.042
137.334	0.000	0.00	0.05	0.02	0.042
137.601	0.000	0.00	0.05	0.02	0.041
137.867	0.000	0.00	0.05	0.02	0.041
138.134	0.000	0.00	0.05	0.02	0.041
138.401	0.000	0.00	0.05	0.02	0.040
138.667	0.000	0.00	0.04	0.02	0.040
138.934	0.000	0.00	0.04	0.02	0.039
139.201	0.000	0.00	0.04	0.02	0.039
139.467	0.000	0.00	0.04	0.02	0.038
139.734	0.000	0.00	0.04	0.02	0.038
140.001	0.000	0.00	0.04	0.02	0.038
140.267	0.000	0.00	0.04	0.02	0.037
140.534	0.000	0.00	0.04	0.02	0.037
140.801	0.000	0.00	0.04	0.02	0.036
141.067	0.000	0.00	0.04	0.02	0.036
141.334	0.000	0.00	0.04	0.02	0.036
141.601	0.000	0.00	0.04	0.02	0.035

141.867	0.000	0.00	0.04	0.02	0.035
142.134	0.000	0.00	0.04	0.02	0.035
142.401	0.000	0.00	0.04	0.02	0.034
142.667	0.000	0.00	0.04	0.02	0.034
142.934	0.000	0.00	0.04	0.02	0.034
143.201	0.000	0.00	0.04	0.02	0.033
143.467	0.000	0.00	0.04	0.02	0.033
143.734	0.000	0.00	0.04	0.02	0.032
144.001	0.000	0.00	0.04	0.02	0.032
144.267	0.000	0.00	0.04	0.02	0.032
144.534	0.000	0.00	0.04	0.02	0.031
144.801	0.000	0.00	0.04	0.02	0.031
145.067	0.000	0.00	0.03	0.01	0.031
145.334	0.000	0.00	0.03	0.01	0.030
145.601	0.000	0.00	0.03	0.01	0.030
145.867	0.000	0.00	0.03	0.01	0.030
146.134	0.000	0.00	0.03	0.01	0.029
146.401	0.000	0.00	0.03	0.01	0.029
146.667	0.000	0.00	0.03	0.01	0.029
146.934	0.000	0.00	0.03	0.01	0.029
147.201	0.000	0.00	0.03	0.01	0.028
147.467	0.000	0.00	0.03	0.01	0.028
147.734	0.000	0.00	0.03	0.01	0.028
148.001	0.000	0.00	0.03	0.01	0.027
148.267	0.000	0.00	0.03	0.01	0.027
148.534	0.000	0.00	0.03	0.01	0.027
148.800	0.000	0.00	0.03	0.01	0.026
149.067	0.000	0.00	0.03	0.01	0.026
149.334	0.000	0.00	0.03	0.01	0.026
149.600	0.000	0.00	0.03	0.01	0.026
149.867	0.000	0.00	0.03	0.01	0.025
150.134	0.000	0.00	0.03	0.01	0.025
150.400	0.000	0.00	0.03	0.01	0.025
150.667	0.000	0.00	0.03	0.01	0.025
150.934	0.000	0.00	0.03	0.01	0.024
151.200	0.000	0.00	0.03	0.01	0.024
151.467	0.000	0.00	0.03	0.01	0.024
151.734	0.000	0.00	0.03	0.01	0.024
152.000	0.000	0.00	0.03	0.01	0.023
152.267	0.000	0.00	0.03	0.01	0.023
152.534	0.000	0.00	0.03	0.01	0.023
152.800	0.000	0.00	0.03	0.01	0.023
153.067	0.000	0.00	0.03	0.01	0.022
153.334	0.000	0.00	0.02	0.01	0.022
153.600	0.000	0.00	0.02	0.01	0.022
153.867	0.000	0.00	0.02	0.01	0.022
154.134	0.000	0.00	0.02	0.01	0.021
154.400	0.000	0.00	0.02	0.01	0.021
154.667	0.000	0.00	0.02	0.01	0.021
154.934	0.000	0.00	0.02	0.01	0.021

155.200	0.000	0.00	0.02	0.01	0.020
155.467	0.000	0.00	0.02	0.01	0.020
155.734	0.000	0.00	0.02	0.01	0.020
156.000	0.000	0.00	0.02	0.01	0.020
156.267	0.000	0.00	0.02	0.01	0.020
156.534	0.000	0.00	0.02	0.01	0.019
156.800	0.000	0.00	0.02	0.01	0.019
157.067	0.000	0.00	0.02	0.01	0.019
157.334	0.000	0.00	0.02	0.01	0.019
157.600	0.000	0.00	0.02	0.01	0.019
157.867	0.000	0.00	0.02	0.01	0.018
158.134	0.000	0.00	0.02	0.01	0.018
158.400	0.000	0.00	0.02	0.01	0.018
158.667	0.000	0.00	0.02	0.01	0.018
158.934	0.000	0.00	0.02	0.01	0.018
159.200	0.000	0.00	0.02	0.01	0.017
159.467	0.000	0.00	0.02	0.01	0.017
159.734	0.000	0.00	0.02	0.01	0.017
160.000	0.000	0.00	0.02	0.01	0.017
160.267	0.000	0.00	0.02	0.01	0.017
160.534	0.000	0.00	0.02	0.01	0.017
160.800	0.000	0.00	0.02	0.01	0.016
161.067	0.000	0.00	0.02	0.01	0.016
161.334	0.000	0.00	0.02	0.01	0.016
161.600	0.000	0.00	0.02	0.01	0.016
161.867	0.000	0.00	0.02	0.01	0.016
162.134	0.000	0.00	0.02	0.01	0.016
162.400	0.000	0.00	0.02	0.01	0.015
162.667	0.000	0.00	0.02	0.01	0.015
162.934	0.000	0.00	0.02	0.01	0.015
163.200	0.000	0.00	0.02	0.01	0.015
163.467	0.000	0.00	0.02	0.01	0.015
163.734	0.000	0.00	0.02	0.01	0.015
164.000	0.000	0.00	0.02	0.01	0.014
164.267	0.000	0.00	0.02	0.01	0.014
164.534	0.000	0.00	0.02	0.01	0.014
164.800	0.000	0.00	0.02	0.01	0.014
165.067	0.000	0.00	0.02	0.01	0.014
165.334	0.000	0.00	0.02	0.01	0.014
165.600	0.000	0.00	0.02	0.01	0.014
165.867	0.000	0.00	0.02	0.01	0.013
166.134	0.000	0.00	0.01	0.01	0.013
166.400	0.000	0.00	0.01	0.01	0.013
166.667	0.000	0.00	0.01	0.01	0.013
166.934	0.000	0.00	0.01	0.01	0.013
167.200	0.000	0.00	0.01	0.01	0.013
167.467	0.000	0.00	0.01	0.01	0.013
167.734	0.000	0.00	0.01	0.01	0.012
168.000	0.000	0.00	0.01	0.01	0.012
168.267	0.000	0.00	0.01	0.01	0.012

168.534	0.000	0.00	0.01	0.01	0.012
168.800	0.000	0.00	0.01	0.01	0.012
169.067	0.000	0.00	0.01	0.01	0.012
169.334	0.000	0.00	0.01	0.01	0.012
169.600	0.000	0.00	0.01	0.01	0.012
169.867	0.000	0.00	0.01	0.01	0.011
170.133	0.000	0.00	0.01	0.01	0.011
170.400	0.000	0.00	0.01	0.01	0.011
170.667	0.000	0.00	0.01	0.01	0.011
170.933	0.000	0.00	0.01	0.01	0.011
171.200	0.000	0.00	0.01	0.01	0.011
171.467	0.000	0.00	0.01	0.01	0.011
171.733	0.000	0.00	0.01	0.01	0.011
172.000	0.000	0.00	0.01	0.01	0.010
172.267	0.000	0.00	0.01	0.01	0.010
172.533	0.000	0.00	0.01	0.00	0.010
172.800	0.000	0.00	0.01	0.00	0.010
173.067	0.000	0.00	0.01	0.00	0.010
173.333	0.000	0.00	0.01	0.00	0.010
173.600	0.000	0.00	0.01	0.00	0.010
173.867	0.000	0.00	0.01	0.00	0.010
174.133	0.000	0.00	0.01	0.00	0.010
174.400	0.000	0.00	0.01	0.00	0.009
174.667	0.000	0.00	0.01	0.00	0.009
174.933	0.000	0.00	0.01	0.00	0.009
175.200	0.000	0.00	0.01	0.00	0.009
175.467	0.000	0.00	0.01	0.00	0.009
175.733	0.000	0.00	0.01	0.00	0.009
176.000	0.000	0.00	0.01	0.00	0.009
176.267	0.000	0.00	0.01	0.00	0.009
176.533	0.000	0.00	0.01	0.00	0.009
176.800	0.000	0.00	0.01	0.00	0.009
177.067	0.000	0.00	0.01	0.00	0.009
177.333	0.000	0.00	0.01	0.00	0.008
177.600	0.000	0.00	0.01	0.00	0.008
177.867	0.000	0.00	0.01	0.00	0.008
178.133	0.000	0.00	0.01	0.00	0.008
178.400	0.000	0.00	0.01	0.00	0.008
178.667	0.000	0.00	0.01	0.00	0.008
178.933	0.000	0.00	0.01	0.00	0.008
179.200	0.000	0.00	0.01	0.00	0.008
179.467	0.000	0.00	0.01	0.00	0.008
179.733	0.000	0.00	0.01	0.00	0.008
180.000	0.000	0.00	0.01	0.00	0.008
180.267	0.000	0.00	0.01	0.00	0.008
180.533	0.000	0.00	0.01	0.00	0.007
180.800	0.000	0.00	0.01	0.00	0.007
181.067	0.000	0.00	0.01	0.00	0.007
181.333	0.000	0.00	0.01	0.00	0.007
181.600	0.000	0.00	0.01	0.00	0.007

181.867	0.000	0.00	0.01	0.00	0.007
182.133	0.000	0.00	0.01	0.00	0.007
182.400	0.000	0.00	0.01	0.00	0.007
182.667	0.000	0.00	0.01	0.00	0.007
182.933	0.000	0.00	0.01	0.00	0.007
183.200	0.000	0.00	0.01	0.00	0.007
183.467	0.000	0.00	0.01	0.00	0.007
183.733	0.000	0.00	0.01	0.00	0.007
184.000	0.000	0.00	0.01	0.00	0.006
184.267	0.000	0.00	0.01	0.00	0.006
184.533	0.000	0.00	0.01	0.00	0.006
184.800	0.000	0.00	0.01	0.00	0.006
185.067	0.000	0.00	0.01	0.00	0.006
185.333	0.000	0.00	0.01	0.00	0.006
185.600	0.000	0.00	0.01	0.00	0.006
185.867	0.000	0.00	0.01	0.00	0.006
186.133	0.000	0.00	0.01	0.00	0.006
186.400	0.000	0.00	0.01	0.00	0.006
186.667	0.000	0.00	0.01	0.00	0.006
186.933	0.000	0.00	0.01	0.00	0.006
187.200	0.000	0.00	0.01	0.00	0.006
187.467	0.000	0.00	0.01	0.00	0.006
187.733	0.000	0.00	0.01	0.00	0.006
188.000	0.000	0.00	0.01	0.00	0.006
188.267	0.000	0.00	0.01	0.00	0.005
188.533	0.000	0.00	0.01	0.00	0.005
188.800	0.000	0.00	0.01	0.00	0.005
189.067	0.000	0.00	0.01	0.00	0.005
189.333	0.000	0.00	0.01	0.00	0.005
189.600	0.000	0.00	0.01	0.00	0.005
189.867	0.000	0.00	0.01	0.00	0.005
190.133	0.000	0.00	0.01	0.00	0.005
190.400	0.000	0.00	0.01	0.00	0.005
190.667	0.000	0.00	0.01	0.00	0.005
190.933	0.000	0.00	0.01	0.00	0.005
191.200	0.000	0.00	0.01	0.00	0.005
191.467	0.000	0.00	0.01	0.00	0.005
191.733	0.000	0.00	0.01	0.00	0.005
192.000	0.000	0.00	0.01	0.00	0.005
192.266	0.000	0.00	0.01	0.00	0.005
192.533	0.000	0.00	0.01	0.00	0.005
192.800	0.000	0.00	0.01	0.00	0.005
193.066	0.000	0.00	0.01	0.00	0.004
193.333	0.000	0.00	0.01	0.00	0.004
193.600	0.000	0.00	0.00	0.00	0.004
193.866	0.000	0.00	0.00	0.00	0.004
194.133	0.000	0.00	0.00	0.00	0.004
194.400	0.000	0.00	0.00	0.00	0.004
194.666	0.000	0.00	0.00	0.00	0.004
194.933	0.000	0.00	0.00	0.00	0.004

195.200	0.000	0.00	0.00	0.00	0.004
195.466	0.000	0.00	0.00	0.00	0.004
195.733	0.000	0.00	0.00	0.00	0.004
196.000	0.000	0.00	0.00	0.00	0.004
196.266	0.000	0.00	0.00	0.00	0.004
196.533	0.000	0.00	0.00	0.00	0.004
196.800	0.000	0.00	0.00	0.00	0.004
197.066	0.000	0.00	0.00	0.00	0.004
197.333	0.000	0.00	0.00	0.00	0.004
197.600	0.000	0.00	0.00	0.00	0.004
197.866	0.000	0.00	0.00	0.00	0.004
198.133	0.000	0.00	0.00	0.00	0.004
198.400	0.000	0.00	0.00	0.00	0.004
198.666	0.000	0.00	0.00	0.00	0.004
198.933	0.000	0.00	0.00	0.00	0.004
199.200	0.000	0.00	0.00	0.00	0.004
199.466	0.000	0.00	0.00	0.00	0.003
199.733	0.000	0.00	0.00	0.00	0.003
200.000	0.000	0.00	0.00	0.00	0.003
200.266	0.000	0.00	0.00	0.00	0.003
200.533	0.000	0.00	0.00	0.00	0.003
200.800	0.000	0.00	0.00	0.00	0.003
201.066	0.000	0.00	0.00	0.00	0.003
201.333	0.000	0.00	0.00	0.00	0.003
201.600	0.000	0.00	0.00	0.00	0.003
201.866	0.000	0.00	0.00	0.00	0.003
202.133	0.000	0.00	0.00	0.00	0.003
202.400	0.000	0.00	0.00	0.00	0.003
202.666	0.000	0.00	0.00	0.00	0.003
202.933	0.000	0.00	0.00	0.00	0.003
203.200	0.000	0.00	0.00	0.00	0.003
203.466	0.000	0.00	0.00	0.00	0.003
203.733	0.000	0.00	0.00	0.00	0.003
204.000	0.000	0.00	0.00	0.00	0.003
204.266	0.000	0.00	0.00	0.00	0.003
204.533	0.000	0.00	0.00	0.00	0.003
204.800	0.000	0.00	0.00	0.00	0.003
205.066	0.000	0.00	0.00	0.00	0.003
205.333	0.000	0.00	0.00	0.00	0.003
205.600	0.000	0.00	0.00	0.00	0.003
205.866	0.000	0.00	0.00	0.00	0.003
206.133	0.000	0.00	0.00	0.00	0.003
206.400	0.000	0.00	0.00	0.00	0.003
206.666	0.000	0.00	0.00	0.00	0.003
206.933	0.000	0.00	0.00	0.00	0.003
207.200	0.000	0.00	0.00	0.00	0.003
207.466	0.000	0.00	0.00	0.00	0.003
207.733	0.000	0.00	0.00	0.00	0.002
208.000	0.000	0.00	0.00	0.00	0.002
208.266	0.000	0.00	0.00	0.00	0.002

208.533	0.000	0.00	0.00	0.00	0.002
208.800	0.000	0.00	0.00	0.00	0.002
209.066	0.000	0.00	0.00	0.00	0.002
209.333	0.000	0.00	0.00	0.00	0.002
209.600	0.000	0.00	0.00	0.00	0.002
209.866	0.000	0.00	0.00	0.00	0.002
210.133	0.000	0.00	0.00	0.00	0.002
210.400	0.000	0.00	0.00	0.00	0.002
210.666	0.000	0.00	0.00	0.00	0.002
210.933	0.000	0.00	0.00	0.00	0.002
211.200	0.000	0.00	0.00	0.00	0.002
211.466	0.000	0.00	0.00	0.00	0.002
211.733	0.000	0.00	0.00	0.00	0.002
212.000	0.000	0.00	0.00	0.00	0.002
212.266	0.000	0.00	0.00	0.00	0.002
212.533	0.000	0.00	0.00	0.00	0.002
212.800	0.000	0.00	0.00	0.00	0.002
213.066	0.000	0.00	0.00	0.00	0.002
213.333	0.000	0.00	0.00	0.00	0.002
213.600	0.000	0.00	0.00	0.00	0.002
213.866	0.000	0.00	0.00	0.00	0.002
214.133	0.000	0.00	0.00	0.00	0.002
214.399	0.000	0.00	0.00	0.00	0.002
214.666	0.000	0.00	0.00	0.00	0.002
214.933	0.000	0.00	0.00	0.00	0.002
215.199	0.000	0.00	0.00	0.00	0.002
215.466	0.000	0.00	0.00	0.00	0.002
215.733	0.000	0.00	0.00	0.00	0.002
215.999	0.000	0.00	0.00	0.00	0.002
216.266	0.000	0.00	0.00	0.00	0.002
216.533	0.000	0.00	0.00	0.00	0.002
216.799	0.000	0.00	0.00	0.00	0.002
217.066	0.000	0.00	0.00	0.00	0.002
217.333	0.000	0.00	0.00	0.00	0.002
217.599	0.000	0.00	0.00	0.00	0.002
217.866	0.000	0.00	0.00	0.00	0.002
218.133	0.000	0.00	0.00	0.00	0.002
218.399	0.000	0.00	0.00	0.00	0.002
218.666	0.000	0.00	0.00	0.00	0.002
218.933	0.000	0.00	0.00	0.00	0.002
219.199	0.000	0.00	0.00	0.00	0.002
219.466	0.000	0.00	0.00	0.00	0.002
219.733	0.000	0.00	0.00	0.00	0.002
219.999	0.000	0.00	0.00	0.00	0.002
220.266	0.000	0.00	0.00	0.00	0.002
220.533	0.000	0.00	0.00	0.00	0.001
220.799	0.000	0.00	0.00	0.00	0.001
221.066	0.000	0.00	0.00	0.00	0.001
221.333	0.000	0.00	0.00	0.00	0.001
221.599	0.000	0.00	0.00	0.00	0.001

221.866	0.000	0.00	0.00	0.00	0.001
222.133	0.000	0.00	0.00	0.00	0.001
222.399	0.000	0.00	0.00	0.00	0.001
222.666	0.000	0.00	0.00	0.00	0.001
222.933	0.000	0.00	0.00	0.00	0.001
223.199	0.000	0.00	0.00	0.00	0.001
223.466	0.000	0.00	0.00	0.00	0.001
223.733	0.000	0.00	0.00	0.00	0.001
223.999	0.000	0.00	0.00	0.00	0.001
224.266	0.000	0.00	0.00	0.00	0.001
224.533	0.000	0.00	0.00	0.00	0.001
224.799	0.000	0.00	0.00	0.00	0.001
225.066	0.000	0.00	0.00	0.00	0.001
225.333	0.000	0.00	0.00	0.00	0.001
225.599	0.000	0.00	0.00	0.00	0.001
225.866	0.000	0.00	0.00	0.00	0.001
226.133	0.000	0.00	0.00	0.00	0.001
226.399	0.000	0.00	0.00	0.00	0.001
226.666	0.000	0.00	0.00	0.00	0.001
226.933	0.000	0.00	0.00	0.00	0.001
227.199	0.000	0.00	0.00	0.00	0.001
227.466	0.000	0.00	0.00	0.00	0.001
227.733	0.000	0.00	0.00	0.00	0.001
227.999	0.000	0.00	0.00	0.00	0.001
228.266	0.000	0.00	0.00	0.00	0.001
228.533	0.000	0.00	0.00	0.00	0.001
228.799	0.000	0.00	0.00	0.00	0.001
229.066	0.000	0.00	0.00	0.00	0.001
229.333	0.000	0.00	0.00	0.00	0.001
229.599	0.000	0.00	0.00	0.00	0.001
229.866	0.000	0.00	0.00	0.00	0.001
230.133	0.000	0.00	0.00	0.00	0.001
230.399	0.000	0.00	0.00	0.00	0.001
230.666	0.000	0.00	0.00	0.00	0.001

Problem Descriptions:

NEWCASTLE-HESPERIA (CITY OF HESPERIA)
 100-YEAR STORM EVENT - POST-PROJECT
 BASIN 100

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
 TOTAL CATCHMENT AREA(ACRES) = 17.50
 SOIL-LOSS RATE, F_m , (INCH/HR) = 0.010
 LOW LOSS FRACTION = 0.229
 TIME OF CONCENTRATION(MIN.) = 16.00
 SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
 USER SPECIFIED RAINFALL VALUES ARE USED

RETURN FREQUENCY(YEARS) = 100

5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.35

30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.93

1-HOUR POINT RAINFALL VALUE(INCHES) = 1.31

3-HOUR POINT RAINFALL VALUE(INCHES) = 2.16

6-HOUR POINT RAINFALL VALUE(INCHES) = 3.05

24-HOUR POINT RAINFALL VALUE(INCHES) = 6.31

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 7.90

TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 1.30

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	10.0	20.0	30.0	40.0
0.27	0.0223	2.02	. Q	.	.	.	.
0.53	0.0669	2.03	. Q	.	.	.	.
0.80	0.1119	2.06	. Q	.	.	.	.
1.07	0.1574	2.07	. Q	.	.	.	.
1.33	0.2032	2.09	. Q	.	.	.	.
1.60	0.2495	2.11	. Q	.	.	.	.
1.87	0.2962	2.13	. Q	.	.	.	.
2.13	0.3433	2.15	. Q	.	.	.	.
2.40	0.3909	2.17	. Q	.	.	.	.
2.67	0.4390	2.19	. Q	.	.	.	.
2.93	0.4876	2.22	. Q	.	.	.	.
3.20	0.5366	2.23	. Q	.	.	.	.
3.47	0.5862	2.27	. Q	.	.	.	.
3.73	0.6363	2.28	. Q	.	.	.	.
4.00	0.6870	2.32	. Q	.	.	.	.
4.27	0.7382	2.33	. Q	.	.	.	.
4.53	0.7900	2.37	. Q	.	.	.	.
4.80	0.8424	2.39	. Q	.	.	.	.
5.07	0.8954	2.43	. Q	.	.	.	.
5.33	0.9491	2.45	. Q	.	.	.	.
5.60	1.0034	2.49	. Q	.	.	.	.
5.87	1.0584	2.51	. Q	.	.	.	.
6.13	1.1142	2.55	. Q	.	.	.	.
6.40	1.1707	2.58	. Q	.	.	.	.
6.67	1.2280	2.62	. Q	.	.	.	.
6.93	1.2861	2.65	. Q	.	.	.	.
7.20	1.3450	2.70	. Q	.	.	.	.
7.47	1.4049	2.73	. Q	.	.	.	.
7.73	1.4656	2.79	. Q	.	.	.	.
8.00	1.5273	2.82	. Q	.	.	.	.
8.27	1.5901	2.88	. Q	.	.	.	.
8.53	1.6539	2.91	. Q	.	.	.	.
8.80	1.7188	2.98	. Q	.	.	.	.

9.07	1.7849	3.02	.	Q	.	.	.	.
9.33	1.8522	3.09	.	Q	.	.	.	.
9.60	1.9209	3.14	.	Q	.	.	.	.
9.87	1.9909	3.22	.	Q	.	.	.	.
10.13	2.0625	3.27	.	Q	.	.	.	.
10.40	2.1356	3.37	.	Q	.	.	.	.
10.67	2.2104	3.42	.	Q	.	.	.	.
10.93	2.2870	3.53	.	Q	.	.	.	.
11.20	2.3656	3.59	.	Q	.	.	.	.
11.47	2.4463	3.73	.	Q	.	.	.	.
11.73	2.5292	3.80	.	Q	.	.	.	.
12.00	2.6146	3.96	.	Q	.	.	.	.
12.27	2.7016	3.93	.	Q	.	.	.	.
12.53	2.7892	4.02	.	Q	.	.	.	.
12.80	2.8790	4.13	.	Q	.	.	.	.
13.07	2.9725	4.36	.	Q	.	.	.	.
13.33	3.0702	4.50	.	Q	.	.	.	.
13.60	3.1728	4.81	.	Q	.	.	.	.
13.87	3.2809	4.99	.	Q	.	.	.	.
14.13	3.3944	5.31	.	Q	.	.	.	.
14.40	3.5102	5.20	.	Q	.	.	.	.
14.67	3.6321	5.86	.	Q	.	.	.	.
14.93	3.7659	6.28	.	Q	.	.	.	.
15.20	3.9175	7.47	.	Q	.	.	.	.
15.47	4.0920	8.36	.	Q	.	.	.	.
15.73	4.3221	12.52	.	.	Q	.	.	.
16.00	4.6510	17.33	.	.	Q	.	.	.
16.27	5.2706	38.90	.	.	.	.	Q	.
16.53	5.8128	10.30	.	Q	.	.	.	.
16.80	6.0013	6.81	.	Q	.	.	.	.
17.07	6.1370	5.50	.	Q	.	.	.	.
17.33	6.2549	5.20	.	Q	.	.	.	.
17.60	6.3634	4.65	.	Q	.	.	.	.
17.87	6.4613	4.24	.	Q	.	.	.	.
18.13	6.5513	3.92	.	Q	.	.	.	.
18.40	6.6371	3.87	.	Q	.	.	.	.
18.67	6.7202	3.66	.	Q	.	.	.	.
18.93	6.7988	3.48	.	Q	.	.	.	.
19.20	6.8736	3.32	.	Q	.	.	.	.
19.47	6.9452	3.18	.	Q	.	.	.	.
19.73	7.0139	3.06	.	Q	.	.	.	.
20.00	7.0800	2.95	.	Q	.	.	.	.
20.27	7.1438	2.85	.	Q	.	.	.	.
20.53	7.2056	2.76	.	Q	.	.	.	.
20.80	7.2654	2.67	.	Q	.	.	.	.
21.07	7.3235	2.60	.	Q	.	.	.	.
21.33	7.3800	2.53	.	Q	.	.	.	.
21.60	7.4351	2.47	.	Q	.	.	.	.
21.87	7.4888	2.41	.	Q	.	.	.	.
22.13	7.5412	2.35	.	Q	.	.	.	.

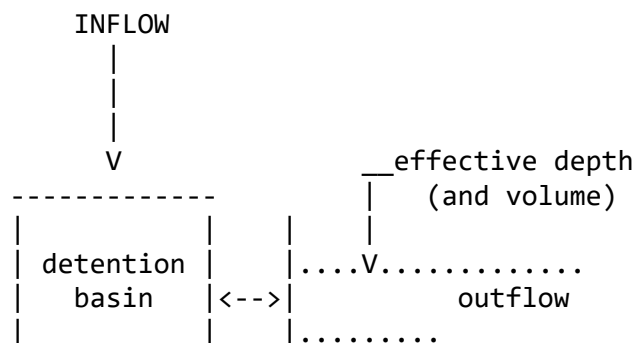
22.40	7.5924	2.30	. Q	.	.	.	.
22.67	7.6425	2.25	. Q	.	.	.	.
22.93	7.6916	2.20	. Q	.	.	.	.
23.20	7.7397	2.16	. Q	.	.	.	.
23.47	7.7868	2.12	. Q	.	.	.	.
23.73	7.8331	2.08	. Q	.	.	.	.
24.00	7.8785	2.04	. Q	.	.	.	.
24.27	7.9010	0.00	Q	.	.	.	.

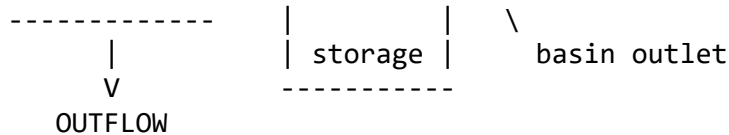
TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
 (Note: 100% of Peak Flow Rate estimate assumed to have
 an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1440.0
10%	384.0
20%	80.0
30%	48.0
40%	32.0
50%	16.0
60%	16.0
70%	16.0
80%	16.0
90%	16.0

FLOW-THROUGH DETENTION BASIN MODEL

SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
 CONSTANT HYDROGRAPH TIME UNIT(MINUTES) = 16.000
 DEAD STORAGE(AF) = 0.00
 SPECIFIED DEAD STORAGE(AF) FILLED = 0.00
 ASSUMED INITIAL DEPTH(FEET) IN STORAGE BASIN = 0.00





DEPTH-VS.-STORAGE AND DEPTH-VS.-DISCHARGE INFORMATION:

TOTAL NUMBER OF BASIN DEPTH INFORMATION ENTRIES = 6

*BASIN-DEPTH	STORAGE	OUTFLOW	**BASIN-DEPTH	STORAGE	OUTFLOW	*
*(FEET)	(ACRE-FEET)	(CFS)	*(FEET)	(ACRE-FEET)	(CFS)	*
* 0.000	0.000	0.000	** 1.000	0.887	0.430	*
* 2.000	1.796	0.430	** 4.000	3.683	4.390	*
* 5.000	3.960	52.050	** 6.400	4.387	179.730	*

BASIN STORAGE, OUTFLOW AND DEPTH ROUTING VALUES:

INTERVAL	DEPTH	{S-O*DT/2}	{S+O*DT/2}
NUMBER	(FEET)	(ACRE-FEET)	(ACRE-FEET)
1	0.00	0.00000	0.00000
2	1.00	0.88226	0.89174
3	2.00	1.79126	1.80074
4	4.00	3.63463	3.73137
5	5.00	3.38645	4.53355
6	6.40	2.40650	6.36750

WHERE S=STORAGE(AF);O=OUTFLOW(AF/MIN.);DT=UNIT INTERVAL(MIN.)

DETENTION BASIN ROUTING RESULTS:

NOTE: COMPUTED BASIN DEPTH, OUTFLOW, AND STORAGE QUANTITIES OCCUR AT THE GIVEN TIME. BASIN INFLOW VALUES REPRESENT THE AVERAGE INFLOW DURING THE RECENT HYDROGRAPH UNIT INTERVAL.

TIME	DEAD-STORAGE	INFLOW	EFFECTIVE	OUTFLOW	EFFECTIVE
(HRS)	FILLED(AF)	(CFS)	DEPTH(FT)	(CFS)	VOLUME(AF)
0.267	0.000	2.02	0.05	0.01	0.044
0.533	0.000	2.03	0.10	0.03	0.088
0.800	0.000	2.06	0.15	0.05	0.132
1.067	0.000	2.07	0.20	0.07	0.176
1.333	0.000	2.09	0.25	0.10	0.220
1.600	0.000	2.11	0.30	0.12	0.264
1.867	0.000	2.13	0.35	0.14	0.308
2.133	0.000	2.15	0.40	0.16	0.352
2.400	0.000	2.17	0.45	0.18	0.396
2.667	0.000	2.19	0.50	0.20	0.440
2.933	0.000	2.22	0.55	0.22	0.484
3.200	0.000	2.23	0.59	0.25	0.527
3.467	0.000	2.27	0.64	0.27	0.571
3.733	0.000	2.28	0.69	0.29	0.615
4.000	0.000	2.32	0.74	0.31	0.660
4.267	0.000	2.33	0.79	0.33	0.704
4.533	0.000	2.37	0.84	0.35	0.748

4.800	0.000	2.39	0.89	0.37	0.793
5.067	0.000	2.43	0.94	0.40	0.837
5.333	0.000	2.45	0.99	0.42	0.882
5.600	0.000	2.49	1.04	0.43	0.927
5.867	0.000	2.51	1.09	0.43	0.973
6.133	0.000	2.55	1.15	0.43	1.020
6.400	0.000	2.58	1.20	0.43	1.067
6.667	0.000	2.62	1.25	0.43	1.116
6.933	0.000	2.65	1.31	0.43	1.164
7.200	0.000	2.70	1.36	0.43	1.214
7.467	0.000	2.73	1.42	0.43	1.265
7.733	0.000	2.79	1.47	0.43	1.317
8.000	0.000	2.82	1.53	0.43	1.370
8.267	0.000	2.88	1.59	0.43	1.424
8.533	0.000	2.91	1.65	0.43	1.478
8.800	0.000	2.98	1.71	0.43	1.534
9.067	0.000	3.02	1.77	0.43	1.591
9.333	0.000	3.09	1.84	0.43	1.650
9.600	0.000	3.14	1.91	0.43	1.710
9.867	0.000	3.22	1.97	0.43	1.771
10.133	0.000	3.27	2.04	0.47	1.833
10.400	0.000	3.37	2.10	0.57	1.895
10.667	0.000	3.42	2.17	0.70	1.955
10.933	0.000	3.53	2.23	0.83	2.014
11.200	0.000	3.59	2.29	0.95	2.073
11.467	0.000	3.73	2.36	1.07	2.131
11.733	0.000	3.80	2.42	1.19	2.189
12.000	0.000	3.96	2.48	1.31	2.247
12.267	0.000	3.93	2.54	1.43	2.302
12.533	0.000	4.02	2.59	1.55	2.356
12.800	0.000	4.13	2.65	1.66	2.411
13.067	0.000	4.36	2.71	1.78	2.468
13.333	0.000	4.50	2.77	1.90	2.525
13.600	0.000	4.81	2.84	2.02	2.586
13.867	0.000	4.99	2.90	2.15	2.649
14.133	0.000	5.31	2.97	2.29	2.715
14.400	0.000	5.20	3.04	2.42	2.777
14.667	0.000	5.86	3.12	2.56	2.849
14.933	0.000	6.28	3.20	2.72	2.928
15.200	0.000	7.47	3.31	2.91	3.028
15.467	0.000	8.36	3.43	3.14	3.143
15.733	0.000	12.52	3.64	3.47	3.343
16.000	0.000	17.33	3.95	3.98	3.637
16.267	0.000	38.90	4.89	25.60	3.930
16.533	0.000	10.30	3.91	25.56	3.594
16.800	0.000	6.81	3.97	4.26	3.650
17.067	0.000	5.50	3.99	4.35	3.676
17.333	0.000	5.20	4.01	4.69	3.687
17.600	0.000	4.65	4.00	4.78	3.684
17.867	0.000	4.24	4.00	4.46	3.679

18.133	0.000	3.92	3.99	4.37	3.669
18.400	0.000	3.87	3.97	4.35	3.659
18.667	0.000	3.66	3.96	4.32	3.644
18.933	0.000	3.48	3.94	4.29	3.626
19.200	0.000	3.32	3.92	4.25	3.606
19.467	0.000	3.18	3.89	4.20	3.583
19.733	0.000	3.06	3.87	4.15	3.559
20.000	0.000	2.95	3.84	4.10	3.533
20.267	0.000	2.85	3.81	4.05	3.507
20.533	0.000	2.76	3.78	3.99	3.479
20.800	0.000	2.67	3.75	3.93	3.452
21.067	0.000	2.60	3.73	3.88	3.424
21.333	0.000	2.53	3.70	3.82	3.395
21.600	0.000	2.47	3.66	3.76	3.367
21.867	0.000	2.41	3.63	3.70	3.338
22.133	0.000	2.35	3.60	3.64	3.310
22.400	0.000	2.30	3.57	3.58	3.282
22.667	0.000	2.25	3.55	3.52	3.254
22.933	0.000	2.20	3.52	3.46	3.226
23.200	0.000	2.16	3.49	3.40	3.199
23.467	0.000	2.12	3.46	3.35	3.172
23.733	0.000	2.08	3.43	3.29	3.145
24.000	0.000	2.04	3.40	3.23	3.119
24.267	0.000	0.00	3.33	3.13	3.050
24.533	0.000	0.00	3.26	2.99	2.984
24.800	0.000	0.00	3.19	2.86	2.921
25.067	0.000	0.00	3.13	2.73	2.861
25.333	0.000	0.00	3.07	2.60	2.803
25.600	0.000	0.00	3.01	2.49	2.749
25.867	0.000	0.00	2.95	2.37	2.696
26.133	0.000	0.00	2.90	2.27	2.646
26.400	0.000	0.00	2.85	2.16	2.599
26.667	0.000	0.00	2.80	2.07	2.553
26.933	0.000	0.00	2.76	1.97	2.510
27.200	0.000	0.00	2.71	1.88	2.468
27.467	0.000	0.00	2.67	1.80	2.428
27.733	0.000	0.00	2.63	1.72	2.391
28.000	0.000	0.00	2.59	1.64	2.354
28.267	0.000	0.00	2.56	1.57	2.320
28.533	0.000	0.00	2.52	1.49	2.287
28.800	0.000	0.00	2.49	1.43	2.256
29.067	0.000	0.00	2.46	1.36	2.225
29.333	0.000	0.00	2.42	1.30	2.197
29.600	0.000	0.00	2.40	1.24	2.169
29.867	0.000	0.00	2.37	1.19	2.143
30.133	0.000	0.00	2.34	1.13	2.118
30.400	0.000	0.00	2.32	1.08	2.094
30.667	0.000	0.00	2.29	1.03	2.072
30.933	0.000	0.00	2.27	0.99	2.050
31.200	0.000	0.00	2.25	0.94	2.029

31.467	0.000	0.00	2.23	0.90	2.009
31.733	0.000	0.00	2.21	0.86	1.991
32.000	0.000	0.00	2.19	0.82	1.972
32.267	0.000	0.00	2.17	0.78	1.955
32.533	0.000	0.00	2.15	0.75	1.939
32.800	0.000	0.00	2.13	0.71	1.923
33.067	0.000	0.00	2.12	0.68	1.908
33.333	0.000	0.00	2.10	0.65	1.894
33.600	0.000	0.00	2.09	0.62	1.880
33.867	0.000	0.00	2.08	0.59	1.867
34.133	0.000	0.00	2.06	0.57	1.855
34.400	0.000	0.00	2.05	0.54	1.843
34.667	0.000	0.00	2.04	0.52	1.831
34.933	0.000	0.00	2.03	0.49	1.820
35.200	0.000	0.00	2.01	0.47	1.810
35.467	0.000	0.00	2.00	0.45	1.800
35.733	0.000	0.00	1.99	0.43	1.791
36.000	0.000	0.00	1.98	0.43	1.781
36.267	0.000	0.00	1.97	0.43	1.772
36.533	0.000	0.00	1.96	0.43	1.762
36.800	0.000	0.00	1.95	0.43	1.753
37.067	0.000	0.00	1.94	0.43	1.743
37.333	0.000	0.00	1.93	0.43	1.734
37.600	0.000	0.00	1.92	0.43	1.724
37.867	0.000	0.00	1.91	0.43	1.715
38.133	0.000	0.00	1.90	0.43	1.705
38.400	0.000	0.00	1.89	0.43	1.696
38.667	0.000	0.00	1.88	0.43	1.686
38.933	0.000	0.00	1.87	0.43	1.677
39.200	0.000	0.00	1.86	0.43	1.667
39.467	0.000	0.00	1.85	0.43	1.658
39.733	0.000	0.00	1.84	0.43	1.648
40.000	0.000	0.00	1.83	0.43	1.639
40.267	0.000	0.00	1.82	0.43	1.629
40.533	0.000	0.00	1.81	0.43	1.620
40.800	0.000	0.00	1.80	0.43	1.610
41.067	0.000	0.00	1.79	0.43	1.601
41.333	0.000	0.00	1.78	0.43	1.592
41.600	0.000	0.00	1.76	0.43	1.582
41.867	0.000	0.00	1.75	0.43	1.573
42.133	0.000	0.00	1.74	0.43	1.563
42.400	0.000	0.00	1.73	0.43	1.554
42.667	0.000	0.00	1.72	0.43	1.544
42.933	0.000	0.00	1.71	0.43	1.535
43.200	0.000	0.00	1.70	0.43	1.525
43.467	0.000	0.00	1.69	0.43	1.516
43.733	0.000	0.00	1.68	0.43	1.506
44.000	0.000	0.00	1.67	0.43	1.497
44.267	0.000	0.00	1.66	0.43	1.487
44.533	0.000	0.00	1.65	0.43	1.478

44.800	0.000	0.00	1.64	0.43	1.468
45.067	0.000	0.00	1.63	0.43	1.459
45.333	0.000	0.00	1.62	0.43	1.449
45.600	0.000	0.00	1.61	0.43	1.440
45.867	0.000	0.00	1.60	0.43	1.430
46.133	0.000	0.00	1.59	0.43	1.421
46.400	0.000	0.00	1.58	0.43	1.411
46.667	0.000	0.00	1.57	0.43	1.402
46.933	0.000	0.00	1.56	0.43	1.393
47.200	0.000	0.00	1.55	0.43	1.383
47.467	0.000	0.00	1.54	0.43	1.374
47.733	0.000	0.00	1.52	0.43	1.364
48.000	0.000	0.00	1.51	0.43	1.355
48.267	0.000	0.00	1.50	0.43	1.345
48.533	0.000	0.00	1.49	0.43	1.336
48.800	0.000	0.00	1.48	0.43	1.326
49.067	0.000	0.00	1.47	0.43	1.317
49.333	0.000	0.00	1.46	0.43	1.307
49.600	0.000	0.00	1.45	0.43	1.298
49.867	0.000	0.00	1.44	0.43	1.288
50.133	0.000	0.00	1.43	0.43	1.279
50.400	0.000	0.00	1.42	0.43	1.269
50.667	0.000	0.00	1.41	0.43	1.260
50.933	0.000	0.00	1.40	0.43	1.250
51.200	0.000	0.00	1.39	0.43	1.241
51.467	0.000	0.00	1.38	0.43	1.231
51.733	0.000	0.00	1.37	0.43	1.222
52.000	0.000	0.00	1.36	0.43	1.212
52.267	0.000	0.00	1.35	0.43	1.203
52.533	0.000	0.00	1.34	0.43	1.194
52.800	0.000	0.00	1.33	0.43	1.184
53.067	0.000	0.00	1.32	0.43	1.175
53.333	0.000	0.00	1.31	0.43	1.165
53.600	0.000	0.00	1.30	0.43	1.156
53.867	0.000	0.00	1.29	0.43	1.146
54.133	0.000	0.00	1.27	0.43	1.137
54.400	0.000	0.00	1.26	0.43	1.127
54.667	0.000	0.00	1.25	0.43	1.118
54.933	0.000	0.00	1.24	0.43	1.108
55.200	0.000	0.00	1.23	0.43	1.099
55.467	0.000	0.00	1.22	0.43	1.089
55.733	0.000	0.00	1.21	0.43	1.080
56.000	0.000	0.00	1.20	0.43	1.070
56.267	0.000	0.00	1.19	0.43	1.061
56.533	0.000	0.00	1.18	0.43	1.051
56.800	0.000	0.00	1.17	0.43	1.042
57.067	0.000	0.00	1.16	0.43	1.032
57.333	0.000	0.00	1.15	0.43	1.023
57.600	0.000	0.00	1.14	0.43	1.013
57.867	0.000	0.00	1.13	0.43	1.004

58.133	0.000	0.00	1.12	0.43	0.995
58.400	0.000	0.00	1.11	0.43	0.985
58.667	0.000	0.00	1.10	0.43	0.976
58.933	0.000	0.00	1.09	0.43	0.966
59.200	0.000	0.00	1.08	0.43	0.957
59.467	0.000	0.00	1.07	0.43	0.947
59.733	0.000	0.00	1.06	0.43	0.938
60.000	0.000	0.00	1.05	0.43	0.928
60.267	0.000	0.00	1.03	0.43	0.919
60.533	0.000	0.00	1.02	0.43	0.909
60.800	0.000	0.00	1.01	0.43	0.900
61.067	0.000	0.00	1.00	0.43	0.890
61.333	0.000	0.00	0.99	0.43	0.881
61.600	0.000	0.00	0.98	0.42	0.871
61.867	0.000	0.00	0.97	0.42	0.862
62.133	0.000	0.00	0.96	0.42	0.853
62.400	0.000	0.00	0.95	0.41	0.844
62.667	0.000	0.00	0.94	0.41	0.835
62.933	0.000	0.00	0.93	0.40	0.826
63.200	0.000	0.00	0.92	0.40	0.817
63.467	0.000	0.00	0.91	0.39	0.809
63.733	0.000	0.00	0.90	0.39	0.800
64.000	0.000	0.00	0.89	0.39	0.792
64.267	0.000	0.00	0.88	0.38	0.783
64.533	0.000	0.00	0.87	0.38	0.775
64.800	0.000	0.00	0.86	0.37	0.767
65.067	0.000	0.00	0.86	0.37	0.758
65.333	0.000	0.00	0.85	0.37	0.750
65.600	0.000	0.00	0.84	0.36	0.742
65.867	0.000	0.00	0.83	0.36	0.735
66.133	0.000	0.00	0.82	0.35	0.727
66.400	0.000	0.00	0.81	0.35	0.719
66.667	0.000	0.00	0.80	0.35	0.711
66.933	0.000	0.00	0.79	0.34	0.704
67.200	0.000	0.00	0.79	0.34	0.696
67.467	0.000	0.00	0.78	0.34	0.689
67.733	0.000	0.00	0.77	0.33	0.682
68.000	0.000	0.00	0.76	0.33	0.674
68.267	0.000	0.00	0.75	0.33	0.667
68.533	0.000	0.00	0.74	0.32	0.660
68.800	0.000	0.00	0.74	0.32	0.653
69.067	0.000	0.00	0.73	0.31	0.646
69.333	0.000	0.00	0.72	0.31	0.639
69.600	0.000	0.00	0.71	0.31	0.632
69.867	0.000	0.00	0.71	0.30	0.626
70.133	0.000	0.00	0.70	0.30	0.619
70.400	0.000	0.00	0.69	0.30	0.613
70.667	0.000	0.00	0.68	0.30	0.606
70.933	0.000	0.00	0.68	0.29	0.600
71.200	0.000	0.00	0.67	0.29	0.593

71.467	0.000	0.00	0.66	0.29	0.587
71.733	0.000	0.00	0.65	0.28	0.581
72.000	0.000	0.00	0.65	0.28	0.575
72.267	0.000	0.00	0.64	0.28	0.568
72.533	0.000	0.00	0.63	0.27	0.562
72.800	0.000	0.00	0.63	0.27	0.556
73.067	0.000	0.00	0.62	0.27	0.550
73.333	0.000	0.00	0.61	0.27	0.545
73.600	0.000	0.00	0.61	0.26	0.539
73.867	0.000	0.00	0.60	0.26	0.533
74.133	0.000	0.00	0.59	0.26	0.527
74.400	0.000	0.00	0.59	0.25	0.522
74.667	0.000	0.00	0.58	0.25	0.516
74.933	0.000	0.00	0.58	0.25	0.511
75.200	0.000	0.00	0.57	0.25	0.505
75.467	0.000	0.00	0.56	0.24	0.500
75.733	0.000	0.00	0.56	0.24	0.495
76.000	0.000	0.00	0.55	0.24	0.489
76.267	0.000	0.00	0.55	0.24	0.484
76.533	0.000	0.00	0.54	0.23	0.479
76.800	0.000	0.00	0.53	0.23	0.474
77.067	0.000	0.00	0.53	0.23	0.469
77.333	0.000	0.00	0.52	0.23	0.464
77.600	0.000	0.00	0.52	0.22	0.459
77.867	0.000	0.00	0.51	0.22	0.454
78.133	0.000	0.00	0.51	0.22	0.449
78.400	0.000	0.00	0.50	0.22	0.445
78.667	0.000	0.00	0.50	0.21	0.440
78.933	0.000	0.00	0.49	0.21	0.435
79.200	0.000	0.00	0.49	0.21	0.431
79.467	0.000	0.00	0.48	0.21	0.426
79.734	0.000	0.00	0.48	0.21	0.421
80.000	0.000	0.00	0.47	0.20	0.417
80.267	0.000	0.00	0.47	0.20	0.413
80.534	0.000	0.00	0.46	0.20	0.408
80.800	0.000	0.00	0.46	0.20	0.404
81.067	0.000	0.00	0.45	0.19	0.400
81.334	0.000	0.00	0.45	0.19	0.395
81.600	0.000	0.00	0.44	0.19	0.391
81.867	0.000	0.00	0.44	0.19	0.387
82.134	0.000	0.00	0.43	0.19	0.383
82.400	0.000	0.00	0.43	0.18	0.379
82.667	0.000	0.00	0.42	0.18	0.375
82.934	0.000	0.00	0.42	0.18	0.371
83.200	0.000	0.00	0.41	0.18	0.367
83.467	0.000	0.00	0.41	0.18	0.363
83.734	0.000	0.00	0.40	0.17	0.359
84.000	0.000	0.00	0.40	0.17	0.355
84.267	0.000	0.00	0.40	0.17	0.351
84.534	0.000	0.00	0.39	0.17	0.348

84.800	0.000	0.00	0.39	0.17	0.344
85.067	0.000	0.00	0.38	0.17	0.340
85.334	0.000	0.00	0.38	0.16	0.337
85.600	0.000	0.00	0.38	0.16	0.333
85.867	0.000	0.00	0.37	0.16	0.330
86.134	0.000	0.00	0.37	0.16	0.326
86.400	0.000	0.00	0.36	0.16	0.323
86.667	0.000	0.00	0.36	0.16	0.319
86.934	0.000	0.00	0.36	0.15	0.316
87.200	0.000	0.00	0.35	0.15	0.312
87.467	0.000	0.00	0.35	0.15	0.309
87.734	0.000	0.00	0.34	0.15	0.306
88.000	0.000	0.00	0.34	0.15	0.303
88.267	0.000	0.00	0.34	0.15	0.299
88.534	0.000	0.00	0.33	0.14	0.296
88.800	0.000	0.00	0.33	0.14	0.293
89.067	0.000	0.00	0.33	0.14	0.290
89.334	0.000	0.00	0.32	0.14	0.287
89.600	0.000	0.00	0.32	0.14	0.284
89.867	0.000	0.00	0.32	0.14	0.281
90.134	0.000	0.00	0.31	0.14	0.278
90.400	0.000	0.00	0.31	0.13	0.275
90.667	0.000	0.00	0.31	0.13	0.272
90.934	0.000	0.00	0.30	0.13	0.269
91.200	0.000	0.00	0.30	0.13	0.266
91.467	0.000	0.00	0.30	0.13	0.263
91.734	0.000	0.00	0.29	0.13	0.261
92.000	0.000	0.00	0.29	0.13	0.258
92.267	0.000	0.00	0.29	0.12	0.255
92.534	0.000	0.00	0.28	0.12	0.252
92.800	0.000	0.00	0.28	0.12	0.250
93.067	0.000	0.00	0.28	0.12	0.247
93.334	0.000	0.00	0.28	0.12	0.244
93.600	0.000	0.00	0.27	0.12	0.242
93.867	0.000	0.00	0.27	0.12	0.239
94.134	0.000	0.00	0.27	0.12	0.237
94.400	0.000	0.00	0.26	0.11	0.234
94.667	0.000	0.00	0.26	0.11	0.232
94.934	0.000	0.00	0.26	0.11	0.229
95.200	0.000	0.00	0.26	0.11	0.227
95.467	0.000	0.00	0.25	0.11	0.224
95.734	0.000	0.00	0.25	0.11	0.222
96.000	0.000	0.00	0.25	0.11	0.220
96.267	0.000	0.00	0.24	0.11	0.217
96.534	0.000	0.00	0.24	0.10	0.215
96.800	0.000	0.00	0.24	0.10	0.213
97.067	0.000	0.00	0.24	0.10	0.210
97.334	0.000	0.00	0.23	0.10	0.208
97.600	0.000	0.00	0.23	0.10	0.206
97.867	0.000	0.00	0.23	0.10	0.204

98.134	0.000	0.00	0.23	0.10	0.202
98.400	0.000	0.00	0.22	0.10	0.199
98.667	0.000	0.00	0.22	0.10	0.197
98.934	0.000	0.00	0.22	0.10	0.195
99.200	0.000	0.00	0.22	0.09	0.193
99.467	0.000	0.00	0.22	0.09	0.191
99.734	0.000	0.00	0.21	0.09	0.189
100.000	0.000	0.00	0.21	0.09	0.187
100.267	0.000	0.00	0.21	0.09	0.185
100.534	0.000	0.00	0.21	0.09	0.183
100.800	0.000	0.00	0.20	0.09	0.181
101.067	0.000	0.00	0.20	0.09	0.179
101.334	0.000	0.00	0.20	0.09	0.177
101.600	0.000	0.00	0.20	0.09	0.175
101.867	0.000	0.00	0.20	0.08	0.174
102.134	0.000	0.00	0.19	0.08	0.172
102.400	0.000	0.00	0.19	0.08	0.170
102.667	0.000	0.00	0.19	0.08	0.168
102.934	0.000	0.00	0.19	0.08	0.166
103.200	0.000	0.00	0.19	0.08	0.165
103.467	0.000	0.00	0.18	0.08	0.163
103.734	0.000	0.00	0.18	0.08	0.161
104.000	0.000	0.00	0.18	0.08	0.159
104.267	0.000	0.00	0.18	0.08	0.158
104.534	0.000	0.00	0.18	0.08	0.156
104.801	0.000	0.00	0.17	0.08	0.154
105.067	0.000	0.00	0.17	0.07	0.153
105.334	0.000	0.00	0.17	0.07	0.151
105.601	0.000	0.00	0.17	0.07	0.150
105.867	0.000	0.00	0.17	0.07	0.148
106.134	0.000	0.00	0.16	0.07	0.146
106.401	0.000	0.00	0.16	0.07	0.145
106.667	0.000	0.00	0.16	0.07	0.143
106.934	0.000	0.00	0.16	0.07	0.142
107.201	0.000	0.00	0.16	0.07	0.140
107.467	0.000	0.00	0.16	0.07	0.139
107.734	0.000	0.00	0.15	0.07	0.137
108.001	0.000	0.00	0.15	0.07	0.136
108.267	0.000	0.00	0.15	0.07	0.134
108.534	0.000	0.00	0.15	0.06	0.133
108.801	0.000	0.00	0.15	0.06	0.132
109.067	0.000	0.00	0.15	0.06	0.130
109.334	0.000	0.00	0.15	0.06	0.129
109.601	0.000	0.00	0.14	0.06	0.127
109.867	0.000	0.00	0.14	0.06	0.126
110.134	0.000	0.00	0.14	0.06	0.125
110.401	0.000	0.00	0.14	0.06	0.123
110.667	0.000	0.00	0.14	0.06	0.122
110.934	0.000	0.00	0.14	0.06	0.121
111.201	0.000	0.00	0.13	0.06	0.119

111.467	0.000	0.00	0.13	0.06	0.118
111.734	0.000	0.00	0.13	0.06	0.117
112.001	0.000	0.00	0.13	0.06	0.116
112.267	0.000	0.00	0.13	0.06	0.114
112.534	0.000	0.00	0.13	0.06	0.113
112.801	0.000	0.00	0.13	0.05	0.112
113.067	0.000	0.00	0.12	0.05	0.111
113.334	0.000	0.00	0.12	0.05	0.110
113.601	0.000	0.00	0.12	0.05	0.109
113.867	0.000	0.00	0.12	0.05	0.107
114.134	0.000	0.00	0.12	0.05	0.106
114.401	0.000	0.00	0.12	0.05	0.105
114.667	0.000	0.00	0.12	0.05	0.104
114.934	0.000	0.00	0.12	0.05	0.103
115.201	0.000	0.00	0.11	0.05	0.102
115.467	0.000	0.00	0.11	0.05	0.101
115.734	0.000	0.00	0.11	0.05	0.100
116.001	0.000	0.00	0.11	0.05	0.099
116.267	0.000	0.00	0.11	0.05	0.098
116.534	0.000	0.00	0.11	0.05	0.096
116.801	0.000	0.00	0.11	0.05	0.095
117.067	0.000	0.00	0.11	0.05	0.094
117.334	0.000	0.00	0.11	0.05	0.093
117.601	0.000	0.00	0.10	0.05	0.092
117.867	0.000	0.00	0.10	0.04	0.091
118.134	0.000	0.00	0.10	0.04	0.090
118.401	0.000	0.00	0.10	0.04	0.090
118.667	0.000	0.00	0.10	0.04	0.089
118.934	0.000	0.00	0.10	0.04	0.088
119.201	0.000	0.00	0.10	0.04	0.087
119.467	0.000	0.00	0.10	0.04	0.086
119.734	0.000	0.00	0.10	0.04	0.085
120.001	0.000	0.00	0.09	0.04	0.084
120.267	0.000	0.00	0.09	0.04	0.083
120.534	0.000	0.00	0.09	0.04	0.082
120.801	0.000	0.00	0.09	0.04	0.081
121.067	0.000	0.00	0.09	0.04	0.080
121.334	0.000	0.00	0.09	0.04	0.080
121.601	0.000	0.00	0.09	0.04	0.079
121.867	0.000	0.00	0.09	0.04	0.078
122.134	0.000	0.00	0.09	0.04	0.077
122.401	0.000	0.00	0.09	0.04	0.076
122.667	0.000	0.00	0.09	0.04	0.075
122.934	0.000	0.00	0.08	0.04	0.075
123.201	0.000	0.00	0.08	0.04	0.074
123.467	0.000	0.00	0.08	0.04	0.073
123.734	0.000	0.00	0.08	0.04	0.072
124.001	0.000	0.00	0.08	0.03	0.072
124.267	0.000	0.00	0.08	0.03	0.071
124.534	0.000	0.00	0.08	0.03	0.070

124.801	0.000	0.00	0.08	0.03	0.069
125.067	0.000	0.00	0.08	0.03	0.069
125.334	0.000	0.00	0.08	0.03	0.068
125.601	0.000	0.00	0.08	0.03	0.067
125.867	0.000	0.00	0.07	0.03	0.066
126.134	0.000	0.00	0.07	0.03	0.066
126.401	0.000	0.00	0.07	0.03	0.065
126.667	0.000	0.00	0.07	0.03	0.064
126.934	0.000	0.00	0.07	0.03	0.064
127.201	0.000	0.00	0.07	0.03	0.063
127.467	0.000	0.00	0.07	0.03	0.062
127.734	0.000	0.00	0.07	0.03	0.062
128.001	0.000	0.00	0.07	0.03	0.061
128.267	0.000	0.00	0.07	0.03	0.060
128.534	0.000	0.00	0.07	0.03	0.060
128.801	0.000	0.00	0.07	0.03	0.059
129.067	0.000	0.00	0.07	0.03	0.058
129.334	0.000	0.00	0.07	0.03	0.058
129.601	0.000	0.00	0.06	0.03	0.057
129.867	0.000	0.00	0.06	0.03	0.057
130.134	0.000	0.00	0.06	0.03	0.056
130.401	0.000	0.00	0.06	0.03	0.055
130.667	0.000	0.00	0.06	0.03	0.055
130.934	0.000	0.00	0.06	0.03	0.054
131.201	0.000	0.00	0.06	0.03	0.054
131.467	0.000	0.00	0.06	0.03	0.053
131.734	0.000	0.00	0.06	0.03	0.052
132.001	0.000	0.00	0.06	0.03	0.052
132.267	0.000	0.00	0.06	0.03	0.051
132.534	0.000	0.00	0.06	0.02	0.051
132.801	0.000	0.00	0.06	0.02	0.050
133.067	0.000	0.00	0.06	0.02	0.050
133.334	0.000	0.00	0.06	0.02	0.049
133.601	0.000	0.00	0.05	0.02	0.049
133.867	0.000	0.00	0.05	0.02	0.048
134.134	0.000	0.00	0.05	0.02	0.048
134.401	0.000	0.00	0.05	0.02	0.047
134.667	0.000	0.00	0.05	0.02	0.047
134.934	0.000	0.00	0.05	0.02	0.046
135.201	0.000	0.00	0.05	0.02	0.046
135.467	0.000	0.00	0.05	0.02	0.045
135.734	0.000	0.00	0.05	0.02	0.045
136.001	0.000	0.00	0.05	0.02	0.044
136.267	0.000	0.00	0.05	0.02	0.044
136.534	0.000	0.00	0.05	0.02	0.043
136.801	0.000	0.00	0.05	0.02	0.043
137.067	0.000	0.00	0.05	0.02	0.042
137.334	0.000	0.00	0.05	0.02	0.042
137.601	0.000	0.00	0.05	0.02	0.041
137.867	0.000	0.00	0.05	0.02	0.041

138.134	0.000	0.00	0.05	0.02	0.041
138.401	0.000	0.00	0.05	0.02	0.040
138.667	0.000	0.00	0.04	0.02	0.040
138.934	0.000	0.00	0.04	0.02	0.039
139.201	0.000	0.00	0.04	0.02	0.039
139.467	0.000	0.00	0.04	0.02	0.038
139.734	0.000	0.00	0.04	0.02	0.038
140.001	0.000	0.00	0.04	0.02	0.038
140.267	0.000	0.00	0.04	0.02	0.037
140.534	0.000	0.00	0.04	0.02	0.037
140.801	0.000	0.00	0.04	0.02	0.036
141.067	0.000	0.00	0.04	0.02	0.036
141.334	0.000	0.00	0.04	0.02	0.036
141.601	0.000	0.00	0.04	0.02	0.035
141.867	0.000	0.00	0.04	0.02	0.035
142.134	0.000	0.00	0.04	0.02	0.035
142.401	0.000	0.00	0.04	0.02	0.034
142.667	0.000	0.00	0.04	0.02	0.034
142.934	0.000	0.00	0.04	0.02	0.034
143.201	0.000	0.00	0.04	0.02	0.033
143.467	0.000	0.00	0.04	0.02	0.033
143.734	0.000	0.00	0.04	0.02	0.032
144.001	0.000	0.00	0.04	0.02	0.032
144.267	0.000	0.00	0.04	0.02	0.032
144.534	0.000	0.00	0.04	0.02	0.031
144.801	0.000	0.00	0.04	0.02	0.031
145.067	0.000	0.00	0.03	0.01	0.031
145.334	0.000	0.00	0.03	0.01	0.030
145.601	0.000	0.00	0.03	0.01	0.030
145.867	0.000	0.00	0.03	0.01	0.030
146.134	0.000	0.00	0.03	0.01	0.029
146.401	0.000	0.00	0.03	0.01	0.029
146.667	0.000	0.00	0.03	0.01	0.029
146.934	0.000	0.00	0.03	0.01	0.029
147.201	0.000	0.00	0.03	0.01	0.028
147.467	0.000	0.00	0.03	0.01	0.028
147.734	0.000	0.00	0.03	0.01	0.028
148.001	0.000	0.00	0.03	0.01	0.027
148.267	0.000	0.00	0.03	0.01	0.027
148.534	0.000	0.00	0.03	0.01	0.027
148.800	0.000	0.00	0.03	0.01	0.026
149.067	0.000	0.00	0.03	0.01	0.026
149.334	0.000	0.00	0.03	0.01	0.026
149.600	0.000	0.00	0.03	0.01	0.026
149.867	0.000	0.00	0.03	0.01	0.025
150.134	0.000	0.00	0.03	0.01	0.025
150.400	0.000	0.00	0.03	0.01	0.025
150.667	0.000	0.00	0.03	0.01	0.025
150.934	0.000	0.00	0.03	0.01	0.024
151.200	0.000	0.00	0.03	0.01	0.024

151.467	0.000	0.00	0.03	0.01	0.024
151.734	0.000	0.00	0.03	0.01	0.024
152.000	0.000	0.00	0.03	0.01	0.023
152.267	0.000	0.00	0.03	0.01	0.023
152.534	0.000	0.00	0.03	0.01	0.023
152.800	0.000	0.00	0.03	0.01	0.023
153.067	0.000	0.00	0.03	0.01	0.022
153.334	0.000	0.00	0.02	0.01	0.022
153.600	0.000	0.00	0.02	0.01	0.022
153.867	0.000	0.00	0.02	0.01	0.022
154.134	0.000	0.00	0.02	0.01	0.021
154.400	0.000	0.00	0.02	0.01	0.021
154.667	0.000	0.00	0.02	0.01	0.021
154.934	0.000	0.00	0.02	0.01	0.021
155.200	0.000	0.00	0.02	0.01	0.020
155.467	0.000	0.00	0.02	0.01	0.020
155.734	0.000	0.00	0.02	0.01	0.020
156.000	0.000	0.00	0.02	0.01	0.020
156.267	0.000	0.00	0.02	0.01	0.020
156.534	0.000	0.00	0.02	0.01	0.019
156.800	0.000	0.00	0.02	0.01	0.019
157.067	0.000	0.00	0.02	0.01	0.019
157.334	0.000	0.00	0.02	0.01	0.019
157.600	0.000	0.00	0.02	0.01	0.019
157.867	0.000	0.00	0.02	0.01	0.018
158.134	0.000	0.00	0.02	0.01	0.018
158.400	0.000	0.00	0.02	0.01	0.018
158.667	0.000	0.00	0.02	0.01	0.018
158.934	0.000	0.00	0.02	0.01	0.018
159.200	0.000	0.00	0.02	0.01	0.017
159.467	0.000	0.00	0.02	0.01	0.017
159.734	0.000	0.00	0.02	0.01	0.017
160.000	0.000	0.00	0.02	0.01	0.017
160.267	0.000	0.00	0.02	0.01	0.017
160.534	0.000	0.00	0.02	0.01	0.017
160.800	0.000	0.00	0.02	0.01	0.016
161.067	0.000	0.00	0.02	0.01	0.016
161.334	0.000	0.00	0.02	0.01	0.016
161.600	0.000	0.00	0.02	0.01	0.016
161.867	0.000	0.00	0.02	0.01	0.016
162.134	0.000	0.00	0.02	0.01	0.016
162.400	0.000	0.00	0.02	0.01	0.015
162.667	0.000	0.00	0.02	0.01	0.015
162.934	0.000	0.00	0.02	0.01	0.015
163.200	0.000	0.00	0.02	0.01	0.015
163.467	0.000	0.00	0.02	0.01	0.015
163.734	0.000	0.00	0.02	0.01	0.015
164.000	0.000	0.00	0.02	0.01	0.014
164.267	0.000	0.00	0.02	0.01	0.014
164.534	0.000	0.00	0.02	0.01	0.014

164.800	0.000	0.00	0.02	0.01	0.014
165.067	0.000	0.00	0.02	0.01	0.014
165.334	0.000	0.00	0.02	0.01	0.014
165.600	0.000	0.00	0.02	0.01	0.014
165.867	0.000	0.00	0.02	0.01	0.013
166.134	0.000	0.00	0.01	0.01	0.013
166.400	0.000	0.00	0.01	0.01	0.013
166.667	0.000	0.00	0.01	0.01	0.013
166.934	0.000	0.00	0.01	0.01	0.013
167.200	0.000	0.00	0.01	0.01	0.013
167.467	0.000	0.00	0.01	0.01	0.013
167.734	0.000	0.00	0.01	0.01	0.012
168.000	0.000	0.00	0.01	0.01	0.012
168.267	0.000	0.00	0.01	0.01	0.012
168.534	0.000	0.00	0.01	0.01	0.012
168.800	0.000	0.00	0.01	0.01	0.012
169.067	0.000	0.00	0.01	0.01	0.012
169.334	0.000	0.00	0.01	0.01	0.012
169.600	0.000	0.00	0.01	0.01	0.012
169.867	0.000	0.00	0.01	0.01	0.011
170.133	0.000	0.00	0.01	0.01	0.011
170.400	0.000	0.00	0.01	0.01	0.011
170.667	0.000	0.00	0.01	0.01	0.011
170.933	0.000	0.00	0.01	0.01	0.011
171.200	0.000	0.00	0.01	0.01	0.011
171.467	0.000	0.00	0.01	0.01	0.011
171.733	0.000	0.00	0.01	0.01	0.011
172.000	0.000	0.00	0.01	0.01	0.010
172.267	0.000	0.00	0.01	0.01	0.010
172.533	0.000	0.00	0.01	0.00	0.010
172.800	0.000	0.00	0.01	0.00	0.010
173.067	0.000	0.00	0.01	0.00	0.010
173.333	0.000	0.00	0.01	0.00	0.010
173.600	0.000	0.00	0.01	0.00	0.010
173.867	0.000	0.00	0.01	0.00	0.010
174.133	0.000	0.00	0.01	0.00	0.010
174.400	0.000	0.00	0.01	0.00	0.009
174.667	0.000	0.00	0.01	0.00	0.009
174.933	0.000	0.00	0.01	0.00	0.009
175.200	0.000	0.00	0.01	0.00	0.009
175.467	0.000	0.00	0.01	0.00	0.009
175.733	0.000	0.00	0.01	0.00	0.009
176.000	0.000	0.00	0.01	0.00	0.009
176.267	0.000	0.00	0.01	0.00	0.009
176.533	0.000	0.00	0.01	0.00	0.009
176.800	0.000	0.00	0.01	0.00	0.009
177.067	0.000	0.00	0.01	0.00	0.009
177.333	0.000	0.00	0.01	0.00	0.008
177.600	0.000	0.00	0.01	0.00	0.008
177.867	0.000	0.00	0.01	0.00	0.008

178.133	0.000	0.00	0.01	0.00	0.008
178.400	0.000	0.00	0.01	0.00	0.008
178.667	0.000	0.00	0.01	0.00	0.008
178.933	0.000	0.00	0.01	0.00	0.008
179.200	0.000	0.00	0.01	0.00	0.008
179.467	0.000	0.00	0.01	0.00	0.008
179.733	0.000	0.00	0.01	0.00	0.008
180.000	0.000	0.00	0.01	0.00	0.008
180.267	0.000	0.00	0.01	0.00	0.008
180.533	0.000	0.00	0.01	0.00	0.007
180.800	0.000	0.00	0.01	0.00	0.007
181.067	0.000	0.00	0.01	0.00	0.007
181.333	0.000	0.00	0.01	0.00	0.007
181.600	0.000	0.00	0.01	0.00	0.007
181.867	0.000	0.00	0.01	0.00	0.007
182.133	0.000	0.00	0.01	0.00	0.007
182.400	0.000	0.00	0.01	0.00	0.007
182.667	0.000	0.00	0.01	0.00	0.007
182.933	0.000	0.00	0.01	0.00	0.007
183.200	0.000	0.00	0.01	0.00	0.007
183.467	0.000	0.00	0.01	0.00	0.007
183.733	0.000	0.00	0.01	0.00	0.007
184.000	0.000	0.00	0.01	0.00	0.006
184.267	0.000	0.00	0.01	0.00	0.006
184.533	0.000	0.00	0.01	0.00	0.006
184.800	0.000	0.00	0.01	0.00	0.006
185.067	0.000	0.00	0.01	0.00	0.006
185.333	0.000	0.00	0.01	0.00	0.006
185.600	0.000	0.00	0.01	0.00	0.006
185.867	0.000	0.00	0.01	0.00	0.006
186.133	0.000	0.00	0.01	0.00	0.006
186.400	0.000	0.00	0.01	0.00	0.006
186.667	0.000	0.00	0.01	0.00	0.006
186.933	0.000	0.00	0.01	0.00	0.006
187.200	0.000	0.00	0.01	0.00	0.006
187.467	0.000	0.00	0.01	0.00	0.006
187.733	0.000	0.00	0.01	0.00	0.006
188.000	0.000	0.00	0.01	0.00	0.006
188.267	0.000	0.00	0.01	0.00	0.005
188.533	0.000	0.00	0.01	0.00	0.005
188.800	0.000	0.00	0.01	0.00	0.005
189.067	0.000	0.00	0.01	0.00	0.005
189.333	0.000	0.00	0.01	0.00	0.005
189.600	0.000	0.00	0.01	0.00	0.005
189.867	0.000	0.00	0.01	0.00	0.005
190.133	0.000	0.00	0.01	0.00	0.005
190.400	0.000	0.00	0.01	0.00	0.005
190.667	0.000	0.00	0.01	0.00	0.005
190.933	0.000	0.00	0.01	0.00	0.005
191.200	0.000	0.00	0.01	0.00	0.005

191.467	0.000	0.00	0.01	0.00	0.005
191.733	0.000	0.00	0.01	0.00	0.005
192.000	0.000	0.00	0.01	0.00	0.005
192.266	0.000	0.00	0.01	0.00	0.005
192.533	0.000	0.00	0.01	0.00	0.005
192.800	0.000	0.00	0.01	0.00	0.005
193.066	0.000	0.00	0.01	0.00	0.004
193.333	0.000	0.00	0.01	0.00	0.004
193.600	0.000	0.00	0.00	0.00	0.004
193.866	0.000	0.00	0.00	0.00	0.004
194.133	0.000	0.00	0.00	0.00	0.004
194.400	0.000	0.00	0.00	0.00	0.004
194.666	0.000	0.00	0.00	0.00	0.004
194.933	0.000	0.00	0.00	0.00	0.004
195.200	0.000	0.00	0.00	0.00	0.004
195.466	0.000	0.00	0.00	0.00	0.004
195.733	0.000	0.00	0.00	0.00	0.004
196.000	0.000	0.00	0.00	0.00	0.004
196.266	0.000	0.00	0.00	0.00	0.004
196.533	0.000	0.00	0.00	0.00	0.004
196.800	0.000	0.00	0.00	0.00	0.004
197.066	0.000	0.00	0.00	0.00	0.004
197.333	0.000	0.00	0.00	0.00	0.004
197.600	0.000	0.00	0.00	0.00	0.004
197.866	0.000	0.00	0.00	0.00	0.004
198.133	0.000	0.00	0.00	0.00	0.004
198.400	0.000	0.00	0.00	0.00	0.004
198.666	0.000	0.00	0.00	0.00	0.004
198.933	0.000	0.00	0.00	0.00	0.004
199.200	0.000	0.00	0.00	0.00	0.004
199.466	0.000	0.00	0.00	0.00	0.003
199.733	0.000	0.00	0.00	0.00	0.003
200.000	0.000	0.00	0.00	0.00	0.003
200.266	0.000	0.00	0.00	0.00	0.003
200.533	0.000	0.00	0.00	0.00	0.003
200.800	0.000	0.00	0.00	0.00	0.003
201.066	0.000	0.00	0.00	0.00	0.003
201.333	0.000	0.00	0.00	0.00	0.003
201.600	0.000	0.00	0.00	0.00	0.003
201.866	0.000	0.00	0.00	0.00	0.003
202.133	0.000	0.00	0.00	0.00	0.003
202.400	0.000	0.00	0.00	0.00	0.003
202.666	0.000	0.00	0.00	0.00	0.003
202.933	0.000	0.00	0.00	0.00	0.003
203.200	0.000	0.00	0.00	0.00	0.003
203.466	0.000	0.00	0.00	0.00	0.003
203.733	0.000	0.00	0.00	0.00	0.003
204.000	0.000	0.00	0.00	0.00	0.003
204.266	0.000	0.00	0.00	0.00	0.003
204.533	0.000	0.00	0.00	0.00	0.003

204.800	0.000	0.00	0.00	0.00	0.003
205.066	0.000	0.00	0.00	0.00	0.003
205.333	0.000	0.00	0.00	0.00	0.003
205.600	0.000	0.00	0.00	0.00	0.003
205.866	0.000	0.00	0.00	0.00	0.003
206.133	0.000	0.00	0.00	0.00	0.003
206.400	0.000	0.00	0.00	0.00	0.003
206.666	0.000	0.00	0.00	0.00	0.003
206.933	0.000	0.00	0.00	0.00	0.003
207.200	0.000	0.00	0.00	0.00	0.003
207.466	0.000	0.00	0.00	0.00	0.003
207.733	0.000	0.00	0.00	0.00	0.002
208.000	0.000	0.00	0.00	0.00	0.002
208.266	0.000	0.00	0.00	0.00	0.002
208.533	0.000	0.00	0.00	0.00	0.002
208.800	0.000	0.00	0.00	0.00	0.002
209.066	0.000	0.00	0.00	0.00	0.002
209.333	0.000	0.00	0.00	0.00	0.002
209.600	0.000	0.00	0.00	0.00	0.002
209.866	0.000	0.00	0.00	0.00	0.002
210.133	0.000	0.00	0.00	0.00	0.002
210.400	0.000	0.00	0.00	0.00	0.002
210.666	0.000	0.00	0.00	0.00	0.002
210.933	0.000	0.00	0.00	0.00	0.002
211.200	0.000	0.00	0.00	0.00	0.002
211.466	0.000	0.00	0.00	0.00	0.002
211.733	0.000	0.00	0.00	0.00	0.002
212.000	0.000	0.00	0.00	0.00	0.002
212.266	0.000	0.00	0.00	0.00	0.002
212.533	0.000	0.00	0.00	0.00	0.002
212.800	0.000	0.00	0.00	0.00	0.002
213.066	0.000	0.00	0.00	0.00	0.002
213.333	0.000	0.00	0.00	0.00	0.002
213.600	0.000	0.00	0.00	0.00	0.002
213.866	0.000	0.00	0.00	0.00	0.002
214.133	0.000	0.00	0.00	0.00	0.002
214.399	0.000	0.00	0.00	0.00	0.002
214.666	0.000	0.00	0.00	0.00	0.002
214.933	0.000	0.00	0.00	0.00	0.002
215.199	0.000	0.00	0.00	0.00	0.002
215.466	0.000	0.00	0.00	0.00	0.002
215.733	0.000	0.00	0.00	0.00	0.002
215.999	0.000	0.00	0.00	0.00	0.002
216.266	0.000	0.00	0.00	0.00	0.002
216.533	0.000	0.00	0.00	0.00	0.002
216.799	0.000	0.00	0.00	0.00	0.002
217.066	0.000	0.00	0.00	0.00	0.002
217.333	0.000	0.00	0.00	0.00	0.002
217.599	0.000	0.00	0.00	0.00	0.002
217.866	0.000	0.00	0.00	0.00	0.002

218.133	0.000	0.00	0.00	0.00	0.002
218.399	0.000	0.00	0.00	0.00	0.002
218.666	0.000	0.00	0.00	0.00	0.002
218.933	0.000	0.00	0.00	0.00	0.002
219.199	0.000	0.00	0.00	0.00	0.002
219.466	0.000	0.00	0.00	0.00	0.002
219.733	0.000	0.00	0.00	0.00	0.002
219.999	0.000	0.00	0.00	0.00	0.002
220.266	0.000	0.00	0.00	0.00	0.002
220.533	0.000	0.00	0.00	0.00	0.001
220.799	0.000	0.00	0.00	0.00	0.001
221.066	0.000	0.00	0.00	0.00	0.001
221.333	0.000	0.00	0.00	0.00	0.001
221.599	0.000	0.00	0.00	0.00	0.001
221.866	0.000	0.00	0.00	0.00	0.001
222.133	0.000	0.00	0.00	0.00	0.001
222.399	0.000	0.00	0.00	0.00	0.001
222.666	0.000	0.00	0.00	0.00	0.001
222.933	0.000	0.00	0.00	0.00	0.001
223.199	0.000	0.00	0.00	0.00	0.001
223.466	0.000	0.00	0.00	0.00	0.001
223.733	0.000	0.00	0.00	0.00	0.001
223.999	0.000	0.00	0.00	0.00	0.001
224.266	0.000	0.00	0.00	0.00	0.001
224.533	0.000	0.00	0.00	0.00	0.001
224.799	0.000	0.00	0.00	0.00	0.001
225.066	0.000	0.00	0.00	0.00	0.001
225.333	0.000	0.00	0.00	0.00	0.001
225.599	0.000	0.00	0.00	0.00	0.001
225.866	0.000	0.00	0.00	0.00	0.001
226.133	0.000	0.00	0.00	0.00	0.001
226.399	0.000	0.00	0.00	0.00	0.001
226.666	0.000	0.00	0.00	0.00	0.001
226.933	0.000	0.00	0.00	0.00	0.001
227.199	0.000	0.00	0.00	0.00	0.001
227.466	0.000	0.00	0.00	0.00	0.001
227.733	0.000	0.00	0.00	0.00	0.001
227.999	0.000	0.00	0.00	0.00	0.001
228.266	0.000	0.00	0.00	0.00	0.001
228.533	0.000	0.00	0.00	0.00	0.001
228.799	0.000	0.00	0.00	0.00	0.001
229.066	0.000	0.00	0.00	0.00	0.001
229.333	0.000	0.00	0.00	0.00	0.001
229.599	0.000	0.00	0.00	0.00	0.001
229.866	0.000	0.00	0.00	0.00	0.001
230.133	0.000	0.00	0.00	0.00	0.001
230.399	0.000	0.00	0.00	0.00	0.001
230.666	0.000	0.00	0.00	0.00	0.001

TYPICAL SECTION TO SUPPORT I MITIGATION CALCULATION, RATING CURVE SUMMARY TABLE.

CURBS

EXIST. GROUND

MIN 3' PONDED DEPTH

A cross-sectional diagram of a curb and gutter assembly. The diagram shows a concrete curb with a top width of 12 inches and a height of 4 inches from the gutter top to the curb top. A roof downspout is shown discharging into the gutter. The gutter is labeled 'OUTLET' and has a dashed line indicating its depth. An arrow points from the gutter to the text 'GOES TO BMP OR LANDSCAPING'. The curb face is indicated by a vertical line and the label 'CURB FACE'. The building is shown on the right side of the diagram.

Technical drawing of a window unit. The drawing shows a cross-section of the unit with the following dimensions and features:

- Overall width: 11'-4"
- Overall height: 2'-0"
- Left side height: 1'-9"
- Right side height: 2'-0"
- Bottom height: 6'-0"
- Slope: 1/4" PER FT. MIN. TO DRAIN
- Label: OPEN
- Foundation: A cross-hatched area representing the foundation or ground.

REVISÉ: JUNE 2022

(CITY CASE #: CUP22-00004)
(SWC MESA LINDA ST & SULTANA ST)

2
OF
2
SHEETS

NOT FOR CONSTRUCTION – THIS POST-CONSTRUCTION BMP SITE PLAN IS FOR WQMP REVIEW PURPOSE

Basin 100 (BMP 1): Stage-Storage-Discharge Rating Curve Summary

Proposed Mitigation: A combination of an aboveground infiltration basin w/ drywell system and a supplemental underground storage facility

Proposed BMP Outletwork Detail

Proposed Basin Characteristics	
Effective Surface Area (ft ²) =	7,488
Top Surface Area (ft ²) =	13,841
System Depth (ft) =	6.40

Stage-Discharge Summary

Elevation (ft)	Discharge (cfs)
0.00	0.43
1.00	0.43
2.00	0.43
4.00	4.39
5.00	52.04
6.40	179.73

Stage-Storage Summary

Elevation (ft)	Area (sf)	Porosity	Effective Surface Area (sf)	Storage (Cumulative) (ac-ft)
0.00	7488	1.00	7488	0.000
1.00	8481	1.00	8481	0.887
2.00	9473	1.00	9473	1.796
4.00	11459	1.00	11459	3.683
5.00	12451	1.00	12451	3.960
6.40	13841	1.00	13841	4.387

Infiltration (If Applicable)	
Applicability (Yes/No)	Yes
Design Infiltration Rate (in/hr)	2.48
Design Infiltration Rate (ft/sec)	0.00006
Design Infiltration Rate (ft ³ /sec)	0.430

Note: This effective design infiltration is based on 2.56 in/hr for drywell and 0.96 in/hr for basin bottom, in order to drain within 24-hour period (drawdown time).

Low-flow Orifice (Restrictor)	
Num. of orifices =	1
Orifice invert elevation (ft) =	0.50
Orifice diameter (in) =	1

Secondary Outlet Pipe (Restrictor)	
Num. of orifices =	2
Orifice invert elevation (ft) =	2.00
Orifice diameter (in) =	8

Overflow Concrete Spillway	
Outlet invert elevation (ft) =	4.00
Spillway Width at F.L. (ft) =	15.50

Orifice/Weir Coefficient	
Orifice coefficient, C _g =	0.60
Weir coefficient, C _s =	3.0

JUNE 2022

$$Q = C L H^{3/2}$$

$$95 \text{ cfs} = 3.0 L (1.25')^{3/2}$$

$$L \approx 22.65' \text{ min.}$$

