DRAINAGE STUDY
FOR
ALVARADO CREEK APARTMENTS

Job Number 19048

August 18, 2020
Revised: February 2, 2021
Revised: May 3, 2021
Revised: July 23, 2021
Revised: September 24, 2021

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DRAINAGE STUDY

FOR

ALVARADO CREEK APARTMENTS

Job Number 19048

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ALVARADO CREEK APARTMENTS

5th Submittal Revision Page

September 24, 2021

No comments were received from the City on the 4th submittal review applicant to this document This document has been updated to incorporate a revised storm drain alignment to be consistent with project grading and utility plans.

ALVARADO CREEK APARTMENTS

4th Submittal Revision Page

July 23, 2021

Pursuant to the review comments completed on May 28, 2021, regarding the subject reports dated May 3, 2021, the following comments were addressed. Below is a list of the comments, followed by Rick Engineering Company's response:

REVIEW COMMENTS

Drainage Study Issues

Reviewing Discipline: LDR-Engineering Review

Drainage Study Issues

27. Please revise the pre and post development hydrology exhibits to include the following information:
a) Q & V and IEs
b) Points of Compliance
c) Area of each basin
d) impervious vs pervious tables
Also, please use a different lineweight and color for the existing and proposed storm drain systems for legibility.

Response: Please see response to Comment 77.

58. Following up with comment#27: Comment has been partially addressed. Please revise the pre and post development hydrology exhibits to add the Q & V at all discharge points and to show existing and proposed storm drain systems in different line weight and color for legibility.

Response: Please see response to Comment 77.

Stormwater Issues

77. Following up with comments#27 & 58: The Q & V on the Grading Plans and not consistent with the hydrology exhibits. Please revise all plans and exhibits to be consistent.
(Continued)

Response: Q & V labeled for all discharge points and existing and proposed storm drain systems clearly shown on the pre- and post-project hydrology exhibits. The Q & V labels are shown on the grading plan, and labels are consistent with the drainage study hydrology exhibits.

78. Please revise the proposed storm drain system on the hydrology exhibit, grading plans, and DMA/HMP exhibits to show all the "multiple" BMPs that serve ONE DMA to be hydraulically connected before being connected to the rest of the system (each set of BMPs to have one connection to the SD system).

    Also, please identify what pipes are public and what are private, and whether the southerly pipe and riprap discharging to the Alvarado Creek is private or public. Additional comments may follow upon response.

    Response: The proposed storm drain system on the hydrology exhibit, grading plans, and DMA/HMP exhibits have been revised to show a single BMP for each DMA or to show that the "multiple" BMPs that serve a single DMA are hydraulically connected before being connected to the rest of the system.

    Pipes have been identified as public or private on the exhibits and plans.

ALVARADO CREEK APARTMENTS

3rd Submittal Revision Page

May 3, 2021

Pursuant to the review comments completed on March 12, 2021 regarding the subject reports dated February 2, 2021, the following comments were addressed. Below is a list of the comments, followed by Rick Engineering Company's response:

REVIEW COMMENTS

Drainage Study Issues

Reviewing Discipline: Storm Water Department – Operations

1. The O&M Engineering division (Storm Water Operations) has reviewed all applicable documents to submitted. Please see below comments from O&M Engineering: (New Issue)

   Response: Noted. Comments reviewed and addressed.

2. As indicated in the Cities Drainage and design manual, "Within floodplain and floodplain fringe areas as defined by the Federal Emergency Management Agency (FEMA), the runoff criteria shall be based upon a 100-year frequency storm. Under City requirements, the minimum elevation of the finished, first floor elevation of any building is two (2) feet above the 100-year frequency flood elevation."

   a) Since this project is within a FEMA flood zone, the Drainage Report needs to be adjusted to evaluate a 100 year storm event and not only the 50 year accounted by the consultant team. (continued) (New Issue)

   Response: Both the 50-year and 100-year storm events have been analyzed and are presented in the drainage study.

3. b) Consistent analysis needs to be provided across all studies. (New Issue)

   Response: There is consistent analysis across all studies.

4. The hydraulic analysis indicates that the first finished floor (included basements) will be elevated two feet of more , at 79 ft of elevation in order to comply with City of San Diego Municipal Code 143.046(c)(6).

   a) Does this also include any parking Structures?

b) Due to the proximity to Alvarado Creek, being within the FEMA flood zone, and the known flooding within this area, it is recommended that no underground parking structures be installed in this location. (continued) (New Issue)

Response: a & b: The project is not proposing underground parking and does not include a basement. The parking is at the same elevation as some of the habitable spaces, which is at least two feet above the base flood elevations. Please note that coordinate with City staff after this cycle review was performed. City staff has informed the project team that the review of the CLOMR (under separate cover) has been deferred until final engineering/ministerial permitting.

5. c) The first finished floor should include all parking structures, electrical rooms, and any other essential services/area that are used to provided services to the homes of the residents. (New Issue)

Response: Please see response to Comment 4.

6. All water from the project should be conveyed and collected at the Detention Vault.

   a) The project current discharges water directly from the alley way to the Alvarado Creek.

   b) This vault need to be sized to withhold a minimum of 100 year storm and have a delayed discharge time into Alvarado Creek. This will minimize the amount of added flow that could be originated from the development of this project and potential flood from high peak events. (New Issue)

Response: All runoff from the project will be conveyed to the proposed vault system. In order to address this comment, additional analysis has performed and is presented in the drainage study, include a detention analysis for the 100-year storm event.

7. Vacated and proposed storm drains and energy dissipators

   a) Storm drains should be removed/vacated per the City Standards. These location should be shared in further detail to Stormwater to asset record keeping.

   b) All storm drains and energy dissipators need to be sized and installed in accordance to the City Drainage and Design manual. (continued) (New Issue)

Response:
a) Final engineering construction documents will include the vacating drainage easements where storm drain is proposed to be removed and will include new easement for proposed storm drain pipe and other utilities, as applicable.

b) Storm drains and energy dissipators have been designed in accordance with the City Drainage and Design Manual and SDD-104.

8. c) Energy dissipators should be installed to the lowest defined point, outside of the highest WSE of Alvarado Creek to avoid damage to the energy dissipator and further erosion of the side slopes, where they are currently being proposed for installation. (New Issue)

   Response: The energy dissipators have been located at highest point possible along the creek; however, these locations are within the 100-year limits of inundation, and this is unavoidable. During final engineering, additional riprap design calculations will be performed that will evaluate two scenarios: (1) the 100-year unmitigated peak flow rate from the project site with no flow in the creek and (2) the 100-year flow in the creek across the project riprap pad.

9. Stormwater Water Quality Improvement
   The Stormwater Check list indicates that the project is low priority, but based on the location of the project and the acreage, being disturbed is greater than an acre. Please provide determination from Regional Waterboard Webpage to indicate that this is not a Medium Priority (CGP- RL1) or High Priority (CGP-RL2). (New Issue)

   Response: Based on the small project area and the anticipated short grading duration, it is anticipated that the project will be low priority. This will be evaluated and verified or updated during final engineering when additional project detail is known. A note has been added to Form D560 to state as much.

10. Not all PDP questions were answered to reflect the changes to site drainage and reflecting the designed Storm drain system. Update all applicable questions. (New Issue)

    Response: All PDP question have been answered in the current submittal.

11. If you have any questions pertaining to the comments or the review by O&M Engineering division staff please contact Anna Wernet, AWernet@sandiego.gov, 619-527-7514. (New Issue)

    Response: A coordination meeting was performed on March 24, 2021 to discuss each O&M comment and determine the appropriate approach to address each. We believe that we fully address each to the satisfaction of the entitlement review. We appreciate the feedback thus far and look forward to continuing work with City staff on this project.

Reviewing Discipline: LDR-Engineering Review

Drainage Study Issues

28. Please add a discussion to the Drainage Study stating if the proposed project is required to obtain approval from the Regional Water Quality Control Board Under Federal Clean Water Act (CWA) section 401 or 404. A complete explanation must be provided. Please note, if the proposed project is subject to regulations as set forth in CWA 401/404, approval from the California Regional Water Quality Control Board must be obtained prior to permit issuance.

    Cleared

29. Please make sure to refer to the current city's storm water manual dated October 2018.

    Cleared

30. Please note that Hydrology must be analyzed for 100 year frequency storm. Hydraulics must be analyzed for 50 year frequency storm. Revise the drainage study accordingly.

    Cleared

31. Please revise the pre and post development hydrology exhibits to include the following information:

e) Q & V and IEs
f) Points of Compliance
g) Area of each basin
h) impervious vs pervious tables

Also, please use a different lineweight and color for the existing and proposed storm drain systems for legibility.

Response: Please see response to Comment 58.

32. Please address the velocity values in the drainage study.

    Cleared

33. Please provide a summary table to compare the pre and post construction onsite and offsite Q, A, C & V values and provide calculations for the C values (if weighted C values are used).

    Cleared

34. Please remove the water quality related sections from the drainage study. This information should be part of the storm water report.

    Cleared

35. If there are no negative impacts to any adjacent properties or downstream system, a statement should be added to the conclusion in the report.

    Cleared

2nd Submittal Comments

59. Following up with comment#27: Comment has been partially addressed. Please revise the pre and post development hydrology exhibits to add the Q & V at all discharge points and to show existing and proposed storm drain systems in different line weight and color for legibility.

    Response: Q & V labeled for all discharge points and existing and proposed storm drain systems clearly shown on the pre- and post-project hydrology exhibits.

ALVARADO CREEK APARTMENTS

2nd Submittal Revision Page

February 2, 2021

Pursuant to the review comments completed on November 17, 2020 regarding the subject reports dated August 18, 2020, the following comments were addressed. Below is a list of the comments, followed by Rick Engineering Company's response:

REVIEW COMMENTS

Drainage Study Issues

19 Please add a discussion to the Drainage Study stating if the proposed project is required to obtain approval from the Regional Water Quality Control Board Under Federal Clean Water Act (CWA) section 401 or 404. A complete explanation must be provided. Please note, if the proposed project is subject to regulations as set forth in CWA 401/404, approval from the California Regional Water Quality Control Board must be obtained prior to permit issuance.

Response: Section 1.7 Environmental Permitting has been added to the Drainage Study address this comment.

20 Please make sure to refer to the current city's storm water manual dated October 2018.

Response: The City of San Diego Drainage Design Manual dated January 2017 and the City of San Diego Stormwater Standards Manual dated October 2018 are referenced in the Drainage Study.

21 Please note that Hydrology must be analyzed for 100 year frequency storm. Hydraulics must be analyzed for 50 year frequency storm. Revise the drainage study accordingly.

Response: The Drainage Study has been revised to include the 100-year frequency storm event analysis.

22 Please revise the pre and post development hydrology exhibits to include the following information:

a) Q & V and IEs
b) Points of Compliance
c) Area of each basin
d) impervious vs pervious tables

Also, please use a different lineweight and color for the existing and proposed storm drain systems for legibility.

Response: The hydrology exhibits have been revised as requested.

23 Please address the velocity values in the drainage study.

Response: Velocity values have been added to Table 2-2.

24 Please provide a summary table to compare the pre and post construction onsite and offsite Q, A, C & V values and provide calculations for the C values (if weighted C values are used).

Response: Flow (Q) and area (A) are on Table 2-3 and velocity (V) has been added to this Table 2-3. A discussion of the runoff coefficients used has been added to the Section 2.1.

25 Please remove the water quality related sections from the drainage study. This information should be part of the storm water report.

Response: The Water Quality Section has been revised to only reference the separate PDP SWQMP for the project.

26 If there are no negative impacts to any adjacent properties or downstream system, a statement should be added to the conclusion in the report.

Response: The conclusion has been revised as recommended.

FEMA Issues

27 Please note: Project is located in flood zone AE. Applicant must comply with all requirements.

Response: Noted.

28 Please resubmit showing and calling out FEMA flood plain boundaries and base flood level on the Grading Plan. Further review of the disturbance of soil in FEMA flood plains is required. If any grading is done in Zone AE or A applicant will be required to comply with all FEMA regulations. Flood plain review may be required.

Response: 100-year base flood elevation limits of inundation provided on grading plan.

29 The project is required to submit an approved Conditional Letter of Map Revision (CLOMR) from the Federal Emergency Management Agency for the subject project prior to the environmental document being circulated for public comment. The developer must provide all documentation, engineering calculations, and fees which are required by FEMA.

Response: A request for a CLOMR has been submitted under separate cover.

30 The developer shall denote on the final map and the improvement plans "Subject to Inundation" all areas lower than the base flood elevation plus 2 feet.

Response: Final map will include above note.

31 FYI: Fill placed in the SFHA for the purpose of creating a building pad must be compacted to 95% of the maximum density obtainable with the Standard Proctor Test Fill method issued by the American Society for Testing and Materials (ASTM Standard D-698). Granular fill slopes must have adequate protection for a minimum flood water velocity of five feet per second.

Response: Final engineering grading plan will include above guidance.

32 FYI: The developer shall enter into an agreement with the City waiving the right to oppose a special assessment initiated for the construction of flood control facilities and their perpetual maintenance.

Response: Noted.

1.0 INTRODUCTION

1.1 Project Description

This drainage study has been prepared to support the proposed Alvarado Creek Apartments Project (hereafter referred to as the "project"). This document provides details of the methodologies and results of the hydrologic and hydraulic analyses performed to support the improvements proposed as part of this project. Hydrologic analysis of the existing conditions was performed to assess the existing drainage patterns. Hydrologic analysis of the proposed (i.e., post-project) condition was performed in order to compare to the existing condition results and in support of the design of drainage features (e.g., proposed storm drain). The hydraulic calculations were then assessed under the proposed conditions to estimate the performance of the system with the proposed improvements.

1.2 Project Location

The project site current zoned as industrial land use and is in Grantville, which is a community in the City of San Diego. The project site address is at 5901 Mission Gorge Road. The project site consists of three parcels: 461-320-06, 461-320-08, and 461-320-09. The project site is bound by commercial properties to the southwest and west, Mission Gorge Road to the northwest, an ally and commercial properties to the north, and industrial properties to the northeast. Alvarado Creek transects the approximate center of the project site and flows in an east-northeast to southeast direction through the project site. A vicinity map of the project location is provided in Figure 1-1.

Figure 1-1: Vicinity Map

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Feet
0 100 200 300 400 500

North

Date of Exhibit: 03.2020
DigitalGlobe Aerial Image: 05.2012

Vicinity Map

J-19048

1.3 Land Use and Drainage Characteristics

Analyses of the topographic data were performed in order to ascertain the drainage areas associated with the project. Additional information on the source of the topographic data is provided in the paragraph below. North of Alvarado Creek, the drainage from the site generally flows towards the middle of the north project site boundary and there is either collected by an inlet and storm drain pipe that conveys flows to the south into Alvarado Creek or surface flows onto an unnamed access road that conveys flows to the south into Alvarado. Based on As-Built Drawings 10515-2-D and 10515-5-D, the above-mentioned storm drain pipe has a diameter of 18 inches, is reinforced concrete pipe (RCP), and conveys flows collected by an existing Type B Curb Inlet located along the west side of Mission Gorge Road. Flow from off-site properties surface flows onto the site property and towards the above-mentioned inlet and access road location near the middle of the north project site boundary, including off-site flows from north and northeast properties.

As part of a planning project that included the preparation of the *Grantville Trolley Station/Alvarado Creek Revitalization Study*, dated August 2017, the City of San Diego provided to the public the topographic survey data collected in support of that project. These survey data were collected on July 14, 2016. The horizontal basis of coordinates for this survey is referenced to the California Coordinate System of 1983 (CCS83) Zone 6, North American Datum of 1983 (NAD83), and elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD 29). Data from the surveys were compiled into computer aided drafting and design (CADD) files that included ground elevation data as well as key features, such as storm water conveyances (e.g., channels flowlines, culverts, etc.).

In the post-project condition, the flow pattern will be similar. That is off-site flows will be collected in inlets and conveyed south to Alvarado Creek. Runoff generated on-site will be directed into water quality and hydromodification management features. The hydromodification management system outlet flows will be conveyed south into Alvarado Creek. The existing 18-inch RCP storm drain will be rerouted around the proposed building and into Alvarado Creek.

1.4 Hydrology and Hydraulic Analyses

The hydrologic and hydraulic analyses were performed in general conformance with the *City of San Diego Transportation & Storm Water Design Manual, Drainage Design Manual* (City Drainage Design Manual), dated January 2017. A hydrologic analysis was performed to estimate peak flow rates for a 50-year and 100-year storm event peak flow rates to align with the City Drainage Design Manual for drainage areas less than 0.5 square miles. Details of the

methodologies and results of the hydrology and hydraulic analyses are provided in Sections 2.0 and 3.0, respectively.

1.5 Detention Analysis

Based on the post-project impervious area proposed as less than the pre-project impervious area and the resulting decrease in the peak flow rate, detention analysis is not required for the project. However, as requested by City review staff a detention analysis was performed and is presented in Section 2.3.

1.6 Water Quality and Hydromodification Management

In accordance with *The City of San Diego Storm Water Standards manual* (SWSM), dated October 1, 2018, the project is considered a priority development project (PDP) and obligated to implement water quality and hydromodification management measures pursuant to the guidance within the SWSM. The proposed water quality and hydromodification management measures along with supporting calculation are provided under separate cover in a PDP Storm Water Quality Management Plan (PDP SWQMP) for the project.

1.7 Environmental Permitting

Alteration to Alvarado Creek would require the preparation and submission of applications for regulatory permits to the U.S. Army Corps of Engineers (USACE), pursuant to Section 404 of the federal Clean Water Act (CWA). Projects impacting drainage and water quality are also required to obtain a Section 401 Water Quality Certification. This permit is obtained through the California Water Quality Control Board (RWQCB) pursuant to Section 401 of the federal CWA. Additionally, a Section 1600 Streambed Alteration Agreement of the California Endangered Species Act Consultation would be required through the California Department of Fish and Wildlife (CDFW). The project property is located within the August 2017 Grantville Revitalization Study Area; however, the project has been designed with development outside of the revitalization study preferred alternative footprint so that the revitalization study preferred alternative creek enhancement can be permitted and constructed in the future separate from this project. This project does include grading along the creek, and as such the need for a CWA 401 and 404 and Streambed Alternation permits will most likely be required prior to the issuance of the grading permit for the project. This drainage study has been prepared for the preliminary phase (i.e., Neighborhood Development Permit [NDP] phase) of the project. The project drainage study will accompany the regulatory permitting applications when submitted by others.

2.0 HYDROLOGIC ANALYSES

The existing and proposed hydrologic conditions were analyzed as part of this study to determine the runoff associated with the design storm event at key locations. This section details the methodology and results performed, which were used in subsequent hydraulic analyses as outlined in Section 3.0. Refer to Section 1.3 for land use and drainage characteristics.

2.1 Rational Method Hydrologic Analysis Methodology

The hydrologic analysis was performed in general conformance with the City Drainage Design Manual. The purpose of the hydrologic analysis was to determine peak flow rates associated with the 50-year and 100-year frequency design storm events. The 100-year frequency is the appropriate flood control design storm to compare pre-project and post-project conditions. The 50-year return frequency is the appropriate flood control design storm for storm drain systems pursuant to the City Drainage Design Manual for drainage areas less than 0.5 square miles. Rainfall intensity data was taken from Figure A-1 in the City Drainage Design Manual. The Modified Rational Method was used in accordance City Drainage Design Manual to determine the peak flow rates at key locations.

Advance Engineering Software (AES) computer software was used to perform Modified Rational Method calculations to determine the peak flow rates expected to reach the key locations within the project area and adjacent area. The hydrologic model was developed by first dividing each watershed into several subareas. The delineation of each subarea was determined so that the area within each subarea is comprised of similar land use and storm drain conveyance system (e.g., pipe size). Nodes were identified at the upstream and downstream extents of each subarea, and subarea hydrologic data were determined, such as drainage facility geometry, elevations, and lengths. Next, the hydrologic data describing each subarea were incorporated into the AES software in order to create a node-link model for each watershed. For each subarea the AES software performs calculations for the specific hydrologic process occurring in the subarea. There are 15 different hydrologic processes programed into the software, and each process is assigned a code number that is presented on the model results. The AES Rational Method computer software hydrologic processes code numbers are described in Table 2-1.

Table 2-1: Summary of AES Processes

Code	Subarea Type
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 subarea
Code 10	Copy mainstream data onto a memory bank
Code 11	Confluence a memory bank with the mainstream memory
Code 12	Clear a memory bank
Code 13	Clear the mainstream memory
Code 14	Copy a memory bank onto the mainstream memory
Code 15	Hydrologic data bank storage functions

Key hydrologic parameters utilized in the analysis in accordance with the City Drainage Design Manual are shown on the AES printout provided in Appendix A.

The percent impervious value was used to determine the runoff coefficient for both the pre-project and post-project conditions following Table A-1 from the Drainage Design Manual. The runoff coefficient generally varied between 0.95 (90% impervious) or 0.85 (80% impervious) depending on the percentage of impervious cover for each subarea. For the subareas that are not either 80% or 90% impervious area, the runoff coefficient was calculated based on the percentage of impervious area pursuant to the guidance provided in the footnotes of Table A-1 from the Drainage Design Manual. A summary of the runoff coefficient calculations is provided in Table 2-2.

Table 2-2. Runoff Coefficient Calculations

Subarea	Area (acres)	Impervious Percentage	Runoff C
105 (Code 8)	0.09	65%	0.69
106 (Code 8)	0.3	0%	0.50
304.5 to 305	0.11	0%	0.50

In order to be conservative, the post-project on-site subarea (Nodes 201 to 202) was analyzed assuming a time of concentration (Tc) of five minutes. During final engineering, the on-site drainage may be analyzed in more detail once site improvement design detail is known.

2.2 Hydrologic Analysis Results

Tables 2-3 and 2-4 provide a summary of flow rates at key locations for the 50-year and 100-years storm event, respectfully, which were used in the storm drain hydraulic analysis discussed in Section 3.0. The hydrologic analysis included analyzing the peak flow at the Mission Gorge Road existing curb inlet in order to provide preliminary sizing for the proposed extension / rerouting of the existing 18-inch storm drain pipe through the project. The drainage area maps and detailed Modified Rational Method results are included in Map Pockets 1 and 2 and Appendix A, respectively.

Table 2-3. 50-Year Storm Event Hydrologic Summary at Key Locations

Node	Pre-Project				Post-Project			
	Area (acres)	Tc (min.)	Velocity (ft/s)	Flow (cfs)	Area (acres)	Tc (min.)	Velocity (ft/s)	Flow (cfs)
104	2.5	5.9	3.2	9.5	2.4	5.9	5.2 [1]	9.2 [4]
106	3.3	6.6	6.3	12.0	2.8	7.4	5.2 [2]	9.3 [4]
204	1.0	5.0	4.1	4.0	1.5	5.5	3.5 [2]	6.1
305	1.4	5.9	3.2	5.2	1.4	5.6	4.6	5.0
Total	**5.6**	**6.6**	**Creek [2]**	**20.8**	**5.6**	**7.4**	**Creek [3]**	**19.5**
Mission Gorge Existing Inlet	**3.6**	**11.4**	**1.6**	**10.4**	**3.6**	**11.4**	**1.6**	**10.4**

[1] Post-project flow at Node 104 is within proposed pipe.

[2] Post-project flow at Nodes 106 and 204 is at the pipe outfall / connection with the creek.

[3] Total flow shown is project site on-site and off-site runoff confluenced within Alvarado Creek where flow will comingle with Alvarado Creek flow minus the Alvarado Creek flow (FEMA Q_{50} is 4,500 cfs for Alvarado Creek at confluence with San Diego River).

[4] Based on inlet calculation (see Section 3.2), additional 2.3 cfs from Mission Gorge (velocity = 6.5 ft/s).

Table 2-4. 100-Year Storm Event Hydrologic Summary at Key Locations

Node	Pre-Project				Post-Project			
	Area (acres)	Tc (min.)	Velocity (ft/s)	Flow (cfs)	Area (acres)	Tc (min.)	Velocity (ft/s)	Flow (cfs)
104	2.5	5.9	3.3	10.0	2.4	5.9	5.5 [1]	9.7
106	3.3	6.6	6.3	12.7	2.8	7.3	5.5 [2]	9.9
204	1.0	5.0	4.1	4.1	1.5	5.5	3.6 [2]	6.4
305	1.4	5.9	3.3	5.5	1.4	5.6	4.7	5.3
Total	**5.6**	**6.6**	**Creek [2]**	**21.9**	**5.6**	**7.3**	**Creek [3]**	**20.7**
Mission Gorge Existing Inlet	**3.6**	**11.4**	**1.6**	**11.2**	**3.6**	**11.4**	**1.6**	**11.2**

[1] Post-project flow at Node 104 is within proposed pipe.

[2] Post-project flow at Nodes 106 and 204 is at the pipe outfall / connection with the creek.

[3] Total flow shown is project site on-site and off-site runoff confluenced within Alvarado Creek where flow will comingle with Alvarado Creek flow minus the Alvarado Creek flow (FEMA Q_{100} is 5,100 cfs for Alvarado Creek at confluence with San Diego River).

[4] Based on inlet calculation (see Section 3.2), additional 2.3 cfs from Mission Gorge (velocity = 6.9 ft/s).

2.3 Detention Analysis

A detention analysis was performed to demonstrate how the project drainage features will function to mitigate peak flow rate in comparison to both the unmitigated post-project and pre-project conditions. It should be noted that based on the post-project impervious area proposed as less than the pre-project impervious area and the resulting decrease in the peak flow rate, detention analysis is not required for the project. However, a detention analysis was performed to evaluate and present the post-project discharge from project for the 100-year storm event with the proposed hydromodification management features in place.

As discussed in Section 1.6, the project is required to implement hydromodifications measures designed to demonstrate that flows leaving the site will not be greater than the flows leaving the site in the pre-developed conditions for storm events between the low-flow threshold of 10 percent of the 2-year frequency storm event peak flow rate and the 10-year frequency storm event peak flow rate. In order to demonstrate that the project will comply with the hydromodification management criteria, a SWMM analysis was prepared and a long-term simulation of both the pre-developed and post-project conditions were modeled and compared. Additional detail related to the preparation of SWMM analysis is provided in the project PDP SWQMP. As part of the detention analysis, the hydromodification SWMM analysis was utilized to analyze the 100-year storm event. That is, instead of performing a long-term simulation, the SWMM analysis included a single 100-year event. First, a time-series hydrograph was created for the unmitigated post-project condition following the guidance of the Drainage Design Manual, which in turn references the County of San Diego Hydrology Manual (June 2003). The Direct Inflow option was utilized

to input the hydrograph time-series data into the SWMM analysis for the on-site drainage basin areas. Figure 2-1 shows the results in comparison to the post-project unmitigated flow rates, and Table 2-5 provides a tabular summary of the comparison.

Figure 2-1. Post-Project Flow Mitigation Results

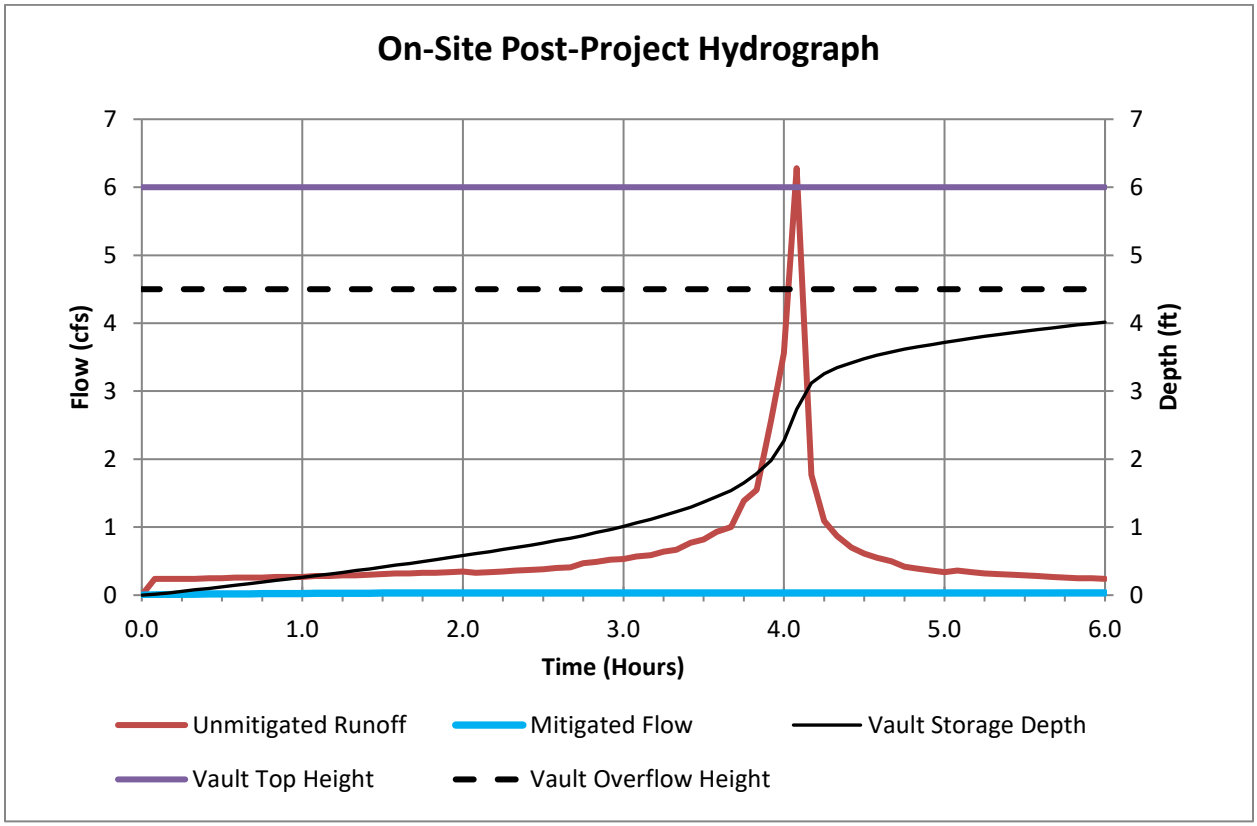

Table 2-5. Detention Analysis Results Summary

Condition	Peak Flow Rate
Unmitigated Flow	6.3 cfs
Mitigated Flow	0.04 cfs

The results indicate that the project, as proposed with hydromodification management features, will capture, temporarily store, and very slowly release the entire analyzed 100-year storm event. Appendix C includes the input hydrograph used in the analysis along with a summary of the results. Digital SWMM files are included as part of the submittal for this project.

3.0 HYDRAULIC ANALYSIS

Hydraulic analyses were performed to determine the flow conveyed by the existing Type B Curb Inlet located along Mission Gorge Road and in support of the preliminary design of proposed conveyance features, including storm drain inlets and pipes.

3.1 Curb Inlets on Grade Calculations Methodology

Curb inlet on a continuous grade calculations were performed to evaluate the capacity of the existing Type B Curb Inlet located along Mission Gorge Road, west of the project. The purpose of these calculations was to estimate the 50-year frequency peak flow rate conveyed by the inlet into the storm drain, which in turn was utilized in pipe capacity hydraulic calculations. The following curb inlet capacity equation was used:

$$Q = 0.7\,L(a + y)^{3/2}$$

Where:

Q = interception capacity of the curb inlet (cfs);
L = length of clear opening of inlet for total interception (ft);
y = depth of flow approaching the curb inlet (ft); and
a = depth of depression of curb at the inlet (ft)
(City Drainage Design Manual, dated January 2017)

The existing curb inlet analyzed has a localized depressed curb and gutter of approximately 0.17 feet (a = 0.17 feet) and a length of opening (L) of three feet. Flow depths (y) were determined from performing using Manning's Formula in combination with the results of the AES analysis.

3.2 Curb Inlets on Grade Calculations Results

The results of the curb inlet on continuous grade are provided in Table 3-1. Additional information related to the curb inlet on grade calculations are provided in Appendix B.

Table 3-1. Curb Inlet on Continuous Grade Calculations Results

Location (Node) Existing Mission Gorge Inlet (Node 405)	Q (cfs)	L_T (feet)	$Q_{CAPACITY}$ (cfs)	Efficiency
50-Year Storm Event	10.4	3.0	2.26	21.7%
100-Year Storm Event	11.2	3.0	2.34	20.9%

3.3 Project Storm Drain Calculations

The proposed on-site storm drain systems have been designed to convey runoff from the 100-year storm event. Assuming a pipe full condition and using Manning's Formula, Table 3-2 provides a summary of pipe capacities when designed at the minimum slope condition of 0.5 percent (i.e., conservative).

Table 3-2. Preliminary Pipe Design / Capacity Summary

Pipe Diameter (inches)	Flow Area (square inches)	Wetted Perimeter (Inches)	Flow Rate Capacity (cfs)[1]	Area[2] (acres)
4	12.6	12.6	0.16	0.04
6	28.3	18.8	0.47	0.12
8	50.3	25.1	1.01	0.25
10	78.5	31.4	1.83	0.46
12	113.1	37.7	2.99	0.75
15	176.7	47.1	5.41	1.36
18	254.5	56.5	7.45	1.87

[1] Slope of 0.5%, Manning's n value of 0.011 for Polyvinyl Chloride (PVC) with smooth inner walls except for the 18-inch, which utilized a Manning's n value of 0.013 for smooth concrete.
[2] Area is based on Runoff C value of 0.95 and Tc of 5 minutes.

4.0 SUMMARY AND CONCLUSION

This drainage report presents the hydrologic and hydraulic calculations in support of the Alvarado Creek Apartment Project. Peak flow rates for the 50-year and 100-year frequency storm events were determined using the Modified Rational Method analysis based on the hydrologic methodology outlined in the City Drainage Design Manual, dated January 2017. The results indicated the project will not result in an increase in flow in comparison to the pre-projection condition. Therefore, the project will not result in negative impacts to any adjacent properties or the downstream system. Hydrologic analysis were performed for the flow to the existing curb inlet west of the project in Mission Gorge Road in order to estimate the 50-year and 100-year frequency peak flow rates from the road into the existing 18-inch storm drain through the project. The analysis included on-grade inlet calculations, and the results indicate approximately 2.3 cfs are conveyed from the inlet into the storm drain during the 50-year storm event. During final engineering, detailed calculations will be performed in support the proposed re-routing of the existing 18-inch storm drain around the project to Alvarado Creek.

APPENDIX A

AES Printouts

Pre-Project, 50-Year Storm Event

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2014 Advanced Engineering Software (aes)
             Ver. 21.0 Release Date: 06/01/2014  License ID 1261

                           Analysis prepared by:

                          RICK ENGINEERING COMPANY
                              5620 Friars Road
                        San Diego, California 92110
                      619-291-0707   Fax 619-291-4165

 ************************** DESCRIPTION OF STUDY **************************
* PACIFIC WEST COMMUNITIES REDEVELOPMENT PROJECT                           *
* PRE-PROJECT 50-YEAR ANALYSIS                                             *
* RICK ENGINEERING COMPANY JOB NUMBER 19048                                *
 ***************************************************************************

  FILE NAME: GRANT50.DAT
  TIME/DATE OF STUDY: 17:09 08/17/2020
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  50.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.01
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  9
   1)   5.000;  4.200
   2)  10.000;  3.200
   3)  15.000;  2.700
   4)  20.000;  2.300
   5)  25.000;  2.050
   6)  30.000;  1.850
   7)  40.000;  1.600
   8)  50.000;  1.400
   9)  60.000;  1.250
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   20.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0180

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  5.0 (FT*FT/S)
```

```
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =     77.00
  DOWNSTREAM ELEVATION(FEET) =     76.10
  ELEVATION DIFFERENCE(FEET) =      0.90
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.361
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    63.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.200
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.36
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.36

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     76.10  DOWNSTREAM(FEET) =     72.40
  CHANNEL LENGTH THRU SUBAREA(FEET) =   215.00   CHANNEL SLOPE =  0.0172
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.117
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.65
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.74
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   2.06
  Tc(MIN.) =    5.42
  SUBAREA AREA(ACRES) =     0.15       SUBAREA RUNOFF(CFS) =    0.59
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.910
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.94

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   1.84
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    103.00 =     290.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 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.) =    5.42
  RAINFALL INTENSITY(INCH/HR) =   4.12
  TOTAL STREAM AREA(ACRES) =     0.25
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.94

******************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =     76.30
  DOWNSTREAM ELEVATION(FEET) =     75.10
  ELEVATION DIFFERENCE(FEET) =      1.20
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.902
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.200
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.40
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.40

******************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    103.00 IS CODE =  51
------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     75.10  DOWNSTREAM(FEET) =     72.40
  CHANNEL LENGTH THRU SUBAREA(FEET) =   160.00   CHANNEL SLOPE =  0.0169
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.200
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.56
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.55
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   1.72
  Tc(MIN.) =    3.62
  SUBAREA AREA(ACRES) =     0.08       SUBAREA RUNOFF(CFS) =    0.32
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.72

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   1.71
```

```
  LONGEST FLOWPATH FROM NODE    111.00 TO NODE    103.00 =     240.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 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.) =    3.62
  RAINFALL INTENSITY(INCH/HR) =   4.20
  TOTAL STREAM AREA(ACRES) =     0.18
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.72

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        0.94     5.42        4.117          0.25
      2        0.72     3.62        4.200          0.18

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        1.34     3.62       4.200
      2        1.64     5.42       4.117

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       1.64   Tc(MIN.) =    5.42
  TOTAL AREA(ACRES) =        0.4
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    103.00 =     290.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.117
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.9328
  SUBAREA AREA(ACRES) =    0.15   SUBAREA RUNOFF(CFS) =    0.59
  TOTAL AREA(ACRES) =        0.6   TOTAL RUNOFF(CFS) =       2.23
  TC(MIN.) =    5.42

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =     72.40  DOWNSTREAM(FEET) =     71.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =    55.00   CHANNEL SLOPE =  0.0127
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.038
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.38
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.34
  AVERAGE FLOW DEPTH(FEET) =   0.16   TRAVEL TIME(MIN.) =   0.39
  Tc(MIN.) =    5.81
  SUBAREA AREA(ACRES) =     0.08       SUBAREA RUNOFF(CFS) =    0.31
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.935
  TOTAL AREA(ACRES) =        0.7         PEAK FLOW RATE(CFS) =       2.49

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.16   FLOW VELOCITY(FEET/SEC.) =   2.41
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    104.00 =     345.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    121.00 TO NODE    122.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =     78.10
  DOWNSTREAM ELEVATION(FEET) =     77.10
  ELEVATION DIFFERENCE(FEET) =      1.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.982
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    62.50
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.200
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.40
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.40

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    123.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     77.10  DOWNSTREAM(FEET) =     73.30
```

```
  CHANNEL LENGTH THRU SUBAREA(FEET) =   260.00   CHANNEL SLOPE =  0.0146
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.200
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.44
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.51
  AVERAGE FLOW DEPTH(FEET) =   0.13   TRAVEL TIME(MIN.) =   1.73
  Tc(MIN.) =    3.71
  SUBAREA AREA(ACRES) =     0.52       SUBAREA RUNOFF(CFS) =    2.07
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       2.47

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.17   FLOW VELOCITY(FEET/SEC.) =   3.03
  LONGEST FLOWPATH FROM NODE    121.00 TO NODE    123.00 =     340.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    123.00 TO NODE    123.00 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.) =    3.71
  RAINFALL INTENSITY(INCH/HR) =   4.20
  TOTAL STREAM AREA(ACRES) =     0.62
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.47

****************************************************************************
  FLOW PROCESS FROM NODE    131.00 TO NODE    132.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    60.00
  UPSTREAM ELEVATION(FEET) =     77.70
  DOWNSTREAM ELEVATION(FEET) =     77.10
  ELEVATION DIFFERENCE(FEET) =      0.60
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.091
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    60.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.200
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.48
  TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.48

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

```
  FLOW PROCESS FROM NODE    132.00 TO NODE    133.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   77.10  DOWNSTREAM ELEVATION(FEET) =   74.50
  STREET LENGTH(FEET) =   210.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

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

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0180
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.84
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.25
    HALFSTREET FLOOD WIDTH(FEET) =    6.18
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.67
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.42
  STREET FLOW TRAVEL TIME(MIN.) =   2.09   Tc(MIN.) =    4.18
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.200
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  SUBAREA AREA(ACRES) =    0.18      SUBAREA RUNOFF(CFS) =    0.72
  TOTAL AREA(ACRES) =        0.3        PEAK FLOW RATE(CFS) =       1.20

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.27   HALFSTREET FLOOD WIDTH(FEET) =   7.38
  FLOW VELOCITY(FEET/SEC.) =  1.81   DEPTH*VELOCITY(FT*FT/SEC.) =   0.49
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    133.00 =     270.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    133.00 TO NODE    133.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.200
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.9500
  SUBAREA AREA(ACRES) =    0.24   SUBAREA RUNOFF(CFS) =    0.96
  TOTAL AREA(ACRES) =        0.5   TOTAL RUNOFF(CFS) =       2.15
  TC(MIN.) =    4.18

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

```
  FLOW PROCESS FROM NODE    133.00 TO NODE    123.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     74.60  DOWNSTREAM(FEET) =     73.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =    80.00   CHANNEL SLOPE =  0.0162
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.200
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.43
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.69
  AVERAGE FLOW DEPTH(FEET) =   0.19   TRAVEL TIME(MIN.) =   0.50
  Tc(MIN.) =    4.68
  SUBAREA AREA(ACRES) =     0.14       SUBAREA RUNOFF(CFS) =    0.56
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        0.7         PEAK FLOW RATE(CFS) =       2.71

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.19   FLOW VELOCITY(FEET/SEC.) =   2.84
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    123.00 =     350.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    123.00 TO NODE    123.00 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.) =    4.68
  RAINFALL INTENSITY(INCH/HR) =   4.20
  TOTAL STREAM AREA(ACRES) =     0.68
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.71

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        2.47     3.71        4.200          0.62
      2        2.71     4.68        4.200          0.68

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        4.63     3.71       4.200
      2        5.19     4.68       4.200

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
```

```
  PEAK FLOW RATE(CFS) =       5.19   Tc(MIN.) =    4.68
  TOTAL AREA(ACRES) =        1.3
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    123.00 =     350.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    123.00 TO NODE    104.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     73.30  DOWNSTREAM(FEET) =     71.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =   205.00   CHANNEL SLOPE =  0.0078
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.016
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.20
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.75
  AVERAGE FLOW DEPTH(FEET) =   0.35   TRAVEL TIME(MIN.) =   1.24
  Tc(MIN.) =    5.92
  SUBAREA AREA(ACRES) =     0.53       SUBAREA RUNOFF(CFS) =    2.02
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        1.8         PEAK FLOW RATE(CFS) =       6.98

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.37   FLOW VELOCITY(FEET/SEC.) =   2.80
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    104.00 =     555.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        6.98     5.92       4.016        1.83
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    104.00 =     555.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        2.49     5.81       4.038        0.66
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    104.00 =     345.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1       9.34       5.81        4.038
      2       9.46       5.92        4.016

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
```

```
  PEAK FLOW RATE(CFS) =       9.46   Tc(MIN.) =    5.92
  TOTAL AREA(ACRES) =        2.5

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     71.70  DOWNSTREAM(FEET) =     71.20
  CHANNEL LENGTH THRU SUBAREA(FEET) =    55.00   CHANNEL SLOPE =  0.0091
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.959
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       9.52
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.21
  AVERAGE FLOW DEPTH(FEET) =   0.41   TRAVEL TIME(MIN.) =   0.29
  Tc(MIN.) =    6.21
  SUBAREA AREA(ACRES) =     0.03       SUBAREA RUNOFF(CFS) =    0.11
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.946
  TOTAL AREA(ACRES) =        2.5         PEAK FLOW RATE(CFS) =       9.46

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.41   FLOW VELOCITY(FEET/SEC.) =   3.19
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    105.00 =     610.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 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.) =    6.21
  RAINFALL INTENSITY(INCH/HR) =   3.96
  TOTAL STREAM AREA(ACRES) =     2.52
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.46

****************************************************************************
  FLOW PROCESS FROM NODE    141.00 TO NODE    142.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =     76.50
  DOWNSTREAM ELEVATION(FEET) =     74.40
  ELEVATION DIFFERENCE(FEET) =      2.10
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.709
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
```

```
          THE MAXIMUM OVERLAND FLOW LENGTH =    76.25
          (Reference: Table 3-1B of Hydrology Manual)
          THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.200
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.40
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.40

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    105.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     74.40  DOWNSTREAM(FEET) =     71.20
  CHANNEL LENGTH THRU SUBAREA(FEET) =   115.00   CHANNEL SLOPE =  0.0278
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.200
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.80
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.38
  AVERAGE FLOW DEPTH(FEET) =   0.09   TRAVEL TIME(MIN.) =   0.81
  Tc(MIN.) =    2.52
  SUBAREA AREA(ACRES) =     0.20       SUBAREA RUNOFF(CFS) =    0.80
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       1.20

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.11   FLOW VELOCITY(FEET/SEC.) =   2.66
  LONGEST FLOWPATH FROM NODE    141.00 TO NODE    105.00 =     195.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    2.52
  RAINFALL INTENSITY(INCH/HR) =   4.20
  TOTAL STREAM AREA(ACRES) =     0.30
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.20

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        9.46     6.21        3.959          2.52
      2        1.20     2.52        4.200          0.30

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
```

```
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        5.03     2.52       4.200
      2       10.59     6.21       3.959

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      10.59   Tc(MIN.) =    6.21
  TOTAL AREA(ACRES) =        2.8
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    105.00 =     610.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     71.20  DOWNSTREAM(FEET) =     66.60
  CHANNEL LENGTH THRU SUBAREA(FEET) =   130.00   CHANNEL SLOPE =  0.0354
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   5.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.890
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      10.74
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.32
  AVERAGE FLOW DEPTH(FEET) =   0.36   TRAVEL TIME(MIN.) =   0.34
  Tc(MIN.) =    6.55
  SUBAREA AREA(ACRES) =     0.08       SUBAREA RUNOFF(CFS) =    0.30
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.947
  TOTAL AREA(ACRES) =        2.9         PEAK FLOW RATE(CFS) =      10.68

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.36   FLOW VELOCITY(FEET/SEC.) =   6.28
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    106.00 =     740.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.890
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.9469
  SUBAREA AREA(ACRES) =    0.37   SUBAREA RUNOFF(CFS) =    1.37
  TOTAL AREA(ACRES) =        3.3   TOTAL RUNOFF(CFS) =      12.05
  TC(MIN.) =    6.55

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =   1
```

```
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.55
  RAINFALL INTENSITY(INCH/HR) =   3.89
  TOTAL STREAM AREA(ACRES) =     3.27
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     12.05

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =     75.30
  DOWNSTREAM ELEVATION(FEET) =     74.10
  ELEVATION DIFFERENCE(FEET) =      1.20
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.902
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.200
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.48
  TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.48

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     74.10  DOWNSTREAM(FEET) =     72.40
  CHANNEL LENGTH THRU SUBAREA(FEET) =   210.00   CHANNEL SLOPE =  0.0081
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.200
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.46
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.71
  AVERAGE FLOW DEPTH(FEET) =   0.13   TRAVEL TIME(MIN.) =   2.05
  Tc(MIN.) =    3.95
  SUBAREA AREA(ACRES) =     0.49       SUBAREA RUNOFF(CFS) =    1.96
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       2.43
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.18   FLOW VELOCITY(FEET/SEC.) =   2.01
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    203.00 =     290.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    203.00 TO NODE    204.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   72.40  DOWNSTREAM ELEVATION(FEET) =   68.00
  STREET LENGTH(FEET) =    85.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

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

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0180
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.19
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.29
    HALFSTREET FLOOD WIDTH(FEET) =    8.37
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.90
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.14
  STREET FLOW TRAVEL TIME(MIN.) =   0.36   Tc(MIN.) =    4.32
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.200
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  SUBAREA AREA(ACRES) =    0.38      SUBAREA RUNOFF(CFS) =    1.52
  TOTAL AREA(ACRES) =        1.0        PEAK FLOW RATE(CFS) =       3.95

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.31   HALFSTREET FLOOD WIDTH(FEET) =   9.24
  FLOW VELOCITY(FEET/SEC.) =  4.07   DEPTH*VELOCITY(FT*FT/SEC.) =   1.26
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    204.00 =     375.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    204.00 TO NODE    204.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    4.32
  RAINFALL INTENSITY(INCH/HR) =   4.20
  TOTAL STREAM AREA(ACRES) =     0.99
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.95
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =     78.40
  DOWNSTREAM ELEVATION(FEET) =     76.80
  ELEVATION DIFFERENCE(FEET) =      1.60
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.793
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    70.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.200
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.72
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.72

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     76.80  DOWNSTREAM(FEET) =     74.90
  CHANNEL LENGTH THRU SUBAREA(FEET) =   200.00   CHANNEL SLOPE =  0.0095
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.200
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.58
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.96
  AVERAGE FLOW DEPTH(FEET) =   0.17   TRAVEL TIME(MIN.) =   1.70
  Tc(MIN.) =    3.49
  SUBAREA AREA(ACRES) =     0.43       SUBAREA RUNOFF(CFS) =    1.72
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       2.43

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.21   FLOW VELOCITY(FEET/SEC.) =   2.26
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    303.00 =     280.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 TO NODE    304.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
```

```
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     74.90  DOWNSTREAM(FEET) =     73.40
  CHANNEL LENGTH THRU SUBAREA(FEET) =   190.00   CHANNEL SLOPE =  0.0079
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.200
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.33
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.33
  AVERAGE FLOW DEPTH(FEET) =   0.26   TRAVEL TIME(MIN.) =   1.36
  Tc(MIN.) =    4.85
  SUBAREA AREA(ACRES) =     0.45       SUBAREA RUNOFF(CFS) =    1.80
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        1.1         PEAK FLOW RATE(CFS) =       4.23

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.29   FLOW VELOCITY(FEET/SEC.) =   2.44
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    304.00 =     470.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    305.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     73.40  DOWNSTREAM(FEET) =     71.40
  CHANNEL LENGTH THRU SUBAREA(FEET) =   200.00   CHANNEL SLOPE =  0.0100
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.017
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.82
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.13
  AVERAGE FLOW DEPTH(FEET) =   0.27   TRAVEL TIME(MIN.) =   1.06
  Tc(MIN.) =    5.91
  SUBAREA AREA(ACRES) =     0.31       SUBAREA RUNOFF(CFS) =    1.18
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        1.4         PEAK FLOW RATE(CFS) =       5.23

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.28   FLOW VELOCITY(FEET/SEC.) =   3.23
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    305.00 =     670.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    305.00 TO NODE    305.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
```

```
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.91
  RAINFALL INTENSITY(INCH/HR) =   4.02
  TOTAL STREAM AREA(ACRES) =     1.37
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.23

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       12.05     6.55        3.890          3.27
      2        3.95     4.32        4.200          0.99
      3        5.23     5.91        4.017          1.37

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       18.92     4.32       4.200
      2       20.67     5.91       4.017
      3       20.77     6.55       3.890

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      20.77   Tc(MIN.) =    6.55
  TOTAL AREA(ACRES) =        5.6
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    305.00 =     740.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        5.6  TC(MIN.) =      6.55
  PEAK FLOW RATE(CFS)   =      20.77
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

🡅

Pre-Project, 100-Year Storm Event

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2014 Advanced Engineering Software (aes)
             Ver. 21.0 Release Date: 06/01/2014  License ID 1261

                           Analysis prepared by:

                          RICK ENGINEERING COMPANY
                              5620 Friars Road
                        San Diego, California 92110
                      619-291-0707   Fax 619-291-4165

 ************************** DESCRIPTION OF STUDY **************************
* PACIFIC WEST COMMUNITIES REDEVELOPMENT PROJECT                           *
* PRE-PROJECT 100-YEAR ANALYSIS                                            *
* RICK ENGINEERING COMPANY JOB NUMBER 19048                                *
 ***************************************************************************

  FILE NAME: GRNT100.DAT
  TIME/DATE OF STUDY: 16:13 01/18/2021
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.01
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  9
   1)   5.000;  4.400
   2)  10.000;  3.450
   3)  15.000;  2.900
   4)  20.000;  2.500
   5)  25.000;  2.220
   6)  30.000;  2.000
   7)  40.000;  1.700
   8)  50.000;  1.500
   9)  60.000;  1.320
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   20.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0180

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  5.0 (FT*FT/S)
```

```
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =     77.00
  DOWNSTREAM ELEVATION(FEET) =     76.10
  ELEVATION DIFFERENCE(FEET) =      0.90
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.361
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    63.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.37
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.37

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     76.10  DOWNSTREAM(FEET) =     72.40
  CHANNEL LENGTH THRU SUBAREA(FEET) =   215.00   CHANNEL SLOPE =  0.0172
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.303
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.68
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.67
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   2.15
  Tc(MIN.) =    5.51
  SUBAREA AREA(ACRES) =     0.15       SUBAREA RUNOFF(CFS) =    0.61
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.910
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.98

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   1.92
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    103.00 =     290.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 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.) =    5.51
  RAINFALL INTENSITY(INCH/HR) =   4.30
  TOTAL STREAM AREA(ACRES) =     0.25
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.98

****************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =     76.30
  DOWNSTREAM ELEVATION(FEET) =     75.10
  ELEVATION DIFFERENCE(FEET) =      1.20
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.902
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.42
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.42

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    103.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     75.10  DOWNSTREAM(FEET) =     72.40
  CHANNEL LENGTH THRU SUBAREA(FEET) =   160.00   CHANNEL SLOPE =  0.0169
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.59
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.62
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   1.64
  Tc(MIN.) =    3.54
  SUBAREA AREA(ACRES) =     0.08       SUBAREA RUNOFF(CFS) =    0.33
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.75

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   1.79
```

```
  LONGEST FLOWPATH FROM NODE    111.00 TO NODE    103.00 =     240.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 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.) =    3.54
  RAINFALL INTENSITY(INCH/HR) =   4.40
  TOTAL STREAM AREA(ACRES) =     0.18
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.75

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        0.98     5.51        4.303          0.25
      2        0.75     3.54        4.400          0.18

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        1.38     3.54       4.400
      2        1.71     5.51       4.303

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       1.71   Tc(MIN.) =    5.51
  TOTAL AREA(ACRES) =        0.4
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    103.00 =     290.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.303
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.9328
  SUBAREA AREA(ACRES) =    0.15   SUBAREA RUNOFF(CFS) =    0.61
  TOTAL AREA(ACRES) =        0.6   TOTAL RUNOFF(CFS) =       2.33
  TC(MIN.) =    5.51

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =     72.40  DOWNSTREAM(FEET) =     71.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =    55.00   CHANNEL SLOPE =  0.0127
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.231
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.49
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.41
  AVERAGE FLOW DEPTH(FEET) =   0.16   TRAVEL TIME(MIN.) =   0.38
  Tc(MIN.) =    5.89
  SUBAREA AREA(ACRES) =     0.08       SUBAREA RUNOFF(CFS) =    0.32
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.935
  TOTAL AREA(ACRES) =        0.7         PEAK FLOW RATE(CFS) =       2.61

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.16   FLOW VELOCITY(FEET/SEC.) =   2.41
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    104.00 =     345.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    121.00 TO NODE    122.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =     78.10
  DOWNSTREAM ELEVATION(FEET) =     77.10
  ELEVATION DIFFERENCE(FEET) =      1.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.982
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    62.50
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.42
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.42

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    123.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     77.10  DOWNSTREAM(FEET) =     73.30
```

```
  CHANNEL LENGTH THRU SUBAREA(FEET) =   260.00   CHANNEL SLOPE =  0.0146
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.50
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.62
  AVERAGE FLOW DEPTH(FEET) =   0.13   TRAVEL TIME(MIN.) =   1.65
  Tc(MIN.) =    3.63
  SUBAREA AREA(ACRES) =     0.52       SUBAREA RUNOFF(CFS) =    2.17
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       2.59

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.18   FLOW VELOCITY(FEET/SEC.) =   3.04
  LONGEST FLOWPATH FROM NODE    121.00 TO NODE    123.00 =     340.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    123.00 TO NODE    123.00 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.) =    3.63
  RAINFALL INTENSITY(INCH/HR) =   4.40
  TOTAL STREAM AREA(ACRES) =     0.62
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.59

****************************************************************************
  FLOW PROCESS FROM NODE    131.00 TO NODE    132.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    60.00
  UPSTREAM ELEVATION(FEET) =     77.70
  DOWNSTREAM ELEVATION(FEET) =     77.10
  ELEVATION DIFFERENCE(FEET) =      0.60
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.091
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    60.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.50

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

```
  FLOW PROCESS FROM NODE    132.00 TO NODE    133.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   77.10  DOWNSTREAM ELEVATION(FEET) =   74.50
  STREET LENGTH(FEET) =   210.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

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

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0180
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.88
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.25
    HALFSTREET FLOOD WIDTH(FEET) =    6.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.67
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.42
  STREET FLOW TRAVEL TIME(MIN.) =   2.09   Tc(MIN.) =    4.19
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  SUBAREA AREA(ACRES) =    0.18      SUBAREA RUNOFF(CFS) =    0.75
  TOTAL AREA(ACRES) =        0.3        PEAK FLOW RATE(CFS) =       1.25

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.28   HALFSTREET FLOOD WIDTH(FEET) =   7.58
  FLOW VELOCITY(FEET/SEC.) =  1.81   DEPTH*VELOCITY(FT*FT/SEC.) =   0.50
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    133.00 =     270.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    133.00 TO NODE    133.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.9500
  SUBAREA AREA(ACRES) =    0.24   SUBAREA RUNOFF(CFS) =    1.00
  TOTAL AREA(ACRES) =        0.5   TOTAL RUNOFF(CFS) =       2.26
  TC(MIN.) =    4.19

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

```
  FLOW PROCESS FROM NODE    133.00 TO NODE    123.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     74.60  DOWNSTREAM(FEET) =     73.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =    80.00   CHANNEL SLOPE =  0.0162
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.55
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.78
  AVERAGE FLOW DEPTH(FEET) =   0.19   TRAVEL TIME(MIN.) =   0.48
  Tc(MIN.) =    4.67
  SUBAREA AREA(ACRES) =     0.14       SUBAREA RUNOFF(CFS) =    0.59
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        0.7         PEAK FLOW RATE(CFS) =       2.84

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.20   FLOW VELOCITY(FEET/SEC.) =   2.82
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    123.00 =     350.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    123.00 TO NODE    123.00 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.) =    4.67
  RAINFALL INTENSITY(INCH/HR) =   4.40
  TOTAL STREAM AREA(ACRES) =     0.68
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.84

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        2.59     3.63        4.400          0.62
      2        2.84     4.67        4.400          0.68

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        4.80     3.63       4.400
      2        5.43     4.67       4.400

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
```

```
  PEAK FLOW RATE(CFS) =       5.43   Tc(MIN.) =    4.67
  TOTAL AREA(ACRES) =        1.3
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    123.00 =     350.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    123.00 TO NODE    104.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     73.30  DOWNSTREAM(FEET) =     71.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =   205.00   CHANNEL SLOPE =  0.0078
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.225
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.50
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.72
  AVERAGE FLOW DEPTH(FEET) =   0.36   TRAVEL TIME(MIN.) =   1.26
  Tc(MIN.) =    5.92
  SUBAREA AREA(ACRES) =     0.53       SUBAREA RUNOFF(CFS) =    2.13
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        1.8         PEAK FLOW RATE(CFS) =       7.34

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.38   FLOW VELOCITY(FEET/SEC.) =   2.86
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    104.00 =     555.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        7.34     5.92       4.225        1.83
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    104.00 =     555.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        2.61     5.89       4.231        0.66
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    104.00 =     345.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1       9.91       5.89        4.231
      2       9.95       5.92        4.225

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
```

```
  PEAK FLOW RATE(CFS) =       9.95   Tc(MIN.) =    5.92
  TOTAL AREA(ACRES) =        2.5

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     71.70  DOWNSTREAM(FEET) =     71.20
  CHANNEL LENGTH THRU SUBAREA(FEET) =    55.00   CHANNEL SLOPE =  0.0091
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.171
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      10.01
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.26
  AVERAGE FLOW DEPTH(FEET) =   0.42   TRAVEL TIME(MIN.) =   0.28
  Tc(MIN.) =    6.20
  SUBAREA AREA(ACRES) =     0.03       SUBAREA RUNOFF(CFS) =    0.12
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.946
  TOTAL AREA(ACRES) =        2.5         PEAK FLOW RATE(CFS) =       9.95

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.42   FLOW VELOCITY(FEET/SEC.) =   3.26
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    105.00 =     610.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.20
  RAINFALL INTENSITY(INCH/HR) =   4.17
  TOTAL STREAM AREA(ACRES) =     2.52
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.95

****************************************************************************
  FLOW PROCESS FROM NODE    141.00 TO NODE    142.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =     76.50
  DOWNSTREAM ELEVATION(FEET) =     74.40
  ELEVATION DIFFERENCE(FEET) =      2.10
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.709
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
```

```
          THE MAXIMUM OVERLAND FLOW LENGTH =    76.25
          (Reference: Table 3-1B of Hydrology Manual)
          THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.42
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.42

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    105.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     74.40  DOWNSTREAM(FEET) =     71.20
  CHANNEL LENGTH THRU SUBAREA(FEET) =   115.00   CHANNEL SLOPE =  0.0278
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.84
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.43
  AVERAGE FLOW DEPTH(FEET) =   0.09   TRAVEL TIME(MIN.) =   0.79
  Tc(MIN.) =    2.50
  SUBAREA AREA(ACRES) =     0.20       SUBAREA RUNOFF(CFS) =    0.84
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       1.25

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.11   FLOW VELOCITY(FEET/SEC.) =   2.73
  LONGEST FLOWPATH FROM NODE    141.00 TO NODE    105.00 =     195.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    2.50
  RAINFALL INTENSITY(INCH/HR) =   4.40
  TOTAL STREAM AREA(ACRES) =     0.30
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.25

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        9.95     6.20        4.171          2.52
      2        1.25     2.50        4.400          0.30

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
```

```
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        5.26     2.50       4.400
      2       11.14     6.20       4.171

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      11.14   Tc(MIN.) =    6.20
  TOTAL AREA(ACRES) =        2.8
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    105.00 =     610.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     71.20  DOWNSTREAM(FEET) =     66.60
  CHANNEL LENGTH THRU SUBAREA(FEET) =   130.00   CHANNEL SLOPE =  0.0354
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   5.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.106
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      11.30
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.32
  AVERAGE FLOW DEPTH(FEET) =   0.37   TRAVEL TIME(MIN.) =   0.34
  Tc(MIN.) =    6.55
  SUBAREA AREA(ACRES) =     0.08       SUBAREA RUNOFF(CFS) =    0.31
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.947
  TOTAL AREA(ACRES) =        2.9         PEAK FLOW RATE(CFS) =      11.27

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.37   FLOW VELOCITY(FEET/SEC.) =   6.30
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    106.00 =     740.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.106
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.9469
  SUBAREA AREA(ACRES) =    0.37   SUBAREA RUNOFF(CFS) =    1.44
  TOTAL AREA(ACRES) =        3.3   TOTAL RUNOFF(CFS) =      12.71
  TC(MIN.) =    6.55

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =   1
```

```
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.55
  RAINFALL INTENSITY(INCH/HR) =   4.11
  TOTAL STREAM AREA(ACRES) =     3.27
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     12.71

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =     75.30
  DOWNSTREAM ELEVATION(FEET) =     74.10
  ELEVATION DIFFERENCE(FEET) =      1.20
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.902
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     74.10  DOWNSTREAM(FEET) =     72.40
  CHANNEL LENGTH THRU SUBAREA(FEET) =   210.00   CHANNEL SLOPE =  0.0081
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.53
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.70
  AVERAGE FLOW DEPTH(FEET) =   0.14   TRAVEL TIME(MIN.) =   2.06
  Tc(MIN.) =    3.96
  SUBAREA AREA(ACRES) =     0.49       SUBAREA RUNOFF(CFS) =    2.05
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       2.55
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.18   FLOW VELOCITY(FEET/SEC.) =   2.08
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    203.00 =     290.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    203.00 TO NODE    204.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   72.40  DOWNSTREAM ELEVATION(FEET) =   68.00
  STREET LENGTH(FEET) =    85.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

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

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0180
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.34
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
    HALFSTREET FLOOD WIDTH(FEET) =    8.57
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.92
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.17
  STREET FLOW TRAVEL TIME(MIN.) =   0.36   Tc(MIN.) =    4.32
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  SUBAREA AREA(ACRES) =    0.38      SUBAREA RUNOFF(CFS) =    1.59
  TOTAL AREA(ACRES) =        1.0        PEAK FLOW RATE(CFS) =       4.14

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.31   HALFSTREET FLOOD WIDTH(FEET) =   9.44
  FLOW VELOCITY(FEET/SEC.) =  4.10   DEPTH*VELOCITY(FT*FT/SEC.) =   1.29
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    204.00 =     375.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    204.00 TO NODE    204.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    4.32
  RAINFALL INTENSITY(INCH/HR) =   4.40
  TOTAL STREAM AREA(ACRES) =     0.99
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.14
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =     78.40
  DOWNSTREAM ELEVATION(FEET) =     76.80
  ELEVATION DIFFERENCE(FEET) =      1.60
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.793
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    70.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.75
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.75

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     76.80  DOWNSTREAM(FEET) =     74.90
  CHANNEL LENGTH THRU SUBAREA(FEET) =   200.00   CHANNEL SLOPE =  0.0095
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.65
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.02
  AVERAGE FLOW DEPTH(FEET) =   0.17   TRAVEL TIME(MIN.) =   1.65
  Tc(MIN.) =    3.44
  SUBAREA AREA(ACRES) =     0.43       SUBAREA RUNOFF(CFS) =    1.80
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       2.55

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.22   FLOW VELOCITY(FEET/SEC.) =   2.28
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    303.00 =     280.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 TO NODE    304.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
```

```
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     74.90  DOWNSTREAM(FEET) =     73.40
  CHANNEL LENGTH THRU SUBAREA(FEET) =   190.00   CHANNEL SLOPE =  0.0079
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.49
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.34
  AVERAGE FLOW DEPTH(FEET) =   0.26   TRAVEL TIME(MIN.) =   1.35
  Tc(MIN.) =    4.79
  SUBAREA AREA(ACRES) =     0.45       SUBAREA RUNOFF(CFS) =    1.88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        1.1         PEAK FLOW RATE(CFS) =       4.43

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.30   FLOW VELOCITY(FEET/SEC.) =   2.46
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    304.00 =     470.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    305.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     73.40  DOWNSTREAM(FEET) =     71.40
  CHANNEL LENGTH THRU SUBAREA(FEET) =   200.00   CHANNEL SLOPE =  0.0100
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.245
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.06
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.25
  AVERAGE FLOW DEPTH(FEET) =   0.27   TRAVEL TIME(MIN.) =   1.02
  Tc(MIN.) =    5.82
  SUBAREA AREA(ACRES) =     0.31       SUBAREA RUNOFF(CFS) =    1.25
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        1.4         PEAK FLOW RATE(CFS) =       5.52

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.29   FLOW VELOCITY(FEET/SEC.) =   3.28
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    305.00 =     670.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    305.00 TO NODE    305.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
==============================================================================
  TOTAL NUMBER OF STREAMS =  3
```

```
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.82
  RAINFALL INTENSITY(INCH/HR) =   4.24
  TOTAL STREAM AREA(ACRES) =     1.37
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.52

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       12.71     6.55        4.106          3.27
      2        4.14     4.32        4.400          0.99
      3        5.52     5.82        4.245          1.37

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       20.11     4.32       4.400
      2       21.82     5.82       4.245
      3       21.92     6.55       4.106

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      21.92   Tc(MIN.) =    6.55
  TOTAL AREA(ACRES) =        5.6
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    305.00 =     740.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        5.6  TC(MIN.) =      6.55
  PEAK FLOW RATE(CFS)   =      21.92
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

🡅

Post-Project, 50-Year Storm Event

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2014 Advanced Engineering Software (aes)
             Ver. 21.0 Release Date: 06/01/2014  License ID 1261

                           Analysis prepared by:

                          RICK ENGINEERING COMPANY
                              5620 Friars Road
                        San Diego, California 92110
                      619-291-0707   Fax 619-291-4165

 ************************** DESCRIPTION OF STUDY **************************
* PACIFIC WEST COMMUNITIES REDEVELOPMENT PROJECT                           *
* POST-PROJECT 50-YEAR ANALYSIS                                            *
* RICK ENGINEERING COMPANY JOB NUMBER 19048                                *
 ***************************************************************************

  FILE NAME: GRNT50P.DAT
  TIME/DATE OF STUDY: 18:38 02/02/2021
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  50.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.01
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  9
   1)   5.000;  4.200
   2)  10.000;  3.200
   3)  15.000;  2.700
   4)  20.000;  2.300
   5)  25.000;  2.050
   6)  30.000;  1.850
   7)  40.000;  1.600
   8)  50.000;  1.400
   9)  60.000;  1.250
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   20.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0180

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  5.0 (FT*FT/S)
```

```
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =     77.00
  DOWNSTREAM ELEVATION(FEET) =     76.10
  ELEVATION DIFFERENCE(FEET) =      0.90
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.361
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    63.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.200
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.36
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.36

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     76.10  DOWNSTREAM(FEET) =     72.40
  CHANNEL LENGTH THRU SUBAREA(FEET) =   215.00   CHANNEL SLOPE =  0.0172
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.113
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.73
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.73
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   2.07
  Tc(MIN.) =    5.43
  SUBAREA AREA(ACRES) =     0.19       SUBAREA RUNOFF(CFS) =    0.74
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.916
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       1.09

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   1.95
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    103.00 =     290.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
```

```
==============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.113
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.9296
  SUBAREA AREA(ACRES) =    0.20   SUBAREA RUNOFF(CFS) =    0.78
  TOTAL AREA(ACRES) =        0.5   TOTAL RUNOFF(CFS) =       1.87
  TC(MIN.) =    5.43

******************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  51
------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     72.40  DOWNSTREAM(FEET) =     71.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =    55.00   CHANNEL SLOPE =  0.0127
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.032
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.07
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.26
  AVERAGE FLOW DEPTH(FEET) =   0.14   TRAVEL TIME(MIN.) =   0.41
  Tc(MIN.) =    5.84
  SUBAREA AREA(ACRES) =     0.10       SUBAREA RUNOFF(CFS) =    0.38
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.933
  TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       2.22

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.15   FLOW VELOCITY(FEET/SEC.) =   2.28
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    104.00 =     345.00 FEET.

******************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =  10
------------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
==============================================================================

******************************************************************************
  FLOW PROCESS FROM NODE    121.00 TO NODE    122.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =     78.10
  DOWNSTREAM ELEVATION(FEET) =     77.10
  ELEVATION DIFFERENCE(FEET) =      1.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.982
```

```
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    62.50
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.200
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.40
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.40

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    123.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     77.10  DOWNSTREAM(FEET) =     73.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   260.00   CHANNEL SLOPE =  0.0146
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.200
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.44
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.51
  AVERAGE FLOW DEPTH(FEET) =   0.13   TRAVEL TIME(MIN.) =   1.73
  Tc(MIN.) =    3.71
  SUBAREA AREA(ACRES) =     0.52       SUBAREA RUNOFF(CFS) =    2.07
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       2.47

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.17   FLOW VELOCITY(FEET/SEC.) =   3.03
  LONGEST FLOWPATH FROM NODE    121.00 TO NODE    123.00 =     340.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    123.00 TO NODE    123.00 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.) =    3.71
  RAINFALL INTENSITY(INCH/HR) =   4.20
  TOTAL STREAM AREA(ACRES) =     0.62
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.47

****************************************************************************
  FLOW PROCESS FROM NODE    131.00 TO NODE    132.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
```

```
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    60.00
  UPSTREAM ELEVATION(FEET) =     77.70
  DOWNSTREAM ELEVATION(FEET) =     77.10
  ELEVATION DIFFERENCE(FEET) =      0.60
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.091
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    60.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.200
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.48
  TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.48

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    133.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   77.10  DOWNSTREAM ELEVATION(FEET) =   74.50
  STREET LENGTH(FEET) =   210.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

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

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0180
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.84
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.25
    HALFSTREET FLOOD WIDTH(FEET) =    6.18
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.67
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.42
  STREET FLOW TRAVEL TIME(MIN.) =   2.09   Tc(MIN.) =    4.18
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.200
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  SUBAREA AREA(ACRES) =    0.18      SUBAREA RUNOFF(CFS) =    0.72
  TOTAL AREA(ACRES) =        0.3        PEAK FLOW RATE(CFS) =       1.20

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.27   HALFSTREET FLOOD WIDTH(FEET) =   7.38
  FLOW VELOCITY(FEET/SEC.) =  1.81   DEPTH*VELOCITY(FT*FT/SEC.) =   0.49
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    133.00 =     270.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    133.00 TO NODE    133.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.200
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.9500
  SUBAREA AREA(ACRES) =    0.24   SUBAREA RUNOFF(CFS) =    0.96
  TOTAL AREA(ACRES) =        0.5   TOTAL RUNOFF(CFS) =       2.15
  TC(MIN.) =    4.18

****************************************************************************
  FLOW PROCESS FROM NODE    133.00 TO NODE    123.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     74.50  DOWNSTREAM(FEET) =     73.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =    80.00   CHANNEL SLOPE =  0.0150
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.200
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.43
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.66
  AVERAGE FLOW DEPTH(FEET) =   0.19   TRAVEL TIME(MIN.) =   0.50
  Tc(MIN.) =    4.68
  SUBAREA AREA(ACRES) =     0.14       SUBAREA RUNOFF(CFS) =    0.56
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        0.7         PEAK FLOW RATE(CFS) =       2.71

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.20   FLOW VELOCITY(FEET/SEC.) =   2.80
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    123.00 =     350.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    123.00 TO NODE    123.00 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.) =    4.68
  RAINFALL INTENSITY(INCH/HR) =   4.20
  TOTAL STREAM AREA(ACRES) =     0.68
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.71
```

```
  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        2.47     3.71        4.200          0.62
      2        2.71     4.68        4.200          0.68

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        4.62     3.71       4.200
      2        5.19     4.68       4.200

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       5.19   Tc(MIN.) =    4.68
  TOTAL AREA(ACRES) =        1.3
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    123.00 =     350.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    123.00 TO NODE    104.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     73.30  DOWNSTREAM(FEET) =     71.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =   205.00   CHANNEL SLOPE =  0.0078
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.015
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.20
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.75
  AVERAGE FLOW DEPTH(FEET) =   0.35   TRAVEL TIME(MIN.) =   1.24
  Tc(MIN.) =    5.93
  SUBAREA AREA(ACRES) =     0.53       SUBAREA RUNOFF(CFS) =    2.02
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        1.8         PEAK FLOW RATE(CFS) =       6.98

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.37   FLOW VELOCITY(FEET/SEC.) =   2.80
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    104.00 =     555.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

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

```
      1        6.98     5.93       4.015        1.83
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    104.00 =     555.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        2.22     5.84       4.032        0.59
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    104.00 =     345.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1       9.10       5.84        4.032
      2       9.19       5.93        4.015

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       9.19   Tc(MIN.) =    5.93
  TOTAL AREA(ACRES) =        2.4

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    65.95  DOWNSTREAM(FEET) =    65.59
  FLOW LENGTH(FEET) =   120.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.20
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.19
  PIPE TRAVEL TIME(MIN.) =   0.38    Tc(MIN.) =    6.31
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    105.00 =     675.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.938
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.9367
  SUBAREA AREA(ACRES) =    0.09   SUBAREA RUNOFF(CFS) =    0.24
  TOTAL AREA(ACRES) =        2.5   TOTAL RUNOFF(CFS) =       9.26
  TC(MIN.) =    6.31

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =    65.59  DOWNSTREAM(FEET) =    64.50
  FLOW LENGTH(FEET) =   330.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.24
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.26
  PIPE TRAVEL TIME(MIN.) =   1.05    Tc(MIN.) =    7.36
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    106.00 =    1005.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.728
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .5000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8901
  SUBAREA AREA(ACRES) =    0.30   SUBAREA RUNOFF(CFS) =    0.56
  TOTAL AREA(ACRES) =        2.8   TOTAL RUNOFF(CFS) =       9.32
  TC(MIN.) =    7.36

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.36
  RAINFALL INTENSITY(INCH/HR) =   3.73
  TOTAL STREAM AREA(ACRES) =     2.81
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.32

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  22
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  USER SPECIFIED Tc(MIN.) =    5.000
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.200
  SUBAREA RUNOFF(CFS) =      6.14
  TOTAL AREA(ACRES) =      1.54   TOTAL RUNOFF(CFS) =      6.14

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    204.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =    69.50  DOWNSTREAM(FEET) =    64.50
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.48
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.14
  PIPE TRAVEL TIME(MIN.) =   0.48    Tc(MIN.) =    5.48
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    204.00 =     130.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    204.00 TO NODE    204.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.48
  RAINFALL INTENSITY(INCH/HR) =   4.10
  TOTAL STREAM AREA(ACRES) =     1.54
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.14

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =     78.40
  DOWNSTREAM ELEVATION(FEET) =     76.80
  ELEVATION DIFFERENCE(FEET) =      1.60
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.793
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    70.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.200
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.72
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.72

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     76.80  DOWNSTREAM(FEET) =     74.90
  CHANNEL LENGTH THRU SUBAREA(FEET) =   200.00   CHANNEL SLOPE =  0.0095
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.200
```

```
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.58
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.96
  AVERAGE FLOW DEPTH(FEET) =   0.17   TRAVEL TIME(MIN.) =   1.70
  Tc(MIN.) =    3.49
  SUBAREA AREA(ACRES) =     0.43       SUBAREA RUNOFF(CFS) =    1.72
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       2.43

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.21   FLOW VELOCITY(FEET/SEC.) =   2.26
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    303.00 =     280.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 TO NODE    304.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     74.90  DOWNSTREAM(FEET) =     73.40
  CHANNEL LENGTH THRU SUBAREA(FEET) =   190.00   CHANNEL SLOPE =  0.0079
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.200
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.33
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.33
  AVERAGE FLOW DEPTH(FEET) =   0.26   TRAVEL TIME(MIN.) =   1.36
  Tc(MIN.) =    4.85
  SUBAREA AREA(ACRES) =     0.45       SUBAREA RUNOFF(CFS) =    1.80
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        1.1         PEAK FLOW RATE(CFS) =       4.23

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.29   FLOW VELOCITY(FEET/SEC.) =   2.44
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    304.00 =     470.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    304.50 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     73.40  DOWNSTREAM(FEET) =     72.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   130.00   CHANNEL SLOPE =  0.0108
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.096
  *USER SPECIFIED(SUBAREA):
```

```
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.60
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.22
  AVERAGE FLOW DEPTH(FEET) =   0.26   TRAVEL TIME(MIN.) =   0.67
  Tc(MIN.) =    5.52
  SUBAREA AREA(ACRES) =     0.19       SUBAREA RUNOFF(CFS) =    0.74
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        1.2         PEAK FLOW RATE(CFS) =       4.86

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.26   FLOW VELOCITY(FEET/SEC.) =   3.26
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    304.50 =     600.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    304.50 TO NODE    305.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     72.00  DOWNSTREAM(FEET) =     71.40
  CHANNEL LENGTH THRU SUBAREA(FEET) =    30.00   CHANNEL SLOPE =  0.0200
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   2.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.074
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .5000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.97
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.59
  AVERAGE FLOW DEPTH(FEET) =   0.30   TRAVEL TIME(MIN.) =   0.11
  Tc(MIN.) =    5.63
  SUBAREA AREA(ACRES) =     0.10       SUBAREA RUNOFF(CFS) =    0.20
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.917
  TOTAL AREA(ACRES) =        1.4         PEAK FLOW RATE(CFS) =       5.04

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.30   FLOW VELOCITY(FEET/SEC.) =   4.63
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    305.00 =     630.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    305.00 TO NODE    305.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.63
  RAINFALL INTENSITY(INCH/HR) =   4.07
  TOTAL STREAM AREA(ACRES) =     1.35
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.04

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

```
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        9.32     7.36        3.728          2.81
      2        6.14     5.48        4.104          1.54
      3        5.04     5.63        4.074          1.35

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       17.99     5.48       4.104
      2       18.27     5.63       4.074
      3       19.52     7.36       3.728

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      19.52   Tc(MIN.) =    7.36
  TOTAL AREA(ACRES) =        5.7
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    305.00 =    1005.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        5.7  TC(MIN.) =      7.36
  PEAK FLOW RATE(CFS)   =      19.52
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

🡅

Post-Project, 100-Year Storm Event

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2014 Advanced Engineering Software (aes)
             Ver. 21.0 Release Date: 06/01/2014  License ID 1261

                           Analysis prepared by:

                          RICK ENGINEERING COMPANY
                              5620 Friars Road
                        San Diego, California 92110
                      619-291-0707   Fax 619-291-4165

 ************************** DESCRIPTION OF STUDY **************************
* PACIFIC WEST COMMUNITIES REDEVELOPMENT PROJECT                           *
* POST-PROJECT 100-YEAR ANALYSIS                                           *
* RICK ENGINEERING COMPANY JOB NUMBER 19048                                *
 ***************************************************************************

  FILE NAME: GRNT100P.DAT
  TIME/DATE OF STUDY: 18:38 02/02/2021
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.01
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  9
   1)   5.000;  4.400
   2)  10.000;  3.450
   3)  15.000;  2.900
   4)  20.000;  2.500
   5)  25.000;  2.220
   6)  30.000;  2.000
   7)  40.000;  1.700
   8)  50.000;  1.500
   9)  60.000;  1.320
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   20.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0180

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  5.0 (FT*FT/S)
```

```
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =     77.00
  DOWNSTREAM ELEVATION(FEET) =     76.10
  ELEVATION DIFFERENCE(FEET) =      0.90
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.361
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    63.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.37
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.37

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     76.10  DOWNSTREAM(FEET) =     72.40
  CHANNEL LENGTH THRU SUBAREA(FEET) =   215.00   CHANNEL SLOPE =  0.0172
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.336
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.76
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.81
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   1.98
  Tc(MIN.) =    5.34
  SUBAREA AREA(ACRES) =     0.19       SUBAREA RUNOFF(CFS) =    0.78
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.916
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       1.15

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   2.05
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    103.00 =     290.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
```

```
==============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.336
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.9296
  SUBAREA AREA(ACRES) =    0.20   SUBAREA RUNOFF(CFS) =    0.82
  TOTAL AREA(ACRES) =        0.5   TOTAL RUNOFF(CFS) =       1.98
  TC(MIN.) =    5.34

******************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  51
------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     72.40  DOWNSTREAM(FEET) =     71.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =    55.00   CHANNEL SLOPE =  0.0127
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.259
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.18
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.27
  AVERAGE FLOW DEPTH(FEET) =   0.15   TRAVEL TIME(MIN.) =   0.40
  Tc(MIN.) =    5.74
  SUBAREA AREA(ACRES) =     0.10       SUBAREA RUNOFF(CFS) =    0.40
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.933
  TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       2.34

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.16   FLOW VELOCITY(FEET/SEC.) =   2.30
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    104.00 =     345.00 FEET.

******************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =  10
------------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
==============================================================================

******************************************************************************
  FLOW PROCESS FROM NODE    121.00 TO NODE    122.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =     78.10
  DOWNSTREAM ELEVATION(FEET) =     77.10
  ELEVATION DIFFERENCE(FEET) =      1.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.982
```

```
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    62.50
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.42
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.42

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    123.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     77.10  DOWNSTREAM(FEET) =     73.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   260.00   CHANNEL SLOPE =  0.0146
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.50
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.62
  AVERAGE FLOW DEPTH(FEET) =   0.13   TRAVEL TIME(MIN.) =   1.65
  Tc(MIN.) =    3.63
  SUBAREA AREA(ACRES) =     0.52       SUBAREA RUNOFF(CFS) =    2.17
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       2.59

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.18   FLOW VELOCITY(FEET/SEC.) =   3.04
  LONGEST FLOWPATH FROM NODE    121.00 TO NODE    123.00 =     340.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    123.00 TO NODE    123.00 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.) =    3.63
  RAINFALL INTENSITY(INCH/HR) =   4.40
  TOTAL STREAM AREA(ACRES) =     0.62
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.59

****************************************************************************
  FLOW PROCESS FROM NODE    131.00 TO NODE    132.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
```

```
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    60.00
  UPSTREAM ELEVATION(FEET) =     77.70
  DOWNSTREAM ELEVATION(FEET) =     77.10
  ELEVATION DIFFERENCE(FEET) =      0.60
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.091
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    60.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    133.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   77.10  DOWNSTREAM ELEVATION(FEET) =   74.50
  STREET LENGTH(FEET) =   210.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

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

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0180
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.88
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.25
    HALFSTREET FLOOD WIDTH(FEET) =    6.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.67
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.42
  STREET FLOW TRAVEL TIME(MIN.) =   2.09   Tc(MIN.) =    4.19
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  SUBAREA AREA(ACRES) =    0.18      SUBAREA RUNOFF(CFS) =    0.75
  TOTAL AREA(ACRES) =        0.3        PEAK FLOW RATE(CFS) =       1.25

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.28   HALFSTREET FLOOD WIDTH(FEET) =   7.58
  FLOW VELOCITY(FEET/SEC.) =  1.81   DEPTH*VELOCITY(FT*FT/SEC.) =   0.50
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    133.00 =     270.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    133.00 TO NODE    133.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.9500
  SUBAREA AREA(ACRES) =    0.24   SUBAREA RUNOFF(CFS) =    1.00
  TOTAL AREA(ACRES) =        0.5   TOTAL RUNOFF(CFS) =       2.26
  TC(MIN.) =    4.19

****************************************************************************
  FLOW PROCESS FROM NODE    133.00 TO NODE    123.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     74.50  DOWNSTREAM(FEET) =     73.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =    80.00   CHANNEL SLOPE =  0.0150
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.55
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.67
  AVERAGE FLOW DEPTH(FEET) =   0.19   TRAVEL TIME(MIN.) =   0.50
  Tc(MIN.) =    4.69
  SUBAREA AREA(ACRES) =     0.14       SUBAREA RUNOFF(CFS) =    0.59
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        0.7         PEAK FLOW RATE(CFS) =       2.84

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.20   FLOW VELOCITY(FEET/SEC.) =   2.78
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    123.00 =     350.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    123.00 TO NODE    123.00 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.) =    4.69
  RAINFALL INTENSITY(INCH/HR) =   4.40
  TOTAL STREAM AREA(ACRES) =     0.68
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.84
```

```
  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        2.59     3.63        4.400          0.62
      2        2.84     4.69        4.400          0.68

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        4.80     3.63       4.400
      2        5.43     4.69       4.400

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       5.43   Tc(MIN.) =    4.69
  TOTAL AREA(ACRES) =        1.3
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    123.00 =     350.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    123.00 TO NODE    104.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     73.30  DOWNSTREAM(FEET) =     71.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =   205.00   CHANNEL SLOPE =  0.0078
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.221
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.50
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.72
  AVERAGE FLOW DEPTH(FEET) =   0.36   TRAVEL TIME(MIN.) =   1.26
  Tc(MIN.) =    5.94
  SUBAREA AREA(ACRES) =     0.53       SUBAREA RUNOFF(CFS) =    2.13
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        1.8         PEAK FLOW RATE(CFS) =       7.34

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.38   FLOW VELOCITY(FEET/SEC.) =   2.86
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    104.00 =     555.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

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

```
      1        7.34     5.94       4.221        1.83
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    104.00 =     555.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        2.34     5.74       4.259        0.59
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    104.00 =     345.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1       9.43       5.74        4.259
      2       9.66       5.94        4.221

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       9.66   Tc(MIN.) =    5.94
  TOTAL AREA(ACRES) =        2.4

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    65.95  DOWNSTREAM(FEET) =    65.59
  FLOW LENGTH(FEET) =   120.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.47
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.66
  PIPE TRAVEL TIME(MIN.) =   0.37    Tc(MIN.) =    6.31
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    105.00 =     675.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.151
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.9367
  SUBAREA AREA(ACRES) =    0.09   SUBAREA RUNOFF(CFS) =    0.26
  TOTAL AREA(ACRES) =        2.5   TOTAL RUNOFF(CFS) =       9.76
  TC(MIN.) =    6.31

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =    65.59  DOWNSTREAM(FEET) =    64.50
  FLOW LENGTH(FEET) =   330.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.52
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.76
  PIPE TRAVEL TIME(MIN.) =   1.00    Tc(MIN.) =    7.30
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    106.00 =    1005.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.962
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .5000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8901
  SUBAREA AREA(ACRES) =    0.30   SUBAREA RUNOFF(CFS) =    0.59
  TOTAL AREA(ACRES) =        2.8   TOTAL RUNOFF(CFS) =       9.91
  TC(MIN.) =    7.30

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.30
  RAINFALL INTENSITY(INCH/HR) =   3.96
  TOTAL STREAM AREA(ACRES) =     2.81
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.91

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  22
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  USER SPECIFIED Tc(MIN.) =    5.000
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  SUBAREA RUNOFF(CFS) =      6.44
  TOTAL AREA(ACRES) =      1.54   TOTAL RUNOFF(CFS) =      6.44

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    204.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =    69.50  DOWNSTREAM(FEET) =    64.50
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.64
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.44
  PIPE TRAVEL TIME(MIN.) =   0.46    Tc(MIN.) =    5.46
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    204.00 =     130.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    204.00 TO NODE    204.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.46
  RAINFALL INTENSITY(INCH/HR) =   4.31
  TOTAL STREAM AREA(ACRES) =     1.54
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.44

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =     78.40
  DOWNSTREAM ELEVATION(FEET) =     76.80
  ELEVATION DIFFERENCE(FEET) =      1.60
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.793
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    70.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.75
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.75

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     76.80  DOWNSTREAM(FEET) =     74.90
  CHANNEL LENGTH THRU SUBAREA(FEET) =   200.00   CHANNEL SLOPE =  0.0095
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
```

```
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.65
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.02
  AVERAGE FLOW DEPTH(FEET) =   0.17   TRAVEL TIME(MIN.) =   1.65
  Tc(MIN.) =    3.44
  SUBAREA AREA(ACRES) =     0.43       SUBAREA RUNOFF(CFS) =    1.80
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       2.55

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.22   FLOW VELOCITY(FEET/SEC.) =   2.28
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    303.00 =     280.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 TO NODE    304.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     74.90  DOWNSTREAM(FEET) =     73.40
  CHANNEL LENGTH THRU SUBAREA(FEET) =   190.00   CHANNEL SLOPE =  0.0079
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.49
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.34
  AVERAGE FLOW DEPTH(FEET) =   0.26   TRAVEL TIME(MIN.) =   1.35
  Tc(MIN.) =    4.79
  SUBAREA AREA(ACRES) =     0.45       SUBAREA RUNOFF(CFS) =    1.88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        1.1         PEAK FLOW RATE(CFS) =       4.43

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.30   FLOW VELOCITY(FEET/SEC.) =   2.46
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    304.00 =     470.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    304.50 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     73.40  DOWNSTREAM(FEET) =     72.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   130.00   CHANNEL SLOPE =  0.0108
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.314
  *USER SPECIFIED(SUBAREA):
```

```
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.82
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.27
  AVERAGE FLOW DEPTH(FEET) =   0.26   TRAVEL TIME(MIN.) =   0.66
  Tc(MIN.) =    5.45
  SUBAREA AREA(ACRES) =     0.19       SUBAREA RUNOFF(CFS) =    0.78
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        1.2         PEAK FLOW RATE(CFS) =       5.12

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.27   FLOW VELOCITY(FEET/SEC.) =   3.33
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    304.50 =     600.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    304.50 TO NODE    305.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     72.00  DOWNSTREAM(FEET) =     71.40
  CHANNEL LENGTH THRU SUBAREA(FEET) =    30.00   CHANNEL SLOPE =  0.0200
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.293
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .5000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.23
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.69
  AVERAGE FLOW DEPTH(FEET) =   0.31   TRAVEL TIME(MIN.) =   0.11
  Tc(MIN.) =    5.56
  SUBAREA AREA(ACRES) =     0.10       SUBAREA RUNOFF(CFS) =    0.21
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.917
  TOTAL AREA(ACRES) =        1.4         PEAK FLOW RATE(CFS) =       5.31

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.31   FLOW VELOCITY(FEET/SEC.) =   4.74
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    305.00 =     630.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    305.00 TO NODE    305.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.56
  RAINFALL INTENSITY(INCH/HR) =   4.29
  TOTAL STREAM AREA(ACRES) =     1.35
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.31

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

```
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        9.91     7.30        3.962          2.81
      2        6.44     5.46        4.313          1.54
      3        5.31     5.56        4.293          1.35

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       19.06     5.46       4.313
      2       19.27     5.56       4.293
      3       20.73     7.30       3.962

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      20.73   Tc(MIN.) =    7.30
  TOTAL AREA(ACRES) =        5.7
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    305.00 =    1005.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        5.7  TC(MIN.) =      7.30
  PEAK FLOW RATE(CFS)   =      20.73
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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Mission Gorge Road Existing Inlet, 50-Year Storm Event

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2014 Advanced Engineering Software (aes)
             Ver. 21.0 Release Date: 06/01/2014  License ID 1261

                           Analysis prepared by:

                          RICK ENGINEERING COMPANY
                              5620 Friars Road
                        San Diego, California 92110
                      619-291-0707   Fax 619-291-4165

 ************************** DESCRIPTION OF STUDY **************************
* PACIFIC WEST COMMUNITIES REDEVELOPMENT PROJECT                           *
* PRE-PROJECT 50-YEAR ANALYSIS, MISSION GORGE ROAD                         *
* RICK ENGINEERING COMPANY JOB NUMBER 19048                                *
 ***************************************************************************

  FILE NAME: MISGOR50.DAT
  TIME/DATE OF STUDY: 12:01 03/17/2020
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  50.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.01
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  9
   1)   5.000;  4.200
   2)  10.000;  3.200
   3)  15.000;  2.700
   4)  20.000;  2.300
   5)  25.000;  2.050
   6)  30.000;  1.850
   7)  40.000;  1.600
   8)  50.000;  1.400
   9)  60.000;  1.250
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   20.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0180

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  5.0 (FT*FT/S)
```

```
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =     80.20
  DOWNSTREAM ELEVATION(FEET) =     79.80
  ELEVATION DIFFERENCE(FEET) =      0.40
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.405
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    50.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.200
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.40
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.40

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    403.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   79.80  DOWNSTREAM ELEVATION(FEET) =   77.70
  STREET LENGTH(FEET) =   225.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

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

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0180
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.15
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.33
    HALFSTREET FLOOD WIDTH(FEET) =   10.27
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.84
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.61
  STREET FLOW TRAVEL TIME(MIN.) =   2.04   Tc(MIN.) =    4.45
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.200
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
```

```
  S.C.S. CURVE NUMBER (AMC II) =  95
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  SUBAREA AREA(ACRES) =    0.88      SUBAREA RUNOFF(CFS) =    3.51
  TOTAL AREA(ACRES) =        1.0        PEAK FLOW RATE(CFS) =       3.91

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.39   HALFSTREET FLOOD WIDTH(FEET) =  13.16
  FLOW VELOCITY(FEET/SEC.) =  2.11   DEPTH*VELOCITY(FT*FT/SEC.) =   0.82
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    403.00 =     305.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    403.00 TO NODE    404.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   77.70  DOWNSTREAM ELEVATION(FEET) =   75.60
  STREET LENGTH(FEET) =   350.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

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

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0180
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.99
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.49
    HALFSTREET FLOOD WIDTH(FEET) =   18.09
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.06
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.01
  STREET FLOW TRAVEL TIME(MIN.) =   2.83   Tc(MIN.) =    7.28
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.745
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  95
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  SUBAREA AREA(ACRES) =    1.73      SUBAREA RUNOFF(CFS) =    6.15
  TOTAL AREA(ACRES) =        2.7        PEAK FLOW RATE(CFS) =       9.64

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.53   HALFSTREET FLOOD WIDTH(FEET) =  21.31
  FLOW VELOCITY(FEET/SEC.) =  2.18   DEPTH*VELOCITY(FT*FT/SEC.) =   1.15
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    404.00 =     655.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    404.00 TO NODE    405.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
```

```
  UPSTREAM ELEVATION(FEET) =   75.60  DOWNSTREAM ELEVATION(FEET) =   74.30
  STREET LENGTH(FEET) =   400.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

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

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0180
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      10.90
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.53   FLOOD WIDTH(FEET) =   21.31
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    1.61
    SPLIT DEPTH(FEET) =    0.46   SPLIT FLOOD WIDTH(FEET) =   16.84
    SPLIT FLOW(CFS) =    4.26   SPLIT VELOCITY(FEET/SEC.) =    1.44
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.53
    HALFSTREET FLOOD WIDTH(FEET) =   21.31
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.61
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.85
  STREET FLOW TRAVEL TIME(MIN.) =   4.15   Tc(MIN.) =   11.43
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.057
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  95
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  SUBAREA AREA(ACRES) =    0.87      SUBAREA RUNOFF(CFS) =    2.53
  TOTAL AREA(ACRES) =        3.6        PEAK FLOW RATE(CFS) =      10.40

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.53   HALFSTREET FLOOD WIDTH(FEET) =  21.31
  FLOW VELOCITY(FEET/SEC.) =  1.61   DEPTH*VELOCITY(FT*FT/SEC.) =   0.85
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    405.00 =    1055.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        3.6  TC(MIN.) =     11.43
  PEAK FLOW RATE(CFS)   =      10.40
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
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Mission Gorge Road Existing Inlet, 100-Year Storm Event

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            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
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             Ver. 21.0 Release Date: 06/01/2014  License ID 1261

                           Analysis prepared by:

                          RICK ENGINEERING COMPANY
                              5620 Friars Road
                        San Diego, California 92110
                      619-291-0707   Fax 619-291-4165

 ************************** DESCRIPTION OF STUDY **************************
* PACIFIC WEST COMMUNITIES REDEVELOPMENT PROJECT                           *
* PRE-PROJECT 100-YEAR ANALYSIS, MISSION GORGE ROAD                        *
* RICK ENGINEERING COMPANY JOB NUMBER 19048                                *
 ***************************************************************************

  FILE NAME: MSGOR100.DAT
  TIME/DATE OF STUDY: 16:16 01/18/2021
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.01
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  9
   1)   5.000;  4.400
   2)  10.000;  3.450
   3)  15.000;  2.900
   4)  20.000;  2.500
   5)  25.000;  2.220
   6)  30.000;  2.000
   7)  40.000;  1.700
   8)  50.000;  1.500
   9)  60.000;  1.320
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   20.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0180

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  5.0 (FT*FT/S)
```

```
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =     80.20
  DOWNSTREAM ELEVATION(FEET) =     79.80
  ELEVATION DIFFERENCE(FEET) =      0.40
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.405
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    50.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.42
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.42

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    403.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   79.80  DOWNSTREAM ELEVATION(FEET) =   77.70
  STREET LENGTH(FEET) =   225.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

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

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0180
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.26
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.34
    HALFSTREET FLOOD WIDTH(FEET) =   10.51
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.85
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.62
  STREET FLOW TRAVEL TIME(MIN.) =   2.03   Tc(MIN.) =    4.44
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
```

```
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  SUBAREA AREA(ACRES) =    0.88      SUBAREA RUNOFF(CFS) =    3.68
  TOTAL AREA(ACRES) =        1.0        PEAK FLOW RATE(CFS) =       4.10

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.39   HALFSTREET FLOOD WIDTH(FEET) =  13.40
  FLOW VELOCITY(FEET/SEC.) =  2.14   DEPTH*VELOCITY(FT*FT/SEC.) =   0.84
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    403.00 =     305.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    403.00 TO NODE    404.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   77.70  DOWNSTREAM ELEVATION(FEET) =   75.60
  STREET LENGTH(FEET) =   350.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

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

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0180
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.37
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.50
    HALFSTREET FLOOD WIDTH(FEET) =   18.48
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.09
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.03
  STREET FLOW TRAVEL TIME(MIN.) =   2.80   Tc(MIN.) =    7.23
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.976
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  SUBAREA AREA(ACRES) =    1.73      SUBAREA RUNOFF(CFS) =    6.53
  TOTAL AREA(ACRES) =        2.7        PEAK FLOW RATE(CFS) =      10.24

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.53   HALFSTREET FLOOD WIDTH(FEET) =  21.31
  FLOW VELOCITY(FEET/SEC.) =  2.18   DEPTH*VELOCITY(FT*FT/SEC.) =   1.15
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    404.00 =     655.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    404.00 TO NODE    405.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
```

```
  UPSTREAM ELEVATION(FEET) =   75.60  DOWNSTREAM ELEVATION(FEET) =   74.30
  STREET LENGTH(FEET) =   400.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

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

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0180
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      11.60
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.53   FLOOD WIDTH(FEET) =   21.31
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    1.61
    SPLIT DEPTH(FEET) =    0.48   SPLIT FLOOD WIDTH(FEET) =   17.85
    SPLIT FLOW(CFS) =    4.96   SPLIT VELOCITY(FEET/SEC.) =    1.50
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.53
    HALFSTREET FLOOD WIDTH(FEET) =   21.31
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.61
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.85
  STREET FLOW TRAVEL TIME(MIN.) =   4.15   Tc(MIN.) =   11.38
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.298
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  SUBAREA AREA(ACRES) =    0.87      SUBAREA RUNOFF(CFS) =    2.73
  TOTAL AREA(ACRES) =        3.6        PEAK FLOW RATE(CFS) =      11.22

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.53   HALFSTREET FLOOD WIDTH(FEET) =  21.31
  FLOW VELOCITY(FEET/SEC.) =  1.61   DEPTH*VELOCITY(FT*FT/SEC.) =   0.85
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    405.00 =    1055.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        3.6  TC(MIN.) =     11.38
  PEAK FLOW RATE(CFS)   =      11.22
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
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APPENDIX B

On-Grade Inlet Intercept Calculations

Street Flow Depth and Inlet Calculations Calculations (50- and 100-Year Event)

Manning Formula Used

Q=1.486/n*A*R^(2/3)*s^(1/2)
(Chow, 1959)

	C&G Width (ft)	C&G Slope (12 For 8.3%)	C&G Mannings n Value	Asphalt Width (ft)	Asphalt Lip at C&G (ft)	Asphalt Slope (50 for 2%)	Asphalt Mannings n Value	Road & Gutter Slope (s=vert./hor.)
INPUT:	1.5	12	0.015	14.5	0.03125	10	0.018	0.003

DEPTH (IN)	**DEPTH** (FT)	**C&G Area** (FT^2)	**C&G P** (FT)	**Asphalt Area** (FT^2)	**Asphalt P** (FT)	**R=A/P R** (FT)	**Q** (CFS)	**V** (FS)
9	0.750	1.031	2.286	1.763	5.967	0.0000	6.83	2.44
9.1	0.758	1.044	2.295	1.813	6.051	0.3422	7.02	2.46
9.2	0.767	1.056	2.303	1.863	6.135	0.3460	7.21	2.47
9.3	0.775	1.069	2.311	1.914	6.218	0.3497	7.41	2.49
9.4	0.783	1.081	2.320	1.966	6.302	0.3535	7.62	2.50
9.5	0.792	1.094	2.328	2.019	6.386	0.3572	7.82	2.51
9.6	0.800	1.106	2.336	2.072	6.470	0.3609	8.03	2.53
9.7	0.808	1.119	2.345	2.126	6.553	0.3647	8.25	2.54
9.8	0.817	1.131	2.353	2.181	6.637	0.3684	8.46	2.55
9.9	0.825	1.144	2.361	2.236	6.721	0.3721	8.68	2.57
10	0.833	1.156	2.370	2.292	6.805	0.3759	8.91	2.58
10.1	0.842	1.169	2.378	2.349	6.888	0.3796	9.13	2.60
10.2	0.850	1.181	2.386	2.406	6.972	0.3834	9.36	2.61
10.3	0.858	1.194	2.395	2.465	7.056	0.3871	9.60	2.62
10.4	0.867	1.206	2.403	2.523	7.140	0.3908	9.84	2.64
10.5	0.875	1.219	2.411	2.583	7.223	0.3946	10.08	2.65
10.6	0.883	1.231	2.420	2.643	7.307	0.3983	10.33	2.66
10.7	0.892	1.244	2.428	2.704	7.391	0.4021	10.57	2.68
10.8	0.900	1.256	2.436	2.766	7.475	0.4058	10.83	2.69
10.9	0.908	1.269	2.445	2.828	7.558	0.4096	11.09	2.71
11	0.917	1.281	2.453	2.891	7.642	0.4133	11.35	2.72
11.1	0.925	1.294	2.461	2.955	7.726	0.4171	11.61	2.73
11.2	0.933	1.306	2.470	3.019	7.810	0.4208	11.88	2.75
11.3	0.942	1.319	2.478	3.084	7.893	0.4245	12.15	2.76
11.4	0.950	1.331	2.486	3.150	7.977	0.4283	12.43	2.77
11.5	0.958	1.344	2.495	3.217	8.061	0.4320	12.71	2.79
11.6	0.967	1.356	2.503	3.284	8.145	0.4358	12.99	2.80
11.7	0.975	1.369	2.511	3.352	8.228	0.4395	13.28	2.81

Inlet Calculations for Mission Gorge Existing Inlet - Node 403 (50- and 100-Year Frequency Storm Event)

Location (Node)	**Drainage (Acres)**	**Runoff "C"**	**Tc**	**I (in/hr)**	**Q (cfs)**	**depth y (feet)**	**a (feet)**	**L_T (feet)**	**$Q_{CAPACITY}$ (cfs)**	**Q Bypass (cfs)**	**Efficiency**
50-Year Storm Event	3.60	0.95	12.9	3.06	10.40	0.883	0.17	3.0	2.26	8.14	21.7%
100-Year Storm Event	3.60	0.95	11.4	3.30	11.20	0.908	0.17	3.0	2.34	8.86	20.9%

APPENDIX C

Detention Analysis

Alvarado Creek Apartment Project Hydrograph Calculations

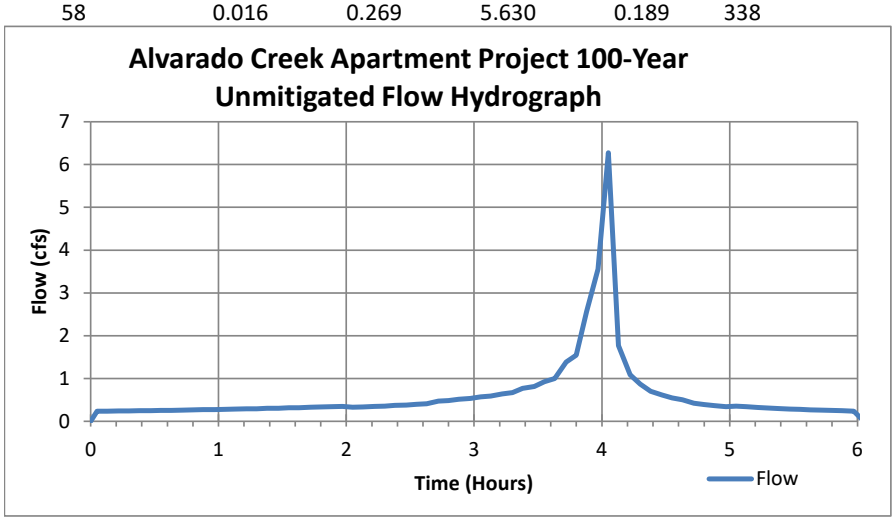
Tc =	**5**	**min**	Ref. 1:	City of San Diego Drainage Design Manual (Jan. 2017)
C =	**0.95**		Ref. 2:	Chapter 6, San Diego County Hydrology Manual (June 2003)
Area =	**1.5**	**ac**		
Qp =	**6.3**	**cfs**		

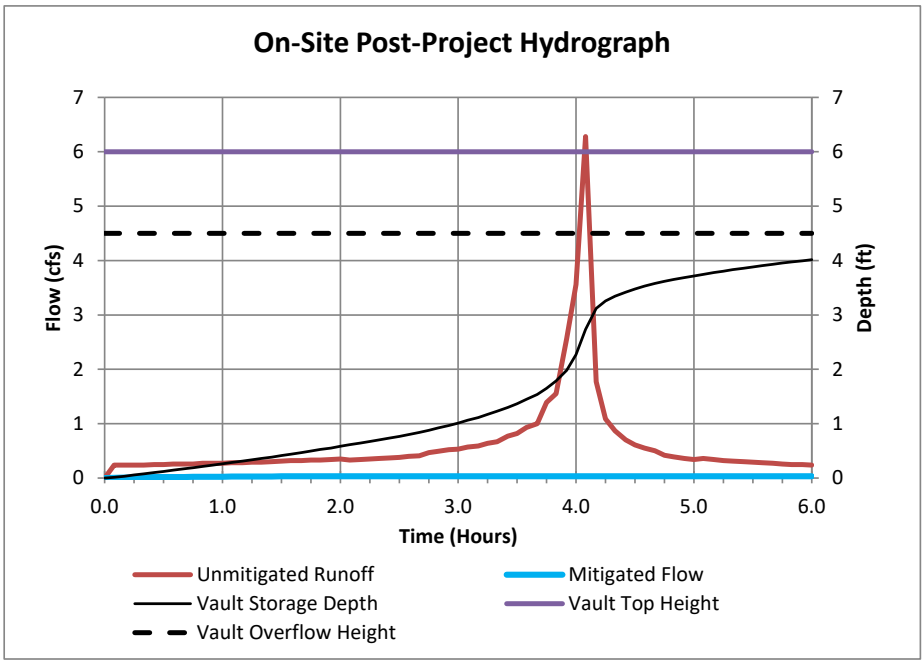
N	PN (inches)	QN (cfs)	Time (hrs)	I (in/hr)	Time (min)
-	0.000	0.0	0	0	0
72	0.014	0.2	0.050	0.165	3.0
71	0.014	0.2	0.130	0.166	8.0
69	0.014	0.2	0.220	0.169	13.0
68	0.014	0.2	0.300	0.171	18.0
66	0.015	0.2	0.380	0.174	23.0
65	0.015	0.3	0.470	0.176	28.0
63	0.015	0.3	0.550	0.179	33.0
62	0.015	0.3	0.630	0.181	38.0
60	0.015	0.3	0.720	0.185	43.0
59	0.016	0.3	0.800	0.187	48.0
57	0.016	0.3	0.880	0.191	53.0
56	0.016	0.3	0.970	0.193	58.0
54	0.016	0.3	1.050	0.197	63.0
53	0.017	0.3	1.130	0.200	68.0
51	0.017	0.3	1.220	0.204	73.0
50	0.017	0.3	1.300	0.207	78.0
48	0.018	0.3	1.380	0.212	83.0
47	0.018	0.3	1.470	0.215	88.0
45	0.018	0.3	1.550	0.221	93.0
44	0.019	0.320	1.630	0.224	98.0
42	0.019	0.329	1.720	0.231	103.0
41	0.020	0.334	1.800	0.234	108.0
39	0.020	0.345	1.880	0.242	113.0
38	0.020	0.350	1.970	0.246	118.0
36	0.019	0.330	2.050	0.231	123.0
35	0.020	0.336	2.130	0.236	128.0
33	0.020	0.349	2.220	0.245	133.0
32	0.021	0.356	2.300	0.250	138.0
30	0.022	0.372	2.380	0.261	143.0
29	0.022	0.380	2.470	0.267	148.0
27	0.023	0.399	2.550	0.280	153.0
26	0.024	0.409	2.630	0.287	158.0
24	0.028	0.474	2.720	0.333	163.0
23	0.028	0.487	2.800	0.342	168.0
21	0.030	0.516	2.880	0.362	173.0
20	0.031	0.532	2.970	0.373	178.0
18	0.033	0.569	3.050	0.399	183.0
17	0.035	0.590	3.130	0.414	188.0
15	0.037	0.639	3.220	0.449	193.0
14	0.039	0.668	3.300	0.469	198.0
12	0.045	0.773	3.380	0.543	203.0
11	0.048	0.816	3.470	0.573	208.0
9	0.054	0.927	3.550	0.650	213.0
8	0.058	0.999	3.630	0.701	218
6	0.081	1.387	3.720	0.973	223
5	0.090	1.545	3.800	1.084	228

Alvarado Creek Apartment Project Hydrograph Calculations

Tc =	**5**	**min**	Ref. 1:	City of San Diego Drainage Design Manual (Jan. 2017)
C =	**0.95**		Ref. 2:	Chapter 6, San Diego County Hydrology Manual (June 2003)
Area =	**1.5**	**ac**		
Qp =	**6.3**	**cfs**		

N	PN (inches)	QN (cfs)	Time (hrs)	I (in/hr)	Time (min)
3	0.150	2.565	3.880	1.800	233
2	0.208	3.557	3.970	2.496	238
1	0.367	6.276	4.050	4.404	243
4	0.104	1.770	4.130	1.242	248
7	0.064	1.089	4.220	0.764	253
10	0.051	0.867	4.300	0.608	258
13	0.041	0.701	4.380	0.492	263
16	0.036	0.613	4.470	0.430	268
19	0.032	0.550	4.550	0.386	273
22	0.029	0.501	4.630	0.352	278
25	0.025	0.420	4.720	0.295	283
28	0.023	0.389	4.800	0.273	288
31	0.021	0.364	4.880	0.255	293
34	0.020	0.342	4.970	0.240	298
37	0.021	0.356	5.050	0.250	303
40	0.020	0.339	5.130	0.238	308
43	0.019	0.324	5.220	0.227	313
46	0.018	0.311	5.300	0.218	318
49	0.017	0.299	5.380	0.210	323
52	0.017	0.288	5.470	0.202	328
55	0.016	0.278	5.550	0.195	333
58	0.016	0.269	5.630	0.189	338

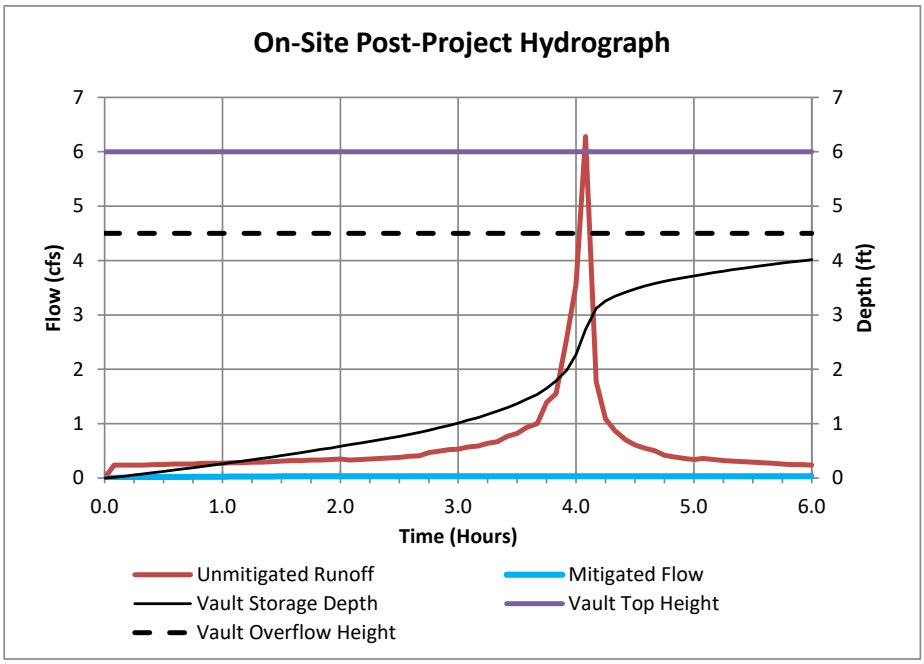




Post-Project Results

Peaks	**6.3**	**0.033**	**4.0**
Units	**cfs**	**cfs**	**ft**

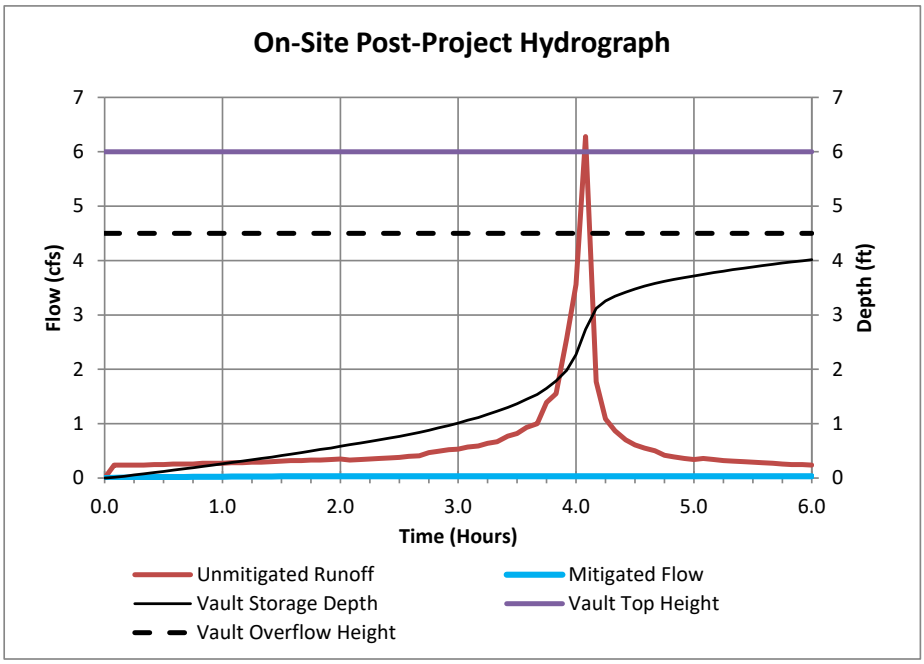
Time (hrs)	**$Q_{unmit.}$ (cfs)**	**From SWMM $Q_{mit.}$ (cfs)**	**From SWMM Vault Depth (ft)**
0.00	**0.00**	**0.00**	**0.00**
0.08	**0.24**	**0.01**	0.0
0.17	**0.24**	**0.01**	0.0
0.25	**0.24**	**0.01**	0.1
0.33	**0.24**	**0.01**	0.1
0.42	**0.25**	**0.02**	0.1
0.50	**0.25**	**0.02**	0.1
0.58	**0.26**	**0.02**	0.1
0.67	**0.26**	**0.02**	0.2
0.75	**0.26**	**0.02**	0.2
0.83	**0.27**	**0.02**	0.2
0.92	**0.27**	**0.02**	0.2
1.00	**0.27**	**0.03**	0.3
1.08	**0.28**	**0.03**	0.3
1.17	**0.28**	**0.03**	0.3
1.25	**0.29**	**0.03**	0.3
1.33	**0.29**	**0.03**	0.4
1.42	**0.30**	**0.03**	0.4
1.50	**0.31**	**0.03**	0.4
1.58	**0.32**	**0.03**	0.4
1.67	**0.32**	**0.03**	0.5
1.75	**0.33**	**0.03**	0.5
1.83	**0.33**	**0.03**	0.5
1.92	**0.34**	**0.03**	0.6
2.00	**0.35**	**0.03**	0.6
2.08	**0.33**	**0.03**	0.6



Post-Project Results

Peaks	**6.3**	**0.033**	**4.0**
Units	**cfs**	**cfs**	**ft**

Time (hrs)	**$Q_{unmit.}$ (cfs)**	**From SWMM $Q_{mit.}$ (cfs)**	**From SWMM Vault Depth (ft)**
2.17	**0.34**	**0.03**	0.6
2.25	**0.35**	**0.03**	0.7
2.33	**0.36**	**0.03**	0.7
2.42	**0.37**	**0.03**	0.7
2.50	**0.38**	**0.03**	0.8
2.58	**0.40**	**0.03**	0.8
2.67	**0.41**	**0.03**	0.8
2.75	**0.47**	**0.03**	0.9
2.83	**0.49**	**0.03**	0.9
2.92	**0.52**	**0.03**	1.0
3.00	**0.53**	**0.03**	1.0
3.08	**0.57**	**0.03**	1.1
3.17	**0.59**	**0.03**	1.1
3.25	**0.64**	**0.03**	1.2
3.33	**0.67**	**0.03**	1.2
3.42	**0.77**	**0.03**	1.3
3.50	**0.82**	**0.03**	1.4
3.58	**0.93**	**0.03**	1.4
3.67	**1.00**	**0.03**	1.5
3.75	**1.39**	**0.03**	1.6
3.83	**1.55**	**0.03**	1.8
3.92	**2.57**	**0.03**	2.0
4.00	**3.56**	**0.03**	2.3
4.08	**6.28**	**0.03**	2.7
4.17	**1.77**	**0.03**	3.1
4.25	**1.09**	**0.03**	3.3



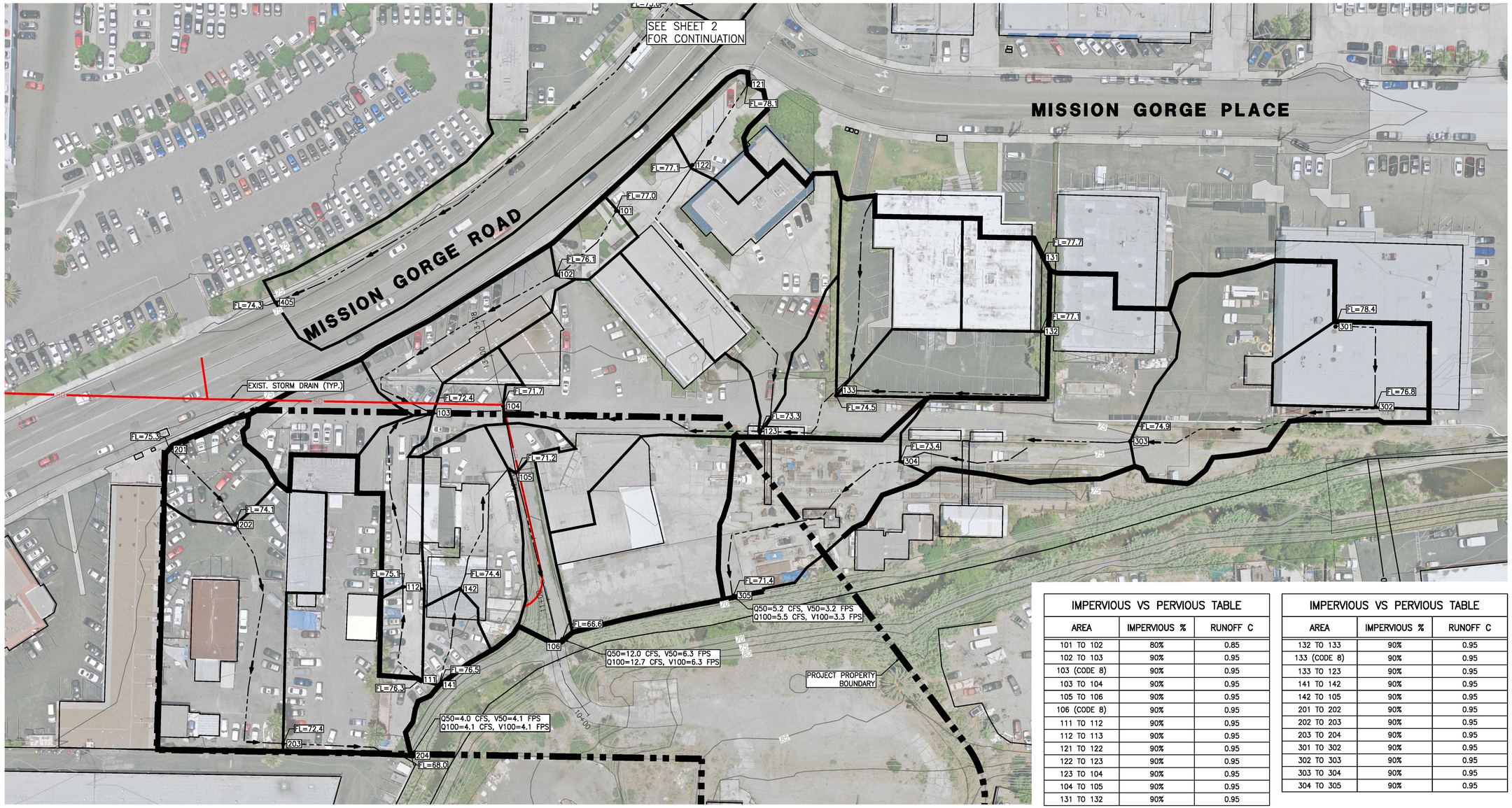
Post-Project Results

Peaks	**6.3**	**0.033**	**4.0**
Units	**cfs**	**cfs**	**ft**

Time (hrs)	**$Q_{unmit.}$ (cfs)**	**From SWMM $Q_{mit.}$ (cfs)**	**From SWMM Vault Depth (ft)**
4.33	**0.87**	**0.03**	3.3
4.42	**0.70**	**0.03**	3.4
4.50	**0.61**	**0.03**	3.5
4.58	**0.55**	**0.03**	3.5
4.67	**0.50**	**0.03**	3.6
4.75	**0.42**	**0.03**	3.6
4.83	**0.39**	**0.03**	3.7
4.92	**0.36**	**0.03**	3.7
5.00	**0.34**	**0.03**	3.7
5.08	**0.36**	**0.03**	3.7
5.17	**0.34**	**0.03**	3.8
5.25	**0.32**	**0.03**	3.8
5.33	**0.31**	**0.03**	3.8
5.42	**0.30**	**0.03**	3.9
5.50	**0.29**	**0.03**	3.9
5.58	**0.28**	**0.03**	3.9
5.67	**0.27**	**0.03**	3.9
5.75	**0.26**	**0.03**	4.0
5.83	**0.25**	**0.03**	4.0
5.92	**0.25**	**0.03**	4.0
6.00	**0.24**	**0.03**	4.0

Map Pocket 1

Drainage Study Map, Pre-Project Condition



IMPERVIOUS VS PERVIOUS TABLE		
AREA	IMPERVIOUS %	RUNOFF C
101 TO 102	80%	0.85
102 TO 103	90%	0.95
103 (CODE 8)	90%	0.95
103 TO 104	90%	0.95
105 TO 106	90%	0.95
106 (CODE 8)	90%	0.95
111 TO 112	90%	0.95
112 TO 113	90%	0.95
121 TO 122	90%	0.95
122 TO 123	90%	0.95
123 TO 104	90%	0.95
104 TO 105	90%	0.95
131 TO 132	90%	0.95

IMPERVIOUS VS PERVIOUS TABLE		
AREA	IMPERVIOUS %	RUNOFF C
132 TO 133	90%	0.95
133 (CODE 8)	90%	0.95
133 TO 123	90%	0.95
141 TO 142	90%	0.95
142 TO 105	90%	0.95
201 TO 202	90%	0.95
202 TO 203	90%	0.95
203 TO 204	90%	0.95
301 TO 302	90%	0.95
302 TO 303	90%	0.95
303 TO 304	90%	0.95
304 TO 305	90%	0.95

LEGEND

- DRAINAGE BOUNDARY (MAJOR)
- DRAINAGE BOUNDARY (MINOR)
- FLOW PATH
- EXISTING STORM DRAIN
- 101 DRAINAGE NODE
- 0.25 AC DRAINAGE AREA
- 75 EXIST. MAJOR ELEV. CONTOUR
- 74 EXIST. MINOR ELEV. CONTOUR

N

40 20 0 40 80 120

GRAPHIC SCALE: 1"=40'

RICK ENGINEERING COMPANY
5620 FRIARS ROAD
SAN DIEGO, CA 92110
619.291.0707
(FAX)619.291.4165

DRAINAGE MAP, PRE-PROJECT
ALVARADO CREEK APARTMENT PROEJCT
SAN DIEGO, CA

DATE: MAY 2021

J-19048

SHEET 1 OF 2

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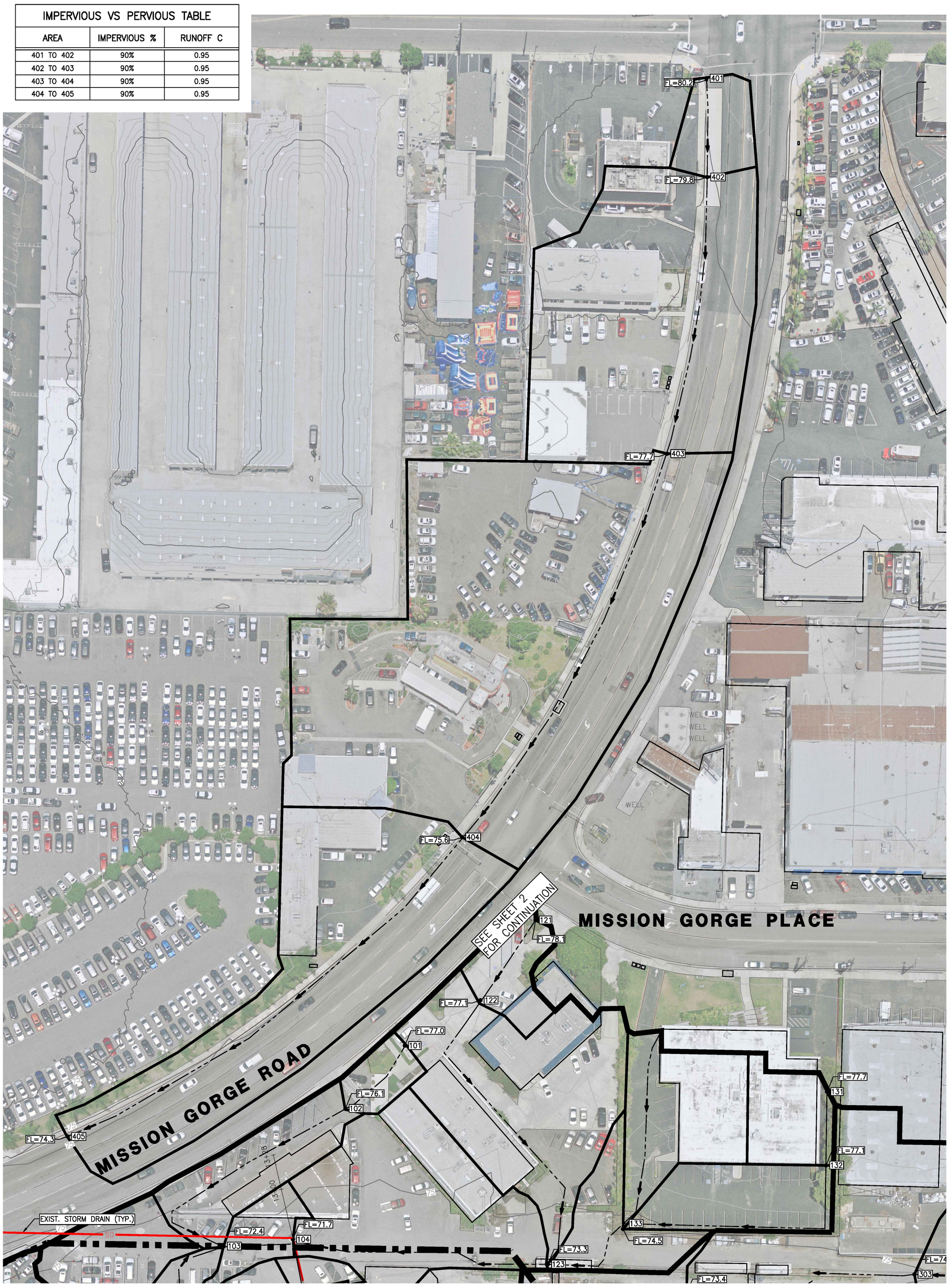
IMPERVIOUS VS PERVIOUS TABLE		
AREA	IMPERVIOUS %	RUNOFF C
401 TO 402	90%	0.95
402 TO 403	90%	0.95
403 TO 404	90%	0.95
404 TO 405	90%	0.95



LEGEND

- DRAINAGE BOUNDARY (MAJOR)
- DRAINAGE BOUNDARY (MINOR)
- FLOW PATH
- EXISTING STORM DRAIN
- 101 DRAINAGE NODE
- 0.25 AC DRAINAGE AREA
- 75 EXIST. MAJOR ELEV. CONTOUR
- 74 EXIST. MINOR ELEV. CONTOUR

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N

40 20 0 40 80 120

GRAPHIC SCALE: 1"=40'

DRAINAGE MAP, PRE-PROJECT
ALVARADO CREEK APARTMENT PROEJCT
SAN DIEGO, CA

DATE: MAY 2021

J-19048

SHEET 2 OF 2

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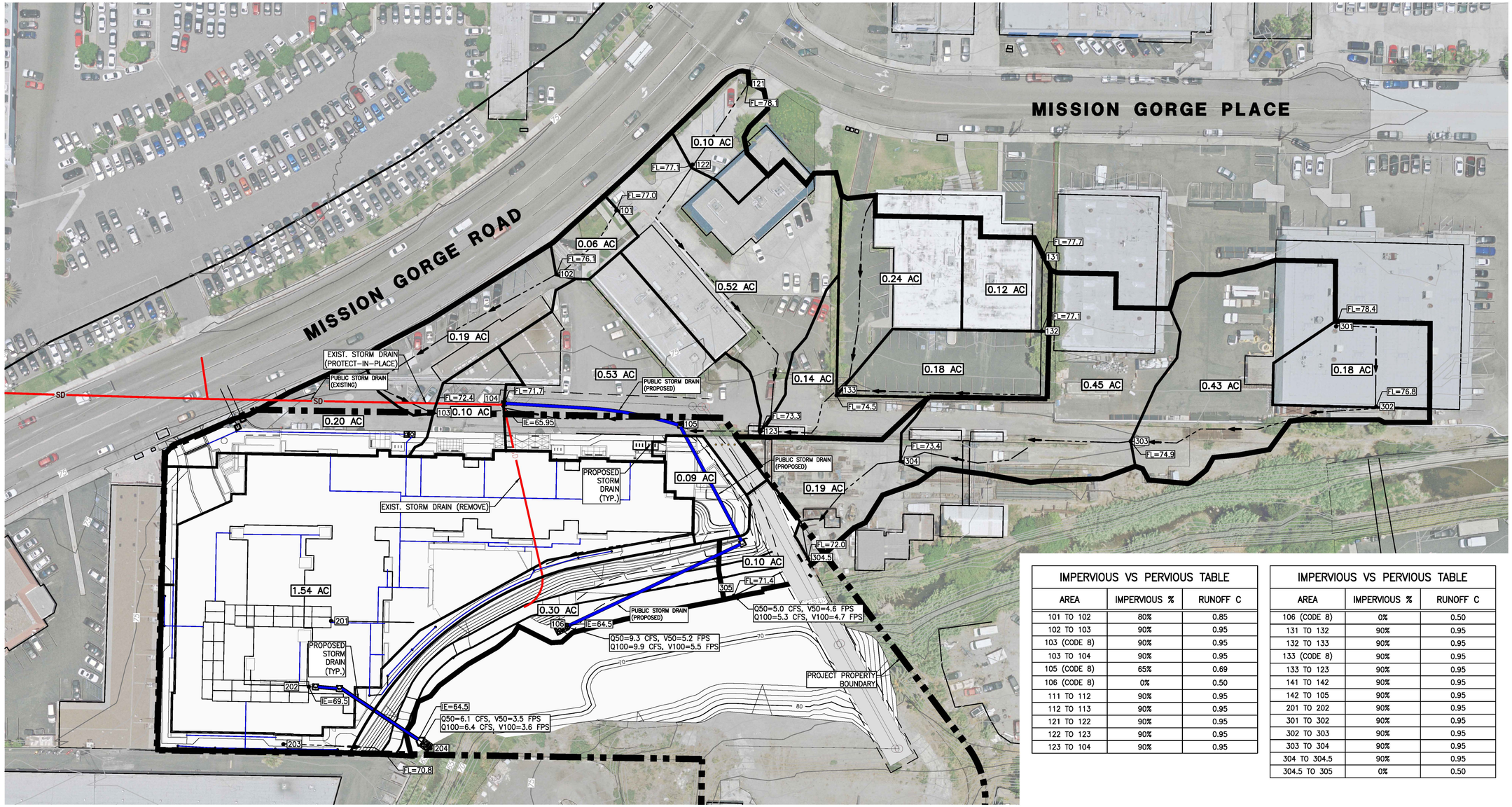
Map Pocket 2

Drainage Study Map, Post-Project Condition



IMPERVIOUS VS PERVIOUS TABLE		
AREA	IMPERVIOUS %	RUNOFF C
101 TO 102	80%	0.85
102 TO 103	90%	0.95
103 (CODE 8)	90%	0.95
103 TO 104	90%	0.95
105 (CODE 8)	65%	0.69
106 (CODE 8)	0%	0.50
111 TO 112	90%	0.95
112 TO 113	90%	0.95
121 TO 122	90%	0.95
122 TO 123	90%	0.95
123 TO 104	90%	0.95

IMPERVIOUS VS PERVIOUS TABLE		
AREA	IMPERVIOUS %	RUNOFF C
106 (CODE 8)	0%	0.50
131 TO 132	90%	0.95
132 TO 133	90%	0.95
133 (CODE 8)	90%	0.95
133 TO 123	90%	0.95
141 TO 142	90%	0.95
142 TO 105	90%	0.95
201 TO 202	90%	0.95
301 TO 302	90%	0.95
302 TO 303	90%	0.95
303 TO 304	90%	0.95
304 TO 304.5	90%	0.95
304.5 TO 305	0%	0.50

LEGEND

- DRAINAGE BOUNDARY (MAJOR)
- DRAINAGE BOUNDARY (MINOR)
- FLOW PATH
- EXISTING STORM DRAIN
- PROPOSED STORM DRAIN
- 101 DRAINAGE NODE
- 0.25 AC DRAINAGE AREA
- 75 EXIST. MAJOR ELEV. CONTOUR
- 74 EXIST. MINOR ELEV. CONTOUR

NOTE:
1. UNLESS NOTED AS PUBLIC, STORM DRAIN LINES SHOWN ARE PRIVATE.

N

40 20 0 40 80 120
GRAPHIC SCALE: 1"=40'

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DRAINAGE MAP, POST-PROJECT
ALVARADO CREEK APARTMENT PROJECT
SAN DIEGO, CA

DATE: SEPT. 2021

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SHEET 1 OF 1

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