Appendix G1
Drainage Study

PRELIMINARY DRAINAGE STUDY
for
OLIVE PARK APARTMENTS

W.O. 3785-0002

APN # 162-111-04-00

Permit No.: D24-00006

City of Oceanside, California

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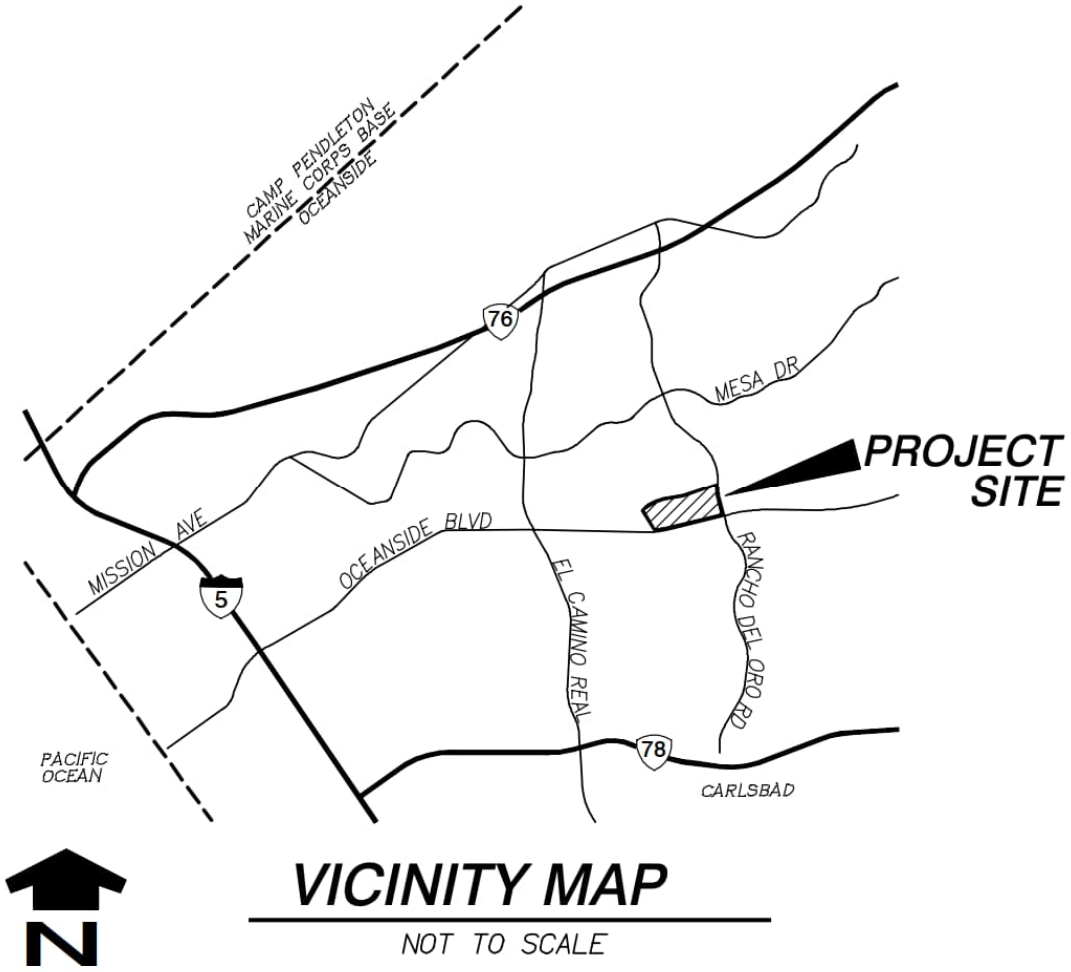
CHAPTER 1 - EXECUTIVE SUMMARY

1.1 - Introduction

The project site is situated in the west of Olive Drive and north of Wooster Drive in Oceanside, California, as illustrated in the vicinity map below, designated by APN 162-111-04-00. Spanning roughly 43 acres, this semi-rectangular property extends east-west, featuring a curved northern edge adjacent to the SDNR rail line. It's flanked by undeveloped land to the west and residential subdivisions to the south and east, with the Olive Drive cul-de-sac meeting its northeast corner. The proposed development occupies the northeastern corner of the site, while the remainder of the site will remain undeveloped.



This study aims to provide hydrology calculations to support the proposed residential development, focusing on estimating runoff for the 100-year frequency storm event and identifying the necessary storm drain infrastructure for safe stormwater conveyance. Stormwater runoff treatment is detailed in a separate document, the

'Stormwater Quality Management Plan for Oceanside Senior Affordable,' by Hunsaker & Associates, San Diego, dated October 2024."

1.2 – Summary of Existing Conditions

The site is situated on slopes descending northwest towards Loma Alta Creek, which borders the site's northern edge. The topographical contours show an increase in gradient from north to south. The creek, characterized by a gentle gradient, flows westward in a meandering pattern and features vertically incised embankments, with heights reaching up to 10 feet at certain points along its edges. A fill berm, constructed as part of railroad enhancements, is present along the site's northeast boundary. A level and graded pad in the southeast corner has been prepared to construct a residential development along Wooster Drive. The site's elevation ranges from approximately 185 feet above Mean Sea Level (MSL) at the northwest corner, near Loma Alta Creek, to 464 feet MSL at the graded pad.

Vegetation across the site varies significantly with the topography, including flat, intermediate, and steep slopes. In areas with flat slopes, the vegetation primarily consists of hydric (water-seeking) species, such as rushes and marsh-type plants, with several eucalyptus trees also dotting these areas. The intermediate slopes, which have undergone disking, are home to sparse, xeric (dry) vegetation. Meanwhile, the areas with steep slopes boast dense vegetation coverage, including species like mustard, sage, and cactuses.

The property can be accessed from College Boulevard via an existing unpaved driveway located to the northeast of the project. It is surrounded by residential developments to the east and south, an undeveloped property to the west, and the SDNR rail line along with Loma Alta Creek to the north. Loma Alta Creek, which flows in an east-west direction, enters the site to the west of the area slated for development, crossing under the rail lines and extending approximately 1280 feet through the property.

The proposed development occupies the northeastern corner of the site, while the remaining area is left undeveloped. The drainage study focuses on the eastern watersheds affected by the development. This analysis encompasses approximately 29.9 acres, featuring multiple points of discharge that converge at node 1, as identified in the maps, located near the north-central edge of the property boundary. The analysis further subdivides all areas tributary to node 1, as described below:

The project’s hydrology includes approximately 7.8 acres of offsite run-on, originating from a neighboring single-family residential site to the east and a dirt access road off College Boulevard, south of the railroad. The single-family residential site drains westward through concrete street gutters, collecting runoff from an area of approximately 5.0 acres. The runoff gathers at a low point in an existing cul-de-sac and then enters the project through a curb opening, discharging into an existing ditch at node 106. This ditch flows northward and eventually merges with runoff from the dirt road at node 112.

Before reaching node 112, the ditch captures 1.18 acres of onsite runoff, converging with the flows from the neighboring residential site.

At node 114, a high point along College Boulevard divides the drainage areas, with runoff flowing both east and west.

The drainage flows westward, covering approximately 2.5 acres, and captures runoff from adjacent slopes before reaching node 112, where all flows converge.

From node 112, the drainage flows west along the railroad tracks toward node 1, which is part of the Loma Alta Creek Floodway. Along the way, it merges with onsite flows conveyed by the existing swales, slopes, and vegetation previously described, contributing approximately 20.9 acres to the analysis. The runoff continues westward through the undisturbed project boundary via earthen swales along the southern side of the railroad, ultimately flowing toward Loma Alta Creek's existing natural channel. This channel crosses beneath the railway line within the site and continues westward, eventually discharging into the Pacific Ocean at the mouth of Loma Alta Creek.

Runoff flowing east from node 114 contributes 0.24 acres to the analysis and is captured by an existing drainage structure located just south of the railroad tracks. The runoff is then conveyed via storm drain directly into Loma Alta Creek. For this drainage study, the area is modeled as being piped from node 137 (the structure) to node 1, ensuring that the analysis includes all contributing areas and assesses the overall impact of the development on the creek. See Appendix 4 for calculations of peak runoff in existing conditions.

According to the FEMA Flood Insurance Rate Map (FIRM 06073C0758G effective 05/16/2012) for this site, the disturbed area for the proposed project is in an unshaded Zone X, which is defined as "Areas determined to be outside the 500-year floodplain". Refer to the FIRMette Map in Appendix 1.

Per NRCS Soil report, the site consists of 10.7% Hydrologic Soil Group "A", 9.4% Hydrologic Soil Group "C", and 68.9% Hydrologic Soil Group "D". Refer to Appendix 2 for NRCS soils information, while the remaining area is impervious.

The runoff coefficient for each subarea was calculated based on soil type and impervious percentage using the formula from San Diego County Hydrology Manual Section 3.1.2

C= 0.90 x (% Impervious) + Cp x (1 - % Impervious)

Cp = Pervious Coefficient Runoff value for the soil type (per San Diego County Hydrology Manual Table 3.1)

Cp Soil A = 0.20, Cp Soil C = 0.30, Cp Soil D= 0.35 (soil type D has been used for areas that have been previously compacted)

Cp-Subarea = (Soil type A% * 0.20) + (Soil type C% * 0.3) + (Soil Type D%* 0.35)

Please refer to existing conditions AES Input Data spreadsheet in appendix 4 for each subarea runoff factor.

Table 1 below summarizes the 100-year existing condition peak flow at the downstream project boundary.

TABLE 1 - Summary of Existing Flows

Exhibit	Node Number on Exhibit	Discharge Location	Drainage Area (ac)	C Area-Average Runoff Coefficient	Tc (min)	Q100-Year Peak Flow (cfs)
1	1	Northwest of the site	29.86	0.390	14.20	49.81
1	118.10	Northeast of the site	14.06	0.457	11.81	28.13
1	138	East of '1'	13.41	0.351	10.37	22.41
1	137	College Blvd.	0.24	0.38	6.06	0.62

1.3 – Proposed Conditions

The proposed project will develop a single pad designated for two building structures, accommodating a total of 282 apartment units, complete with courtyards. The development plan includes private driveways, sidewalks, landscaping, parking spaces, and the necessary infrastructure and utilities typical for such a development. This infrastructure will have a dual storm drain system comprising pipes, inlets, catch basins, brow ditches, and cleanouts. One component of this dual system is designed to collect and convey the onsite 100-year runoff through the project area to the proposed underground storage facilities.

These facilities will attenuate and direct the runoff to the proposed structural pollutant control Best Management Practices (BMPs) to meet water quality requirements. The second component, the bypass storm drain system, aims to capture and convey the offsite flows along with a portion of the onsite flows from the undisturbed slopes directly to the existing northern channel.

To facilitate access to the site from College Blvd, the existing access road northeast of the site will be paved and improved as a gated emergency-only ingress/egress road. Additionally, a new connection to the cul-de-sac on Olive Drive, east of the site, is proposed.

The onsite runoff will be directed via a street curb and gutter system, captured by proposed inlets, and routed through the proposed storm drain system to the underground storage facilities (constructed of Corrugated Metal Pipe, CMP, or an approved equivalent). These facilities are designed to store the required water quality volume and to fulfill hydromodification and peak flow management requirements. Moreover, the underground storage will feature an outlet structure engineered to release the required water quality volume within the specified drawdown time to the downstream proprietary biofiltration BMPs. These outlet structures will attenuate the peak flows and aid in meeting flow control to address hydromodification requirements.

No development is proposed within the flood zone as designated by FEMA, except for an approximate 107-square-foot area allocated for an offsite, on-grade, publicly accessible concrete pedestrian connection to the existing concrete train station north of the site, which is situated within the floodway. This minor encroachment in the

floodway has been evaluated, and it is considered to have a negligible impact due to its small footprint, the absence of hydraulic alterations, no offsite fill requirements, and its alignment with the existing grade.

The remainder of the accessible concrete pedestrian connection crosses an existing flow line outside the floodway and floodplain areas. Low-flow pipes will manage normal flows, while peak flows will overtop the crossing, following the natural drainage path.

A flow-based proprietary biofiltration BMP (Modular Wetlands System or equivalent) is planned for installation on the emergency-only ingress/egress road at its lowest point to address the water quality requirements for this area. Meanwhile, the proposed underground storage facilities will offer additional storage and over-detention capabilities to meet hydromodification and peak flow attenuation requirements at the point of compliance to mitigate the construction of the proposed emergency-only ingress/egress road.

Runoff from the northeast, small section of the emergency-only ingress/egress road will be directed to a flow-based MWS unit and an underground storage facility to address water quality, hydromodification, and peak flow attenuation for this area. The treated and mitigated flow from the underground storage facility will then connect to the existing storm drain, which leads to the catch basin located just south of the railroad tracks. From there, it will discharge into the existing storm drain that flows directly into Loma Alta Creek, similar to existing conditions, where it will travel west to merge with the treated and mitigated flows from the site.

For further details on the proposed water quality features of the site, refer to the Stormwater Quality Management Plan for the Olive Park Apartments (October 2024) prepared by Hunsaker & Associates San Diego, Inc.

The development occupies approximately 6.56 acres of the onsite area, which were existing slopes and swales and will now be streets and buildings. The drainage on the developed portions of the site will be conveyed via roof drains, curbs and gutters, area drains, curb inlets, and underground storm drains. As previously discussed, these flows will be mitigated before confluence with undisturbed flows.

Runoff from the western and southern undisturbed slopes will be diverted through proposed brow ditches directly into the northwestern discharge point. This system is tasked with conveying the aforementioned flows and the offsite flows (from Olive Drive) to their designated discharge points northeast and northwest of the site. They will combine with the onsite treated flows and proceed westerly to Loma Alta Creek. For calculations regarding the proposed condition runoff, see Appendix 4.

The total studied drainage area is 29.9 ac with 32% imperviousness. The runoff coefficient for each subarea was calculated based on soil type covering the area and impervious percentage using the formula from San Diego County Hydrology Manual Section 3.1.2 for the undisturbed areas, while the runoff coefficient for disturbed areas was calculated using soil type D and impervious percentage.

C= 0.90 x (% Impervious) + Cp x (1 - % Impervious)

Cp = Pervious Coefficient Runoff value for the soil type (per San Diego County Hydrology Manual Table 3.1)

Cp Soil A = 0.20, Cp Soil C = 0.30, Cp Soil D= 0.35 (soil D for disturbed areas)

Cp-Subarea = (Soil type A% * 0.20) + (Soil type C% * 0.3) + (Soil Type D%* 0.35)

Please refer to the proposed conditions AES Input Data spreadsheet in Appendix 4 for each subarea runoff factor.

Table 2 below summarizes the unmitigated 100-year proposed condition peak flow at the downstream project boundary.

TABLE 2 - Summary of Proposed Unmitigated Flows

Exhibit	Node Number on Exhibit	Discharge Location	Drainage Area (ac)	C Area-Average Runoff Coefficient	Tc (min)	Q100-Year Peak Flow (cfs)
2	1	Northwest of the site	29.86	0.507	14.34	46.82
2	143	Northeast of the site	11.91	0.572	11.29	28.63
2	175	East of '1'	17.18	0.471	5.49	29.56
2	137	College Blvd.	0.24	0.475	5.00	0.87

Although the flow associated with the development of the *Olive Park Apartments project* did not increase at the very downstream discharge location, the proposed underground storage facilities required for hydromodification management will provide peak flow attenuation. The riser within these facilities has been designed with orifices along its height, maintaining a foot of freeboard above the 100-year water surface elevation (WSE).

Sizes and heights of orifices were determined to achieve outlet flow less than the pre-development flow shown in Table 1 above. Please refer to Chapter 2.2 for methodology and Appendix 5 for detention Analysis.

The resultant discharge at Node 1 will continue westerly to comingle with Loma Alta Creek and ultimately discharge into the Pacific Ocean.

Since this project is subject to compliance with hydromodification requirements, the design of the storage\detention facilities has been coordinated with those calculations, which are part of the *SWQMP for Olive Park Apartments.*

Table 3 below summarizes the Q100 Mitigated flow at Node 1.

TABLE 3 - Summary of Mitigated Developed Flows

Exhibit	Node Number on Exhibit	Discharge Location	Drainage Area (ac)	C Area-Average Runoff Coefficient	Tc (min)	Q100-Year Peak Flow (cfs)
2	1	Northwest of the site	29.86	0.507	14.39	36.88
2	143	Northeast of the site	11.91	0.572	11.29	27.37
2	175	East of '1'	17.18	0.471	26.12	17.11
2	137	College Blvd.	0.24	0.475	6.21	0.54

1.4 – Summary of Results

The conveyance of Q100 runoff flows through the proposed site required a dual storm drain system. One of the dual systems is an on-site storm drain system proposed to route flows to the proposed detention facilities to address water quality, hydromodification, and peak flow attenuation, while the second system is a bypassed storm drain to convey the offsite flows to the existing northern channel.

Storm drain system and hydraulic calculations will be conducted in the final engineering drainage study.

Rip rap is proposed at the storm drain discharge location to help dissipate outlet velocities to a non-erosive level. The design for the rip rap will be provided during final engineering. Preliminary sizing has been performed in Chapter 4 using the velocities determined with the Hydraflow Express extension.

Two volume-based proprietary biofiltration BMPs, along with two underground storage facilities, have been included in the site's design to address hydromodification, peak flow attenuation, and water quality requirements. A flow-based proprietary biofiltration BMP is proposed at the emergency-only ingress/egress road to meet water quality requirements for the portion of the road that cannot be routed to the storage facility. A small northeastern portion of the emergency-only ingress/egress road, which drains away from the site, will be routed to a flow-based proprietary biofiltration unit to address water quality, and to an underground storage facility to manage hydromodification and peak flow attenuation. Per the hydrologic and detention analysis conducted in this study, the detention analysis for the vaults is included in Appendix 5 of this report. The table below summarizes the flow reductions at the discharge location.

The flow from the site is attenuated to ensure that the post-developed flows will not exceed the capacity of the existing downstream drainage facilities (post-development flows compared to the pre-development flows at the point of compliance southwest corner of the project (POC-1/ Node 1). See Table 4 below.

TABLE 4 – Pre-development Condition vs. Post-development Condition

Dis. Location	Pre-Area (ac)	Post-Area (ac)	Pre-: 100-Year Peak Flow (cfs)	Post-: 100-Year Unmit. Peak Flow (cfs)	Post-: 100-Year Mit. Peak Flow (cfs)	TC Pre (min)	TC Post Unmit (min)	TC Post Mit (min)	Q100 Flow Difference (cfs)
Northwest corner	29.86	29.86	49.81	47.35	36.88	14.20	14.34	14.39	-12.93
Northeast of the site	14.06	11.91	28.13	28.63	27.37	11.81	11.29	11.29	-0.76
East of '1'	13.41	17.18	22.41	29.56	17.11	10.37	5.49	26.12	-5.30
College Blvd.	0.24	0.24	0.62	0.89	0.54	6.06	5.00	6.21	-0.08

-Dis. Location: Discharge Location

-Pre : Pre-Developed Conditions

-Post. Unmit.: Post Developed Unmitigated Conditions

-Post. Mit.: Post Developed Mitigated Conditions

1.5 – Conclusion

The proposed development of *Olive Park Apartments* can be roughly graded and improved with a storm drain system to accommodate the expected ultimate flows from development. In addition, with the proposed drainage facilities such as curb inlets, storm drains, water quality, flow control, and detention facilities, runoff can be mitigated to accepted San Diego County and City of Oceanside standards.

The proposed project will not substantially alter the existing drainage pattern of the site. There will be a decrease in the peak discharge from the site. Therefore, the proposed project will not impact downstream properties or drainage facilities.

1.6 - References

San Diego County Hydrology Manual, County of San Diego Department of Public Works Flood Control Division, June 2003.

San Diego County Hydraulic Design Manual, County of San Diego Department of Public Works Flood Control Division, September 2014

San Diego County Drainage Design Manual, County of San Diego Department of Public Works Flood Control Division, July 2005

Stormwater Quality Management Plan for Olive Park Apartments, Hunsaker & Associates San Diego, Inc., October 2024.

CHAPTER 2

METHODOLOGY

Rational Method Hydrologic Analysis

The Rational Method as described in the San Diego County Hydrology Manual, was used for the hydrologic calculations for this project. The Rational Method formula is expressed as follows:

$Q = C\ I\ A$

$I = 7.44 P_6 T_c^{-0.645}$

$T_c = T_t + T_i$

$T_t = D/V^*$

Where:

Q = Peak discharge, in cubic feet per second (cfs).
C = Runoff coefficient, proportion of the rainfall that runs off the surface. The C coefficient was obtained from Table 3-1 of the SDCHM. It has no units and is based on the soil group and the development type for the drainage sub-area.
A = Drainage area contributing to the design location (ac).
I = Average rainfall intensity (in/hr). The formula can be found on Figure 3-2 of the SDCHM.
P_6 = 6-hour precipitation (in). This value was taken from the 6-hour isopluvial maps found in Appendix B of the SDCHM.
T = Time of concentration (min). The formula can be found on Figure 3-3 of the SDCHM.
T_i = Initial time of concentration, from Table 3-2 (min).
T_t = Travel time (min). Based on methods described in Chapter 3.1.4.2 of the SDCHM.
D = Longest flow path distance (ft).
S = Slope along the flow path (%).
V = Flow velocity(ft/sec).

*Assumed flow at top of 6" gutter.

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

The procedure for the subarea summation model is as follows:
(1) Subdivide the watershed into an initial subarea (generally 1 lot) and subsequent subareas, which are generally less than 10 acres in size. Assign upstream and downstream node numbers to each subarea.
(2) Estimate an initial Tc by using the appropriate nomograph or overland flow velocity estimation.
(3) Using the initial Tc, determine the corresponding values of I. Then Q = C I A.

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

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

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

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

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

$Qp = Qa + Qb$; $Tp = Ta = Tb$

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

(i). The most frequent case is where the collection stream with the longer time of concentration has the larger Q. The smaller Q value is adjusted by the ratio of rainfall intensities.
$Qp = Qa + Qb\ (Ia/Ib)$; $Tp = Ta$

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

$Qp = Qb + Qa\ (Tb/Ta)$; $Tp = Tb$

Design Storm - 100-year return interval

Land Use – Commercial;

Soil Type – Hydrologic soil groups A, C, and D are present within the drainage boundaries and a weighted average of the runoff coefficient is used based on drainage area and respective soil type.

Runoff Coefficient - In accordance with the County of San Diego standards, runoff coefficients were based on land use and soil type.

Rainfall Intensity - Initial time of concentration values were determined using the County of San Diego standards. The rainfall intensity-duration-frequency curve for the San Diego County was used to determine rainfall intensities

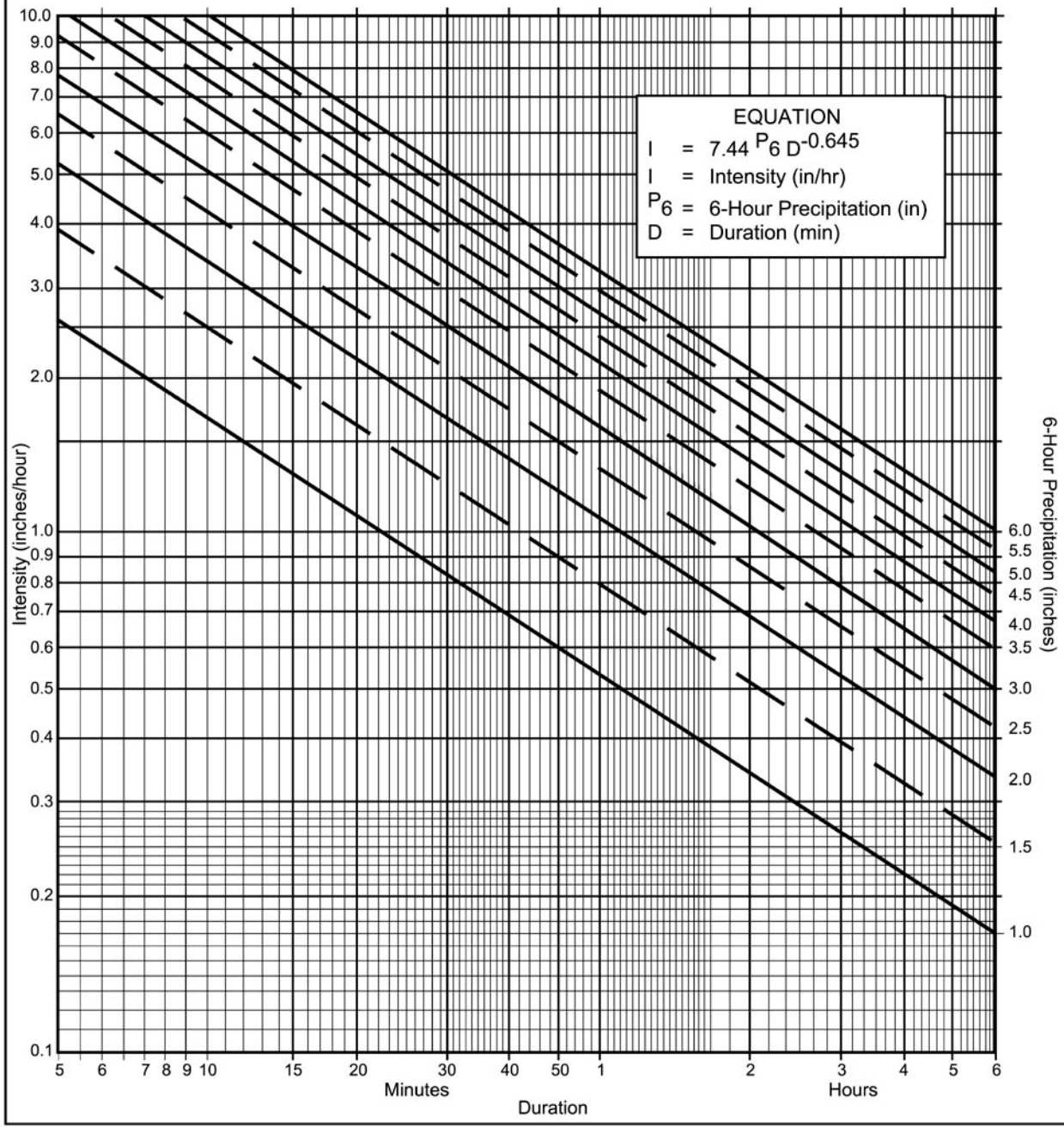
2.4 Detention

In order to provide adequate flood control, increases in peak flow rates at the outfall location for this site were mitigated using the proposed underground storage facilities (vaults).

The hydrology calculations discussed above provide peak flowrates for the vaults' inflow, which are entered into a separate program called RickRatHydro. The RickratHydro was used to produce an inflow hydrograph for the project drainage area to the vault, based on the area, time of concentration, P6 value, runoff coefficient, and peak flow rate.

Mitigation within the vault was modeled using SWMM 5.1. The Hydrograph that was generated from RickRatHydro was used as an input data for the inflows to the storage unit in the SWMM model. The riser was modeled using stage discharge table (Rating Curve in SWMM), and the volume was modeled using the storage stage table (Storage Curve), which represents the storage provided within the vault depth above excluding the water quality ponding depth.

The results from the SWMM model were used as input data (code 7) in the AES proposed condition model at the discharge location from the proposed vaults (Node 140 and 162), to generate the AES model for proposed mitigated flows.



Directions for Application:

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

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

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

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

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

Application Form:

(a) Selected frequency 100 year

(b) P_6 = 2.90 in., P_{24} = 5.25, $\frac{P_6}{P_{24}} = \frac{2.90}{5.25}$ = 55% (2)

(c) Adjusted P_6 (2) = 2.70 in.

(d) t_x = _____ min.

(e) I = _____ in./hr.

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

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

Intensity-Duration Design Chart - Template

FIGURE 3-1

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

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

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

3.1.2 Runoff Coefficient

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

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

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

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

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

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

Land Use		Runoff Coefficient "C"				
			Soil Type			
NRCS Elements	County Elements	% IMPER.	A	B	C	D
Undisturbed Natural Terrain (Natural)	Permanent Open Space	0*	0.20	0.25	0.30	0.35
Low Density Residential (LDR)	Residential, 1.0 DU/A or less	10	0.27	0.32	0.36	0.41
Low Density Residential (LDR)	Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46
Low Density Residential (LDR)	Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49
Medium Density Residential (MDR)	Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52
Medium Density Residential (MDR)	Residential, 7.3 DU/A or less	40	0.48	0.51	0.54	0.57
Medium Density Residential (MDR)	Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60
Medium Density Residential (MDR)	Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63
High Density Residential (HDR)	Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71
High Density Residential (HDR)	Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79
Commercial/Industrial (N. Com)	Neighborhood Commercial	80	0.76	0.77	0.78	0.79
Commercial/Industrial (G. Com)	General Commercial	85	0.80	0.80	0.81	0.82
Commercial/Industrial (O.P. Com)	Office Professional/Commercial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (Limited I.)	Limited Industrial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (General I.)	General Industrial	95	0.87	0.87	0.87	0.87

*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).
DU/A = dwelling units per acre
NRCS = National Resources Conservation Service

CHAPTER 3

HYDROLOGIC MODEL FOR EXISTING CONDITIONS

CHAPTER 3

HYDROLOGIC MODEL FOR EXISTING CONDITIONS

3.1 – 100 Year Storm Event

Existing Condition																		
AES INPUT DATA																		
Node #		Code	Elevation		Length (ft)	Slope	Area (Ac)			imperviousness	Soil Type A Area	Soil Type C Area	Soil Type D	C value	If Channel			If memory
From	To		Up	Down			total	Pervious	impervious		(ac)	(ac)	Area (ac)		Base (ft)	Z:1	maning	Bank #
102	104	2	464.0	432.0	100	32.0%	0.17	0.17	0.00	0.00%	0.00	0.00	0.17	0.35				
104	106	5	432.0	256.5	850	20.7%	1.01	1.01	0.00	0.00%	0.00	0.09	0.92	0.35	5	3	0.015	
106	106	1																1 of 2
108	110	2	264.3	263.6	65	1.1%	0.14	0.05	0.09	65.00%	0.03	0.00	0.02	0.68				
110	106	6	263.6	256.5	717	1.0%	4.90	1.87	3.03	61.94%	0.04	1.78	0.05	0.67				
106	106	1																2 of 2
106	118	5	256.5	219.0	255	14.7%									5	2	0.015	
118	118	1																1 of 3
114	116	2	248.0	240.0	100	8.0%	0.17	0.17	0.00	0.00%	0.00	0.00	0.17	0.35				
116	112	5	240.0	223.0	845	2.0%	2.33	2.18	0.15	6.30%	0.00	0.00	2.18	0.38	10	4	0.023	
112	118	5	223.0	219.0	260	1.5%	0.25	0.25	0.00	0.00%	0.25	0.00	0.00	0.20	10	8	0.023	
118	118	1																2 of 3
120	122	2	464.0	418.0	100	46.0%	0.10	0.10	0.00	0.00%	0.00	0.00	0.10	0.35				
122	124	5	418.0	280.0	624	22.1%	2.10	2.10	0.00	0.00%	0.00	0.00	2.10	0.35	20	40	0.03	
124	126	5	280.0	256.0	105	22.8%									18	8	0.04	
124	126	8					0.95	0.95	0.00	0.00%	0.00	0.00	0.95	0.35				
126	128	5	256.0	225.0	199	15.5%									10	8	0.04	
126	128	8					0.93	0.93	0.00	0.00%	0.00	0.93	0.00	0.30				
128	118	5	225.0	219.0	65	9.2%	0.41	0.41	0.00	0.00%	0.41	0.00	0.00	0.20	20	20	0.03	
118	118	1																3 of 3
118	118.1	5	219.0	217.0	180	1.1%	0.12	0.12	0.00	0.00%	0.12	0.00	0.00	0.20	10	8	0.023	
118.1	118.1	1																1 of 2
140	142	2	307.6	296.4	100	11.2%	0.05	0.05	0.00	0.00%	0.00	0.00	0.05	0.35				
142	144	5	296.4	246.0	250	20.2%	0.21	0.21	0.00	0.00%	0.00	0.00	0.21	0.35	20	8	0.04	
144	118.1	5	246.0	217.0	135	21.5%	0.22	0.22	0.00	0.00%	0.22	0.00	0.00	0.20	10	5	0.03	
118.1	118.1	1																2 of 2
118.1	1	5	217.0	204.0	750	1.7%									5	20	0.015	
1	1	1																1 of 3
114	137	2	245.0	235.0	100	10.0%	0.24	0.22	0.02	6.30%	0.00	0.00	0.22	0.38				
137	1	3	230.0	204.0	2400	1.1%												
137	1	1																2 of 3
132	134	2	463.8	448.0	100	15.8%	0.13	0.13	0.00	0.00%	0.00	0.00	0.13	0.35				
134	136	5	448.0	300.5	475	31.1%	7.66	7.64	0.02	0.31%	0.00	0.00	7.64	0.35	100	50	0.03	
136	138	5	300.5	229.3	338	21.0%									20	10	0.03	
136	138	8					5.62	5.62	0.00	0.00%	0.00	0.00	5.62	0.35				
138	1	5	229.3	204.0	610	4.1%	2.15	2.15	0.00	0.00%	2.15	0.00	0.00	0.20	20	50	0.023	
1	1	1																3 of 3
Total							29.86	26.55	3.31	11%	3.22	2.80	20.53	0.390				

Nodes correspond to existing dirt road. Although this subwatershed is within hydrologic soil types A and C, it is a man-made road and has been compaced. Soil type D has been assumed for these node processes.

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                          2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2015 Advanced Engineering Software (aes)
              Ver. 22.0 Release Date: 07/01/2015  License ID 1239

                             Analysis prepared by:

                      Hunsaker & Associates San Diego, Inc.
                               9707 Waples Street
                              San Diego,  CA 92121


 ************************* DESCRIPTION OF STUDY *************************
* OLIVE PARK APARTMENTS                                                 *
* 100 YR EXISTING HYDROLOGY ANALYSIS                                    *
* DLN 1746 W.O. 3785-0002                                               *
 ************************************************************************

  FILE NAME: R:\1746\HYD\TM\DR\CALCS\AES\EX\100EX.DAT
  TIME/DATE OF STUDY: 17:18 10/04/2024
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.900
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   20.0     15.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  2   14.0      9.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0160
  3   12.0      6.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

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

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    104.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    464.00
  DOWNSTREAM ELEVATION(FEET) =    432.00
  ELEVATION DIFFERENCE(FEET) =     32.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.605
  SUBAREA RUNOFF(CFS) =      0.39
  TOTAL AREA(ACRES) =      0.17   TOTAL RUNOFF(CFS) =      0.39

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    106.00 IS CODE =  51
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    432.00  DOWNSTREAM(FEET) =    257.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   850.00   CHANNEL SLOPE =  0.2059
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   3.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.265
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.34
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.36
  AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   2.64
  Tc(MIN.) =    8.91
  SUBAREA AREA(ACRES) =     1.01       SUBAREA RUNOFF(CFS) =    1.86
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        1.2         PEAK FLOW RATE(CFS) =       2.17

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   6.55
  LONGEST FLOWPATH FROM NODE    102.00 TO NODE    106.00 =     950.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 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.) =    8.91
  RAINFALL INTENSITY(INCH/HR) =   5.26
  TOTAL STREAM AREA(ACRES) =     1.18
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.17

****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    110.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6800
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    264.30
  DOWNSTREAM ELEVATION(FEET) =    263.60
  ELEVATION DIFFERENCE(FEET) =      0.70
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.946
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.832
  SUBAREA RUNOFF(CFS) =      0.65
  TOTAL AREA(ACRES) =      0.14   TOTAL RUNOFF(CFS) =      0.65

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    106.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  263.60  DOWNSTREAM ELEVATION(FEET) =  256.50
  STREET LENGTH(FEET) =   717.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  15.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200
```

```
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       8.52
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.38
   HALFSTREET FLOOD WIDTH(FEET) =   12.53
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.52
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.95
  STREET FLOW TRAVEL TIME(MIN.) =   4.74   Tc(MIN.) =   10.68
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.683
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6700
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.670
  SUBAREA AREA(ACRES) =    4.90      SUBAREA RUNOFF(CFS) =   15.37
  TOTAL AREA(ACRES) =        5.0        PEAK FLOW RATE(CFS) =      15.82

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.45   HALFSTREET FLOOD WIDTH(FEET) =  16.04
  FLOW VELOCITY(FEET/SEC.) =  2.94   DEPTH*VELOCITY(FT*FT/SEC.) =   1.31
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    106.00 =     782.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.68
  RAINFALL INTENSITY(INCH/HR) =   4.68
  TOTAL STREAM AREA(ACRES) =     5.04
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     15.82

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        2.17     8.91        5.265          1.18
      2       15.82    10.68        4.683          5.04

  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       15.36     8.91       5.265
      2       17.75    10.68       4.683

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      17.75   Tc(MIN.) =   10.68
  TOTAL AREA(ACRES) =        6.2
  LONGEST FLOWPATH FROM NODE    102.00 TO NODE    106.00 =     950.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    118.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    256.50  DOWNSTREAM(FEET) =    219.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   250.00   CHANNEL SLOPE =  0.1500
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =      17.75
  FLOW VELOCITY(FEET/SEC.) =  13.54   FLOW DEPTH(FEET) =   0.24
  TRAVEL TIME(MIN.) =   0.31   Tc(MIN.) =   10.99
  LONGEST FLOWPATH FROM NODE    102.00 TO NODE    118.00 =    1200.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    118.00 TO NODE    118.00 IS CODE =   1
```

```
------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
========================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.99
  RAINFALL INTENSITY(INCH/HR) =   4.60
  TOTAL STREAM AREA(ACRES) =     6.22
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     17.75

************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    116.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
========================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    248.00
  DOWNSTREAM ELEVATION(FEET) =    240.00
  ELEVATION DIFFERENCE(FEET) =      8.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.750
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.296
  SUBAREA RUNOFF(CFS) =      0.37
  TOTAL AREA(ACRES) =      0.17   TOTAL RUNOFF(CFS) =      0.37

************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    112.00 IS CODE =  51
------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    240.00  DOWNSTREAM(FEET) =    223.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   845.00   CHANNEL SLOPE =  0.0201
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.023   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.991
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3800
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.20
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.03
  AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =   6.94
  Tc(MIN.) =   13.69
  SUBAREA AREA(ACRES) =     2.33       SUBAREA RUNOFF(CFS) =    3.53
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.378
  TOTAL AREA(ACRES) =        2.5         PEAK FLOW RATE(CFS) =       3.77

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.15   FLOW VELOCITY(FEET/SEC.) =   2.41
  LONGEST FLOWPATH FROM NODE    114.00 TO NODE    112.00 =     945.00 FEET.

************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    118.00 IS CODE =  51
------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    223.00  DOWNSTREAM(FEET) =    219.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   260.00   CHANNEL SLOPE =  0.0154
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   8.000
  MANNING'S FACTOR = 0.023   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.656
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .2000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.86
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.18
  AVERAGE FLOW DEPTH(FEET) =   0.16   TRAVEL TIME(MIN.) =   1.99
  Tc(MIN.) =   15.67
```

```
  SUBAREA AREA(ACRES) =     0.25       SUBAREA RUNOFF(CFS) =    0.18
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.362
  TOTAL AREA(ACRES) =        2.8         PEAK FLOW RATE(CFS) =       3.77

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.16   FLOW VELOCITY(FEET/SEC.) =   2.16
  LONGEST FLOWPATH FROM NODE    114.00 TO NODE    118.00 =    1205.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    118.00 TO NODE    118.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   15.67
  RAINFALL INTENSITY(INCH/HR) =   3.66
  TOTAL STREAM AREA(ACRES) =     2.75
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.77

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    122.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    464.00
  DOWNSTREAM ELEVATION(FEET) =    418.00
  ELEVATION DIFFERENCE(FEET) =     46.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.605
  SUBAREA RUNOFF(CFS) =      0.23
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.23

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    124.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    418.00  DOWNSTREAM(FEET) =    280.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   624.00   CHANNEL SLOPE =  0.2212
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  40.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.848
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.04
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.70
  AVERAGE FLOW DEPTH(FEET) =   0.04   TRAVEL TIME(MIN.) =   3.86
  Tc(MIN.) =   10.12
  SUBAREA AREA(ACRES) =     2.10       SUBAREA RUNOFF(CFS) =    3.56
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        2.2         PEAK FLOW RATE(CFS) =       3.73

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   2.98
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    124.00 =     724.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    124.00 TO NODE    126.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    280.00  DOWNSTREAM(FEET) =    256.00
```

```
  CHANNEL LENGTH THRU SUBAREA(FEET) =   105.00   CHANNEL SLOPE =  0.2286
  CHANNEL BASE(FEET) =   18.00   "Z" FACTOR =   8.000
  MANNING'S FACTOR = 0.040   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       3.73
  FLOW VELOCITY(FEET/SEC.) =   2.81   FLOW DEPTH(FEET) =   0.07
  TRAVEL TIME(MIN.) =   0.62   Tc(MIN.) =   10.75
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    126.00 =     829.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    124.00 TO NODE    126.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.664
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.95   SUBAREA RUNOFF(CFS) =    1.55
  TOTAL AREA(ACRES) =        3.1   TOTAL RUNOFF(CFS) =       5.14
  TC(MIN.) =   10.75

****************************************************************************
  FLOW PROCESS FROM NODE    126.00 TO NODE    128.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    256.00  DOWNSTREAM(FEET) =    225.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   199.00   CHANNEL SLOPE =  0.1558
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   8.000
  MANNING'S FACTOR = 0.040   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       5.14
  FLOW VELOCITY(FEET/SEC.) =   3.51   FLOW DEPTH(FEET) =   0.13
  TRAVEL TIME(MIN.) =   0.95   Tc(MIN.) =   11.69
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    128.00 =    1028.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    126.00 TO NODE    128.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.418
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3386
  SUBAREA AREA(ACRES) =    0.93   SUBAREA RUNOFF(CFS) =    1.23
  TOTAL AREA(ACRES) =        4.1   TOTAL RUNOFF(CFS) =       6.10
  TC(MIN.) =   11.69

****************************************************************************
  FLOW PROCESS FROM NODE    128.00 TO NODE    118.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    225.00  DOWNSTREAM(FEET) =    219.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    65.00   CHANNEL SLOPE =  0.0923
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.331
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .2000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.28
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.97
  AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =   0.36
  Tc(MIN.) =   12.06
  SUBAREA AREA(ACRES) =     0.41       SUBAREA RUNOFF(CFS) =    0.36
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.326
```

```
  TOTAL AREA(ACRES) =        4.5         PEAK FLOW RATE(CFS) =       6.34

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.10   FLOW VELOCITY(FEET/SEC.) =   3.00
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    118.00 =    1093.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    118.00 TO NODE    118.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =   12.06
  RAINFALL INTENSITY(INCH/HR) =   4.33
  TOTAL STREAM AREA(ACRES) =     4.49
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.34

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       17.75    10.99        4.598          6.22
      2        3.77    15.67        3.656          2.75
      3        6.34    12.06        4.331          4.49

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       26.17    10.99       4.598
      2       25.96    12.06       4.331
      3       23.24    15.67       3.656

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      26.17   Tc(MIN.) =   10.99
  TOTAL AREA(ACRES) =       13.5
  LONGEST FLOWPATH FROM NODE    114.00 TO NODE    118.00 =    1205.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    118.00 TO NODE    118.10 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    219.00  DOWNSTREAM(FEET) =    217.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   180.00   CHANNEL SLOPE =  0.0111
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   8.000
  MANNING'S FACTOR = 0.023   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.390
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .2000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      26.23
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.67
  AVERAGE FLOW DEPTH(FEET) =   0.51   TRAVEL TIME(MIN.) =   0.82
  Tc(MIN.) =   11.81
  SUBAREA AREA(ACRES) =     0.12       SUBAREA RUNOFF(CFS) =    0.11
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.462
  TOTAL AREA(ACRES) =       13.6         PEAK FLOW RATE(CFS) =      27.54

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.52   FLOW VELOCITY(FEET/SEC.) =   3.71
  LONGEST FLOWPATH FROM NODE    114.00 TO NODE    118.10 =    1385.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    118.10 TO NODE    118.10 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
```

```
==============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.81
  RAINFALL INTENSITY(INCH/HR) =   4.39
  TOTAL STREAM AREA(ACRES) =    13.58
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     27.54

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    142.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    307.60
  DOWNSTREAM ELEVATION(FEET) =    296.40
  ELEVATION DIFFERENCE(FEET) =     11.20
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.605
  SUBAREA RUNOFF(CFS) =      0.12
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.12

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    144.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    296.40  DOWNSTREAM(FEET) =    246.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   250.00   CHANNEL SLOPE =  0.2016
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =   8.000
  MANNING'S FACTOR = 0.040   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.933
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.29
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.16
  AVERAGE FLOW DEPTH(FEET) =   0.01   TRAVEL TIME(MIN.) =   3.59
  Tc(MIN.) =    9.85
  SUBAREA AREA(ACRES) =     0.21       SUBAREA RUNOFF(CFS) =    0.36
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       0.45

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.02   FLOW VELOCITY(FEET/SEC.) =   1.23
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    144.00 =     350.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    144.00 TO NODE    118.10 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    246.00  DOWNSTREAM(FEET) =    217.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   135.00   CHANNEL SLOPE =  0.2148
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   5.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.595
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .2000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.55
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.96
  AVERAGE FLOW DEPTH(FEET) =   0.03   TRAVEL TIME(MIN.) =   1.15
  Tc(MIN.) =   11.00
  SUBAREA AREA(ACRES) =     0.22       SUBAREA RUNOFF(CFS) =    0.20
```

```
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.281
 TOTAL AREA(ACRES) =        0.5         PEAK FLOW RATE(CFS) =       0.62

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.03   FLOW VELOCITY(FEET/SEC.) =   2.21
 LONGEST FLOWPATH FROM NODE    140.00 TO NODE    118.10 =     485.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    118.10 TO NODE    118.10 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.) =   11.00
 RAINFALL INTENSITY(INCH/HR) =   4.60
 TOTAL STREAM AREA(ACRES) =     0.48
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.62

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       27.54    11.81        4.390         13.58
     2        0.62    11.00        4.595          0.48

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

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc      INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       26.93    11.00       4.595
     2       28.13    11.81       4.390

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      28.13   Tc(MIN.) =   11.81
 TOTAL AREA(ACRES) =       14.1
 LONGEST FLOWPATH FROM NODE    114.00 TO NODE    118.10 =    1385.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    118.10 TO NODE      1.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    217.00  DOWNSTREAM(FEET) =    204.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   750.00   CHANNEL SLOPE =  0.0173
 CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  20.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
 CHANNEL FLOW THRU SUBAREA(CFS) =      28.13
 FLOW VELOCITY(FEET/SEC.) =   5.22   FLOW DEPTH(FEET) =   0.41
 TRAVEL TIME(MIN.) =   2.40   Tc(MIN.) =   14.20
 LONGEST FLOWPATH FROM NODE    114.00 TO NODE      1.00 =    2135.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   14.20
 RAINFALL INTENSITY(INCH/HR) =   3.90
 TOTAL STREAM AREA(ACRES) =    14.06
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     28.13

****************************************************************************
 FLOW PROCESS FROM NODE    114.00 TO NODE    137.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
==============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3800
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    245.00
  DOWNSTREAM ELEVATION(FEET) =    235.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.016
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.781
  SUBAREA RUNOFF(CFS) =      0.62
  TOTAL AREA(ACRES) =      0.24   TOTAL RUNOFF(CFS) =      0.62

****************************************************************************
  FLOW PROCESS FROM NODE    137.00 TO NODE      1.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   230.00  DOWNSTREAM(FEET) =   204.00
  FLOW LENGTH(FEET) =  2400.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.23
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.62
  PIPE TRAVEL TIME(MIN.) =  12.40    Tc(MIN.) =   18.42
  LONGEST FLOWPATH FROM NODE    114.00 TO NODE      1.00 =    2500.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    137.00 TO NODE      1.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   18.42
  RAINFALL INTENSITY(INCH/HR) =   3.30
  TOTAL STREAM AREA(ACRES) =     0.24
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.62

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    134.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    463.80
  DOWNSTREAM ELEVATION(FEET) =    448.00
  ELEVATION DIFFERENCE(FEET) =     15.80
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.605
  SUBAREA RUNOFF(CFS) =      0.30
  TOTAL AREA(ACRES) =      0.13   TOTAL RUNOFF(CFS) =      0.30

****************************************************************************
  FLOW PROCESS FROM NODE    134.00 TO NODE    136.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    448.00  DOWNSTREAM(FEET) =    300.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   475.00   CHANNEL SLOPE =  0.3105
  CHANNEL BASE(FEET) =  100.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.105
```

```
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.21
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.57
  AVERAGE FLOW DEPTH(FEET) =   0.03   TRAVEL TIME(MIN.) =   3.08
  Tc(MIN.) =    9.34
  SUBAREA AREA(ACRES) =     7.66       SUBAREA RUNOFF(CFS) =   13.69
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        7.8         PEAK FLOW RATE(CFS) =      13.92

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.04   FLOW VELOCITY(FEET/SEC.) =   3.33
  LONGEST FLOWPATH FROM NODE    132.00 TO NODE    136.00 =     575.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    136.00 TO NODE    138.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    300.50  DOWNSTREAM(FEET) =    229.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   338.00   CHANNEL SLOPE =  0.2107
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =      13.92
  FLOW VELOCITY(FEET/SEC.) =   5.51   FLOW DEPTH(FEET) =   0.12
  TRAVEL TIME(MIN.) =   1.02   Tc(MIN.) =   10.37
  LONGEST FLOWPATH FROM NODE    132.00 TO NODE    138.00 =     913.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    136.00 TO NODE    138.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.774
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    5.62   SUBAREA RUNOFF(CFS) =    9.39
  TOTAL AREA(ACRES) =       13.4   TOTAL RUNOFF(CFS) =      22.41
  TC(MIN.) =   10.37

****************************************************************************
  FLOW PROCESS FROM NODE    138.00 TO NODE      1.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    229.30  DOWNSTREAM(FEET) =    204.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   610.00   CHANNEL SLOPE =  0.0415
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.023   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.117
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .2000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      23.29
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.80
  AVERAGE FLOW DEPTH(FEET) =   0.20   TRAVEL TIME(MIN.) =   2.67
  Tc(MIN.) =   13.04
  SUBAREA AREA(ACRES) =     2.15       SUBAREA RUNOFF(CFS) =    1.77
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.329
  TOTAL AREA(ACRES) =       15.6         PEAK FLOW RATE(CFS) =      22.41

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.20   FLOW VELOCITY(FEET/SEC.) =   3.70
  LONGEST FLOWPATH FROM NODE    132.00 TO NODE      1.00 =    1523.00 FEET.

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

```
 FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
 TIME OF CONCENTRATION(MIN.) =   13.04
 RAINFALL INTENSITY(INCH/HR) =   4.12
 TOTAL STREAM AREA(ACRES) =    15.56
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     22.41

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       28.13    14.20        3.896         14.06
     2        0.62    18.42        3.295          0.24
     3       22.41    13.04        4.117         15.56

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

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc      INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       49.47    13.04       4.117
     2       49.81    14.20       3.896
     3       42.35    18.42       3.295

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      49.81   Tc(MIN.) =   14.20
 TOTAL AREA(ACRES) =       29.9
 LONGEST FLOWPATH FROM NODE    114.00 TO NODE      1.00 =    2500.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =       29.9  TC(MIN.) =     14.20
 PEAK FLOW RATE(CFS)   =      49.81
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

CHAPTER 4

HYDROLOGIC MODEL FOR DEVELOPED CONDITIONS

CHAPTER 4

HYDROLOGIC MODEL FOR DEVELOPED CONDITIONS

4.1 – 100 Year Storm Event

Proposed Condition																			
AES INPUT DATA																			
Node #		Code	Elevation		Length (ft)	Slope	Area (Ac)			imperviousness	Soil Type A Area	Soil Type C Area	Soil Type D	C value	If Channel			If memory
From	To		Up	Down			total	Pervious	impervious		(ac)	(ac)	Area (ac)		Base (ft)	Z:1	maning	Bank #
102	104	2	464.0	453.0	65	16.9%	0.11	0.11	0.00	0.00%	0.00	0.00	0.11	0.35				
104	106	5	453.0	254.0	850	23.4%	1.32	1.32	0.00	0.00%	0.00	0.02	1.30	0.35	5	3	0.015	
106	112	3	244.0	243.4	61	1.1%												
112	112	1																1 of 2
108	110	2	264.3	263.6	65	1.1%	0.14	0.05	0.09	65.00%	0.03	0.00	0.02	0.68				
110	112	6	263.6	256.5	717	1.0%	4.89	1.86	3.03	61.96%	0.04	1.77	0.05	0.67				
112	112	1																2 of 2
112	113	3	238.0	222.5	176	8.8%												
113	113	10																1
120	122	2	264.0	263.3	65	1.1%	0.10	0.00	0.10	100.00%	0.00	0.00	0.00	0.90				
122	124	6	263.3	256.0	384	1.9%	0.60	0.18	0.42	70.00%	0.00	0.00	0.18	0.74				
124	125	3	246.0	244.0	101	2.0%												
126	125	8					0.21	0.06	0.15	70.00%	0.00	0.00	0.06	0.74				
125	127	3	244.0	242.9	55	2.0%												
128	127	8					0.22	0.07	0.15	70.00%	0.00	0.00	0.07	0.74				
127	142	3	242.9	227.0	208	7.6%												
142	142	1																1 of 3
130	132	2	264.0	262.7	65	2.0%	0.10	0.00	0.10	100.00%	0.00	0.00	0.00	0.90				
132	134	6	262.7	260.5	111	2.0%	0.30	0.09	0.21	70.00%	0.00	0.00	0.09	0.74				
134	135	3	250.5	249.7	74	1.0%												
136	135	8					0.15	0.05	0.11	70.00%	0.00	0.00	0.05	0.74				
135	142	3	249.7	227.0	296	7.7%												
142	142	1																2 of 3
138	140	2	263.0	262.3	65	1.1%	0.10	0.03	0.07	70.00%	0.00	0.00	0.03	0.74				
140	142	6	262.3	233.0	245	12.0%	0.55	0.17	0.39	70.00%	0.00	0.00	0.17	0.74				
142	142	1																3 of 3
142	145	3	222.0	221.5	10	5.0%												
145	145	10																2
114	116	2	242.7	242.0	65	1.0%	0.1	0.10	0.00	0.00%	0.00	0.10	0.00	0.30				
116	118	5	242.0	235.3	758	0.9%	1.29	1.14	0.15	11.63%	0.62	0.52	0.00	0.32	2	2	0.015	
118	119	3	225.0	224.8	25	0.8%												
118	119	8					0.53	0.03	0.50	95.00%	0.00	0.00	0.03	0.87				
119	113	3	224.8	223.0	180	1.0%												
119	113	8					0.27	0.27	0.00	0.00%	0.00	0.00	0.27	0.35				
113	113	11																1
113	113	12																1
113	145	3	223.0	221.5	140	1.1%												
145	145	11																2
145	145	12																2
145	143	3	221.5	220.0	90	1.7%												
143	143	1																1 of 2
139	141	2	238.0	234.0	100	4.0%	0.12	0.12	0.00	0.00%	0.12	0.00	0.00	0.20				
141	143	5	234.0	220.0	1080	1.3%	0.81	0.81	0.00	0.00%	0.81	0.00	0.00	0.20	10	8	0.023	
143	143	1																2 of 2
143	1	5	220.0	204.0	950	1.7%	0.53	0.53	0.00	0.00%	0.53	0.00	0.00	0.20	5	20	0.015	
1	1	10																1
146	148	2	264.0	262.5	65	2.3%	0.10	0.00	0.10	100.00%	0.00	0.00	0.00	0.90				
148	150	6	262.5	255.0	507	1.5%	1.47	0.15	1.32	90.00%	0.00	0.00	0.15	0.85				
150	151	3	245.0	244.0	88	1.1%												
152	151	8					0.25	0.03	0.23	90.00%	0.00	0.00	0.03	0.85				
151	160	3	244.0	242.4	131	1.3%												
160	160	1																1 of 3
162	164	2	264.0	263.4	65	1.0%	0.10	0.00	0.10	100.00%	0.00	0.00	0.00	0.90				
164	166	6	263.4	255.6	367	2.1%	0.72	0.07	0.65	90.00%	0.00	0.00	0.07	0.85				
166	167	3	245.6	245.2	17	2.4%												

Proposed Condition																			
AES INPUT DATA																			
Node #		Code	Elevation		Length (ft)	Slope	Area (Ac)			imperviousness	Soil Type A Area (ac)	Soil Type C Area (ac)	Soil Type D Area (ac)	C value	If Channel			If memory
From	To		Up	Down			total	Pervious	impervious						Base (ft)	Z:1	maning	Bank #
168	167	8					0.21	0.02	0.19	90.00%	0.00	0.00	0.02	0.85				
167	160	3	251.0	244.0	119	5.9%												
160	160	1																2 of 3
172	174	2	255.8	255.0	65	1.2%	0.09	0.01	0.08	90.00%	0.00	0.00	0.01	0.85				
174	176	6	255.0	252.0	305	1.0%	1.32	0.13	1.19	90.00%	0.00	0.00	0.13	0.85				
176	160	3	248.0	244.0	63	6.3%												
160	160	1																3 of 3
160	175	3	220.0	209.5	112	9.4%												
173	175	8					0.42	0.42	0.00	0.00%	0.00	0.00	0.42	0.35				
175	175	10																3
178	180	2	464.0	442.0	65	33.8%	0.10	0.10	0.00	0.00%	0.00	0.00	0.10	0.35				
180	182	5	442.0	312.0	394	33.0%									100	50	0.03	
180	182	8					2.08	2.08	0.00	0.00%	0.00	0.00	2.08	0.35				
184	182	8					0.16	0.16	0.00	0.00%	0.00	0.00	0.16	0.35				
182	182	1																1 of 2
186	188	2	464.2	463.5	65	1.1%	0.10	0.10	0.00	0.00%	0.00	0.00	0.10	0.35				
188	182	5	463.5	312.0	478	31.7%									100	50	0.03	
188	182	8					2.88	2.88	0.00	0.00%	0.00	0.00	2.88	0.35				
182	182	1																2 of 2
182	191	5	312.0	278.0	274	12.4%									3	3	0.015	
192	191	8					0.90	0.90	0.00	0.00%	0.00	0.00	0.90	0.35				
191	193	5	278.0	256.0	66	33.4%									3	3	0.015	
194	193	8					0.54	0.54	0.00	0.00%	0.00	0.00	0.54	0.35				
193	195	5	256.0	244.0	242	5.0%									3	3	0.015	
195	195	1																1 of 2
196	198	2	470.0	461.0	65	13.8%	0.10	0.08	0.02	15.46%	0.00	0.00	0.08	0.42				
198	195	5	461.0	244.0	550	39.5%									14	10	0.03	
198	195	8					2.50	2.50	0.00	0.00%	0.00	0.00	2.50	0.35				
195	195	1																2 of 2
195	175	5	244.0	209.5	333	10.4%									3	2	0.015	
199	175	8					0.50	0.50	0.00	0.00%	0.00	0.00	0.50	0.35				
175	175	1																1 of 2
200	202	2	448.5	426.0	65	34.6%	0.10	0.10	0.00	0.00%	0.00	0.00	0.10	0.35				
202	175	5	426.0	209.5	795	27.2%									80	50	0.03	
202	175	8					2.54	2.54	0.00	0.00%	0.28	0.00	2.26	0.33				
175	175	1																2 of 2
175	175	11																3
175	175	12																3
175	1	5	209.5	204.0	202	2.7%									10	8	0.03	
1	1	11																1
1	1	12																1
1	1	1																1 of 2
131	133	2	245.0	235.0	100	10.0%	0.06	0.01	0.05	90.00%	0.00	0.00	0.01	0.85				
133	137	3	231.0	230.0	35													
133	137	8					0.18	0.18	0.00	0.00%	0.00	0.00	0.18	0.35				
137	1	3	230.0	204.0	2400	1.1%												
137	1	1																2 of 2
Total							29.86	20.47	9.39	31.44%	2.52	2.33	15.64	0.507				

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2015 Advanced Engineering Software (aes)
              Ver. 22.0 Release Date: 07/01/2015  License ID 1239

                            Analysis prepared by:

                     Hunsaker & Associates San Diego, Inc.
                               9707 Waples Street
                              San Diego,  CA 92121


 ************************* DESCRIPTION OF STUDY *************************
* OLIVE PARK APARTMENTS                                                 *
* 100 YR PROPOSED DRAINAGE ANALYSIS                                     *
* DLN 1746 W.O. 3785-0002                                               *
 ************************************************************************

  FILE NAME: R:\1746\HYD\TM\DR\CALCS\AES\PR\100PR.DAT
  TIME/DATE OF STUDY: 14:30 10/11/2024
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.900
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   20.0     15.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  2   14.0      9.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  3   18.0     13.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  4   10.0      5.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    104.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
========================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    464.00
  DOWNSTREAM ELEVATION(FEET) =    453.00
  ELEVATION DIFFERENCE(FEET) =     11.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.052
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.590
  SUBAREA RUNOFF(CFS) =      0.29
  TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.29

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

```
 FLOW PROCESS FROM NODE    104.00 TO NODE    106.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    453.00  DOWNSTREAM(FEET) =    254.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   850.00   CHANNEL SLOPE =  0.2341
 CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   3.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.030
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .3500
 S.C.S. CURVE NUMBER (AMC II) =   0
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.70
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.54
 AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   2.16
 Tc(MIN.) =    7.22
 SUBAREA AREA(ACRES) =     1.32       SUBAREA RUNOFF(CFS) =    2.79
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
 TOTAL AREA(ACRES) =        1.4         PEAK FLOW RATE(CFS) =       3.02

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   8.09
 LONGEST FLOWPATH FROM NODE    102.00 TO NODE    106.00 =     915.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    106.00 TO NODE    112.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   244.00  DOWNSTREAM(FEET) =   243.40
 FLOW LENGTH(FEET) =    61.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.91
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       3.02
 PIPE TRAVEL TIME(MIN.) =   0.21    Tc(MIN.) =    7.42
 LONGEST FLOWPATH FROM NODE    102.00 TO NODE    112.00 =     976.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    112.00 TO NODE    112.00 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.) =    7.42
 RAINFALL INTENSITY(INCH/HR) =   5.92
 TOTAL STREAM AREA(ACRES) =     1.43
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.02

****************************************************************************
 FLOW PROCESS FROM NODE    108.00 TO NODE    110.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .6800
 S.C.S. CURVE NUMBER (AMC II) =   0
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
 UPSTREAM ELEVATION(FEET) =    264.30
 DOWNSTREAM ELEVATION(FEET) =    263.60
 ELEVATION DIFFERENCE(FEET) =      0.70
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.946
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.832
 SUBAREA RUNOFF(CFS) =      0.65
 TOTAL AREA(ACRES) =      0.14   TOTAL RUNOFF(CFS) =      0.65

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

```
 FLOW PROCESS FROM NODE    110.00 TO NODE    112.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  263.60  DOWNSTREAM ELEVATION(FEET) =  256.50
 STREET LENGTH(FEET) =   717.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 20.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  15.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       8.51
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.38
   HALFSTREET FLOOD WIDTH(FEET) =   12.53
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.52
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.95
 STREET FLOW TRAVEL TIME(MIN.) =   4.74   Tc(MIN.) =   10.68
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.682
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .6700
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.670
 SUBAREA AREA(ACRES) =    4.89      SUBAREA RUNOFF(CFS) =   15.34
 TOTAL AREA(ACRES) =        5.0        PEAK FLOW RATE(CFS) =      15.79

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.45   HALFSTREET FLOOD WIDTH(FEET) =  16.04
 FLOW VELOCITY(FEET/SEC.) =  2.93   DEPTH*VELOCITY(FT*FT/SEC.) =   1.31
 LONGEST FLOWPATH FROM NODE    108.00 TO NODE    112.00 =     782.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    112.00 TO NODE    112.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =   10.68
 RAINFALL INTENSITY(INCH/HR) =   4.68
 TOTAL STREAM AREA(ACRES) =     5.03
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     15.79

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1        3.02     7.42        5.921          1.43
     2       15.79    10.68        4.682          5.03

 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       13.99     7.42       5.921
     2       18.17    10.68       4.682

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      18.17   Tc(MIN.) =   10.68
 TOTAL AREA(ACRES) =        6.5
 LONGEST FLOWPATH FROM NODE    102.00 TO NODE    112.00 =     976.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    113.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   238.00  DOWNSTREAM(FEET) =   222.50
  FLOW LENGTH(FEET) =   176.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.59
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      18.17
  PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =   10.85
  LONGEST FLOWPATH FROM NODE    102.00 TO NODE    113.00 =    1152.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    113.00 TO NODE    113.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    122.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    264.00
  DOWNSTREAM ELEVATION(FEET) =    263.30
  ELEVATION DIFFERENCE(FEET) =      0.70
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.832
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.641
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.69
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.69

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    124.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  263.30  DOWNSTREAM ELEVATION(FEET) =  256.00
  STREET LENGTH(FEET) =   384.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 14.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   9.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.38
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
    HALFSTREET FLOOD WIDTH(FEET) =    8.48
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.84
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.84
  STREET FLOW TRAVEL TIME(MIN.) =   2.25   Tc(MIN.) =    5.08
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.562
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7400
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.763
```

```
  SUBAREA AREA(ACRES) =    0.60      SUBAREA RUNOFF(CFS) =    3.36
  TOTAL AREA(ACRES) =        0.7        PEAK FLOW RATE(CFS) =       4.04

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =  10.66
  FLOW VELOCITY(FEET/SEC.) =  3.22   DEPTH*VELOCITY(FT*FT/SEC.) =   1.09
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    124.00 =     449.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    124.00 TO NODE    125.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   246.00  DOWNSTREAM(FEET) =   244.00
  FLOW LENGTH(FEET) =   101.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.86
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.04
  PIPE TRAVEL TIME(MIN.) =   0.25    Tc(MIN.) =    5.33
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    125.00 =     550.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    126.00 TO NODE    125.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.335
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7400
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7576
  SUBAREA AREA(ACRES) =    0.21   SUBAREA RUNOFF(CFS) =    1.14
  TOTAL AREA(ACRES) =        0.9   TOTAL RUNOFF(CFS) =       5.06
  TC(MIN.) =    5.33

****************************************************************************
  FLOW PROCESS FROM NODE    125.00 TO NODE    127.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   244.00  DOWNSTREAM(FEET) =   242.90
  FLOW LENGTH(FEET) =    55.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.32
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.06
  PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =    5.45
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    127.00 =     605.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    128.00 TO NODE    127.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.226
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7400
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7542
  SUBAREA AREA(ACRES) =    0.22   SUBAREA RUNOFF(CFS) =    1.18
  TOTAL AREA(ACRES) =        1.1   TOTAL RUNOFF(CFS) =       6.16
  TC(MIN.) =    5.45

****************************************************************************
  FLOW PROCESS FROM NODE    127.00 TO NODE    142.00 IS CODE =  31
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   242.90  DOWNSTREAM(FEET) =   227.00
  FLOW LENGTH(FEET) =   208.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.56
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.16
  PIPE TRAVEL TIME(MIN.) =   0.28    Tc(MIN.) =    5.73
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    142.00 =     813.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.73
  RAINFALL INTENSITY(INCH/HR) =   7.00
  TOTAL STREAM AREA(ACRES) =     1.13
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.16

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    132.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    264.00
  DOWNSTREAM ELEVATION(FEET) =    262.70
  ELEVATION DIFFERENCE(FEET) =      1.30
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.304
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.641
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.69
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.69

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    134.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  3 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  262.70  DOWNSTREAM ELEVATION(FEET) =  260.45
  STREET LENGTH(FEET) =   111.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 18.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  13.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.54
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.26
    HALFSTREET FLOOD WIDTH(FEET) =    6.80
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.64
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.69
  STREET FLOW TRAVEL TIME(MIN.) =   0.70   Tc(MIN.) =    3.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.641
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
```

```
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7400
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.780
  SUBAREA AREA(ACRES) =    0.30      SUBAREA RUNOFF(CFS) =    1.70
  TOTAL AREA(ACRES) =        0.4        PEAK FLOW RATE(CFS) =       2.38

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.29   HALFSTREET FLOOD WIDTH(FEET) =   8.38
  FLOW VELOCITY(FEET/SEC.) =  2.91   DEPTH*VELOCITY(FT*FT/SEC.) =   0.85
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    134.00 =     176.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    134.00 TO NODE    135.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   250.45  DOWNSTREAM(FEET) =   249.70
  FLOW LENGTH(FEET) =    74.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.66
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.38
  PIPE TRAVEL TIME(MIN.) =   0.26    Tc(MIN.) =    3.27
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    135.00 =     250.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    136.00 TO NODE    135.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.641
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7718
  SUBAREA AREA(ACRES) =    0.15   SUBAREA RUNOFF(CFS) =    0.86
  TOTAL AREA(ACRES) =        0.6   TOTAL RUNOFF(CFS) =       3.24
  TC(MIN.) =    3.27

****************************************************************************
  FLOW PROCESS FROM NODE    135.00 TO NODE    142.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   249.70  DOWNSTREAM(FEET) =   227.00
  FLOW LENGTH(FEET) =   296.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.47
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.24
  PIPE TRAVEL TIME(MIN.) =   0.47    Tc(MIN.) =    3.74
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    142.00 =     546.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    3.74
  RAINFALL INTENSITY(INCH/HR) =   7.64
  TOTAL STREAM AREA(ACRES) =     0.55
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.24
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    138.00 TO NODE    140.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7400
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    263.00
  DOWNSTREAM ELEVATION(FEET) =    262.30
  ELEVATION DIFFERENCE(FEET) =      0.70
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.097
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.547
  SUBAREA RUNOFF(CFS) =      0.56
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.56

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    142.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  262.30  DOWNSTREAM ELEVATION(FEET) =  233.00
  STREET LENGTH(FEET) =   245.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  15.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.97
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.17
    HALFSTREET FLOOD WIDTH(FEET) =    2.35
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.68
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.98
  STREET FLOW TRAVEL TIME(MIN.) =   0.72   Tc(MIN.) =    5.82
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.931
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7400
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.740
  SUBAREA AREA(ACRES) =    0.55      SUBAREA RUNOFF(CFS) =    2.82
  TOTAL AREA(ACRES) =        0.7        PEAK FLOW RATE(CFS) =       3.33

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.21   HALFSTREET FLOOD WIDTH(FEET) =   4.21
  FLOW VELOCITY(FEET/SEC.) =  5.65   DEPTH*VELOCITY(FT*FT/SEC.) =   1.19
  LONGEST FLOWPATH FROM NODE    138.00 TO NODE    142.00 =     310.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.82
  RAINFALL INTENSITY(INCH/HR) =   6.93
  TOTAL STREAM AREA(ACRES) =     0.65
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.33

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

```
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        6.16     5.73        6.999          1.13
      2        3.24     3.74        7.641          0.55
      3        3.33     5.82        6.931          0.65

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        9.41     3.74       7.641
      2       12.41     5.73       6.999
      3       12.37     5.82       6.931

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      12.41   Tc(MIN.) =    5.73
  TOTAL AREA(ACRES) =        2.3
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    142.00 =     813.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    145.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   222.00  DOWNSTREAM(FEET) =   221.50
  FLOW LENGTH(FEET) =    10.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   9.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.95
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.41
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =    5.74
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    145.00 =     823.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    145.00 TO NODE    145.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    116.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    242.70
  DOWNSTREAM ELEVATION(FEET) =    242.00
  ELEVATION DIFFERENCE(FEET) =      0.70
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =   11.326
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.509
  SUBAREA RUNOFF(CFS) =      0.14
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.14

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    118.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    242.00  DOWNSTREAM(FEET) =    235.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   758.00   CHANNEL SLOPE =  0.0088
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.540
  *USER SPECIFIED(SUBAREA):
```

```
  USER-SPECIFIED RUNOFF COEFFICIENT = .3300
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.89
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.45
  AVERAGE FLOW DEPTH(FEET) =   0.16   TRAVEL TIME(MIN.) =   5.15
  Tc(MIN.) =   16.48
  SUBAREA AREA(ACRES) =     1.29       SUBAREA RUNOFF(CFS) =    1.51
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.328
  TOTAL AREA(ACRES) =        1.4         PEAK FLOW RATE(CFS) =       1.61

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.22   FLOW VELOCITY(FEET/SEC.) =   2.94
  LONGEST FLOWPATH FROM NODE    114.00 TO NODE    118.00 =     823.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    118.00 TO NODE    119.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   225.00  DOWNSTREAM(FEET) =   224.80
  FLOW LENGTH(FEET) =    25.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.84
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.61
  PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =   16.59
  LONGEST FLOWPATH FROM NODE    114.00 TO NODE    119.00 =     848.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    118.00 TO NODE    119.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.525
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4775
  SUBAREA AREA(ACRES) =    0.53   SUBAREA RUNOFF(CFS) =    1.63
  TOTAL AREA(ACRES) =        1.9   TOTAL RUNOFF(CFS) =       3.23
  TC(MIN.) =   16.59

****************************************************************************
  FLOW PROCESS FROM NODE    119.00 TO NODE    113.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   224.80  DOWNSTREAM(FEET) =   223.00
  FLOW LENGTH(FEET) =   180.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.04
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.23
  PIPE TRAVEL TIME(MIN.) =   0.60    Tc(MIN.) =   17.18
  LONGEST FLOWPATH FROM NODE    114.00 TO NODE    113.00 =    1028.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    119.00 TO NODE    113.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.446
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4618
  SUBAREA AREA(ACRES) =    0.27   SUBAREA RUNOFF(CFS) =    0.33
```

```
  TOTAL AREA(ACRES) =        2.2   TOTAL RUNOFF(CFS) =       3.49
  TC(MIN.) =   17.18

****************************************************************************
  FLOW PROCESS FROM NODE    113.00 TO NODE    113.00 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        3.49    17.18       3.446        2.19
  LONGEST FLOWPATH FROM NODE    114.00 TO NODE    113.00 =    1028.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       18.17    10.85       4.635        6.46
  LONGEST FLOWPATH FROM NODE    102.00 TO NODE    113.00 =    1152.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      20.37      10.85        4.635
      2      16.99      17.18        3.446

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      20.37   Tc(MIN.) =   10.85
  TOTAL AREA(ACRES) =        8.6

****************************************************************************
  FLOW PROCESS FROM NODE    113.00 TO NODE    113.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    113.00 TO NODE    145.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   223.00  DOWNSTREAM(FEET) =   221.50
  FLOW LENGTH(FEET) =   140.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  18.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.02
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      20.37
  PIPE TRAVEL TIME(MIN.) =   0.29    Tc(MIN.) =   11.14
  LONGEST FLOWPATH FROM NODE    102.00 TO NODE    145.00 =    1292.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    145.00 TO NODE    145.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       20.37    11.14       4.557        8.65
  LONGEST FLOWPATH FROM NODE    102.00 TO NODE    145.00 =    1292.00 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       12.41     5.74       6.989        2.33
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    145.00 =     823.00 FEET.

  ** PEAK FLOW RATE TABLE **
```

```
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      22.91       5.74        6.989
      2      28.47      11.14        4.557

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      28.47   Tc(MIN.) =   11.14
  TOTAL AREA(ACRES) =       11.0

****************************************************************************
  FLOW PROCESS FROM NODE    145.00 TO NODE    145.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    145.00 TO NODE    143.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   221.50  DOWNSTREAM(FEET) =   220.00
  FLOW LENGTH(FEET) =    90.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  17.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.47
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      28.47
  PIPE TRAVEL TIME(MIN.) =   0.14    Tc(MIN.) =   11.29
  LONGEST FLOWPATH FROM NODE    102.00 TO NODE    143.00 =    1382.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    143.00 TO NODE    143.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.29
  RAINFALL INTENSITY(INCH/HR) =   4.52
  TOTAL STREAM AREA(ACRES) =    10.98
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     28.47

****************************************************************************
  FLOW PROCESS FROM NODE    139.00 TO NODE    141.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .2000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    238.00
  DOWNSTREAM ELEVATION(FEET) =    234.00
  ELEVATION DIFFERENCE(FEET) =      4.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =   10.206
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.822
  SUBAREA RUNOFF(CFS) =      0.12
  TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.12

****************************************************************************
  FLOW PROCESS FROM NODE    141.00 TO NODE    143.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    234.00  DOWNSTREAM(FEET) =    220.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1080.00   CHANNEL SLOPE =  0.0130
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   8.000
  MANNING'S FACTOR = 0.023   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.359
  *USER SPECIFIED(SUBAREA):
```

```
  USER-SPECIFIED RUNOFF COEFFICIENT = .2000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.32
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.87
  AVERAGE FLOW DEPTH(FEET) =   0.04   TRAVEL TIME(MIN.) =  20.71
  Tc(MIN.) =   30.92
  SUBAREA AREA(ACRES) =     0.81       SUBAREA RUNOFF(CFS) =    0.38
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.200
  TOTAL AREA(ACRES) =        0.9         PEAK FLOW RATE(CFS) =       0.44

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.05   FLOW VELOCITY(FEET/SEC.) =   0.87
  LONGEST FLOWPATH FROM NODE    139.00 TO NODE    143.00 =    1180.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    143.00 TO NODE    143.00 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.) =   30.92
  RAINFALL INTENSITY(INCH/HR) =   2.36
  TOTAL STREAM AREA(ACRES) =     0.93
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.44

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       28.47    11.29        4.520         10.98
      2        0.44    30.92        2.359          0.93

  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       28.63    11.29       4.520
      2       15.30    30.92       2.359

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      28.63   Tc(MIN.) =   11.29
  TOTAL AREA(ACRES) =       11.9
  LONGEST FLOWPATH FROM NODE    102.00 TO NODE    143.00 =    1382.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    143.00 TO NODE      1.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    220.00  DOWNSTREAM(FEET) =    204.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   950.00   CHANNEL SLOPE =  0.0168
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.873
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .2000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      28.83
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.19
  AVERAGE FLOW DEPTH(FEET) =   0.42   TRAVEL TIME(MIN.) =   3.05
  Tc(MIN.) =   14.34
  SUBAREA AREA(ACRES) =     0.53       SUBAREA RUNOFF(CFS) =    0.41
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.557
  TOTAL AREA(ACRES) =       12.4         PEAK FLOW RATE(CFS) =      28.63

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.41   FLOW VELOCITY(FEET/SEC.) =   5.19
```

 LONGEST FLOWPATH FROM NODE 102.00 TO NODE 1.00 = 2332.00 FEET.

****
 FLOW PROCESS FROM NODE 1.00 TO NODE 1.00 IS CODE = 10

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

****
 FLOW PROCESS FROM NODE 146.00 TO NODE 148.00 IS CODE = 21

 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .9000
 S.C.S. CURVE NUMBER (AMC II) = 0
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 65.00
 UPSTREAM ELEVATION(FEET) = 264.00
 DOWNSTREAM ELEVATION(FEET) = 262.50
 ELEVATION DIFFERENCE(FEET) = 1.50
 SUBAREA OVERLAND TIME OF FLOW(MIN.) = 2.196
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.641
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) = 0.69
 TOTAL AREA(ACRES) = 0.10 TOTAL RUNOFF(CFS) = 0.69

****
 FLOW PROCESS FROM NODE 148.00 TO NODE 150.00 IS CODE = 62

 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION # 3 USED)<<<<<
==
 UPSTREAM ELEVATION(FEET) = 262.50 DOWNSTREAM ELEVATION(FEET) = 255.00
 STREET LENGTH(FEET) = 507.00 CURB HEIGHT(INCHES) = 6.0
 STREET HALFWIDTH(FEET) = 18.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 13.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 5.46
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.38
   HALFSTREET FLOOD WIDTH(FEET) = 12.74
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.13
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.19
 STREET FLOW TRAVEL TIME(MIN.) = 2.70 Tc(MIN.) = 4.89
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.641
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) = 0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.853
 SUBAREA AREA(ACRES) = 1.47 SUBAREA RUNOFF(CFS) = 9.55
 TOTAL AREA(ACRES) = 1.6 PEAK FLOW RATE(CFS) = 10.23

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.45 HALFSTREET FLOOD WIDTH(FEET) = 16.40
 FLOW VELOCITY(FEET/SEC.) = 3.65 DEPTH*VELOCITY(FT*FT/SEC.) = 1.66
 LONGEST FLOWPATH FROM NODE 146.00 TO NODE 150.00 = 572.00 FEET.

****
 FLOW PROCESS FROM NODE 150.00 TO NODE 151.00 IS CODE = 31

 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

```
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   245.00  DOWNSTREAM(FEET) =   244.00
  FLOW LENGTH(FEET) =    88.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  14.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.84
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.23
  PIPE TRAVEL TIME(MIN.) =   0.21    Tc(MIN.) =    5.11
  LONGEST FLOWPATH FROM NODE    146.00 TO NODE    151.00 =     660.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    152.00 TO NODE    151.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.538
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8527
  SUBAREA AREA(ACRES) =    0.25   SUBAREA RUNOFF(CFS) =    1.60
  TOTAL AREA(ACRES) =        1.8   TOTAL RUNOFF(CFS) =      11.70
  TC(MIN.) =    5.11

****************************************************************************
  FLOW PROCESS FROM NODE    151.00 TO NODE    160.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   244.00  DOWNSTREAM(FEET) =   242.40
  FLOW LENGTH(FEET) =   131.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.48
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.70
  PIPE TRAVEL TIME(MIN.) =   0.29    Tc(MIN.) =    5.40
  LONGEST FLOWPATH FROM NODE    146.00 TO NODE    160.00 =     791.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.40
  RAINFALL INTENSITY(INCH/HR) =   7.27
  TOTAL STREAM AREA(ACRES) =     1.82
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     11.70

****************************************************************************
  FLOW PROCESS FROM NODE    162.00 TO NODE    164.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    264.00
  DOWNSTREAM ELEVATION(FEET) =    263.35
  ELEVATION DIFFERENCE(FEET) =      0.65
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.789
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    60.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.641
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.69
```

```
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.69

****************************************************************************
  FLOW PROCESS FROM NODE    164.00 TO NODE    166.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  263.35  DOWNSTREAM ELEVATION(FEET) =  255.60
  STREET LENGTH(FEET) =   367.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 14.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   9.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.03
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.31
    HALFSTREET FLOOD WIDTH(FEET) =    9.25
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.10
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.97
  STREET FLOW TRAVEL TIME(MIN.) =   1.97   Tc(MIN.) =    4.76
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.641
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.856
  SUBAREA AREA(ACRES) =    0.72      SUBAREA RUNOFF(CFS) =    4.68
  TOTAL AREA(ACRES) =        0.8        PEAK FLOW RATE(CFS) =       5.36

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.36   HALFSTREET FLOOD WIDTH(FEET) =  11.79
  FLOW VELOCITY(FEET/SEC.) =  3.56   DEPTH*VELOCITY(FT*FT/SEC.) =   1.29
  LONGEST FLOWPATH FROM NODE    162.00 TO NODE    166.00 =     432.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    166.00 TO NODE    167.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   245.60  DOWNSTREAM(FEET) =   245.20
  FLOW LENGTH(FEET) =    17.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.89
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.36
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    4.79
  LONGEST FLOWPATH FROM NODE    162.00 TO NODE    167.00 =     449.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    168.00 TO NODE    167.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.641
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8549
  SUBAREA AREA(ACRES) =    0.21   SUBAREA RUNOFF(CFS) =    1.36
  TOTAL AREA(ACRES) =        1.0   TOTAL RUNOFF(CFS) =       6.73
```

```
  TC(MIN.) =    4.79

****************************************************************************
  FLOW PROCESS FROM NODE    167.00 TO NODE    160.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   251.00  DOWNSTREAM(FEET) =   244.00
  FLOW LENGTH(FEET) =   119.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.71
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.73
  PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =    4.96
  LONGEST FLOWPATH FROM NODE    162.00 TO NODE    160.00 =     568.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    4.96
  RAINFALL INTENSITY(INCH/HR) =   7.64
  TOTAL STREAM AREA(ACRES) =     1.03
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.73

****************************************************************************
  FLOW PROCESS FROM NODE    172.00 TO NODE    174.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    255.80
  DOWNSTREAM ELEVATION(FEET) =    255.00
  ELEVATION DIFFERENCE(FEET) =      0.80
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.315
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    62.31
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.641
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.58
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.58

****************************************************************************
  FLOW PROCESS FROM NODE    174.00 TO NODE    176.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  255.00  DOWNSTREAM ELEVATION(FEET) =  252.00
  STREET LENGTH(FEET) =   305.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 14.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   9.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200
```

```
  **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.57
  STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
  STREET FLOW DEPTH(FEET) =  0.32
  HALFSTREET FLOOD WIDTH(FEET) =    9.61
  AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.19
  PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.70
 STREET FLOW TRAVEL TIME(MIN.) =   2.32   Tc(MIN.) =    5.63
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.077
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
 SUBAREA AREA(ACRES) =    1.32      SUBAREA RUNOFF(CFS) =    7.94
 TOTAL AREA(ACRES) =        1.4        PEAK FLOW RATE(CFS) =       8.48

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.38   HALFSTREET FLOOD WIDTH(FEET) =  12.49
 FLOW VELOCITY(FEET/SEC.) =  2.53   DEPTH*VELOCITY(FT*FT/SEC.) =   0.95
 LONGEST FLOWPATH FROM NODE    172.00 TO NODE    176.00 =     370.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    176.00 TO NODE    160.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   248.00  DOWNSTREAM(FEET) =   244.00
 FLOW LENGTH(FEET) =    63.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  12.83
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       8.48
 PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =    5.71
 LONGEST FLOWPATH FROM NODE    172.00 TO NODE    160.00 =     433.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
 TIME OF CONCENTRATION(MIN.) =    5.71
 RAINFALL INTENSITY(INCH/HR) =   7.01
 TOTAL STREAM AREA(ACRES) =     1.41
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      8.48

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       11.70     5.40        7.272          1.82
     2        6.73     4.96        7.641          1.03
     3        8.48     5.71        7.011          1.41

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

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc      INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       24.85     4.96       7.641
     2       26.12     5.40       7.272
     3       25.93     5.71       7.011

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      26.12   Tc(MIN.) =    5.40
 TOTAL AREA(ACRES) =        4.3
 LONGEST FLOWPATH FROM NODE    146.00 TO NODE    160.00 =     791.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    175.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   220.00  DOWNSTREAM(FEET) =   209.50
  FLOW LENGTH(FEET) =   112.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  19.40
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      26.12
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =    5.49
  LONGEST FLOWPATH FROM NODE    146.00 TO NODE    175.00 =     903.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    173.00 TO NODE    175.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.190
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8073
  SUBAREA AREA(ACRES) =    0.42   SUBAREA RUNOFF(CFS) =    1.06
  TOTAL AREA(ACRES) =        4.7   TOTAL RUNOFF(CFS) =      27.16
  TC(MIN.) =    5.49

****************************************************************************
  FLOW PROCESS FROM NODE    175.00 TO NODE    175.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 3 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    178.00 TO NODE    180.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    464.00
  DOWNSTREAM ELEVATION(FEET) =    442.00
  ELEVATION DIFFERENCE(FEET) =     22.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.052
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.590
  SUBAREA RUNOFF(CFS) =      0.27
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.27

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    182.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    442.00  DOWNSTREAM(FEET) =    312.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   394.00   CHANNEL SLOPE =  0.3299
  CHANNEL BASE(FEET) =  100.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.27
  FLOW VELOCITY(FEET/SEC.) =   0.56   FLOW DEPTH(FEET) =   0.00
  TRAVEL TIME(MIN.) =  11.82   Tc(MIN.) =   16.87
  LONGEST FLOWPATH FROM NODE    178.00 TO NODE    182.00 =     459.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    182.00 IS CODE =  81
----------------------------------------------------------------------------
```

```
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.487
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    2.08   SUBAREA RUNOFF(CFS) =    2.54
  TOTAL AREA(ACRES) =        2.2   TOTAL RUNOFF(CFS) =       2.66
  TC(MIN.) =   16.87

****************************************************************************
  FLOW PROCESS FROM NODE    184.00 TO NODE    182.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.487
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.16   SUBAREA RUNOFF(CFS) =    0.20
  TOTAL AREA(ACRES) =        2.3   TOTAL RUNOFF(CFS) =       2.86
  TC(MIN.) =   16.87

****************************************************************************
  FLOW PROCESS FROM NODE    182.00 TO NODE    182.00 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.) =   16.87
  RAINFALL INTENSITY(INCH/HR) =   3.49
  TOTAL STREAM AREA(ACRES) =     2.34
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.86

****************************************************************************
  FLOW PROCESS FROM NODE    186.00 TO NODE    188.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
================================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    464.20
  DOWNSTREAM ELEVATION(FEET) =    463.50
  ELEVATION DIFFERENCE(FEET) =      0.70
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =   10.618
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.701
  SUBAREA RUNOFF(CFS) =      0.16
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.16

****************************************************************************
  FLOW PROCESS FROM NODE    188.00 TO NODE    182.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    463.50  DOWNSTREAM(FEET) =    312.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   478.00   CHANNEL SLOPE =  0.3169
  CHANNEL BASE(FEET) =  100.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.16
  FLOW VELOCITY(FEET/SEC.) =   0.57   FLOW DEPTH(FEET) =   0.00
  TRAVEL TIME(MIN.) =  13.87   Tc(MIN.) =   24.49
  LONGEST FLOWPATH FROM NODE    186.00 TO NODE    182.00 =     543.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    188.00 TO NODE    182.00 IS CODE =  81
```

```
------------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.742
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    2.88   SUBAREA RUNOFF(CFS) =    2.76
  TOTAL AREA(ACRES) =        3.0   TOTAL RUNOFF(CFS) =       2.86
  TC(MIN.) =   24.49

****************************************************************************
  FLOW PROCESS FROM NODE    182.00 TO NODE    182.00 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.) =   24.49
  RAINFALL INTENSITY(INCH/HR) =   2.74
  TOTAL STREAM AREA(ACRES) =     2.98
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.86

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        2.86    16.87        3.487          2.34
      2        2.86    24.49        2.742          2.98

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        4.83    16.87       3.487
      2        5.11    24.49       2.742

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       5.11   Tc(MIN.) =   24.49
  TOTAL AREA(ACRES) =        5.3
  LONGEST FLOWPATH FROM NODE    186.00 TO NODE    182.00 =     543.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    182.00 TO NODE    191.00 IS CODE =  51
------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    312.00  DOWNSTREAM(FEET) =    278.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   274.00   CHANNEL SLOPE =  0.1241
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   3.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       5.11
  FLOW VELOCITY(FEET/SEC.) =   9.34   FLOW DEPTH(FEET) =   0.16
  TRAVEL TIME(MIN.) =   0.49   Tc(MIN.) =   24.98
  LONGEST FLOWPATH FROM NODE    186.00 TO NODE    191.00 =     817.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    192.00 TO NODE    191.00 IS CODE =  81
------------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.707
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.90   SUBAREA RUNOFF(CFS) =    0.85
```

```
  TOTAL AREA(ACRES) =        6.2   TOTAL RUNOFF(CFS) =       5.89
  TC(MIN.) =   24.98

****************************************************************************
  FLOW PROCESS FROM NODE    191.00 TO NODE    193.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    278.00  DOWNSTREAM(FEET) =    256.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    66.00   CHANNEL SLOPE =  0.3333
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   3.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       5.89
  FLOW VELOCITY(FEET/SEC.) =  13.74   FLOW DEPTH(FEET) =   0.13
  TRAVEL TIME(MIN.) =   0.08   Tc(MIN.) =   25.06
  LONGEST FLOWPATH FROM NODE    186.00 TO NODE    193.00 =     883.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    194.00 TO NODE    193.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.702
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.54   SUBAREA RUNOFF(CFS) =    0.51
  TOTAL AREA(ACRES) =        6.8   TOTAL RUNOFF(CFS) =       6.39
  TC(MIN.) =   25.06

****************************************************************************
  FLOW PROCESS FROM NODE    193.00 TO NODE    195.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    256.00  DOWNSTREAM(FEET) =    244.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   242.00   CHANNEL SLOPE =  0.0496
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   3.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       6.39
  FLOW VELOCITY(FEET/SEC.) =   7.39   FLOW DEPTH(FEET) =   0.23
  TRAVEL TIME(MIN.) =   0.55   Tc(MIN.) =   25.61
  LONGEST FLOWPATH FROM NODE    186.00 TO NODE    195.00 =    1125.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    195.00 TO NODE    195.00 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.) =   25.61
  RAINFALL INTENSITY(INCH/HR) =   2.66
  TOTAL STREAM AREA(ACRES) =     6.76
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.39

****************************************************************************
  FLOW PROCESS FROM NODE    196.00 TO NODE    198.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4200
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    470.00
  DOWNSTREAM ELEVATION(FEET) =    461.00
  ELEVATION DIFFERENCE(FEET) =      9.00
```

```
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.581
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.641
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE    198.00 TO NODE    195.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    461.00  DOWNSTREAM(FEET) =    244.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   550.00   CHANNEL SLOPE =  0.3945
  CHANNEL BASE(FEET) =   14.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.32
  FLOW VELOCITY(FEET/SEC.) =   1.83   FLOW DEPTH(FEET) =   0.01
  TRAVEL TIME(MIN.) =   5.00   Tc(MIN.) =    9.58
  LONGEST FLOWPATH FROM NODE    196.00 TO NODE    195.00 =     615.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    198.00 TO NODE    195.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.022
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3527
  SUBAREA AREA(ACRES) =    2.50   SUBAREA RUNOFF(CFS) =    4.39
  TOTAL AREA(ACRES) =        2.6   TOTAL RUNOFF(CFS) =       4.61
  TC(MIN.) =    9.58

****************************************************************************
  FLOW PROCESS FROM NODE    195.00 TO NODE    195.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.58
  RAINFALL INTENSITY(INCH/HR) =   5.02
  TOTAL STREAM AREA(ACRES) =     2.60
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.61

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        6.39    25.61        2.664          6.76
      2        4.61     9.58        5.022          2.60

  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        8.00     9.58       5.022
      2        8.84    25.61       2.664

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       8.84   Tc(MIN.) =   25.61
  TOTAL AREA(ACRES) =        9.4
  LONGEST FLOWPATH FROM NODE    186.00 TO NODE    195.00 =    1125.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    195.00 TO NODE    175.00 IS CODE =  51
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    244.00  DOWNSTREAM(FEET) =    209.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   333.00   CHANNEL SLOPE =  0.1036
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       8.84
  FLOW VELOCITY(FEET/SEC.) =  10.91   FLOW DEPTH(FEET) =   0.23
  TRAVEL TIME(MIN.) =   0.51   Tc(MIN.) =   26.12
  LONGEST FLOWPATH FROM NODE    186.00 TO NODE    175.00 =    1458.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    199.00 TO NODE    175.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.631
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3507
  SUBAREA AREA(ACRES) =    0.50   SUBAREA RUNOFF(CFS) =    0.46
  TOTAL AREA(ACRES) =        9.9   TOTAL RUNOFF(CFS) =       9.10
  TC(MIN.) =   26.12

****************************************************************************
  FLOW PROCESS FROM NODE    175.00 TO NODE    175.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   26.12
  RAINFALL INTENSITY(INCH/HR) =   2.63
  TOTAL STREAM AREA(ACRES) =     9.86
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.10

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    202.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    448.50
  DOWNSTREAM ELEVATION(FEET) =    426.00
  ELEVATION DIFFERENCE(FEET) =     22.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.052
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.590
  SUBAREA RUNOFF(CFS) =      0.27
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.27

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    175.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    426.00  DOWNSTREAM(FEET) =    209.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   795.00   CHANNEL SLOPE =  0.2723
  CHANNEL BASE(FEET) =   80.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.27
  FLOW VELOCITY(FEET/SEC.) =   0.69   FLOW DEPTH(FEET) =   0.00
  TRAVEL TIME(MIN.) =  19.08   Tc(MIN.) =   24.14
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    175.00 =     860.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    175.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.768
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3300
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3308
  SUBAREA AREA(ACRES) =    2.54   SUBAREA RUNOFF(CFS) =    2.32
  TOTAL AREA(ACRES) =        2.6   TOTAL RUNOFF(CFS) =       2.42
  TC(MIN.) =   24.14

****************************************************************************
  FLOW PROCESS FROM NODE    175.00 TO NODE    175.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   24.14
  RAINFALL INTENSITY(INCH/HR) =   2.77
  TOTAL STREAM AREA(ACRES) =     2.64
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.42

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        9.10    26.12        2.631          9.86
      2        2.42    24.14        2.768          2.64

  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       11.06    24.14       2.768
      2       11.39    26.12       2.631

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      11.39   Tc(MIN.) =   26.12
  TOTAL AREA(ACRES) =       12.5
  LONGEST FLOWPATH FROM NODE    186.00 TO NODE    175.00 =    1458.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    175.00 TO NODE    175.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 3 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       11.39    26.12       2.631       12.50
  LONGEST FLOWPATH FROM NODE    186.00 TO NODE    175.00 =    1458.00 FEET.

  ** MEMORY BANK #  3 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       27.16     5.49       7.190        4.68
  LONGEST FLOWPATH FROM NODE    146.00 TO NODE    175.00 =     903.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      29.56       5.49        7.190
      2      21.33      26.12        2.631
```

```
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      29.56   Tc(MIN.) =    5.49
  TOTAL AREA(ACRES) =       17.2

****************************************************************************
  FLOW PROCESS FROM NODE    175.00 TO NODE    175.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 3 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    175.00 TO NODE      1.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    209.50  DOWNSTREAM(FEET) =    204.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   202.00   CHANNEL SLOPE =  0.0272
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   8.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =      29.56
  FLOW VELOCITY(FEET/SEC.) =   4.30   FLOW DEPTH(FEET) =   0.49
  TRAVEL TIME(MIN.) =   0.78   Tc(MIN.) =    6.28
  LONGEST FLOWPATH FROM NODE    186.00 TO NODE      1.00 =    1660.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 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       29.56     6.28       6.598       17.18
  LONGEST FLOWPATH FROM NODE    186.00 TO NODE      1.00 =    1660.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       28.63    14.34       3.873       12.44
  LONGEST FLOWPATH FROM NODE    102.00 TO NODE      1.00 =    2332.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      42.09       6.28        6.598
      2      45.98      14.34        3.873

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      45.98   Tc(MIN.) =   14.34
  TOTAL AREA(ACRES) =       29.6

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 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.) =   14.34
  RAINFALL INTENSITY(INCH/HR) =   3.87
  TOTAL STREAM AREA(ACRES) =    29.62
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     45.98
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    131.00 TO NODE    133.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    245.00
  DOWNSTREAM ELEVATION(FEET) =    235.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.089
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.641
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.39
  TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.39

****************************************************************************
  FLOW PROCESS FROM NODE    133.00 TO NODE    137.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   231.00  DOWNSTREAM(FEET) =   230.00
  FLOW LENGTH(FEET) =    35.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   1.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.96
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.39
  PIPE TRAVEL TIME(MIN.) =   0.15    Tc(MIN.) =    2.24
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    137.00 =     135.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    133.00 TO NODE    137.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.641
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4750
  SUBAREA AREA(ACRES) =    0.18   SUBAREA RUNOFF(CFS) =    0.48
  TOTAL AREA(ACRES) =        0.2   TOTAL RUNOFF(CFS) =       0.87
  TC(MIN.) =    2.24

****************************************************************************
  FLOW PROCESS FROM NODE    137.00 TO NODE      1.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   230.00  DOWNSTREAM(FEET) =   204.00
  FLOW LENGTH(FEET) =  2400.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.56
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.87
  PIPE TRAVEL TIME(MIN.) =  11.24    Tc(MIN.) =   13.47
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE      1.00 =    2535.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    137.00 TO NODE      1.00 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.) = 13.47
RAINFALL INTENSITY(INCH/HR) = 4.03
TOTAL STREAM AREA(ACRES) = 0.24
PEAK FLOW RATE(CFS) AT CONFLUENCE = 0.87

** CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	45.98	14.34	3.873	29.62
2	0.87	13.47	4.031	0.24

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	44.08	13.47	4.031
2	46.82	14.34	3.873

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 46.82 Tc(MIN.) = 14.34
TOTAL AREA(ACRES) = 29.9
LONGEST FLOWPATH FROM NODE 131.00 TO NODE 1.00 = 2535.00 FEET.

==========

END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 29.9 TC(MIN.) = 14.34
PEAK FLOW RATE(CFS) = 46.82

==========

==========

END OF RATIONAL METHOD ANALYSIS

CHAPTER 4

HYDROLOGIC MODEL FOR DEVELOPED CONDITIONS

4.2 – Mitigated 100 Year Storm Event

Proposed Mitigated Condition																		
AES INPUT DATA																		
Node #		Code	Elevation		Length (ft)	Slope	Area (Ac)			imperviousness	Soil Type A Area (ac)	Soil Type C Area (ac)	Soil Type D Area (ac)	C value	If Channel			If memory
From	To		Up	Down			total	Pervious	impervious						Base (ft)	Z:1	maning	Bank #
102	104	2	464.0	453.0	65	16.9%	0.11	0.11	0.00	0.00%	0.00	0.00	0.11	0.35				
104	106	5	453.0	254.0	850	23.4%	1.32	1.32	0.00	0.00%	0.00	0.02	1.30	0.35	5	3	0.015	
106	112	3	244.0	243.4	61	1.1%												
112	112	1																1 of 2
108	110	2	264.3	263.6	65	1.1%	0.14	0.05	0.09	65.00%	0.03	0.00	0.02	0.68				
110	112	6	263.6	256.5	717	1.0%	4.89	1.86	3.03	61.96%	0.04	1.77	0.05	0.67				
112	112	1																2 of 2
112	113	3	238.0	222.5	176	8.8%												
113	113	10																1
120	122	2	264.0	263.3	65	1.1%	0.10	0.00	0.10	100.00%	0.00	0.00	0.00	0.90				
122	124	6	263.3	256.0	384	1.9%	0.60	0.18	0.42	70.00%	0.00	0.00	0.18	0.74				
124	125	3	246.0	244.0	101	2.0%												
126	125	8					0.21	0.06	0.15	70.00%	0.00	0.00	0.06	0.74				
125	127	3	244.0	242.9	55	2.0%												
128	127	8					0.22	0.07	0.15	70.00%	0.00	0.00	0.07	0.74				
127	142	3	242.9	227.0	208	7.6%												
142	142	1																1 of 3
130	132	2	264.0	262.7	65	2.0%	0.10	0.00	0.10	100.00%	0.00	0.00	0.00	0.90				
132	134	6	262.7	260.5	111	2.0%	0.30	0.09	0.21	70.00%	0.00	0.00	0.09	0.74				
134	135	3	250.5	249.7	74	1.0%												
136	135	8					0.15	0.05	0.11	70.00%	0.00	0.00	0.05	0.74				
135	142	3	249.7	227.0	296	7.7%												
142	142	1																2 of 3
138	140	2	263.0	262.3	65	1.1%	0.10	0.03	0.07	70.00%	0.00	0.00	0.03	0.74				
140	142	6	262.3	233.0	245	12.0%	0.55	0.17	0.39	70.00%	0.00	0.00	0.17	0.74				
142	142	1																3 of 3
			Q (CFS)		A (AC)		TC (MIN)											
142	142	7	8.65		2.33		=5.73+2											
142	145	3	222.0	221.5	10	5.0%												
145	145	10																2
114	116	2	242.7	242.0	65	1.0%	0.1	0.10	0.00	0.00%	0.00	0.10	0.00	0.30				
116	118	5	242.0	235.3	758	0.9%									2	2	0.015	
116	118	8					1.29	1.14	0.15	11.63%	0.62	0.52	0.00	0.32				
118	119	3	225.0	224.8	25	0.8%												
118	119	8					0.53	0.03	0.50	95.00%	0.00	0.00	0.03	0.87				
119	113	3	224.8	223.0	180	1.0%												
119	113	8					0.27	0.27	0.00	0.00%	0.00	0.00	0.27	0.35				
113	113	11																1
113	113	12																1
113	145	3	223.0	221.5	140	1.1%												
145	145	11																2
145	145	12																2
145	143	3	221.5	220.0	90	1.7%												
143	143	1																1 of 2
139	141	2	238.0	234.0	100	4.0%	0.12	0.12	0.00	0.00%	0.12	0.00	0.00	0.20				
141	143	5	234.0	220.0	1080	1.3%	0.81	0.81	0.00	0.00%	0.81	0.00	0.00	0.20	10	8	0.023	
143	143	1																2 of 2
143	1	5	220.0	204.0	950	1.7%	0.53	0.53	0.00	0.00%	0.53	0.00	0.00	0.20	5	20	0.015	
1	1	10																1
146	148	2	264.0	262.5	65	2.3%	0.10	0.00	0.10	100.00%	0.00	0.00	0.00	0.90				
148	150	6	262.5	255.0	507	1.5%	1.47	0.15	1.32	90.00%	0.00	0.00	0.15	0.85				
150	151	3	245.0	244.0	88	1.1%												
152	151	8					0.25	0.03	0.23	90.00%	0.00	0.00	0.03	0.85				
151	160	3	244.0	242.4	131	1.3%												
160	160	1																1 of 3
162	164	2	264.0	263.4	65	1.0%	0.10	0.00	0.10	100.00%	0.00	0.00	0.00	0.90				
164	166	6	263.4	255.6	367	2.1%	0.72	0.07	0.65	90.00%	0.00	0.00	0.07	0.85				
166	167	3	245.6	245.2	17	2.4%												

Proposed Mitigated Condition																		
AES INPUT DATA																		
Node #		Code	Elevation		Length (ft)	Slope	Area (Ac)			imperviousness	Soil Type A Area (ac)	Soil Type C Area (ac)	Soil Type D Area (ac)	C value	If Channel			If memory
From	To		Up	Down			total	Pervious	impervious						Base (ft)	Z:1	maning	Bank #
168	167	8					0.21	0.02	0.19	90.00%	0.00	0.00	0.02	0.85				
167	160	3	251.0	244.0	119	5.9%												
160	160	1																2 of 3
172	174	2	255.8	255.0	65	1.2%	0.09	0.01	0.08	90.00%	0.00	0.00	0.01	0.85				
174	176	6	255.0	252.0	305	1.0%	1.32	0.13	1.19	90.00%	0.00	0.00	0.13	0.85				
176	160	3	248.0	244.0	63	6.3%												
160	160	1																3 of 3
			Q (CFS)		A (AC)		TC (MIN)											
160	160	7	9.65		4.26		=5.40+5											
160	175	3	220.0	209.5	112	9.4%												
173	175	8					0.42	0.42	0.00	0.00%	0.00	0.00	0.42	0.35				
175	175	10																3
178	180	2	464.0	442.0	65	33.8%	0.10	0.10	0.00	0.00%	0.00	0.00	0.10	0.35				
180	182	5	442.0	312.0	394	33.0%									100	50	0.03	
180	182	8					2.08	2.08	0.00	0.00%	0.00	0.00	2.08	0.35				
184	182	8					0.16	0.16	0.00	0.00%	0.00	0.00	0.16	0.35				
182	182	1																1 of 2
186	188	2	464.2	463.5	65	1.1%	0.10	0.10	0.00	0.00%	0.00	0.00	0.10	0.35				
188	182	5	463.5	312.0	478	31.7%									100	50	0.03	
188	182	8					2.88	2.88	0.00	0.00%	0.00	0.00	2.88	0.35				
182	182	1																2 of 2
182	191	5	312.0	278.0	274	12.4%									3	3	0.015	
192	191	8					0.90	0.90	0.00	0.00%	0.00	0.00	0.90	0.35				
191	193	5	278.0	256.0	66	33.4%									3	3	0.015	
194	193	8					0.54	0.54	0.00	0.00%	0.00	0.00	0.54	0.35				
193	195	5	256.0	244.0	242	5.0%									3	3	0.015	
195	195	1																1 of 2
196	198	2	470.0	461.0	65	13.8%	0.10	0.08	0.02	15.46%	0.00	0.00	0.08	0.42				
198	195	5	461.0	244.0	550	39.5%									14	10	0.03	
198	195	8					2.50	2.50	0.00	0.00%	0.00	0.00	2.50	0.35				
195	195	1																2 of 2
195	175	5	244.0	209.5	333	10.4%									3	2	0.015	
199	175	8					0.50	0.50	0.00	0.00%	0.00	0.00	0.50	0.35				
175	175	1																1 of 2
200	202	2	448.5	426.0	65	34.6%	0.10	0.10	0.00	0.00%	0.00	0.00	0.10	0.35				
202	175	5	426.0	209.5	795	27.2%									80	50	0.03	
202	175	8					2.54	2.54	0.00	0.00%	0.28	0.00	2.26	0.33				
175	175	1																2 of 2
175	175	11																3
175	175	12																3
175	1	5	209.5	204.0	202	2.7%									10	8	0.03	
1	1	11																1
1	1	12																1
1	1	1																1 of 2
131	133	2	245.0	235.0	100	10.0%	0.06	0.01	0.05	90.00%	0.00	0.00	0.01	0.85				
			Q (CFS)		A (AC)		TC (MIN)											
133	133	7	0.12		0.06		=2+4											
133	137	3	231.0	230.0	35													
133	137	8					0.18	0.18	0.00	0.00%	0.00	0.00	0.18	0.35				
137	1	3	230.0	204.0	2400	1.1%												
137	1	1																2 of 2
Total							29.86	20.47	9.39	31.44%	2.52	2.33	15.63	0.506				

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2015 Advanced Engineering Software (aes)
              Ver. 22.0 Release Date: 07/01/2015  License ID 1239

                              Analysis prepared by:

                     Hunsaker & Associates San Diego, Inc.
                               9707 Waples Street
                              San Diego,  CA 92121


 ************************* DESCRIPTION OF STUDY *************************
* OLIVE PARK APARTMENTS                                                 *
* 100 YR PROPOSED MITIGATED DRAINAGE ANALYSIS                           *
* DLN 1746 W.O. 3785-0002                                               *
 ************************************************************************

  FILE NAME: R:\1746\HYD\TM\DR\CALCS\AES\MIT\100MIT.DAT
  TIME/DATE OF STUDY: 15:12 10/11/2024
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.900
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   20.0     15.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  2   14.0      9.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  3   18.0     13.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  4   10.0      5.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

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

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    104.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    464.00
  DOWNSTREAM ELEVATION(FEET) =    453.00
  ELEVATION DIFFERENCE(FEET) =     11.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.052
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.590
  SUBAREA RUNOFF(CFS) =      0.29
  TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.29

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

```
 FLOW PROCESS FROM NODE    104.00 TO NODE    106.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    453.00  DOWNSTREAM(FEET) =    254.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   850.00   CHANNEL SLOPE =  0.2341
 CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   3.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.030
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .3500
 S.C.S. CURVE NUMBER (AMC II) =   0
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.70
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.54
 AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   2.16
 Tc(MIN.) =    7.22
 SUBAREA AREA(ACRES) =     1.32       SUBAREA RUNOFF(CFS) =    2.79
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
 TOTAL AREA(ACRES) =        1.4         PEAK FLOW RATE(CFS) =       3.02

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   8.09
 LONGEST FLOWPATH FROM NODE    102.00 TO NODE    106.00 =     915.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    106.00 TO NODE    112.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   244.00  DOWNSTREAM(FEET) =   243.40
 FLOW LENGTH(FEET) =    61.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.91
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       3.02
 PIPE TRAVEL TIME(MIN.) =   0.21    Tc(MIN.) =    7.42
 LONGEST FLOWPATH FROM NODE    102.00 TO NODE    112.00 =     976.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    112.00 TO NODE    112.00 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.) =    7.42
 RAINFALL INTENSITY(INCH/HR) =   5.92
 TOTAL STREAM AREA(ACRES) =     1.43
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.02

****************************************************************************
 FLOW PROCESS FROM NODE    108.00 TO NODE    110.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .6800
 S.C.S. CURVE NUMBER (AMC II) =   0
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
 UPSTREAM ELEVATION(FEET) =    264.30
 DOWNSTREAM ELEVATION(FEET) =    263.60
 ELEVATION DIFFERENCE(FEET) =      0.70
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.946
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.832
 SUBAREA RUNOFF(CFS) =      0.65
 TOTAL AREA(ACRES) =      0.14   TOTAL RUNOFF(CFS) =      0.65

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

```
 FLOW PROCESS FROM NODE    110.00 TO NODE    112.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  263.60  DOWNSTREAM ELEVATION(FEET) =  256.50
 STREET LENGTH(FEET) =   717.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 20.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  15.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       8.51
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.38
   HALFSTREET FLOOD WIDTH(FEET) =   12.53
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.52
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.95
 STREET FLOW TRAVEL TIME(MIN.) =   4.74   Tc(MIN.) =   10.68
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.682
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .6700
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.670
 SUBAREA AREA(ACRES) =    4.89      SUBAREA RUNOFF(CFS) =   15.34
 TOTAL AREA(ACRES) =        5.0        PEAK FLOW RATE(CFS) =      15.79

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.45   HALFSTREET FLOOD WIDTH(FEET) =  16.04
 FLOW VELOCITY(FEET/SEC.) =  2.93   DEPTH*VELOCITY(FT*FT/SEC.) =   1.31
 LONGEST FLOWPATH FROM NODE    108.00 TO NODE    112.00 =     782.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    112.00 TO NODE    112.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =   10.68
 RAINFALL INTENSITY(INCH/HR) =   4.68
 TOTAL STREAM AREA(ACRES) =     5.03
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     15.79

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1        3.02     7.42        5.921          1.43
     2       15.79    10.68        4.682          5.03

 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       13.99     7.42       5.921
     2       18.17    10.68       4.682

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      18.17   Tc(MIN.) =   10.68
 TOTAL AREA(ACRES) =        6.5
 LONGEST FLOWPATH FROM NODE    102.00 TO NODE    112.00 =     976.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    113.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   238.00  DOWNSTREAM(FEET) =   222.50
  FLOW LENGTH(FEET) =   176.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.59
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      18.17
  PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =   10.85
  LONGEST FLOWPATH FROM NODE    102.00 TO NODE    113.00 =    1152.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    113.00 TO NODE    113.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    122.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    264.00
  DOWNSTREAM ELEVATION(FEET) =    263.30
  ELEVATION DIFFERENCE(FEET) =      0.70
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.832
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.641
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.69
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.69

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    124.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  263.30  DOWNSTREAM ELEVATION(FEET) =  256.00
  STREET LENGTH(FEET) =   384.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 14.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   9.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.38
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
    HALFSTREET FLOOD WIDTH(FEET) =    8.48
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.84
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.84
  STREET FLOW TRAVEL TIME(MIN.) =   2.25   Tc(MIN.) =    5.08
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.562
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7400
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.763
```

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  SUBAREA AREA(ACRES) =    0.60      SUBAREA RUNOFF(CFS) =    3.36
  TOTAL AREA(ACRES) =        0.7        PEAK FLOW RATE(CFS) =       4.04

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =  10.66
  FLOW VELOCITY(FEET/SEC.) =  3.22   DEPTH*VELOCITY(FT*FT/SEC.) =   1.09
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    124.00 =     449.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    124.00 TO NODE    125.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   246.00  DOWNSTREAM(FEET) =   244.00
  FLOW LENGTH(FEET) =   101.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.86
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.04
  PIPE TRAVEL TIME(MIN.) =   0.25    Tc(MIN.) =    5.33
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    125.00 =     550.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    126.00 TO NODE    125.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.335
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7400
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7576
  SUBAREA AREA(ACRES) =    0.21   SUBAREA RUNOFF(CFS) =    1.14
  TOTAL AREA(ACRES) =        0.9   TOTAL RUNOFF(CFS) =       5.06
  TC(MIN.) =    5.33

****************************************************************************
  FLOW PROCESS FROM NODE    125.00 TO NODE    127.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   244.00  DOWNSTREAM(FEET) =   242.90
  FLOW LENGTH(FEET) =    55.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.32
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.06
  PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =    5.45
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    127.00 =     605.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    128.00 TO NODE    127.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.226
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7400
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7542
  SUBAREA AREA(ACRES) =    0.22   SUBAREA RUNOFF(CFS) =    1.18
  TOTAL AREA(ACRES) =        1.1   TOTAL RUNOFF(CFS) =       6.16
  TC(MIN.) =    5.45

****************************************************************************
  FLOW PROCESS FROM NODE    127.00 TO NODE    142.00 IS CODE =  31
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   242.90  DOWNSTREAM(FEET) =   227.00
  FLOW LENGTH(FEET) =   208.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.56
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.16
  PIPE TRAVEL TIME(MIN.) =   0.28    Tc(MIN.) =    5.73
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    142.00 =     813.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.73
  RAINFALL INTENSITY(INCH/HR) =   7.00
  TOTAL STREAM AREA(ACRES) =     1.13
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.16

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    132.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    264.00
  DOWNSTREAM ELEVATION(FEET) =    262.70
  ELEVATION DIFFERENCE(FEET) =      1.30
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.304
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.641
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.69
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.69

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    134.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  3 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  262.70  DOWNSTREAM ELEVATION(FEET) =  260.45
  STREET LENGTH(FEET) =   111.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 18.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  13.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.54
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.26
    HALFSTREET FLOOD WIDTH(FEET) =    6.80
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.64
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.69
  STREET FLOW TRAVEL TIME(MIN.) =   0.70   Tc(MIN.) =    3.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.641
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
```

```
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7400
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.780
  SUBAREA AREA(ACRES) =    0.30      SUBAREA RUNOFF(CFS) =    1.70
  TOTAL AREA(ACRES) =        0.4        PEAK FLOW RATE(CFS) =       2.38

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.29   HALFSTREET FLOOD WIDTH(FEET) =   8.38
  FLOW VELOCITY(FEET/SEC.) =  2.91   DEPTH*VELOCITY(FT*FT/SEC.) =   0.85
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    134.00 =     176.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    134.00 TO NODE    135.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   250.45  DOWNSTREAM(FEET) =   249.70
  FLOW LENGTH(FEET) =    74.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.66
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.38
  PIPE TRAVEL TIME(MIN.) =   0.26    Tc(MIN.) =    3.27
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    135.00 =     250.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    136.00 TO NODE    135.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.641
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7718
  SUBAREA AREA(ACRES) =    0.15   SUBAREA RUNOFF(CFS) =    0.86
  TOTAL AREA(ACRES) =        0.6   TOTAL RUNOFF(CFS) =       3.24
  TC(MIN.) =    3.27

****************************************************************************
  FLOW PROCESS FROM NODE    135.00 TO NODE    142.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   249.70  DOWNSTREAM(FEET) =   227.00
  FLOW LENGTH(FEET) =   296.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.47
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.24
  PIPE TRAVEL TIME(MIN.) =   0.47    Tc(MIN.) =    3.74
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    142.00 =     546.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    3.74
  RAINFALL INTENSITY(INCH/HR) =   7.64
  TOTAL STREAM AREA(ACRES) =     0.55
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.24
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    138.00 TO NODE    140.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7400
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    263.00
  DOWNSTREAM ELEVATION(FEET) =    262.30
  ELEVATION DIFFERENCE(FEET) =      0.70
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.097
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.547
  SUBAREA RUNOFF(CFS) =      0.56
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.56

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    142.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  262.30  DOWNSTREAM ELEVATION(FEET) =  233.00
  STREET LENGTH(FEET) =   245.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  15.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.97
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.17
    HALFSTREET FLOOD WIDTH(FEET) =    2.35
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.68
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.98
  STREET FLOW TRAVEL TIME(MIN.) =   0.72   Tc(MIN.) =    5.82
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.931
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7400
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.740
  SUBAREA AREA(ACRES) =    0.55      SUBAREA RUNOFF(CFS) =    2.82
  TOTAL AREA(ACRES) =        0.7        PEAK FLOW RATE(CFS) =       3.33

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.21   HALFSTREET FLOOD WIDTH(FEET) =   4.21
  FLOW VELOCITY(FEET/SEC.) =  5.65   DEPTH*VELOCITY(FT*FT/SEC.) =   1.19
  LONGEST FLOWPATH FROM NODE    138.00 TO NODE    142.00 =     310.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.82
  RAINFALL INTENSITY(INCH/HR) =   6.93
  TOTAL STREAM AREA(ACRES) =     0.65
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.33

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

```
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        6.16     5.73        6.999          1.13
      2        3.24     3.74        7.641          0.55
      3        3.33     5.82        6.931          0.65

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        9.41     3.74       7.641
      2       12.41     5.73       6.999
      3       12.37     5.82       6.931

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      12.41   Tc(MIN.) =    5.73
  TOTAL AREA(ACRES) =        2.3
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    142.00 =     813.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =   7.73   RAIN INTENSITY(INCH/HOUR) =  5.77
  TOTAL AREA(ACRES) =     2.33   TOTAL RUNOFF(CFS) =      8.65

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    145.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   222.00  DOWNSTREAM(FEET) =   221.50
  FLOW LENGTH(FEET) =    10.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.81
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.65
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =    7.74
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    145.00 =     823.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    145.00 TO NODE    145.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    116.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    242.70
  DOWNSTREAM ELEVATION(FEET) =    242.00
  ELEVATION DIFFERENCE(FEET) =      0.70
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =   11.326
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.509
  SUBAREA RUNOFF(CFS) =      0.14
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.14

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    118.00 IS CODE =  51
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    242.00  DOWNSTREAM(FEET) =    235.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   758.00   CHANNEL SLOPE =  0.0088
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.540
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3300
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.89
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.45
  AVERAGE FLOW DEPTH(FEET) =   0.16   TRAVEL TIME(MIN.) =   5.15
  Tc(MIN.) =   16.48
  SUBAREA AREA(ACRES) =     1.29       SUBAREA RUNOFF(CFS) =    1.51
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.328
  TOTAL AREA(ACRES) =        1.4         PEAK FLOW RATE(CFS) =       1.61

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.22   FLOW VELOCITY(FEET/SEC.) =   2.94
  LONGEST FLOWPATH FROM NODE    114.00 TO NODE    118.00 =     823.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    118.00 TO NODE    119.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   225.00  DOWNSTREAM(FEET) =   224.80
  FLOW LENGTH(FEET) =    25.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.84
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.61
  PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =   16.59
  LONGEST FLOWPATH FROM NODE    114.00 TO NODE    119.00 =     848.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    118.00 TO NODE    119.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.525
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4775
  SUBAREA AREA(ACRES) =    0.53   SUBAREA RUNOFF(CFS) =    1.63
  TOTAL AREA(ACRES) =        1.9   TOTAL RUNOFF(CFS) =       3.23
  TC(MIN.) =   16.59

****************************************************************************
  FLOW PROCESS FROM NODE    119.00 TO NODE    113.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   224.80  DOWNSTREAM(FEET) =   223.00
  FLOW LENGTH(FEET) =   180.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.04
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.23
  PIPE TRAVEL TIME(MIN.) =   0.60    Tc(MIN.) =   17.18
  LONGEST FLOWPATH FROM NODE    114.00 TO NODE    113.00 =    1028.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    119.00 TO NODE    113.00 IS CODE =  81
```

```
------------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.446
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4618
  SUBAREA AREA(ACRES) =    0.27   SUBAREA RUNOFF(CFS) =    0.33
  TOTAL AREA(ACRES) =        2.2   TOTAL RUNOFF(CFS) =       3.49
  TC(MIN.) =   17.18

****************************************************************************
  FLOW PROCESS FROM NODE    113.00 TO NODE    113.00 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        3.49    17.18       3.446        2.19
  LONGEST FLOWPATH FROM NODE    114.00 TO NODE    113.00 =    1028.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       18.17    10.85       4.635        6.46
  LONGEST FLOWPATH FROM NODE    102.00 TO NODE    113.00 =    1152.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      20.37      10.85        4.635
      2      16.99      17.18        3.446

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      20.37   Tc(MIN.) =   10.85
  TOTAL AREA(ACRES) =        8.6

****************************************************************************
  FLOW PROCESS FROM NODE    113.00 TO NODE    113.00 IS CODE =  12
------------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
==============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    113.00 TO NODE    145.00 IS CODE =  31
------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   223.00  DOWNSTREAM(FEET) =   221.50
  FLOW LENGTH(FEET) =   140.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  18.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.02
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      20.37
  PIPE TRAVEL TIME(MIN.) =   0.29    Tc(MIN.) =   11.14
  LONGEST FLOWPATH FROM NODE    102.00 TO NODE    145.00 =    1292.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    145.00 TO NODE    145.00 IS CODE =  11
------------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
==============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       20.37    11.14       4.557        8.65
```

 LONGEST FLOWPATH FROM NODE 102.00 TO NODE 145.00 = 1292.00 FEET.

 ** MEMORY BANK # 2 CONFLUENCE DATA **
 STREAM   RUNOFF   Tc   INTENSITY   AREA
 NUMBER   (CFS)   (MIN.)   (INCH/HOUR)   (ACRE)
    1   8.65   7.74   5.762   2.33
 LONGEST FLOWPATH FROM NODE 120.00 TO NODE 145.00 =   823.00 FEET.

 ** PEAK FLOW RATE TABLE **
 STREAM   RUNOFF   Tc   INTENSITY
 NUMBER   (CFS)   (MIN.)   (INCH/HOUR)
    1   22.81   7.74   5.762
    2   27.21   11.14   4.557

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =   27.21   Tc(MIN.) =   11.14
 TOTAL AREA(ACRES) =   11.0

****
 FLOW PROCESS FROM NODE 145.00 TO NODE 145.00 IS CODE = 12

 >>>>>CLEAR MEMORY BANK # 2 <<<<<
==

****
 FLOW PROCESS FROM NODE 145.00 TO NODE 143.00 IS CODE = 31

 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==
 ELEVATION DATA: UPSTREAM(FEET) =   221.50 DOWNSTREAM(FEET) =   220.00
 FLOW LENGTH(FEET) =   90.00   MANNING'S N = 0.013
 DEPTH OF FLOW IN 24.0 INCH PIPE IS 19.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 10.05
 ESTIMATED PIPE DIAMETER(INCH) = 24.00   NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =   27.21
 PIPE TRAVEL TIME(MIN.) =   0.15   Tc(MIN.) =   11.29
 LONGEST FLOWPATH FROM NODE 102.00 TO NODE 143.00 = 1382.00 FEET.

****
 FLOW PROCESS FROM NODE 143.00 TO NODE 143.00 IS CODE =   1

 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) =   11.29
 RAINFALL INTENSITY(INCH/HR) =   4.52
 TOTAL STREAM AREA(ACRES) =   10.98
 PEAK FLOW RATE(CFS) AT CONFLUENCE =   27.21

****
 FLOW PROCESS FROM NODE 139.00 TO NODE 141.00 IS CODE = 21

 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .2000
 S.C.S. CURVE NUMBER (AMC II) =   0
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
 UPSTREAM ELEVATION(FEET) =   238.00
 DOWNSTREAM ELEVATION(FEET) =   234.00
 ELEVATION DIFFERENCE(FEET) =   4.00
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =   10.206
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.822
 SUBAREA RUNOFF(CFS) =   0.12
 TOTAL AREA(ACRES) =   0.12   TOTAL RUNOFF(CFS) =   0.12

****
 FLOW PROCESS FROM NODE 141.00 TO NODE 143.00 IS CODE = 51

```
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    234.00  DOWNSTREAM(FEET) =    220.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1080.00   CHANNEL SLOPE =  0.0130
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   8.000
  MANNING'S FACTOR = 0.023   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.359
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .2000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.32
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.87
  AVERAGE FLOW DEPTH(FEET) =   0.04   TRAVEL TIME(MIN.) =  20.71
  Tc(MIN.) =   30.92
  SUBAREA AREA(ACRES) =     0.81       SUBAREA RUNOFF(CFS) =    0.38
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.200
  TOTAL AREA(ACRES) =        0.9         PEAK FLOW RATE(CFS) =       0.44

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.05   FLOW VELOCITY(FEET/SEC.) =   0.87
  LONGEST FLOWPATH FROM NODE    139.00 TO NODE    143.00 =    1180.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    143.00 TO NODE    143.00 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.) =   30.92
  RAINFALL INTENSITY(INCH/HR) =   2.36
  TOTAL STREAM AREA(ACRES) =     0.93
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.44

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       27.21    11.29        4.518         10.98
      2        0.44    30.92        2.359          0.93

  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       27.37    11.29       4.518
      2       14.65    30.92       2.359

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      27.37   Tc(MIN.) =   11.29
  TOTAL AREA(ACRES) =       11.9
  LONGEST FLOWPATH FROM NODE    102.00 TO NODE    143.00 =    1382.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    143.00 TO NODE      1.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    220.00  DOWNSTREAM(FEET) =    204.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   950.00   CHANNEL SLOPE =  0.0168
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.864
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .2000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      27.58
```

```
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.11
  AVERAGE FLOW DEPTH(FEET) =   0.41   TRAVEL TIME(MIN.) =   3.10
  Tc(MIN.) =   14.39
  SUBAREA AREA(ACRES) =     0.53       SUBAREA RUNOFF(CFS) =    0.41
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.537
  TOTAL AREA(ACRES) =       12.4         PEAK FLOW RATE(CFS) =      27.37

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.41   FLOW VELOCITY(FEET/SEC.) =   5.11
  LONGEST FLOWPATH FROM NODE    102.00 TO NODE      1.00 =    2332.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    146.00 TO NODE    148.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    264.00
  DOWNSTREAM ELEVATION(FEET) =    262.50
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.196
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.641
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.69
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.69

****************************************************************************
  FLOW PROCESS FROM NODE    148.00 TO NODE    150.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  3 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  262.50  DOWNSTREAM ELEVATION(FEET) =  255.00
  STREET LENGTH(FEET) =   507.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 18.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  13.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.46
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.38
    HALFSTREET FLOOD WIDTH(FEET) =   12.74
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.13
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.19
  STREET FLOW TRAVEL TIME(MIN.) =   2.70   Tc(MIN.) =    4.89
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.641
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.853
  SUBAREA AREA(ACRES) =    1.47      SUBAREA RUNOFF(CFS) =    9.55
  TOTAL AREA(ACRES) =        1.6        PEAK FLOW RATE(CFS) =      10.23

  END OF SUBAREA STREET FLOW HYDRAULICS:
```

```
  DEPTH(FEET) = 0.45   HALFSTREET FLOOD WIDTH(FEET) =  16.40
  FLOW VELOCITY(FEET/SEC.) =  3.65   DEPTH*VELOCITY(FT*FT/SEC.) =   1.66
  LONGEST FLOWPATH FROM NODE    146.00 TO NODE    150.00 =     572.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    151.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   245.00  DOWNSTREAM(FEET) =   244.00
  FLOW LENGTH(FEET) =    88.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  14.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.84
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.23
  PIPE TRAVEL TIME(MIN.) =   0.21    Tc(MIN.) =    5.11
  LONGEST FLOWPATH FROM NODE    146.00 TO NODE    151.00 =     660.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    152.00 TO NODE    151.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.538
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8527
  SUBAREA AREA(ACRES) =    0.25   SUBAREA RUNOFF(CFS) =    1.60
  TOTAL AREA(ACRES) =        1.8   TOTAL RUNOFF(CFS) =      11.70
  TC(MIN.) =    5.11

****************************************************************************
  FLOW PROCESS FROM NODE    151.00 TO NODE    160.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   244.00  DOWNSTREAM(FEET) =   242.40
  FLOW LENGTH(FEET) =   131.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.48
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.70
  PIPE TRAVEL TIME(MIN.) =   0.29    Tc(MIN.) =    5.40
  LONGEST FLOWPATH FROM NODE    146.00 TO NODE    160.00 =     791.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.40
  RAINFALL INTENSITY(INCH/HR) =   7.27
  TOTAL STREAM AREA(ACRES) =     1.82
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     11.70

****************************************************************************
  FLOW PROCESS FROM NODE    162.00 TO NODE    164.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    264.00
  DOWNSTREAM ELEVATION(FEET) =    263.35
```

```
  ELEVATION DIFFERENCE(FEET) =      0.65
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.789
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    60.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.641
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.69
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.69

****************************************************************************
  FLOW PROCESS FROM NODE    164.00 TO NODE    166.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  263.35  DOWNSTREAM ELEVATION(FEET) =  255.60
  STREET LENGTH(FEET) =   367.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 14.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   9.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.03
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.31
    HALFSTREET FLOOD WIDTH(FEET) =    9.25
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.10
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.97
  STREET FLOW TRAVEL TIME(MIN.) =   1.97   Tc(MIN.) =    4.76
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.641
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.856
  SUBAREA AREA(ACRES) =    0.72      SUBAREA RUNOFF(CFS) =    4.68
  TOTAL AREA(ACRES) =        0.8        PEAK FLOW RATE(CFS) =       5.36

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.36   HALFSTREET FLOOD WIDTH(FEET) =  11.79
  FLOW VELOCITY(FEET/SEC.) =  3.56   DEPTH*VELOCITY(FT*FT/SEC.) =   1.29
  LONGEST FLOWPATH FROM NODE    162.00 TO NODE    166.00 =     432.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    166.00 TO NODE    167.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   245.60  DOWNSTREAM(FEET) =   245.20
  FLOW LENGTH(FEET) =    17.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.89
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.36
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    4.79
  LONGEST FLOWPATH FROM NODE    162.00 TO NODE    167.00 =     449.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    168.00 TO NODE    167.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
```

```
==============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.641
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8549
  SUBAREA AREA(ACRES) =    0.21   SUBAREA RUNOFF(CFS) =    1.36
  TOTAL AREA(ACRES) =        1.0   TOTAL RUNOFF(CFS) =       6.73
  TC(MIN.) =    4.79

****************************************************************************
  FLOW PROCESS FROM NODE    167.00 TO NODE    160.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   251.00  DOWNSTREAM(FEET) =   244.00
  FLOW LENGTH(FEET) =   119.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.71
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.73
  PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =    4.96
  LONGEST FLOWPATH FROM NODE    162.00 TO NODE    160.00 =     568.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    4.96
  RAINFALL INTENSITY(INCH/HR) =   7.64
  TOTAL STREAM AREA(ACRES) =     1.03
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.73

****************************************************************************
  FLOW PROCESS FROM NODE    172.00 TO NODE    174.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    255.80
  DOWNSTREAM ELEVATION(FEET) =    255.00
  ELEVATION DIFFERENCE(FEET) =      0.80
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.315
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    62.31
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.641
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.58
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.58

****************************************************************************
  FLOW PROCESS FROM NODE    174.00 TO NODE    176.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
==============================================================================
  UPSTREAM ELEVATION(FEET) =  255.00  DOWNSTREAM ELEVATION(FEET) =  252.00
  STREET LENGTH(FEET) =   305.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 14.00
```

```
  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   9.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.57
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.32
    HALFSTREET FLOOD WIDTH(FEET) =    9.61
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.19
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.70
  STREET FLOW TRAVEL TIME(MIN.) =   2.32   Tc(MIN.) =    5.63
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.077
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  SUBAREA AREA(ACRES) =    1.32      SUBAREA RUNOFF(CFS) =    7.94
  TOTAL AREA(ACRES) =        1.4        PEAK FLOW RATE(CFS) =       8.48

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.38   HALFSTREET FLOOD WIDTH(FEET) =  12.49
  FLOW VELOCITY(FEET/SEC.) =  2.53   DEPTH*VELOCITY(FT*FT/SEC.) =   0.95
  LONGEST FLOWPATH FROM NODE    172.00 TO NODE    176.00 =     370.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    176.00 TO NODE    160.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   248.00  DOWNSTREAM(FEET) =   244.00
  FLOW LENGTH(FEET) =    63.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.83
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.48
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =    5.71
  LONGEST FLOWPATH FROM NODE    172.00 TO NODE    160.00 =     433.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.71
  RAINFALL INTENSITY(INCH/HR) =   7.01
  TOTAL STREAM AREA(ACRES) =     1.41
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      8.48

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       11.70     5.40        7.272          1.82
      2        6.73     4.96        7.641          1.03
      3        8.48     5.71        7.011          1.41

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

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

```
      1       24.85     4.96       7.641
      2       26.12     5.40       7.272
      3       25.93     5.71       7.011

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      26.12   Tc(MIN.) =    5.40
  TOTAL AREA(ACRES) =        4.3
  LONGEST FLOWPATH FROM NODE    146.00 TO NODE    160.00 =     791.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  10.40   RAIN INTENSITY(INCH/HOUR) =  4.76
  TOTAL AREA(ACRES) =     4.26   TOTAL RUNOFF(CFS) =      9.65

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    175.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   220.00  DOWNSTREAM(FEET) =   209.50
  FLOW LENGTH(FEET) =   112.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.31
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.65
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =   10.52
  LONGEST FLOWPATH FROM NODE    146.00 TO NODE    175.00 =     903.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    173.00 TO NODE    175.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.728
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4642
  SUBAREA AREA(ACRES) =    0.42   SUBAREA RUNOFF(CFS) =    0.70
  TOTAL AREA(ACRES) =        4.7   TOTAL RUNOFF(CFS) =      10.27
  TC(MIN.) =   10.52

****************************************************************************
  FLOW PROCESS FROM NODE    175.00 TO NODE    175.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 3 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    178.00 TO NODE    180.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    464.00
  DOWNSTREAM ELEVATION(FEET) =    442.00
  ELEVATION DIFFERENCE(FEET) =     22.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.052
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.590
  SUBAREA RUNOFF(CFS) =      0.27
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.27
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    182.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    442.00  DOWNSTREAM(FEET) =    312.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   394.00   CHANNEL SLOPE =  0.3299
  CHANNEL BASE(FEET) =  100.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.27
  FLOW VELOCITY(FEET/SEC.) =   0.56   FLOW DEPTH(FEET) =   0.00
  TRAVEL TIME(MIN.) =  11.82   Tc(MIN.) =   16.87
  LONGEST FLOWPATH FROM NODE    178.00 TO NODE    182.00 =     459.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    182.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.487
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    2.08   SUBAREA RUNOFF(CFS) =    2.54
  TOTAL AREA(ACRES) =        2.2   TOTAL RUNOFF(CFS) =       2.66
  TC(MIN.) =   16.87

****************************************************************************
  FLOW PROCESS FROM NODE    184.00 TO NODE    182.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.487
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.16   SUBAREA RUNOFF(CFS) =    0.20
  TOTAL AREA(ACRES) =        2.3   TOTAL RUNOFF(CFS) =       2.86
  TC(MIN.) =   16.87

****************************************************************************
  FLOW PROCESS FROM NODE    182.00 TO NODE    182.00 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.) =   16.87
  RAINFALL INTENSITY(INCH/HR) =   3.49
  TOTAL STREAM AREA(ACRES) =     2.34
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.86

****************************************************************************
  FLOW PROCESS FROM NODE    186.00 TO NODE    188.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    464.20
  DOWNSTREAM ELEVATION(FEET) =    463.50
  ELEVATION DIFFERENCE(FEET) =      0.70
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =   10.618
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.701
  SUBAREA RUNOFF(CFS) =      0.16
```

```
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.16

****************************************************************************
  FLOW PROCESS FROM NODE    188.00 TO NODE    182.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    463.50  DOWNSTREAM(FEET) =    312.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   478.00   CHANNEL SLOPE =  0.3169
  CHANNEL BASE(FEET) =  100.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.16
  FLOW VELOCITY(FEET/SEC.) =   0.57   FLOW DEPTH(FEET) =   0.00
  TRAVEL TIME(MIN.) =  13.87   Tc(MIN.) =   24.49
  LONGEST FLOWPATH FROM NODE    186.00 TO NODE    182.00 =     543.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    188.00 TO NODE    182.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.742
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    2.88   SUBAREA RUNOFF(CFS) =    2.76
  TOTAL AREA(ACRES) =        3.0   TOTAL RUNOFF(CFS) =       2.86
  TC(MIN.) =   24.49

****************************************************************************
  FLOW PROCESS FROM NODE    182.00 TO NODE    182.00 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.) =   24.49
  RAINFALL INTENSITY(INCH/HR) =   2.74
  TOTAL STREAM AREA(ACRES) =     2.98
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.86

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        2.86    16.87        3.487          2.34
      2        2.86    24.49        2.742          2.98

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        4.83    16.87       3.487
      2        5.11    24.49       2.742

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       5.11   Tc(MIN.) =   24.49
  TOTAL AREA(ACRES) =        5.3
  LONGEST FLOWPATH FROM NODE    186.00 TO NODE    182.00 =     543.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    182.00 TO NODE    191.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    312.00  DOWNSTREAM(FEET) =    278.00
```

```
  CHANNEL LENGTH THRU SUBAREA(FEET) =   274.00   CHANNEL SLOPE =  0.1241
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   3.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       5.11
  FLOW VELOCITY(FEET/SEC.) =   9.34   FLOW DEPTH(FEET) =   0.16
  TRAVEL TIME(MIN.) =   0.49   Tc(MIN.) =   24.98
  LONGEST FLOWPATH FROM NODE    186.00 TO NODE    191.00 =     817.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    192.00 TO NODE    191.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.707
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.90   SUBAREA RUNOFF(CFS) =    0.85
  TOTAL AREA(ACRES) =        6.2   TOTAL RUNOFF(CFS) =       5.89
  TC(MIN.) =   24.98

****************************************************************************
  FLOW PROCESS FROM NODE    191.00 TO NODE    193.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    278.00  DOWNSTREAM(FEET) =    256.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    66.00   CHANNEL SLOPE =  0.3333
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   3.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       5.89
  FLOW VELOCITY(FEET/SEC.) =  13.74   FLOW DEPTH(FEET) =   0.13
  TRAVEL TIME(MIN.) =   0.08   Tc(MIN.) =   25.06
  LONGEST FLOWPATH FROM NODE    186.00 TO NODE    193.00 =     883.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    194.00 TO NODE    193.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.702
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.54   SUBAREA RUNOFF(CFS) =    0.51
  TOTAL AREA(ACRES) =        6.8   TOTAL RUNOFF(CFS) =       6.39
  TC(MIN.) =   25.06

****************************************************************************
  FLOW PROCESS FROM NODE    193.00 TO NODE    195.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    256.00  DOWNSTREAM(FEET) =    244.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   242.00   CHANNEL SLOPE =  0.0496
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   3.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       6.39
  FLOW VELOCITY(FEET/SEC.) =   7.39   FLOW DEPTH(FEET) =   0.23
  TRAVEL TIME(MIN.) =   0.55   Tc(MIN.) =   25.61
  LONGEST FLOWPATH FROM NODE    186.00 TO NODE    195.00 =    1125.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    195.00 TO NODE    195.00 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.) =   25.61
  RAINFALL INTENSITY(INCH/HR) =   2.66
  TOTAL STREAM AREA(ACRES) =     6.76
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.39

****************************************************************************
  FLOW PROCESS FROM NODE    196.00 TO NODE    198.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4200
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    470.00
  DOWNSTREAM ELEVATION(FEET) =    461.00
  ELEVATION DIFFERENCE(FEET) =      9.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.581
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.641
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE    198.00 TO NODE    195.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    461.00  DOWNSTREAM(FEET) =    244.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   550.00   CHANNEL SLOPE =  0.3945
  CHANNEL BASE(FEET) =   14.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.32
  FLOW VELOCITY(FEET/SEC.) =   1.83   FLOW DEPTH(FEET) =   0.01
  TRAVEL TIME(MIN.) =   5.00   Tc(MIN.) =    9.58
  LONGEST FLOWPATH FROM NODE    196.00 TO NODE    195.00 =     615.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    198.00 TO NODE    195.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.022
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3527
  SUBAREA AREA(ACRES) =    2.50   SUBAREA RUNOFF(CFS) =    4.39
  TOTAL AREA(ACRES) =        2.6   TOTAL RUNOFF(CFS) =       4.61
  TC(MIN.) =    9.58

****************************************************************************
  FLOW PROCESS FROM NODE    195.00 TO NODE    195.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.58
  RAINFALL INTENSITY(INCH/HR) =   5.02
  TOTAL STREAM AREA(ACRES) =     2.60
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.61

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

```
     1        6.39    25.61        2.664          6.76
     2        4.61     9.58        5.022          2.60

  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        8.00     9.58       5.022
      2        8.84    25.61       2.664

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       8.84   Tc(MIN.) =   25.61
  TOTAL AREA(ACRES) =        9.4
  LONGEST FLOWPATH FROM NODE    186.00 TO NODE    195.00 =    1125.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    195.00 TO NODE    175.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    244.00  DOWNSTREAM(FEET) =    209.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   333.00   CHANNEL SLOPE =  0.1036
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       8.84
  FLOW VELOCITY(FEET/SEC.) =  10.91   FLOW DEPTH(FEET) =   0.23
  TRAVEL TIME(MIN.) =   0.51   Tc(MIN.) =   26.12
  LONGEST FLOWPATH FROM NODE    186.00 TO NODE    175.00 =    1458.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    199.00 TO NODE    175.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.631
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3507
  SUBAREA AREA(ACRES) =    0.50   SUBAREA RUNOFF(CFS) =    0.46
  TOTAL AREA(ACRES) =        9.9   TOTAL RUNOFF(CFS) =       9.10
  TC(MIN.) =   26.12

****************************************************************************
  FLOW PROCESS FROM NODE    175.00 TO NODE    175.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   26.12
  RAINFALL INTENSITY(INCH/HR) =   2.63
  TOTAL STREAM AREA(ACRES) =     9.86
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.10

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    202.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    448.50
  DOWNSTREAM ELEVATION(FEET) =    426.00
  ELEVATION DIFFERENCE(FEET) =     22.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.052
```

```
 WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.590
 SUBAREA RUNOFF(CFS) =      0.27
 TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.27

****************************************************************************
 FLOW PROCESS FROM NODE    202.00 TO NODE    175.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    426.00  DOWNSTREAM(FEET) =    209.50
 CHANNEL LENGTH THRU SUBAREA(FEET) =   795.00   CHANNEL SLOPE =  0.2723
 CHANNEL BASE(FEET) =   80.00   "Z" FACTOR =  50.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
 CHANNEL FLOW THRU SUBAREA(CFS) =       0.27
 FLOW VELOCITY(FEET/SEC.) =   0.69   FLOW DEPTH(FEET) =   0.00
 TRAVEL TIME(MIN.) =  19.08   Tc(MIN.) =   24.14
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    175.00 =     860.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    202.00 TO NODE    175.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.768
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .3300
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.3308
 SUBAREA AREA(ACRES) =    2.54   SUBAREA RUNOFF(CFS) =    2.32
 TOTAL AREA(ACRES) =        2.6   TOTAL RUNOFF(CFS) =       2.42
 TC(MIN.) =   24.14

****************************************************************************
 FLOW PROCESS FROM NODE    175.00 TO NODE    175.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =   24.14
 RAINFALL INTENSITY(INCH/HR) =   2.77
 TOTAL STREAM AREA(ACRES) =     2.64
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.42

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1        9.10    26.12        2.631          9.86
     2        2.42    24.14        2.768          2.64

 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       11.06    24.14       2.768
     2       11.39    26.12       2.631

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      11.39   Tc(MIN.) =   26.12
 TOTAL AREA(ACRES) =       12.5
 LONGEST FLOWPATH FROM NODE    186.00 TO NODE    175.00 =    1458.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    175.00 TO NODE    175.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 3 WITH THE MAIN-STREAM MEMORY<<<<<
```

```
==============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       11.39    26.12       2.631       12.50
  LONGEST FLOWPATH FROM NODE    186.00 TO NODE    175.00 =    1458.00 FEET.

  ** MEMORY BANK #  3 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       10.27    10.52       4.728        4.68
  LONGEST FLOWPATH FROM NODE    146.00 TO NODE    175.00 =     903.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      14.86      10.52        4.728
      2      17.11      26.12        2.631

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      17.11   Tc(MIN.) =   26.12
  TOTAL AREA(ACRES) =       17.2

****************************************************************************
  FLOW PROCESS FROM NODE    175.00 TO NODE    175.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 3 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    175.00 TO NODE      1.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    209.50  DOWNSTREAM(FEET) =    204.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   202.00   CHANNEL SLOPE =  0.0272
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   8.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =      17.11
  FLOW VELOCITY(FEET/SEC.) =   3.65   FLOW DEPTH(FEET) =   0.36
  TRAVEL TIME(MIN.) =   0.92   Tc(MIN.) =   27.04
  LONGEST FLOWPATH FROM NODE    186.00 TO NODE      1.00 =    1660.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 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       17.11    27.04       2.572       17.18
  LONGEST FLOWPATH FROM NODE    186.00 TO NODE      1.00 =    1660.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       27.37    14.39       3.864       12.44
  LONGEST FLOWPATH FROM NODE    102.00 TO NODE      1.00 =    2332.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      36.48      14.39        3.864
      2      35.33      27.04        2.572

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      36.48   Tc(MIN.) =   14.39
```

```
  TOTAL AREA(ACRES) =       29.6

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 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.) =   14.39
  RAINFALL INTENSITY(INCH/HR) =   3.86
  TOTAL STREAM AREA(ACRES) =    29.62
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     36.48

****************************************************************************
  FLOW PROCESS FROM NODE    131.00 TO NODE    133.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    245.00
  DOWNSTREAM ELEVATION(FEET) =    235.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.089
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.641
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.39
  TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.39

****************************************************************************
  FLOW PROCESS FROM NODE    133.00 TO NODE    133.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =   6.00   RAIN INTENSITY(INCH/HOUR) =  6.79
  TOTAL AREA(ACRES) =     0.06   TOTAL RUNOFF(CFS) =      0.12

****************************************************************************
  FLOW PROCESS FROM NODE    133.00 TO NODE    137.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   231.00  DOWNSTREAM(FEET) =   230.00
  FLOW LENGTH(FEET) =    35.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   1.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.77
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.12
  PIPE TRAVEL TIME(MIN.) =   0.21    Tc(MIN.) =    6.21
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    137.00 =     135.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    133.00 TO NODE    137.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.643
  *USER SPECIFIED(SUBAREA):
```

```
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3361
  SUBAREA AREA(ACRES) =    0.18   SUBAREA RUNOFF(CFS) =    0.42
  TOTAL AREA(ACRES) =        0.2   TOTAL RUNOFF(CFS) =       0.54
  TC(MIN.) =    6.21

****************************************************************************
  FLOW PROCESS FROM NODE    137.00 TO NODE      1.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   230.00  DOWNSTREAM(FEET) =   204.00
  FLOW LENGTH(FEET) =  2400.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.07
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.54
  PIPE TRAVEL TIME(MIN.) =  13.01    Tc(MIN.) =   19.22
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE      1.00 =    2535.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    137.00 TO NODE      1.00 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.) =   19.22
  RAINFALL INTENSITY(INCH/HR) =   3.21
  TOTAL STREAM AREA(ACRES) =     0.24
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.54

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       36.48    14.39        3.864         29.62
      2        0.54    19.22        3.206          0.24

  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       36.88    14.39       3.864
      2       30.80    19.22       3.206

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      36.88   Tc(MIN.) =   14.39
  TOTAL AREA(ACRES) =       29.9
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE      1.00 =    2535.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       29.9  TC(MIN.) =     14.39
  PEAK FLOW RATE(CFS)   =      36.88
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

CHAPTER 4

HYDROLOGIC MODEL FOR DEVELOPED CONDITIONS

4.3 – Preliminary Rip Rap Sizing

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Oct 7 2024

Outfall @ Node 143 from 145

Circular

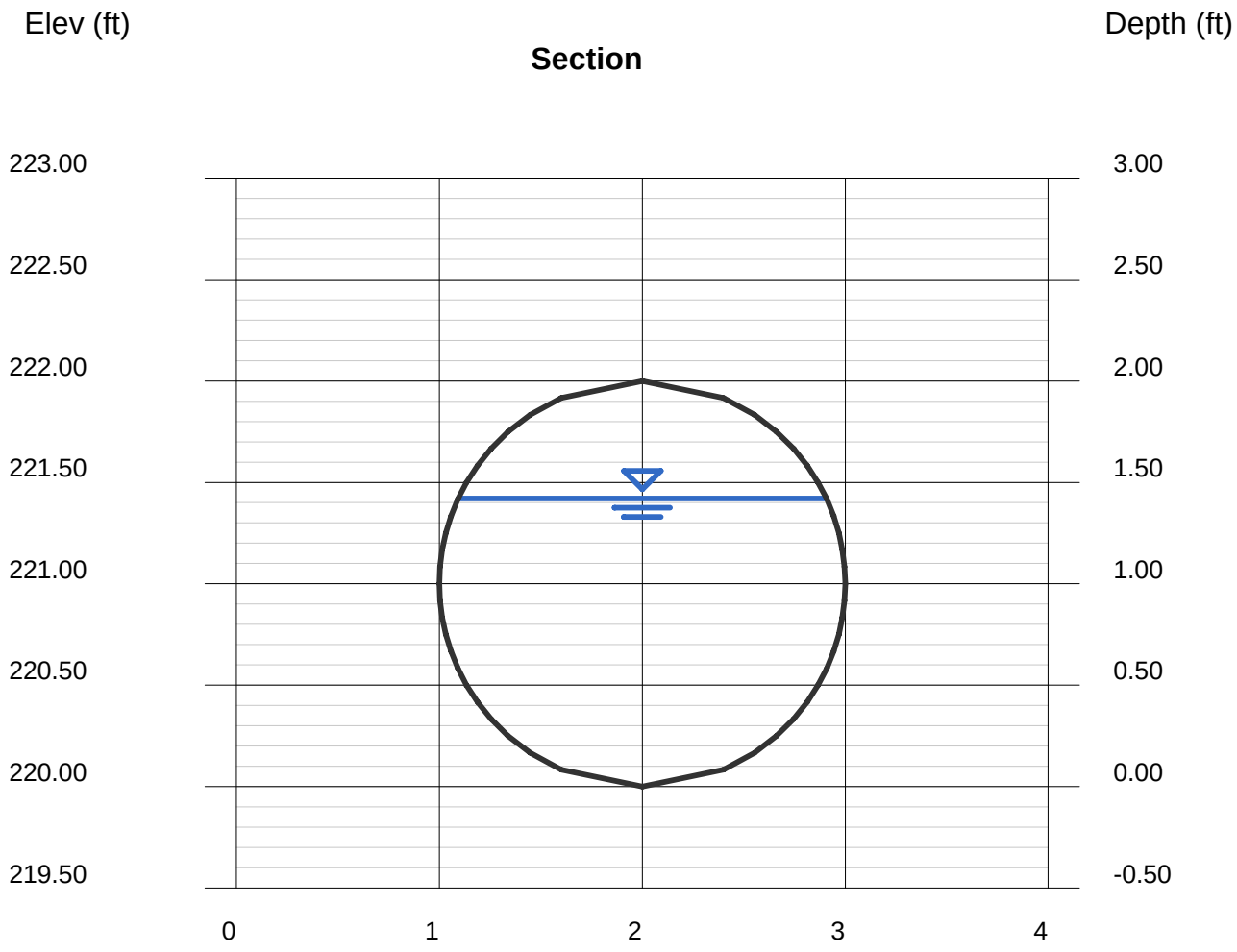
Diameter (ft)	= 2.00
Invert Elev (ft)	= 220.00
Slope (%)	= 2.00
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 27.21

Highlighted

Depth (ft)	= 1.42
Q (cfs)	= 27.21
Area (sqft)	= 2.39
Velocity (ft/s)	= 11.40
Wetted Perim (ft)	= 4.01
Crit Depth, Yc (ft)	= 1.82
Top Width (ft)	= 1.81
EGL (ft)	= 3.44



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Thursday, Aug 8 2024

Outfall @ Node 175 from 160

Circular

Diameter (ft)	= 2.00
Invert Elev (ft)	= 222.00
Slope (%)	= 14.00
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 9.65

Highlighted

Depth (ft)	= 0.46
Q (cfs)	= 9.650
Area (sqft)	= 0.55
Velocity (ft/s)	= 17.47
Wetted Perim (ft)	= 2.01
Crit Depth, Yc (ft)	= 1.11
Top Width (ft)	= 1.69
EGL (ft)	= 5.20

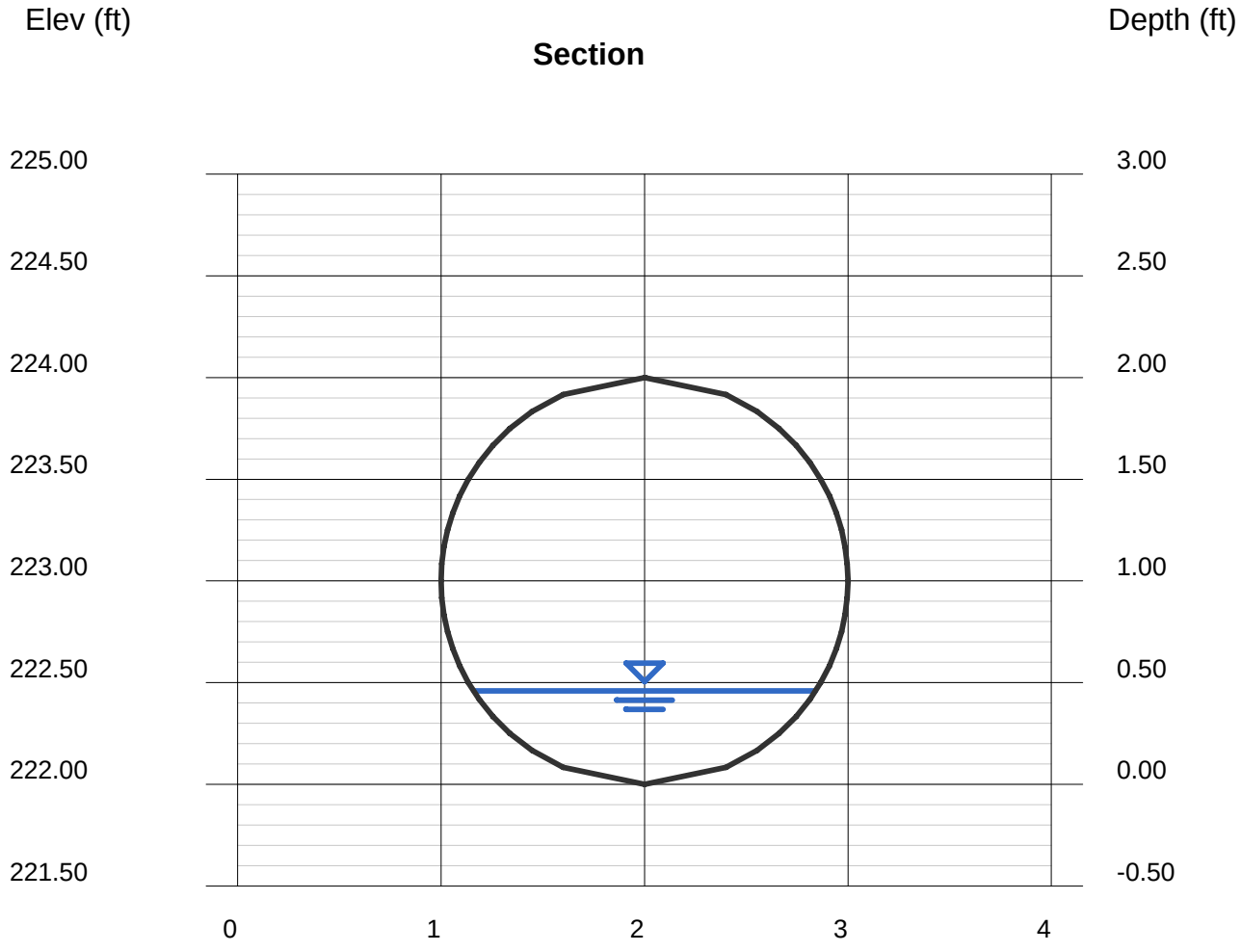
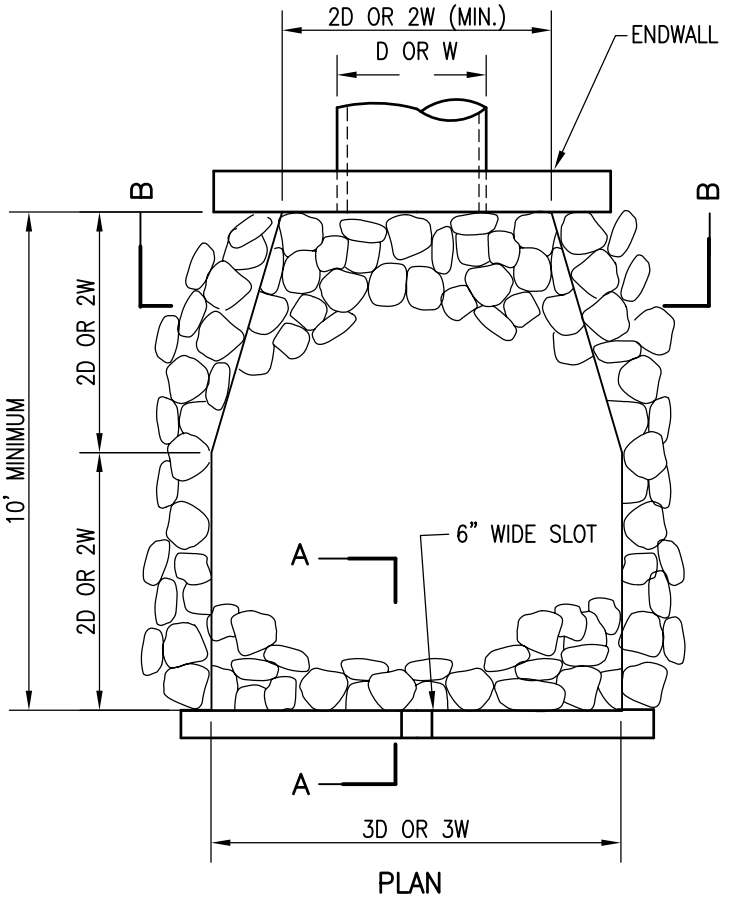


TABLE 7-1 (BELOW) PER JULY 2005
SAN DIEGO COUNTY DRAINAGE DESIGN MANUAL

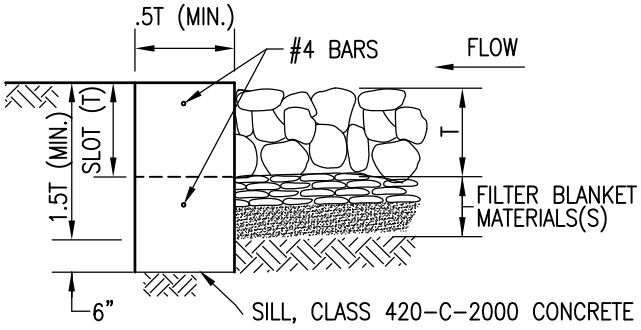
DESIGN VELOCITY (FT/SEC) *	ROCK CLASS	RIP-RAP THICKNESS "T" (MIN)
6-10	NO. 2 BACKING	1.1 FT
10-12	1/4 TON	2.7 FT
12-14	1/2 TON	3.5 FT
14-16	1 TON	4.4 FT
16-18	2 TON	5.4 FT

* OVER 20 FT/SEC REQUIRES SPECIAL DESIGN

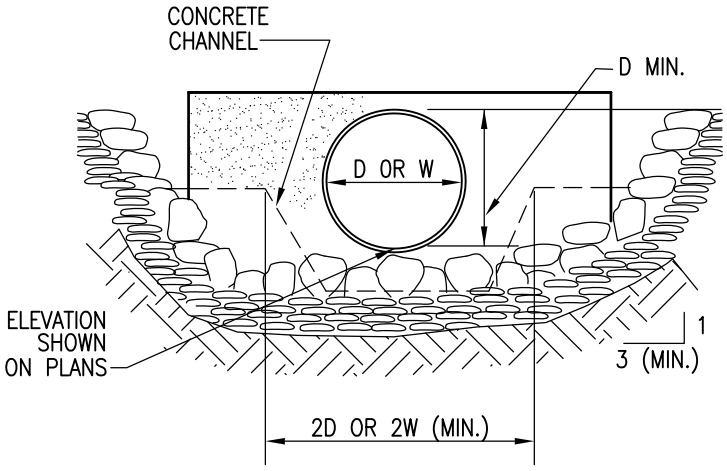
D = PIPE DIAMETER ø
W = BOTTOM WIDTH OF CHANNEL



PLAN



SECTION A-A



SECTION B-B

NOTES

1. PLANS SHALL SPECIFY:
   (A) ROCK CLASS AND RIP-RAP THICKNESS (T). T SHALL BE AT LEAST 1.5 TIMES THE NOMINAL EQUIVALENT DIAMETER OF STONE (d_{50}) OF THE SPECIFIED RIP-RAP.
   (B) FILTER BLANKET MATERIAL, NUMBER OF LAYERS AND THICKNESS.
2. RIP-RAP SHALL BE EITHER QUARRY STONE OR BROKEN CONCRETE (IF SHOWN ON PLANS). COBBLES ARE NOT ACCEPTABLE.
3. RIP-RAP SHALL BE PLACED OVER FILTER BLANKET MATERIAL, WHICH MAY BE EITHER GRANULAR MATERIAL OR NON-WOVEN GEOTEXTILE FILTER FABRIC; MATERIAL AT WEIGHT SPECIFIED IN PLANS OR SPECIFICATIONS.
4. SEE TABLE 200-1.7 IN THE SAN DIEGO REGIONAL SUPPLEMENT TO GREENBOOK FOR SELECTION OF FILTER BLANKET.
5. RIP-RAP ENERGY DISSIPATERS SHALL BE DESIGNATED AS EITHER TYPE 1 OR TYPE 2. TYPE 1 SHALL BE WITH CONCRETE SILL; TYPE 2 SHALL BE WITHOUT SILL.

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Add Rip Rap Table		S. Brady	04/06
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

SAN DIEGO REGIONAL STANDARD DRAWING

RIP RAP
ENERGY DISSIPATER

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

10/25/2018
Chairperson R.C.E. 19246 Date

DRAWING NUMBER D-40

CHAPTER 5

Basin Attenuation Calculations

STORAGE FACILITY 1 HYDROGRAPH

RATIONAL METHOD HYDROGRAPH PROGRAM

RUN DATE 8/8/2024
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 6 MIN.
6 HOUR RAINFALL 2.9 INCHES
BASIN AREA 4.26 ACRES
RUNOFF COEFFICIENT 0.848
PEAK DISCHARGE 26.12 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 6	DISCHARGE (CFS) = 0.6
TIME (MIN) = 12	DISCHARGE (CFS) = 0.6
TIME (MIN) = 18	DISCHARGE (CFS) = 0.6
TIME (MIN) = 24	DISCHARGE (CFS) = 0.7
TIME (MIN) = 30	DISCHARGE (CFS) = 0.7
TIME (MIN) = 36	DISCHARGE (CFS) = 0.7
TIME (MIN) = 42	DISCHARGE (CFS) = 0.7
TIME (MIN) = 48	DISCHARGE (CFS) = 0.7
TIME (MIN) = 54	DISCHARGE (CFS) = 0.7
TIME (MIN) = 60	DISCHARGE (CFS) = 0.7
TIME (MIN) = 66	DISCHARGE (CFS) = 0.8
TIME (MIN) = 72	DISCHARGE (CFS) = 0.8
TIME (MIN) = 78	DISCHARGE (CFS) = 0.8
TIME (MIN) = 84	DISCHARGE (CFS) = 0.8
TIME (MIN) = 90	DISCHARGE (CFS) = 0.8
TIME (MIN) = 96	DISCHARGE (CFS) = 0.8
TIME (MIN) = 102	DISCHARGE (CFS) = 0.9
TIME (MIN) = 108	DISCHARGE (CFS) = 0.9
TIME (MIN) = 114	DISCHARGE (CFS) = 0.9
TIME (MIN) = 120	DISCHARGE (CFS) = 0.9
TIME (MIN) = 126	DISCHARGE (CFS) = 1
TIME (MIN) = 132	DISCHARGE (CFS) = 1
TIME (MIN) = 138	DISCHARGE (CFS) = 1.1
TIME (MIN) = 144	DISCHARGE (CFS) = 1.1
TIME (MIN) = 150	DISCHARGE (CFS) = 1.1
TIME (MIN) = 156	DISCHARGE (CFS) = 1.2
TIME (MIN) = 162	DISCHARGE (CFS) = 1.2
TIME (MIN) = 168	DISCHARGE (CFS) = 1.3
TIME (MIN) = 174	DISCHARGE (CFS) = 1.4
TIME (MIN) = 180	DISCHARGE (CFS) = 1.4
TIME (MIN) = 186	DISCHARGE (CFS) = 1.6
TIME (MIN) = 192	DISCHARGE (CFS) = 1.6
TIME (MIN) = 198	DISCHARGE (CFS) = 1.8
TIME (MIN) = 204	DISCHARGE (CFS) = 1.9
TIME (MIN) = 210	DISCHARGE (CFS) = 2.2
TIME (MIN) = 216	DISCHARGE (CFS) = 2.4
TIME (MIN) = 222	DISCHARGE (CFS) = 2.9
TIME (MIN) = 228	DISCHARGE (CFS) = 3.3
TIME (MIN) = 234	DISCHARGE (CFS) = 4.9
TIME (MIN) = 240	DISCHARGE (CFS) = 5.3
TIME (MIN) = 246	DISCHARGE (CFS) = 26.12
TIME (MIN) = 252	DISCHARGE (CFS) = 3.9
TIME (MIN) = 258	DISCHARGE (CFS) = 2.6
TIME (MIN) = 264	DISCHARGE (CFS) = 2
TIME (MIN) = 270	DISCHARGE (CFS) = 1.7
TIME (MIN) = 276	DISCHARGE (CFS) = 1.5
TIME (MIN) = 282	DISCHARGE (CFS) = 1.3
TIME (MIN) = 288	DISCHARGE (CFS) = 1.2
TIME (MIN) = 294	DISCHARGE (CFS) = 1.1
TIME (MIN) = 300	DISCHARGE (CFS) = 1
TIME (MIN) = 306	DISCHARGE (CFS) = 1
TIME (MIN) = 312	DISCHARGE (CFS) = 0.9
TIME (MIN) = 318	DISCHARGE (CFS) = 0.9
TIME (MIN) = 324	DISCHARGE (CFS) = 0.8
TIME (MIN) = 330	DISCHARGE (CFS) = 0.8
TIME (MIN) = 336	DISCHARGE (CFS) = 0.7
TIME (MIN) = 342	DISCHARGE (CFS) = 0.7
TIME (MIN) = 348	DISCHARGE (CFS) = 0.7
TIME (MIN) = 354	DISCHARGE (CFS) = 0.7
TIME (MIN) = 360	DISCHARGE (CFS) = 0.6
TIME (MIN) = 366	DISCHARGE (CFS) = 0

CMP-1 Discharge to MWS BF-3-1

Discharge vs Elevation Table

Low orifice:	0.5625 "	Top orifice:	0.625 "
Number:	8	Number:	0
Cg-low:	0.61	Cg-low:	0.61
invert elev:	0.00 ft	invert elev:	0.40 ft

h	H/D-low	H/D-mid	H/D-top	Qlow-orif	Qlow-weir	Qtot-low	Qmid-orif	Qmid-weir	Qtot-med	Qtop-orif	Qtop-weir	Qtot-top	Qpeak-top	Qtot
(ft)	-	-	-	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000
0.17	3.56	0.00	0.00	0.026	0.031	0.026	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0256
0.33	7.11	0.00	0.00	0.038	2.023	0.038	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0376
0.50	10.67	0.00	1.92	0.047	23.644	0.047	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0467
0.67	14.22	2.42	5.12	0.054	118.943	0.054	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0542
0.83	17.78	4.85	8.32	0.061	399.127	0.061	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0608
1.00	21.33	7.27	11.52	0.067	1053.340	0.067	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0668
1.17	24.89	9.70	14.72	0.072	2369.442	0.072	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0723
1.33	28.44	12.12	17.92	0.077	4754.788	0.077	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0773
1.50	32.00	14.55	21.12	0.082	8757.006	0.082	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0821
1.67	35.56	16.97	24.32	0.087	15084.775	0.087	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0866
1.83	39.11	19.39	27.52	0.091	24628.607	0.091	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0909
2.00	42.67	21.82	30.72	0.095	38481.619	0.095	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0950
2.17	46.22	24.24	33.92	0.099	57960.320	0.099	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0989
2.33	49.78	26.67	37.12	0.103	84625.382	0.103	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1027
2.50	53.33	29.09	40.32	0.106	120302.423	0.106	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1064
2.67	56.89	31.52	43.52	0.110	167102.785	0.110	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1099
2.83	60.44	33.94	46.72	0.113	227444.312	0.113	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1133
3.00	64.00	36.36	49.92	0.117	304072.128	0.117	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1166
3.17	67.56	38.79	53.12	0.120	400079.417	0.120	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1198
3.33	71.11	41.21	56.32	0.123	518928.201	0.123	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1230
3.50	74.67	43.64	59.52	0.126	664470.120	0.126	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1260
3.67	78.29	46.11	62.78	0.129	844844.376	0.129	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1291
3.83	81.78	48.48	65.92	0.132	1053112.667	0.132	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1319
4.00	85.33	50.91	69.12	0.135	1306051.664	0.135	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1348
4.17	88.89	53.33	72.32	0.138	1605402.088	0.138	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1376
4.33	92.44	55.76	75.52	0.140	1957275.340	0.140	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1403
4.50	96.00	58.18	78.72	0.143	2368297.110	0.143	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1430
4.67	99.56	60.61	81.92	0.146	2845628.153	0.146	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1456
4.83	103.11	63.03	85.12	0.148	3396985.073	0.148	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1482
5.00	106.67	65.45	88.32	0.151	4030661.095	0.151	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1508
5.17	110.22	67.88	91.52	0.153	4755546.849	0.153	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1533
5.33	113.78	70.30	94.72	0.156	5581151.145	0.156	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1557
5.50	117.33	72.73	97.92	0.158	6517621.754	0.158	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1582
5.67	120.89	75.15	101.12	0.161	7575766.186	0.161	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1605
5.83	124.44	77.58	104.32	0.163	8767072.466	0.163	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1629
6.00	128.00	80.00	107.52	0.165	10103729.919	0.165	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1652
6.17	131.56	82.42	110.72	0.168	11598649.940	0.168	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1675
6.33	135.11	84.85	113.92	0.170	13265486.781	0.170	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1698
6.50	138.67	87.27	117.12	0.172	15118658.325	0.172	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1720
6.67	142.22	89.70	120.32	0.174	17173366.863	0.174	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1742
6.83	145.78	92.12	123.52	0.176	19445619.877	0.176	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1764
7.00	149.33	94.55	126.72	0.179	21952250.818	0.179	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1785
7.17	152.89	96.97	129.92	0.181	24710939.881	0.181	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1806
7.33	156.44	99.39	133.12	0.183	27740234.786	0.183	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1827
7.50	160.00	101.82	136.32	0.185	31059571.558	0.185	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1848

CMP #1 Stage Storage					
Input DCV			7,569		
Input Factor			2		
WQ Ponding Depth			2.833	ft	
Note: Find out the elevation value in relation to required WQ volume					
HMP-2-A Stage Storage					
depth	area	area (ac)	elevation	volume (cf)	volume (acft)
0.00	3008.4	0.0691	0.00	0.0	0.00000
0.17	3990.6	0.0916	0.17	611.1	0.01403
0.33	4380.5	0.1006	0.33	1,310.7	0.03009
0.50	4667.7	0.1072	0.50	2,065.7	0.04742
0.67	4899.6	0.1125	0.67	2,863.6	0.06574
0.83	5094.9	0.1170	0.83	3,696.9	0.08487
1.00	5262.9	0.1208	1.00	4,560.4	0.10469
1.17	5409.5	0.1242	1.17	5,450.0	0.12512
1.33	5538.3	0.1271	1.33	6,362.6	0.14606
1.50	5652.0	0.1298	1.50	7,295.3	0.16748
1.67	5752.5	0.1321	1.67	8,245.8	0.18930
1.83	5841.1	0.1341	1.83	9,212.1	0.21148
2.00	5919.0	0.1359	2.00	10,192.3	0.23398
2.17	5986.9	0.1374	2.17	11,184.6	0.25676
2.33	6045.6	0.1388	2.33	12,187.4	0.27978
2.50	6095.5	0.1399	2.50	13,199.3	0.30301
2.67	6137.2	0.1409	2.67	14,218.8	0.32642
2.83	6170.8	0.1417	2.83	15,244.5	0.34997
3.00	6196.8	0.1423	3.00	16,275.3	0.37363
3.17	6215.2	0.1427	3.17	17,309.7	0.39738
3.33	6226.1	0.1429	3.33	18,346.6	0.42118
3.50	6229.8	0.1430	3.50	19,384.7	0.44501
3.67	6226.1	0.1429	3.67	20,422.8	0.46884
3.83	6215.2	0.1427	3.83	21,459.7	0.49265
4.00	6196.8	0.1423	4.00	22,494.1	0.51639
4.17	6170.8	0.1417	4.17	23,524.8	0.54006
4.33	6137.2	0.1409	4.33	24,550.6	0.56360
4.50	6095.5	0.1399	4.50	25,570.1	0.58701
4.67	6045.6	0.1388	4.67	26,582.0	0.61024
4.83	5986.9	0.1374	4.83	27,584.8	0.63326
5.00	5919.0	0.1359	5.00	28,577.1	0.65604
5.17	5841.1	0.1341	5.17	29,557.2	0.67854
5.33	5752.5	0.1321	5.33	30,523.5	0.70072
5.50	5652.0	0.1298	5.50	31,474.1	0.72255
5.67	5538.3	0.1271	5.67	32,406.8	0.74396
5.83	5409.5	0.1242	5.83	33,319.4	0.76491
6.00	5262.9	0.1208	6.00	34,209.0	0.78533
6.17	5094.9	0.1170	6.17	35,072.5	0.80515
6.33	4899.6	0.1125	6.33	35,905.8	0.82428
6.50	4667.7	0.1072	6.50	36,703.7	0.84260
6.67	4380.5	0.1006	6.67	37,458.6	0.85993
6.83	3990.6	0.0916	6.83	38,158.3	0.87599
7.00	3008.4	0.0691	7.00	38,769.4	0.89002
7.17	3008.4	0.0691	7.17	39,270.8	0.90153
7.33	3008.4	0.0691	7.33	39,772.2	0.91304
7.50	3008.4	0.0691	7.50	40,273.6	0.92455

Date: 8/7/2024
Project Name: West Storage-1 - 47951 (8-7-2024 21-27-19)

City / County:
State:

Designed By:
Company:
Telephone:

CMP: Underground Detention System Storage Volume Estimation

=Adjustable Input Cells

Contech Engineered Solutions, LLC is pleased to offer the following estimate of storage volume for the above named project. The results are submitted as an estimate only, without liability on the part of Contech Engineered Solutions, LLC for accuracy or suitability to any particular applicaton and are subject to verification of the Engineer of Record. This tool is only applicable for rectangular shaped systems.

Summary of Inputs

System Information		Backfill Information		Pipe & Analysis Information	
Out-to-out length (ft):	107.0	Backfill Porosity (%):	40%	System Diameter (in):	84
Out-to-out width (ft):	67.0	Depth Above Pipe (in):	6.0	Pipe Spacing (in):	36
Number of Manifolds (ea):	1.0	Depth Below Pipe (in):	0.0	Incremental Analysis (in):	2
Number of Barrels (ea):	7.0	Width At Ends (ft):	1.0	System Invert (Elevation):	0
		Width At Sides (ft):	1.0		

Storage Volume Estimation

System		Pipe		Stone		Total System		Miscellaneous	
Depth (ft)	Elevation (ft)	Incremental Storage (cf)	Cumulative Storage (cf)	Incremental Storage (cf)	Cumulative Storage (cf)	Incremental Storage (cf)	Cumulative Storage (cf)	Percent Open Storage (%)	Ave. Surface Area (sf)
0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	3,008.4
0.17	0.16	182.8	182.8	428.3	428.3	611.1	611.1	29.9%	3,990.6
0.33	0.33	330.4	513.2	369.2	797.5	699.7	1,310.7	39.2%	4,380.5
0.50	0.50	422.6	935.8	332.3	1,129.9	755.0	2,065.7	45.3%	4,667.7
0.67	0.66	494.1	1,430.0	303.7	1,433.6	797.9	2,863.6	49.9%	4,899.6
0.83	0.83	553.2	1,983.2	280.1	1,713.7	833.3	3,696.9	53.6%	5,094.9
1.00	1.00	603.5	2,586.6	260.0	1,973.7	863.5	4,560.4	56.7%	5,262.9
1.17	1.16	647.1	3,233.7	242.6	2,216.3	889.6	5,450.0	59.3%	5,409.5
1.33	1.33	685.2	3,918.9	227.3	2,443.6	912.5	6,362.6	61.6%	5,538.3
1.50	1.50	718.9	4,637.8	213.8	2,657.5	932.7	7,295.3	63.6%	5,652.0
1.67	1.66	748.6	5,386.4	202.0	2,859.4	950.6	8,245.8	65.3%	5,752.5
1.83	1.83	774.8	6,161.2	191.5	3,050.9	966.3	9,212.1	66.9%	5,841.1
2.00	2.00	797.9	6,959.1	182.2	3,233.1	980.1	10,192.3	68.3%	5,919.0
2.17	2.16	818.1	7,777.3	174.1	3,407.3	992.3	11,184.6	69.5%	5,986.9
2.33	2.33	835.7	8,613.0	167.1	3,574.4	1,002.8	12,187.4	70.7%	6,045.6
2.50	2.50	850.8	9,463.8	161.1	3,735.5	1,011.9	13,199.3	71.7%	6,095.5
2.67	2.66	863.5	10,327.3	156.0	3,891.5	1,019.5	14,218.8	72.6%	6,137.2
2.83	2.83	874.0	11,201.2	151.8	4,043.3	1,025.8	15,244.5	73.5%	6,170.8
3.00	3.00	882.2	12,083.5	148.5	4,191.8	1,030.7	16,275.3	74.2%	6,196.8
3.17	3.16	888.4	12,971.9	146.0	4,337.9	1,034.4	17,309.7	74.9%	6,215.2
3.33	3.33	892.5	13,864.3	144.4	4,482.3	1,036.9	18,346.6	75.6%	6,226.1
3.50	3.50	894.5	14,758.8	143.6	4,625.9	1,038.1	19,384.7	76.1%	6,229.8
3.67	3.66	894.5	15,653.3	143.6	4,769.5	1,038.1	20,422.8	76.6%	6,226.1
3.83	3.83	892.5	16,545.8	144.4	4,913.9	1,036.9	21,459.7	77.1%	6,215.2
4.00	4.00	888.4	17,434.2	146.0	5,059.9	1,034.4	22,494.1	77.5%	6,196.8
4.17	4.16	882.2	18,316.4	148.5	5,208.4	1,030.7	23,524.8	77.9%	6,170.8
4.33	4.33	874.0	19,190.3	151.8	5,360.3	1,025.8	24,550.6	78.2%	6,137.2
4.50	4.50	863.5	20,053.8	156.0	5,516.3	1,019.5	25,570.1	78.4%	6,095.5
4.67	4.66	850.8	20,904.6	161.1	5,677.3	1,011.9	26,582.0	78.6%	6,045.6
4.83	4.83	835.7	21,740.3	167.1	5,844.5	1,002.8	27,584.8	78.8%	5,986.9
5.00	5.00	818.1	22,558.5	174.1	6,018.6	992.3	28,577.1	78.9%	5,919.0
5.17	5.16	797.9	23,356.4	182.2	6,200.8	980.1	29,557.2	79.0%	5,841.1
5.33	5.33	774.8	24,131.2	191.5	6,392.3	966.3	30,523.5	79.1%	5,752.5
5.50	5.50	748.6	24,879.8	202.0	6,594.3	950.6	31,474.1	79.0%	5,652.0
5.67	5.66	718.9	25,598.7	213.8	6,808.1	932.7	32,406.8	79.0%	5,538.3
5.83	5.83	685.2	26,283.9	227.3	7,035.4	912.5	33,319.4	78.9%	5,409.5
6.00	6.00	647.1	26,931.0	242.6	7,278.0	889.6	34,209.0	78.7%	5,262.9
6.17	6.16	603.5	27,534.5	260.0	7,538.0	863.5	35,072.5	78.5%	5,094.9
6.33	6.33	553.2	28,087.6	280.1	7,818.1	833.3	35,905.8	78.2%	4,899.6
6.50	6.50	494.1	28,581.8	303.7	8,121.9	797.9	36,703.7	77.9%	4,667.7
6.67	6.66	422.6	29,004.4	332.3	8,454.2	755.0	37,458.6	77.4%	4,380.5
6.83	6.83	330.4	29,334.8	369.2	8,823.5	699.7	38,158.3	76.9%	3,990.6
7.00	7.00	182.8	29,517.6	428.3	9,251.8	611.1	38,769.4	76.1%	3,008.4
7.17	7.16	0.0	29,517.6	501.4	9,753.2	501.4	39,270.8	75.2%	3,008.4
7.33	7.33	0.0	29,517.6	501.4	10,254.6	501.4	39,772.2	74.2%	3,008.4
7.50	7.50	0.0	29,517.6	501.4	10,756.0	501.4	40,273.6	73.3%	3,008.4

WQ Drawdown @		2.83	ft=	62.68
Elevation	Q_{AVG} (CFS)	DV (CF)	DT (HR)	Total T
0.00	0.026	611	6.64	62.68
0.17	0.032	700	6.15	56.05
0.33	0.042	755	4.98	49.90
0.50	0.050	798	4.40	44.92
0.67	0.058	833	4.02	40.52
0.83	0.064	863	3.76	36.50
1.00	0.070	890	3.55	32.74
1.17	0.075	913	3.39	29.19
1.33	0.080	933	3.25	25.80
1.50	0.084	951	3.13	22.55
1.67	0.089	966	3.02	19.42
1.83	0.093	980	2.93	16.40
2.00	0.097	992	2.84	13.47
2.17	0.101	1003	2.76	10.62
2.33	0.105	1012	2.69	7.86
2.50	0.108	1020	2.62	5.17
2.67	0.112	1026	2.55	2.55
2.83				

CMP #1 Discharge HMP Riser

Discharge vs Elevation Table

Low orifice:	0.50 "	Top orifice:	4 "
Number:	1	Number:	12
Cg-low:	0.61	Cg-low:	0.61
invert elev:	2.83 ft	invert elev:	5.00 ft
Middle orifice:	2 "	Emergency inlet:	
number of orif:	10	Rim height:	6.40 ft
Cg-middle:	0.61	Riser Box D	3x4
invert elev:	4.75 ft	Weir Length	14.00 ft

h	H/D-low	H/D-mid	H/D-top	Qlow-orif	Qlow-weir	Qtot-low	Qmid-orif	Qmid-weir	Qtot-med	Qtop-orif	Qtop-weir	Qtot-top	Qpeak-top	Peak Flow WQ+HMP Qtot	Qtot
(ft)	-	-	-	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000
0.17	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0256
0.33	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0376
0.50	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0467
0.67	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0542
0.83	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0608
1.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0668
1.17	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0723
1.33	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0773
1.50	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0821
1.67	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0866
1.83	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0909
2.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0950
2.17	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0989
2.33	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1027
2.50	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1064
2.67	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1099
2.83	0.08	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1133
3.00	4.08	0.00	0.00	0.003	0.005	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.1192
3.17	8.08	0.00	0.00	0.004	0.422	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.1236
3.33	12.08	0.00	0.00	0.005	4.470	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.1276
3.50	16.08	0.00	0.00	0.005	21.637	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.1314
3.67	20.16	0.00	0.00	0.006	72.690	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.1351
3.83	24.08	0.00	0.00	0.007	185.564	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.1385
4.00	28.08	0.00	0.00	0.007	414.035	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.1419
4.17	32.08	0.00	0.00	0.008	826.024	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.1452
4.33	36.08	0.00	0.00	0.008	1514.674	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.1484
4.50	40.08	0.00	0.00	0.009	2600.318	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.009	0.1516
4.67	44.08	0.00	0.00	0.009	4233.968	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.009	0.1546
4.83	48.08	0.50	0.00	0.009	6600.799	0.009	0.000	0.087	0.087	0.000	0.000	0.000	0.000	0.096	0.2445
5.00	52.08	1.50	0.00	0.010	9923.637	0.010	0.436	0.530	0.436	0.000	0.000	0.000	0.000	0.446	0.5965
5.17	56.08	2.50	0.50	0.010	14466.445	0.010	0.617	0.788	0.617	0.000	0.590	0.590	0.000	1.217	1.3701
5.33	60.08	3.50	1.00	0.011	20537.809	0.011	0.755	0.888	0.755	2.093	1.999	1.999	0.000	2.765	2.9209
5.50	64.08	4.50	1.50	0.011	28494.427	0.011	0.872	2.617	0.872	2.960	3.599	2.960	0.000	3.843	4.0007
5.67	68.08	5.50	2.00	0.011	38744.594	0.011	0.975	10.607	0.975	3.625	4.814	3.625	0.000	4.611	4.7715
5.83	72.08	6.50	2.50	0.012	51751.690	0.012	1.068	33.432	1.068	4.186	5.351	4.186	0.000	5.265	5.4280
6.00	76.08	7.50	3.00	0.012	68037.662	0.012	1.154	84.691	1.154	4.680	5.434	4.680	0.000	5.845	6.0102
6.17	80.08	8.50	3.50	0.012	88186.518	0.012	1.233	184.101	1.233	5.126	6.031	5.126	0.000	6.372	6.5391
6.33	84.08	9.50	4.00	0.012	112847.808	0.012	1.308	358.584	1.308	5.537	9.089	5.537	0.000	6.857	7.0272
6.50	88.08	10.50	4.50	0.013	142740.112	0.013	1.379	643.360	1.379	5.919	17.762	5.919	1.474	8.785	8.9570
6.67	92.08	11.50	5.00	0.013	178654.529	0.013	1.446	1083.034	1.446	6.278	36.645	6.278	6.420	14.157	14.3315
6.83	96.08	12.50	5.50	0.013	221458.160	0.013	1.510	1732.686	1.510	6.618	72.003	6.618	13.299	21.440	21.6166
7.00	100.08	13.50	6.00	0.014	272097.598	0.014	1.572	2658.962	1.572	6.941	132.003	6.941	21.667	30.194	30.3721
7.17	104.08	14.50	6.50	0.014	331602.411	0.014	1.631	3941.161	1.631	7.250	226.944	7.250	31.296	40.190	40.3710
7.33	108.08	15.50	7.00	0.014	401088.632	0.014	1.689	5672.326	1.689	7.546	369.491	7.546	42.037	51.285	51.4677
7.50	112.08	16.50	7.50	0.014	481762.245	0.014	1.744	7960.336	1.744	7.831	574.902	7.831	53.785	63.374	63.5587

HMP-2A Drawdown @		7.5	ft=	91.23
Elevation	Q_{AVG} (CFS)	DV (CF)	DT (HR)	Total T
0.00	0.019	611	9.02	91.23
0.17	0.032	700	6.15	82.20
0.33	0.042	755	4.98	76.05
0.50	0.050	798	4.40	71.07
0.67	0.058	833	4.02	66.68
0.83	0.064	863	3.76	62.65
1.00	0.070	890	3.55	58.90
1.17	0.075	913	3.39	55.34
1.33	0.080	933	3.25	51.95
1.50	0.084	951	3.13	48.70
1.67	0.089	966	3.02	45.57
1.83	0.093	980	2.93	42.55
2.00	0.097	992	2.84	39.62
2.17	0.101	1003	2.76	36.78
2.33	0.105	1012	2.69	34.02
2.50	0.108	1020	2.62	31.33
2.67	0.112	1026	2.55	28.71
2.83	0.116	1031	2.46	26.15
3.00	0.121	1034	2.37	23.69
3.17	0.126	1037	2.29	21.32
3.33	0.129	1038	2.23	19.03
3.50	0.133	1038	2.16	16.80
3.67	0.137	1037	2.11	14.64
3.83	0.140	1034	2.05	12.53
4.00	0.144	1031	1.99	10.49
4.17	0.147	1026	1.94	8.49
4.33	0.150	1020	1.89	6.55
4.50	0.153	1012	1.84	4.66
4.67	0.200	1003	1.40	2.83
4.83	0.421	992	0.66	1.43
5.00	0.983	980	0.28	0.78
5.17	2.145	966	0.13	0.50
5.33	3.461	951	0.08	0.37
5.50	4.386	933	0.06	0.30
5.67	5.100	913	0.05	0.24
5.83	5.719	890	0.04	0.19
6.00	6.275	863	0.04	0.14
6.17	6.783	833	0.03	0.11
6.33	7.992	798	0.03	0.07
6.50	11.644	755	0.02	0.04
6.67	17.974	700	0.01	0.03
6.83	25.994	611	0.01	0.02
7.00	35.372	501	0.00	0.01
7.17	45.919	501	0.00	0.01
7.33	57.513	501	0.00	0.00
7.50	31.779			

STORAGE FACILITY 2 HYDROGRAPH

RATIONAL METHOD HYDROGRAPH PROGRAM

RUN DATE 10/7/2024
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 6 MIN.
6 HOUR RAINFALL 2.9 INCHES
BASIN AREA 2.33 ACRES
RUNOFF COEFFICIENT 0.75
PEAK DISCHARGE 12.41 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 6	DISCHARGE (CFS) = 0.3
TIME (MIN) = 12	DISCHARGE (CFS) = 0.3
TIME (MIN) = 18	DISCHARGE (CFS) = 0.3
TIME (MIN) = 24	DISCHARGE (CFS) = 0.3
TIME (MIN) = 30	DISCHARGE (CFS) = 0.3
TIME (MIN) = 36	DISCHARGE (CFS) = 0.3
TIME (MIN) = 42	DISCHARGE (CFS) = 0.3
TIME (MIN) = 48	DISCHARGE (CFS) = 0.3
TIME (MIN) = 54	DISCHARGE (CFS) = 0.3
TIME (MIN) = 60	DISCHARGE (CFS) = 0.4
TIME (MIN) = 66	DISCHARGE (CFS) = 0.4
TIME (MIN) = 72	DISCHARGE (CFS) = 0.4
TIME (MIN) = 78	DISCHARGE (CFS) = 0.4
TIME (MIN) = 84	DISCHARGE (CFS) = 0.4
TIME (MIN) = 90	DISCHARGE (CFS) = 0.4
TIME (MIN) = 96	DISCHARGE (CFS) = 0.4
TIME (MIN) = 102	DISCHARGE (CFS) = 0.4
TIME (MIN) = 108	DISCHARGE (CFS) = 0.4
TIME (MIN) = 114	DISCHARGE (CFS) = 0.4
TIME (MIN) = 120	DISCHARGE (CFS) = 0.5
TIME (MIN) = 126	DISCHARGE (CFS) = 0.5
TIME (MIN) = 132	DISCHARGE (CFS) = 0.5
TIME (MIN) = 138	DISCHARGE (CFS) = 0.5
TIME (MIN) = 144	DISCHARGE (CFS) = 0.5
TIME (MIN) = 150	DISCHARGE (CFS) = 0.6
TIME (MIN) = 156	DISCHARGE (CFS) = 0.6
TIME (MIN) = 162	DISCHARGE (CFS) = 0.6
TIME (MIN) = 168	DISCHARGE (CFS) = 0.6
TIME (MIN) = 174	DISCHARGE (CFS) = 0.7
TIME (MIN) = 180	DISCHARGE (CFS) = 0.7
TIME (MIN) = 186	DISCHARGE (CFS) = 0.8
TIME (MIN) = 192	DISCHARGE (CFS) = 0.8
TIME (MIN) = 198	DISCHARGE (CFS) = 0.9
TIME (MIN) = 204	DISCHARGE (CFS) = 0.9
TIME (MIN) = 210	DISCHARGE (CFS) = 1.1
TIME (MIN) = 216	DISCHARGE (CFS) = 1.1
TIME (MIN) = 222	DISCHARGE (CFS) = 1.4
TIME (MIN) = 228	DISCHARGE (CFS) = 1.6
TIME (MIN) = 234	DISCHARGE (CFS) = 2.4
TIME (MIN) = 240	DISCHARGE (CFS) = 2.8
TIME (MIN) = 246	DISCHARGE (CFS) = 12.41
TIME (MIN) = 252	DISCHARGE (CFS) = 1.9
TIME (MIN) = 258	DISCHARGE (CFS) = 1.3
TIME (MIN) = 264	DISCHARGE (CFS) = 1
TIME (MIN) = 270	DISCHARGE (CFS) = 0.8
TIME (MIN) = 276	DISCHARGE (CFS) = 0.7
TIME (MIN) = 282	DISCHARGE (CFS) = 0.6
TIME (MIN) = 288	DISCHARGE (CFS) = 0.6
TIME (MIN) = 294	DISCHARGE (CFS) = 0.5
TIME (MIN) = 300	DISCHARGE (CFS) = 0.5
TIME (MIN) = 306	DISCHARGE (CFS) = 0.5
TIME (MIN) = 312	DISCHARGE (CFS) = 0.4
TIME (MIN) = 318	DISCHARGE (CFS) = 0.4
TIME (MIN) = 324	DISCHARGE (CFS) = 0.4
TIME (MIN) = 330	DISCHARGE (CFS) = 0.4
TIME (MIN) = 336	DISCHARGE (CFS) = 0.4
TIME (MIN) = 342	DISCHARGE (CFS) = 0.3
TIME (MIN) = 348	DISCHARGE (CFS) = 0.3
TIME (MIN) = 354	DISCHARGE (CFS) = 0.3
TIME (MIN) = 360	DISCHARGE (CFS) = 0.3
TIME (MIN) = 366	DISCHARGE (CFS) = 0

CMP-2 Discharge to MWS BF-3-2

Discharge vs Elevation Table

Low orifice:	0.525 "	Top orifice:	0.75 "
Number:	4	Number:	0
Cg-low:	0.61	Cg-low:	0.61
invert elev:	0.00 ft	invert elev:	0.75 ft

h	H/D-low	H/D-mid	H/D-top	Qlow-orif	Qlow-weir	Qtot-low	Qmid-orif	Qmid-weir	Qtot-med	Qtop-orif	Qtop-weir	Qtot-top	Qpeak-top	Qtot
(ft)	-	-	-	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000
0.17	3.81	0.00	0.00	0.011	0.016	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0112
0.33	7.62	0.00	0.00	0.016	1.321	0.016	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0164
0.50	11.43	0.00	0.00	0.020	14.762	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0204
0.67	15.24	2.42	0.00	0.024	73.005	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0236
0.83	19.05	4.85	1.33	0.027	242.879	0.027	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0265
1.00	22.86	7.27	4.00	0.029	637.724	0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0291
1.17	26.67	9.70	6.67	0.031	1429.734	0.031	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0315
1.33	30.48	12.12	9.33	0.034	2862.302	0.034	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0337
1.50	34.29	14.55	12.00	0.036	5262.368	0.036	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0358
1.67	38.10	16.97	14.67	0.038	9052.761	0.038	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0378
1.83	41.90	19.39	17.33	0.040	14764.544	0.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0396
2.00	45.71	21.82	20.00	0.041	23049.363	0.041	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0414
2.17	49.52	24.24	22.67	0.043	34691.785	0.043	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0431
2.33	53.33	26.67	25.33	0.045	50621.653	0.045	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0448
2.50	57.14	29.09	28.00	0.046	71926.420	0.046	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0463
2.67	60.95	31.52	30.67	0.048	99863.503	0.048	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0479
2.83	64.76	33.94	33.33	0.049	135872.625	0.049	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0494
3.00	68.57	36.36	36.00	0.051	181588.157	0.051	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0508
3.17	72.38	38.79	38.67	0.052	238851.469	0.052	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0522

CMP #HMP-2 Stage Storage					
Input DCV			3,285		
Input Factor			2.05		
WQ Ponding Depth			3.000	ft	
Note: Find out the elevation value in relation to required WQ volume					
HMP-2-A Stage Storage					
depth	Average Surface area	area (ac)	elevation	Comulative volume (cf)	volume (acft)
0.00	1244.4	0.0286	0.00	0.0	0.0
0.17	1650.4	0.0379	0.17	252.7	0.00580
0.33	1811.9	0.0416	0.33	542.1	0.01244
0.50	1931.4	0.0443	0.50	854.4	0.01961
0.67	2028.1	0.0466	0.67	1,184.6	0.02720
0.83	2109.9	0.0484	0.83	1,529.6	0.03512
1.00	2180.6	0.0501	1.00	1,887.3	0.04333
1.17	2242.5	0.0515	1.17	2,256.0	0.05179
1.33	2297.3	0.0527	1.33	2,634.4	0.06048
1.50	2346.0	0.0539	1.50	3,021.5	0.06936
1.67	2389.3	0.0549	1.67	3,416.1	0.07842
1.83	2428.0	0.0557	1.83	3,817.6	0.08764
2.00	2462.3	0.0565	2.00	4,225.2	0.09700
2.17	2492.6	0.0572	2.17	4,638.2	0.10648
2.33	2519.4	0.0578	2.33	5,055.9	0.11607
2.50	2542.6	0.0584	2.50	5,477.8	0.12575
2.67	2562.7	0.0588	2.67	5,903.3	0.13552
2.83	2579.6	0.0592	2.83	6,331.8	0.14536
3.00	2593.6	0.0595	3.00	6,763.0	0.15526
3.17	2604.6	0.0598	3.17	7,196.2	0.16520
3.33	2612.9	0.0600	3.33	7,631.0	0.17518
3.50	2618.3	0.0601	3.50	8,067.0	0.18519
3.67	2621.1	0.0602	3.67	8,503.7	0.19522
3.83	2621.1	0.0602	3.83	8,940.5	0.20525
4.00	2618.3	0.0601	4.00	9,377.2	0.21527
4.17	2612.9	0.0600	4.17	9,813.2	0.22528
4.33	2604.6	0.0598	4.33	10,248.0	0.23526
4.50	2593.6	0.0595	4.50	10,681.2	0.24521
4.67	2579.6	0.0592	4.67	11,112.4	0.25510
4.83	2562.7	0.0588	4.83	11,540.9	0.26494
5.00	2542.6	0.0584	5.00	11,966.4	0.27471
5.17	2519.4	0.0578	5.17	12,388.3	0.28440
5.33	2492.6	0.0572	5.33	12,806.0	0.29399
5.50	2462.3	0.0565	5.50	13,219.0	0.30347
5.67	2428.0	0.0557	5.67	13,626.6	0.31282
5.83	2389.3	0.0549	5.83	14,028.1	0.32204
6.00	2346.0	0.0539	6.00	14,422.7	0.33110
6.17	2297.3	0.0527	6.17	14,809.8	0.33999
6.33	2242.5	0.0515	6.33	15,188.2	0.34867
6.50	2180.6	0.0501	6.50	15,556.9	0.35714
6.67	2109.9	0.0484	6.67	15,914.6	0.36535
6.83	2028.1	0.0466	6.83	16,259.6	0.37327
7.00	1931.4	0.0443	7.00	16,589.8	0.38085
7.17	1811.9	0.0416	7.17	16,902.1	0.38802
7.33	1650.4	0.0379	7.33	17,191.5	0.39466
7.50	1244.4	0.0286	7.50	17,444.2	0.40046
7.67	1244.4	0.0286	7.67	17,651.6	0.40522
7.83	1244.4	0.0286	7.83	17,859.0	0.40999
8.00	1244.4	0.0286	8.00	18,066.4	0.41475
8.17	1244.4	0.0286	8.17	18,273.8	0.41951

CONTECH ENGINEERED SOLUTIONS

Date: 8/7/2024
Project Name: East Storage-2 - 47954 (8-7-2024 0-5-24)

City / County:
State:

Designed By:
Company:
Telephone:

CMP: Underground Detention System Storage Volume Estimation

=Adjustable Input Cells

Contech Engineered Solutions, LLC is pleased to offer the following estimate of storage volume for the above named project. The results are submitted as an estimate only, without liability on the part of Contech Engineered Solutions, LLC for accuracy or suitability to any particular applicaton and are subject to verification of the Engineer of Record. This tool is only applicable for rectangular shaped systems.

Summary of Inputs

System Information		Backfill Information		Pipe & Analysis Information	
Out-to-out length (ft):	100.0	Backfill Porosity (%):	40%	System Diameter (in):	90
Out-to-out width (ft):	28.5	Depth Above Pipe (in):	9.0	Pipe Spacing (in):	36
Number of Manifolds (ea):	1.0	Depth Below Pipe (in):	0.0	Incremental Analysis (in):	2
Number of Barrels (ea):	3.0	Width At Ends (ft):	1.0	System Invert (Elevation):	0
		Width At Sides (ft):	1.0		

Storage Volume Estimation

System		Pipe		Stone		Total System		Miscellaneous	
Depth (ft)	Elevation (ft)	Incremental Storage (cf)	Cumulative Storage (cf)	Incremental Storage (cf)	Cumulative Storage (cf)	Incremental Storage (cf)	Cumulative Storage (cf)	Percent Open Storage (%)	Ave. Surface Area (sf)
0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	1,244.4
0.17	0.16	75.5	75.5	177.2	177.2	252.7	252.7	29.9%	1,650.4
0.33	0.33	136.6	212.1	152.7	329.9	289.4	542.1	39.1%	1,811.9
0.50	0.50	174.9	387.0	137.4	467.4	312.3	854.4	45.3%	1,931.4
0.67	0.66	204.7	591.7	125.5	592.9	330.2	1,184.6	49.9%	2,028.1
0.83	0.83	229.4	821.1	115.7	708.6	345.0	1,529.6	53.7%	2,109.9
1.00	1.00	250.5	1,071.5	107.2	815.8	357.7	1,887.3	56.8%	2,180.6
1.17	1.16	268.8	1,340.4	99.9	915.7	368.7	2,256.0	59.4%	2,242.5
1.33	1.33	285.0	1,625.4	93.4	1,009.0	378.4	2,634.4	61.7%	2,297.3
1.50	1.50	299.4	1,924.8	87.7	1,096.7	387.0	3,021.5	63.7%	2,346.0
1.67	1.66	312.1	2,236.9	82.5	1,179.2	394.7	3,416.1	65.5%	2,389.3
1.83	1.83	323.5	2,560.4	78.0	1,257.2	401.5	3,817.6	67.1%	2,428.0
2.00	2.00	333.6	2,894.0	74.0	1,331.2	407.6	4,225.2	68.5%	2,462.3
2.17	2.16	342.6	3,236.6	70.4	1,401.5	413.0	4,638.2	69.8%	2,492.6
2.33	2.33	350.5	3,587.2	67.2	1,468.7	417.7	5,055.9	71.0%	2,519.4
2.50	2.50	357.5	3,944.6	64.4	1,533.1	421.9	5,477.8	72.0%	2,542.6
2.67	2.66	363.5	4,308.1	62.0	1,595.2	425.5	5,903.3	73.0%	2,562.7
2.83	2.83	368.6	4,676.7	60.0	1,655.1	428.6	6,331.8	73.9%	2,579.6
3.00	3.00	372.9	5,049.6	58.2	1,713.3	431.1	6,763.0	74.7%	2,593.6
3.17	3.16	376.4	5,426.0	56.9	1,770.2	433.2	7,196.2	75.4%	2,604.6
3.33	3.33	379.1	5,805.1	55.8	1,826.0	434.8	7,631.0	76.1%	2,612.9
3.50	3.50	381.0	6,186.0	55.0	1,881.0	436.0	8,067.0	76.7%	2,618.3
3.67	3.66	382.1	6,568.1	54.6	1,935.6	436.7	8,503.7	77.2%	2,621.1
3.83	3.83	382.5	6,950.6	54.4	1,990.0	436.9	8,940.5	77.7%	2,621.1
4.00	4.00	382.1	7,332.7	54.6	2,044.5	436.7	9,377.2	78.2%	2,618.3
4.17	4.16	381.0	7,713.6	55.0	2,099.6	436.0	9,813.2	78.6%	2,612.9
4.33	4.33	379.1	8,092.7	55.8	2,155.3	434.8	10,248.0	79.0%	2,604.6
4.50	4.50	376.4	8,469.0	56.9	2,212.2	433.2	10,681.2	79.3%	2,593.6
4.67	4.66	372.9	8,841.9	58.2	2,270.4	431.1	11,112.4	79.6%	2,579.6
4.83	4.83	368.6	9,210.6	60.0	2,330.4	428.6	11,540.9	79.8%	2,562.7
5.00	5.00	363.5	9,574.0	62.0	2,392.4	425.5	11,966.4	80.0%	2,542.6
5.17	5.16	357.5	9,931.5	64.4	2,456.8	421.9	12,388.3	80.2%	2,519.4
5.33	5.33	350.5	10,282.0	67.2	2,524.0	417.7	12,806.0	80.3%	2,492.6
5.50	5.50	342.6	10,624.6	70.4	2,594.3	413.0	13,219.0	80.4%	2,462.3
5.67	5.66	333.6	10,958.3	74.0	2,668.3	407.6	13,626.6	80.4%	2,428.0
5.83	5.83	323.5	11,281.8	78.0	2,746.3	401.5	14,028.1	80.4%	2,389.3
6.00	6.00	312.1	11,593.9	82.5	2,828.8	394.7	14,422.7	80.4%	2,346.0
6.17	6.16	299.4	11,893.3	87.7	2,916.5	387.0	14,809.8	80.3%	2,297.3
6.33	6.33	285.0	12,178.3	93.4	3,009.9	378.4	15,188.2	80.2%	2,242.5
6.50	6.50	268.8	12,447.1	99.9	3,109.7	368.7	15,556.9	80.0%	2,180.6
6.67	6.66	250.5	12,697.6	107.2	3,217.0	357.7	15,914.6	79.8%	2,109.9
6.83	6.83	229.4	12,926.9	115.7	3,332.6	345.0	16,259.6	79.5%	2,028.1
7.00	7.00	204.7	13,131.6	125.5	3,458.2	330.2	16,589.8	79.2%	1,931.4
7.17	7.16	174.9	13,306.5	137.4	3,595.6	312.3	16,902.1	78.7%	1,811.9
7.33	7.33	136.6	13,443.1	152.7	3,748.3	289.4	17,191.5	78.2%	1,650.4
7.50	7.50	75.5	13,518.7	177.2	3,925.5	252.7	17,444.2	77.5%	1,244.4
7.67	7.66	0.0	13,518.7	207.4	4,132.9	207.4	17,651.6	76.6%	1,244.4
7.83	7.83	0.0	13,518.7	207.4	4,340.3	207.4	17,859.0	75.7%	1,244.4
8.00	8.00	0.0	13,518.7	207.4	4,547.7	207.4	18,066.4	74.8%	1,244.4
8.17	8.16	0.0	13,518.7	207.4	4,755.1	207.4	18,273.8	74.0%	1,244.4

WQ Drawdown @		3.00	ft=	62.00
Elevation	Q_{AVG} (CFS)	DV (CF)	DT (HR)	Total T
0.00	0.011	253	6.27	62.00
0.17	0.014	289	5.82	55.74
0.33	0.018	312	4.72	49.92
0.50	0.022	330	4.17	45.20
0.67	0.025	345	3.82	41.03
0.83	0.028	358	3.57	37.21
1.00	0.030	369	3.38	33.64
1.17	0.033	378	3.22	30.26
1.33	0.035	387	3.09	27.03
1.50	0.037	395	2.98	23.94
1.67	0.039	402	2.88	20.96
1.83	0.041	408	2.79	18.07
2.00	0.042	413	2.71	15.28
2.17	0.044	418	2.64	12.56
2.33	0.046	422	2.57	9.92
2.50	0.047	425	2.51	7.35
2.67	0.049	429	2.45	4.84
2.83	0.050	431	2.39	2.39
3.00				

CMP #HMP-2 Discharge HMP Riser

Discharge vs Elevation Table

Bottom orifice:	0.50 "		
Number:	1		
Cg-low:	0.61		
invert elev:	3.00 ft		
Low orifice:	1 "	Top orifice:	3 "
Number:	4	Number:	16
Cg-low:	0.61	Cg-low:	0.61
invert elev:	5.50 ft	invert elev:	6.60 ft
Middle orifice:	3 "	Emergency inlet:	
number of orif:	12	Rim height:	7.00 ft
Cg-middle:	0.61	Riser Box D	3x4
invert elev:	6.00 ft	Weir Length	14.00 ft

h	H/D-bot	H/D-low	H/D-mid	H/D-top	Qbot-orif	Qbot-weir	Qtot-bot	Qlow-orif	Qlow-weir	Qtot-low	Qmid-orif	Qmid-weir	Qtot-med	Qtop-orif	Qtop-weir	Qtot-top	Qpeak-top	Qtot	Peak Flow WQ+HMP Qtot
(ft)		-	-	-	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000
0.17	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0112
0.33	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0164
0.50	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0204
0.67	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0236
0.83	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0265
1.00	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0291
1.17	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0315
1.33	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0337
1.50	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0358
1.67	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0378
1.83	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0396
2.00	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0414
2.17	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0431
2.33	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0448
2.50	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0463
2.67	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0479
2.83	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0494
3.00	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0508
3.17	4.00	0.00	0.00	0.00	0.003	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0522
3.33	8.00	0.00	0.00	0.00	0.004	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0536
3.50	12.00	0.00	0.00	0.00	0.005	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0549
3.67	16.00	0.00	0.00	0.00	0.005	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0562
3.83	20.00	0.00	0.00	0.00	0.006	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0575
4.00	24.00	0.00	0.00	0.00	0.007	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0587
4.17	28.00	0.00	0.00	0.00	0.007	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0599
4.33	32.00	0.00	0.00	0.00	0.008	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0611
4.50	36.00	0.00	0.00	0.00	0.008	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0623
4.67	40.00	0.00	0.00	0.00	0.009	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0634
4.83	44.00	0.00	0.00	0.00	0.009	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0646
5.00	48.00	0.00	0.00	0.00	0.009	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0657
5.17	52.00	0.00	0.00	0.00	0.010	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0668
5.33	56.00	0.00	0.00	0.00	0.010	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0678
5.50	60.00	0.00	0.00	0.00	0.011	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0689
5.67	64.00	2.00	0.00	0.00	0.011	0.00	0.002	0.038	0.050	0.038	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.1099
5.83	68.00	4.00	0.00	0.00	0.011	0.00	0.004	0.058	0.095	0.058	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.062	0.1328
6.00	72.00	6.00	0.00	0.00	0.012	0.06	0.012	0.072	1.375	0.072	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.084	0.1558
6.17	76.00	8.00	0.67	0.00	0.012	0.40	0.012	0.084	8.971	0.084	0.589	0.486	0.486	0.000	0.000	0.000	0.000	0.583	0.6556
6.33	80.00	10.00	1.33	0.00	0.012	1.51	0.012	0.095	34.269	0.095	1.316	1.502	1.316	0.000	0.000	0.000	0.000	1.423	1.4973
6.50	84.00	12.00	2.00	0.00	0.012	4.31	0.012	0.105	97.420	0.105	1.766	2.345	1.766	0.000	0.000	0.000	0.000	1.883	1.9577
6.67	88.00	14.00	2.67	0.27	0.013	10.16	0.013	0.113	229.816	0.113	2.122	2.630	2.122	0.000	0.116	0.116	0.000	2.364	2.4401
6.83	92.00	16.00	3.33	0.93	0.013	21.06	0.013	0.121	476.546	0.121	2.427	2.766	2.427	1.265	1.160	1.160	0.000	3.722	3.7983
7.00	96.00	18.00	4.00	1.60	0.013	39.72	0.013	0.129	898.865	0.129	2.697	4.427	2.697	2.016	2.525	2.016	0.000	4.856	4.9335
7.17	100.00	20.00	4.67	2.27	0.014	69.68	0.014	0.136	1576.661	0.136	2.943	11.033	2.943	2.555	3.368	2.555	3.172	8.820	8.8986
7.33	104.00	22.00	5.33	2.93	0.014	115.39	0.014	0.143	2610.918	0.143	3.170	28.217	3.170	2.999	3.522	2.999	8.972	15.297	15.3768
7.50	108.00	24.00	6.00	3.60	0.014	182.35	0.014	0.149	4126.181	0.149	3.381	64.304	3.381	3.385	4.133	3.385	16.483	23.412	23.4926
7.67	112.08	26.04	6.68	4.28	0.014	279.47	0.014	0.156	6323.584	0.156	3.584	132.520	3.584	3.737	8.441	3.737	25.567	33.059	33.0591
7.83	115.92	27.96	7.32	4.92	0.015	404.91	0.015	0.162	9162.119	0.162	3.765	239.982	3.765	4.042	21.240	4.042	35.252	43.235	43.2353
8.00	120.00	30.00	8.00	5.60	0.015	583.75	0.015	0.167	13208.685	0.167	3.948	419.555	3.948	4.341	53.088	4.341	46.620	55.092	55.0921
8.17	124.08	32.04	8.68	6.28	0.015	820.71	0.015	0.173	18570.570	0.173	4.124	691.324	4.124	4.622	116.986	4.622	59.000	67.933	67.9333

HMP-2A Drawdown @		8.17	ft=	95.50
Elevation	Q_{AVG} (CFS)	DV (CF)	DT (HR)	Total T
0.00	0.011	253	6.27	95.50
0.17	0.014	289	5.82	89.23
0.33	0.018	312	4.72	83.41
0.50	0.022	330	4.17	78.69
0.67	0.025	345	3.82	74.52
0.83	0.028	358	3.57	70.70
1.00	0.030	369	3.38	67.13
1.17	0.033	378	3.22	63.75
1.33	0.035	387	3.09	60.52
1.50	0.037	395	2.98	57.43
1.67	0.039	402	2.88	54.45
1.83	0.041	408	2.79	51.57
2.00	0.042	413	2.71	48.77
2.17	0.044	418	2.64	46.06
2.33	0.046	422	2.57	43.41
2.50	0.047	425	2.51	40.84
2.67	0.049	429	2.45	38.33
2.83	0.050	431	2.39	35.88
3.00	0.051	433	2.34	33.49
3.17	0.053	435	2.28	31.16
3.33	0.054	436	2.23	28.87
3.50	0.056	437	2.18	26.64
3.67	0.057	437	2.14	24.45
3.83	0.058	437	2.09	22.32
4.00	0.059	436	2.04	20.23
4.17	0.061	435	2.00	18.19
4.33	0.062	433	1.95	16.19
4.50	0.063	431	1.91	14.24
4.67	0.064	429	1.86	12.34
4.83	0.065	425	1.81	10.48
5.00	0.066	422	1.77	8.66
5.17	0.067	418	1.72	6.89
5.33	0.068	413	1.68	5.17
5.50	0.089	408	1.27	3.49
5.67	0.121	402	0.92	2.23
5.83	0.144	395	0.76	1.31
6.00	0.406	387	0.26	0.55
6.17	1.076	378	0.10	0.28
6.33	1.727	369	0.06	0.18
6.50	2.199	358	0.05	0.13
6.67	3.119	345	0.03	0.08
6.83	4.366	330	0.02	0.05
7.00	6.916	312	0.01	0.03
7.17	12.138	289	0.01	0.02
7.33	19.435	253	0.00	0.01
7.50	28.276	207	0.00	0.01
7.67	38.147	207	0.00	0.00
7.83	49.164	207	0.00	0.00
8.00	61.513	207	0.00	0.00
8.17				

Rational Method Hydrograph Calculations
for
Storage Facility #4

		Q_{100}=	0.39	cfs			
		Tc=	5	min	C=	0.85	
#=	72	$P_{100,6}$=	2.9	in	A=	0.06	acres

#	D (MIN)	I (IN/HR)	VOL (IN)	ΔVOL (IN)	I (INCR) (IN/HR)	Q (CFS)	VOL (CF)	ORDINATE (CFS)
		*(7.44*P6*D^-.645)*	*(I*D/60)*	*(V1-V0)*	*(ΔV/ΔT)*	*(Q=ciA)*		*(Re-ordered)*
0	0	0.00	0.00	0.64	7.64	0.39	117	
1	5	7.64	0.64	0.18	2.13	0.11	33	0.009
2	10	4.89	0.81	0.13	1.51	0.08	23	0.009
3	15	3.76	0.94	0.10	1.21	0.06	19	0.009
4	20	3.12	1.04	0.09	1.03	0.05	16	0.009
5	25	2.71	1.13	0.08	0.90	0.05	14	0.009
6	30	2.41	1.20	0.07	0.81	0.04	12	0.009
7	35	2.18	1.27	0.06	0.74	0.04	11	0.010
8	40	2.00	1.33	0.06	0.68	0.03	10	0.010
9	45	1.85	1.39	0.05	0.64	0.03	10	0.010
10	50	1.73	1.44	0.05	0.60	0.03	9	0.010
11	55	1.63	1.49	0.05	0.56	0.03	9	0.010
12	60	1.54	1.54	0.04	0.53	0.03	8	0.010
13	65	1.46	1.58	0.04	0.51	0.03	8	0.011
14	70	1.39	1.62	0.04	0.48	0.02	7	0.011
15	75	1.33	1.67	0.04	0.46	0.02	7	0.011
16	80	1.28	1.70	0.04	0.44	0.02	7	0.011
17	85	1.23	1.74	0.04	0.43	0.02	7	0.011
18	90	1.18	1.78	0.03	0.41	0.02	6	0.012
19	95	1.14	1.81	0.03	0.40	0.02	6	0.012
20	100	1.11	1.84	0.03	0.39	0.02	6	0.012
21	105	1.07	1.88	0.03	0.37	0.02	6	0.013
22	110	1.04	1.91	0.03	0.36	0.02	6	0.013
23	115	1.01	1.94	0.03	0.35	0.02	5	0.013
24	120	0.98	1.97	0.03	0.34	0.02	5	0.013
25	125	0.96	2.00	0.03	0.34	0.02	5	0.014
26	130	0.93	2.02	0.03	0.33	0.02	5	0.014
27	135	0.91	2.05	0.03	0.32	0.02	5	0.015
28	140	0.89	2.08	0.03	0.31	0.02	5	0.015
29	145	0.87	2.10	0.03	0.31	0.02	5	0.016
30	150	0.85	2.13	0.02	0.30	0.02	5	0.016
31	155	0.83	2.15	0.02	0.29	0.01	4	0.017
32	160	0.82	2.18	0.02	0.29	0.01	4	0.017
33	165	0.80	2.20	0.02	0.28	0.01	4	0.018
34	170	0.79	2.23	0.02	0.28	0.01	4	0.019
35	175	0.77	2.25	0.02	0.27	0.01	4	0.020
36	180	0.76	2.27	0.02	0.27	0.01	4	0.020
37	185	0.74	2.29	0.02	0.26	0.01	4	0.022
38	190	0.73	2.32	0.02	0.26	0.01	4	0.023
39	195	0.72	2.34	0.02	0.25	0.01	4	0.025
40	200	0.71	2.36	0.02	0.25	0.01	4	0.026
41	205	0.70	2.38	0.02	0.25	0.01	4	0.029

Rational Method Hydrograph Calculations
for
Storage Facility #4

42	210	0.69	2.40	0.02	0.24	0.01	4	0.030
43	215	0.68	2.42	0.02	0.24	0.01	4	0.035
44	220	0.67	2.44	0.02	0.23	0.01	4	0.038
45	225	0.66	2.46	0.02	0.23	0.01	4	0.046
46	230	0.65	2.48	0.02	0.23	0.01	3	0.053
47	235	0.64	2.50	0.02	0.22	0.01	3	0.077
48	240	0.63	2.52	0.02	0.22	0.01	3	0.109
49	245	0.62	2.53	0.02	0.22	0.01	3	***0.390***
50	250	0.61	2.55	0.02	0.22	0.01	3	0.062
51	255	0.60	2.57	0.02	0.21	0.01	3	0.041
52	260	0.60	2.59	0.02	0.21	0.01	3	0.032
53	265	0.59	2.61	0.02	0.21	0.01	3	0.027
54	270	0.58	2.62	0.02	0.21	0.01	3	0.024
55	275	0.58	2.64	0.02	0.20	0.01	3	0.021
56	280	0.57	2.66	0.02	0.20	0.01	3	0.019
57	285	0.56	2.67	0.02	0.20	0.01	3	0.018
58	290	0.56	2.69	0.02	0.20	0.01	3	0.016
59	295	0.55	2.71	0.02	0.19	0.01	3	0.015
60	300	0.54	2.72	0.02	0.19	0.01	3	0.014
61	305	0.54	2.74	0.02	0.19	0.01	3	0.014
62	310	0.53	2.76	0.02	0.19	0.01	3	0.013
63	315	0.53	2.77	0.02	0.19	0.01	3	0.012
64	320	0.52	2.79	0.02	0.18	0.01	3	0.012
65	325	0.52	2.80	0.02	0.18	0.01	3	0.011
66	330	0.51	2.82	0.02	0.18	0.01	3	0.011
67	335	0.51	2.83	0.01	0.18	0.01	3	0.010
68	340	0.50	2.85	0.01	0.18	0.01	3	0.010
69	345	0.50	2.86	0.01	0.18	0.01	3	0.010
70	350	0.49	2.88	0.01	0.17	0.01	3	0.010
71	355	0.49	2.89	0.01	0.17	0.01	3	0.009
72	360	0.48	2.91	0.00	0.00	0.00	0	0.009
						SUM=	**367**	**cubic feet**
							0.01	**acre-feet**

CMP #4 Discharge HMP Riser

Discharge vs Elevation Table

Low orifice:	0.25 "	Top orifice:	1 "
Number:	1	Number:	0
Cg-low:	0.61	Cg-low:	3
invert elev:	0.00 ft	invert elev:	1.00 ft
Middle orifice:	2 "	Emergency inlet:	
number of orif:	0	Rim height:	2.90 ft
Cg-middle:	0.61	Riser Box D	3x4
invert elev:	1.00 ft	Weir Length	3.14 ft

h	H/D-low	H/D-mid	H/D-top	Qlow-orif	Qlow-weir	Qtot-low	Qmid-orif	Qmid-weir	Qtot-med	Qtop-orif	Qtop-weir	Qtot-top	Qpeak-top	Qtot
(ft)	-	-	-	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.17	8.00	0.00	0.00	0.001	0.070	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
0.33	16.00	0.00	0.00	0.001	3.723	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
0.50	24.00	0.00	0.00	0.001	32.236	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
0.67	32.00	0.00	0.00	0.001	144.148	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
0.83	40.00	0.00	0.00	0.002	454.986	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
1.00	48.00	0.00	0.00	0.002	1156.986	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
1.17	56.00	1.00	2.00	0.002	2538.816	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
1.33	64.00	2.00	4.00	0.002	5005.303	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
1.50	72.00	3.00	6.00	0.002	9097.150	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
1.67	80.00	4.00	8.00	0.002	15510.669	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
1.83	88.00	5.00	10.00	0.002	25117.495	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
2.00	96.00	6.00	12.00	0.002	38984.315	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
2.17	104.00	7.00	14.00	0.002	58392.588	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
2.33	112.00	8.00	16.00	0.003	84858.274	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
2.50	120.00	9.00	18.00	0.003	120151.551	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
2.67	128.00	10.00	20.00	0.003	166316.542	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
2.83	136.00	11.00	22.00	0.003	225691.037	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
3.00	144.00	12.00	24.00	0.003	300926.219	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.331	0.334
3.17	152.00	13.00	26.00	0.003	395006.385	0.003	0.000	0.000	0.000	0.000	0.000	0.000	1.440	1.443
3.33	160.00	14.00	28.00	0.003	511268.668	0.003	0.000	0.000	0.000	0.000	0.000	0.000	2.983	2.986
3.50	168.00	15.00	30.00	0.003	653422.765	0.003	0.000	0.000	0.000	0.000	0.000	0.000	4.860	4.863
3.67	176.16	16.02	32.04	0.003	829349.841	0.003	0.000	0.000	0.000	0.000	0.000	0.000	7.065	7.068
3.83	184.00	17.00	34.00	0.003	1032226.336	0.003	0.000	0.000	0.000	0.000	0.000	0.000	9.428	9.431
4.00	192.00	18.00	36.00	0.003	1278335.521	0.003	0.000	0.000	0.000	0.000	0.000	0.000	12.063	12.067
4.17	200.00	19.00	38.00	0.003	1569295.390	0.003	0.000	0.000	0.000	0.000	0.000	0.000	14.906	14.910
4.33	208.00	20.00	40.00	0.003	1910974.299	0.003	0.000	0.000	0.000	0.000	0.000	0.000	17.943	17.946
4.50	216.00	21.00	42.00	0.004	2309731.506	0.004	0.000	0.000	0.000	0.000	0.000	0.000	21.162	21.165
4.67	224.00	22.00	44.00	0.004	2772436.895	0.004	0.000	0.000	0.000	0.000	0.000	0.000	24.553	24.557
4.83	232.00	23.00	46.00	0.004	3306490.700	0.004	0.000	0.000	0.000	0.000	0.000	0.000	28.108	28.112
5.00	240.00	24.00	48.00	0.004	3919843.227	0.004	0.000	0.000	0.000	0.000	0.000	0.000	31.820	31.824

CMP #4 Stage Storage					
HMP Volume			350		
HMP Ponding Depth			2.667	ft	
Note: Find out the elevation value in relation to required WQ volume					
HMP-2-A Stage Storage					
depth	area	area (ac)	elevation	volume (cf)	volume (acft)
0.00	74.4	0.0017	0.00	0.0	0.00000
0.17	102.2	0.0023	0.17	15.5	0.00036
0.33	112.9	0.0026	0.33	33.5	0.00077
0.50	120.4	0.0028	0.50	53.0	0.00122
0.67	126.3	0.0029	0.67	73.6	0.00169
0.83	130.9	0.0030	0.83	95.0	0.00218
1.00	134.7	0.0031	1.00	117.1	0.00269
1.17	137.7	0.0032	1.17	139.9	0.00321
1.33	140.0	0.0032	1.33	163.0	0.00374
1.50	141.8	0.0033	1.50	186.5	0.00428
1.67	143.0	0.0033	1.67	210.2	0.00483
1.83	143.8	0.0033	1.83	234.1	0.00538
2.00	144.0	0.0033	2.00	258.1	0.00593
2.17	143.8	0.0033	2.17	282.1	0.00648
2.33	143.0	0.0033	2.33	306.0	0.00703
2.50	141.8	0.0033	2.50	329.8	0.00757
2.67	140.0	0.0032	2.67	353.3	0.00811
2.83	137.7	0.0032	2.83	376.4	0.00864
3.00	134.7	0.0031	3.00	399.1	0.00916
3.17	130.9	0.0030	3.17	421.3	0.00967
3.33	126.3	0.0029	3.33	442.7	0.01016
3.50	120.4	0.0028	3.50	463.3	0.01064
3.67	112.9	0.0026	3.67	482.8	0.01108
3.83	102.2	0.0023	3.83	500.7	0.01150
4.00	74.4	0.0017	4.00	516.3	0.01185
4.17	74.4	0.0017	4.17	528.7	0.01214
4.33	74.4	0.0017	4.33	541.1	0.01242
4.50	74.4	0.0017	4.50	553.5	0.01271
4.67	74.4	0.0017	4.67	565.9	0.01299
4.83	74.4	0.0017	4.83	578.3	0.01327
5.00	74.4	0.0017	5.00	590.7	0.01356

Date: 10/10/2024
Project Name: East Storage-2 - COPY - 61024 (10-10-2024 18-3-52)

City / County:
State:

Designed By:
Company:
Telephone:

CMP: Underground Detention System Storage Volume Estimation

=Adjustable Input Cells

Contech Engineered Solutions, LLC is pleased to offer the following estimate of storage volume for the above named project. The results are submitted as an estimate only, without liability on the part of Contech Engineered Solutions, LLC for accuracy or suitability to any particular applicaton and are subject to verification of the Engineer of Record. This tool is only applicable for rectangular shaped systems.

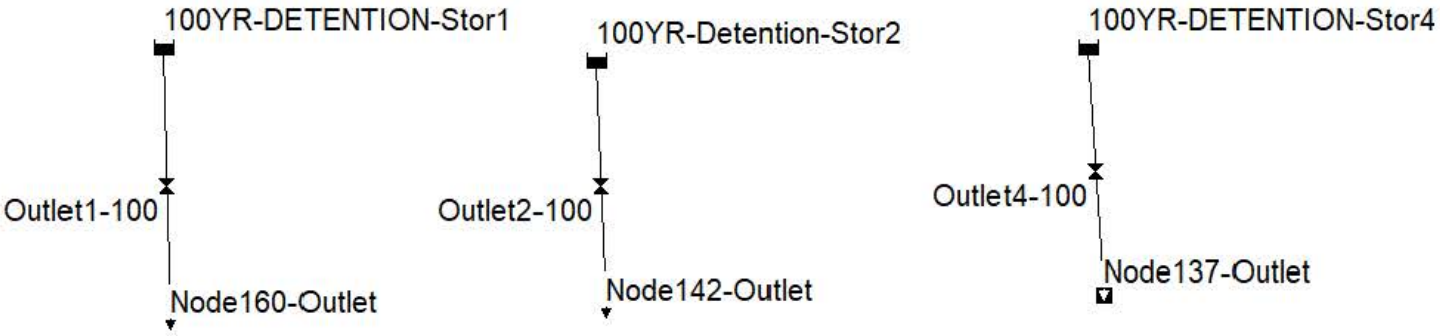
Summary of Inputs

System Information		Backfill Information		Pipe & Analysis Information	
Out-to-out length (ft):	29.0	Backfill Porosity (%):	40%	System Diameter (in):	48
Out-to-out width (ft):	4.0	Depth Above Pipe (in):	12.0	Pipe Spacing (in):	24
Number of Manifolds (ea):	1.0	Depth Below Pipe (in):	0.0	Incremental Analysis (in):	2
Number of Barrels (ea):	1.0	Width At Ends (ft):	1.0	System Invert (Elevation):	331
		Width At Sides (ft):	1.0		

Storage Volume Estimation

System		Pipe		Stone		Total System		Miscellaneous	
Depth (ft)	Elevation (ft)	Incremental Storage (cf)	Cumulative Storage (cf)	Incremental Storage (cf)	Cumulative Storage (cf)	Incremental Storage (cf)	Cumulative Storage (cf)	Percent Open Storage (%)	Ave. Surface Area (sf)
0.00	331.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	74.4
0.17	331.16	5.2	5.2	10.3	10.3	15.5	15.5	33.5%	102.2
0.33	331.33	9.3	14.5	8.7	19.0	18.0	33.5	43.3%	112.9
0.50	331.50	11.8	26.3	7.7	26.7	19.5	53.0	49.6%	120.4
0.67	331.66	13.6	39.9	6.9	33.6	20.6	73.6	54.3%	126.3
0.83	331.83	15.1	55.0	6.4	40.0	21.4	95.0	57.9%	130.9
1.00	332.00	16.2	71.2	5.9	45.9	22.1	117.1	60.8%	134.7
1.17	332.16	17.2	88.4	5.5	51.4	22.7	139.9	63.2%	137.7
1.33	332.33	17.9	106.3	5.2	56.7	23.1	163.0	65.2%	140.0
1.50	332.50	18.5	124.8	5.0	61.7	23.5	186.5	66.9%	141.8
1.67	332.66	18.9	143.7	4.8	66.5	23.7	210.2	68.4%	143.0
1.83	332.83	19.2	162.9	4.7	71.2	23.9	234.1	69.6%	143.8
2.00	333.00	19.3	182.2	4.7	75.9	24.0	258.1	70.6%	144.0
2.17	333.16	19.3	201.5	4.7	80.6	24.0	282.1	71.4%	143.8
2.33	333.33	19.2	220.7	4.7	85.3	23.9	306.0	72.1%	143.0
2.50	333.50	18.9	239.6	4.8	90.2	23.7	329.8	72.7%	141.8
2.67	333.66	18.5	258.1	5.0	95.2	23.5	353.3	73.1%	140.0
2.83	333.83	17.9	276.0	5.2	100.4	23.1	376.4	73.3%	137.7
3.00	334.00	17.2	293.2	5.5	105.9	22.7	399.1	73.5%	134.7
3.17	334.16	16.2	309.4	5.9	111.8	22.1	421.3	73.5%	130.9
3.33	334.33	15.1	324.5	6.4	118.2	21.4	442.7	73.3%	126.3
3.50	334.50	13.6	338.1	6.9	125.1	20.6	463.3	73.0%	120.4
3.67	334.66	11.8	349.9	7.7	132.8	19.5	482.8	72.5%	112.9
3.83	334.83	9.3	359.2	8.7	141.5	18.0	500.7	71.7%	102.2
4.00	335.00	5.2	364.4	10.3	151.8	15.5	516.3	70.6%	74.4
4.17	335.16	0.0	364.4	12.4	164.2	12.4	528.7	68.9%	74.4
4.33	335.33	0.0	364.4	12.4	176.6	12.4	541.1	67.4%	74.4
4.50	335.50	0.0	364.4	12.4	189.0	12.4	553.5	65.8%	74.4
4.67	335.66	0.0	364.4	12.4	201.4	12.4	565.9	64.4%	74.4
4.83	335.83	0.0	364.4	12.4	213.8	12.4	578.3	63.0%	74.4
5.00	336.00	0.0	364.4	12.4	226.2	12.4	590.7	61.7%	74.4

HMP-4 Drawdown @		5	ft=	85.68
Elevation	Q_{AVG} (CFS)	DV (CF)	DT (HR)	Total T
0.00	0.000	16	13.07	85.68
0.17	0.000	18	15.15	72.61
0.33	0.001	19	6.73	57.46
0.50	0.001	21	5.40	50.73
0.67	0.001	21	4.73	45.33
0.83	0.001	22	4.29	40.60
1.00	0.002	23	3.97	36.30
1.17	0.002	23	3.72	32.33
1.33	0.002	23	3.51	28.61
1.50	0.002	24	3.33	25.09
1.67	0.002	24	3.17	21.76
1.83	0.002	24	3.03	18.58
2.00	0.002	24	2.89	15.56
2.17	0.002	24	2.76	12.66
2.33	0.002	24	2.64	9.90
2.50	0.003	23	2.52	7.26
2.67	0.003	23	2.40	4.74
2.83	0.003	23	2.28	2.33
3.00	0.168	22	0.04	0.05
3.17	0.888	21	0.01	0.01
3.33	2.214	21	0.00	0.01
3.50	3.924	19	0.00	0.00
3.67	5.965	18	0.00	0.00
3.83	8.250	16	0.00	0.00
4.00	10.749	12	0.00	0.00
4.17	13.488	12	0.00	0.00
4.33	16.428	12	0.00	0.00
4.50	19.556	12	0.00	0.00
4.67	22.861	12	0.00	0.00
4.83	26.334	12	0.00	0.00
5.00	29.968			


100YR-DETENTION-Stor1
Outlet1-100
Node160-Outlet
100YR-Detention-Stor2
Outlet2-100
Node142-Outlet
100YR-DETENTION-Stor4
Outlet4-100
Node137-Outlet

```
[TITLE]
;;Project Title/Notes
OLIVE PARK APARTMENTS - POC1 PRE-DEVELOPED

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

START_DATE           08/28/1951
START_TIME           00:00:00
REPORT_START_DATE    08/28/1951
REPORT_START_TIME    00:00:00
END_DATE             08/28/1951
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:12:00
DRY_STEP             03:00:00
ROUTING_STEP         0:01:00
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         12.557
MAX_TRIALS           8
HEAD_TOLERANCE       0.005
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
MONTHLY          0.06   0.08   0.11   0.15   0.17   0.19   0.19   0.18   0.15   0.11   0.08   0.06
DRY_ONLY         NO

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
Node160-Outlet   0          FREE                        NO
Node142-Outlet   0          FREE                        NO
Node137-Outlet   0          FREE                        NO

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape      Curve Name/Params            N/A      Fevap    Psi
  Ksat     IMD
;;-------------- -------- ---------- ---------- ---------- ---------------------------- -------- --------
   -------- --------
100YR-DETENTION-Stor1 0        7.5        2.83       TABULAR    Stor1                        0        0
100YR-Detention-Stor2 0        7.5        3          TABULAR    Stor2                        0        0
100YR-DETENTION-Stor4 0        5          0          TABULAR    Stor4                        0        0

[OUTLETS]
;;Name           From Node        To Node          Offset     Type            QTable/Qcoeff    Qexpon     Gated

;;-------------- ---------------- ---------------- ---------- --------------- ---------------- ----------
--------
Outlet1-100      100YR-DETENTION-Stor1 Node160-Outlet   0          TABULAR/DEPTH   Outlet1
NO
```

```
Outlet2-100      100YR-Detention-Stor2 Node142-Outlet   0          TABULAR/DEPTH   Outlet2
NO
Outlet4-100      100YR-DETENTION-Stor4 Node137-Outlet   0          TABULAR/DEPTH   Outlet4
NO

[INFLOWS]
;;Node           Constituent      Time Series      Type     Mfactor  Sfactor  Baseline Pattern
;;-------------- ---------------- ---------------- -------- -------- -------- -------- --------
100YR-DETENTION-Stor1 FLOW             100YR-Node160-inflow FLOW     1.0      1.0
100YR-Detention-Stor2 FLOW             100YR-Node142-Inflow FLOW     1.0      1.0
100YR-DETENTION-Stor4 FLOW             100YR-Node137-Inflow FLOW     1.0      1.0

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
Outlet1          Rating     0.00       0.0000
Outlet1                     0.17       0.0256
Outlet1                     0.33       0.0376
Outlet1                     0.50       0.0467
Outlet1                     0.67       0.0542
Outlet1                     0.83       0.0608
Outlet1                     1.00       0.0668
Outlet1                     1.17       0.0723
Outlet1                     1.33       0.0773
Outlet1                     1.50       0.0821
Outlet1                     1.67       0.0866
Outlet1                     1.83       0.0909
Outlet1                     2.00       0.0950
Outlet1                     2.17       0.0989
Outlet1                     2.33       0.1027
Outlet1                     2.50       0.1064
Outlet1                     2.67       0.1099
Outlet1                     2.83       0.1133
Outlet1                     3.00       0.1192
Outlet1                     3.17       0.1236
Outlet1                     3.33       0.1276
Outlet1                     3.50       0.1314
Outlet1                     3.67       0.1351
Outlet1                     3.83       0.1385
Outlet1                     4.00       0.1419
Outlet1                     4.17       0.1452
Outlet1                     4.33       0.1484
Outlet1                     4.50       0.1516
Outlet1                     4.67       0.1546
Outlet1                     4.83       0.2445
Outlet1                     5.00       0.5965
Outlet1                     5.17       1.3701
Outlet1                     5.33       2.9209
Outlet1                     5.50       4.0007
Outlet1                     5.67       4.7715
Outlet1                     5.83       5.4280
Outlet1                     6.00       6.0102
Outlet1                     6.17       6.5391
Outlet1                     6.33       7.0272
Outlet1                     6.50       8.9570
Outlet1                     6.67       14.3315
Outlet1                     6.83       21.6166
Outlet1                     7.00       30.3721
Outlet1                     7.17       40.3710
Outlet1                     7.33       51.4677
Outlet1                     7.50       63.5587
;
Outlet2          Rating     0.00       0.0000
Outlet2                     0.17       0.0112
Outlet2                     0.33       0.0164
Outlet2                     0.50       0.0204
Outlet2                     0.67       0.0236
Outlet2                     0.83       0.0265
Outlet2                     1.00       0.0291
Outlet2                     1.17       0.0315
Outlet2                     1.33       0.0337
```

```
Outlet2                    1.50       0.0358
Outlet2                    1.67       0.0378
Outlet2                    1.83       0.0396
Outlet2                    2.00       0.0414
Outlet2                    2.17       0.0431
Outlet2                    2.33       0.0448
Outlet2                    2.50       0.0463
Outlet2                    2.67       0.0479
Outlet2                    2.83       0.0494
Outlet2                    3.00       0.0508
Outlet2                    3.17       0.0522
Outlet2                    3.33       0.0536
Outlet2                    3.50       0.0549
Outlet2                    3.67       0.0562
Outlet2                    3.83       0.0575
Outlet2                    4.00       0.0587
Outlet2                    4.17       0.0599
Outlet2                    4.33       0.0611
Outlet2                    4.50       0.0623
Outlet2                    4.67       0.0634
Outlet2                    4.83       0.0646
Outlet2                    5.00       0.0657
Outlet2                    5.17       0.0668
Outlet2                    5.33       0.0678
Outlet2                    5.50       0.0689
Outlet2                    5.67       0.1099
Outlet2                    5.83       0.1328
Outlet2                    6.00       0.1558
Outlet2                    6.17       0.6556
Outlet2                    6.33       1.4973
Outlet2                    6.50       1.9577
Outlet2                    6.67       2.4401
Outlet2                    6.83       3.7983
Outlet2                    7.00       4.9335
Outlet2                    7.17       8.8986
Outlet2                    7.33       15.3768
Outlet2                    7.50       23.4926
Outlet2                    7.67       33.0591
Outlet2                    7.83       43.2353
Outlet2                    8.00       55.0921
Outlet2                    8.17       67.9333
;
Outlet4          Rating    0.00       0.000
Outlet4                    0.17       0.001
Outlet4                    0.33       0.001
Outlet4                    0.50       0.001
Outlet4                    0.67       0.001
Outlet4                    0.83       0.002
Outlet4                    1.00       0.002
Outlet4                    1.17       0.002
Outlet4                    1.33       0.002
Outlet4                    1.50       0.002
Outlet4                    1.67       0.002
Outlet4                    1.83       0.002
Outlet4                    2.00       0.002
Outlet4                    2.17       0.002
Outlet4                    2.33       0.003
Outlet4                    2.50       0.003
Outlet4                    2.67       0.003
Outlet4                    2.83       0.003
Outlet4                    3.00       0.334
Outlet4                    3.17       1.443
Outlet4                    3.33       2.986
Outlet4                    3.50       4.863
Outlet4                    3.67       7.068
Outlet4                    3.83       9.431
Outlet4                    4.00       12.067
Outlet4                    4.17       14.910
Outlet4                    4.33       17.946
Outlet4                    4.50       21.165
Outlet4                    4.67       24.557
```

```
Outlet4                    4.83       28.112
Outlet4                    5.00       31.824
;
Stor1            Storage   0.00       3008.4
Stor1                      0.17       3990.6
Stor1                      0.33       4380.5
Stor1                      0.50       4667.7
Stor1                      0.67       4899.6
Stor1                      0.83       5094.9
Stor1                      1.00       5262.9
Stor1                      1.17       5409.5
Stor1                      1.33       5538.3
Stor1                      1.50       5652.0
Stor1                      1.67       5752.5
Stor1                      1.83       5841.1
Stor1                      2.00       5919.0
Stor1                      2.17       5986.9
Stor1                      2.33       6045.6
Stor1                      2.50       6095.5
Stor1                      2.67       6137.2
Stor1                      2.83       6170.8
Stor1                      3.00       6196.8
Stor1                      3.17       6215.2
Stor1                      3.33       6226.1
Stor1                      3.50       6229.8
Stor1                      3.67       6226.1
Stor1                      3.83       6215.2
Stor1                      4.00       6196.8
Stor1                      4.17       6170.8
Stor1                      4.33       6137.2
Stor1                      4.50       6095.5
Stor1                      4.67       6045.6
Stor1                      4.83       5986.9
Stor1                      5.00       5919.0
Stor1                      5.17       5841.1
Stor1                      5.33       5752.5
Stor1                      5.50       5652.0
Stor1                      5.67       5538.3
Stor1                      5.83       5409.5
Stor1                      6.00       5262.9
Stor1                      6.17       5094.9
Stor1                      6.33       4899.6
Stor1                      6.50       4667.7
Stor1                      6.67       4380.5
Stor1                      6.83       3990.6
Stor1                      7.00       3008.4
Stor1                      7.17       3008.4
Stor1                      7.33       3008.4
Stor1                      7.50       3008.4
;
Stor2            Storage   0.00       1244.4
Stor2                      0.17       1650.4
Stor2                      0.33       1811.9
Stor2                      0.50       1931.4
Stor2                      0.67       2028.1
Stor2                      0.83       2109.9
Stor2                      1.00       2180.6
Stor2                      1.17       2242.5
Stor2                      1.33       2297.3
Stor2                      1.50       2346.0
Stor2                      1.67       2389.3
Stor2                      1.83       2428.0
Stor2                      2.00       2462.3
Stor2                      2.17       2492.6
Stor2                      2.33       2519.4
Stor2                      2.50       2542.6
Stor2                      2.67       2562.7
Stor2                      2.83       2579.6
Stor2                      3.00       2593.6
Stor2                      3.17       2604.6
Stor2                      3.33       2612.9
```

```
Stor2                      3.50       2618.3
Stor2                      3.67       2621.1
Stor2                      3.83       2621.1
Stor2                      4.00       2618.3
Stor2                      4.17       2612.9
Stor2                      4.33       2604.6
Stor2                      4.50       2593.6
Stor2                      4.67       2579.6
Stor2                      4.83       2562.7
Stor2                      5.00       2542.6
Stor2                      5.17       2519.4
Stor2                      5.33       2492.6
Stor2                      5.50       2462.3
Stor2                      5.67       2428.0
Stor2                      5.83       2389.3
Stor2                      6.00       2346.0
Stor2                      6.17       2297.3
Stor2                      6.33       2242.5
Stor2                      6.50       2180.6
Stor2                      6.67       2109.9
Stor2                      6.83       2028.1
Stor2                      7.00       1931.4
Stor2                      7.17       1811.9
Stor2                      7.33       1650.4
Stor2                      7.50       1244.4
Stor2                      7.67       1244.4
Stor2                      7.83       1244.4
Stor2                      8.00       1244.4
Stor2                      8.17       1244.4
;
Stor4            Storage   0.00       74.4
Stor4                      0.17       102.2
Stor4                      0.33       112.9
Stor4                      0.50       120.4
Stor4                      0.67       126.3
Stor4                      0.83       130.9
Stor4                      1.00       134.7
Stor4                      1.17       137.7
Stor4                      1.33       140.0
Stor4                      1.50       141.8
Stor4                      1.67       143.0
Stor4                      1.83       143.8
Stor4                      2.00       144.0
Stor4                      2.17       143.8
Stor4                      2.33       143.0
Stor4                      2.50       141.8
Stor4                      2.67       140.0
Stor4                      2.83       137.7
Stor4                      3.00       134.7
Stor4                      3.17       130.9
Stor4                      3.33       126.3
Stor4                      3.50       120.4
Stor4                      3.67       112.9
Stor4                      3.83       102.2
Stor4                      4.00       74.4
Stor4                      4.17       74.4
Stor4                      4.33       74.4
Stor4                      4.50       74.4
Stor4                      4.67       74.4
Stor4                      4.83       74.4
Stor4                      5.00       74.4

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
100YR-Node142-Inflow 8/28/1951  5:00       0
100YR-Node142-Inflow 8/28/1951  5:06       0.3
100YR-Node142-Inflow 8/28/1951  5:12       0.3
100YR-Node142-Inflow 8/28/1951  5:18       0.3
100YR-Node142-Inflow 8/28/1951  5:24       0.3
100YR-Node142-Inflow 8/28/1951  5:30       0.3
```

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100YR-Node142-Inflow 8/28/1951  5:36       0.3
100YR-Node142-Inflow 8/28/1951  5:42       0.3
100YR-Node142-Inflow 8/28/1951  5:48       0.3
100YR-Node142-Inflow 8/28/1951  5:54       0.3
100YR-Node142-Inflow 8/28/1951  6:00       0.4
100YR-Node142-Inflow 8/28/1951  6:06       0.4
100YR-Node142-Inflow 8/28/1951  6:12       0.4
100YR-Node142-Inflow 8/28/1951  6:18       0.4
100YR-Node142-Inflow 8/28/1951  6:24       0.4
100YR-Node142-Inflow 8/28/1951  6:30       0.4
100YR-Node142-Inflow 8/28/1951  6:36       0.4
100YR-Node142-Inflow 8/28/1951  6:42       0.4
100YR-Node142-Inflow 8/28/1951  6:48       0.4
100YR-Node142-Inflow 8/28/1951  6:54       0.4
100YR-Node142-Inflow 8/28/1951  7:00       0.5
100YR-Node142-Inflow 8/28/1951  7:06       0.5
100YR-Node142-Inflow 8/28/1951  7:12       0.5
100YR-Node142-Inflow 8/28/1951  7:18       0.5
100YR-Node142-Inflow 8/28/1951  7:24       0.5
100YR-Node142-Inflow 8/28/1951  7:30       0.6
100YR-Node142-Inflow 8/28/1951  7:36       0.6
100YR-Node142-Inflow 8/28/1951  7:42       0.6
100YR-Node142-Inflow 8/28/1951  7:48       0.6
100YR-Node142-Inflow 8/28/1951  7:54       0.7
100YR-Node142-Inflow 8/28/1951  8:00       0.7
100YR-Node142-Inflow 8/28/1951  8:06       0.8
100YR-Node142-Inflow 8/28/1951  8:12       0.8
100YR-Node142-Inflow 8/28/1951  8:18       0.9
100YR-Node142-Inflow 8/28/1951  8:24       0.9
100YR-Node142-Inflow 8/28/1951  8:30       1.1
100YR-Node142-Inflow 8/28/1951  8:36       1.1
100YR-Node142-Inflow 8/28/1951  8:42       1.4
100YR-Node142-Inflow 8/28/1951  8:48       1.6
100YR-Node142-Inflow 8/28/1951  8:54       2.4
100YR-Node142-Inflow 8/28/1951  9:00       2.8
100YR-Node142-Inflow 8/28/1951  9:06       12.41
100YR-Node142-Inflow 8/28/1951  9:12       1.9
100YR-Node142-Inflow 8/28/1951  9:18       1.3
100YR-Node142-Inflow 8/28/1951  9:24       1
100YR-Node142-Inflow 8/28/1951  9:30       0.8
100YR-Node142-Inflow 8/28/1951  9:36       0.7
100YR-Node142-Inflow 8/28/1951  9:42       0.6
100YR-Node142-Inflow 8/28/1951  9:48       0.6
100YR-Node142-Inflow 8/28/1951  9:54       0.5
100YR-Node142-Inflow 8/28/1951  10:00      0.5
100YR-Node142-Inflow 8/28/1951  10:06      0.5
100YR-Node142-Inflow 8/28/1951  10:12      0.4
100YR-Node142-Inflow 8/28/1951  10:18      0.4
100YR-Node142-Inflow 8/28/1951  10:24      0.4
100YR-Node142-Inflow 8/28/1951  10:30      0.4
100YR-Node142-Inflow 8/28/1951  10:36      0.4
100YR-Node142-Inflow 8/28/1951  10:42      0.3
100YR-Node142-Inflow 8/28/1951  10:48      0.3
100YR-Node142-Inflow 8/28/1951  10:54      0.3
100YR-Node142-Inflow 8/28/1951  11:00      0.3
100YR-Node142-Inflow 8/28/1951  11:06      0
;
100YR-Node160-inflow 8/28/1951  5:00       0
100YR-Node160-inflow 8/28/1951  5:06       0.6
100YR-Node160-inflow 8/28/1951  5:12       0.6
100YR-Node160-inflow 8/28/1951  5:18       0.6
100YR-Node160-inflow 8/28/1951  5:24       0.7
100YR-Node160-inflow 8/28/1951  5:30       0.7
100YR-Node160-inflow 8/28/1951  5:36       0.7
100YR-Node160-inflow 8/28/1951  5:42       0.7
100YR-Node160-inflow 8/28/1951  5:48       0.7
100YR-Node160-inflow 8/28/1951  5:54       0.7
100YR-Node160-inflow 8/28/1951  6:00       0.7
100YR-Node160-inflow 8/28/1951  6:06       0.8
100YR-Node160-inflow 8/28/1951  6:12       0.8
100YR-Node160-inflow 8/28/1951  6:18       0.8
```

```
100YR-Node160-inflow 8/28/1951  6:24       0.8
100YR-Node160-inflow 8/28/1951  6:30       0.8
100YR-Node160-inflow 8/28/1951  6:36       0.8
100YR-Node160-inflow 8/28/1951  6:42       0.9
100YR-Node160-inflow 8/28/1951  6:48       0.9
100YR-Node160-inflow 8/28/1951  6:54       0.9
100YR-Node160-inflow 8/28/1951  7:00       0.9
100YR-Node160-inflow 8/28/1951  7:06       1
100YR-Node160-inflow 8/28/1951  7:12       1
100YR-Node160-inflow 8/28/1951  7:18       1.1
100YR-Node160-inflow 8/28/1951  7:24       1.1
100YR-Node160-inflow 8/28/1951  7:30       1.1
100YR-Node160-inflow 8/28/1951  7:36       1.2
100YR-Node160-inflow 8/28/1951  7:42       1.2
100YR-Node160-inflow 8/28/1951  7:48       1.3
100YR-Node160-inflow 8/28/1951  7:54       1.4
100YR-Node160-inflow 8/28/1951  8:00       1.4
100YR-Node160-inflow 8/28/1951  8:06       1.6
100YR-Node160-inflow 8/28/1951  8:12       1.6
100YR-Node160-inflow 8/28/1951  8:18       1.8
100YR-Node160-inflow 8/28/1951  8:24       1.9
100YR-Node160-inflow 8/28/1951  8:30       2.2
100YR-Node160-inflow 8/28/1951  8:36       2.4
100YR-Node160-inflow 8/28/1951  8:42       2.9
100YR-Node160-inflow 8/28/1951  8:48       3.3
100YR-Node160-inflow 8/28/1951  8:54       4.9
100YR-Node160-inflow 8/28/1951  9:00       5.3
100YR-Node160-inflow 8/28/1951  9:06       26.12
100YR-Node160-inflow 8/28/1951  9:12       3.9
100YR-Node160-inflow 8/28/1951  9:18       2.6
100YR-Node160-inflow 8/28/1951  9:24       2
100YR-Node160-inflow 8/28/1951  9:30       1.7
100YR-Node160-inflow 8/28/1951  9:36       1.5
100YR-Node160-inflow 8/28/1951  9:42       1.3
100YR-Node160-inflow 8/28/1951  9:48       1.2
100YR-Node160-inflow 8/28/1951  9:54       1.1
100YR-Node160-inflow 8/28/1951  10:00      1
100YR-Node160-inflow 8/28/1951  10:06      1
100YR-Node160-inflow 8/28/1951  10:12      0.9
100YR-Node160-inflow 8/28/1951  10:18      0.9
100YR-Node160-inflow 8/28/1951  10:24      0.8
100YR-Node160-inflow 8/28/1951  10:30      0.8
100YR-Node160-inflow 8/28/1951  10:36      0.7
100YR-Node160-inflow 8/28/1951  10:42      0.7
100YR-Node160-inflow 8/28/1951  10:48      0.7
100YR-Node160-inflow 8/28/1951  10:54      0.7
100YR-Node160-inflow 8/28/1951  11:00      0.6
100YR-Node160-inflow 8/28/1951  11:06      0
;
100YR-Node137-Inflow 8/28/1951  5:00       0
100YR-Node137-Inflow 8/28/1951  5:05       0.009
100YR-Node137-Inflow 8/28/1951  5:10       0.009
100YR-Node137-Inflow 8/28/1951  5:15       0.009
100YR-Node137-Inflow 8/28/1951  5:20       0.009
100YR-Node137-Inflow 8/28/1951  5:25       0.009
100YR-Node137-Inflow 8/28/1951  5:30       0.010
100YR-Node137-Inflow 8/28/1951  5:35       0.010
100YR-Node137-Inflow 8/28/1951  5:40       0.010
100YR-Node137-Inflow 8/28/1951  5:45       0.010
100YR-Node137-Inflow 8/28/1951  5:50       0.010
100YR-Node137-Inflow 8/28/1951  5:55       0.010
100YR-Node137-Inflow 8/28/1951  6:00       0.011
100YR-Node137-Inflow 8/28/1951  6:05       0.011
100YR-Node137-Inflow 8/28/1951  6:10       0.011
100YR-Node137-Inflow 8/28/1951  6:15       0.011
100YR-Node137-Inflow 8/28/1951  6:20       0.011
100YR-Node137-Inflow 8/28/1951  6:25       0.012
100YR-Node137-Inflow 8/28/1951  6:30       0.012
100YR-Node137-Inflow 8/28/1951  6:35       0.012
100YR-Node137-Inflow 8/28/1951  6:40       0.013
100YR-Node137-Inflow 8/28/1951  6:45       0.013
```

```
100YR-Node137-Inflow 8/28/1951  6:50       0.013
100YR-Node137-Inflow 8/28/1951  6:55       0.013
100YR-Node137-Inflow 8/28/1951  7:00       0.014
100YR-Node137-Inflow 8/28/1951  7:05       0.014
100YR-Node137-Inflow 8/28/1951  7:10       0.015
100YR-Node137-Inflow 8/28/1951  7:15       0.015
100YR-Node137-Inflow 8/28/1951  7:20       0.016
100YR-Node137-Inflow 8/28/1951  7:25       0.016
100YR-Node137-Inflow 8/28/1951  7:30       0.017
100YR-Node137-Inflow 8/28/1951  7:35       0.017
100YR-Node137-Inflow 8/28/1951  7:40       0.018
100YR-Node137-Inflow 8/28/1951  7:45       0.019
100YR-Node137-Inflow 8/28/1951  7:50       0.020
100YR-Node137-Inflow 8/28/1951  7:55       0.020
100YR-Node137-Inflow 8/28/1951  8:00       0.022
100YR-Node137-Inflow 8/28/1951  8:05       0.023
100YR-Node137-Inflow 8/28/1951  8:10       0.025
100YR-Node137-Inflow 8/28/1951  8:15       0.026
100YR-Node137-Inflow 8/28/1951  8:20       0.029
100YR-Node137-Inflow 8/28/1951  8:25       0.030
100YR-Node137-Inflow 8/28/1951  8:30       0.035
100YR-Node137-Inflow 8/28/1951  8:35       0.038
100YR-Node137-Inflow 8/28/1951  8:40       0.046
100YR-Node137-Inflow 8/28/1951  8:45       0.053
100YR-Node137-Inflow 8/28/1951  8:50       0.077
100YR-Node137-Inflow 8/28/1951  8:55       0.109
100YR-Node137-Inflow 8/28/1951  9:00       0.390
100YR-Node137-Inflow 8/28/1951  9:05       0.062
100YR-Node137-Inflow 8/28/1951  9:10       0.041
100YR-Node137-Inflow 8/28/1951  9:15       0.032
100YR-Node137-Inflow 8/28/1951  9:20       0.027
100YR-Node137-Inflow 8/28/1951  9:25       0.024
100YR-Node137-Inflow 8/28/1951  9:30       0.021
100YR-Node137-Inflow 8/28/1951  9:35       0.019
100YR-Node137-Inflow 8/28/1951  9:40       0.018
100YR-Node137-Inflow 8/28/1951  9:45       0.016
100YR-Node137-Inflow 8/28/1951  9:50       0.015
100YR-Node137-Inflow 8/28/1951  9:55       0.014
100YR-Node137-Inflow 8/28/1951  10:00      0.014
100YR-Node137-Inflow 8/28/1951  10:05      0.013
100YR-Node137-Inflow 8/28/1951  10:10      0.012
100YR-Node137-Inflow 8/28/1951  10:15      0.012
100YR-Node137-Inflow 8/28/1951  10:20      0.011
100YR-Node137-Inflow 8/28/1951  10:25      0.011
100YR-Node137-Inflow 8/28/1951  10:30      0.010
100YR-Node137-Inflow 8/28/1951  10:35      0.010
100YR-Node137-Inflow 8/28/1951  10:40      0.010
100YR-Node137-Inflow 8/28/1951  10:45      0.010
100YR-Node137-Inflow 8/28/1951  10:50      0.009
100YR-Node137-Inflow 8/28/1951  10:55      0.009
100YR-Node137-Inflow 8/28/1951  11:00      0.009

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

[TAGS]

[MAP]
DIMENSIONS 0.000 0.000 10000.000 10000.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
Node160-Outlet   10749.559          5634.921
Node142-Outlet   13166.954          5697.074
Node137-Outlet   15920.826          5800.344
100YR-DETENTION-Stor1 10705.467          7169.312
```

```
100YR-Detention-Stor2 13106.713          7091.222
100YR-DETENTION-Stor4 15834.768          7168.675

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

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

OLIVE PARK APARTMENTS - POC1 PRE-DEVELOPED

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

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... NO
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Flow Routing Method ..... KINWAVE
Starting Date 08/28/1951 00:00:00
Ending Date 08/28/1951 23:00:00
Antecedent Dry Days 0.0
Report Time Step 01:00:00
Routing Time Step ..... 60.00 sec

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	1.300	0.424
External Outflow	1.050	0.342
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.504	0.164
Final Stored Volume	0.752	0.245
Continuity Error (%)	0.113	

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****
Minimum Time Step : 59.00 sec
Average Time Step : 60.00 sec
Maximum Time Step : 60.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 1.00
Percent Not Converging : 0.00

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
Node160-Outlet	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
Node142-Outlet	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
Node137-Outlet	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
100YR-DETENTION-Stor1	STORAGE	3.90	6.52	6.52	0 09:12	5.18
100YR-Detention-Stor2	STORAGE	4.53	7.16	7.16	0 09:09	6.15
100YR-DETENTION-Stor4	STORAGE	1.62	2.89	2.89	0 09:05	2.84

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
Node160-Outlet	OUTFALL	0.00	9.65	0 09:12	0	0.236	0.000
Node142-Outlet	OUTFALL	0.00	8.65	0 09:09	0	0.104	0.000
Node137-Outlet	OUTFALL	0.00	0.12	0 09:05	0	0.00202	0.000
100YR-DETENTION-Stor1	STORAGE	26.12	26.12	0 09:07	0.283	0.396	0.097
100YR-Detention-Stor2	STORAGE	12.41	12.41	0 09:07	0.137	0.187	0.140
100YR-DETENTION-Stor4	STORAGE	0.39	0.39	0 09:01	0.00398	0.00398	0.389

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
100YR-DETENTION-Stor1	21.801	54	0	0	36.780	91	0 09:11	9.65
100YR-Detention-Stor2	10.703	61	0	0	16.876	97	0 09:09	8.65
100YR-DETENTION-Stor4	0.211	36	0	0	0.383	65	0 09:05	0.12

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
Node160-Outlet	100.00	0.38	9.65	0.236
Node142-Outlet	100.00	0.17	8.65	0.104
Node137-Outlet	75.87	0.00	0.12	0.002
System	91.96	0.55	0.12	0.342

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	Time of Max Occurrence hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
Outlet1-100	DUMMY	9.65	0	09:12			
Outlet2-100	DUMMY	8.65	0	09:09			
Outlet4-100	DUMMY	0.12	0	09:05			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Fri Oct 11 15:11:38 2024
Analysis ended on: Fri Oct 11 15:11:38 2024
Total elapsed time: < 1 sec

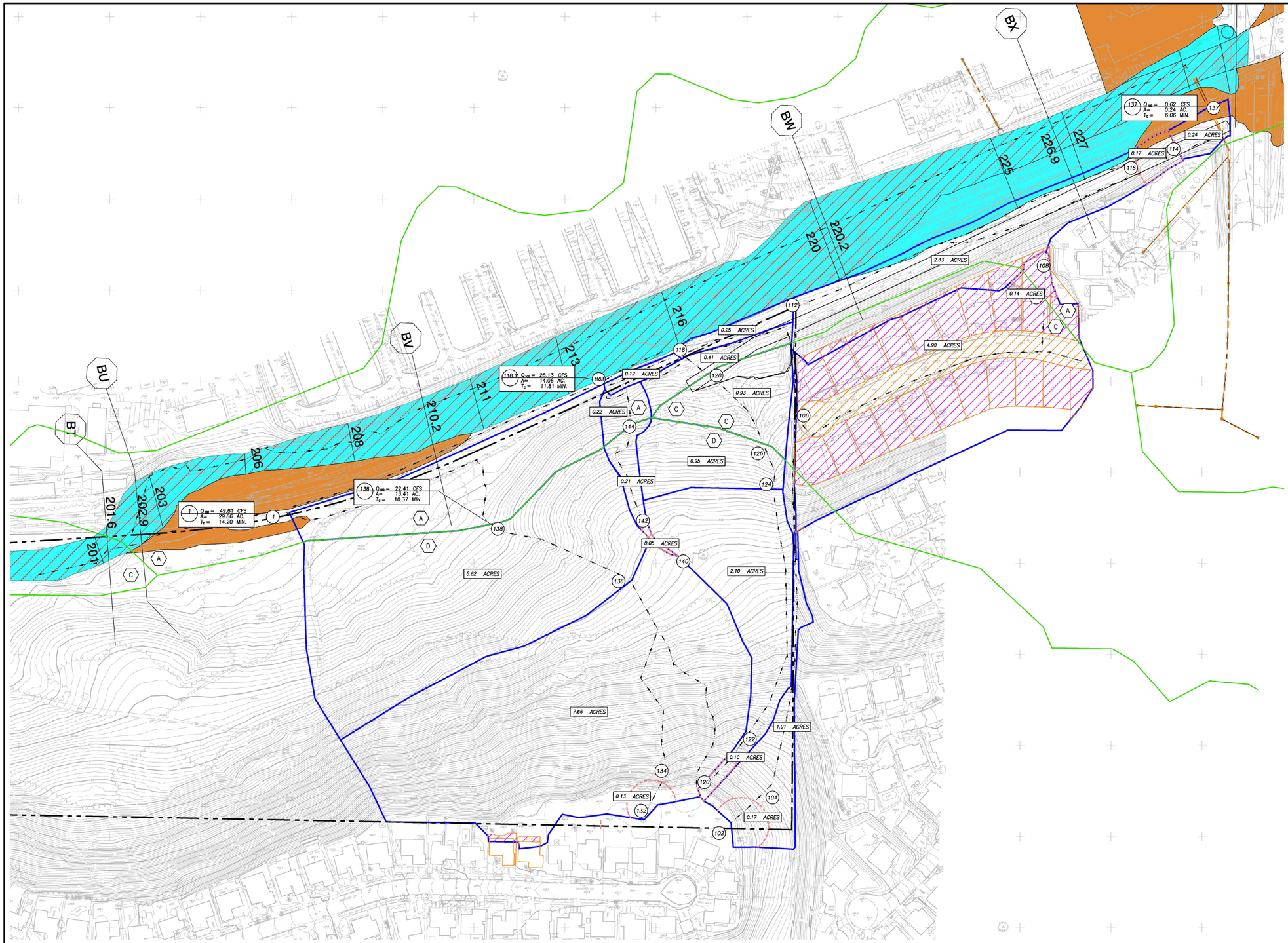
CHAPTER 6

HYDROLOGY MAPS

CHAPTER 6

HYDROLOGY MAPS

6.1 – Existing Condition Hydrology Map



LEGEND

- PROJECT BOUNDARY
- DRAINAGE BOUNDARY
- INITIAL SUBAREA
- FLOW DIRECTION
- 00.00 ACRES — AREA
- X — HYDROLOGIC SOIL TYPE
- 406 — NODE NUMBER
- EXISTING STORM DRAIN SYSTEM
- EXISTING SINGLE FAMILY DEVELOPMENT 65% IMPERVIOUSNESS
- EXISTING ROADS 90% IMPERVIOUSNESS
- HYDROLOGIC SOIL GROUP BOUNDARY
- 100-YEAR FLOOD WAY PER FEMA FIRM
- 100-YEAR FLOOD PLAIN PER FEMA FIRM\ ZONE AE
- 500-YEAR FLOOD PLAIN PER FEMA FIRM\ ZONE X
- BW 220.2 — FEMA CROSS SECTION

H&A

PREPARED BY:

HUNSAKER & ASSOCIATES SAN DIEGO, INC.

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ENGINEERING San Diego, Ca 92121
SURVEYING PH(858)558-4500 FX(858)558-1414

EXISTING
DRAINAGE MAP

OLIVE PARK APARTMENTS

CITY OF OCEANSIDE, CALIFORNIA

MAP 1 OF 1

W.O.# 3785-0602

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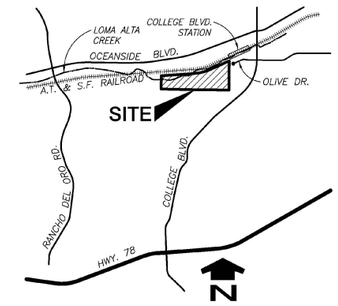
CHAPTER 6

HYDROLOGY MAPS

6.2 – Developed Condition Hydrology Map

LEGEND

- PROJECT BOUNDARY
- DRAINAGE BOUNDARY
- INITIAL SUBAREA
- FLOW DIRECTION
- 00.00 ACRES — AREA
- X — HYDROLOGIC SOIL TYPE
- 406 — NODE NUMBER
- EXISTING STORM DRAIN SYSTEM
- PROPOSED STORM DRAIN SYSTEM
- DETENTION STORAGE FACILITY
- EXISTING SINGLE FAMILY DEVELOPMENT 65% IMPERVIOUSNESS
- EXISTING ROADS 90% IMPERVIOUSNESS
- HYDROLOGIC SOIL GROUP BOUNDARY
- 100-YEAR FLOOD WAY PER FEMA FIRM
- 100-YEAR FLOOD PLAIN PER FEMA FIRM\ ZONE AE
- 500-YEAR FLOOD PLAIN PER FEMA FIRM\ ZONE X
- BW 220.2 — FEMA CROSS SECTION
- INLET LOCATIONS



VICINITY MAP

NOT TO SCALE

100 0 100 200 300

SCALE 1"= 100'

PREPARED BY:		MAP
HUNSAKER & ASSOCIATES SAN DIEGO, INC.	PROPOSED DRAINAGE MAP	1 OF 1
PLANNING 9707 Waples Street ENGINEERING San Diego, Ca 92121 SURVEYING PH(858)558-4500 FX(858)558-1414	**OLIVE PARK APARTMENTS** CITY OF OCEANSIDE, CALIFORNIA	

W.O.# 3785-0602

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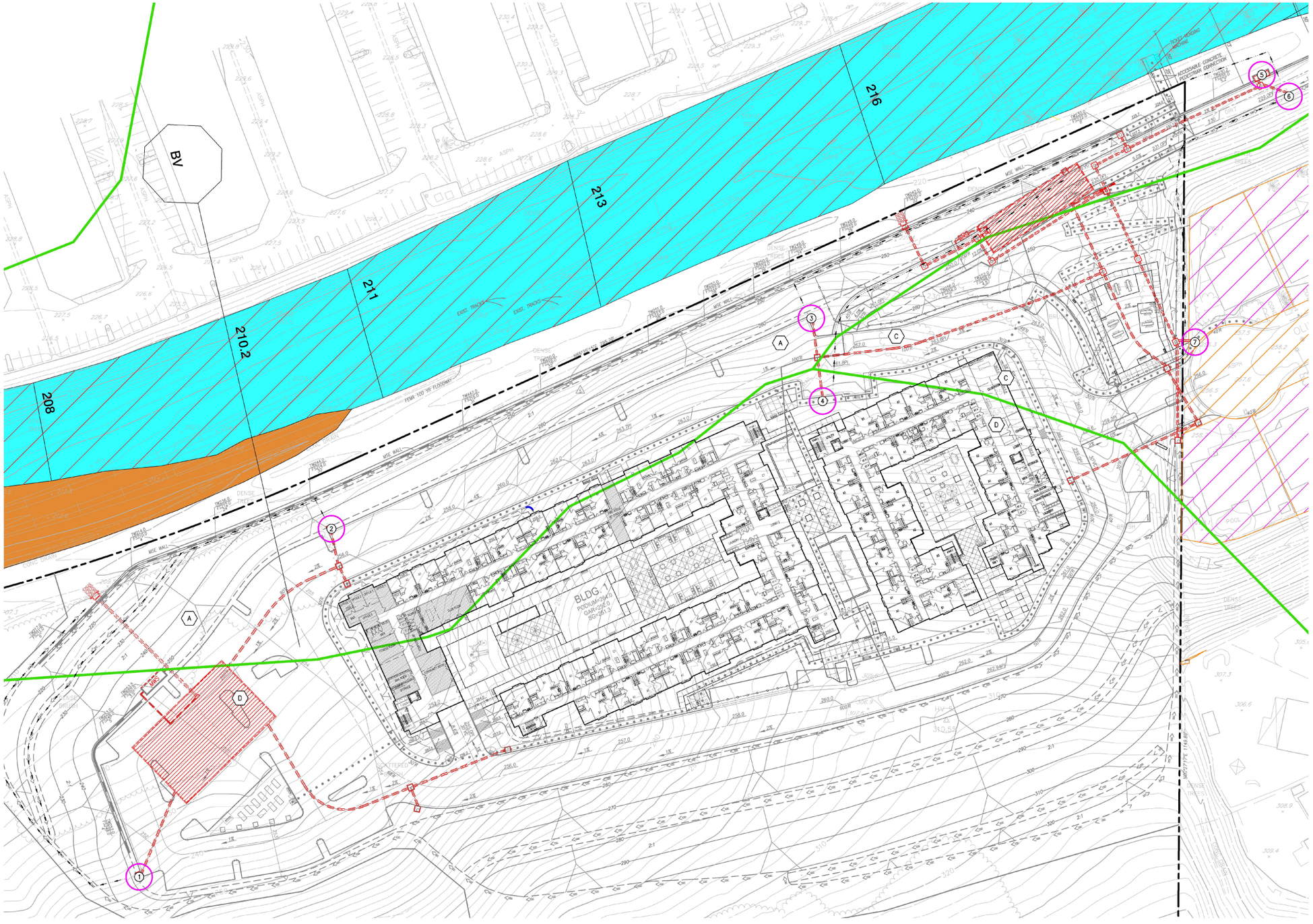
CHAPTER 6

HYDROLOGY MAPS

6.3 – Sump Inlet Location Map



LEGEND

- PROJECT BOUNDARY
- EMERGENCY FLOW PATH
- HYDROLOGIC SOIL TYPE
- EXISTING STORM DRAIN SYSTEM
- PROPOSED STORM DRAIN SYSTEM
- DETENTION STORAGE FACILITY
- EXISTING SINGLE FAMILY DEVELOPMENT 65% IMPERVIOUSNESS
- EXISTING ROADS 90% IMPERVIOUSNESS
- HYDROLOGIC SOIL GROUP BOUNDARY
- 100-YEAR FLOOD WAY PER FEMA FIRM
- 100-YEAR FLOOD PLAIN PER FEMA FIRM\ ZONE AE
- 500-YEAR FLOOD PLAIN PER FEMA FIRM\ ZONE X
- BW 220.2 — FEMA CROSS SECTION
- ① — PROPOSED SUMP INLET LOCATIONS

SUMP LOCATION AND EMERGENCY PATH DESCRIPTION:

1. THIS SUMP COLLECTS 8.48 CFS. THIS RUNOFF WILL OVERTOP THE CURB AND DRAIN INTO THE BROW DITCH DOWNSTREAM BEFORE IMPACTING ANY SURROUNDING STRUCTURES.

2. THIS SUMP COLLECTS 1.36 CFS. THE RUNOFF IS NOT LARGE ENOUGH TO OVERTOP THE CURB OR THE STREET CROWN. PONDING IN THIS AREA WOULD NOT AFFECT ANY SURROUNDING STRUCTURES. IF ADDITIONAL RUNOFF REACHED THIS POINT, THE FLOWS WOULD DRAIN DOWN THE SLOPE AND DISCHARGE INTO THE BROW DITCH, AS SHOWN.

3. THIS SUMP COLLECTS 0.86 CFS. LIKE SUMP #2, THE RUNOFF WOULD POND IN THIS LOCATION WITHOUT NEGATIVELY IMPACTING NEARBY STRUCTURES. ANY ADDITIONAL RUNOFF WOULD DRAIN DOWN THE SLOPE, AS SHOWN.

4. THIS SUMP COLLECTS 2.38 CFS. WHILE THE RUNOFF IS NOT ENOUGH TO OVERTOP THE CURB, A PORTION WOULD FLOW OVER THE ROAD'S CROWN AND COULD EITHER ENTER SUMP #3 OR DRAIN TO A DOWNSTREAM ON-GRADE INLET, AS SHOWN.

5. THIS SUMP COLLECTS 1.63 CFS. THIS RUNOFF IS INSUFFICIENT TO OVERTOP THE CURB OR THE STREET CROWN. PONDING IN THIS AREA WOULD NOT IMPACT ANY SURROUNDING STRUCTURES. IF ADDITIONAL RUNOFF REACHED THIS POINT, THE FLOWS WOULD OVERTOP THE CURB AND BEGIN FLOWING INTO THE CATCH BASIN AT SUMP #6.

6. THIS SUMP COLLECTS 1.61 CFS. THE RUNOFF IS NOT LARGE ENOUGH TO OVERTOP THE DITCH. STORMWATER WOULD POND AT THIS LOCATION WITHOUT IMPACTING NEARBY STRUCTURES. IF ANY ADDITIONAL FLOWS LARGE ENOUGH TO OVERTOP THE DITCH REACH THIS LOCATION, THE RUNOFF WILL DRAIN INTO THE STREET. THE PROPOSED MWS UNITS WOULD NOT HAVE ENOUGH CAPACITY TO CAPTURE THIS RUNOFF, RESULTING IN PONDING THAT COULD OVERTOP THE CURB AND DISCHARGE THROUGH AN EMERGENCY OPENING ON THE PROPOSED RETAINING WALL.

7. THIS SUMP COLLECTS 15.79 CFS FROM THE EXISTING DEVELOPMENT. THE EXISTING CUL-DE-SAC AND PROPOSED SUMP INLET WILL HAVE SUFFICIENT CAPACITY TO CAPTURE THIS RUNOFF. IF THE INLET WERE TO FAIL, THE FLOWS WOULD OVERTOP THE CURB AND DRAIN INTO THE EXISTING BROW DITCH, LIKE CURRENT CONDITIONS. THE EXISTING DITCH WILL BE REMOVED AND REROUTED WITH A PROPOSED DITCH OF THE SAME HYDRAULIC GEOMETRY. THIS NEW DITCH WILL DIRECT ALL FLOWS TO A PROPOSED CATCH BASIN WITH TWO OPENINGS, AS SHOWN.

40 0 40 80 120
SCALE 1" = 40'

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PROPOSED
SUMP INLET LOCATIONS

OLIVE PARK APARTMENTS

CITY OF OCEANSIDE, CALIFORNIA

MAP 1 OF 1

W.O.# 3785-0002

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CHAPTER 7

APPENDICES

APPENDIX 1
Hydrologic Soil Information

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

Map Scale: 1:4,440 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1200

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

Streams and Canals

Transportation

Rails
Interstate Highways
US Routes
Major Roads
Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 19, Aug 30, 2023

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

Date(s) aerial images were photographed: Mar 14, 2022—Mar 17, 2022

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CsB	Corralitos loamy sand, 0 to 5 percent slopes	A	3.7	8.5%
DaE2	Diablo clay, 15 to 30 percent slopes, eroded, warm MAAT	C	1.0	2.3%
DaF	Diablo clay, 30 to 50 percent slopes, warm MAAT, MLRA 20	C	0.9	2.0%
GaF	Gaviota fine sandy loam, 30 to 50 percent slopes	D	14.2	32.3%
LeC2	Las Flores loamy fine sand, 5 to 9 percent slopes, eroded	D	0.3	0.7%
LeD2	Las Flores loamy fine sand, 9 to 15 percent slopes, eroded	D	15.6	35.6%
SbA	Salinas clay loam, 0 to 2 percent slopes, warm MAAT, MLRA 19	C	8.2	18.6%
Totals for Area of Interest			**43.9**	**100.0%**

Description

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

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

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

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

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

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

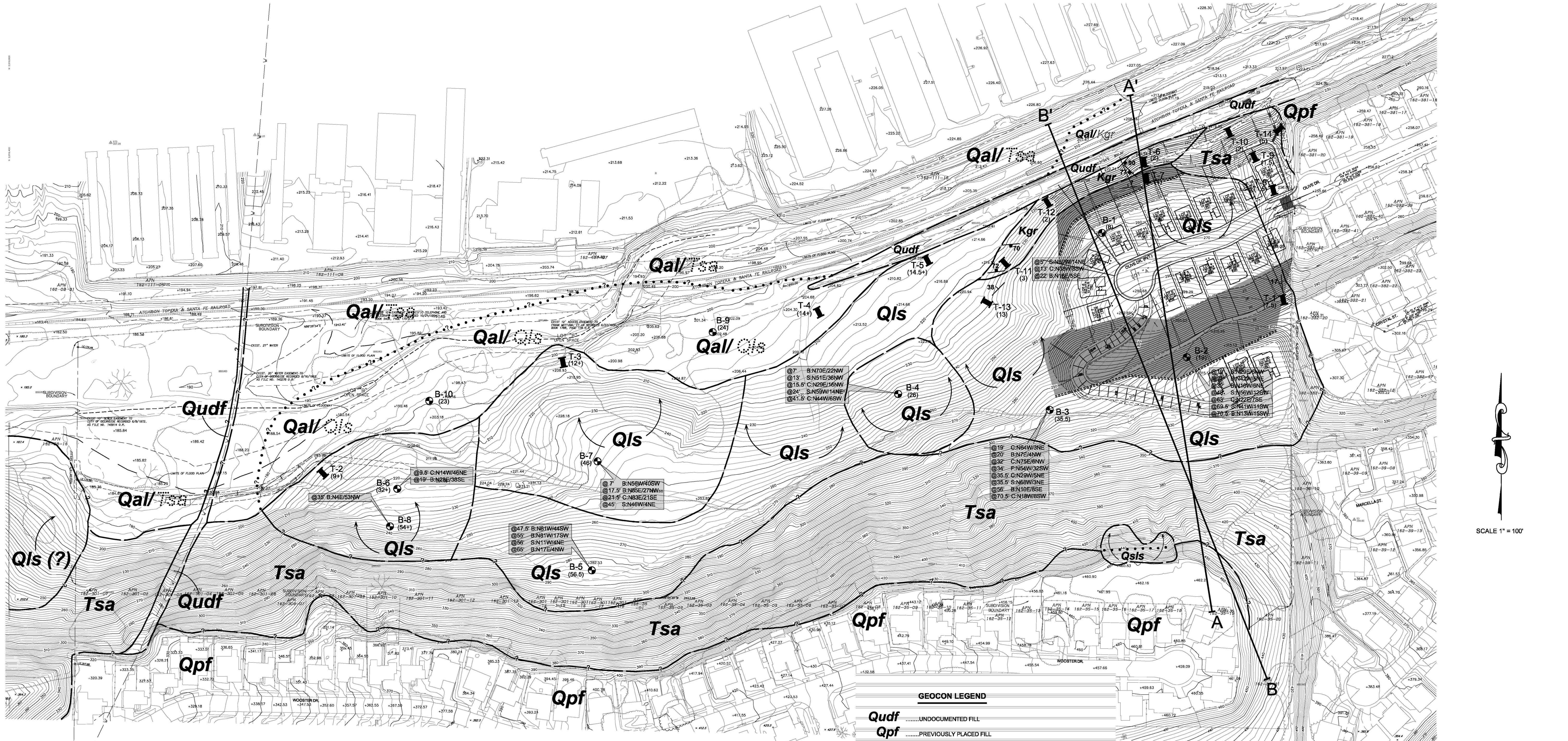
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



GEOCON LEGEND

Qudf	........UNDOCUMENTED FILL
Qpf	........PREVIOUSLY PLACED FILL
Qal	........ALLUVIUM
Qsls	........SURFICIAL LANDSLIDE DEBRIS
Qls	........LANDSLIDE DEBRIS (Dotted Where Buried; Queried Where Uncertain)
Tsa	........SANTIAGO FORMATION (Dotted Where Buried)
Kgr	........GRANITIC ROCK (Dotted Where Buried)
B-10	........APPROX. LOCATION OF EXPLORATORY BORINGS
T-14	........APPROX. LOCATION OF EXPLORATORY TRENCHES
(56.5)	........APPROX. DEPTH TO FORMATIONAL MATERIAL
77	........APPROX. ORIENTATION OF GEOLOGIC STRUCTURE
@35' B:N4E/53NW	........APPROX. DEPTH AND ORIENTATION OF GEOLOGIC FEATURE IN BORING
	........APPROX. LOCATION OF PROPOSED WIDTH OF BUTTRESS
B B'	........APPROX. LOCATION OF GEOLOGIC CROSS SECTION
	........APPROX. LOCATION OF GEOLOGIC CONTACT (Dotted Where Buried; Queried Where Uncertain)
	........APPROX. LOCATION OF BUTTRESS DRAIN

GEOLOGIC MAP
OCEANSIDE VISTA
OCEANSIDE, CALIFORNIA

GEOCON INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

SCALE	1" = 100'
DATE	10 - 12 - 2005
PROJECT NO.	07227 - 52 - 02
SHEET	1 OF 1
FIGURE	2

X:\07227-52-02\RA\NA_7227 NEW COLORED GEOLOGIC MAP (UPGRADED 10-10-2005).DWG.

APPENDIX 2
Rainfall Isopluvial Map

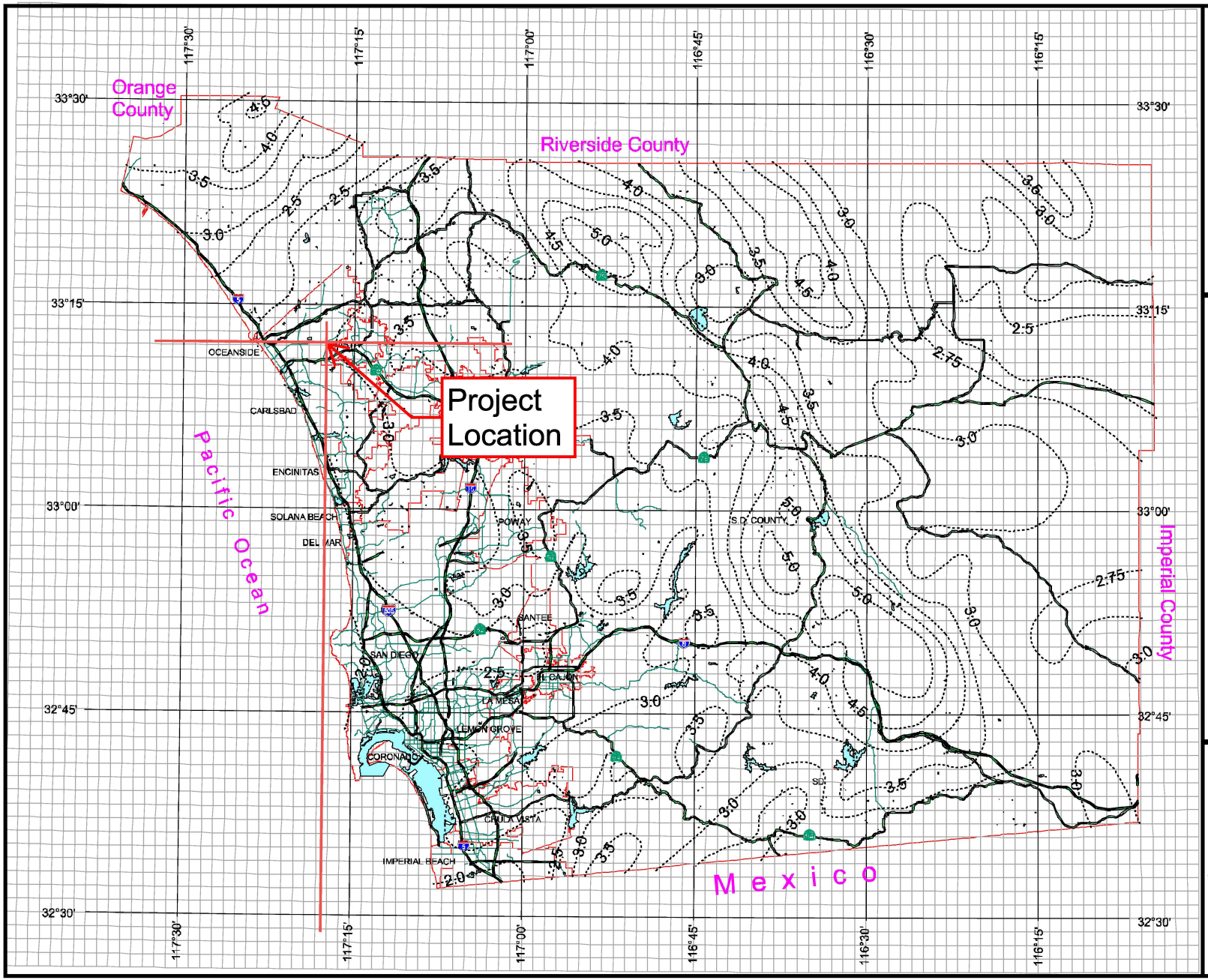
County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

P6 = 2.90 Inch

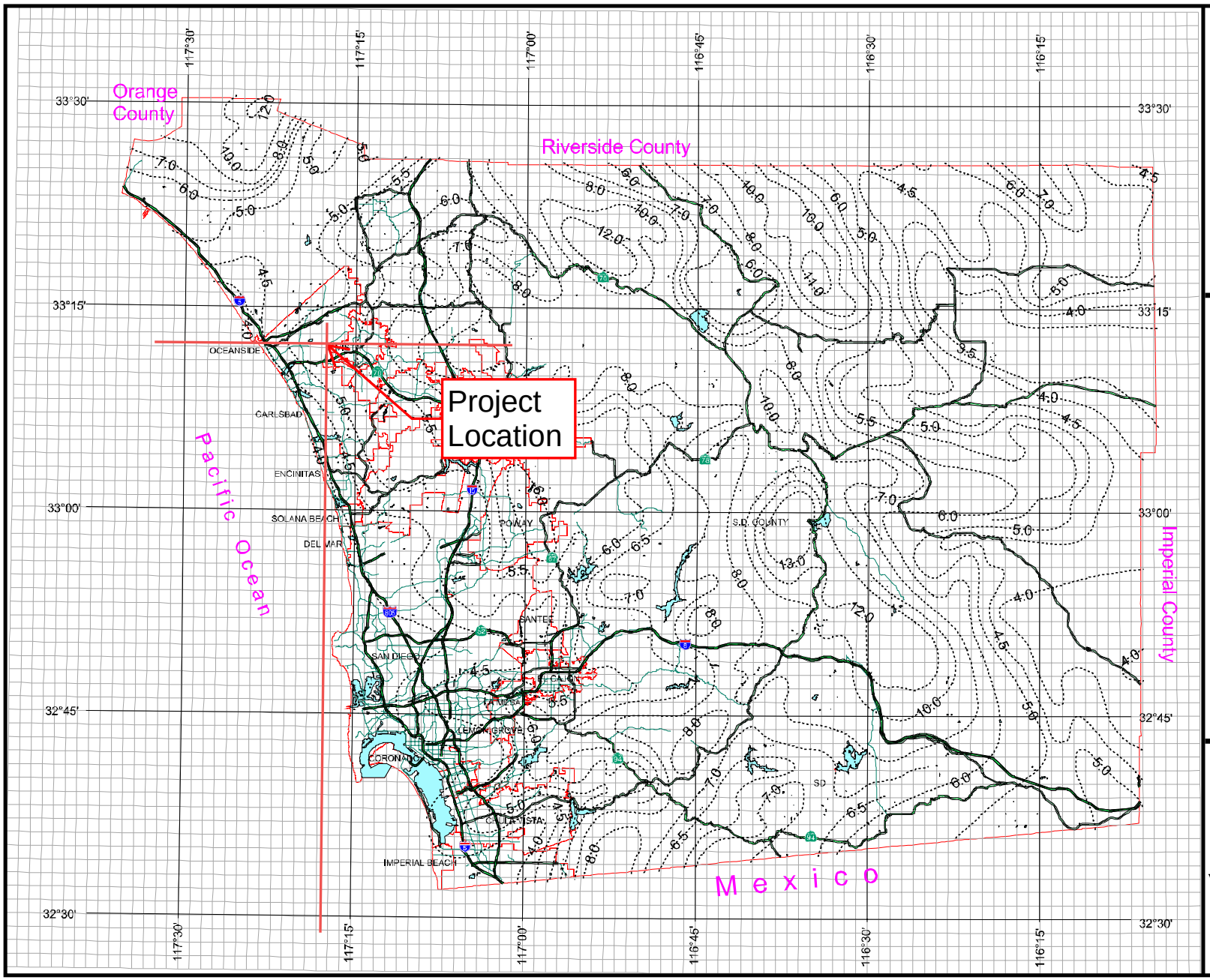


DPW GIS — Department of Public Works Geographic Information Services

SanGIS — We Have San Diego Covered!

N W E S

3 0 3 Miles



County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

P24 = 5.25 Inch

DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

N
W E
S

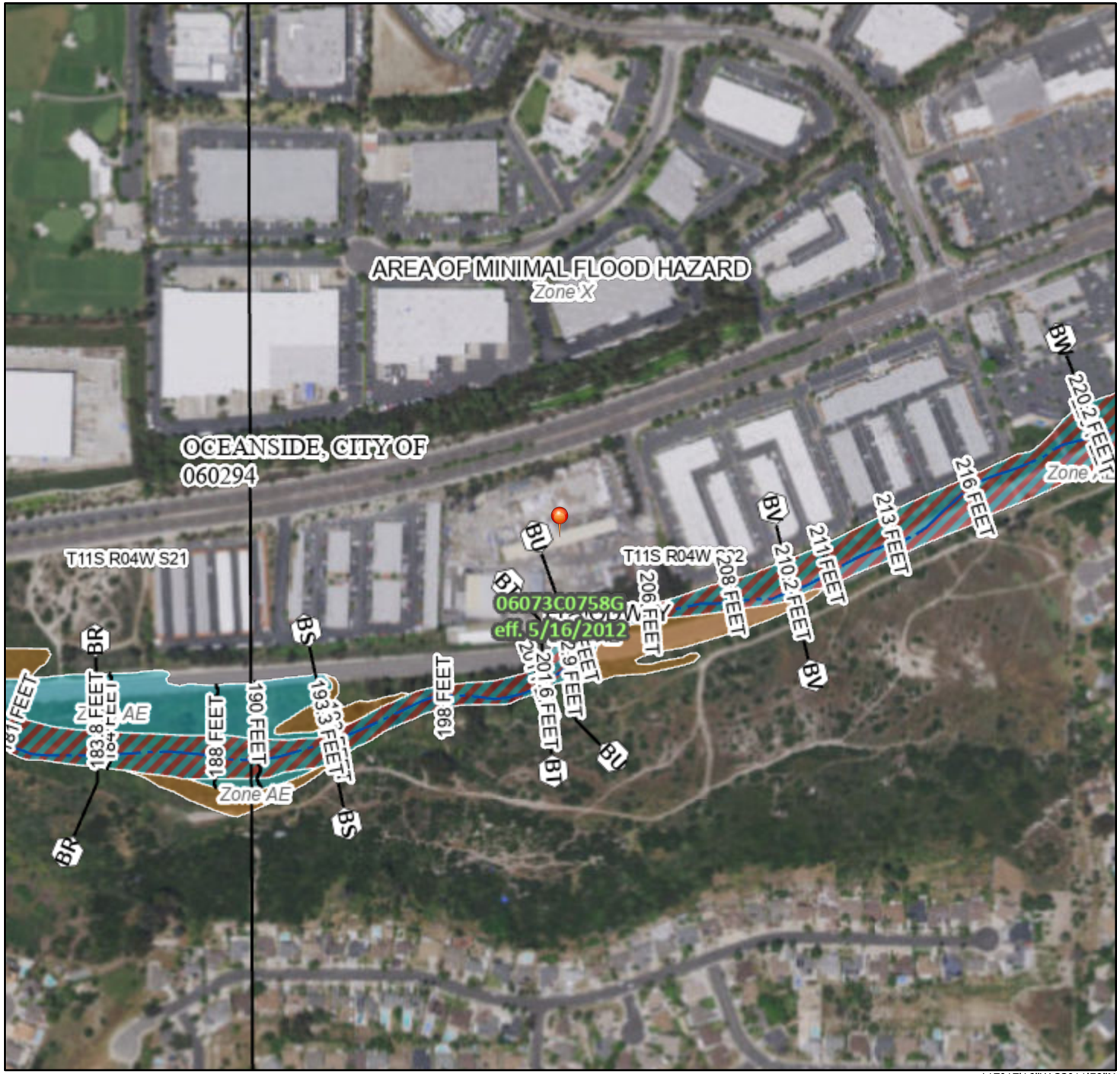
3 0 3 Miles

APPENDIX 3
FEMA FIRMette

National Flood Hazard Layer FIRMette

FEMA

117°17'53"W 33°12'29"N



117°17'16"W 33°11'59"N

Feet

0 250 500 1,000 1,500 2,000

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

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

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/15/2024 at 8:56 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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