PRELIMINARY DRAINAGE STUDY
(HYDROLOGY AND HYDRAULICS)
FOR
BREW ENT. II-HARLEY KNOX
(PRELIMINARY ENGINEERING)

CITY CASE #: TBD

Job Number 2220

October 14, 2022

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October 14, 2022

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1.0 INTRODUCTION

1.1 Project Location

This drainage study presents preliminary engineering hydrologic and hydraulic analyses for the proposed Brew Ent. II-Harley Knox project (herein referred to as "the project"). The project is located in the City of Perris, bounded by Harley Knox Blvd. to the north, and undeveloped parcels to east and west, and an easement and developed industrial parcel to the south. Refer to Figure 1.0 for a Vicinity Map of the project. Applicable Assessor Parcel Number (APN) is 302-090-021.

1.2 Project Description

The overall gross site area is approximately 4.0 acres and the net site area is approximately 3.5 acres. The on-site drainage management area is approximately 3.5 acres, of which approximately 0.1 acre of landscape (pervious) area will be combined with the westerly offsite bypass flow that will be conveyed around the site. The westerly offsite run-on flow onto the site is primarily from the vacant parcels to the west and has approximately 6.7 acres. The proposed on-site improvements will consist of a tilt-up warehouse building and associated parking areas, sidewalks, and landscape areas. The proposed warehouse building footprint is approximately 62,505 square feet and there will be a total of approximately 67 parking spaces to be provided. The proposed impervious and pervious footprints within the drainage management area are approximately 123,543 square feet and 30,431 square feet, respectively. This also includes minor frontage sidewalk improvement along Harley Knox Blvd. In order to comply with the Riverside County drainage and water quality management requirements, the project also includes construction of permanent stormwater BMPs.

1.3 Drainage Characteristics

In the existing condition, the site consists of open, undeveloped space, draining generally from west to east. Based on available Riverside County Flood Control and Water Conservation District's (RCFC&WCD's) 4-ft contour topography in the area and Google Earth imagery, there is an offsite run-on to the site from the westerly undeveloped land with an approximate area of 6.7 acres (identified at Drainage Node 1010 on the Offsite Existing Drainage Study Map). All of this offsite drainage area may not run-on to the project; however, this area was accounted to be conservative

for design purpose. Runoff from the project currently runs onto an existing vacant parcel to the east and sheet-flow thru the adjacent parcel towards Perris Blvd. to an existing catch basin and MDP Storm Drain Lateral Line D-1. From there, runoff is conveyed via the existing storm drain in a southeasterly direction towards the existing MDP Perris Valley Storm Drain (PVSD) Channel, which ultimately discharges into Canyon Lake and then Lake Elsinore.

In the post-project condition, the drainage characteristics will be maintained similar as compared to the pre-project condition. Runoff from the project will be captured via proposed on-site catch basins and conveyed via proposed storm drain pipes towards a combination of an underground storage facility (i.e. – CMP detention system or approved equal) and a proprietary Modular Wetland System (MWS), located near the southeasterly corner of the project, for storm water quality treatment purpose, prior to discharging to a linear gravel trench flow spreader located along southeasterly edge of the site. Runoff is in the gravel trench is distributed across the gravel trench flow spreader for energy dissipation before the runoff sheet-flow onto the existing adjacent parcel. The westerly offsite run-on is collected via a proposed perimeter concrete ditch and conveyed easterly via a proposed storm drain pipe to the aforementioned gravel trench flow spreader near the southeasterly corner. The drainage characteristic from the project is maintained as similar to the existing condition and sheet-flow towards the existing Perris Blvd. storm drain system.

1.4 FEMA Flood Hazard Zone Information

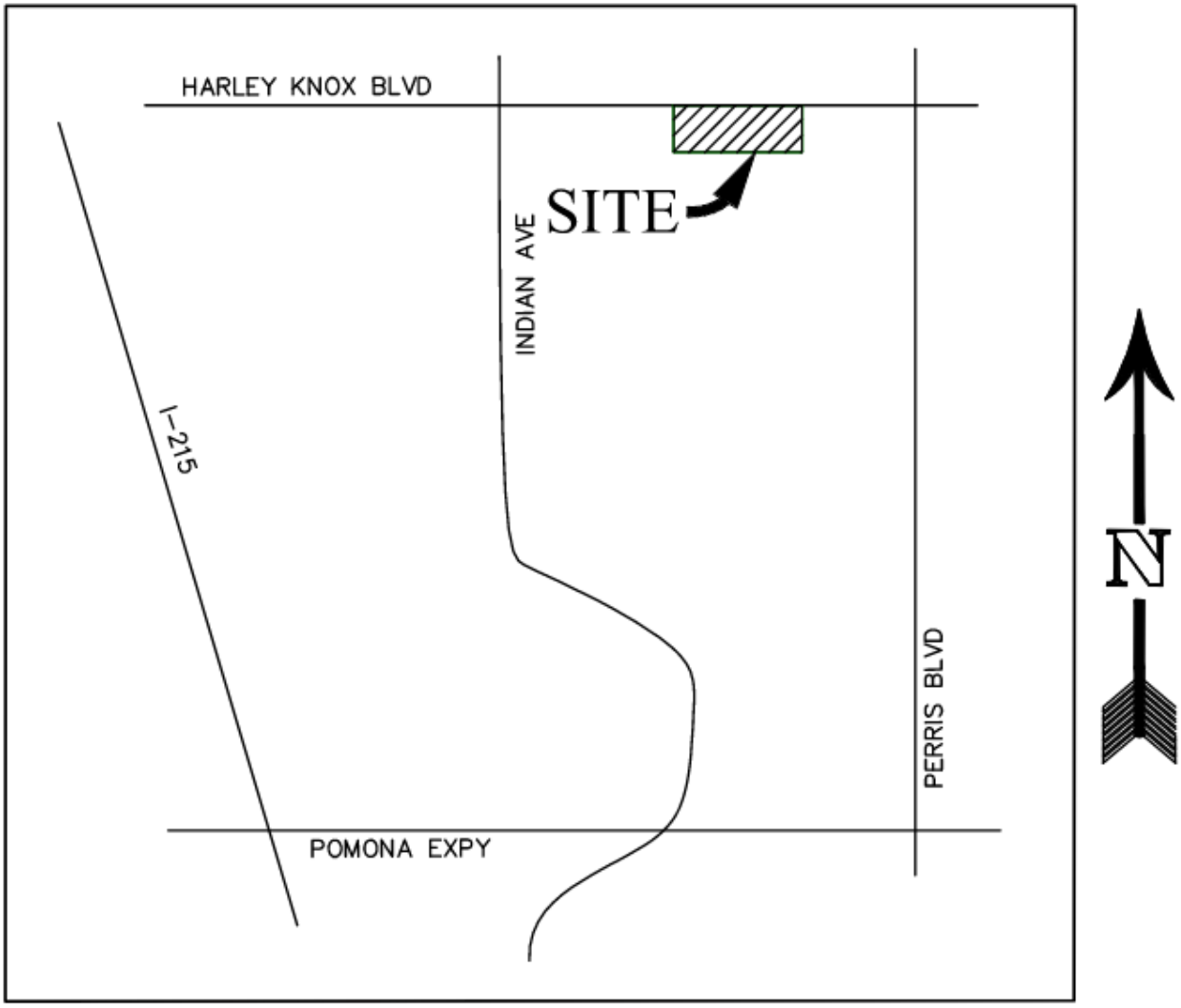
The water courses around the project have been identified by the Federal Emergency Management Agency (FEMA) as Zone D, based on the FEMA Flood Insurance Rate Map (FIRM) number 06065C1430H, effective August 18, 2014. As the project is outside of the special flood hazard areas subject to inundation by the 1% annual chance flood (i.e. – Zone A and Zone AE), no FEMA submittals are anticipated to be required for this project. For reference purpose, a copy of the FIRMette (reduced size) is included at the end of Appendix A.

1.6 Water Quality Management

In support of the preliminary site plan, a preliminary Water Quality Management Plan (WQMP) has been prepared for the project. The report is titled, “Preliminary Water Quality Management Plan for Brew Enterprise II-Harley Knox,” dated October 14, 2022, prepared by SDH & Associates, Inc.

(Job Number 2130). The preliminary WQMP documents how the project addresses the requirements regarding permanent stormwater quality management, in accordance with the stormwater guidance document titled, "2010 Water Quality Management Plan for the Santa Ana Region of Riverside County."

Figure 1: Vicinity Map



VICINITY MAP
NOT TO SCALE

2.0 HYDROLOGY

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

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

Subarea Hydrologic Processes (Codes)

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

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

Area

Drainage boundaries were delineated (subdivided) to runoff collection (or runoff concentration) locations, in order to determine peak flows for the purpose of sizing proposed storm drain facilities. Drainage basin boundaries, flow patterns, and topographic elevations are shown on the drainage study map for the site, included in Appendix B.

Time of Concentration/Intensity

The time of concentration was calculated using AES to determine the intensity for the 10-year and 100-year storm events. The 10-minute and 60-minute intensity values for the project were obtained from the Riverside County Hydrology Manual as input data into AES. An annotated chart has been included in Appendix A.

Runoff Coefficient

The runoff coefficients used for each minor basin were calculated by the AES software based on the user-entered information of the hydrologic soil group and the land use for each basin. The specified land use information in accordance with Plate D-5.6 of the Hydrology Manual was used by AES to estimate the runoff coefficient. Supporting information for parameters assigned to AES calculations is included with Appendix A of this report.

Hydrologic soil group data based on the Riverside County Hydrology Manual indicates the project primarily consists of Hydrologic Soil Group "C". For the purpose of hydrologic calculations for the proposed condition, Soil Group C has been applied.

Topography

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

2.1 Hydrologic Results

The hydrologic results at key points of interest for the project can be found in Table 2.1. The summary shows the hydrologic results at the proposed on-site catch basin locations (major catch basin locations) and overall on-site peak flow rate at the project outlet point of interest. The summary table also shows the hydrologic results for the existing westerly offsite area that is expected to be picked up by the proposed on-site perimeter v-ditches and conveyed around the site. The detailed hydrologic calculation results are located in Appendix B of this report.

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

Key Drainage Node ID[3]	Offsite and On-site Post-project[1]		
	Total Area (Acres)	Peak Flow Rate, Q_{10} (cfs)[2]	Peak Flow Rate, Q_{100} (cfs)[2]
1010 (On-site Catch Basin for Offsite Flow - Surface)	6.7	4.5	7.3
1020 (On-site Catch Basin - Surface)	0.05	0.03	0.05
1030 (On-site Catch Basin - Surface)	0.05	0.03	0.05
1050 (Offsite Drainage Outlet)	**6.9**	**4.6**	**7.5**
105 (On-site Catch Basin - Surface)	0.3	0.6	0.9
110 (On-site Catch Basin - Surface)	0.5	0.9	1.3
140 (On-site Catch Basin - Surface)	0.7	1.3	1.8
145 (On-site Catch Basin - Surface)	0.05	0.1	0.2
150 (On-site Catch Basin - Surface)	0.05	0.1	0.2
160 (On-site Catch Basin - Surface)	0.7	1.6	2.3
170 (On-site Flow to Proposed Detention Facility)	3.2	5.8	8.3
180 (On-site Drainage Outlet)	**3.4**	**6.0**	**8.5**

Note:

1: Refer to Appendix A for supporting information.

2: "cfs"= cubic feet per second.

3: Refer to Appendix B for Drainage Study Map

3.0 HYDRAULICS

3.1 Hydraulic Methodology and Criteria

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

3.2 Inlet Sizing

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

3.3 Storm Drain Sizing

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

The westerly offsite run-on will be picked up by proposed on-site perimeter ditches and conveyed around the site. The proposed perimeter v-ditch is expected to have 2:1 sides with a minimum of 1-foot depth. Base on a normal depth calculation, the proposed v-ditch is expected to have adequate capacity to collect and convey the existing offsite run-on from the westerly vacant parcels and its normal depth is expected to be less than 1 foot. Supporting calculation is included in Appendix D, following the on-site storm drain normal depth calculation summary.

4.0 FLOOD CONTROL ASSESSMENT

The project is expected to increase the peak flow rate as a result of the proposed improvements. As indicated in Section 1.0 of this report, runoff from the proposed project will be directed southeasterly as similar to the existing condition. Since the site drainage sheet-flows in southeasterly direction onto adjacent vacant parcel and there is no frontage storm drain pipe that serves this site currently, it is anticipated that the project's post-project flow will need to be mitigated. In order to mitigate for anticipated increased runoff due to the proposed development, the project is proposing an underground storage facility underneath the southeasterly parking area to attenuate/mitigate the increased peak flow rates back to the existing condition level, prior to discharging onto the existing parcel to the east via gravel trench flow spreader (energy dissipater). The proposed underground storage facility is being proposed to mitigate requirements for both the storm water quality management plan (i.e. – volume requirements for water quality design capture) and flood control. The capacity of the proposed underground storage facility has been upsized beyond the required storm water quality volume to also account for the anticipated flood control volume, as consistent with the Riverside County Flood Control & Water Conservation District's (RCFC&WCD's) increased runoff criteria.

In order to help address the aforementioned requirements, a proprietary underground storage facility such as "Contech CMP Detention" facility (or an approved equivalent product) will be utilized. For this preliminary stage, the anticipated volume is estimated based on the 10-year, 24-hour precipitation value for the project and based on our recent experience in this area. In order to account for the potentially applicable increased runoff criteria for 10-year, 24-hour volume, approximately ~6,500 cubic feet per acre of volume is estimated (based on our recent past experience for similar projects in the region). With approximately 3.4 acre of drainage area, a storage volume of approximately 22,100 cubic feet would be anticipated. Therefore, the proposed underground storage facility will be designed to provide the minimum volume. During the final design stage, a detailed calculation will be provided to show that the proposed peak flow rates are mitigated based on the RCFC&WCD's flood control increased runoff criteria. Separately, it is understood the project is considered exempt from the hydrologic condition of concern (HCOC) requirements.

5.0 CONCLUSION

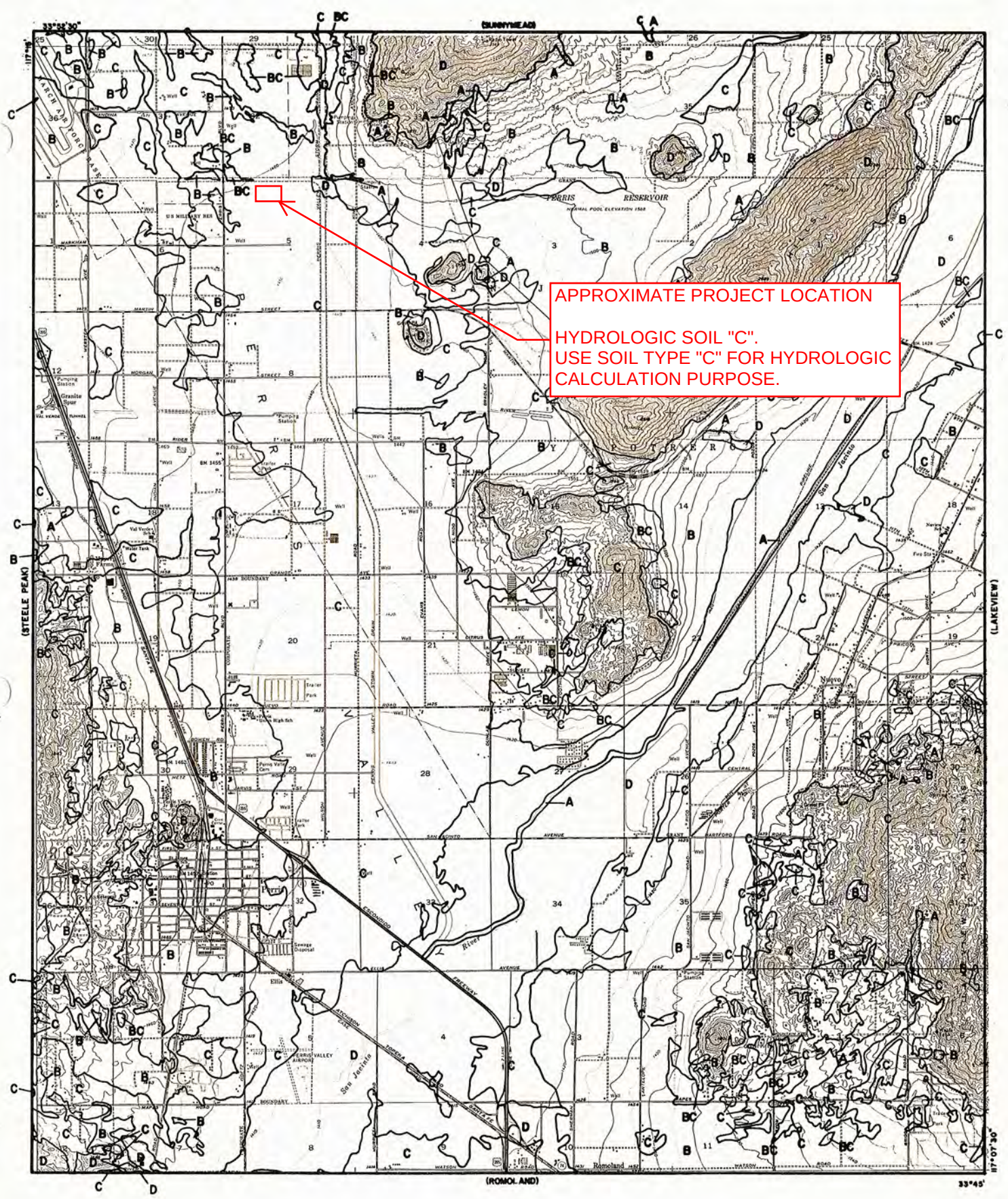
This drainage study presents preliminary hydrologic and hydraulic analyses for the proposed Brew Ent. II-Harley Knox project. Hydrologic calculations were computed in accordance with the Riverside County Flood Control and Water Conservation District - Hydrology Manual, dated April 1978 (manual). The Advanced Engineering Software (AES) 2016 Rational Method Analysis (Version 23.0) program was used for the rational method modeling in this study. The peak discharge rates for the 10-year and 100-year storm events with 1-hour storm frequency have been determined for the project. The relevant peak flow rates were used to determine the preliminary onsite storm drain sizes. Runoff from the project will be directed southeasterly onto the adjacent parcel and eventually to Perris Blvd. It is understood that the site drainage sheet-flows onto the adjacent parcel prior to discharging onto Perris Blvd. in the existing condition and there is no existing frontage storm drain that serves this site. Therefore, the project plans to provide an underground storage facility (detention facility) to mitigate the post-project peak flow rates based on the RCFC&WCD's flood control increased runoff criteria. A preliminary storage volume has been estimated and it's been accounted for in the preliminary detention storage design. During the final design stage, a detailed calculation will be provided to show the relevant peak flow rates are mitigated based on the aforementioned RCFC&WCD's flood control increased runoff criteria. The on-site mitigated flow will be directed to a proposed gravel trench flow spreader along the southeasterly edge of the site to allow/mimic sheet-flow condition onto the adjacent easterly parcel, as similar to the existing condition. The westerly offsite flow is expected to be picked up by a proposed on-site perimeter v-ditch and a storm drain pipe and conveyed around the site towards the same gravel trench flow spreader (energy dissipater), prior to allowing sheet-flow onto the adjacent parcel. This is done in an effort to maintain the existing drainage characteristics. In summary, no adverse impacts are anticipated to the downstream drainage facilities as a result of the proposed improvements for this project.

Appendix A

Hydrologic Backup Information

Includes:

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



LEGEND

—— SOILS GROUP BOUNDARY

A SOILS GROUP DESIGNATION

RCFC&WCD

HYDROLOGY MANUAL

0 FEET 5000

HYDROLOGIC SOILS GROUP MAP FOR PERRIS

PLATE C-1.30

PROJECT WITHIN THIS AREA

RAINFALL INTENSITY–INCHES PER HOUR

MIRA LOMA			MURRIETA - TEMECULA & RANCHO CALIFORNIA			NORCO			PALM SPRINGS			PERRIS VALLEY		
DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR
5	2.84	4.48	5	3.45	5.10	5	2.77	4.16	5	4.23	6.76	5	2.64	3.78
6	2.58	4.07	6	3.12	4.61	6	2.53	3.79	6	3.80	6.08	6	2.41	3.46
7	2.37	3.75	7	2.87	4.24	7	2.34	3.51	7	3.48	5.56	7	2.24	3.21
8	2.21	3.49	8	2.67	3.94	8	2.19	3.29	8	3.22	5.15	8	2.09	3.01
9	2.08	3.28	9	2.50	3.69	9	2.07	3.10	9	3.01	4.81	9	1.98	2.84
10	1.96	3.10	10	2.36	3.48	10	1.96	2.94	10	2.83	4.52	10	1.88	2.69
11	1.87	2.95	11	2.24	3.30	11	1.87	2.80	11	2.67	4.28	11	1.79	2.57
12	1.78	2.82	12	2.13	3.15	12	1.79	2.68	12	2.54	4.07	12	1.72	2.46
13	1.71	2.70	13	2.04	3.01	13	1.72	2.58	13	2.43	3.88	13	1.65	2.37
14	1.64	2.60	14	1.96	2.89	14	1.66	2.48	14	2.33	3.72	14	1.59	2.29
15	1.58	2.50	15	1.89	2.79	15	1.60	2.40	15	2.23	3.58	15	1.54	2.21
16	1.53	2.42	16	1.82	2.69	16	1.55	2.32	16	2.15	3.44	16	1.49	2.14
17	1.48	2.34	17	1.76	2.60	17	1.50	2.25	17	2.08	3.32	17	1.45	2.08
18	1.44	2.27	18	1.71	2.52	18	1.46	2.19	18	2.01	3.22	18	1.41	2.02
19	1.40	2.21	19	1.66	2.45	19	1.42	2.13	19	1.95	3.12	19	1.37	1.97
20	1.36	2.15	20	1.61	2.38	20	1.39	2.08	20	1.89	3.03	20	1.34	1.92
22	1.29	2.04	22	1.53	2.26	22	1.32	1.98	22	1.79	2.86	22	1.28	1.83
24	1.24	1.95	24	1.46	2.15	24	1.26	1.90	24	1.70	2.72	24	1.22	1.75
26	1.18	1.87	26	1.39	2.06	26	1.22	1.82	26	1.62	2.60	26	1.18	1.69
28	1.14	1.80	28	1.34	1.98	28	1.17	1.76	28	1.56	2.49	28	1.13	1.63
30	1.10	1.73	30	1.29	1.90	30	1.13	1.70	30	1.49	2.39	30	1.10	1.57
32	1.06	1.67	32	1.24	1.84	32	1.10	1.64	32	1.44	2.30	32	1.06	1.52
34	1.03	1.62	34	1.20	1.78	34	1.06	1.59	34	1.39	2.22	34	1.03	1.48
36	1.00	1.57	36	1.17	1.72	36	1.03	1.55	36	1.34	2.15	36	1.00	1.44
38	.97	1.53	38	1.13	1.67	38	1.01	1.51	38	1.30	2.09	38	.98	1.40
40	.94	1.49	40	1.10	1.62	40	.98	1.47	40	1.27	2.02	40	.95	1.37
45	.89	1.40	45	1.03	1.52	45	.92	1.39	45	1.18	1.89	45	.90	1.29
50	.84	1.32	50	.97	1.44	50	.88	1.31	50	1.11	1.78	50	.85	1.22
55	.80	1.26	55	.92	1.36	55	.84	1.25	55	1.05	1.68	55	.81	1.17
60	.76	1.20	60	.88	1.30	60	.80	1.20	60	1.00	1.60	60	.78	1.12
65	.73	1.15	65	.84	1.24	65	.77	1.15	65	.95	1.53	65	.75	1.08
70	.70	1.11	70	.81	1.19	70	.74	1.11	70	.91	1.46	70	.72	1.04
75	.68	1.07	75	.78	1.15	75	.72	1.07	75	.88	1.41	75	.70	1.00
80	.65	1.03	80	.75	1.11	80	.69	1.04	80	.85	1.35	80	.68	.97
85	.63	1.00	85	.73	1.07	85	.67	1.01	85	.82	1.31	85	.66	.94
SLOPE = .530			SLOPE = .550			SLOPE = .500			SLOPE = .580			SLOPE = .490		

RCFC & WCD

HYDROLOGY MANUAL

STANDARD INTENSITY–DURATION CURVES DATA

PLATE D-4.1 (4 of 6)

NOTES TO USERS

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

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

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

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

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

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 11. The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

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

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

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

Base map information shown on this FIRM was derived from multiple sources including the Riverside County, CA effective database, and the National Geodetic Survey. Base map imagery for Riverside County, CA is a mosaic of the NAIP 2009 images, 1 meter resolution.

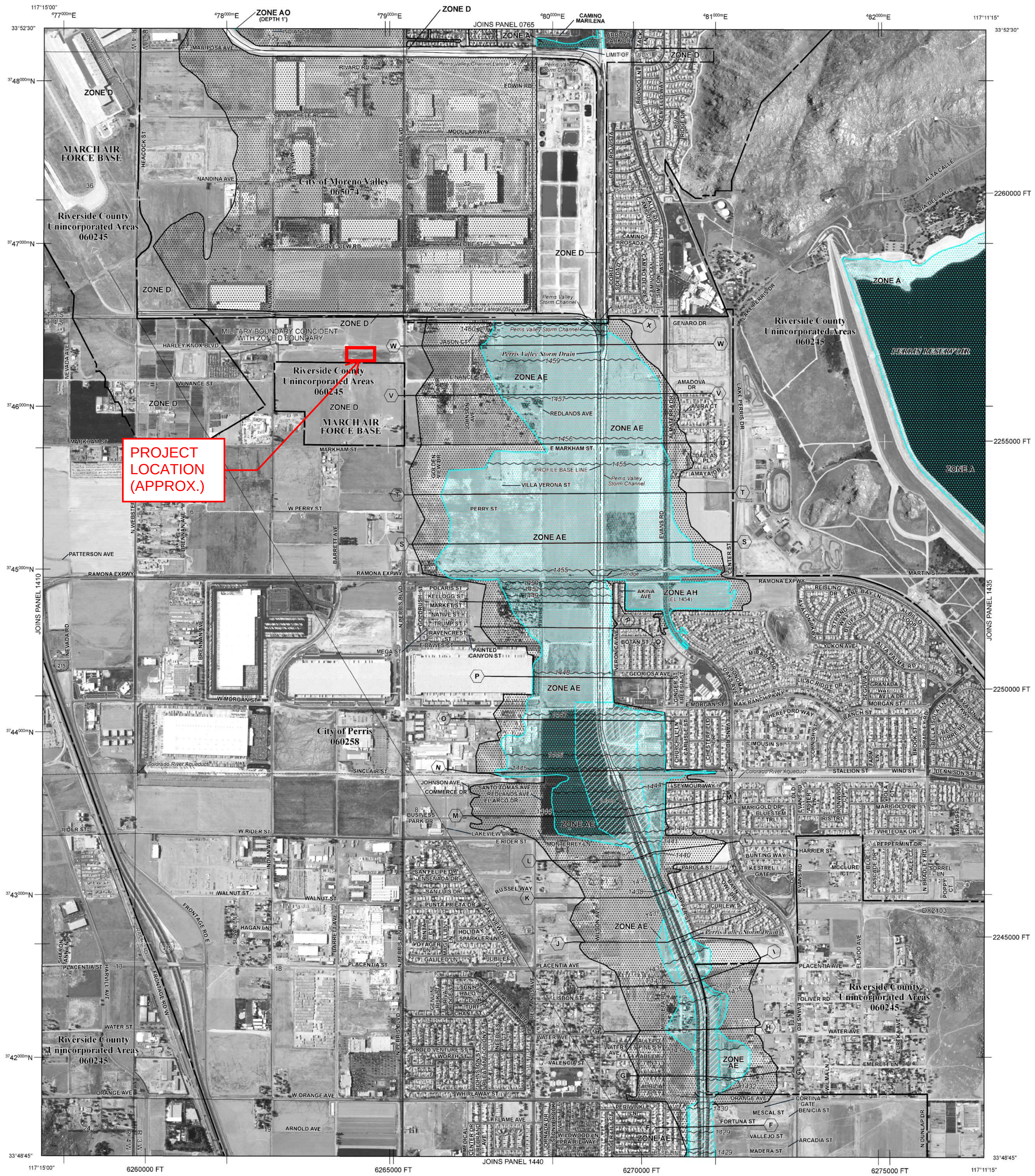
The **"profile base lines"** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the "profile base line", in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

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

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

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Map Service Center website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website. Users may determine the current map date for each FIRM panel by visiting the FEMA Map Service Center website or by calling the FEMA Map Information eXchange.

NOTE:
THE PROJECT IS SITUATED WITHIN FEMA ZONE D AND IT'S OUTSIDE OF THE SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD. THEREFORE, NO PROCESSING SHOULD BE REQUIRED THROUGH FEMA.



LEGEND

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

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

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

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

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

OTHER AREAS

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

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities

513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

(A)——(A)	Cross section line
(23)- - -(23)	Transect line
97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
4275000mE	1000-meter Universal Transverse Mercator grid ticks, zone 11
6000000 FT	5000-foot grid values: California State Plane coordinate system, Zone VI (FIPSZONE = 406), Lambert projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories List on Map Index

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

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
August 18, 2014: for a description of revisions, see Notice to Users page in the Flood Insurance Study report.

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

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

MAP SCALE 1" = 1000'

500 0 500 1,000 1,500 2,000 FEET
300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1430H

FIRM
FLOOD INSURANCE RATE MAP
RIVERSIDE COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 1430 OF 3805

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MORENO VALLEY, CITY OF	065074	1430	H
PERRIS, CITY OF	060258	1430	H
RIVERSIDE COUNTY UNINCORPORATED AREAS	060245	1430	H

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

MAP NUMBER
06065C1430H

MAP REVISED
AUGUST 18, 2014

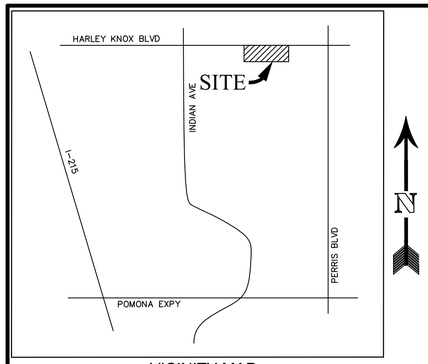
Federal Emergency Management Agency

Appendix B

Modified Rational Method Results

Includes:

1. Post-project Drainage Study Map
2. Post-project AES Rational Method Output (10-year & 100-year)



VICINITY MAP
NOT TO SCALE

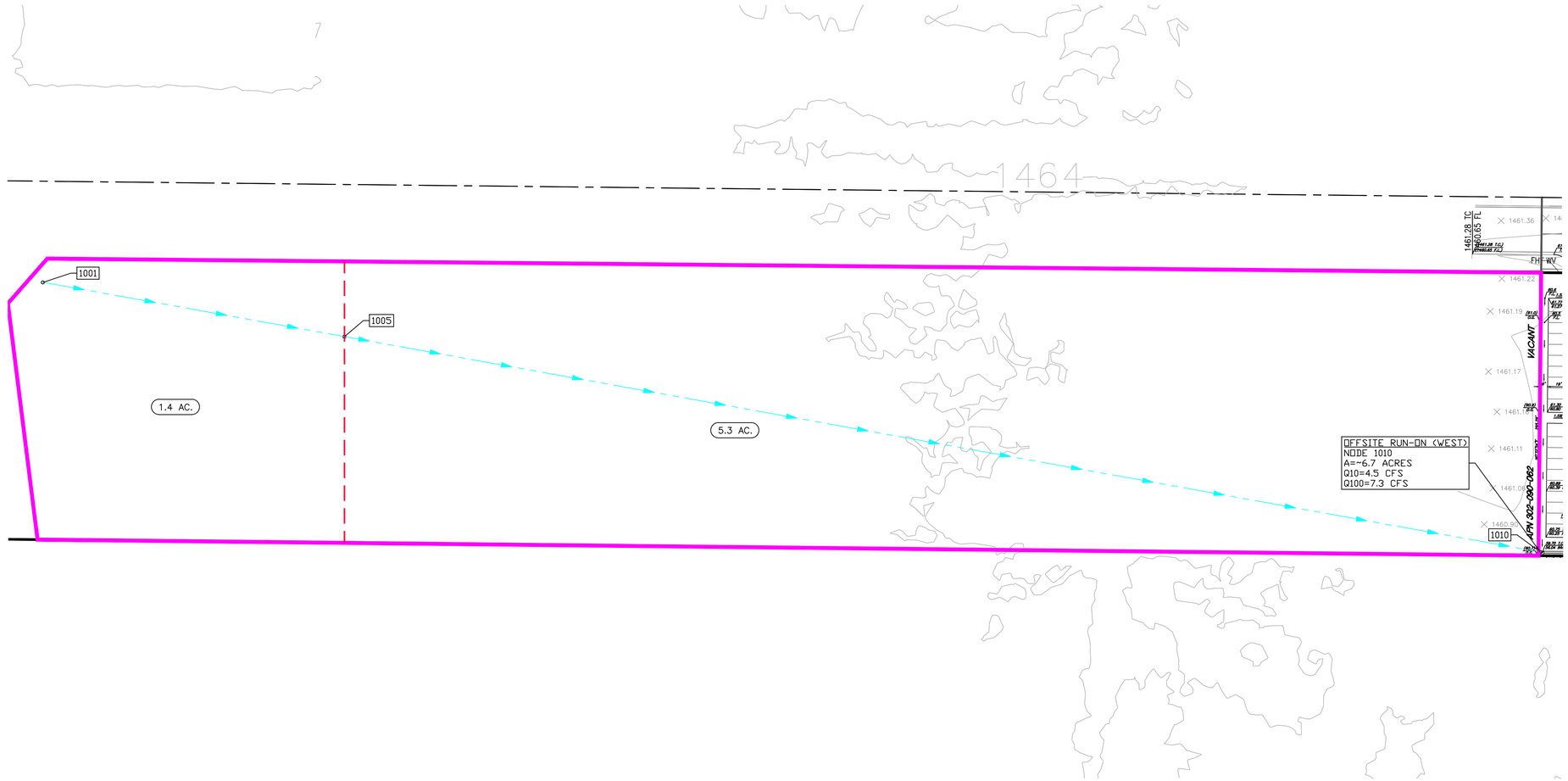
GENERAL NOTES

1. REFERENCE – THE UNDERLYING TOPOGRAPHY USED FOR THE "OFFSITE" PORTION OF THE DRAINAGE STUDY MAP IS BASED ON THE COUNTY OF RIVERSIDE 4–FT TOPOGRAPHY.
2. REFERENCE – THE UNDERLYING TOPOGRAPHY USED FOR THE "ON–SITE" PORTION OF THE DRAINAGE STUDY MAP IS BASED ON THE PROJECT–SPECIFIC FLOWN 1–FT TOPOGRAPHY (BASED ON NAVD 88).
3. IN THE EXISTING CONDITION, THE SITE IS VACANT AND THE MAJORITY OF THE SITE CONSISTS OF LITTLE TO NO VEGETATION. RUNOFF FROM THE MAJORITY OF THE SITE SURFACE–DRAINS IN A SOUTHEASTERLY DIRECTION TO A VACANT PARCEL AND AN EASEMENT. THERE IS AN OFFSITE RUN–ON FROM THE WESTERLY EXISTING PARCELS.
4. IN AN EFFORT TO MAINTAIN THE EXISTING DRAINAGE CHARACTERISTICS, THE WESTERLY OFFSITE AREA WILL BE PICKED UP BY PROPOSED ON–SITE PERIMETER V–DITCH AND STORM DRAIN PIPE AND CONVEYED EASTERLY TOWARDS THE EXISTING PARCEL. SEE THE ON–SITE POST–PROJECT DRAINAGE STUDY MAP FOR MORE INFORMATION.
5. BASED ON THE RIVERSIDE COUNTY HYDROLOGY MANUAL (1978), THE PROJECT PREDOMINANTLY CONSISTS OF HYDROLOGIC SOIL GROUPS C. FOR THE PURPOSE OF THE HYDROLOGIC ANALYSIS, SOIL GROUP C WAS UTILIZED FOR PERVIOUS AREAS. BASED ON THE SITE–SPECIFIC INFILTRATION TESTING BY THE GEOTECHNICAL ENGINEER, THE FIELD INFILTRATION RATE OF 0.1 INCH/HOUR AND 1.6 INCH/HOUR WERE OBSERVED.
6. THE PROJECT IS SITUATED WITHIN THE FEMA ZONE D / ZONE X; THEREFORE, PROCESSING THROUGH FEMA IS NOT EXPECTED TO BE REQUIRED FOR THIS PROJECT.

HYDROLOGIC SUMMARY

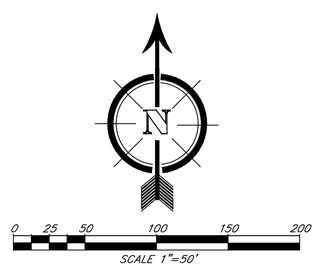
POST–PROJECT:

OFFSITE RUN–ON AT NODE 1010
- AREA=6.7 ACRES
- % IMPERVIOUS=~0%
- Q10=~4.5 CFS
- Q100=~7.3 CFS



LEGEND

- TRACT BOUNDARY
- MAJOR DRAINAGE BOUNDARY
- SUB BASIN BOUNDARY
- DRAINAGE FLOW PATH
- DRAINAGE ACREAGE
- BASIN NODE ID (XXX)
- POINT OF INTEREST (OUTLET)
- PROPOSED STORM DRAIN

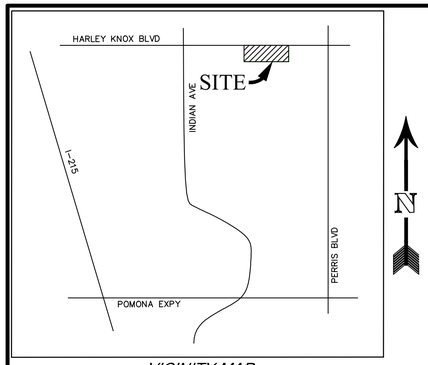


DRAINAGE STUDY MAP FOR BREW ENT. II–HARLEY KNOX (OFFSITE EXISTING) CITY CASE #: TBD

JN 2220 REVISED: 10/14/2022

S:\SDH DRAWINGS\WOLF–HARLEY KNOX\WFLY2586 Exhibit Post.dwg 2022–10–13 – 3:43PM – SDH

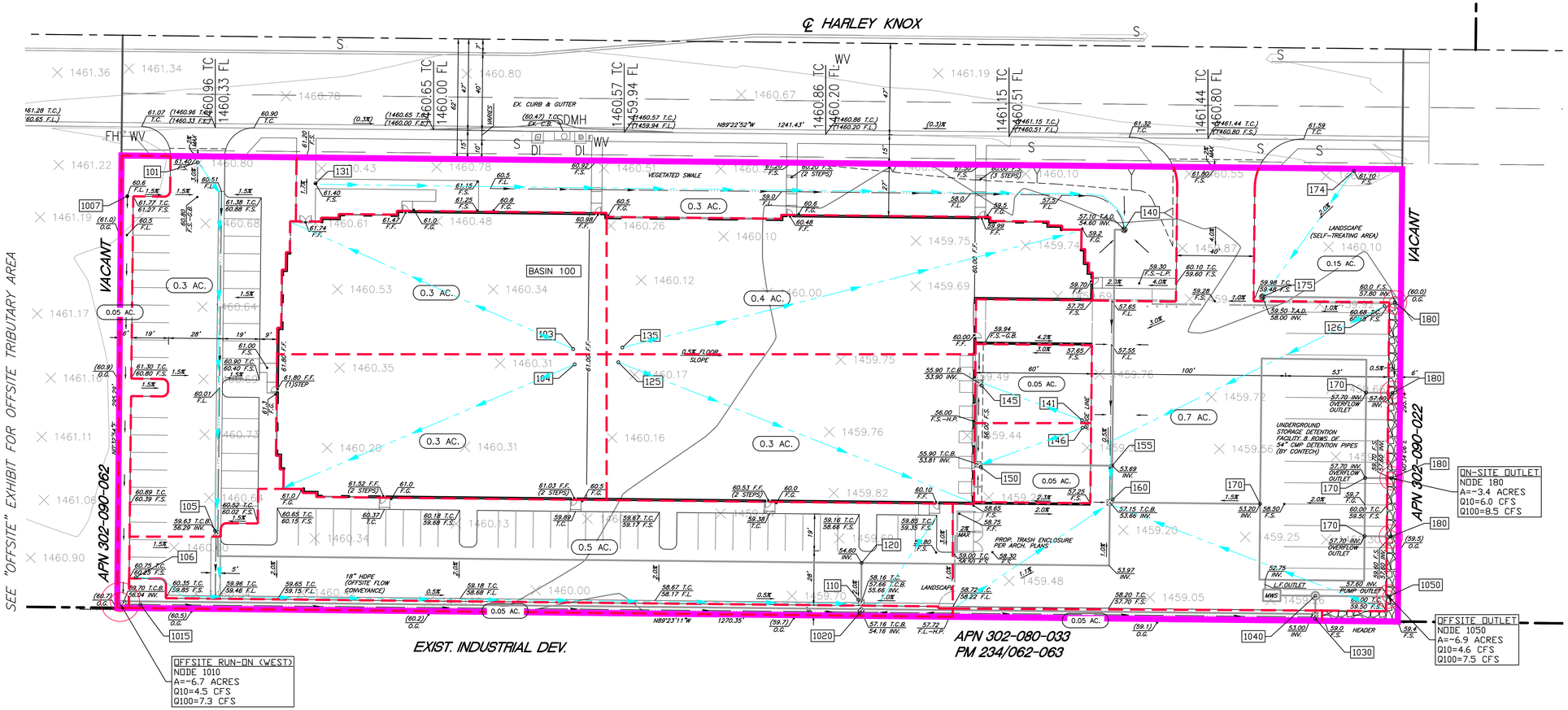
NOT FOR CONSTRUCTION – EXHIBIT FOR DRAINAGE STUDY ONLY



VICINITY MAP
NOT TO SCALE

GENERAL NOTES

1. REFERENCE – THE UNDERLYING TOPOGRAPHY USED FOR THE "OFFSITE" PORTION OF THE DRAINAGE STUDY MAP IS BASED ON THE COUNTY OF RIVERSIDE 4–FT TOPOGRAPHY.
2. REFERENCE – THE UNDERLYING TOPOGRAPHY USED FOR THE "ON–SITE" PORTION OF THE DRAINAGE STUDY MAP IS BASED ON THE PROJECT–SPECIFIC FLOWN 1–FT TOPOGRAPHY (BASED ON NAVD 88).
3. IN THE EXISTING CONDITION, THE SITE IS VACANT AND THE MAJORITY OF THE SITE CONSISTS OF LITTLE TO NO VEGETATION. RUNOFF FROM THE MAJORITY OF THE SITE SURFACE–DRAINS IN A SOUTHEASTERLY DIRECTION TO A VACANT PARCEL AND AN EASEMENT. THERE IS AN OFFSITE RUN–ON FROM THE WESTERLY EXISTING PARCELS.
4. THE POST–PROJECT DRAINAGE CHARACTERISTICS WILL BE MAINTAINED SIMILAR AS COMPARED TO THE PRE–PROJECT CONDITION. RUNOFF FROM THE SITE (APPROXIMATELY 3.5 ACRES FROM DRAINAGE BASIN 100) WILL BE CAPTURED VIA PROPOSED CATCH BASINS AND CONVEYED VIA PROPOSED STORM DRAIN PIPES TOWARDS A COMBINATION OF A PROPOSED UNDERGROUND STORAGE FACILITY AND A PROPRIETARY MODULAR WETLAND SYSTEM (MWS) FOR STORM WATER QUALITY AND FLOOD CONTROL MITIGATION PURPOSES, PRIOR TO ALLOWING SHEET–FLOW ONTO THE EXISTING PARCEL TO THE EAST (VIA A PUMP FOR LOW–FLOW/OFFSITE FLOW AND A GRAVEL TRENCH FLOW SPREADER SYSTEM). THE GRAVEL TRENCH FLOW SPREADER WILL CONSIST OF NO. 2 BACKING RIPRAPS (OR EQUIVALENT) TO HELP DISSIPATE ENERGY/VELOCITY PRIOR TO ALLOWING SHEET–FLOW ONTO THE ADJACENT LAND AS SIMILAR TO THE EXISTING CONDITION.
5. IN AN EFFORT TO MAINTAIN THE EXISTING DRAINAGE CHARACTERISTICS, THE WESTERLY OFFSITE AREA WILL BE PICKED UP BY PROPOSED ON–SITE PERIMETER V–DITCH AND STORM DRAIN PIPE AND CONVEYED TOWARDS THE SAME GRAVEL TRENCH FLOW SPREADER SYSTEM.
6. BASED ON THE RIVERSIDE COUNTY HYDROLOGY MANUAL (1978), THE PROJECT PREDOMINANTLY CONSISTS OF HYDROLOGIC SOIL GROUPS C. FOR THE PURPOSE OF THE HYDROLOGIC ANALYSIS, SOIL GROUP C WAS UTILIZED FOR PERVIOUS AREAS. BASED ON THE SITE–SPECIFIC INFILTRATION TESTING BY THE GEOTECHNICAL ENGINEER, THE FIELD INFILTRATION RATE OF 0.1 INCH/HOUR AND 1.6 INCH/HOUR WERE OBSERVED. DUE TO EXISTING CLAYEY MATERIALS BELOW 5', INFILTRATION WAS NOT DEEMED FEASIBLE. FOR STORM WATER QUALITY MANAGEMENT, PLEASE REFER TO A SEPARATE TECHNICAL DOCUMENT TITLED, "WATER QUALITY MANAGEMENT PLAN (WQMP) FOR B.I.G. PATTERSON INDUSTRIAL."
7. THE PROJECT IS SITUATED WITHIN THE FEMA ZONE X; THEREFORE, PROCESSING THROUGH FEMA IS NOT EXPECTED TO BE REQUIRED FOR THIS PROJECT.



HYDROLOGIC SUMMARY

POST–PROJECT:

ON–SITE FLOW OUTLET AT NODE 180
- AREA=3.4 ACRES
- PROPOSED LAND USE: LIGHT INDUSTRIAL
- % IMPERVIOUS=~90%
- Q10=~6.0 CFS
- Q100=~8.0 CFS

OFFSITE FLOW OUTLET AT NODE 1050
- AREA=6.9 ACRES
- % IMPERVIOUS=~0%
- Q10=~4.6 CFS
- Q100=~7.5 CFS

NOTE: THE PROJECT PROPOSES AN UNDERGROUND STORAGE FACILITY TO ADDRESS THE RCFC&WCD'S INCREASED RUNOFF CRITERIA.

LEGEND

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

N

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

DRAINAGE STUDY MAP FOR BREW ENT. II–HARLEY KNOX (ON–SITE / POST–PROJECT)

CITY CASE #: TBD

JN 2220 REVISED: 10/14/2022

S:\SDH DRAWINGS\WQLF–HARLEY KNOX\MXD\PDR Exhibit Post.dwg 2022–10–13 – 3:40PM – SDH

NOT FOR CONSTRUCTION – EXHIBIT FOR DRAINAGE STUDY ONLY

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

                          Analysis prepared by:

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

 ************************* DESCRIPTION OF STUDY *************************
* BREW ENT. II-HARLEY KNOX (JN 2220)                                     *
* POST-PROJECT CONDITION: 10-YEAR, 1-HOUR STORM EVENT                    *
* BASIN 100                                                              *
 **************************************************************************

  FILE NAME: WHK1HP10.RAT
  TIME/DATE OF STUDY: 16:02 10/12/2022
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  1.880
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.780
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.690
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.120
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.4909883
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.4890234
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =   10.00   1-HOUR INTENSITY(INCH/HOUR) =   0.788
  SLOPE OF INTENSITY DURATION CURVE = 0.4910
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   20.0     15.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0160

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
```

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

****************************************************************************
  FLOW PROCESS FROM NODE   1001.00 TO NODE   1005.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH FAIR COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   250.00
  UPSTREAM ELEVATION(FEET) =   1466.00
  DOWNSTREAM ELEVATION(FEET) =   1464.90
  ELEVATION DIFFERENCE(FEET) =      1.10
  TC = 0.709*[(  250.00**3)/(     1.10)]**.2 =   19.115
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.381
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .6278
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      1.21
  TOTAL AREA(ACRES) =      1.40   TOTAL RUNOFF(CFS) =      1.21

****************************************************************************
  FLOW PROCESS FROM NODE   1005.00 TO NODE   1010.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1464.90  DOWNSTREAM(FEET) =   1460.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1000.00   CHANNEL SLOPE =  0.0042
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.025   MAXIMUM DEPTH(FEET) =   3.00
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.080
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .5789
  SOIL CLASSIFICATION IS "C"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.89
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.34
  AVERAGE FLOW DEPTH(FEET) =   0.28   TRAVEL TIME(MIN.) =  12.43
  Tc(MIN.) =   31.54
  SUBAREA AREA(ACRES) =     5.30       SUBAREA RUNOFF(CFS) =    3.31
  TOTAL AREA(ACRES) =        6.7         PEAK FLOW RATE(CFS) =       4.53

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.35   FLOW VELOCITY(FEET/SEC.) =   1.53
  LONGEST FLOWPATH FROM NODE   1001.00 TO NODE   1010.00 =    1250.00 FEET.

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

```
  FLOW PROCESS FROM NODE   1010.00 TO NODE   1010.00 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.) =   31.54
  RAINFALL INTENSITY(INCH/HR) =   1.08
  TOTAL STREAM AREA(ACRES) =     6.70
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.53

****************************************************************************
  FLOW PROCESS FROM NODE   1007.00 TO NODE   1010.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH GOOD COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   210.00
  UPSTREAM ELEVATION(FEET) =     60.60
  DOWNSTREAM ELEVATION(FEET) =     59.70
  ELEVATION DIFFERENCE(FEET) =      0.90
  TC = 0.937*[(  210.00**3)/(     0.90)]**.2 =   23.681
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.244
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .6074
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.04
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.04

****************************************************************************
  FLOW PROCESS FROM NODE   1010.00 TO NODE   1010.00 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.) =   23.68
  RAINFALL INTENSITY(INCH/HR) =   1.24
  TOTAL STREAM AREA(ACRES) =     0.05
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.04

  ** CONFLUENCE DATA **
  STREAM     RUNOFF        Tc       INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        4.53    31.54        1.080          6.70
      2        0.04    23.68        1.244          0.05

 ********************************WARNING**********************************
```

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

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        3.44    23.68       1.244
      2        4.56    31.54       1.080

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       4.56   Tc(MIN.) =   31.54
  TOTAL AREA(ACRES) =        6.8
  LONGEST FLOWPATH FROM NODE   1001.00 TO NODE   1010.00 =    1250.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1010.00 TO NODE   1020.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    56.04  DOWNSTREAM(FEET) =    54.16
  FLOW LENGTH(FEET) =   378.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.50
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.56
  PIPE TRAVEL TIME(MIN.) =   1.40    Tc(MIN.) =   32.94
  LONGEST FLOWPATH FROM NODE   1001.00 TO NODE   1020.00 =    1628.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1020.00 TO NODE   1020.00 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.) =   32.94
  RAINFALL INTENSITY(INCH/HR) =   1.06
  TOTAL STREAM AREA(ACRES) =     6.75
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.56

****************************************************************************
  FLOW PROCESS FROM NODE   1015.00 TO NODE   1020.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
==========================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH GOOD COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   372.00
  UPSTREAM ELEVATION(FEET) =     59.70
  DOWNSTREAM ELEVATION(FEET) =     57.16
  ELEVATION DIFFERENCE(FEET) =      2.54
  TC = 0.937*[(  372.00**3)/(     2.54)]**.2 =   27.120
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.163
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .5941
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.03
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.03

**************************************************************************
  FLOW PROCESS FROM NODE   1020.00 TO NODE   1020.00 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.) =   27.12
  RAINFALL INTENSITY(INCH/HR) =   1.16
  TOTAL STREAM AREA(ACRES) =     0.05
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.03

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        4.56    32.94        1.057          6.75
      2        0.03    27.12        1.163          0.05

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

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        3.79    27.12       1.163
      2        4.59    32.94       1.057

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
```

```
  PEAK FLOW RATE(CFS) =       4.59   Tc(MIN.) =   32.94
  TOTAL AREA(ACRES) =        6.8
  LONGEST FLOWPATH FROM NODE   1001.00 TO NODE   1020.00 =    1628.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1020.00 TO NODE   1030.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    54.16  DOWNSTREAM(FEET) =    53.00
  FLOW LENGTH(FEET) =   232.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.52
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.59
  PIPE TRAVEL TIME(MIN.) =   0.86    Tc(MIN.) =   33.80
  LONGEST FLOWPATH FROM NODE   1001.00 TO NODE   1030.00 =    1860.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1030.00 TO NODE   1030.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.044
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .5719
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    0.05   SUBAREA RUNOFF(CFS) =    0.03
  TOTAL AREA(ACRES) =        6.9   TOTAL RUNOFF(CFS) =       4.62
  TC(MIN.) =   33.80

****************************************************************************
  FLOW PROCESS FROM NODE   1030.00 TO NODE   1040.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    53.00  DOWNSTREAM(FEET) =    52.22
  FLOW LENGTH(FEET) =     7.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.02
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.62
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =   33.81
  LONGEST FLOWPATH FROM NODE   1001.00 TO NODE   1040.00 =    1867.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1040.00 TO NODE   1050.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    57.61  DOWNSTREAM(FEET) =    57.60
  FLOW LENGTH(FEET) =    36.00   MANNING'S N =  0.012
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   1.16
  (PIPE FLOW VELOCITY CORRESPONDING TO NORMAL-DEPTH FLOW
   AT DEPTH = 0.82 * DIAMETER)
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.62
  PIPE TRAVEL TIME(MIN.) =   0.52    Tc(MIN.) =   34.33
  LONGEST FLOWPATH FROM NODE   1001.00 TO NODE   1050.00 =    1903.00 FEET.

+--------------------------------------------------------------------------+
| ON-SITE HYDROLOGY                                                        |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    105.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   195.00
  UPSTREAM ELEVATION(FEET) =     61.40
  DOWNSTREAM ELEVATION(FEET) =     59.63
  ELEVATION DIFFERENCE(FEET) =      1.77
  TC = 0.303*[(  195.00**3)/(     1.77)]**.2 =    6.398
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.364
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8818
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.63
  TOTAL AREA(ACRES) =      0.30   TOTAL RUNOFF(CFS) =      0.63

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.364
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8818
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    0.30   SUBAREA RUNOFF(CFS) =    0.63
  TOTAL AREA(ACRES) =        0.6   TOTAL RUNOFF(CFS) =       1.25
  TC(MIN.) =    6.40
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.364
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8818
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    0.30   SUBAREA RUNOFF(CFS) =    0.63
  TOTAL AREA(ACRES) =        0.9   TOTAL RUNOFF(CFS) =       1.88
  TC(MIN.) =    6.40

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    120.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    56.29  DOWNSTREAM(FEET) =    54.60
  FLOW LENGTH(FEET) =   342.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.58
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.88
  PIPE TRAVEL TIME(MIN.) =   1.59    Tc(MIN.) =    7.99
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    120.00 =     537.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    120.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.99
  RAINFALL INTENSITY(INCH/HR) =   2.12
  TOTAL STREAM AREA(ACRES) =     0.90
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.88

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    110.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
          ASSUMED INITIAL SUBAREA UNIFORM
          DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   378.00
  UPSTREAM ELEVATION(FEET) =     60.20
  DOWNSTREAM ELEVATION(FEET) =     57.66
```

```
  ELEVATION DIFFERENCE(FEET) =      2.54
  TC = 0.303*[(  378.00**3)/(     2.54)]**.2 =    8.853
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.016
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8794
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.89
  TOTAL AREA(ACRES) =      0.50   TOTAL RUNOFF(CFS) =      0.89

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    120.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    55.66  DOWNSTREAM(FEET) =    54.60
  FLOW LENGTH(FEET) =    19.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   2.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.07
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.89
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    8.90
  LONGEST FLOWPATH FROM NODE    106.00 TO NODE    120.00 =     397.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    120.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.90
  RAINFALL INTENSITY(INCH/HR) =   2.01
  TOTAL STREAM AREA(ACRES) =     0.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.89

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        1.88     7.99        2.120          0.90
      2        0.89     8.90        2.011          0.50

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

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

```
  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        2.67     7.99       2.120
      2        2.67     8.90       2.011

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       2.67   Tc(MIN.) =    7.99
  TOTAL AREA(ACRES) =        1.4
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    120.00 =     537.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    160.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    54.60  DOWNSTREAM(FEET) =    53.66
  FLOW LENGTH(FEET) =   158.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.19
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.67
  PIPE TRAVEL TIME(MIN.) =   0.63    Tc(MIN.) =    8.62
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    160.00 =     695.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    125.00 TO NODE    160.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.043
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8796
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    0.30   SUBAREA RUNOFF(CFS) =    0.54
  TOTAL AREA(ACRES) =        1.7   TOTAL RUNOFF(CFS) =       3.21
  TC(MIN.) =    8.62

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.62
  RAINFALL INTENSITY(INCH/HR) =   2.04
  TOTAL STREAM AREA(ACRES) =     1.70
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.21
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    126.00 TO NODE    160.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   175.00
  UPSTREAM ELEVATION(FEET) =     60.18
  DOWNSTREAM ELEVATION(FEET) =     57.15
  ELEVATION DIFFERENCE(FEET) =      3.03
  TC = 0.303*[(  175.00**3)/(     3.03)]**.2 =    5.384
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.573
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8830
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      1.59
  TOTAL AREA(ACRES) =      0.70   TOTAL RUNOFF(CFS) =      1.59

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.38
  RAINFALL INTENSITY(INCH/HR) =   2.57
  TOTAL STREAM AREA(ACRES) =     0.70
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.59

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        3.21     8.62        2.043          1.70
      2        1.59     5.38        2.573          0.70

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

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
```

```
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        3.60     5.38       2.573
      2        4.47     8.62       2.043

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       4.47   Tc(MIN.) =    8.62
  TOTAL AREA(ACRES) =        2.4
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    160.00 =     695.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    131.00 TO NODE    140.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   423.00
  UPSTREAM ELEVATION(FEET) =     61.40
  DOWNSTREAM ELEVATION(FEET) =     57.10
  ELEVATION DIFFERENCE(FEET) =      4.30
  TC = 0.303*[(  423.00**3)/(     4.30)]**.2 =    8.525
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.054
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8797
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.54
  TOTAL AREA(ACRES) =      0.30   TOTAL RUNOFF(CFS) =      0.54

****************************************************************************
  FLOW PROCESS FROM NODE    135.00 TO NODE    140.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.054
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8797
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    0.40   SUBAREA RUNOFF(CFS) =    0.72
  TOTAL AREA(ACRES) =        0.7   TOTAL RUNOFF(CFS) =       1.26
  TC(MIN.) =    8.53

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    155.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    54.60  DOWNSTREAM(FEET) =    53.69
  FLOW LENGTH(FEET) =   125.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.65
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.26
  PIPE TRAVEL TIME(MIN.) =   0.57    Tc(MIN.) =    9.10
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    155.00 =     548.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    155.00 TO NODE    155.00 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.) =    9.10
  RAINFALL INTENSITY(INCH/HR) =   1.99
  TOTAL STREAM AREA(ACRES) =     0.70
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.26

****************************************************************************
  FLOW PROCESS FROM NODE    141.00 TO NODE    145.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    56.00
  UPSTREAM ELEVATION(FEET) =     57.60
  DOWNSTREAM ELEVATION(FEET) =     55.90
  ELEVATION DIFFERENCE(FEET) =      1.70
  TC = 0.303*[(   56.00**3)/(     1.70)]**.2 =    3.051
  COMPUTED TIME OF CONCENTRATION INCREASED TO 5 MIN.
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.669
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8835
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.12
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.12

****************************************************************************
  FLOW PROCESS FROM NODE    145.00 TO NODE    150.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    53.90  DOWNSTREAM(FEET) =    53.81
```

```
  FLOW LENGTH(FEET) =    39.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   2.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   1.26
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.12
  PIPE TRAVEL TIME(MIN.) =   0.51    Tc(MIN.) =    5.51
  LONGEST FLOWPATH FROM NODE    141.00 TO NODE    150.00 =      95.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    146.00 TO NODE    150.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.543
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8828
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    0.05   SUBAREA RUNOFF(CFS) =    0.11
  TOTAL AREA(ACRES) =        0.1   TOTAL RUNOFF(CFS) =       0.23
  TC(MIN.) =    5.51

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    155.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    53.81  DOWNSTREAM(FEET) =    53.69
  FLOW LENGTH(FEET) =    67.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   3.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   1.42
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.23
  PIPE TRAVEL TIME(MIN.) =   0.79    Tc(MIN.) =    6.30
  LONGEST FLOWPATH FROM NODE    141.00 TO NODE    155.00 =     162.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    155.00 TO NODE    155.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.30
  RAINFALL INTENSITY(INCH/HR) =   2.38
  TOTAL STREAM AREA(ACRES) =     0.10
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.23

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

```
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1        1.26     9.10        1.989          0.70
     2        0.23     6.30        2.382          0.10

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

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        1.11     6.30       2.382
      2        1.46     9.10       1.989

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       1.46   Tc(MIN.) =    9.10
  TOTAL AREA(ACRES) =        0.8
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    155.00 =     548.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    155.00 TO NODE    160.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    53.69  DOWNSTREAM(FEET) =    53.66
  FLOW LENGTH(FEET) =    17.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.28
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.46
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =    9.22
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    160.00 =     565.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 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        1.46     9.22       1.976        0.80
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    160.00 =     565.00 FEET.
```

```
 ** MEMORY BANK #  1 CONFLUENCE DATA **
 STREAM     RUNOFF       Tc       INTENSITY     AREA
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1        4.47     8.62       2.043        2.40
 LONGEST FLOWPATH FROM NODE    101.00 TO NODE    160.00 =     695.00 FEET.

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

 ** PEAK FLOW RATE TABLE **
 STREAM    RUNOFF       Tc       INTENSITY
 NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1       5.84       8.62        2.043
     2       5.78       9.22        1.976

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       5.84   Tc(MIN.) =    8.62
 TOTAL AREA(ACRES) =        3.2

****************************************************************************
 FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =  12
----------------------------------------------------------------------------
 >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    160.00 TO NODE    170.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    53.66  DOWNSTREAM(FEET) =    53.20
 FLOW LENGTH(FEET) =    76.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  24.0 INCH PIPE IS   9.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.13
 GIVEN PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       5.84
 PIPE TRAVEL TIME(MIN.) =   0.25    Tc(MIN.) =    8.86
 LONGEST FLOWPATH FROM NODE    101.00 TO NODE    170.00 =     771.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    170.00 TO NODE    180.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =    57.70  DOWNSTREAM(FEET) =    57.60
  FLOW LENGTH(FEET) =    14.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.17
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   3
  PIPE-FLOW(CFS) =       5.84
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    8.92
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    180.00 =     785.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.92
  RAINFALL INTENSITY(INCH/HR) =   2.01
  TOTAL STREAM AREA(ACRES) =     3.20
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.84

****************************************************************************
  FLOW PROCESS FROM NODE    174.00 TO NODE    175.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH GOOD COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =     61.10
  DOWNSTREAM ELEVATION(FEET) =     59.48
  ELEVATION DIFFERENCE(FEET) =      1.62
  TC = 0.937*[(   80.00**3)/(     1.62)]**.2 =   11.800
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.751
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .6705
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.18
  TOTAL AREA(ACRES) =      0.15   TOTAL RUNOFF(CFS) =      0.18

****************************************************************************
  FLOW PROCESS FROM NODE    175.00 TO NODE    180.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    59.48  DOWNSTREAM(FEET) =    57.80
  FLOW LENGTH(FEET) =    69.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN   8.0 INCH PIPE IS   1.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.44
```

```
  GIVEN PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.18
  PIPE TRAVEL TIME(MIN.) =   0.33    Tc(MIN.) =   12.13
  LONGEST FLOWPATH FROM NODE    174.00 TO NODE    180.00 =     149.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   12.13
  RAINFALL INTENSITY(INCH/HR) =   1.73
  TOTAL STREAM AREA(ACRES) =     0.15
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.18

  ** CONFLUENCE DATA **
  STREAM     RUNOFF        Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        5.84     8.92        2.008          3.20
      2        0.18    12.13        1.727          0.15

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

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        5.96     8.92       2.008
      2        5.19    12.13       1.727

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       5.96   Tc(MIN.) =    8.92
  TOTAL AREA(ACRES) =        3.4
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    180.00 =     785.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        3.4  TC(MIN.) =      8.92
  PEAK FLOW RATE(CFS)   =       5.96
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

                          Analysis prepared by:

                          SDH & ASSOCIATES, INC.
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 ************************* DESCRIPTION OF STUDY *************************
* BREW ENT. II-HARLEY KNOX (JN 2220)                                     *
* POST-PROJECT CONDITION: 100-YEAR, 1-HOUR STORM EVENT                   *
* BASIN 100                                                              *
 ************************************************************************

  FILE NAME: WHK1HP00.RAT
  TIME/DATE OF STUDY: 15:59 10/12/2022
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  1.880
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.780
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.690
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.120
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.4909883
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.4890234
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.120
  SLOPE OF INTENSITY DURATION CURVE = 0.4890
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   20.0     15.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0160

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
```

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

****************************************************************************
  FLOW PROCESS FROM NODE   1001.00 TO NODE   1005.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH FAIR COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   250.00
  UPSTREAM ELEVATION(FEET) =   1466.00
  DOWNSTREAM ELEVATION(FEET) =   1464.90
  ELEVATION DIFFERENCE(FEET) =      1.10
  TC = 0.709*[(  250.00**3)/(     1.10)]**.2 =   19.115
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.960
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .6893
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      1.89
  TOTAL AREA(ACRES) =      1.40   TOTAL RUNOFF(CFS) =      1.89

****************************************************************************
  FLOW PROCESS FROM NODE   1005.00 TO NODE   1010.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1464.90  DOWNSTREAM(FEET) =   1460.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1000.00   CHANNEL SLOPE =  0.0042
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.025   MAXIMUM DEPTH(FEET) =   3.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.572
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .6517
  SOIL CLASSIFICATION IS "C"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.63
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.53
  AVERAGE FLOW DEPTH(FEET) =   0.35   TRAVEL TIME(MIN.) =  10.87
  Tc(MIN.) =   29.99
  SUBAREA AREA(ACRES) =     5.30       SUBAREA RUNOFF(CFS) =    5.43
  TOTAL AREA(ACRES) =        6.7         PEAK FLOW RATE(CFS) =       7.32

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.45   FLOW VELOCITY(FEET/SEC.) =   1.74
  LONGEST FLOWPATH FROM NODE   1001.00 TO NODE   1010.00 =    1250.00 FEET.

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

```
  FLOW PROCESS FROM NODE   1010.00 TO NODE   1010.00 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.) =   29.99
  RAINFALL INTENSITY(INCH/HR) =   1.57
  TOTAL STREAM AREA(ACRES) =     6.70
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.32

****************************************************************************
  FLOW PROCESS FROM NODE   1007.00 TO NODE   1010.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH GOOD COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   210.00
  UPSTREAM ELEVATION(FEET) =     60.60
  DOWNSTREAM ELEVATION(FEET) =     59.70
  ELEVATION DIFFERENCE(FEET) =      0.90
  TC = 0.937*[(  210.00**3)/(     0.90)]**.2 =   23.681
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.765
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .6719
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.06
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.06

****************************************************************************
  FLOW PROCESS FROM NODE   1010.00 TO NODE   1010.00 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.) =   23.68
  RAINFALL INTENSITY(INCH/HR) =   1.76
  TOTAL STREAM AREA(ACRES) =     0.05
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.06

  ** CONFLUENCE DATA **
  STREAM     RUNOFF        Tc       INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        7.32    29.99        1.572          6.70
      2        0.06    23.68        1.765          0.05

 ********************************WARNING**********************************
```

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

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        5.84    23.68       1.765
      2        7.37    29.99       1.572

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       7.37   Tc(MIN.) =   29.99
  TOTAL AREA(ACRES) =        6.8
  LONGEST FLOWPATH FROM NODE   1001.00 TO NODE   1010.00 =    1250.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1010.00 TO NODE   1020.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    56.04  DOWNSTREAM(FEET) =    54.16
  FLOW LENGTH(FEET) =   378.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  14.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.90
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.37
  PIPE TRAVEL TIME(MIN.) =   1.28    Tc(MIN.) =   31.27
  LONGEST FLOWPATH FROM NODE   1001.00 TO NODE   1020.00 =    1628.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1020.00 TO NODE   1020.00 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.) =   31.27
  RAINFALL INTENSITY(INCH/HR) =   1.54
  TOTAL STREAM AREA(ACRES) =     6.75
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.37

****************************************************************************
  FLOW PROCESS FROM NODE   1015.00 TO NODE   1020.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
================================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH GOOD COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   372.00
  UPSTREAM ELEVATION(FEET) =     59.70
  DOWNSTREAM ELEVATION(FEET) =     57.16
  ELEVATION DIFFERENCE(FEET) =      2.54
  TC = 0.937*[(  372.00**3)/(     2.54)]**.2 =   27.120
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.651
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .6604
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.05
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.05

****************************************************************************
  FLOW PROCESS FROM NODE   1020.00 TO NODE   1020.00 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.) =   27.12
  RAINFALL INTENSITY(INCH/HR) =   1.65
  TOTAL STREAM AREA(ACRES) =     0.05
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.05

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        7.37    31.27        1.540          6.75
      2        0.05    27.12        1.651          0.05

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

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        6.45    27.12       1.651
      2        7.43    31.27       1.540

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
```

```
  PEAK FLOW RATE(CFS) =       7.43   Tc(MIN.) =   31.27
  TOTAL AREA(ACRES) =        6.8
  LONGEST FLOWPATH FROM NODE   1001.00 TO NODE   1020.00 =    1628.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1020.00 TO NODE   1030.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    54.16  DOWNSTREAM(FEET) =    53.00
  FLOW LENGTH(FEET) =   232.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  14.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.92
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.43
  PIPE TRAVEL TIME(MIN.) =   0.79    Tc(MIN.) =   32.06
  LONGEST FLOWPATH FROM NODE   1001.00 TO NODE   1030.00 =    1860.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1030.00 TO NODE   1030.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.522
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .6458
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    0.05   SUBAREA RUNOFF(CFS) =    0.05
  TOTAL AREA(ACRES) =        6.9   TOTAL RUNOFF(CFS) =       7.47
  TC(MIN.) =   32.06

****************************************************************************
  FLOW PROCESS FROM NODE   1030.00 TO NODE   1040.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    53.00  DOWNSTREAM(FEET) =    52.22
  FLOW LENGTH(FEET) =     7.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.08
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.47
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =   32.06
  LONGEST FLOWPATH FROM NODE   1001.00 TO NODE   1040.00 =    1867.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1040.00 TO NODE   1050.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    57.61  DOWNSTREAM(FEET) =    57.60
  FLOW LENGTH(FEET) =    36.00   MANNING'S N =  0.012
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   1.16
  (PIPE FLOW VELOCITY CORRESPONDING TO NORMAL-DEPTH FLOW
   AT DEPTH = 0.82 * DIAMETER)
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.47
  PIPE TRAVEL TIME(MIN.) =   0.52    Tc(MIN.) =   32.58
  LONGEST FLOWPATH FROM NODE   1001.00 TO NODE   1050.00 =    1903.00 FEET.

+--------------------------------------------------------------------------+
| ON-SITE HYDROLOGY                                                        |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    105.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   195.00
  UPSTREAM ELEVATION(FEET) =     61.40
  DOWNSTREAM ELEVATION(FEET) =     59.63
  ELEVATION DIFFERENCE(FEET) =      1.77
  TC = 0.303*[(  195.00**3)/(     1.77)]**.2 =    6.398
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.347
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8863
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.89
  TOTAL AREA(ACRES) =      0.30   TOTAL RUNOFF(CFS) =      0.89

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.347
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8863
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    0.30   SUBAREA RUNOFF(CFS) =    0.89
  TOTAL AREA(ACRES) =        0.6   TOTAL RUNOFF(CFS) =       1.78
  TC(MIN.) =    6.40
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.347
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8863
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    0.30   SUBAREA RUNOFF(CFS) =    0.89
  TOTAL AREA(ACRES) =        0.9   TOTAL RUNOFF(CFS) =       2.67
  TC(MIN.) =    6.40

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    120.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    56.29  DOWNSTREAM(FEET) =    54.60
  FLOW LENGTH(FEET) =   342.00   MANNING'S N =  0.012
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.73
  (PIPE FLOW VELOCITY CORRESPONDING TO NORMAL-DEPTH FLOW
   AT DEPTH = 0.82 * DIAMETER)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.67
  PIPE TRAVEL TIME(MIN.) =   1.53    Tc(MIN.) =    7.92
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    120.00 =     537.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    120.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.92
  RAINFALL INTENSITY(INCH/HR) =   3.01
  TOTAL STREAM AREA(ACRES) =     0.90
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.67

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    110.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
          ASSUMED INITIAL SUBAREA UNIFORM
          DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   378.00
```

```
  UPSTREAM ELEVATION(FEET) =     60.20
  DOWNSTREAM ELEVATION(FEET) =     57.66
  ELEVATION DIFFERENCE(FEET) =      2.54
  TC = 0.303*[(  378.00**3)/(     2.54)]**.2 =    8.853
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.855
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8844
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      1.26
  TOTAL AREA(ACRES) =      0.50   TOTAL RUNOFF(CFS) =      1.26

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    120.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    55.66  DOWNSTREAM(FEET) =    54.60
  FLOW LENGTH(FEET) =    19.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   3.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.86
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.26
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    8.89
  LONGEST FLOWPATH FROM NODE    106.00 TO NODE    120.00 =     397.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    120.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.89
  RAINFALL INTENSITY(INCH/HR) =   2.85
  TOTAL STREAM AREA(ACRES) =     0.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.26

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        2.67     7.92        3.014          0.90
      2        1.26     8.89        2.849          0.50

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

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        3.79     7.92       3.014
      2        3.79     8.89       2.849

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       3.79   Tc(MIN.) =    7.92
  TOTAL AREA(ACRES) =        1.4
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    120.00 =     537.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    160.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    54.60  DOWNSTREAM(FEET) =    53.66
  FLOW LENGTH(FEET) =   158.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.60
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.79
  PIPE TRAVEL TIME(MIN.) =   0.57    Tc(MIN.) =    8.50
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    160.00 =     695.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    125.00 TO NODE    160.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.913
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8846
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    0.30   SUBAREA RUNOFF(CFS) =    0.77
  TOTAL AREA(ACRES) =        1.7   TOTAL RUNOFF(CFS) =       4.57
  TC(MIN.) =    8.50

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.50
  RAINFALL INTENSITY(INCH/HR) =   2.91
```

```
  TOTAL STREAM AREA(ACRES) =     1.70
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.57

****************************************************************************
  FLOW PROCESS FROM NODE    126.00 TO NODE    160.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   175.00
  UPSTREAM ELEVATION(FEET) =     60.18
  DOWNSTREAM ELEVATION(FEET) =     57.15
  ELEVATION DIFFERENCE(FEET) =      3.03
  TC = 0.303*[(  175.00**3)/(     3.03)]**.2 =    5.384
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.641
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8873
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      2.26
  TOTAL AREA(ACRES) =      0.70   TOTAL RUNOFF(CFS) =      2.26

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.38
  RAINFALL INTENSITY(INCH/HR) =   3.64
  TOTAL STREAM AREA(ACRES) =     0.70
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.26

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        4.57     8.50        2.913          1.70
      2        2.26     5.38        3.641          0.70

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

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

```
  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        5.16     5.38       3.641
      2        6.38     8.50       2.913

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       6.38   Tc(MIN.) =    8.50
  TOTAL AREA(ACRES) =        2.4
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    160.00 =     695.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    131.00 TO NODE    140.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   423.00
  UPSTREAM ELEVATION(FEET) =     61.40
  DOWNSTREAM ELEVATION(FEET) =     57.10
  ELEVATION DIFFERENCE(FEET) =      4.30
  TC = 0.303*[(  423.00**3)/(     4.30)]**.2 =    8.525
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.908
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8846
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.77
  TOTAL AREA(ACRES) =      0.30   TOTAL RUNOFF(CFS) =      0.77

****************************************************************************
  FLOW PROCESS FROM NODE    135.00 TO NODE    140.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.908
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8846
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    0.40   SUBAREA RUNOFF(CFS) =    1.03
  TOTAL AREA(ACRES) =        0.7   TOTAL RUNOFF(CFS) =       1.80
  TC(MIN.) =    8.53

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    155.00 IS CODE =  41
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    54.60  DOWNSTREAM(FEET) =    53.69
  FLOW LENGTH(FEET) =   125.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.04
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.80
  PIPE TRAVEL TIME(MIN.) =   0.52    Tc(MIN.) =    9.04
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    155.00 =     548.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    155.00 TO NODE    155.00 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.) =    9.04
  RAINFALL INTENSITY(INCH/HR) =   2.83
  TOTAL STREAM AREA(ACRES) =     0.70
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.80

****************************************************************************
  FLOW PROCESS FROM NODE    141.00 TO NODE    145.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    56.00
  UPSTREAM ELEVATION(FEET) =     57.60
  DOWNSTREAM ELEVATION(FEET) =     55.90
  ELEVATION DIFFERENCE(FEET) =      1.70
  TC = 0.303*[(   56.00**3)/(     1.70)]**.2 =    3.051
  COMPUTED TIME OF CONCENTRATION INCREASED TO 5 MIN.
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.775
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8877
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.17
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.17

****************************************************************************
  FLOW PROCESS FROM NODE    145.00 TO NODE    150.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
```

```
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    53.90  DOWNSTREAM(FEET) =    53.81
  FLOW LENGTH(FEET) =    39.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   2.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   1.39
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.17
  PIPE TRAVEL TIME(MIN.) =   0.47    Tc(MIN.) =    5.47
  LONGEST FLOWPATH FROM NODE    141.00 TO NODE    150.00 =      95.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    146.00 TO NODE    150.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.613
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8872
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    0.05   SUBAREA RUNOFF(CFS) =    0.16
  TOTAL AREA(ACRES) =        0.1   TOTAL RUNOFF(CFS) =       0.33
  TC(MIN.) =    5.47

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    155.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    53.81  DOWNSTREAM(FEET) =    53.69
  FLOW LENGTH(FEET) =    67.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   3.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   1.57
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.33
  PIPE TRAVEL TIME(MIN.) =   0.71    Tc(MIN.) =    6.18
  LONGEST FLOWPATH FROM NODE    141.00 TO NODE    155.00 =     162.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    155.00 TO NODE    155.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
==========================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.18
  RAINFALL INTENSITY(INCH/HR) =   3.40
  TOTAL STREAM AREA(ACRES) =     0.10
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.33
```

```
 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1        1.80     9.04        2.826          0.70
     2        0.33     6.18        3.403          0.10

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

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

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc      INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1        1.56     6.18       3.403
     2        2.07     9.04       2.826

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       2.07   Tc(MIN.) =    9.04
 TOTAL AREA(ACRES) =        0.8
 LONGEST FLOWPATH FROM NODE    131.00 TO NODE    155.00 =     548.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    155.00 TO NODE    160.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    53.69  DOWNSTREAM(FEET) =    53.66
 FLOW LENGTH(FEET) =    17.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   2.50
 GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       2.07
 PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =    9.15
 LONGEST FLOWPATH FROM NODE    131.00 TO NODE    160.00 =     565.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

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

```
      1        2.07     9.15       2.809        0.80
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    160.00 =     565.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF       Tc       INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        6.38     8.50       2.913        2.40
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    160.00 =     695.00 FEET.

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

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc       INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1       8.30       8.50        2.913
      2       8.22       9.15        2.809

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       8.30   Tc(MIN.) =    8.50
  TOTAL AREA(ACRES) =        3.2

************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =  12
------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
========================================================================

************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    170.00 IS CODE =  41
------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    53.66  DOWNSTREAM(FEET) =    53.20
  FLOW LENGTH(FEET) =    76.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  11.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.63
  GIVEN PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.30
  PIPE TRAVEL TIME(MIN.) =   0.22    Tc(MIN.) =    8.72
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    170.00 =     771.00 FEET.

************************************************************************
  FLOW PROCESS FROM NODE    170.00 TO NODE    180.00 IS CODE =  41
------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    57.70  DOWNSTREAM(FEET) =    57.60
  FLOW LENGTH(FEET) =    14.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   8.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.46
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   3
  PIPE-FLOW(CFS) =       8.30
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    8.78
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    180.00 =     785.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.78
  RAINFALL INTENSITY(INCH/HR) =   2.87
  TOTAL STREAM AREA(ACRES) =     3.20
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      8.30

****************************************************************************
  FLOW PROCESS FROM NODE    174.00 TO NODE    175.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH GOOD COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =     61.10
  DOWNSTREAM ELEVATION(FEET) =     59.48
  ELEVATION DIFFERENCE(FEET) =      1.62
  TC = 0.937*[(   80.00**3)/(     1.62)]**.2 =   11.800
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.481
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7250
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.27
  TOTAL AREA(ACRES) =      0.15   TOTAL RUNOFF(CFS) =      0.27

****************************************************************************
  FLOW PROCESS FROM NODE    175.00 TO NODE    180.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    59.48  DOWNSTREAM(FEET) =    57.80
  FLOW LENGTH(FEET) =    69.00   MANNING'S N =  0.012
```

```
 DEPTH OF FLOW IN   8.0 INCH PIPE IS   2.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   3.90
 GIVEN PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       0.27
 PIPE TRAVEL TIME(MIN.) =   0.29    Tc(MIN.) =   12.09
 LONGEST FLOWPATH FROM NODE    174.00 TO NODE    180.00 =     149.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =   12.09
 RAINFALL INTENSITY(INCH/HR) =   2.45
 TOTAL STREAM AREA(ACRES) =     0.15
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.27

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1        8.30     8.78        2.867          3.20
     2        0.27    12.09        2.451          0.15

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

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

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc      INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1        8.50     8.78       2.867
     2        7.37    12.09       2.451

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       8.50   Tc(MIN.) =    8.78
 TOTAL AREA(ACRES) =        3.4
 LONGEST FLOWPATH FROM NODE    101.00 TO NODE    180.00 =     785.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =        3.4  TC(MIN.) =      8.78
 PEAK FLOW RATE(CFS)   =       8.50
============================================================================
```

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

Appendix C

Preliminary Inlet Sizing

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

Appendix D

Preliminary Storm Drain Sizing

Includes:

1. On-site preliminary storm drain sizing

Brew Ent. II-Harley Knox
Job # 2220
10/14/2022

On-site Storm Drain Size

The purpose of this table is to provide an estimated on-site private storm drain pipe sizes to convey the anticipated (minimum) 10-year peak flow rates based on the normal depth (Manning's equation) with a sizing bump-up factor to account for potential head losses through the pipe. This project also includes perimeter storm drain that conveys the westerly offsite run-on flow.

Manning's n: 0.012 HDPE or equivalent

Sizing Bump-up (%): 30

			Storm Drain Sizes per Varying Slopes						
		Slope at:	0.2%		0.5%		1.0%		
Node ID's:	**Q_{100} (cfs[1])**	**Q_{100} with Sizing Factor (cfs[1])**	**Minimum Pipe Size[2] (feet)**	**Suggested Pipe Size (inches)**	**Minimum Pipe Size[2] (feet)**	**Suggested Pipe Size (inches)**	**Minimum Pipe Size [2] (feet)**	**Suggested Pipe Size (inches)**	**RECOMMENDATIONS[3]**
1010 - 1020	4.6	6.0	1.59	24"	1.34	18"	1.18	18"	**Use 18" HDPE @ 0.2% MIN.**
1020 - 1040	4.6	6.0	1.59	24"	1.34	18"	1.18	18"	**Use 18" HDPE @ 0.2% MIN.**
105 - 120	1.9	2.5	1.14	18"	0.96	12"	0.85	12"	**Use 12" HDPE @ 0.2% MIN.**
110 - 120	0.9	1.2	0.86	12"	0.73	10"	0.64	8"	**Use 12" HDPE @ 0.2% MIN.**
120 - 160	2.7	3.5	1.30	18"	1.10	18"	0.96	12"	**Use 18" HDPE @ 0.2% MIN.**
140 - 155	1.3	1.7	0.99	12"	0.83	10"	0.73	10"	**Use 12" HDPE @ 0.2% MIN.**
145 - 150	0.1	0.1	0.38	6"	0.32	4"	0.28	4"	**Use 12" HDPE @ 0.2% MIN.**
150 - 155	0.2	0.3	0.49	6"	0.41	6"	0.36	6"	**Use 12" HDPE @ 0.2% MIN.**
155 - 160	1.5	2.0	1.05	18"	0.88	12"	0.77	10"	**Use 18" HDPE @ 0.2% MIN.**
160 - 170	5.8	7.5	1.74	24"	1.46	18"	1.28	18"	**Use 24" HDPE @ 0.2% MIN.**
170 - 180	5.8	7.5	1.74	24"	1.46	18"	1.28	18"	**Use 3-12" HDPE @ 0.2% MIN.**

Note:

1. "cfs" = cubic feet per second.
2. Minimum pipe sizes are calculated using the Manning's equation (normal depth) and are based on the flow rates with "bump up factor" to account for potential head losses through the storm drain pipes.
3. The on-site storm drain systems are private and the normal depth calculations should suffice for pipe sizing purpose.
   The recommendations may differ slightly from the pipe sizing summary table above. If necessary, detailed calculations may be performed on an as-needed basis during final engineering to validate the required sizes.

Channel Report

SUPPORTING CALCULATION FOR WESTERLY PERIMETER V-DITCH (FOR OFFSITE FLOW CONVEYANCE)

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Oct 13 2022

Brew Ent. II - Perimeter V-Ditch Sizing for Offsite Flow Conveyance

Triangular

Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.50
N-Value	= 0.014

Calculations

Compute by:	Known Q
Known Q (cfs)	= 7.30

WESTERLY OFFSITE RUN-ON (100-YEAR PEAK FLOW RATE)

Highlighted

Depth (ft)	= 0.94
Q (cfs)	= 7.300
Area (sqft)	= 1.77
Velocity (ft/s)	= 4.13
Wetted Perim (ft)	= 4.20
Crit Depth, Yc (ft)	= 0.97
Top Width (ft)	= 3.76
EGL (ft)	= 1.21