Magnolia Tank Farm

INFRASTRUCTURE TECHNICAL REPORT FOR HYDROLOGY

City of Huntington Beach
Orange County, California

Prepared For

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CITY OF HUNTINGTON BEACH
MAGNOLIA TANK FARM

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ACRONYMS & ABBREVIATIONS

CEQA	California Environmental Quality Act
cfs	cubic feet per second
EIR	Environmental Impact Report
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
LID	Low Impact Development
NA	Not Available
OCFCD	Orange County Flood Control District
RCP	Reinforced Concrete Pipe
sf	square feet
SFHA	Special Flood Hazard Area
Tc	Time of Concentration

1 INTRODUCTION & BACKGROUND INFORMATION

The proposed Magnolia Tank Farm Project ("Project") encompasses approximately 29 acres in the City of Huntington Beach ("City"). The Project site is bounded by Magnolia Street on the east, the Huntington Beach Magnolia Marsh and the Huntington Beach Channel on the southwest, and the vacant ASCON property on the north. See **Figure 1** for a vicinity map of the proposed Project.

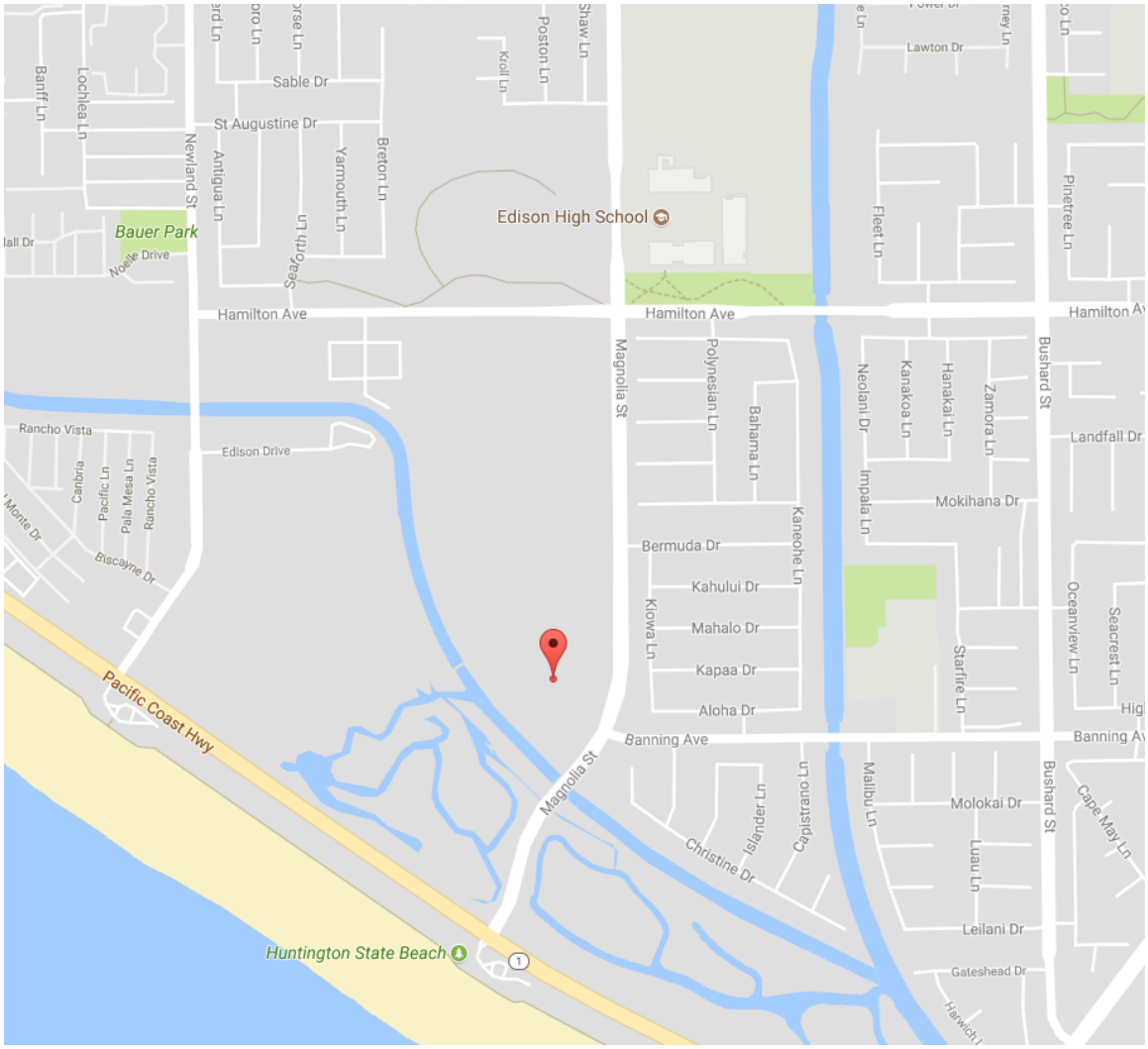
From 1972 until 2009, the Project site was used as a fuel oil storage facility with three above-ground, 45-foot tall, 25-million-gallon fuel storage tanks, and other oil-related infrastructure including roads, pipelines and ancillary buildings. The oil storage tanks provided fuel for the adjacent power generating facility (now owned by AES Southland) until that facility was converted to an all-natural gas facility in the 1990s. Each of the tanks measured approximately 300 feet in diameter. Adjacent land uses include the AES Southland power generating facility to the west of the Channel; single family residences to the east; Magnolia Marsh, Wildlife Conservancy and wetlands to the south; and the vacant ASCON property on the north.

The Project proposes the construction of a mixed-use community that includes a residential neighborhood, hotel/lodge, and up to 40 beds in a "guesthouse format" type land use that provides lower-cost group overnight accommodations. The Project also includes visitor-serving and neighborhood-supporting retail uses (primarily restaurants), a Coastal Conservation area adjacent to Magnolia Marsh, and Open Space Park areas. The residential portion of the Project includes the development of up to 250 (maximum) units.

The Project will include the development of the Magnolia Tank Farm Specific Plan ("Specific Plan") and associated documentation pursuant to Government Code §§65450 and 65457. The Government Code authorizes local jurisdictions to adopt specific plans by resolution and/or ordinance. Upon adoption, the Specific Plan and Environmental Impact Report (EIR) will establish the land use and supplemental development standards for the Specific Plan area. The Specific Plan is intended to be a regulatory document that serves as the zoning regulation for the property and provides guidance on the development of the future site plan that must comply with all the zoning requirements of the Specific Plan. While the City's General Plan is the primary guide for citywide growth and development, a Specific Plan focuses on the distinctive characteristics of a specific property in the context of the community that surround it by beneficially customizing the planning process and land use regulations to that area, all consistent with the General Plan. Some elements of the development program will be enforced through conditions, covenants and restrictions (CC&Rs) established in conjunction with the subdivision map for the property.

As part of the EIR technical documentation for the Project, this report analyzes hydrology impacts to existing drainage facilities serving the Project site and identifies the proposed improvements to meet hydrology and flood control standards.

Figure 1 Vicinity Map



2 ENVIRONMENTAL SETTING

2.1 HYDROLOGY

The purpose of this hydrology and hydraulic analysis is to evaluate the existing storm drain infrastructure and identify any infrastructure improvements necessary for the proposed conditions to reduce potential impacts. The analysis is based on information provided by the City of Huntington Beach and the Orange County Flood Control District (OCFCD).

2.1.1 Existing Hydrology Conditions

The interior of the Project site is relatively flat and generally slopes from the northwest to the southeast with an elevation range from 4.3 to 12.5 feet (NAVD88), with an average elevation of approximately 8.4 feet (NAVD88). Along the southern and eastern edges includes a berm that averages approximately 16'-17' feet. The site is also separated from the Huntington Beach Channel by a chain link fence and a gated maintenance road. Near the midpoint of the western property line is a bridge over the Huntington Beach Channel. On the eastern end of the site adjacent to Magnolia Street is a landscaped area comprised of turf, ornamental trees, decorative rocks, and an earthen berm, which provides some visual screening of the storage tanks along the eastern site frontage. The area is known as "Squirrel Park" to the local residents.

Under existing drainage conditions, the site is delineated into two main drainage areas. Drainage area A encompasses approximately 24 acres drains towards the Huntington Beach Channel. Drainage area B encompasses approximately 5 acres and drains towards Magnolia Street. As shown on the existing condition exhibit, Drainage Area C is considered off-site as it slopes away from the Project site and falls outside the property boundary. See **Figure 2** below for Project site existing drainage conditions.

Runoff from drainage area A converge at an existing sump pump on site that ultimately pumps flows directly into the Huntington Beach Channel. Runoff from drainage area B that is not naturally infiltrated into the ground surface flows away from the site in an easterly direction towards Magnolia Street. Surface flows on Magnolia Street travel north before being captured at a drop inlet south of the intersection with Hamilton Avenue. Captured flows travel through a 24-inch City storm drain pipeline into the existing 60-inch City reinforced concrete pipe (RCP) that runs under Hamilton Ave. Flows that bypass the drop inlet travel west on Hamilton Ave. These flows are then intercepted by an existing catch basin approximately 1 mile from the Project site at the intersection of Hamilton Avenue and Surveyor Circle. The runoff then feeds into a pump station located between Surveyor Circle and Newland Street, hereon referred to as Newland Pump Station, and ultimately pumps out to the Huntington Beach Channel.

Existing condition hydrology calculations were performed and are summarized in Table 1 below. See **Figure 2** for the existing condition hydrology exhibit. Hydrology calculations can be found in Appendix A.

Table 1 Existing Hydrology Condition Flows

Drainage Area	Discharge Point	Drainage Area Acreage	2-year (cfs)	25-year (cfs)	100-year (cfs)
A	Huntington Beach Channel	24.1	8.58	23.56	31.42
B	Magnolia Street	4.9	3.43	8.66	11.30
	Total	29.0	12.01	32.22	42.72
Notes See Appendix A for hydrology calculations					

SITE CHARACTERISTICS

AREA A	
TOTAL AREA	24.08 ACRES
PERVIOUS AREA	14.45 ACRES
IMPERVIOUS AREA	9.63 ACRES
PERCENT PERVIOUS	60.01%

AREA B	
TOTAL AREA	4.91 ACRES
PERVIOUS AREA	4.87 ACRES
IMPERVIOUS AREA	0.04 ACRES
PERCENT PERVIOUS	99.19%

SITE = INDUSTRIAL
SOIL CLASS = C

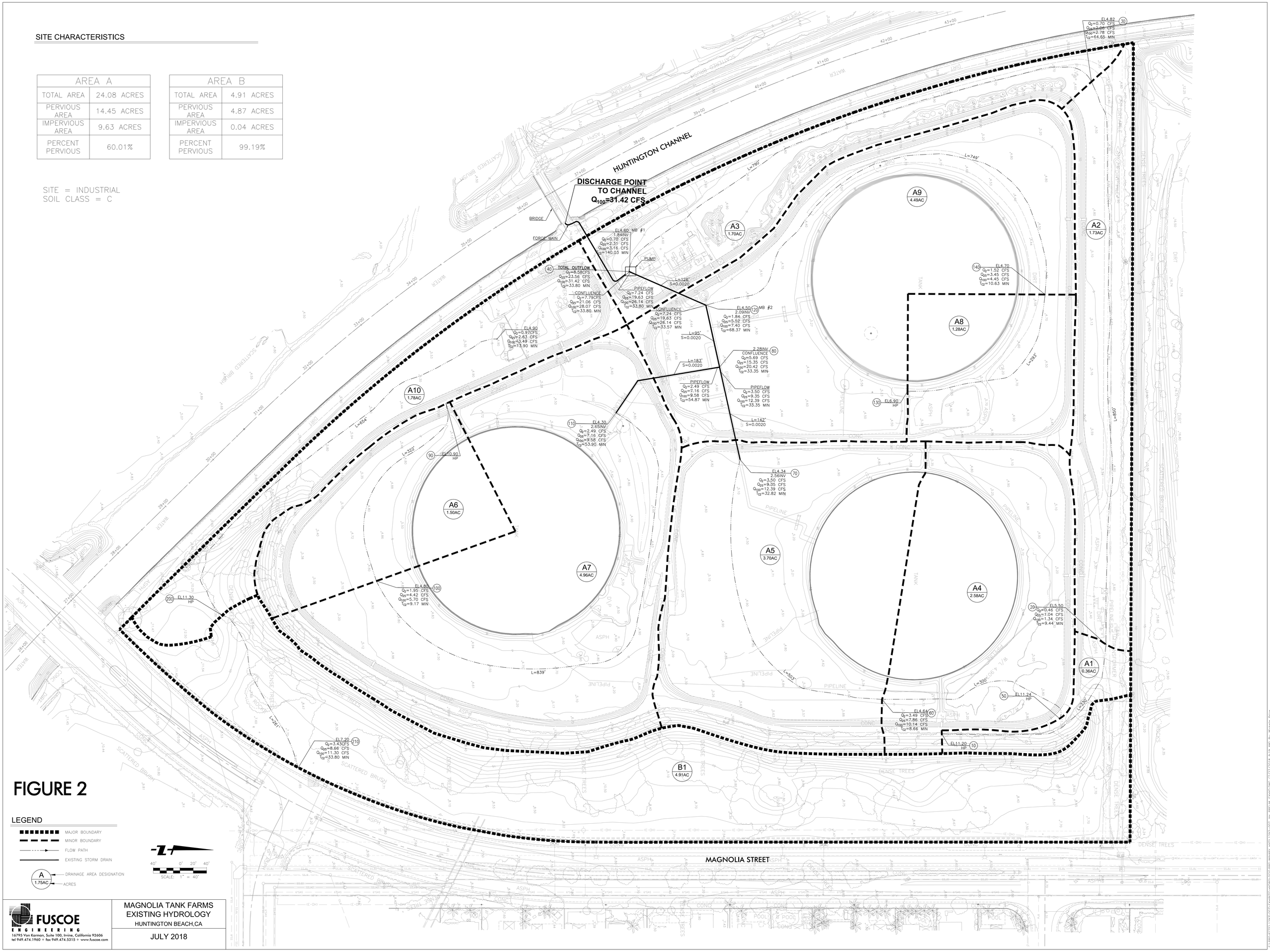


FIGURE 2

LEGEND

- MAJOR BOUNDARY
- MINOR BOUNDARY
- FLOW PATH
- EXISTING STORM DRAIN
- A / 1.75AC — DRAINAGE AREA DESIGNATION / ACRES

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MAGNOLIA TANK FARMS
EXISTING HYDROLOGY
HUNTINGTON BEACH,CA

JULY 2018

2.1.2 Existing Drainage Facilities

As mentioned above, flows from drainage area A are pumped to Huntington Beach Channel and all other flows from drainage area B drain to Magnolia Street and are either captured by a drop inlet in Magnolia Street or flow to a catch basin in Hamilton Avenue. All stormwater ultimately flows to the Huntington Beach Channel as described in more detail below.

- *Hamilton Avenue Local 60-inch Reinforced Concrete Pipe (RCP)* – The runoff from drainage area B at the Project site that drains to Magnolia Street flows north before being captured by a drop inlet and traveling through a 24" City line to the 60-inch RCP. Flows not captured by the drop inlet flow west on Hamilton Avenue before being intercepted at a catch basin at Surveyor Circle. This runoff then feeds through the City 60-inch RCP line into Newland Pump Station, and ultimately pumps out to the Huntington Beach Channel.

- *Huntington Beach Channel OCFCD* – Surface flows from drainage area A at the Project site converge at a centrally located existing pump station, which serves as a low point for this drainage area (see **Figure 2**), and are pumped out into the Huntington Beach Channel ("Channel"). A portion of the Project, as described above, flows northerly into a drop inlet or to a catch basin and into a 60-inch RCP pipe owned by the City which ultimately discharges into Huntington Beach Channel. Huntington Beach Channel is maintained by OCFCD.

OCFCD is tasked with the ultimate goal of protecting Orange County from the threat of floods by designing and constructing channels, storm drains, dams, pump stations and other drainage related facilities. Specifically, it is the goal of OCFCD to provide 100-year flood control protection. To provide for this goal, OCFCD attempts to design facilities to convey 100-year flows where feasible.

In 2004, the Huntington Beach Channel underwent 5,600 feet of channel improvements to provide 100-year channel conveyance for that portion of the Huntington Beach Channel (D01) that is directly adjacent to the Project property (see **Figure 3** below). The subject reach of D01 previously existed as a trapezoidal-earthen channel originally designed to convey the storm runoff generated by a 10-year storm event. The earthen channel was replaced by an 80 foot wide, soft-bottom (earthen), vertical wall channel. The vertical channel walls were constructed of 13-14 foot high steel sheet piles. The overall length of the sheet piles are 36 feet where approximately 25-26 feet of the pile is embedded into the earth. The steel piles are protected from the harsh saltwater environment by a special corrosion resistant coating and a process/system called cathodic protection.[1,2]

The 100-year Channel improvements in 2004 were based off the hydraulic analysis conducted in the Fountain Valley Channel Diversion Feasibility Report – Phases I & II (June

[1] OC Public Works – Flood Division. Huntington Beach Channel – Magnolia Street to Newland Street Project. Project description found here, December 28, 2017: http://www.ocflood.com/nfc/projects_a/complete/hbchannel/huntington2

[2] OC Public Works – Flood Division. Huntington Beach Channel – Magnolia Street to Indianapolis Avenue Project. Project description found here, January 2, 2018: http://www.ocflood.com/nfc/projects_a/complete/hbchannel/huntington3

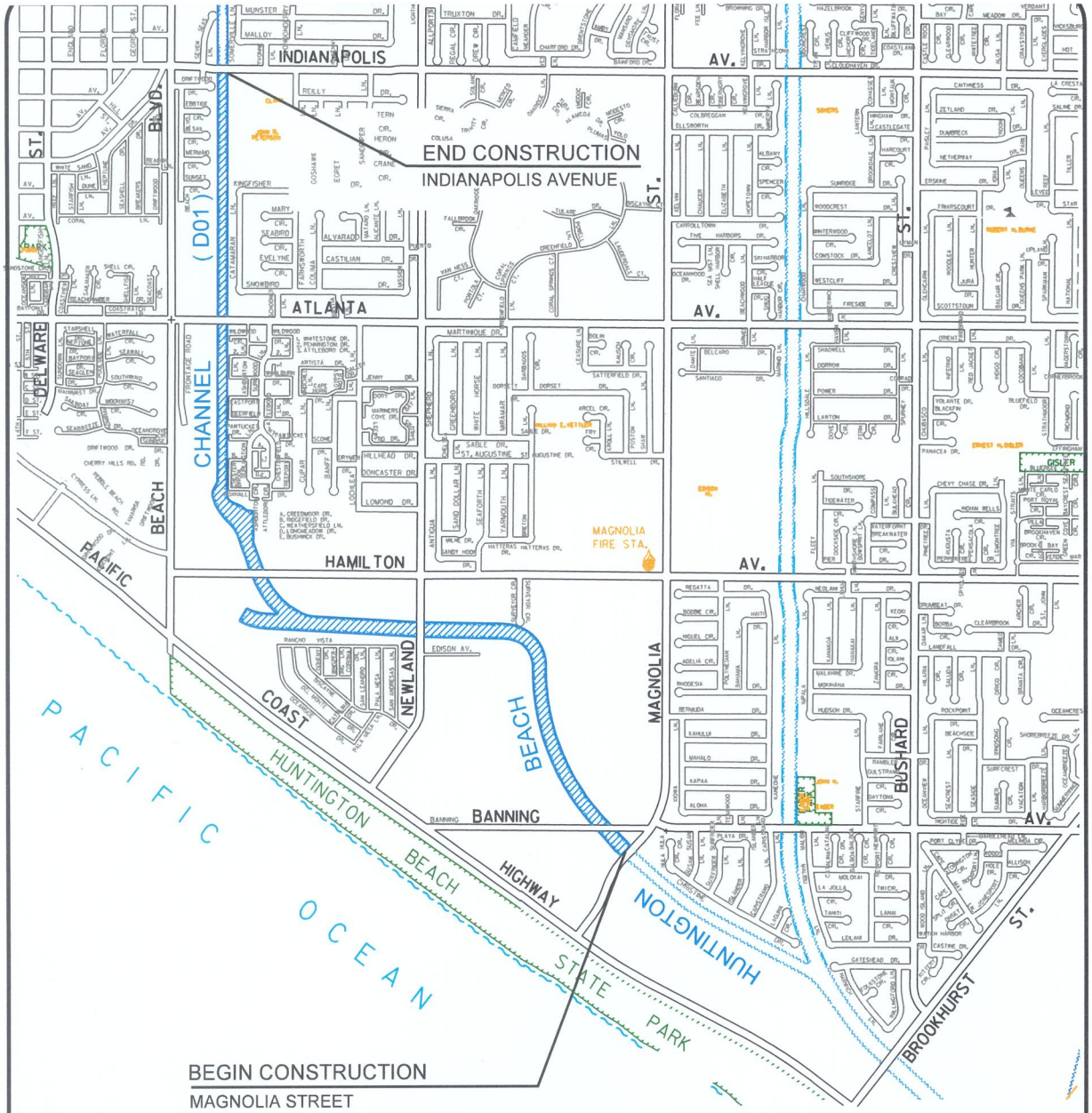
1990). Based on the findings of the analysis, the recommended design discharge within D01 of the Huntington Beach Channel adjacent to the Project site is 2,315 cfs. The proposed Project area was considered an "Industrial Energy Production" land use in the analysis based on 1990 General Plan land use demonstrating flow contributions from the Project area were factored into the sizing and design of the 100-year improvements. Industrial Energy Production land use areas were assigned "Commercial" runoff coefficients for the said hydrologic analysis.[3] Please refer to Appendix C for the map used by OCFCD for modeling land uses which was validated in the City of Huntington Beach 1995 Master Plan of Drainage.

Under existing conditions, the water surface elevation for the 100-year peak flow condition (2,315 cfs) within the fully channelized portion of the Channel at Station 40+00.00 is 8.62' (NAVD88) The top of the Channel wall on the side of the project site is 13.3'. See Appendix D for these hydraulic calculations.

In addition, in 2012, additional improvements were made because the sheet piles began to exhibit failure of the protective coatings and corrosion primarily within the "splash zone"; the area on the sheet pile surface most susceptible to repeated wetting and drying due tidal influence (see **Figure 4**). This improvement project directly downstream of the Project site mitigated and repaired portions of coating failures and to made changes to the cathodic protection systems. Remediation efforts included providing additional electrical continuity between sheet piles, installation of additional anodes for the cathodic protection system, and implementation of a coatings maintenance program to touch-up areas showing visible signs of coatings failure.[4]

Between 2009 and 2011, a major wetland restoration project led by the Huntington Beach Wetlands Conservancy occurred at the Huntington Beach Wetlands and included modifications westerly of the project site within the Magnolia Marsh. As part of the project, the westerly earthen embankment of the Channel was removed to increase circulation within the Magnolia Marsh and improve habitat conditions. Approximately 2,900 linear feet of the westerly side of the Channel was removed including approximately 900 linear feet adjacent to the project. Other improvements also occurred in within Brookhurst Marsh and Talbert Marsh as part of the same Huntington Beach Wetlands Restoration Project including dredging, creation of meandering channels and levee removals.

[4] OC Public Works – Flood Division. Huntington Beach & Talbert Channels Coating Repair Project. Project description found here, December 28, 2017: http://www.ocflood.com/nfc/projects_a/complete/huntington



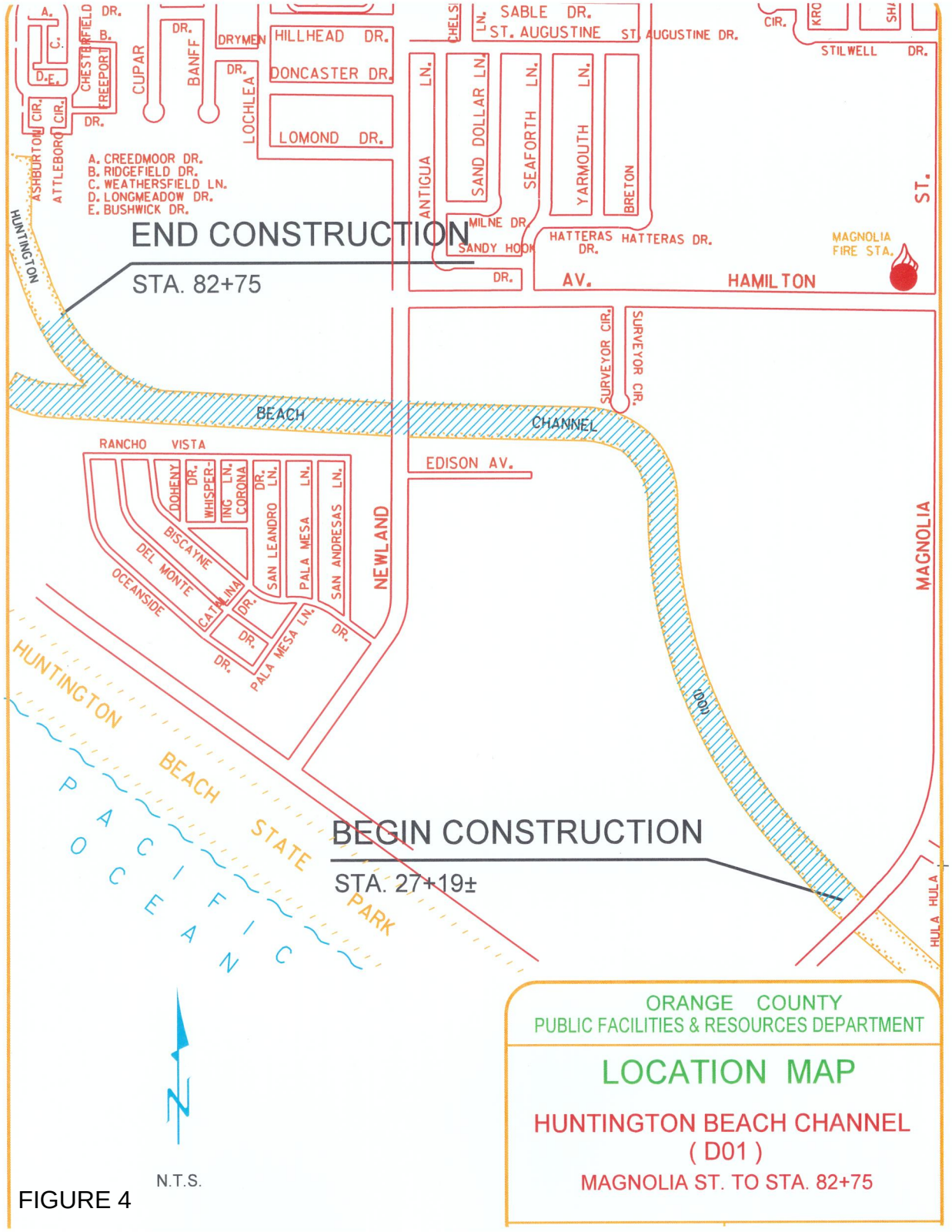
ORANGE COUNTY
RESOURCES & DEVELOPMENT MANAGEMENT DEPARTMENT

LOCATION MAP

HUNTINGTON BEACH CHANNEL (D01)
CATHODIC PROTECTION SYSTEM PROJECT

MAGNOLIA STREET TO INDIANAPOLIS AVENUE
(Sta. 27+19 to Sta. 137+18)

FIGURE 3



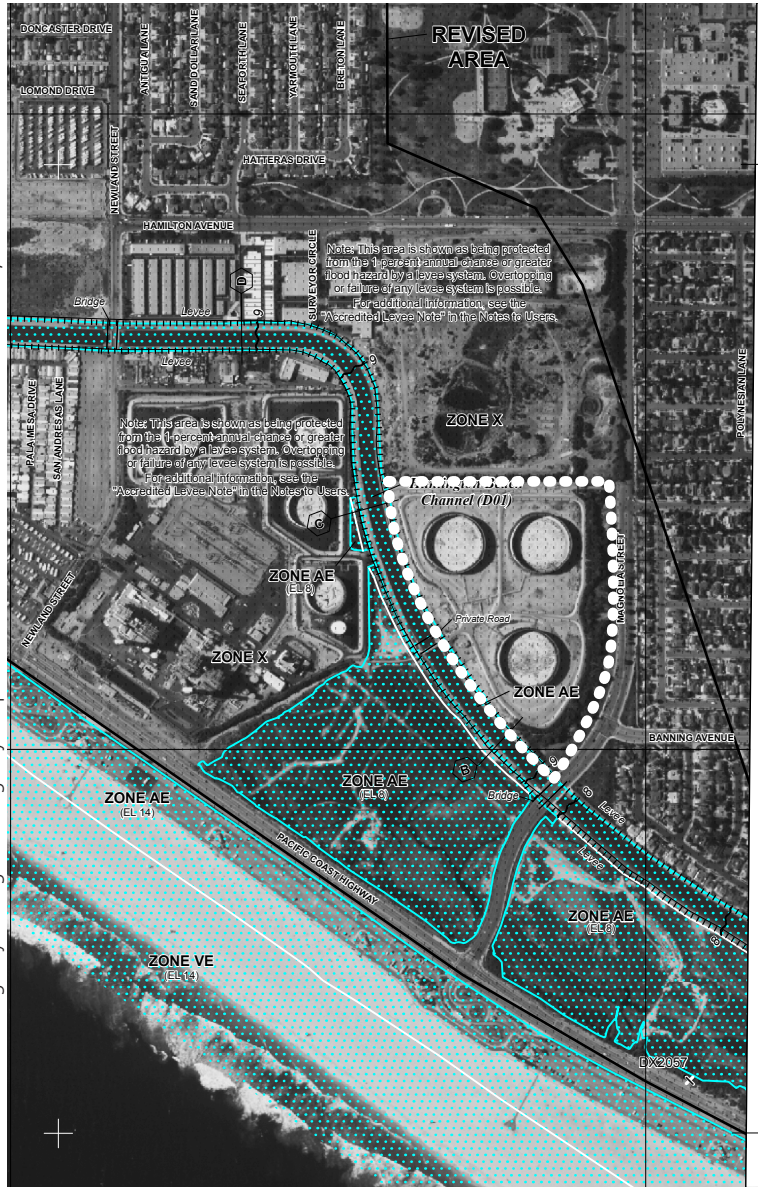
END CONSTRUCTION
STA. 82+75
BEGIN CONSTRUCTION
STA. 27+19±
A. CREEDMOOR DR.
B. RIDGEFIELD DR.
C. WEATHERSFIELD LN.
D. LONGMEADOW DR.
E. BUSHWICK DR.
HILLHEAD DR.
DONCASTER DR.
LOMOND DR.
SABLE DR.
ST. AUGUSTINE
ST. AUGUSTINE DR.
STILWELL DR.
ANTIGUA LN.
SAND DOLLAR LN.
SEAFORTH LN.
YARMOUTH LN.
BRETON
MILNE DR.
SANDY HOOK DR.
HATTERAS DR.
HATTERAS DR.
MAGNOLIA FIRE STA.
AV.
HAMILTON
ST.
HUNTINGTON
BEACH
CHANNEL
SURVEYOR CIR.
SURVEYOR CIR.
RANCHO VISTA
EDISON AV.
NEWLAND
MAGNOLIA
DOHENY DR.
WHISPERING LN.
CORONA DR.
SAN LEANDRO LN.
PALA MESA LN.
SAN ANDRESAS LN.
BISCAYNE
DEL MONTE
OCEANSIDE
CATALINA DR.
PALA MESA LN.
HUNTINGTON BEACH STATE PARK
PACIFIC OCEAN
HULA HULA
N
N.T.S.
ORANGE COUNTY
PUBLIC FACILITIES & RESOURCES DEPARTMENT
LOCATION MAP
HUNTINGTON BEACH CHANNEL
(D01)
MAGNOLIA ST. TO STA. 82+75

FIGURE 4

2.1.3 Existing Floodplain Mapping

The National Flood Insurance Act (1968) established the National Flood Insurance Program, which is based on the minimal requirements for flood plain management and is designed to minimize flood damage within Special Flood Hazard Areas (SFHAs). The Federal Emergency Management Agency (FEMA) is the agency that administrates the National Flood Insurance Program. SFHAs are defined as areas that have a one percent chance of flooding within a given year, also referred to as the 100-year flood. Flood Insurance Rate Maps (FIRMs) were developed to identify areas of flood hazards within a community.

Figure 5 below shows the flood zones designated for the Project site. As shown on Figure 5, and according to the most recent (December 15, 2009) FIRM, the Specific Plan area is not located within the 100-year floodplain. During the 100-year food, the water elevation in the flood control channel is estimated to reach +9.0 feet (NAVD88). Since the crest elevation of the channel wall is +13 feet (NAVD88) the flood waters would not overtop the channel wall causing flooding of the low-lying areas of the Specific Plan area.



Source: Federal Emergency Management Agency, Map Number 06059C0261J, Revised December 15, 2009.

NTS

Legend

Magnolia Tank Farm

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

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

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

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

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

OTHER AREAS

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

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

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

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A — A	Cross section line
23 - - - - - 23	Transect line
97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
$^{42}75^{000m}$N	1000-meter Universal Transverse Mercator grid values, zone 11
6000000 FT	5000-foot grid ticks: California State Plane coordinate system, VI zone (FIPSZONE 0406), Lambert Conformal Conic
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

FIGURE 5 **FEMA Flood Insurance Map**

3 THRESHOLDS OF SIGNIFICANCE

CEQA significance criteria are used to evaluate the degree of impact caused by a development project on environmental resources such as hydrology and water quality. According to Appendix G of the CEQA Guidelines, a project would normally have a significant effect on the environment if the project would result in any of the following:

A. Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table? (e.g. the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted);

B. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or in a manner which would result in a substantial erosion or siltation on- or off-site;

C. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site;

D. Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff;

E. Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map;

F. Place within a 100-year flood hazard area structures which would impede or redirect flood flows;

G. Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam;

H. Be subject to inundation by seiche, tsunami, or mudflow;

I. Create or contribute significant increases in the flow velocity or volume of stormwater runoff to cause environmental harm?

J. Create or contribute significant increases in erosion of the project site or surrounding areas?

Should the answers to these environmental factors prove to be a potentially significant impact, mitigation measures would be required to reduce those impacts to a less-than-significant threshold. The impacts associated with hydrology and hydromodification are analyzed within Section 4.1.4 of this report.

4 ENVIRONMENTAL IMPACTS

4.1 HYDROLOGY

The purpose of the Hydrology evaluation is to determine impacts anticipated for the proposed Project, characterize changes as compared to the existing runoff conditions and identify where additional storm drain facilities are recommended.

4.1.1 Proposed Hydrology Conditions

The proposed Project includes the development of 250 (maximum) residential units, a visitor serving lodge area in addition to areas dedicated for open space and parks.

Under proposed conditions, the Project site is delineated into three main drainage areas (A, B and C). Runoff from drainage areas A and C flow towards Huntington Beach Channel and will discharge into the channel as a single confluence point. Runoff from drainage area B (landscaped area along Magnolia) drains easterly and will be flow to a small pump that will raise flows to near surface level, where they will gravity drain to Huntington Beach Channel at a separate discharge point to the channel south of the A & C discharge point. Flows from drainage area A enter a high-flow bypass splitter, where low flows will be pumped up to water quality features (please reference Preliminary Water Quality Management Plan dated 1/23/2018), and high flows will bypass the pumping well and tie directly into the proposed storm drain lines and discharge to the Huntington Beach Channel. See **Figure 6** for the proposed hydrology exhibit.

Runoff from the majority of the residential areas generally drain towards proposed catch basins along private streets and continue to flow in a westerly direction. The remaining residential areas adjacent to the landscape setbacks/open space areas within the eastern and western boundary will drain away from the site interior. All low flows will receive treatment prior to draining into the Huntington Beach Channel, while high flows will bypass treatment and connect directly to the proposed storm drain lines and the Channel (pending review and approval by the County of Orange Public Works Department). All low flow design details for water quality compliance are provided in the Preliminary Water Quality Management Plan, dated 1/23/2018. The remaining landscape setbacks, open space, and park areas along the eastern and western boundary of the site will drain towards Magnolia Street and Huntington Beach Channel, respectively.

Proposed hydrology calculations were performed and can be compared with existing conditions for the 2-year, 25-year and 100-year storm event as shown in **Table 2** below.

Table 2 Existing and Proposed Hydrology Conditions

Existing Hydrology Conditions					
Drainage Area	Discharge Point	Drainage Area Acreage	Existing 2-year (cfs)	Existing 25-year (cfs)	Existing 100-year (cfs)
A	Huntington Beach Channel	24.1	8.58	23.56	31.42
B	Magnolia Street	4.9	3.43	8.66	11.3
	Totals	29.0	12.01	32.22	42.72
Proposed Hydrology Conditions					
Drainage Area	Discharge Point	Drainage Area Acreage	Proposed 2-year (cfs)	Proposed 25-year (cfs)	Proposed 100-year (cfs)
A	Huntington Beach Channel	23.3	23.10	53.69	69.82
B	Huntington Beach Channel	3.0	2.57	6.57	8.66
C	Huntington Beach Channel	2.7	2.28	5.59	7.28
	Totals	29.0	27.95	65.85	85.76
	Net Increase		15.94	33.63	43.04

Notes
See Appendix A for hydrology calculations

As shown above, all proposed flows will be routed directly to Huntington Beach Channel from the Project area. Flows will no longer be directed to Magnolia Street. The proposed condition flows will result in an increase over the existing conditions by approximately 43 cfs for the 100-year storm event. Under proposed conditions, the water surface elevation for the 100-year peak flow condition (2,315 cfs + 43 cfs = 2,369 cfs)[5] within the fully channelized portion of the Channel at Station 40+00.00 is 8.75 feet. This represents an increase of 0.13' (1.6 inches) of water depth over the existing conditions. See Appendix D for depth calculations. After flows discharge into the Channel, they dissipate into the 41-acre Magnolia Marsh ("Marsh"), which is hydrologically connected to the Channel adjacent to the Project site. The changes in water surface elevation in Magnolia Marsh between existing and

[5] 2,315 cfs is the design discharge for D01 of the Channel as recommended in the Fountain Valley Channel Diversion Feasibility Report – Phases I & II (June 1990). The increase of 42.7 cfs from the proposed Project is conservatively added to the design discharge of 2,315 cfs to estimate a proposed flow of 2,369 cfs within the Channel.

proposed conditions are less than 0.5 ″ (see Appendix D) which is less than significant and do not significantly alter flooding conditions within the Magnolia Marsh. Therefore, impacts associates with flooding on and off site are not anticipated. Potential impacts of the additional discharge to the channel and Magnolia Marsh as it relates to channel stability and hydromodification will be analyzed separately

In addition, the conservative analysis regarding changes in water surface depths in the channel and in Magnolia Marsh assumes the Time of Concentration (Tc) and maximum peak flows for the project site and the flood control channel occur at the same time. Based on the much longer travel time associated with the Channel, Tc's would occur much later than the Project site Tc and associated project peak flows. The peak flow from the site will discharge into the Channel well before the peak flow from the upstream tributary area arrives to the Channel adjacent to the Project site.

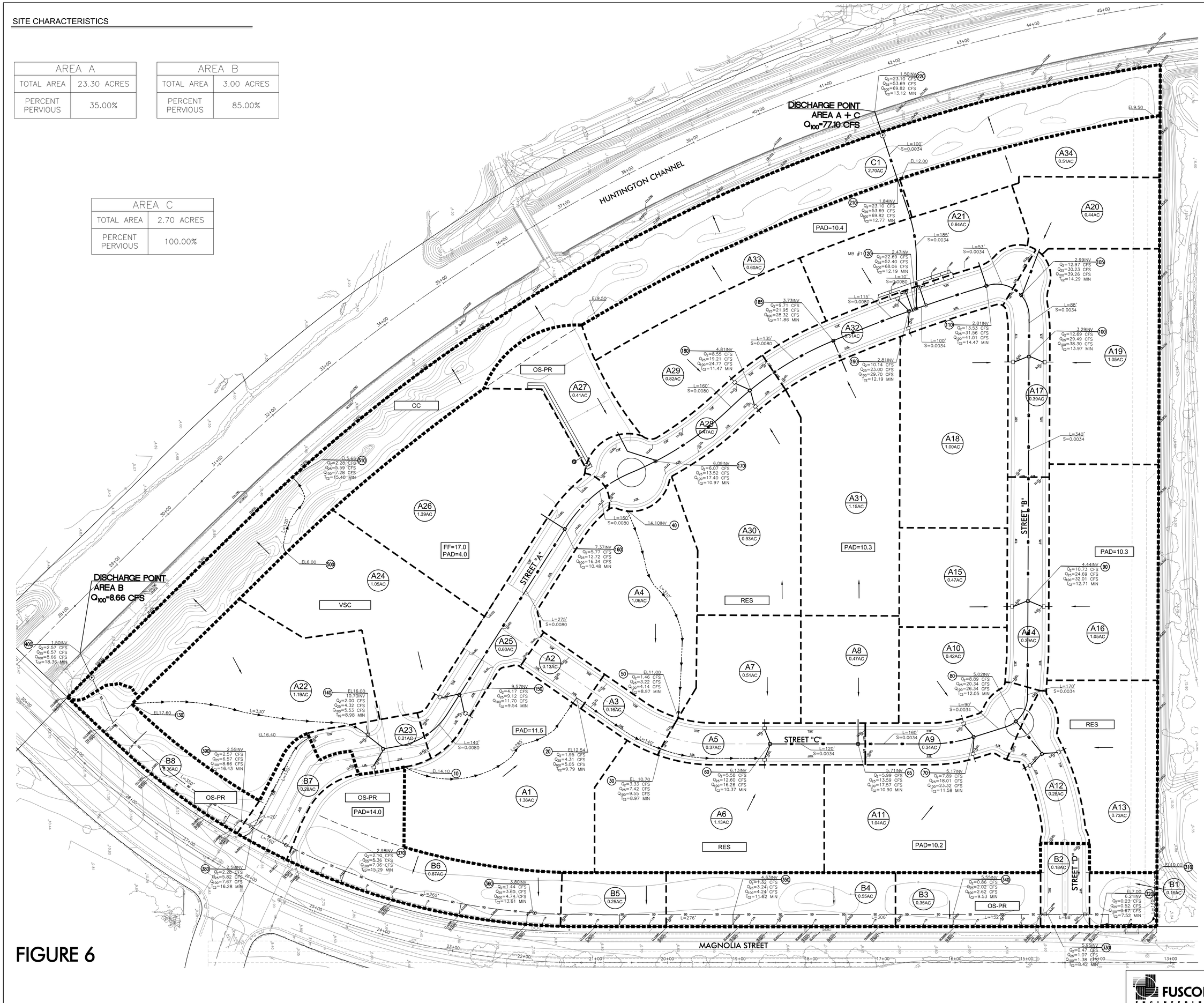
See **Figure 6** for the proposed condition hydrology exhibit.

SITE CHARACTERISTICS

AREA A	
TOTAL AREA	23.30 ACRES
PERCENT PERVIOUS	35.00%

AREA B	
TOTAL AREA	3.00 ACRES
PERCENT PERVIOUS	85.00%

AREA C	
TOTAL AREA	2.70 ACRES
PERCENT PERVIOUS	100.00%



SITE = RESIDENTIAL/HOTEL
SOIL CLASS = C

LEGEND

- MAJOR BOUNDARY
- MINOR BOUNDARY
- FLOW PATH
- LAND USE BOUNDARY
- PAD SUB-BOUNDARY
- PROPOSED STORM DRAIN
- A / 1.75AC — DRAINAGE AREA DESIGNATION / ACRES
- S — SPLITTER BOX FOR LOW FLOW
- P — PUMP

BW	BACK OF WALK	GB	GRADEBREAK
EX	EXISTING	HP	HIGHT POINT
FF	FINISHED FLOOR	LP	LOW POINT
FG	FINISHED GRADE	PROP	PROPOSED
FL	FLOWLINE	TC	TOP OF CURB
FS	FINISHED SURFACE	TW	TOP OF WALL

40' 0' 20' 40'
SCALE: 1" = 40'

FIGURE 6

FUSCOE ENGINEERING
16795 Von Karman, Suite 100, Irvine, California 92606
tel 949.474.1960 • fax 949.474.5315 • www.fuscoe.com

MAGNOLIA TANK FARM:
PROPOSED HYDROLOGY
FOR RESIDENTIAL/HOTEL
HUNTINGTON BEACH, CA

JULY 2018

4.1.2 Hydromodification Requirements and Analysis

The purpose of this section is to identify any hydrologic conditions of concern (HCOC) with respect to downstream flooding, erosion potential of natural channels downstream, impacts of increased flows on natural habitat, etc. As specified in Section 2.3.3 of the 2011 Model WQMP, projects must identify and mitigate any HCOCs. A HCOC is a combination of upland hydrologic conditions and stream biological and physical conditions that presents a condition of concern for physical and/or biological degradation of streams.

In the North Orange County permit area, HCOCs are considered to exist if any streams located downstream from the project are determined to be potentially susceptible to hydromodification impacts and either of the following conditions exists:

- Post-development runoff volume for the 2-yr, 24-hr storm exceeds the pre-development runoff volume for the 2-yr, 24-hr storm by more than 5 percent; or

- Tc of post-development runoff for the 2-yr, 24-hr storm event exceeds the time of concentration of the pre-development condition for the 2-yr, 24-hr storm event by more than 5 percent.

If these conditions do not exist or streams are not potentially susceptible to hydromodification impacts, an HCOC does not exist and hydromodification does not need to be considered further. In the North Orange County permit area, downstream channels are considered not susceptible to hydromodification, and therefore do not have the potential for a HCOC, if all downstream conveyance channels that will receive runoff from the project are engineered, hardened, and regularly maintained to ensure design flow capacity, and no sensitive habitat areas will be affected.

The Project site is in an area of the Santa Ana River watershed considered not susceptible to hydromodification impacts based on Figure XVI-3c of the 2011 TGD (December 2013 Update) and therefore, hydromodification controls are not required. The Project site discharges into Huntington Beach Channel that is identified as stable and not subject to hydromodification. See Appendix B for Figure XVI-3c for more details.

Although the project is identified in an area not susceptible to HCOC's, the map does indicate that a portion of the channel downstream of the project site is considered "unstable". The "unstable" designation and mapping linework appears to show a confined channel and does not reflect the modified levees and channel embankments removals that were part of the Huntington Beach Wetlands Restoration Project which widened and opened the channel, thereby reducing the potential for channel scour and instability. Based on the implementation of the Restoration Project and changes to the channel, it is likely the "unstable" designation no longer applies for this reach.

Regardless of prior and current HCOC mapping designations, the Project will result in increased flows into the channel which ultimately discharge into the Magnolia Marsh and the larger HB wetlands network. In order to determine potential hydromodification impacts consistent with section 5.3.1 of the TGD, the 2-year existing and proposed unit hydrographs were analyzed to determine potential changes in flow velocities and scour within the channel and the Magnolia Marsh. The City requested the 25-year unit hydrograph (existing and

proposed) also be analyzed to determine potential impacts of larger storm events so the results of the 25-year event are also included.

A separate hydromodification assessment was performed by Everest International Consultants, Inc to determine velocities and scour potential based on the changes in flow. A 2-dimensional model was constructed (HEC-RAS 2d) to analyze complicated flow patterns within the Magnolia Marsh portion of the HB Wetlands since the changes in flow will impact the marsh the most. For the 2-year storm (existing and proposed), the maximum velocities observed ranged from 3.5 feet per second under the Magnolia Street Bridge to 1.5 feet per second near the northern boundary of the site which are considered to be non-erosive flows. In addition, the maximum water velocity within the narrow, shallow tidal channels within the marsh ranged from 0.8 feet per second to 1.6 feet per second, indicating low potential for scour and erosion. Lastly, there was no observable increase in maximum flow velocity between the existing and proposed condition indicating the maximum water velocities are driven by tidal velocities with little influence from storm discharges resulting from the local runoff being discharged into the HB Channel. The 25-year storm (existing versus proposed) revealed similar results with no observable increase in maximum flow velocities between existing and proposed; similar maximum flow velocities (3.5 fps to 1.5 fps for channel) and similar flow velocities for the shall tidal channels within the wetlands (0.8 fps to 1.6 fps). Therefore, the County's conclusion within the 2013 Technical Guidance Document (TGD) that the project area is not susceptible to hydromodification is valid and hydromodification controls are not required.

4.1.3 OCFCD Huntington Beach Channel Design Capacity Assessment

To determine impacts of project flows discharging into the HBC Flood Control Channel and potential on-site detention requirements, the design capacity of the channel must be evaluated. A detailed analysis of the Fountain Valley Channel Diversion Feasibility Report – Phases 1 & II (June 1990) which included the design capacity for the 100-year channel improvements for the HBC assumed the Project's land use was "Industrial Energy Production". Industrial Energy Production land use areas were assigned "commercial" runoff coefficients for the 100-year hydrologic analysis and design capacity for the HBC channel. As part of the Project's hydrology analysis, the site was analyzed as a commercial site consistent with the design assumptions for the channel. The commercial site hydrology evaluation was then compared with the proposed project's hydrology peak flows previously reported in Section 4.1.1. For conservative purposes, the OCFCD Channel Design commercial site hydrology condition assumed the same setbacks and park conditions as the proposed project although it's likely the original County's design hydrology assumed the entire 29 acres as a commercial development.

Table 3: OCFCD Channel Design Vs Proposed Conditions

OCFCD Channel Design Hydrology Conditions – "Commercial"					
Drainage Area	Discharge Point	Drainage Area Acreage	Existing 2-year (cfs)	Existing 25-year (cfs)	Existing 100-year (cfs)
A	Huntington Beach Channel	23.3	24.52	56.46	73.21
B	Huntington Beach Channel	3.0	2.57	6.57	8.66
C	Huntington Beach Channel	2.7	2.28	5.59	7.28
	Totals	29.0	29.37	68.62	89.15
Proposed Hydrology Conditions – Residential/Hotel					
Drainage Area	Discharge Point	Drainage Area Acreage	Proposed 2-year (cfs)	Proposed 25-year (cfs)	Proposed 100-year (cfs)
A	Huntington Beach Channel	23.3	23.10	53.69	69.82
B	Huntington Beach Channel	3.0	2.57	6.57	8.66
C	Huntington Beach Channel	2.7	2.28	5.59	7.28
	Totals	29.0	27.95	65.85	85.76
		Net Decrease	1.42	2.77	3.39
Notes See Appendix A for hydrology calculations					

The peak flows discharging from the site based on the commercial land use assumed in the channel design results in slightly higher peak flow rates than the proposed project peak flow rates. Orange County Public Works (OCPW) has noted that due to channel design capacity and no significant hydraulic impacts posed to the channel, they do not object to the modeled 100-year peak flows exiting the site under proposed buildout conditions. Therefore, no on-site detention is required.

4.1.4 Hydrology Impacts

The following impact assessments are based on the significance criteria established in Section 3 for hydrology.

Impact A: *Would the Project substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g. the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?*

Impact Analysis: In the existing condition, the Project site is currently not used as a groundwater recharge facility. In the proposed condition, infiltration will also be minimized due to the close proximity of sea water impacts to groundwater levels below the Project site.

The Project site is within the Orange County Water District (OCWD) service boundary. OCWD has been managing groundwater supplies within northern Orange County since 1933. The primary recharge facilities and groundwater production wells are several miles from the proposed Project location and would not be impacted by the proposed Project. Therefore, any impacts to groundwater supplies or groundwater recharge are not anticipated to be significant.

Impact B: *Would the Project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or in a manner which would result in a substantial erosion or siltation on- or off-site?*

Impact Analysis: Under the proposed conditions, all flows will ultimately discharge directly to Huntington Beach Channel. Stormwater flows that were directed towards Magnolia Street in the existing condition which ultimately discharged into Huntington Beach Channel at Hamilton Avenue will now tie directly into the Huntington Beach Channel in the proposed condition. Flows will not cause erosion or siltation on or off the Project site as the Huntington Beach Channel is considered stabilized and is tidally influenced, thereby providing controls on velocities and scour potential within the Channel. Such water bodies are not subject to substantial erosion or siltation based on their ability to receive large influxes of water while maintaining their channel stability. Based on the independent hydromodification analysis, flow velocities for both existing and proposed conditions are well below thresholds of concern and the analysis determined there are no noticeable differences in flow velocities between existing and proposed flows for both the 2-year and 25-year events. Therefore, implementation of the project will not increase erosion within the wetland marsh areas or the channel.

Impact C: *Would the Project substantially alter the existing drainage pattern of the site, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site?*

Impact Analysis: The proposed Project will result in an increase of peak flow runoff that will be routed to the Huntington Beach Channel. All on-site storm drain facilities will be designed to accommodate and convey the 100-year peak flows without flooding of the proposed

buildings. The estimated conservative increase in runoff between existing and proposed will result in an increase in water surface elevation in the channel of 0.13′ (1.6″) which is less than significant. OCPW has confirmed that they do not object to the proposed 100-year peak flow discharge into the channel and that it will have no significant hydraulic impact on the channel's capacity. Due to the minimal changes in water surface elevations within Huntington Beach Channel, flooding on or off site is not anticipated.

In addition, the Project site is located at the end of the Huntington Beach Channel that is hydrologically connected to the 41-acre Magnolia Marsh ("Marsh") that provides natural storage capacity for stormwater. The changes in water surface elevation in Magnolia Marsh between existing and proposed conditions are less than 0.5″ (see Appendix D) which is less than significant and do not significantly alter flooding conditions within the Magnolia Marsh.

Lastly, the proposed project peak flow rates are less than the assumed channel design flow rates associated with the HBC channel. For these reasons, impacts related to on-site or off-site flooding are less than significant.

Impact D: Would the Project create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff?

Impact Analysis: See Impact Analysis C. No significant impacts related to drainage systems are anticipated due to the 100-year conveyance capacity of the Huntington Beach Channel as confirmed through the design channel evaluation. All on-site storm drain facilities and site grading will be designed to accommodate 100-year flood flows thereby eliminating any on-site flooding conditions. Discussion regarding additional sources of pollutant runoff are discussed in the Water Quality Management Plan appendices for the proposed Project.

Impact E: Would the Project place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?

Impact Analysis: As mentioned above, the Specific Plan area is not located within the 100-year floodplain. During the 100-year flood, the water elevation in the flood control channel is estimated to reach +9.0 feet (NAVD88). Since the crest elevation of the channel wall is +13 feet (NAVD88), the flood waters would not overtop the channel wall causing flooding of the low-lying areas of the Specific Plan area. In addition, all pad elevations will be set at least one foot above the 100-year floodplain.

Impact F: Would the Project place within a 100-year flood hazard area structures which would impede or redirect flood flows?

Impact Analysis: See Impact Analysis E above. The Project is not within a 100-year flood hazard area and does not include structures that would impede or redirect flood flows.

Impact G: Would the Project expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?

Impact Analysis: As mentioned above in Impact Analyses E and F, the proposed Project will be located outside of the 100-year flood plain under the proposed conditions. The Project is also not located downstream of a dam or levee; therefore, any impacts related to flooding as a result of the failure of a levee or dam are not significant.

Impact H: Would the Project be subject to inundation by seiche, tsunami, or mudflow?

Impact Analysis: In 2009, the California Emergency Management Agency (CalEMA) prepared tsunami inundation (flooding) maps throughout the state of California. The maps show that the Specific Plan area is currently located in an tsunami inundation area. The extent and degree of tsunami flooding would decrease with the implementation of the Project. This decrease is due to the increase in elevation of the proposed Project site that would reduce tsunami impacts as compared to existing conditions. The City has resources in place to provide residents and businesses with response plans in the event of a tsunami. These resources are provided on the City's website[1]. In addition, all future residents/tenants will be informed of the tsunami inundation maps through the disclosure process including emergency evacuation plans. Impacts related to inundation by tsunami are considered less than significant.

Impact I: Would the Project create or contribute significant increase in the flow velocity or volume or stormwater runoff to cause environmental harm?

Impact Analysis: As described above in Impact Analysis C, the proposed Project will result in an increase of peak flow runoff. The increase in runoff to the Magnolia Marsh will result in water surface changes of less than ½" which is less than significant (see Appendix D). In addition, based on the grading and geometry of the Magnolia Marsh, increases in flow to the Marsh will not result in significant changes in flow velocity or erosion within the Marsh. This was verified by the hydromodification assessment by Everest International which concluded there are no significant changes in flow velocities or scour potential between existing and proposed conditions and velocities are largely controlled by existing tidal influences. Therefore, impacts related to the increase in stormwater runoff to the marsh are considered less than significant.

Impact J: Would the Project create or contribute significant increases in erosion of the project site or surrounding areas?

Impact Analysis: As described above in Impact Analysis B, flows from the Project site will not contribute to significant increases in erosion of the surrounding areas as Huntington Beach Channel is considered stabilized. In addition, the Huntington Beach Channel has tidal influences and is not subject to substantial erosion or siltation based on the channel's ability to

[1] City of Huntington Beach – Tsunami Preparedness Webpage. Found here: https://www.huntingtonbeachca.gov/government/departments/fire/safety_tips/TsunamiPreparedness.cfm

receive large influxes of water while maintaining channel stability. See additional details on hydromodification impacts within Impact B and Impact I.

5 CONCLUSION

Based on the analysis of the proposed Project in this technical study, no significant impacts regarding hydrology or drainage are anticipated. No mitigation measures are required.

6 TECHNICAL APPENDICES

LIST OF APPENDICES

Appendix A Hydrology Calculations
Appendix B Hydromodification Exhibit
Appendix C Project Land Use for Huntington Beach Channel Improvements
Appendix D Channel Hydraulics
Appendix E Everest International Consultants Hydromodification Assessment

APPENDIX A

HYDROLOGY CALCULATIONS

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
          (c) Copyright 1983-2016 Advanced Engineering Software (aes)
             Ver. 23.0  Release Date: 07/01/2016  License ID 1355

                           Analysis prepared by:

                              Fuscoe Engineering
                         16795 Von Karman, Suite 100
                                  Irvine
                                 CA 92606

 ************************** DESCRIPTION OF STUDY **************************
* Magnolia Tank Farms                                                      *
* Existing 2-year Hydrology                                                *
* Output:1293exot.002 Input:1293exin.002                                   *
 ***************************************************************************

  FILE NAME: 1293EXIN.002
  TIME/DATE OF STUDY: 16:53 09/20/2017
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *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   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  1.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  0.3 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =     11.20  DOWNSTREAM(FEET) =      5.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.437
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.572
```

```
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       C        0.36      0.25     0.600    50    9.44
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      0.46
  TOTAL AREA(ACRES) =      0.36   PEAK FLOW RATE(CFS) =      0.46

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =      5.50
  DOWNSTREAM NODE ELEVATION(FEET) =      4.82
  CHANNEL LENGTH THRU SUBAREA(FEET) =   850.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0350
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   1.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  0.521
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       C        1.73      0.25     0.600    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      0.75
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.26
  AVERAGE FLOW DEPTH(FEET) =   0.20   FLOOD WIDTH(FEET) =   33.46
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =  55.21   Tc(MIN.) =   64.65
  SUBAREA AREA(ACRES) =    1.73       SUBAREA RUNOFF(CFS) =    0.58
  EFFECTIVE AREA(ACRES) =    2.09     AREA-AVERAGED Fm(INCH/HR) =   0.15
  AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   0.60
  TOTAL AREA(ACRES) =        2.1         PEAK FLOW RATE(CFS) =       0.70

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.20   FLOOD WIDTH(FEET) =   32.36
  FLOW VELOCITY(FEET/SEC.) =   0.26   DEPTH*VELOCITY(FT*FT/SEC) =   0.05
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     30.00 =    1180.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     40.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =      4.82
  DOWNSTREAM NODE ELEVATION(FEET) =      4.60
  CHANNEL LENGTH THRU SUBAREA(FEET) =   790.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0350
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   1.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  0.334
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
```

```
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       C        1.70      0.25     0.600    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      0.84
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.17
  AVERAGE FLOW DEPTH(FEET) =   0.25   FLOOD WIDTH(FEET) =   43.37
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =  75.38   Tc(MIN.) =  140.03
  SUBAREA AREA(ACRES) =    1.70       SUBAREA RUNOFF(CFS) =    0.28
  EFFECTIVE AREA(ACRES) =    3.79     AREA-AVERAGED Fm(INCH/HR) =   0.15
  AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   0.60
  TOTAL AREA(ACRES) =        3.8         PEAK FLOW RATE(CFS) =       0.70
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.24   FLOOD WIDTH(FEET) =   40.07
  FLOW VELOCITY(FEET/SEC.) =   0.17   DEPTH*VELOCITY(FT*FT/SEC) =   0.04
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     40.00 =    1970.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     60.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =     11.24  DOWNSTREAM(FEET) =      4.64

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.655
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.652
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       C        2.58      0.25     0.600    50    8.65
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      3.49
  TOTAL AREA(ACRES) =      2.58   PEAK FLOW RATE(CFS) =      3.49

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     70.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =      4.64
  DOWNSTREAM NODE ELEVATION(FEET) =      4.34
  CHANNEL LENGTH THRU SUBAREA(FEET) =   503.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0350
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   1.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  0.769
```

```
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       C        3.70      0.25     0.600    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      4.54
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.35
  AVERAGE FLOW DEPTH(FEET) =   0.40   FLOOD WIDTH(FEET) =   72.01
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =  24.16   Tc(MIN.) =   32.82
  SUBAREA AREA(ACRES) =    3.70       SUBAREA RUNOFF(CFS) =    2.06
  EFFECTIVE AREA(ACRES) =    6.28     AREA-AVERAGED Fm(INCH/HR) =   0.15
  AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   0.60
  TOTAL AREA(ACRES) =        6.3         PEAK FLOW RATE(CFS) =       3.50

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.36   FLOOD WIDTH(FEET) =   65.04
  FLOW VELOCITY(FEET/SEC.) =   0.33   DEPTH*VELOCITY(FT*FT/SEC) =   0.12
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     70.00 =     803.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     80.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.56  DOWNSTREAM(FEET) =     2.28
  FLOW LENGTH(FEET) =   142.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.45
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.50
  PIPE TRAVEL TIME(MIN.) =   0.53    Tc(MIN.) =   33.35
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     80.00 =     945.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     80.00 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.) =   33.35
  RAINFALL INTENSITY(INCH/HR) =   0.76
  AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       6.28
  TOTAL STREAM AREA(ACRES) =       6.28
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.50

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE    100.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   322.00
```

```
  ELEVATION DATA: UPSTREAM(FEET) =     10.90  DOWNSTREAM(FEET) =      4.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.174
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.598
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       C        1.50      0.25     0.600    50    9.17
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      1.95
  TOTAL AREA(ACRES) =      1.50   PEAK FLOW RATE(CFS) =      1.95

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    110.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =      4.80
  DOWNSTREAM NODE ELEVATION(FEET) =      4.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   839.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0350
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   1.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  0.578
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       C        4.96      0.25     0.600    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      2.91
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.31
  AVERAGE FLOW DEPTH(FEET) =   0.34   FLOOD WIDTH(FEET) =   60.63
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =  44.73   Tc(MIN.) =   53.90
  SUBAREA AREA(ACRES) =    4.96       SUBAREA RUNOFF(CFS) =    1.91
  EFFECTIVE AREA(ACRES) =    6.46     AREA-AVERAGED Fm(INCH/HR) =   0.15
  AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   0.60
  TOTAL AREA(ACRES) =        6.5         PEAK FLOW RATE(CFS) =       2.49

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.32   FLOOD WIDTH(FEET) =   57.32
  FLOW VELOCITY(FEET/SEC.) =   0.30   DEPTH*VELOCITY(FT*FT/SEC) =   0.10
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE    110.00 =    1161.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE     80.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.65  DOWNSTREAM(FEET) =     2.28
  FLOW LENGTH(FEET) =   183.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.17
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
```

```
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.49
  PIPE TRAVEL TIME(MIN.) =   0.96    Tc(MIN.) =   54.87
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE     80.00 =    1344.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     80.00 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.) =   54.87
  RAINFALL INTENSITY(INCH/HR) =   0.57
  AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       6.46
  TOTAL STREAM AREA(ACRES) =       6.46
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.49

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        3.50   33.35    0.762  0.25( 0.15) 0.60       6.3      50.00
      2        2.49   54.87    0.572  0.25( 0.15) 0.60       6.5      90.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        5.69   33.35    0.762  0.25( 0.15) 0.60      10.2      50.00
      2        4.90   54.87    0.572  0.25( 0.15) 0.60      12.7      90.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       5.69    Tc(MIN.) =    33.35
  EFFECTIVE AREA(ACRES) =      10.21   AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.60
  TOTAL AREA(ACRES) =       12.7
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE     80.00 =    1344.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE    120.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.28  DOWNSTREAM(FEET) =     2.09
  FLOW LENGTH(FEET) =    95.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.24
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.69
  PIPE TRAVEL TIME(MIN.) =   0.22    Tc(MIN.) =   33.57
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE    120.00 =    1439.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    120.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    140.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   293.00
  ELEVATION DATA: UPSTREAM(FEET) =      6.90  DOWNSTREAM(FEET) =      4.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.627
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.468
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       C        1.28      0.25     0.600    50   10.63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      1.52
  TOTAL AREA(ACRES) =      1.28   PEAK FLOW RATE(CFS) =      1.52

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    120.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =      4.70
  DOWNSTREAM NODE ELEVATION(FEET) =      4.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   749.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0350
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   1.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  0.504
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       C        4.49      0.25     0.600    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      2.23
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.22
  AVERAGE FLOW DEPTH(FEET) =   0.35   FLOOD WIDTH(FEET) =   63.93
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =  57.74   Tc(MIN.) =   68.37
  SUBAREA AREA(ACRES) =    4.49       SUBAREA RUNOFF(CFS) =    1.43
  EFFECTIVE AREA(ACRES) =    5.77     AREA-AVERAGED Fm(INCH/HR) =   0.15
  AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   0.60
  TOTAL AREA(ACRES) =        5.8         PEAK FLOW RATE(CFS) =       1.84

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.33   FLOOD WIDTH(FEET) =   59.53
  FLOW VELOCITY(FEET/SEC.) =   0.21   DEPTH*VELOCITY(FT*FT/SEC) =   0.07
```

```
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    120.00 =    1042.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    120.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        1.84   68.37    0.504  0.25( 0.15) 0.60       5.8     130.00
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    120.00 =    1042.00 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        5.69   33.57    0.759  0.25( 0.15) 0.60      10.2      50.00
      2        4.90   55.12    0.571  0.25( 0.15) 0.60      12.7      90.00
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE    120.00 =    1439.00 FEET.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        7.24   33.57    0.759  0.25( 0.15) 0.60      13.0      50.00
      2        6.67   55.12    0.571  0.25( 0.15) 0.60      17.4      90.00
      3        5.97   68.37    0.504  0.25( 0.15) 0.60      18.5     130.00
    TOTAL AREA(ACRES) =        18.5

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =        7.24  Tc(MIN.) =   33.569
  EFFECTIVE AREA(ACRES) =     13.04  AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.60
  TOTAL AREA(ACRES) =       18.5
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE    120.00 =    1439.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE     40.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.09  DOWNSTREAM(FEET) =     1.84
  FLOW LENGTH(FEET) =   126.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.22
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.24
  PIPE TRAVEL TIME(MIN.) =   0.23    Tc(MIN.) =   33.80
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE     40.00 =    1565.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
```

```
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
    1        7.24   33.80    0.756  0.25( 0.15) 0.60      13.0      50.00
    2        6.67   55.37    0.569  0.25( 0.15) 0.60      17.4      90.00
    3        5.97   68.64    0.503  0.25( 0.15) 0.60      18.5     130.00
 LONGEST FLOWPATH FROM NODE     90.00 TO NODE     40.00 =    1565.00 FEET.

 ** MEMORY BANK #  1 CONFLUENCE DATA **
 STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
    1        0.70  140.03    0.334  0.25( 0.15) 0.60       3.8      10.00
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     40.00 =    1970.00 FEET.

 ** PEAK FLOW RATE TABLE **
 STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
    1        7.79   33.80    0.756  0.25( 0.15) 0.60      14.0      50.00
    2        7.29   55.37    0.569  0.25( 0.15) 0.60      18.9      90.00
    3        6.63   68.64    0.503  0.25( 0.15) 0.60      20.4     130.00
    4        3.81  140.03    0.334  0.25( 0.15) 0.60      22.3      10.00
  TOTAL AREA(ACRES) =        22.3

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =        7.79  Tc(MIN.) =   33.797
 EFFECTIVE AREA(ACRES) =     13.95  AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.60
 TOTAL AREA(ACRES) =       22.3
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     40.00 =    1970.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =  82
----------------------------------------------------------------------------
 >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
 >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   654.00
 ELEVATION DATA: UPSTREAM(FEET) =     11.30  DOWNSTREAM(FEET) =      4.90

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   13.900
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.259
 SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       C        1.78      0.25     0.600    50   13.90
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA AREA(ACRES) =    1.78   INITIAL SUBAREA RUNOFF(CFS) =    1.78

 ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
 MAINLINE Tc(MIN.) =   33.80
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  0.756
 SUBAREA AREA(ACRES) =    1.78      SUBAREA RUNOFF(CFS) =    0.97
 EFFECTIVE AREA(ACRES) =     15.73   AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.60
 TOTAL AREA(ACRES) =       24.1       PEAK FLOW RATE(CFS) =       8.58

****************************************************************************
 FLOW PROCESS FROM NODE    200.00 TO NODE    210.00 IS CODE =  21
----------------------------------------------------------------------------
```

```
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   261.00
  ELEVATION DATA: UPSTREAM(FEET) =     11.30  DOWNSTREAM(FEET) =      7.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   19.872
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.025
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL GOOD COVER
  "GRASS"                    C        4.91      0.25     1.000    56   19.87
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      3.43
  TOTAL AREA(ACRES) =      4.91   PEAK FLOW RATE(CFS) =      3.43
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        4.9  TC(MIN.) =     19.87
  EFFECTIVE AREA(ACRES) =      4.91  AREA-AVERAGED Fm(INCH/HR)=  0.25
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =       3.43
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
____________________________________________________________________________
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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                           Analysis prepared by:

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                         16795 Von Karman, Suite 100
                                  Irvine
                                 CA 92606

 ************************** DESCRIPTION OF STUDY **************************
* Magnolia Tank Farms                                                      *
* Existing 25-year Hydrology                                               *
* Output:1293exot.025 Input:1293exin.025                                   *
 ***************************************************************************

  FILE NAME: 1293EXIN.025
  TIME/DATE OF STUDY: 18:10 09/20/2017
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *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   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  1.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  0.3 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =     11.20  DOWNSTREAM(FEET) =      5.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.437
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.367
```

```
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       C        0.36      0.25     0.600    69    9.44
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      1.04
  TOTAL AREA(ACRES) =      0.36   PEAK FLOW RATE(CFS) =      1.04

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =      5.50
  DOWNSTREAM NODE ELEVATION(FEET) =      4.82
  CHANNEL LENGTH THRU SUBAREA(FEET) =   850.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0350
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   1.00
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  1.247
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       C        1.73      0.25     0.600    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      1.88
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.31
  AVERAGE FLOW DEPTH(FEET) =   0.28   FLOOD WIDTH(FEET) =   48.51
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =  45.13   Tc(MIN.) =   54.57
  SUBAREA AREA(ACRES) =    1.73       SUBAREA RUNOFF(CFS) =    1.71
  EFFECTIVE AREA(ACRES) =    2.09     AREA-AVERAGED Fm(INCH/HR) =   0.15
  AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   0.60
  TOTAL AREA(ACRES) =        2.1         PEAK FLOW RATE(CFS) =       2.06

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.28   FLOOD WIDTH(FEET) =   49.98
  FLOW VELOCITY(FEET/SEC.) =   0.32   DEPTH*VELOCITY(FT*FT/SEC) =   0.09
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     30.00 =    1180.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     40.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =      4.82
  DOWNSTREAM NODE ELEVATION(FEET) =      4.60
  CHANNEL LENGTH THRU SUBAREA(FEET) =   790.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0350
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   1.00
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  0.827
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
```

```
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       C        1.70      0.25     0.600    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      2.59
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.23
  AVERAGE FLOW DEPTH(FEET) =   0.37   FLOOD WIDTH(FEET) =   67.24
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =  58.11   Tc(MIN.) =  112.67
  SUBAREA AREA(ACRES) =    1.70       SUBAREA RUNOFF(CFS) =    1.04
  EFFECTIVE AREA(ACRES) =    3.79     AREA-AVERAGED Fm(INCH/HR) =   0.15
  AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   0.60
  TOTAL AREA(ACRES) =        3.8         PEAK FLOW RATE(CFS) =       2.31

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.36   FLOOD WIDTH(FEET) =   64.30
  FLOW VELOCITY(FEET/SEC.) =   0.22   DEPTH*VELOCITY(FT*FT/SEC) =   0.08
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     40.00 =    1970.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     60.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =     11.24  DOWNSTREAM(FEET) =      4.64

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.655
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.536
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       C        2.58      0.25     0.600    69    8.65
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      7.86
  TOTAL AREA(ACRES) =      2.58   PEAK FLOW RATE(CFS) =      7.86

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     70.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =      4.64
  DOWNSTREAM NODE ELEVATION(FEET) =      4.34
  CHANNEL LENGTH THRU SUBAREA(FEET) =   503.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0350
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   1.00
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  1.805
  SUBAREA LOSS RATE DATA(AMC  II):
```

```
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       C        3.70      0.25     0.600    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     10.65
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.42
  AVERAGE FLOW DEPTH(FEET) =   0.53   FLOOD WIDTH(FEET) =   99.92
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =  19.74   Tc(MIN.) =   28.40
  SUBAREA AREA(ACRES) =    3.70       SUBAREA RUNOFF(CFS) =    5.51
  EFFECTIVE AREA(ACRES) =    6.28     AREA-AVERAGED Fm(INCH/HR) =   0.15
  AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   0.60
  TOTAL AREA(ACRES) =        6.3         PEAK FLOW RATE(CFS) =       9.35

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.51   FLOOD WIDTH(FEET) =   95.14
  FLOW VELOCITY(FEET/SEC.) =   0.41   DEPTH*VELOCITY(FT*FT/SEC) =   0.21
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     70.00 =     803.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     80.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.56  DOWNSTREAM(FEET) =     2.28
  FLOW LENGTH(FEET) =   142.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.91
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.35
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =   28.60
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     80.00 =     945.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     80.00 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.) =   28.60
  RAINFALL INTENSITY(INCH/HR) =   1.80
  AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       6.28
  TOTAL STREAM AREA(ACRES) =       6.28
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       9.35

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE    100.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   322.00
  ELEVATION DATA: UPSTREAM(FEET) =     10.90  DOWNSTREAM(FEET) =      4.80
```

```
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.174
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.421
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       C        1.50      0.25     0.600    69    9.17
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      4.42
  TOTAL AREA(ACRES) =      1.50   PEAK FLOW RATE(CFS) =      4.42

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    110.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =      4.80
  DOWNSTREAM NODE ELEVATION(FEET) =      4.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   839.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0350
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   1.00
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  1.381
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       C        4.96      0.25     0.600    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      7.14
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.38
  AVERAGE FLOW DEPTH(FEET) =   0.46   FLOOD WIDTH(FEET) =   85.96
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =  36.39   Tc(MIN.) =   45.56
  SUBAREA AREA(ACRES) =    4.96       SUBAREA RUNOFF(CFS) =    5.50
  EFFECTIVE AREA(ACRES) =    6.46     AREA-AVERAGED Fm(INCH/HR) =   0.15
  AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   0.60
  TOTAL AREA(ACRES) =        6.5         PEAK FLOW RATE(CFS) =       7.16

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.46   FLOOD WIDTH(FEET) =   85.96
  FLOW VELOCITY(FEET/SEC.) =   0.39   DEPTH*VELOCITY(FT*FT/SEC) =   0.18
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE    110.00 =    1161.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE     80.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.65  DOWNSTREAM(FEET) =     2.28
  FLOW LENGTH(FEET) =   183.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.11
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
```

```
  PIPE-FLOW(CFS) =       7.16
  PIPE TRAVEL TIME(MIN.) =   0.33    Tc(MIN.) =   45.89
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE     80.00 =    1344.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     80.00 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.) =   45.89
  RAINFALL INTENSITY(INCH/HR) =   1.38
  AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       6.46
  TOTAL STREAM AREA(ACRES) =       6.46
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       7.16

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        9.35   28.60    1.798  0.25( 0.15) 0.60       6.3      50.00
      2        7.16   45.89    1.375  0.25( 0.15) 0.60       6.5      90.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       15.35   28.60    1.798  0.25( 0.15) 0.60      10.3      50.00
      2       14.11   45.89    1.375  0.25( 0.15) 0.60      12.7      90.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      15.35    Tc(MIN.) =    28.60
  EFFECTIVE AREA(ACRES) =      10.31   AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.60
  TOTAL AREA(ACRES) =       12.7
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE     80.00 =    1344.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE    120.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.28  DOWNSTREAM(FEET) =     2.09
  FLOW LENGTH(FEET) =    95.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =  19.54
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      15.35
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =   28.68
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE    120.00 =    1439.00 FEET.

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

```
  FLOW PROCESS FROM NODE    120.00 TO NODE    120.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    140.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   293.00
  ELEVATION DATA: UPSTREAM(FEET) =      6.90  DOWNSTREAM(FEET) =      4.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.627
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.148
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       C        1.28      0.25     0.600    69   10.63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      3.45
  TOTAL AREA(ACRES) =      1.28   PEAK FLOW RATE(CFS) =      3.45

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    120.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =      4.70
  DOWNSTREAM NODE ELEVATION(FEET) =      4.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   749.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0350
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   1.00
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  1.213
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       C        4.49      0.25     0.600    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      5.58
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.27
  AVERAGE FLOW DEPTH(FEET) =   0.49   FLOOD WIDTH(FEET) =   91.11
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =  46.66   Tc(MIN.) =   57.28
  SUBAREA AREA(ACRES) =    4.49       SUBAREA RUNOFF(CFS) =    4.30
  EFFECTIVE AREA(ACRES) =    5.77     AREA-AVERAGED Fm(INCH/HR) =   0.15
  AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   0.60
  TOTAL AREA(ACRES) =        5.8         PEAK FLOW RATE(CFS) =       5.52

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.49   FLOOD WIDTH(FEET) =   90.74
  FLOW VELOCITY(FEET/SEC.) =   0.27   DEPTH*VELOCITY(FT*FT/SEC) =   0.13
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    120.00 =    1042.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    120.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        5.52   57.28    1.213  0.25( 0.15) 0.60       5.8     130.00
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    120.00 =    1042.00 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       15.35   28.68    1.795  0.25( 0.15) 0.60      10.3      50.00
      2       14.11   45.98    1.374  0.25( 0.15) 0.60      12.7      90.00
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE    120.00 =    1439.00 FEET.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       19.63   28.68    1.795  0.25( 0.15) 0.60      13.2      50.00
      2       19.22   45.98    1.374  0.25( 0.15) 0.60      17.4      90.00
      3       17.78   57.28    1.213  0.25( 0.15) 0.60      18.5     130.00
    TOTAL AREA(ACRES) =        18.5

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       19.63  Tc(MIN.) =   28.679
  EFFECTIVE AREA(ACRES) =     13.19  AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.60
  TOTAL AREA(ACRES) =       18.5
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE    120.00 =    1439.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE     40.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.09  DOWNSTREAM(FEET) =     1.84
  FLOW LENGTH(FEET) =   126.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =  24.99
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      19.63
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =   28.76
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE     40.00 =    1565.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
```

```
     1       19.63   28.76    1.792  0.25( 0.15) 0.60      13.2      50.00
     2       19.22   46.07    1.373  0.25( 0.15) 0.60      17.4      90.00
     3       17.78   57.38    1.212  0.25( 0.15) 0.60      18.5     130.00
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE     40.00 =    1565.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1         2.31  112.67    0.827  0.25( 0.15) 0.60       3.8      10.00
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     40.00 =    1970.00 FEET.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1       21.06   28.76    1.792  0.25( 0.15) 0.60      14.2      50.00
     2       20.92   46.07    1.373  0.25( 0.15) 0.60      18.9      90.00
     3       19.63   57.38    1.212  0.25( 0.15) 0.60      20.4     130.00
     4       13.65  112.67    0.827  0.25( 0.15) 0.60      22.3      10.00
    TOTAL AREA(ACRES) =        22.3

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       21.06  Tc(MIN.) =   28.763
  EFFECTIVE AREA(ACRES) =     14.16  AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.60
  TOTAL AREA(ACRES) =       22.3
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     40.00 =    1970.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =  82
----------------------------------------------------------------------------
  >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
  >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   654.00
  ELEVATION DATA: UPSTREAM(FEET) =     11.30  DOWNSTREAM(FEET) =      4.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   13.900
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.704
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       C        1.78      0.25     0.600    69   13.90
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA AREA(ACRES) =    1.78   INITIAL SUBAREA RUNOFF(CFS) =    4.09

  ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
  MAINLINE Tc(MIN.) =   28.76
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  1.792
  SUBAREA AREA(ACRES) =    1.78      SUBAREA RUNOFF(CFS) =    2.63
  EFFECTIVE AREA(ACRES) =     15.94   AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.60
  TOTAL AREA(ACRES) =       24.1       PEAK FLOW RATE(CFS) =      23.56

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    210.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   261.00
  ELEVATION DATA: UPSTREAM(FEET) =     11.30  DOWNSTREAM(FEET) =      7.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   19.872
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.209
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL GOOD COVER
  "GRASS"                    C        4.91      0.25     1.000    74   19.87
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      8.66
  TOTAL AREA(ACRES) =      4.91   PEAK FLOW RATE(CFS) =      8.66
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        4.9  TC(MIN.) =     19.87
  EFFECTIVE AREA(ACRES) =      4.91  AREA-AVERAGED Fm(INCH/HR)=  0.25
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =       8.66
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
____________________________________________________________________________
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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                           Analysis prepared by:

                              Fuscoe Engineering
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                                  Irvine
                                 CA 92606

 ************************** DESCRIPTION OF STUDY **************************
* Magnolia Tank Farms                                                      *
* Existing 100-year Hydrology                                              *
* Output:1293exot.100 Input:1293exin.100                                   *
 ***************************************************************************

  FILE NAME: 1293EXIN.100
  TIME/DATE OF STUDY: 18:13 09/20/2017
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *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   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  1.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  0.3 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =     11.20  DOWNSTREAM(FEET) =      5.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.437
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.300
```

```
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       C        0.36      0.25     0.600    86    9.44
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      1.34
  TOTAL AREA(ACRES) =      0.36   PEAK FLOW RATE(CFS) =      1.34

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =      5.50
  DOWNSTREAM NODE ELEVATION(FEET) =      4.82
  CHANNEL LENGTH THRU SUBAREA(FEET) =   850.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0350
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   1.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.628
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       C        1.73      0.25     0.600    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      2.47
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.34
  AVERAGE FLOW DEPTH(FEET) =   0.30   FLOOD WIDTH(FEET) =   53.65
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =  41.97   Tc(MIN.) =   51.41
  SUBAREA AREA(ACRES) =    1.73       SUBAREA RUNOFF(CFS) =    2.30
  EFFECTIVE AREA(ACRES) =    2.09     AREA-AVERAGED Fm(INCH/HR) =   0.15
  AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   0.60
  TOTAL AREA(ACRES) =        2.1         PEAK FLOW RATE(CFS) =       2.78

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.32   FLOOD WIDTH(FEET) =   56.22
  FLOW VELOCITY(FEET/SEC.) =   0.35   DEPTH*VELOCITY(FT*FT/SEC) =   0.11
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     30.00 =    1180.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     40.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =      4.82
  DOWNSTREAM NODE ELEVATION(FEET) =      4.60
  CHANNEL LENGTH THRU SUBAREA(FEET) =   790.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0350
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   1.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.077
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
```

```
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       C        1.70      0.25     0.600    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      3.50
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.24
  AVERAGE FLOW DEPTH(FEET) =   0.41   FLOOD WIDTH(FEET) =   75.68
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =  54.35   Tc(MIN.) =  105.76
  SUBAREA AREA(ACRES) =    1.70       SUBAREA RUNOFF(CFS) =    1.42
  EFFECTIVE AREA(ACRES) =    3.79     AREA-AVERAGED Fm(INCH/HR) =   0.15
  AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   0.60
  TOTAL AREA(ACRES) =        3.8         PEAK FLOW RATE(CFS) =       3.16

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.40   FLOOD WIDTH(FEET) =   72.75
  FLOW VELOCITY(FEET/SEC.) =   0.24   DEPTH*VELOCITY(FT*FT/SEC) =   0.09
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     40.00 =    1970.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     60.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =     11.24  DOWNSTREAM(FEET) =      4.64

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.655
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.518
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       C        2.58      0.25     0.600    86    8.65
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =     10.14
  TOTAL AREA(ACRES) =      2.58   PEAK FLOW RATE(CFS) =     10.14

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     70.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =      4.64
  DOWNSTREAM NODE ELEVATION(FEET) =      4.34
  CHANNEL LENGTH THRU SUBAREA(FEET) =   503.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0350
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   1.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.342
  SUBAREA LOSS RATE DATA(AMC III):
```

```
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       C        3.70      0.25     0.600    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     13.83
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.45
  AVERAGE FLOW DEPTH(FEET) =   0.59   FLOOD WIDTH(FEET) =  110.57
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =  18.60   Tc(MIN.) =   27.25
  SUBAREA AREA(ACRES) =    3.70       SUBAREA RUNOFF(CFS) =    7.30
  EFFECTIVE AREA(ACRES) =    6.28     AREA-AVERAGED Fm(INCH/HR) =   0.15
  AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   0.60
  TOTAL AREA(ACRES) =        6.3         PEAK FLOW RATE(CFS) =      12.39

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.56   FLOOD WIDTH(FEET) =  105.79
  FLOW VELOCITY(FEET/SEC.) =   0.44   DEPTH*VELOCITY(FT*FT/SEC) =   0.25
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     70.00 =     803.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     80.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.56  DOWNSTREAM(FEET) =     2.28
  FLOW LENGTH(FEET) =   142.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.77
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.39
  PIPE TRAVEL TIME(MIN.) =   0.15    Tc(MIN.) =   27.40
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     80.00 =     945.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     80.00 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.) =   27.40
  RAINFALL INTENSITY(INCH/HR) =   2.33
  AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       6.28
  TOTAL STREAM AREA(ACRES) =       6.28
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      12.39

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE    100.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   322.00
  ELEVATION DATA: UPSTREAM(FEET) =     10.90  DOWNSTREAM(FEET) =      4.80
```

```
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.174
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.370
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       C        1.50      0.25     0.600    86    9.17
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      5.70
  TOTAL AREA(ACRES) =      1.50   PEAK FLOW RATE(CFS) =      5.70

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    110.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =      4.80
  DOWNSTREAM NODE ELEVATION(FEET) =      4.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   839.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0350
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   1.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.798
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       C        4.96      0.25     0.600    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      9.34
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.41
  AVERAGE FLOW DEPTH(FEET) =   0.51   FLOOD WIDTH(FEET) =   95.14
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =  34.05   Tc(MIN.) =   43.22
  SUBAREA AREA(ACRES) =    4.96       SUBAREA RUNOFF(CFS) =    7.36
  EFFECTIVE AREA(ACRES) =    6.46     AREA-AVERAGED Fm(INCH/HR) =   0.15
  AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   0.60
  TOTAL AREA(ACRES) =        6.5         PEAK FLOW RATE(CFS) =       9.58

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.51   FLOOD WIDTH(FEET) =   95.88
  FLOW VELOCITY(FEET/SEC.) =   0.41   DEPTH*VELOCITY(FT*FT/SEC) =   0.21
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE    110.00 =    1161.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE     80.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.65  DOWNSTREAM(FEET) =     2.28
  FLOW LENGTH(FEET) =   183.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.20
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
```

```
  PIPE-FLOW(CFS) =       9.58
  PIPE TRAVEL TIME(MIN.) =   0.25    Tc(MIN.) =   43.47
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE     80.00 =    1344.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     80.00 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.) =   43.47
  RAINFALL INTENSITY(INCH/HR) =   1.79
  AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       6.46
  TOTAL STREAM AREA(ACRES) =       6.46
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       9.58

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       12.39   27.40    2.334  0.25( 0.15) 0.60       6.3      50.00
      2        9.58   43.47    1.792  0.25( 0.15) 0.60       6.5      90.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       20.42   27.40    2.334  0.25( 0.15) 0.60      10.4      50.00
      2       18.89   43.47    1.792  0.25( 0.15) 0.60      12.7      90.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      20.42    Tc(MIN.) =    27.40
  EFFECTIVE AREA(ACRES) =      10.35   AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.60
  TOTAL AREA(ACRES) =       12.7
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE     80.00 =    1344.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE    120.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.28  DOWNSTREAM(FEET) =     2.09
  FLOW LENGTH(FEET) =    95.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =  26.00
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      20.42
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =   27.46
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE    120.00 =    1439.00 FEET.

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

```
  FLOW PROCESS FROM NODE    120.00 TO NODE    120.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    140.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   293.00
  ELEVATION DATA: UPSTREAM(FEET) =      6.90  DOWNSTREAM(FEET) =      4.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.627
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.017
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       C        1.28      0.25     0.600    86   10.63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      4.45
  TOTAL AREA(ACRES) =      1.28   PEAK FLOW RATE(CFS) =      4.45

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    120.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =      4.70
  DOWNSTREAM NODE ELEVATION(FEET) =      4.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   749.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0350
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   1.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.575
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       C        4.49      0.25     0.600    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      7.30
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.28
  AVERAGE FLOW DEPTH(FEET) =   0.54   FLOOD WIDTH(FEET) =  101.02
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =  43.81   Tc(MIN.) =   54.44
  SUBAREA AREA(ACRES) =    4.49       SUBAREA RUNOFF(CFS) =    5.76
  EFFECTIVE AREA(ACRES) =    5.77     AREA-AVERAGED Fm(INCH/HR) =   0.15
  AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   0.60
  TOTAL AREA(ACRES) =        5.8         PEAK FLOW RATE(CFS) =       7.40

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.54   FLOOD WIDTH(FEET) =  101.39
  FLOW VELOCITY(FEET/SEC.) =   0.29   DEPTH*VELOCITY(FT*FT/SEC) =   0.16
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    120.00 =    1042.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    120.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        7.40   54.44    1.575  0.25( 0.15) 0.60       5.8     130.00
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    120.00 =    1042.00 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       20.42   27.46    2.331  0.25( 0.15) 0.60      10.4      50.00
      2       18.89   43.54    1.790  0.25( 0.15) 0.60      12.7      90.00
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE    120.00 =    1439.00 FEET.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       26.14   27.46    2.331  0.25( 0.15) 0.60      13.3      50.00
      2       25.70   43.54    1.790  0.25( 0.15) 0.60      17.4      90.00
      3       23.81   54.44    1.575  0.25( 0.15) 0.60      18.5     130.00
    TOTAL AREA(ACRES) =        18.5

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       26.14  Tc(MIN.) =   27.462
  EFFECTIVE AREA(ACRES) =     13.26  AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.60
  TOTAL AREA(ACRES) =       18.5
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE    120.00 =    1439.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE     40.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.09  DOWNSTREAM(FEET) =     1.84
  FLOW LENGTH(FEET) =   126.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =  33.28
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      26.14
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =   27.52
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE     40.00 =    1565.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
```

```
     1       26.14   27.52    2.328  0.25( 0.15) 0.60      13.3      50.00
     2       25.70   43.60    1.789  0.25( 0.15) 0.60      17.4      90.00
     3       23.81   54.51    1.574  0.25( 0.15) 0.60      18.5     130.00
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE     40.00 =    1565.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1         3.16  105.76    1.077  0.25( 0.15) 0.60       3.8      10.00
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     40.00 =    1970.00 FEET.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1       28.07   27.52    2.328  0.25( 0.15) 0.60      14.2      50.00
     2       28.01   43.60    1.789  0.25( 0.15) 0.60      18.9      90.00
     3       26.32   54.51    1.574  0.25( 0.15) 0.60      20.5     130.00
     4       18.66  105.76    1.077  0.25( 0.15) 0.60      22.3      10.00
    TOTAL AREA(ACRES) =        22.3

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       28.07  Tc(MIN.) =   27.525
  EFFECTIVE AREA(ACRES) =     14.25  AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.60
  TOTAL AREA(ACRES) =       22.3
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     40.00 =    1970.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =  82
----------------------------------------------------------------------------
  >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
  >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   654.00
  ELEVATION DATA: UPSTREAM(FEET) =     11.30  DOWNSTREAM(FEET) =      4.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   13.900
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.444
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       C        1.78      0.25     0.600    86   13.90
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA AREA(ACRES) =    1.78   INITIAL SUBAREA RUNOFF(CFS) =    5.28

  ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
  MAINLINE Tc(MIN.) =   27.52
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.328
  SUBAREA AREA(ACRES) =    1.78      SUBAREA RUNOFF(CFS) =    3.49
  EFFECTIVE AREA(ACRES) =     16.03   AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.60
  TOTAL AREA(ACRES) =       24.1       PEAK FLOW RATE(CFS) =      31.42

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    210.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   261.00
  ELEVATION DATA: UPSTREAM(FEET) =     11.30  DOWNSTREAM(FEET) =      7.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   19.872
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.806
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL GOOD COVER
  "GRASS"                    C        4.91      0.25     1.000    90   19.87
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =     11.30
  TOTAL AREA(ACRES) =      4.91   PEAK FLOW RATE(CFS) =     11.30
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        4.9  TC(MIN.) =     19.87
  EFFECTIVE AREA(ACRES) =      4.91  AREA-AVERAGED Fm(INCH/HR)=  0.25
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =      11.30
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
____________________________________________________________________________
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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                           Analysis prepared by:

                              Fuscoe Engineering
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                                  Irvine
                                 CA 92606

 ************************** DESCRIPTION OF STUDY **************************
* Magnolia Tank Farm - Area A                                              *
* Proposed 2 Yr Hydrology - Residential & Hotel                            *
* OUTPUT:MTFAP2.OUT INPUT:MTFAP2.DAT                                       *
 ***************************************************************************

  FILE NAME: MTFAP2.DAT
  TIME/DATE OF STUDY: 15:01 07/26/2018
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   20.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0312 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.60 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  5.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   285.00
  ELEVATION DATA: UPSTREAM(FEET) =     14.10  DOWNSTREAM(FEET) =     12.54

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.786
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.540
```

```
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  CONDOMINIUMS               C        1.36      0.25     0.350    50    9.79
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA RUNOFF(CFS) =      1.78
  TOTAL AREA(ACRES) =      1.36   PEAK FLOW RATE(CFS) =      1.78

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     20.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.79
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.540
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.13      0.25     0.350    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.13      SUBAREA RUNOFF(CFS) =    0.17
  EFFECTIVE AREA(ACRES) =      1.49   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        1.5       PEAK FLOW RATE(CFS) =       1.95

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   12.54  DOWNSTREAM ELEVATION(FEET) =   10.70
  STREET LENGTH(FEET) =   140.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

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

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  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 =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.05
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.25
    HALFSTREET FLOOD WIDTH(FEET) =    6.18
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.04
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.51
  STREET FLOW TRAVEL TIME(MIN.) =   1.14   Tc(MIN.) =   10.93
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.445
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.16      0.25     0.350    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
```

```
  SUBAREA AREA(ACRES) =    0.16      SUBAREA RUNOFF(CFS) =    0.20
  EFFECTIVE AREA(ACRES) =      1.65    AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        1.6        PEAK FLOW RATE(CFS) =       2.02

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.25   HALFSTREET FLOOD WIDTH(FEET) =   6.12
  FLOW VELOCITY(FEET/SEC.) =  2.05   DEPTH*VELOCITY(FT*FT/SEC.) =   0.51
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     30.00 =     425.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     30.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.93
  RAINFALL INTENSITY(INCH/HR) =   1.45
  AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.35
  EFFECTIVE STREAM AREA(ACRES) =       1.65
  TOTAL STREAM AREA(ACRES) =       1.65
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.02

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     50.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   310.00
  ELEVATION DATA: UPSTREAM(FEET) =     14.10  DOWNSTREAM(FEET) =     11.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.971
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.618
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  CONDOMINIUMS               C        1.06      0.25     0.350    50    8.97
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA RUNOFF(CFS) =      1.46
  TOTAL AREA(ACRES) =      1.06   PEAK FLOW RATE(CFS) =      1.46

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     30.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.97
  RAINFALL INTENSITY(INCH/HR) =   1.62
  AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.35
```

```
  EFFECTIVE STREAM AREA(ACRES) =       1.06
  TOTAL STREAM AREA(ACRES) =       1.06
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.46

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        2.02   10.93    1.445  0.25( 0.09) 0.35       1.6      10.00
      2        1.46    8.97    1.618  0.25( 0.09) 0.35       1.1      40.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        3.33    8.97    1.618  0.25( 0.09) 0.35       2.4      40.00
      2        3.31   10.93    1.445  0.25( 0.09) 0.35       2.7      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       3.33    Tc(MIN.) =     8.97
  EFFECTIVE AREA(ACRES) =       2.41   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        2.7
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     30.00 =     425.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     60.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   10.70  DOWNSTREAM ELEVATION(FEET) =    9.80
  STREET LENGTH(FEET) =   145.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

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

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  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 =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.56
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.32
    HALFSTREET FLOOD WIDTH(FEET) =    9.57
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.72
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.55
  STREET FLOW TRAVEL TIME(MIN.) =   1.40   Tc(MIN.) =   10.37
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.489
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.37      0.25     0.350    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.37      SUBAREA RUNOFF(CFS) =    0.47
```

```
  EFFECTIVE AREA(ACRES) =      2.78    AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        3.1        PEAK FLOW RATE(CFS) =       3.51

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =   9.50
  FLOW VELOCITY(FEET/SEC.) =  1.72   DEPTH*VELOCITY(FT*FT/SEC.) =   0.54
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     60.00 =     570.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     60.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.37
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.489
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        1.13      0.25     0.350    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    1.13      SUBAREA RUNOFF(CFS) =    1.43
  EFFECTIVE AREA(ACRES) =      3.91   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        4.2       PEAK FLOW RATE(CFS) =       4.94

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     60.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.37
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.489
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.51      0.25     0.350    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.51      SUBAREA RUNOFF(CFS) =    0.64
  EFFECTIVE AREA(ACRES) =      4.42   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        4.7       PEAK FLOW RATE(CFS) =       5.58

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     65.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     6.13  DOWNSTREAM(FEET) =     5.71
  FLOW LENGTH(FEET) =   120.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  14.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.80
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.58
  PIPE TRAVEL TIME(MIN.) =   0.53    Tc(MIN.) =   10.90
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     65.00 =     690.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     65.00 TO NODE     65.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.90
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.447
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.47      0.25     0.350    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.47      SUBAREA RUNOFF(CFS) =    0.58
  EFFECTIVE AREA(ACRES) =      4.89   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        5.2       PEAK FLOW RATE(CFS) =       5.99

****************************************************************************
  FLOW PROCESS FROM NODE     65.00 TO NODE     70.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     5.71  DOWNSTREAM(FEET) =     5.17
  FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  12.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.91
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.99
  PIPE TRAVEL TIME(MIN.) =   0.68    Tc(MIN.) =   11.58
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     70.00 =     850.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     70.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.58
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.398
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.42      0.25     0.350    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.42      SUBAREA RUNOFF(CFS) =    0.50
  EFFECTIVE AREA(ACRES) =      5.31   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        5.6       PEAK FLOW RATE(CFS) =       6.27

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     70.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.58
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.398
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS             C        1.04      0.25     0.350    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    1.04      SUBAREA RUNOFF(CFS) =    1.23
  EFFECTIVE AREA(ACRES) =      6.35   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        6.7       PEAK FLOW RATE(CFS) =       7.49

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     70.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.58
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.398
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS             C        0.34      0.25     0.350    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.34      SUBAREA RUNOFF(CFS) =    0.40
  EFFECTIVE AREA(ACRES) =      6.69   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        7.0       PEAK FLOW RATE(CFS) =       7.89

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     80.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     5.17  DOWNSTREAM(FEET) =     5.02
  FLOW LENGTH(FEET) =    90.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.16
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.89
  PIPE TRAVEL TIME(MIN.) =   0.48    Tc(MIN.) =   12.06
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     80.00 =     940.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     80.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.06
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.366
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS             C        0.28      0.25     0.350    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.28      SUBAREA RUNOFF(CFS) =    0.32
  EFFECTIVE AREA(ACRES) =      6.97   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        7.3       PEAK FLOW RATE(CFS) =       8.02
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     80.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.06
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.366
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       C        0.73      0.25     0.200    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.73      SUBAREA RUNOFF(CFS) =    0.86
  EFFECTIVE AREA(ACRES) =      7.70   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.34
  TOTAL AREA(ACRES) =        8.0       PEAK FLOW RATE(CFS) =       8.89

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     90.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     5.02  DOWNSTREAM(FEET) =     4.44
  FLOW LENGTH(FEET) =   170.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  14.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.33
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.89
  PIPE TRAVEL TIME(MIN.) =   0.65    Tc(MIN.) =   12.71
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     90.00 =    1110.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.71
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.325
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.39      0.25     0.350    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.39      SUBAREA RUNOFF(CFS) =    0.43
  EFFECTIVE AREA(ACRES) =      8.09   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.34
  TOTAL AREA(ACRES) =        8.4       PEAK FLOW RATE(CFS) =       9.04

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.71
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.325
  SUBAREA LOSS RATE DATA(AMC  I ):
```

```
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
CONDOMINIUMS               C        0.47      0.25     0.350    50
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
SUBAREA AREA(ACRES) =    0.47      SUBAREA RUNOFF(CFS) =    0.52
EFFECTIVE AREA(ACRES) =      8.56   AREA-AVERAGED Fm(INCH/HR) =  0.08
AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.34
TOTAL AREA(ACRES) =        8.9       PEAK FLOW RATE(CFS) =       9.56

****************************************************************************
FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
MAINLINE Tc(MIN.) =   12.71
*   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.325
SUBAREA LOSS RATE DATA(AMC  I ):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
CONDOMINIUMS               C        1.05      0.25     0.350    50
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
SUBAREA AREA(ACRES) =    1.05      SUBAREA RUNOFF(CFS) =    1.17
EFFECTIVE AREA(ACRES) =      9.61   AREA-AVERAGED Fm(INCH/HR) =  0.08
AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.34
TOTAL AREA(ACRES) =        9.9       PEAK FLOW RATE(CFS) =      10.73

****************************************************************************
FLOW PROCESS FROM NODE     90.00 TO NODE    100.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =     4.44  DOWNSTREAM(FEET) =     3.29
FLOW LENGTH(FEET) =   340.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   4.47
ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =      10.73
PIPE TRAVEL TIME(MIN.) =   1.27    Tc(MIN.) =   13.98
LONGEST FLOWPATH FROM NODE     10.00 TO NODE    100.00 =    1450.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
MAINLINE Tc(MIN.) =   13.98
*   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.255
SUBAREA LOSS RATE DATA(AMC  I ):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
CONDOMINIUMS               C        0.39      0.25     0.350    50
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
SUBAREA AREA(ACRES) =    0.39      SUBAREA RUNOFF(CFS) =    0.41
EFFECTIVE AREA(ACRES) =     10.00   AREA-AVERAGED Fm(INCH/HR) =  0.08
AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.34
TOTAL AREA(ACRES) =       10.3       PEAK FLOW RATE(CFS) =      10.73
```

```
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   13.98
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.255
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        1.00      0.25     0.350    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    1.00      SUBAREA RUNOFF(CFS) =    1.05
  EFFECTIVE AREA(ACRES) =     11.00   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.34
  TOTAL AREA(ACRES) =       11.3       PEAK FLOW RATE(CFS) =      11.58

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   13.98
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.255
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        1.05      0.25     0.350    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    1.05      SUBAREA RUNOFF(CFS) =    1.10
  EFFECTIVE AREA(ACRES) =     12.05   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.34
  TOTAL AREA(ACRES) =       12.4       PEAK FLOW RATE(CFS) =      12.69

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    105.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     3.29  DOWNSTREAM(FEET) =     2.99
  FLOW LENGTH(FEET) =    88.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  17.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.72
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.69
  PIPE TRAVEL TIME(MIN.) =   0.31    Tc(MIN.) =   14.29
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    105.00 =    1538.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   14.29
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.239
```

```
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.44      0.25     0.350    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.44      SUBAREA RUNOFF(CFS) =    0.46
  EFFECTIVE AREA(ACRES) =     12.49   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.34
  TOTAL AREA(ACRES) =       12.8       PEAK FLOW RATE(CFS) =      12.97

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    110.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.99  DOWNSTREAM(FEET) =     2.81
  FLOW LENGTH(FEET) =    53.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  17.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.74
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.97
  PIPE TRAVEL TIME(MIN.) =   0.19    Tc(MIN.) =   14.48
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    110.00 =    1591.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   14.48
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.230
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.64      0.25     0.350    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.64      SUBAREA RUNOFF(CFS) =    0.66
  EFFECTIVE AREA(ACRES) =     13.13   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.34
  TOTAL AREA(ACRES) =       13.4       PEAK FLOW RATE(CFS) =      13.53

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    120.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.81  DOWNSTREAM(FEET) =     2.47
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.77
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.53
  PIPE TRAVEL TIME(MIN.) =   0.35    Tc(MIN.) =   14.83
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    120.00 =    1691.00 FEET.

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

```
  FLOW PROCESS FROM NODE    120.00 TO NODE    120.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    140.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =     17.60  DOWNSTREAM(FEET) =     16.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.978
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.618
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C        1.19      0.25     0.100    50    8.98
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      1.71
  TOTAL AREA(ACRES) =      1.19   PEAK FLOW RATE(CFS) =      1.71

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    140.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    8.98
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.618
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.21      0.25     0.350    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.21      SUBAREA RUNOFF(CFS) =    0.29
  EFFECTIVE AREA(ACRES) =      1.40   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.14
  TOTAL AREA(ACRES) =        1.4       PEAK FLOW RATE(CFS) =       2.00

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    150.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    10.70  DOWNSTREAM(FEET) =     9.57
  FLOW LENGTH(FEET) =   140.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.12
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.00
  PIPE TRAVEL TIME(MIN.) =   0.57    Tc(MIN.) =    9.54
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    150.00 =     470.00 FEET.

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

```
  FLOW PROCESS FROM NODE    150.00 TO NODE    150.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.54
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.562
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        1.05      0.25     0.100    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.05      SUBAREA RUNOFF(CFS) =    1.45
  EFFECTIVE AREA(ACRES) =      2.45   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.12
  TOTAL AREA(ACRES) =        2.5       PEAK FLOW RATE(CFS) =       3.38

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    150.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.54
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.562
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.60      0.25     0.350    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.60      SUBAREA RUNOFF(CFS) =    0.80
  EFFECTIVE AREA(ACRES) =      3.05   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.17
  TOTAL AREA(ACRES) =        3.1       PEAK FLOW RATE(CFS) =       4.17

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 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) =     9.57  DOWNSTREAM(FEET) =     7.37
  FLOW LENGTH(FEET) =   275.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   9.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.92
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.17
  PIPE TRAVEL TIME(MIN.) =   0.93    Tc(MIN.) =   10.48
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    160.00 =     745.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.48
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.481
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
```

```
  COMMERCIAL                  C        1.39      0.25     0.100    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.39      SUBAREA RUNOFF(CFS) =    1.82
  EFFECTIVE AREA(ACRES) =      4.44   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.15
  TOTAL AREA(ACRES) =        4.4       PEAK FLOW RATE(CFS) =       5.77

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    170.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     7.37  DOWNSTREAM(FEET) =     6.09
  FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.36
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.77
  PIPE TRAVEL TIME(MIN.) =   0.50    Tc(MIN.) =   10.97
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    170.00 =     905.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    170.00 TO NODE    170.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.97
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.442
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                 C        0.41      0.25     0.850    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =    0.41      SUBAREA RUNOFF(CFS) =    0.45
  EFFECTIVE AREA(ACRES) =      4.85   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.21
  TOTAL AREA(ACRES) =        4.8       PEAK FLOW RATE(CFS) =       6.07

****************************************************************************
  FLOW PROCESS FROM NODE    170.00 TO NODE    180.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     6.09  DOWNSTREAM(FEET) =     4.81
  FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.42
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.07
  PIPE TRAVEL TIME(MIN.) =   0.49    Tc(MIN.) =   11.47
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    180.00 =    1065.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
```

```
==============================================================================
  MAINLINE Tc(MIN.) =   11.47
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.406
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.47      0.25     0.350    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.47      SUBAREA RUNOFF(CFS) =    0.56
  EFFECTIVE AREA(ACRES) =      5.32   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.22
  TOTAL AREA(ACRES) =        5.3       PEAK FLOW RATE(CFS) =       6.47

******************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 IS CODE =  81
------------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
  MAINLINE Tc(MIN.) =   11.47
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.406
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.82      0.25     0.350    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.82      SUBAREA RUNOFF(CFS) =    0.97
  EFFECTIVE AREA(ACRES) =      6.14   AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.24
  TOTAL AREA(ACRES) =        6.1       PEAK FLOW RATE(CFS) =       7.44

******************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 IS CODE =  81
------------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
  MAINLINE Tc(MIN.) =   11.47
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.406
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.93      0.25     0.350    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.93      SUBAREA RUNOFF(CFS) =    1.10
  EFFECTIVE AREA(ACRES) =      7.07   AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.25
  TOTAL AREA(ACRES) =        7.1       PEAK FLOW RATE(CFS) =       8.55

******************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    185.00 IS CODE =  31
------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     4.81  DOWNSTREAM(FEET) =     3.73
  FLOW LENGTH(FEET) =   135.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  14.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.74
```

```
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.55
  PIPE TRAVEL TIME(MIN.) =   0.39    Tc(MIN.) =   11.86
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    185.00 =    1200.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    185.00 TO NODE    185.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.86
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.379
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        1.15      0.25     0.350    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    1.15      SUBAREA RUNOFF(CFS) =    1.34
  EFFECTIVE AREA(ACRES) =      8.22   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.26
  TOTAL AREA(ACRES) =        8.2       PEAK FLOW RATE(CFS) =       9.71

****************************************************************************
  FLOW PROCESS FROM NODE    185.00 TO NODE    190.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     3.73  DOWNSTREAM(FEET) =     2.81
  FLOW LENGTH(FEET) =   115.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.09
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.71
  PIPE TRAVEL TIME(MIN.) =   0.31    Tc(MIN.) =   12.17
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    190.00 =    1315.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    190.00 TO NODE    190.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.17
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.358
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.51      0.25     0.350    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.51      SUBAREA RUNOFF(CFS) =    0.58
  EFFECTIVE AREA(ACRES) =      8.73   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.27
  TOTAL AREA(ACRES) =        8.7       PEAK FLOW RATE(CFS) =      10.14

****************************************************************************
  FLOW PROCESS FROM NODE    190.00 TO NODE    120.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.81  DOWNSTREAM(FEET) =     2.47
  FLOW LENGTH(FEET) =    10.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  11.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.41
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.14
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =   12.19
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    120.00 =    1325.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    120.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
==============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       10.14   12.19    1.357  0.25( 0.07) 0.27       8.7     130.00
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    120.00 =    1325.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       13.53   14.83    1.213  0.25( 0.09) 0.34      13.1      40.00
      2       12.74   16.88    1.126  0.25( 0.09) 0.34      13.4      10.00
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    120.00 =    1691.00 FEET.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       22.69   12.19    1.357  0.25( 0.08) 0.31      19.5     130.00
      2       22.53   14.83    1.213  0.25( 0.08) 0.31      21.9      40.00
      3       21.06   16.88    1.126  0.25( 0.08) 0.31      22.2      10.00
    TOTAL AREA(ACRES) =        22.2

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       22.69  Tc(MIN.) =   12.188
  EFFECTIVE AREA(ACRES) =     19.53  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.31
  TOTAL AREA(ACRES) =       22.2
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    120.00 =    1691.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    210.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.47  DOWNSTREAM(FEET) =     1.84
  FLOW LENGTH(FEET) =   185.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  24.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.27
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      22.69
  PIPE TRAVEL TIME(MIN.) =   0.58    Tc(MIN.) =   12.77
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    210.00 =    1876.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    210.00 IS CODE =  82
----------------------------------------------------------------------------
  >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
  >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   530.00
  ELEVATION DATA: UPSTREAM(FEET) =     12.00  DOWNSTREAM(FEET) =      9.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   12.921
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.313
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  CONDOMINIUMS               C        0.60      0.25     0.350    50   12.92
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.60   INITIAL SUBAREA RUNOFF(CFS) =    0.66

  ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
  MAINLINE Tc(MIN.) =   12.77
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.321
  SUBAREA AREA(ACRES) =    0.60      SUBAREA RUNOFF(CFS) =    0.67
  EFFECTIVE AREA(ACRES) =     20.13   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.31
  TOTAL AREA(ACRES) =       22.8       PEAK FLOW RATE(CFS) =      22.69
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    210.00 IS CODE =  82
----------------------------------------------------------------------------
  >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
  >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   440.00
  ELEVATION DATA: UPSTREAM(FEET) =     12.00  DOWNSTREAM(FEET) =      9.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.555
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.400
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  CONDOMINIUMS               C        0.51      0.25     0.350    50   11.56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.51   INITIAL SUBAREA RUNOFF(CFS) =    0.60

  ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
  MAINLINE Tc(MIN.) =   12.77
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.321
  SUBAREA AREA(ACRES) =    0.51      SUBAREA RUNOFF(CFS) =    0.57
  EFFECTIVE AREA(ACRES) =     20.64   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.31
  TOTAL AREA(ACRES) =       23.3       PEAK FLOW RATE(CFS) =      23.10

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    220.00 IS CODE =  31
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.25  DOWNSTREAM(FEET) =     2.00
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  25.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.79
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      23.10
  PIPE TRAVEL TIME(MIN.) =   0.35    Tc(MIN.) =   13.12
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    220.00 =    1976.00 FEET.
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       23.3  TC(MIN.) =     13.12
  EFFECTIVE AREA(ACRES) =     20.64  AREA-AVERAGED Fm(INCH/HR)=  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.312
  PEAK FLOW RATE(CFS)   =      23.10

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       23.10   13.12    1.301  0.25( 0.08) 0.31      20.6     130.00
      2       22.90   15.76    1.171  0.25( 0.08) 0.31      23.0      40.00
      3       21.47   17.82    1.091  0.25( 0.08) 0.32      23.3      10.00
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
____________________________________________________________________________
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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             Ver. 23.0  Release Date: 07/01/2016  License ID 1355

                           Analysis prepared by:

                              Fuscoe Engineering
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                                 Irvine
                                CA 92606

 ************************** DESCRIPTION OF STUDY **************************
* MAGNOLIA TANK FARMS                                                      *
* PROPOSED 25 YEAR HYDROLOGY-AREA A                                        *
* OUTPUT:MTFAP25.OUT INPUT:MTFAP25                                         *
 ***************************************************************************

  FILE NAME: MTFAP25.DAT
  TIME/DATE OF STUDY: 11:34 08/01/2018
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   20.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.60 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  5.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   285.00
  ELEVATION DATA: UPSTREAM(FEET) =     14.10  DOWNSTREAM(FEET) =     12.54

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.786
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.299
```

```
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  CONDOMINIUMS               C        1.36      0.25     0.350    69    9.79
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA RUNOFF(CFS) =      3.93
  TOTAL AREA(ACRES) =      1.36   PEAK FLOW RATE(CFS) =      3.93

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     20.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.79
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.299
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.13      0.25     0.350    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.13      SUBAREA RUNOFF(CFS) =    0.38
  EFFECTIVE AREA(ACRES) =      1.49   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        1.5       PEAK FLOW RATE(CFS) =       4.31

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   12.54  DOWNSTREAM ELEVATION(FEET) =   10.70
  STREET LENGTH(FEET) =   140.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

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

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  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 =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.53
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.31
    HALFSTREET FLOOD WIDTH(FEET) =    8.97
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.45
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.75
  STREET FLOW TRAVEL TIME(MIN.) =   0.95   Tc(MIN.) =   10.74
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.130
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.16      0.25     0.350    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
```

```
  SUBAREA AREA(ACRES) =    0.16      SUBAREA RUNOFF(CFS) =    0.44
  EFFECTIVE AREA(ACRES) =      1.65    AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        1.6        PEAK FLOW RATE(CFS) =       4.52

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.31   HALFSTREET FLOOD WIDTH(FEET) =   8.97
  FLOW VELOCITY(FEET/SEC.) =  2.45   DEPTH*VELOCITY(FT*FT/SEC.) =   0.75
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     30.00 =     425.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     30.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.74
  RAINFALL INTENSITY(INCH/HR) =   3.13
  AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.35
  EFFECTIVE STREAM AREA(ACRES) =       1.65
  TOTAL STREAM AREA(ACRES) =       1.65
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.52

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     50.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   310.00
  ELEVATION DATA: UPSTREAM(FEET) =     14.10  DOWNSTREAM(FEET) =     11.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.971
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.465
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  CONDOMINIUMS               C        1.06      0.25     0.350    69    8.97
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA RUNOFF(CFS) =      3.22
  TOTAL AREA(ACRES) =      1.06   PEAK FLOW RATE(CFS) =      3.22

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     30.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.97
  RAINFALL INTENSITY(INCH/HR) =   3.46
  AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.35
```

```
  EFFECTIVE STREAM AREA(ACRES) =       1.06
  TOTAL STREAM AREA(ACRES) =       1.06
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.22

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        4.52   10.74    3.130  0.25( 0.09) 0.35       1.6      10.00
      2        3.22    8.97    3.465  0.25( 0.09) 0.35       1.1      40.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        7.41    8.97    3.465  0.25( 0.09) 0.35       2.4      40.00
      2        7.42   10.74    3.130  0.25( 0.09) 0.35       2.7      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       7.42    Tc(MIN.) =    10.74
  EFFECTIVE AREA(ACRES) =       2.71   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        2.7
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     30.00 =     425.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     60.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   10.70  DOWNSTREAM ELEVATION(FEET) =    9.80
  STREET LENGTH(FEET) =   145.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

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

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  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 =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.90
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.39
    HALFSTREET FLOOD WIDTH(FEET) =   13.32
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.09
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.82
  STREET FLOW TRAVEL TIME(MIN.) =   1.16   Tc(MIN.) =   11.90
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.953
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.37      0.25     0.350    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.37      SUBAREA RUNOFF(CFS) =    0.95
```

```
  EFFECTIVE AREA(ACRES) =      3.08    AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        3.1        PEAK FLOW RATE(CFS) =       7.94

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.39   HALFSTREET FLOOD WIDTH(FEET) =  13.40
  FLOW VELOCITY(FEET/SEC.) =  2.08   DEPTH*VELOCITY(FT*FT/SEC.) =   0.82
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     60.00 =     570.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     60.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.90
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.953
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        1.13      0.25     0.350    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    1.13      SUBAREA RUNOFF(CFS) =    2.91
  EFFECTIVE AREA(ACRES) =      4.21   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        4.2       PEAK FLOW RATE(CFS) =      10.86

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       11.15   10.14    3.233  0.25( 0.09) 0.35       3.9      40.00
      2       10.86   11.90    2.953  0.25( 0.09) 0.35       4.2      10.00
  NEW PEAK FLOW DATA ARE:
  PEAK FLOW RATE(CFS) =      11.15  Tc(MIN.) =   10.14
  AREA-AVERAGED Fm(INCH/HR) =  0.09  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.35  EFFECTIVE AREA(ACRES) =       3.94

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     60.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.14
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.233
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.51      0.25     0.350    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.51      SUBAREA RUNOFF(CFS) =    1.44
  EFFECTIVE AREA(ACRES) =      4.45   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        4.7       PEAK FLOW RATE(CFS) =      12.60

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     65.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
```

```
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     6.13  DOWNSTREAM(FEET) =     5.71
  FLOW LENGTH(FEET) =   120.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  19.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.61
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.60
  PIPE TRAVEL TIME(MIN.) =   0.43    Tc(MIN.) =   10.57
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     65.00 =     690.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     65.00 TO NODE     65.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
  MAINLINE Tc(MIN.) =   10.57
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.158
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.47      0.25     0.350    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.47      SUBAREA RUNOFF(CFS) =    1.30
  EFFECTIVE AREA(ACRES) =      4.92   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        5.2       PEAK FLOW RATE(CFS) =      13.59

****************************************************************************
  FLOW PROCESS FROM NODE     65.00 TO NODE     70.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     5.71  DOWNSTREAM(FEET) =     5.17
  FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.76
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.59
  PIPE TRAVEL TIME(MIN.) =   0.56    Tc(MIN.) =   11.13
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     70.00 =     850.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     70.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
  MAINLINE Tc(MIN.) =   11.13
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.067
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.42      0.25     0.350    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.42      SUBAREA RUNOFF(CFS) =    1.13
  EFFECTIVE AREA(ACRES) =      5.34   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        5.6       PEAK FLOW RATE(CFS) =      14.31
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     70.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.13
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.067
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        1.04      0.25     0.350    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    1.04      SUBAREA RUNOFF(CFS) =    2.79
  EFFECTIVE AREA(ACRES) =      6.38   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        6.7       PEAK FLOW RATE(CFS) =      17.10

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     70.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.13
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.067
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.34      0.25     0.350    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.34      SUBAREA RUNOFF(CFS) =    0.91
  EFFECTIVE AREA(ACRES) =      6.72   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        7.0       PEAK FLOW RATE(CFS) =      18.01

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     80.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     5.17  DOWNSTREAM(FEET) =     5.02
  FLOW LENGTH(FEET) =    90.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  24.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.89
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      18.01
  PIPE TRAVEL TIME(MIN.) =   0.39    Tc(MIN.) =   11.52
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     80.00 =     940.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     80.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.52
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.008
  SUBAREA LOSS RATE DATA(AMC  II):
```

```
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.28      0.25     0.350    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.28      SUBAREA RUNOFF(CFS) =    0.74
  EFFECTIVE AREA(ACRES) =      7.00   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        7.3       PEAK FLOW RATE(CFS) =      18.40

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     80.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.52
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.008
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       C        0.73      0.25     0.200    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.73      SUBAREA RUNOFF(CFS) =    1.94
  EFFECTIVE AREA(ACRES) =      7.73   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.34
  TOTAL AREA(ACRES) =        8.0       PEAK FLOW RATE(CFS) =      20.34

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     90.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     5.02  DOWNSTREAM(FEET) =     4.44
  FLOW LENGTH(FEET) =   170.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  22.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.24
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      20.34
  PIPE TRAVEL TIME(MIN.) =   0.54    Tc(MIN.) =   12.06
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     90.00 =    1110.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.06
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.931
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.39      0.25     0.350    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.39      SUBAREA RUNOFF(CFS) =    1.00
  EFFECTIVE AREA(ACRES) =      8.12   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.34
```

```
  TOTAL AREA(ACRES) =        8.4       PEAK FLOW RATE(CFS) =      20.80

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.06
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.931
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.47      0.25     0.350    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.47      SUBAREA RUNOFF(CFS) =    1.20
  EFFECTIVE AREA(ACRES) =      8.59   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.34
  TOTAL AREA(ACRES) =        8.9       PEAK FLOW RATE(CFS) =      22.00

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.06
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.931
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        1.05      0.25     0.350    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    1.05      SUBAREA RUNOFF(CFS) =    2.69
  EFFECTIVE AREA(ACRES) =      9.64   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.34
  TOTAL AREA(ACRES) =        9.9       PEAK FLOW RATE(CFS) =      24.69

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE    100.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     4.44  DOWNSTREAM(FEET) =     3.29
  FLOW LENGTH(FEET) =   340.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  23.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.51
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      24.69
  PIPE TRAVEL TIME(MIN.) =   1.03    Tc(MIN.) =   13.09
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    100.00 =    1450.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   13.09
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.798
```

```
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.39      0.25     0.350    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.39      SUBAREA RUNOFF(CFS) =    0.95
  EFFECTIVE AREA(ACRES) =     10.03   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.34
  TOTAL AREA(ACRES) =       10.3       PEAK FLOW RATE(CFS) =      24.69
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   13.09
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.798
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        1.00      0.25     0.350    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    1.00      SUBAREA RUNOFF(CFS) =    2.44
  EFFECTIVE AREA(ACRES) =     11.03   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.34
  TOTAL AREA(ACRES) =       11.3       PEAK FLOW RATE(CFS) =      26.93

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   13.09
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.798
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        1.05      0.25     0.350    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    1.05      SUBAREA RUNOFF(CFS) =    2.56
  EFFECTIVE AREA(ACRES) =     12.08   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.34
  TOTAL AREA(ACRES) =       12.4       PEAK FLOW RATE(CFS) =      29.49

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    105.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     3.29  DOWNSTREAM(FEET) =     2.99
  FLOW LENGTH(FEET) =    88.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  24.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.80
  ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      29.49
```

```
  PIPE TRAVEL TIME(MIN.) =   0.25    Tc(MIN.) =   13.34
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    105.00 =    1538.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   13.34
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.768
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.44      0.25     0.350    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.44      SUBAREA RUNOFF(CFS) =    1.06
  EFFECTIVE AREA(ACRES) =     12.52   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.34
  TOTAL AREA(ACRES) =       12.8       PEAK FLOW RATE(CFS) =      30.23

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    110.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.99  DOWNSTREAM(FEET) =     2.81
  FLOW LENGTH(FEET) =    53.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  24.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.82
  ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      30.23
  PIPE TRAVEL TIME(MIN.) =   0.15    Tc(MIN.) =   13.49
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    110.00 =    1591.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   13.49
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.751
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.64      0.25     0.350    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.64      SUBAREA RUNOFF(CFS) =    1.53
  EFFECTIVE AREA(ACRES) =     13.16   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.34
  TOTAL AREA(ACRES) =       13.4       PEAK FLOW RATE(CFS) =      31.56

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    120.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =     2.81  DOWNSTREAM(FEET) =     2.47
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  25.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.86
  ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      31.56
  PIPE TRAVEL TIME(MIN.) =   0.28    Tc(MIN.) =   13.77
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    120.00 =    1691.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    120.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    140.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =     17.60  DOWNSTREAM(FEET) =     16.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.978
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.463
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C        1.19      0.25     0.100    69    8.98
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      3.68
  TOTAL AREA(ACRES) =      1.19   PEAK FLOW RATE(CFS) =      3.68

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    140.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    8.98
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.463
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.21      0.25     0.350    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.21      SUBAREA RUNOFF(CFS) =    0.64
  EFFECTIVE AREA(ACRES) =      1.40   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.14
  TOTAL AREA(ACRES) =        1.4       PEAK FLOW RATE(CFS) =       4.32

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    150.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =    10.70  DOWNSTREAM(FEET) =     9.57
  FLOW LENGTH(FEET) =   140.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.96
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.32
  PIPE TRAVEL TIME(MIN.) =   0.47    Tc(MIN.) =    9.45
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    150.00 =     470.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    150.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.45
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.365
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        1.05      0.25     0.100    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.05      SUBAREA RUNOFF(CFS) =    3.16
  EFFECTIVE AREA(ACRES) =      2.45   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.12
  TOTAL AREA(ACRES) =        2.5       PEAK FLOW RATE(CFS) =       7.35

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    150.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.45
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.365
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.60      0.25     0.350    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.60      SUBAREA RUNOFF(CFS) =    1.77
  EFFECTIVE AREA(ACRES) =      3.05   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.17
  TOTAL AREA(ACRES) =        3.1       PEAK FLOW RATE(CFS) =       9.12

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 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) =     9.57  DOWNSTREAM(FEET) =     7.37
  FLOW LENGTH(FEET) =   275.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  12.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.01
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.12
  PIPE TRAVEL TIME(MIN.) =   0.76    Tc(MIN.) =   10.21
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    160.00 =     745.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.21
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.220
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        1.39      0.25     0.100    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.39      SUBAREA RUNOFF(CFS) =    4.00
  EFFECTIVE AREA(ACRES) =      4.44   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.15
  TOTAL AREA(ACRES) =        4.4       PEAK FLOW RATE(CFS) =      12.72

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    170.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     7.37  DOWNSTREAM(FEET) =     6.09
  FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  16.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.36
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.72
  PIPE TRAVEL TIME(MIN.) =   0.42    Tc(MIN.) =   10.63
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    170.00 =     905.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    170.00 TO NODE    170.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.63
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.148
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                C        0.41      0.25     0.850    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =    0.41      SUBAREA RUNOFF(CFS) =    1.08
  EFFECTIVE AREA(ACRES) =      4.85   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.21
  TOTAL AREA(ACRES) =        4.8       PEAK FLOW RATE(CFS) =      13.52

****************************************************************************
  FLOW PROCESS FROM NODE    170.00 TO NODE    180.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     6.09  DOWNSTREAM(FEET) =     4.81
  FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  14.9 INCHES
```

```
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.62
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.52
  PIPE TRAVEL TIME(MIN.) =   0.40    Tc(MIN.) =   11.03
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    180.00 =    1065.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.03
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.082
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.47      0.25     0.350    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.47      SUBAREA RUNOFF(CFS) =    1.27
  EFFECTIVE AREA(ACRES) =      5.32   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.22
  TOTAL AREA(ACRES) =        5.3       PEAK FLOW RATE(CFS) =      14.50

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.03
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.082
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.82      0.25     0.350    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.82      SUBAREA RUNOFF(CFS) =    2.21
  EFFECTIVE AREA(ACRES) =      6.14   AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.24
  TOTAL AREA(ACRES) =        6.1       PEAK FLOW RATE(CFS) =      16.71

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.03
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.082
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.93      0.25     0.350    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.93      SUBAREA RUNOFF(CFS) =    2.51
  EFFECTIVE AREA(ACRES) =      7.07   AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.25
  TOTAL AREA(ACRES) =        7.1       PEAK FLOW RATE(CFS) =      19.21
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    185.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     4.81  DOWNSTREAM(FEET) =     3.73
  FLOW LENGTH(FEET) =   135.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  17.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.22
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      19.21
  PIPE TRAVEL TIME(MIN.) =   0.31    Tc(MIN.) =   11.34
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    185.00 =    1200.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    185.00 TO NODE    185.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.34
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.034
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        1.15      0.25     0.350    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    1.15      SUBAREA RUNOFF(CFS) =    3.05
  EFFECTIVE AREA(ACRES) =      8.22   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.26
  TOTAL AREA(ACRES) =        8.2       PEAK FLOW RATE(CFS) =      21.95

****************************************************************************
  FLOW PROCESS FROM NODE    185.00 TO NODE    190.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     3.73  DOWNSTREAM(FEET) =     2.81
  FLOW LENGTH(FEET) =   115.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.40
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      21.95
  PIPE TRAVEL TIME(MIN.) =   0.26    Tc(MIN.) =   11.60
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    190.00 =    1315.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    190.00 TO NODE    190.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.60
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.995
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.51      0.25     0.350    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
```

```
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.51      SUBAREA RUNOFF(CFS) =    1.33
  EFFECTIVE AREA(ACRES) =      8.73   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.27
  TOTAL AREA(ACRES) =        8.7       PEAK FLOW RATE(CFS) =      23.00

****************************************************************************
  FLOW PROCESS FROM NODE    190.00 TO NODE    190.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.60
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.995
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.51      0.25     0.350    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.51      SUBAREA RUNOFF(CFS) =    1.33
  EFFECTIVE AREA(ACRES) =      9.24   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.27
  TOTAL AREA(ACRES) =        9.2       PEAK FLOW RATE(CFS) =      24.34

****************************************************************************
  FLOW PROCESS FROM NODE    190.00 TO NODE    120.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.81  DOWNSTREAM(FEET) =     2.47
  FLOW LENGTH(FEET) =    10.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.00
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      24.34
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =   11.62
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    120.00 =    1325.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    120.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       24.34   11.62    2.993  0.25( 0.07) 0.27       9.2     130.00
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    120.00 =    1325.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       31.56   13.77    2.718  0.25( 0.09) 0.34      13.2      40.00
      2       29.95   15.57    2.536  0.25( 0.09) 0.34      13.4      10.00
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    120.00 =    1691.00 FEET.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
```

```
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       53.74   11.62    2.993  0.25( 0.08) 0.31      20.3     130.00
      2       53.61   13.77    2.718  0.25( 0.08) 0.31      22.4      40.00
      3       50.48   15.57    2.536  0.25( 0.08) 0.31      22.7      10.00
    TOTAL AREA(ACRES) =        22.7

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       53.74  Tc(MIN.) =   11.617
  EFFECTIVE AREA(ACRES) =     20.34  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.31
  TOTAL AREA(ACRES) =       22.7
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    120.00 =    1691.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    210.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.47  DOWNSTREAM(FEET) =     1.84
  FLOW LENGTH(FEET) =   185.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  42.0 INCH PIPE IS  33.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.59
  ESTIMATED PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      53.74
  PIPE TRAVEL TIME(MIN.) =   0.47    Tc(MIN.) =   12.08
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    210.00 =    1876.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    210.00 IS CODE =  82
----------------------------------------------------------------------------
  >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
  >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   530.00
  ELEVATION DATA: UPSTREAM(FEET) =     12.00  DOWNSTREAM(FEET) =      9.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   12.921
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.818
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  CONDOMINIUMS               C        0.60      0.25     0.350    69   12.92
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.60   INITIAL SUBAREA RUNOFF(CFS) =    1.47

  ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
  MAINLINE Tc(MIN.) =   12.08
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.927
  SUBAREA AREA(ACRES) =    0.60      SUBAREA RUNOFF(CFS) =    1.53
  EFFECTIVE AREA(ACRES) =     20.94   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.31
  TOTAL AREA(ACRES) =       23.3       PEAK FLOW RATE(CFS) =      53.74
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    210.00 IS CODE =  82
----------------------------------------------------------------------------
```

```
  >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
  >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   440.00
  ELEVATION DATA: UPSTREAM(FEET) =     12.00  DOWNSTREAM(FEET) =      9.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.555
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.002
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  CONDOMINIUMS               C        0.51      0.25     0.350    69   11.56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.51   INITIAL SUBAREA RUNOFF(CFS) =    1.34

  ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
  MAINLINE Tc(MIN.) =   12.08
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.927
  SUBAREA AREA(ACRES) =    0.51      SUBAREA RUNOFF(CFS) =    1.30
  EFFECTIVE AREA(ACRES) =     21.45   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.31
  TOTAL AREA(ACRES) =       23.8       PEAK FLOW RATE(CFS) =      54.99

******************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    220.00 IS CODE =  31
------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.25  DOWNSTREAM(FEET) =     2.00
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  45.0 INCH PIPE IS  35.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.91
  ESTIMATED PIPE DIAMETER(INCH) =  45.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      54.99
  PIPE TRAVEL TIME(MIN.) =   0.28    Tc(MIN.) =   12.37
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    220.00 =    1976.00 FEET.
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       23.8  TC(MIN.) =     12.37
  EFFECTIVE AREA(ACRES) =     21.45  AREA-AVERAGED Fm(INCH/HR)=  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.313
  PEAK FLOW RATE(CFS)   =      54.99

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       54.99   12.37    2.889  0.25( 0.08) 0.31      21.4     130.00
      2       54.77   14.52    2.638  0.25( 0.08) 0.32      23.5      40.00
      3       51.68   16.32    2.469  0.25( 0.08) 0.32      23.8      10.00
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
____________________________________________________________________________
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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                           Analysis prepared by:

                              Fuscoe Engineering
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                                  Irvine
                                 CA 92606

 ************************** DESCRIPTION OF STUDY **************************
* MAGNOLIA TANK FARMS                                                      *
* PROPOSED 100 YEAR HYDROLOGY - AREA A                                     *
* OUTPUT:MTFAP100.OUT INPUT: MTFAP100                                      *
 ***************************************************************************

  FILE NAME: MTFAP100.DAT
  TIME/DATE OF STUDY: 11:41 08/01/2018
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   20.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.60 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  5.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   285.00
  ELEVATION DATA: UPSTREAM(FEET) =     14.10  DOWNSTREAM(FEET) =     12.54

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.786
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.211
```

```
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  CONDOMINIUMS               C        1.36      0.25     0.350    86    9.79
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA RUNOFF(CFS) =      5.05
  TOTAL AREA(ACRES) =      1.36   PEAK FLOW RATE(CFS) =      5.05

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     20.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.79
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.211
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.13      0.25     0.350    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.13      SUBAREA RUNOFF(CFS) =    0.48
  EFFECTIVE AREA(ACRES) =      1.49   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        1.5       PEAK FLOW RATE(CFS) =       5.53

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   12.54  DOWNSTREAM ELEVATION(FEET) =   10.70
  STREET LENGTH(FEET) =   140.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

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

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  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 =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.81
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.33
    HALFSTREET FLOOD WIDTH(FEET) =   10.04
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.58
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.84
  STREET FLOW TRAVEL TIME(MIN.) =   0.90   Tc(MIN.) =   10.69
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.003
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.16      0.25     0.350    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
```

```
  SUBAREA AREA(ACRES) =    0.16      SUBAREA RUNOFF(CFS) =    0.56
  EFFECTIVE AREA(ACRES) =      1.65    AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        1.6        PEAK FLOW RATE(CFS) =       5.81

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) =  10.04
  FLOW VELOCITY(FEET/SEC.) =  2.58   DEPTH*VELOCITY(FT*FT/SEC.) =   0.84
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     30.00 =     425.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     30.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.69
  RAINFALL INTENSITY(INCH/HR) =   4.00
  AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.35
  EFFECTIVE STREAM AREA(ACRES) =       1.65
  TOTAL STREAM AREA(ACRES) =       1.65
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       5.81

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     50.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   310.00
  ELEVATION DATA: UPSTREAM(FEET) =     14.10  DOWNSTREAM(FEET) =     11.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.971
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.426
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  CONDOMINIUMS               C        1.06      0.25     0.350    86    8.97
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA RUNOFF(CFS) =      4.14
  TOTAL AREA(ACRES) =      1.06   PEAK FLOW RATE(CFS) =      4.14

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     30.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.97
  RAINFALL INTENSITY(INCH/HR) =   4.43
  AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.35
```

```
  EFFECTIVE STREAM AREA(ACRES) =       1.06
  TOTAL STREAM AREA(ACRES) =       1.06
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.14

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        5.81   10.69    4.003  0.25( 0.09) 0.35       1.6      10.00
      2        4.14    8.97    4.426  0.25( 0.09) 0.35       1.1      40.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        9.55    8.97    4.426  0.25( 0.09) 0.35       2.4      40.00
      2        9.55   10.69    4.003  0.25( 0.09) 0.35       2.7      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       9.55    Tc(MIN.) =    10.69
  EFFECTIVE AREA(ACRES) =       2.71   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        2.7
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     30.00 =     425.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     60.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   10.70  DOWNSTREAM ELEVATION(FEET) =    9.80
  STREET LENGTH(FEET) =   145.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

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

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  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 =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      10.17
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.42
    HALFSTREET FLOOD WIDTH(FEET) =   14.73
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.22
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.94
  STREET FLOW TRAVEL TIME(MIN.) =   1.09   Tc(MIN.) =   11.78
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.787
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.37      0.25     0.350    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.37      SUBAREA RUNOFF(CFS) =    1.23
```

```
  EFFECTIVE AREA(ACRES) =      3.08    AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        3.1        PEAK FLOW RATE(CFS) =      10.26

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.42   HALFSTREET FLOOD WIDTH(FEET) =  14.80
  FLOW VELOCITY(FEET/SEC.) =  2.22   DEPTH*VELOCITY(FT*FT/SEC.) =   0.94

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       10.28   10.06    4.144  0.25( 0.09) 0.35       2.8      40.00
      2       10.26   11.78    3.787  0.25( 0.09) 0.35       3.1      10.00
  NEW PEAK FLOW DATA ARE:
  PEAK FLOW RATE(CFS) =      10.28  Tc(MIN.) =   10.06
  AREA-AVERAGED Fm(INCH/HR) =  0.09  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.35  EFFECTIVE AREA(ACRES) =       2.81
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     60.00 =     570.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     60.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.06
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.144
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        1.13      0.25     0.350    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    1.13      SUBAREA RUNOFF(CFS) =    4.13
  EFFECTIVE AREA(ACRES) =      3.94   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        4.2       PEAK FLOW RATE(CFS) =      14.40

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     60.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.06
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.144
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.51      0.25     0.350    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.51      SUBAREA RUNOFF(CFS) =    1.86
  EFFECTIVE AREA(ACRES) =      4.45   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        4.7       PEAK FLOW RATE(CFS) =      16.26

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     65.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
```

```
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     6.13  DOWNSTREAM(FEET) =     5.71
  FLOW LENGTH(FEET) =   120.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  20.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.97
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      16.26
  PIPE TRAVEL TIME(MIN.) =   0.40    Tc(MIN.) =   10.47
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     65.00 =     690.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     65.00 TO NODE     65.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
  MAINLINE Tc(MIN.) =   10.47
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.052
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.47      0.25     0.350    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.47      SUBAREA RUNOFF(CFS) =    1.68
  EFFECTIVE AREA(ACRES) =      4.92   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        5.2       PEAK FLOW RATE(CFS) =      17.57

****************************************************************************
  FLOW PROCESS FROM NODE     65.00 TO NODE     70.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     5.71  DOWNSTREAM(FEET) =     5.17
  FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  19.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.09
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      17.57
  PIPE TRAVEL TIME(MIN.) =   0.52    Tc(MIN.) =   10.99
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     70.00 =     850.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     70.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
  MAINLINE Tc(MIN.) =   10.99
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.940
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.42      0.25     0.350    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.42      SUBAREA RUNOFF(CFS) =    1.46
  EFFECTIVE AREA(ACRES) =      5.34   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        5.6       PEAK FLOW RATE(CFS) =      18.53
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     70.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.99
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.940
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        1.04      0.25     0.350    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    1.04      SUBAREA RUNOFF(CFS) =    3.61
  EFFECTIVE AREA(ACRES) =      6.38   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        6.7       PEAK FLOW RATE(CFS) =      22.14

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     70.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.99
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.940
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.34      0.25     0.350    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.34      SUBAREA RUNOFF(CFS) =    1.18
  EFFECTIVE AREA(ACRES) =      6.72   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        7.0       PEAK FLOW RATE(CFS) =      23.32

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     80.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     5.17  DOWNSTREAM(FEET) =     5.02
  FLOW LENGTH(FEET) =    90.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  26.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.14
  ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      23.32
  PIPE TRAVEL TIME(MIN.) =   0.36    Tc(MIN.) =   11.35
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     80.00 =     940.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     80.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.35
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.868
  SUBAREA LOSS RATE DATA(AMC III):
```

```
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.28      0.25     0.350    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.28      SUBAREA RUNOFF(CFS) =    0.95
  EFFECTIVE AREA(ACRES) =      7.00   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        7.3       PEAK FLOW RATE(CFS) =      23.83

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     80.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.35
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.868
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       C        0.73      0.25     0.200    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.73      SUBAREA RUNOFF(CFS) =    2.51
  EFFECTIVE AREA(ACRES) =      7.73   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.34
  TOTAL AREA(ACRES) =        8.0       PEAK FLOW RATE(CFS) =      26.34

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     90.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     5.02  DOWNSTREAM(FEET) =     4.44
  FLOW LENGTH(FEET) =   170.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  24.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.58
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      26.34
  PIPE TRAVEL TIME(MIN.) =   0.51    Tc(MIN.) =   11.86
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     90.00 =    1110.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.86
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.772
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.39      0.25     0.350    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.39      SUBAREA RUNOFF(CFS) =    1.29
  EFFECTIVE AREA(ACRES) =      8.12   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.34
```

```
  TOTAL AREA(ACRES) =        8.4       PEAK FLOW RATE(CFS) =      26.97

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.86
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.772
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.47      0.25     0.350    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.47      SUBAREA RUNOFF(CFS) =    1.56
  EFFECTIVE AREA(ACRES) =      8.59   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.34
  TOTAL AREA(ACRES) =        8.9       PEAK FLOW RATE(CFS) =      28.52

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.86
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.772
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        1.05      0.25     0.350    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    1.05      SUBAREA RUNOFF(CFS) =    3.48
  EFFECTIVE AREA(ACRES) =      9.64   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.34
  TOTAL AREA(ACRES) =        9.9       PEAK FLOW RATE(CFS) =      32.01

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE    100.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     4.44  DOWNSTREAM(FEET) =     3.29
  FLOW LENGTH(FEET) =   340.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  26.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.86
  ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      32.01
  PIPE TRAVEL TIME(MIN.) =   0.97    Tc(MIN.) =   12.83
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    100.00 =    1450.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.83
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.606
```

```
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.39      0.25     0.350    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.39      SUBAREA RUNOFF(CFS) =    1.24
  EFFECTIVE AREA(ACRES) =     10.03   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.34
  TOTAL AREA(ACRES) =       10.3       PEAK FLOW RATE(CFS) =      32.01
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.83
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.606
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        1.00      0.25     0.350    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    1.00      SUBAREA RUNOFF(CFS) =    3.17
  EFFECTIVE AREA(ACRES) =     11.03   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.34
  TOTAL AREA(ACRES) =       11.3       PEAK FLOW RATE(CFS) =      34.97

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.83
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.606
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        1.05      0.25     0.350    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    1.05      SUBAREA RUNOFF(CFS) =    3.33
  EFFECTIVE AREA(ACRES) =     12.08   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.34
  TOTAL AREA(ACRES) =       12.4       PEAK FLOW RATE(CFS) =      38.30

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    105.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     3.29  DOWNSTREAM(FEET) =     2.99
  FLOW LENGTH(FEET) =    88.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  39.0 INCH PIPE IS  27.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.17
  ESTIMATED PIPE DIAMETER(INCH) =  39.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      38.30
```

```
  PIPE TRAVEL TIME(MIN.) =   0.24    Tc(MIN.) =   13.06
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    105.00 =    1538.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   13.06
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.569
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.44      0.25     0.350    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.44      SUBAREA RUNOFF(CFS) =    1.38
  EFFECTIVE AREA(ACRES) =     12.52   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.34
  TOTAL AREA(ACRES) =       12.8       PEAK FLOW RATE(CFS) =      39.26

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    110.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.99  DOWNSTREAM(FEET) =     2.81
  FLOW LENGTH(FEET) =    53.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  39.0 INCH PIPE IS  27.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.19
  ESTIMATED PIPE DIAMETER(INCH) =  39.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      39.26
  PIPE TRAVEL TIME(MIN.) =   0.14    Tc(MIN.) =   13.21
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    110.00 =    1591.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   13.21
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.546
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.64      0.25     0.350    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.64      SUBAREA RUNOFF(CFS) =    1.99
  EFFECTIVE AREA(ACRES) =     13.16   AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.34
  TOTAL AREA(ACRES) =       13.4       PEAK FLOW RATE(CFS) =      41.01

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    120.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =     2.81  DOWNSTREAM(FEET) =     2.47
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  39.0 INCH PIPE IS  28.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.23
  ESTIMATED PIPE DIAMETER(INCH) =  39.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      41.01
  PIPE TRAVEL TIME(MIN.) =   0.27    Tc(MIN.) =   13.47
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    120.00 =    1691.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    120.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    140.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =     17.60  DOWNSTREAM(FEET) =     16.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.978
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.424
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C        1.19      0.25     0.100    86    8.98
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      4.71
  TOTAL AREA(ACRES) =      1.19   PEAK FLOW RATE(CFS) =      4.71

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    140.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    8.98
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.424
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.21      0.25     0.350    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.21      SUBAREA RUNOFF(CFS) =    0.82
  EFFECTIVE AREA(ACRES) =      1.40   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.14
  TOTAL AREA(ACRES) =        1.4       PEAK FLOW RATE(CFS) =       5.53

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    150.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =    10.70  DOWNSTREAM(FEET) =     9.57
  FLOW LENGTH(FEET) =   140.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.33
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.53
  PIPE TRAVEL TIME(MIN.) =   0.44    Tc(MIN.) =    9.42
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    150.00 =     470.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    150.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.42
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.305
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        1.05      0.25     0.100    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.05      SUBAREA RUNOFF(CFS) =    4.04
  EFFECTIVE AREA(ACRES) =      2.45   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.12
  TOTAL AREA(ACRES) =        2.5       PEAK FLOW RATE(CFS) =       9.43

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    150.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.42
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.305
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.60      0.25     0.350    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.60      SUBAREA RUNOFF(CFS) =    2.28
  EFFECTIVE AREA(ACRES) =      3.05   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.17
  TOTAL AREA(ACRES) =        3.1       PEAK FLOW RATE(CFS) =      11.70

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 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) =     9.57  DOWNSTREAM(FEET) =     7.37
  FLOW LENGTH(FEET) =   275.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.30
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.70
  PIPE TRAVEL TIME(MIN.) =   0.73    Tc(MIN.) =   10.14
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    160.00 =     745.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.14
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.126
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        1.39      0.25     0.100    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.39      SUBAREA RUNOFF(CFS) =    5.13
  EFFECTIVE AREA(ACRES) =      4.44   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.15
  TOTAL AREA(ACRES) =        4.4       PEAK FLOW RATE(CFS) =      16.34

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    170.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     7.37  DOWNSTREAM(FEET) =     6.09
  FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.86
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      16.34
  PIPE TRAVEL TIME(MIN.) =   0.39    Tc(MIN.) =   10.53
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    170.00 =     905.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    170.00 TO NODE    170.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.53
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.038
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                C        0.41      0.25     0.850    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =    0.41      SUBAREA RUNOFF(CFS) =    1.41
  EFFECTIVE AREA(ACRES) =      4.85   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.21
  TOTAL AREA(ACRES) =        4.8       PEAK FLOW RATE(CFS) =      17.40

****************************************************************************
  FLOW PROCESS FROM NODE    170.00 TO NODE    180.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     6.09  DOWNSTREAM(FEET) =     4.81
  FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.9 INCHES
```

```
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.92
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      17.40
  PIPE TRAVEL TIME(MIN.) =   0.39    Tc(MIN.) =   10.92
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    180.00 =    1065.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.92
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.955
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.47      0.25     0.350    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.47      SUBAREA RUNOFF(CFS) =    1.64
  EFFECTIVE AREA(ACRES) =      5.32   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.22
  TOTAL AREA(ACRES) =        5.3       PEAK FLOW RATE(CFS) =      18.68

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.92
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.955
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.82      0.25     0.350    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.82      SUBAREA RUNOFF(CFS) =    2.85
  EFFECTIVE AREA(ACRES) =      6.14   AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.24
  TOTAL AREA(ACRES) =        6.1       PEAK FLOW RATE(CFS) =      21.53

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.92
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.955
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.93      0.25     0.350    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.93      SUBAREA RUNOFF(CFS) =    3.24
  EFFECTIVE AREA(ACRES) =      7.07   AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.25
  TOTAL AREA(ACRES) =        7.1       PEAK FLOW RATE(CFS) =      24.77
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    185.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     4.81  DOWNSTREAM(FEET) =     3.73
  FLOW LENGTH(FEET) =   135.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  20.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.52
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      24.77
  PIPE TRAVEL TIME(MIN.) =   0.30    Tc(MIN.) =   11.22
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    185.00 =    1200.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    185.00 TO NODE    185.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.22
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.894
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        1.15      0.25     0.350    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    1.15      SUBAREA RUNOFF(CFS) =    3.94
  EFFECTIVE AREA(ACRES) =      8.22   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.26
  TOTAL AREA(ACRES) =        8.2       PEAK FLOW RATE(CFS) =      28.32

****************************************************************************
  FLOW PROCESS FROM NODE    185.00 TO NODE    190.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     3.73  DOWNSTREAM(FEET) =     2.81
  FLOW LENGTH(FEET) =   115.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  20.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.90
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      28.32
  PIPE TRAVEL TIME(MIN.) =   0.24    Tc(MIN.) =   11.46
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    190.00 =    1315.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    190.00 TO NODE    190.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.46
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.847
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.51      0.25     0.350    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
```

```
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.51      SUBAREA RUNOFF(CFS) =    1.73
  EFFECTIVE AREA(ACRES) =      8.73   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.27
  TOTAL AREA(ACRES) =        8.7       PEAK FLOW RATE(CFS) =      29.70

****************************************************************************
  FLOW PROCESS FROM NODE    190.00 TO NODE    120.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.81  DOWNSTREAM(FEET) =     2.47
  FLOW LENGTH(FEET) =    10.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.83
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      29.70
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =   11.47
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    120.00 =    1325.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    120.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       29.70   11.47    3.845  0.25( 0.07) 0.27       8.7     130.00
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    120.00 =    1325.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       41.01   13.47    3.506  0.25( 0.09) 0.34      13.2      40.00
      2       38.87   15.24    3.268  0.25( 0.09) 0.34      13.4      10.00
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    120.00 =    1691.00 FEET.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       68.06   11.47    3.845  0.25( 0.08) 0.31      19.9     130.00
      2       68.04   13.47    3.506  0.25( 0.08) 0.31      21.9      40.00
      3       64.03   15.24    3.268  0.25( 0.08) 0.31      22.2      10.00
    TOTAL AREA(ACRES) =        22.2

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       68.06  Tc(MIN.) =   11.471
  EFFECTIVE AREA(ACRES) =     19.94  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.31
  TOTAL AREA(ACRES) =       22.2
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    120.00 =    1691.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    210.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
```

```
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.47  DOWNSTREAM(FEET) =     1.84
  FLOW LENGTH(FEET) =   185.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  48.0 INCH PIPE IS  34.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.11
  ESTIMATED PIPE DIAMETER(INCH) =  48.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      68.06
  PIPE TRAVEL TIME(MIN.) =   0.43    Tc(MIN.) =   11.90
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    210.00 =    1876.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    210.00 IS CODE =  82
----------------------------------------------------------------------------
  >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
  >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   530.00
  ELEVATION DATA: UPSTREAM(FEET) =     12.00  DOWNSTREAM(FEET) =      9.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   12.921
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.591
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  CONDOMINIUMS               C        0.60      0.25     0.350    86   12.92
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.60   INITIAL SUBAREA RUNOFF(CFS) =    1.89

  ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
  MAINLINE Tc(MIN.) =   11.90
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.764
  SUBAREA AREA(ACRES) =    0.60      SUBAREA RUNOFF(CFS) =    1.99
  EFFECTIVE AREA(ACRES) =     20.54   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.31
  TOTAL AREA(ACRES) =       22.8       PEAK FLOW RATE(CFS) =      68.13

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    210.00 IS CODE =  82
----------------------------------------------------------------------------
  >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
  >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   440.00
  ELEVATION DATA: UPSTREAM(FEET) =     12.00  DOWNSTREAM(FEET) =      9.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.555
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.829
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  CONDOMINIUMS               C        0.51      0.25     0.350    86   11.56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.51   INITIAL SUBAREA RUNOFF(CFS) =    1.72

  ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
  MAINLINE Tc(MIN.) =   11.90
```

```
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.764
  SUBAREA AREA(ACRES) =    0.51      SUBAREA RUNOFF(CFS) =    1.69
  EFFECTIVE AREA(ACRES) =     21.05   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.31
  TOTAL AREA(ACRES) =       23.3       PEAK FLOW RATE(CFS) =      69.82

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    220.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.25  DOWNSTREAM(FEET) =     2.00
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  51.0 INCH PIPE IS  36.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.36
  ESTIMATED PIPE DIAMETER(INCH) =  51.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      69.82
  PIPE TRAVEL TIME(MIN.) =   0.26    Tc(MIN.) =   12.17
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    220.00 =    1976.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       23.3  TC(MIN.) =     12.17
  EFFECTIVE AREA(ACRES) =     21.05  AREA-AVERAGED Fm(INCH/HR)=  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.312
  PEAK FLOW RATE(CFS)   =      69.82

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       69.82   12.17    3.717  0.25( 0.08) 0.31      21.0     130.00
      2       69.65   14.17    3.406  0.25( 0.08) 0.31      23.0      40.00
      3       65.66   15.95    3.183  0.25( 0.08) 0.32      23.3      10.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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                          Analysis prepared by:

                             Fuscoe Engineering
                        16795 Vona Karman Suite 100
                                 Irvine CA
                                   92606

 ************************** DESCRIPTION OF STUDY **************************
* MAGNOLIA TANK FARMS                                                      *
* PROPOSED 2 YEAR HYDROLOGY - AREA B                                       *
* OUTPUT: MTFBP2 INPUT: MTFBP2                                             *
 ***************************************************************************

  FILE NAME: MTFBP2.DAT
  TIME/DATE OF STUDY: 12:43 01/15/2018
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   20.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.60 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  5.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

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

```
  FLOW PROCESS FROM NODE    310.00 TO NODE    320.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   140.00
  ELEVATION DATA: UPSTREAM(FEET) =     10.00  DOWNSTREAM(FEET) =      7.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.520
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.791
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  PUBLIC PARK                C        0.16      0.25     0.850    50    7.52
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA RUNOFF(CFS) =      0.23
  TOTAL AREA(ACRES) =      0.16   PEAK FLOW RATE(CFS) =      0.23

****************************************************************************
  FLOW PROCESS FROM NODE    320.00 TO NODE    330.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     6.21  DOWNSTREAM(FEET) =     5.95
  FLOW LENGTH(FEET) =    88.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   4.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   1.63
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.23
  PIPE TRAVEL TIME(MIN.) =   0.90    Tc(MIN.) =    8.42
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    330.00 =     228.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    330.00 TO NODE    330.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    8.42
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.679
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.18      0.25     0.350    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.18      SUBAREA RUNOFF(CFS) =    0.26
```

```
  EFFECTIVE AREA(ACRES) =      0.34   AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.59
  TOTAL AREA(ACRES) =        0.3       PEAK FLOW RATE(CFS) =       0.47

****************************************************************************
  FLOW PROCESS FROM NODE    330.00 TO NODE    340.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     5.95  DOWNSTREAM(FEET) =     5.55
  FLOW LENGTH(FEET) =   132.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   1.98
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.47
  PIPE TRAVEL TIME(MIN.) =   1.11    Tc(MIN.) =    9.53
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    340.00 =     360.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    340.00 TO NODE    340.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.53
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.563
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                C        0.35      0.25     0.850    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =    0.35      SUBAREA RUNOFF(CFS) =    0.43
  EFFECTIVE AREA(ACRES) =      0.69   AREA-AVERAGED Fm(INCH/HR) =  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.72
  TOTAL AREA(ACRES) =        0.7       PEAK FLOW RATE(CFS) =       0.86

****************************************************************************
  FLOW PROCESS FROM NODE    340.00 TO NODE    350.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     5.55  DOWNSTREAM(FEET) =     4.63
  FLOW LENGTH(FEET) =   306.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   7.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.23
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.86
```

```
  PIPE TRAVEL TIME(MIN.) =   2.29    Tc(MIN.) =   11.82
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    350.00 =     666.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    350.00 TO NODE    350.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.82
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.381
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                C        0.55      0.25     0.850    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =    0.55      SUBAREA RUNOFF(CFS) =    0.58
  EFFECTIVE AREA(ACRES) =      1.24   AREA-AVERAGED Fm(INCH/HR) =  0.19
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.78
  TOTAL AREA(ACRES) =        1.2       PEAK FLOW RATE(CFS) =       1.32

****************************************************************************
  FLOW PROCESS FROM NODE    350.00 TO NODE    360.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     4.63  DOWNSTREAM(FEET) =     3.80
  FLOW LENGTH(FEET) =   276.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.57
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.32
  PIPE TRAVEL TIME(MIN.) =   1.79    Tc(MIN.) =   13.61
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    360.00 =     942.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    360.00 TO NODE    360.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   13.61
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.274
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                C        0.25      0.25     0.850    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
```

```
  SUBAREA AREA(ACRES) =    0.25      SUBAREA RUNOFF(CFS) =    0.24
  EFFECTIVE AREA(ACRES) =      1.49   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.79
  TOTAL AREA(ACRES) =        1.5       PEAK FLOW RATE(CFS) =       1.44

****************************************************************************
  FLOW PROCESS FROM NODE    360.00 TO NODE    370.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     3.80  DOWNSTREAM(FEET) =     2.98
  FLOW LENGTH(FEET) =   265.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.63
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.44
  PIPE TRAVEL TIME(MIN.) =   1.68    Tc(MIN.) =   15.29
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    370.00 =    1207.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    370.00 TO NODE    370.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   15.29
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.192
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                C        0.87      0.25     0.850    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =    0.87      SUBAREA RUNOFF(CFS) =    0.77
  EFFECTIVE AREA(ACRES) =      2.36   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.81
  TOTAL AREA(ACRES) =        2.4       PEAK FLOW RATE(CFS) =       2.10

****************************************************************************
  FLOW PROCESS FROM NODE    370.00 TO NODE    380.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.98  DOWNSTREAM(FEET) =     2.58
  FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   9.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.69
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
```

```
  PIPE-FLOW(CFS) =       2.10
  PIPE TRAVEL TIME(MIN.) =   0.99    Tc(MIN.) =   16.28
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    380.00 =    1367.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    380.00 TO NODE    380.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   16.28
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.150
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.28      0.25     0.350    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.28      SUBAREA RUNOFF(CFS) =    0.27
  EFFECTIVE AREA(ACRES) =      2.64   AREA-AVERAGED Fm(INCH/HR) =  0.19
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.76
  TOTAL AREA(ACRES) =        2.6       PEAK FLOW RATE(CFS) =       2.28

****************************************************************************
  FLOW PROCESS FROM NODE    380.00 TO NODE    390.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.58  DOWNSTREAM(FEET) =     2.55
  FLOW LENGTH(FEET) =    20.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  11.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.21
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.28
  PIPE TRAVEL TIME(MIN.) =   0.15    Tc(MIN.) =   16.43
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    390.00 =    1387.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    390.00 TO NODE    390.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   16.43
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.144
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                C        0.36      0.25     0.850    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
```

```
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =    0.36      SUBAREA RUNOFF(CFS) =    0.30
  EFFECTIVE AREA(ACRES) =      3.00   AREA-AVERAGED Fm(INCH/HR) =  0.19
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.77
  TOTAL AREA(ACRES) =        3.0       PEAK FLOW RATE(CFS) =       2.57

****************************************************************************
  FLOW PROCESS FROM NODE    390.00 TO NODE    400.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.55  DOWNSTREAM(FEET) =     1.50
  FLOW LENGTH(FEET) =   350.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   9.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.02
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.57
  PIPE TRAVEL TIME(MIN.) =   1.93    Tc(MIN.) =   18.36
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    400.00 =    1737.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        3.0  TC(MIN.) =     18.36
  EFFECTIVE AREA(ACRES) =      3.00  AREA-AVERAGED Fm(INCH/HR)=  0.19
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.773
  PEAK FLOW RATE(CFS)   =       2.57
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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             Ver. 23.0  Release Date: 07/01/2016  License ID 1355

                          Analysis prepared by:

                              Fuscoe Engineering
                        16795 Vona Karman Suite 100
                                 Irvine CA
                                   92606

 ************************** DESCRIPTION OF STUDY **************************
* MAGNOLIA TANK FARMS                                                      *
* PROPOSED 25 YEAR HYDROLOGY - AREA B                                      *
* OUTPUT: MTFBP25 INPUT:MTFBP25                                            *
 ***************************************************************************

  FILE NAME: MTFBP25.DAT
  TIME/DATE OF STUDY: 13:41 01/15/2018
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   20.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.60 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  5.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE    310.00 TO NODE    320.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   140.00
  ELEVATION DATA: UPSTREAM(FEET) =     10.00  DOWNSTREAM(FEET) =      7.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.520
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.829
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  PUBLIC PARK                C        0.16      0.25     0.850    69    7.52
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA RUNOFF(CFS) =      0.52
  TOTAL AREA(ACRES) =      0.16   PEAK FLOW RATE(CFS) =      0.52

****************************************************************************
  FLOW PROCESS FROM NODE    320.00 TO NODE    330.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     6.21  DOWNSTREAM(FEET) =     5.95
  FLOW LENGTH(FEET) =    88.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   5.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.03
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.52
  PIPE TRAVEL TIME(MIN.) =   0.72    Tc(MIN.) =    8.24
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    330.00 =     228.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    330.00 TO NODE    330.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    8.24
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.635
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.18      0.25     0.350    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.18      SUBAREA RUNOFF(CFS) =    0.57
  EFFECTIVE AREA(ACRES) =      0.34   AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.59
  TOTAL AREA(ACRES) =        0.3       PEAK FLOW RATE(CFS) =       1.07

****************************************************************************
  FLOW PROCESS FROM NODE    330.00 TO NODE    340.00 IS CODE =  31
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     5.95  DOWNSTREAM(FEET) =     5.55
  FLOW LENGTH(FEET) =   132.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.46
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.07
  PIPE TRAVEL TIME(MIN.) =   0.89    Tc(MIN.) =    9.14
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    340.00 =     360.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    340.00 TO NODE    340.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.14
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.429
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                C        0.35      0.25     0.850    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =    0.35      SUBAREA RUNOFF(CFS) =    1.01
  EFFECTIVE AREA(ACRES) =      0.69   AREA-AVERAGED Fm(INCH/HR) =  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.72
  TOTAL AREA(ACRES) =        0.7       PEAK FLOW RATE(CFS) =       2.02

****************************************************************************
  FLOW PROCESS FROM NODE    340.00 TO NODE    350.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     5.55  DOWNSTREAM(FEET) =     4.63
  FLOW LENGTH(FEET) =   306.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.86
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.02
  PIPE TRAVEL TIME(MIN.) =   1.78    Tc(MIN.) =   10.92
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    350.00 =     666.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    350.00 TO NODE    350.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.92
```

```
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.100
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                C        0.55      0.25     0.850    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =    0.55      SUBAREA RUNOFF(CFS) =    1.43
  EFFECTIVE AREA(ACRES) =      1.24   AREA-AVERAGED Fm(INCH/HR) =  0.19
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.78
  TOTAL AREA(ACRES) =        1.2       PEAK FLOW RATE(CFS) =       3.24

****************************************************************************
  FLOW PROCESS FROM NODE    350.00 TO NODE    360.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     4.63  DOWNSTREAM(FEET) =     3.80
  FLOW LENGTH(FEET) =   276.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  11.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.12
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.24
  PIPE TRAVEL TIME(MIN.) =   1.47    Tc(MIN.) =   12.40
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    360.00 =     942.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    360.00 TO NODE    360.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.40
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.885
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                C        0.25      0.25     0.850    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =    0.25      SUBAREA RUNOFF(CFS) =    0.60
  EFFECTIVE AREA(ACRES) =      1.49   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.79
  TOTAL AREA(ACRES) =        1.5       PEAK FLOW RATE(CFS) =       3.60

****************************************************************************
  FLOW PROCESS FROM NODE    360.00 TO NODE    370.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     3.80  DOWNSTREAM(FEET) =     2.98
```

```
  FLOW LENGTH(FEET) =   265.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.34
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.60
  PIPE TRAVEL TIME(MIN.) =   1.32    Tc(MIN.) =   13.72
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    370.00 =    1207.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    370.00 TO NODE    370.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   13.72
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.724
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                C        0.87      0.25     0.850    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =    0.87      SUBAREA RUNOFF(CFS) =    1.97
  EFFECTIVE AREA(ACRES) =      2.36   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.81
  TOTAL AREA(ACRES) =        2.4       PEAK FLOW RATE(CFS) =       5.36

****************************************************************************
  FLOW PROCESS FROM NODE    370.00 TO NODE    380.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.98  DOWNSTREAM(FEET) =     2.58
  FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.39
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.36
  PIPE TRAVEL TIME(MIN.) =   0.79    Tc(MIN.) =   14.50
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    380.00 =    1367.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    380.00 TO NODE    380.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   14.50
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.640
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.28      0.25     0.350    69
```

```
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.28      SUBAREA RUNOFF(CFS) =    0.64
  EFFECTIVE AREA(ACRES) =      2.64   AREA-AVERAGED Fm(INCH/HR) =  0.19
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.76
  TOTAL AREA(ACRES) =        2.6       PEAK FLOW RATE(CFS) =       5.82

****************************************************************************
  FLOW PROCESS FROM NODE    380.00 TO NODE    390.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.58  DOWNSTREAM(FEET) =     2.55
  FLOW LENGTH(FEET) =    20.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  17.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.76
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.82
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =   14.63
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    390.00 =    1387.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    390.00 TO NODE    390.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   14.63
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.628
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                C        0.36      0.25     0.850    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =    0.36      SUBAREA RUNOFF(CFS) =    0.78
  EFFECTIVE AREA(ACRES) =      3.00   AREA-AVERAGED Fm(INCH/HR) =  0.19
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.77
  TOTAL AREA(ACRES) =        3.0       PEAK FLOW RATE(CFS) =       6.57

****************************************************************************
  FLOW PROCESS FROM NODE    390.00 TO NODE    400.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.55  DOWNSTREAM(FEET) =     1.50
  FLOW LENGTH(FEET) =   350.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.80
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.57
```

```
  PIPE TRAVEL TIME(MIN.) =   1.53    Tc(MIN.) =   16.16
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    400.00 =    1737.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        3.0  TC(MIN.) =     16.16
  EFFECTIVE AREA(ACRES) =      3.00  AREA-AVERAGED Fm(INCH/HR)=  0.19
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.773
  PEAK FLOW RATE(CFS)   =       6.57
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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                          Analysis prepared by:

                              Fuscoe Engineering
                        16795 Vona Karman Suite 100
                                 Irvine CA
                                   92606

 ************************** DESCRIPTION OF STUDY **************************
* MAGNOLIA TANK FARMS                                                      *
* PROPOSED 100 YEAR HYDROLOGY - AREA B                                     *
* OUTPUT: MTFBP100 INPUT: MTFBP100                                         *
 ***************************************************************************

  FILE NAME: MTFBP100.DAT
  TIME/DATE OF STUDY: 13:52 01/15/2018
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   20.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.60 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  5.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE    310.00 TO NODE    320.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   140.00
  ELEVATION DATA: UPSTREAM(FEET) =     10.00  DOWNSTREAM(FEET) =      7.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.520
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.897
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  PUBLIC PARK                C        0.16      0.25     0.850    86    7.52
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA RUNOFF(CFS) =      0.67
  TOTAL AREA(ACRES) =      0.16   PEAK FLOW RATE(CFS) =      0.67

****************************************************************************
  FLOW PROCESS FROM NODE    320.00 TO NODE    330.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     6.21  DOWNSTREAM(FEET) =     5.95
  FLOW LENGTH(FEET) =    88.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   6.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.14
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.67
  PIPE TRAVEL TIME(MIN.) =   0.68    Tc(MIN.) =    8.20
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    330.00 =     228.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    330.00 TO NODE    330.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    8.20
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.659
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.18      0.25     0.350    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.18      SUBAREA RUNOFF(CFS) =    0.74
  EFFECTIVE AREA(ACRES) =      0.34   AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.59
  TOTAL AREA(ACRES) =        0.3       PEAK FLOW RATE(CFS) =       1.38

****************************************************************************
  FLOW PROCESS FROM NODE    330.00 TO NODE    340.00 IS CODE =  31
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     5.95  DOWNSTREAM(FEET) =     5.55
  FLOW LENGTH(FEET) =   132.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.59
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.38
  PIPE TRAVEL TIME(MIN.) =   0.85    Tc(MIN.) =    9.05
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    340.00 =     360.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    340.00 TO NODE    340.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.05
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.403
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                C        0.35      0.25     0.850    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =    0.35      SUBAREA RUNOFF(CFS) =    1.32
  EFFECTIVE AREA(ACRES) =      0.69   AREA-AVERAGED Fm(INCH/HR) =  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.72
  TOTAL AREA(ACRES) =        0.7       PEAK FLOW RATE(CFS) =       2.62

****************************************************************************
  FLOW PROCESS FROM NODE    340.00 TO NODE    350.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     5.55  DOWNSTREAM(FEET) =     4.63
  FLOW LENGTH(FEET) =   306.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.03
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.62
  PIPE TRAVEL TIME(MIN.) =   1.68    Tc(MIN.) =   10.74
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    350.00 =     666.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    350.00 TO NODE    350.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.74
```

```
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.993
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                C        0.55      0.25     0.850    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =    0.55      SUBAREA RUNOFF(CFS) =    1.87
  EFFECTIVE AREA(ACRES) =      1.24   AREA-AVERAGED Fm(INCH/HR) =  0.19
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.78
  TOTAL AREA(ACRES) =        1.2       PEAK FLOW RATE(CFS) =       4.24

****************************************************************************
  FLOW PROCESS FROM NODE    350.00 TO NODE    360.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     4.63  DOWNSTREAM(FEET) =     3.80
  FLOW LENGTH(FEET) =   276.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.42
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.24
  PIPE TRAVEL TIME(MIN.) =   1.35    Tc(MIN.) =   12.08
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    360.00 =     942.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    360.00 TO NODE    360.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.08
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.732
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                C        0.25      0.25     0.850    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =    0.25      SUBAREA RUNOFF(CFS) =    0.79
  EFFECTIVE AREA(ACRES) =      1.49   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.79
  TOTAL AREA(ACRES) =        1.5       PEAK FLOW RATE(CFS) =       4.74

****************************************************************************
  FLOW PROCESS FROM NODE    360.00 TO NODE    370.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     3.80  DOWNSTREAM(FEET) =     2.98
```

```
  FLOW LENGTH(FEET) =   265.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.52
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.74
  PIPE TRAVEL TIME(MIN.) =   1.25    Tc(MIN.) =   13.34
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    370.00 =    1207.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    370.00 TO NODE    370.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   13.34
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.527
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                C        0.87      0.25     0.850    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =    0.87      SUBAREA RUNOFF(CFS) =    2.60
  EFFECTIVE AREA(ACRES) =      2.36   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.81
  TOTAL AREA(ACRES) =        2.4       PEAK FLOW RATE(CFS) =       7.06

****************************************************************************
  FLOW PROCESS FROM NODE    370.00 TO NODE    380.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.98  DOWNSTREAM(FEET) =     2.58
  FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  16.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.55
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.06
  PIPE TRAVEL TIME(MIN.) =   0.75    Tc(MIN.) =   14.09
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    380.00 =    1367.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    380.00 TO NODE    380.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   14.09
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.418
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        0.28      0.25     0.350    86
```

```
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.28      SUBAREA RUNOFF(CFS) =    0.84
  EFFECTIVE AREA(ACRES) =      2.64   AREA-AVERAGED Fm(INCH/HR) =  0.19
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.76
  TOTAL AREA(ACRES) =        2.6       PEAK FLOW RATE(CFS) =       7.67

****************************************************************************
  FLOW PROCESS FROM NODE    380.00 TO NODE    390.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.58  DOWNSTREAM(FEET) =     2.55
  FLOW LENGTH(FEET) =    20.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  18.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.00
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.67
  PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =   14.20
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    390.00 =    1387.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    390.00 TO NODE    390.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   14.20
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.402
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                C        0.36      0.25     0.850    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =    0.36      SUBAREA RUNOFF(CFS) =    1.03
  EFFECTIVE AREA(ACRES) =      3.00   AREA-AVERAGED Fm(INCH/HR) =  0.19
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.77
  TOTAL AREA(ACRES) =        3.0       PEAK FLOW RATE(CFS) =       8.66

****************************************************************************
  FLOW PROCESS FROM NODE    390.00 TO NODE    400.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.55  DOWNSTREAM(FEET) =     1.50
  FLOW LENGTH(FEET) =   350.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.09
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.66
```

```
                                    MTFBP100
  PIPE TRAVEL TIME(MIN.) =   1.43    Tc(MIN.) =   15.62
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    400.00 =    1737.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        3.0  TC(MIN.) =     15.62
  EFFECTIVE AREA(ACRES) =      3.00  AREA-AVERAGED Fm(INCH/HR)=  0.19
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.773
  PEAK FLOW RATE(CFS)   =       8.66
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
____________________________________________________________________________
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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                           Analysis prepared by:

                              Fuscoe Engineering
                        16795 Von Karman, Suite 100
                                 Irvine
                                CA 92606

 ************************** DESCRIPTION OF STUDY **************************
* MAGNOLIA TANK FARM                                                       *
* PROPOSED 2 YEAR HYDROLOGY - AREA C                                       *
* OUTPUT:MTFCP2.DAT INPUT:MTFCP2.OUT                                       *
 ***************************************************************************

  FILE NAME: MTFCP2.DAT
  TIME/DATE OF STUDY: 18:03 07/26/2018
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   20.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0312 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.60 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  5.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    510.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   120.00
  ELEVATION DATA: UPSTREAM(FEET) =      6.00  DOWNSTREAM(FEET) =      5.65

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   15.399
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.187
```

```
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"                C        2.70      0.25     1.000    59   15.40
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      2.28
  TOTAL AREA(ACRES) =      2.70   PEAK FLOW RATE(CFS) =      2.28
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        2.7  TC(MIN.) =     15.40
  EFFECTIVE AREA(ACRES) =      2.70  AREA-AVERAGED Fm(INCH/HR)=  0.25
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =       2.28
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
____________________________________________________________________________
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                           Analysis prepared by:

                              Fuscoe Engineering
                        16795 Von Karman, Suite 100
                                 Irvine
                                CA 92606

 ************************** DESCRIPTION OF STUDY **************************
* MAGNOLIA TANK FARM                                                       *
* PROPOSED 25 YEAR HYDROLOGY - AREA C                                      *
* OUTPUT:MTFCP25.DAT INPUT:MTFCP25.OUT                                     *
 ***************************************************************************

  FILE NAME: MTFCP25.DAT
  TIME/DATE OF STUDY: 18:22 07/26/2018
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   20.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0312 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.60 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  5.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    510.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   120.00
  ELEVATION DATA: UPSTREAM(FEET) =      6.00  DOWNSTREAM(FEET) =      5.65

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   15.399
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.552
```

```
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"                C        2.70      0.25     1.000    77   15.40
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      5.59
  TOTAL AREA(ACRES) =      2.70   PEAK FLOW RATE(CFS) =      5.59
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        2.7  TC(MIN.) =     15.40
  EFFECTIVE AREA(ACRES) =      2.70  AREA-AVERAGED Fm(INCH/HR)=  0.25
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =       5.59
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
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                           Analysis prepared by:

                              Fuscoe Engineering
                         16795 Von Karman, Suite 100
                                  Irvine
                                 CA 92606

 ************************** DESCRIPTION OF STUDY **************************
* MAGNOLIA TANK FARM                                                       *
* PROPOSED 100 YEAR HYDROLOGY - AREA C                                     *
* OUTPUT:MTFCP100.DAT INPUT:MTFCP100.OUT                                   *
 ***************************************************************************

  FILE NAME: MTFCP100.DAT
  TIME/DATE OF STUDY: 18:27 07/26/2018
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   20.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0312 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.60 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  5.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    510.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   120.00
  ELEVATION DATA: UPSTREAM(FEET) =      6.00  DOWNSTREAM(FEET) =      5.65

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   15.399
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.248
```

```
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"                C        2.70      0.25     1.000    92   15.40
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      7.28
  TOTAL AREA(ACRES) =      2.70   PEAK FLOW RATE(CFS) =      7.28
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        2.7  TC(MIN.) =     15.40
  EFFECTIVE AREA(ACRES) =      2.70  AREA-AVERAGED Fm(INCH/HR)=  0.25
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =       7.28
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
____________________________________________________________________________
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                           Analysis prepared by:

                              Fuscoe Engineering
                        16795 Von Karman, Suite 100
                                 Irvine
                                CA 92606

 ************************** DESCRIPTION OF STUDY **************************
* Magnolia Tank Farms - Commercial                                         *
* Proposed 2 year Hydrology - Area A                                       *
* OUTPUT:MTFAPC2.OUT INPUT:MTFAPC2.DAT                                     *
 ***************************************************************************

  FILE NAME: MTFAPC2.DAT
  TIME/DATE OF STUDY: 17:41 07/26/2018
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   20.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0312 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.60 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  5.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   285.00
  ELEVATION DATA: UPSTREAM(FEET) =     14.10  DOWNSTREAM(FEET) =     12.54

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.807
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.636
```

```
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        1.36      0.25     0.200    50    8.81
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.94
  TOTAL AREA(ACRES) =      1.36   PEAK FLOW RATE(CFS) =      1.94

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     20.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    8.81
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.636
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.13      0.25     0.200    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.13      SUBAREA RUNOFF(CFS) =    0.19
  EFFECTIVE AREA(ACRES) =      1.49   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        1.5       PEAK FLOW RATE(CFS) =       2.13

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   12.54  DOWNSTREAM ELEVATION(FEET) =   10.70
  STREET LENGTH(FEET) =   140.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

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

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  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 =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.23
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.26
    HALFSTREET FLOOD WIDTH(FEET) =    6.45
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.09
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.53
  STREET FLOW TRAVEL TIME(MIN.) =   1.12   Tc(MIN.) =    9.92
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.527
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.16      0.25     0.200    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
```

```
  SUBAREA AREA(ACRES) =    0.16      SUBAREA RUNOFF(CFS) =    0.21
  EFFECTIVE AREA(ACRES) =      1.65    AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        1.6        PEAK FLOW RATE(CFS) =       2.19

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.25   HALFSTREET FLOOD WIDTH(FEET) =   6.38
  FLOW VELOCITY(FEET/SEC.) =  2.09   DEPTH*VELOCITY(FT*FT/SEC.) =   0.53
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     30.00 =     425.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     30.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.92
  RAINFALL INTENSITY(INCH/HR) =   1.53
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       1.65
  TOTAL STREAM AREA(ACRES) =       1.65
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.19

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     50.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   310.00
  ELEVATION DATA: UPSTREAM(FEET) =     14.10  DOWNSTREAM(FEET) =     11.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.074
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.719
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        1.07      0.25     0.200    50    8.07
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.61
  TOTAL AREA(ACRES) =      1.07   PEAK FLOW RATE(CFS) =      1.61

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     30.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.07
  RAINFALL INTENSITY(INCH/HR) =   1.72
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
```

```
  EFFECTIVE STREAM AREA(ACRES) =       1.07
  TOTAL STREAM AREA(ACRES) =       1.07
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.61

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        2.19    9.92    1.527  0.25( 0.05) 0.20       1.6      10.00
      2        1.61    8.07    1.719  0.25( 0.05) 0.20       1.1      40.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        3.62    8.07    1.719  0.25( 0.05) 0.20       2.4      40.00
      2        3.62    9.92    1.527  0.25( 0.05) 0.20       2.7      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       3.62    Tc(MIN.) =     8.07
  EFFECTIVE AREA(ACRES) =       2.41   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        2.7
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     30.00 =     425.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     60.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   10.70  DOWNSTREAM ELEVATION(FEET) =    9.80
  STREET LENGTH(FEET) =   145.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

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

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  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 =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.88
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.32
    HALFSTREET FLOOD WIDTH(FEET) =    9.90
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.77
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.57
  STREET FLOW TRAVEL TIME(MIN.) =   1.37   Tc(MIN.) =    9.44
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.572
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.37      0.25     0.200    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.37      SUBAREA RUNOFF(CFS) =    0.51
```

```
  EFFECTIVE AREA(ACRES) =      2.78    AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        3.1        PEAK FLOW RATE(CFS) =       3.81

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =   9.83
  FLOW VELOCITY(FEET/SEC.) =  1.76   DEPTH*VELOCITY(FT*FT/SEC.) =   0.57
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     60.00 =     570.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     60.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.44
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.572
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        1.13      0.25     0.200    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    1.13      SUBAREA RUNOFF(CFS) =    1.55
  EFFECTIVE AREA(ACRES) =      3.91   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        4.2       PEAK FLOW RATE(CFS) =       5.36

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     60.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.44
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.572
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.51      0.25     0.200    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.51      SUBAREA RUNOFF(CFS) =    0.70
  EFFECTIVE AREA(ACRES) =      4.42   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        4.7       PEAK FLOW RATE(CFS) =       6.06

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     65.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     6.13  DOWNSTREAM(FEET) =     5.71
  FLOW LENGTH(FEET) =   120.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  12.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.98
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.06
  PIPE TRAVEL TIME(MIN.) =   0.50    Tc(MIN.) =    9.95
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     65.00 =     690.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     65.00 TO NODE     65.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.95
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.525
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.47      0.25     0.200    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.47      SUBAREA RUNOFF(CFS) =    0.62
  EFFECTIVE AREA(ACRES) =      4.89   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        5.2       PEAK FLOW RATE(CFS) =       6.50

****************************************************************************
  FLOW PROCESS FROM NODE     65.00 TO NODE     70.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     5.71  DOWNSTREAM(FEET) =     5.17
  FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.98
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.50
  PIPE TRAVEL TIME(MIN.) =   0.67    Tc(MIN.) =   10.62
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     70.00 =     850.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     70.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.62
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.469
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.42      0.25     0.200    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.42      SUBAREA RUNOFF(CFS) =    0.54
  EFFECTIVE AREA(ACRES) =      5.31   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        5.6       PEAK FLOW RATE(CFS) =       6.79

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     70.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.62
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.469
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                C        1.04      0.25     0.200    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    1.04      SUBAREA RUNOFF(CFS) =    1.33
  EFFECTIVE AREA(ACRES) =      6.35   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        6.7       PEAK FLOW RATE(CFS) =       8.11

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     70.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.62
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.469
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                C        0.34      0.25     0.200    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.34      SUBAREA RUNOFF(CFS) =    0.43
  EFFECTIVE AREA(ACRES) =      6.69   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        7.0       PEAK FLOW RATE(CFS) =       8.55

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     80.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     5.17  DOWNSTREAM(FEET) =     5.02
  FLOW LENGTH(FEET) =    90.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  19.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.18
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.55
  PIPE TRAVEL TIME(MIN.) =   0.47    Tc(MIN.) =   11.09
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     80.00 =     940.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     80.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.09
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.433
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                C        0.28      0.25     0.200    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.28      SUBAREA RUNOFF(CFS) =    0.35
  EFFECTIVE AREA(ACRES) =      6.97   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        7.3       PEAK FLOW RATE(CFS) =       8.68
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     80.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.09
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.433
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.73      0.25     0.200    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.73      SUBAREA RUNOFF(CFS) =    0.91
  EFFECTIVE AREA(ACRES) =      7.70   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        8.0       PEAK FLOW RATE(CFS) =       9.59

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     90.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     5.02  DOWNSTREAM(FEET) =     4.44
  FLOW LENGTH(FEET) =   170.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.40
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.59
  PIPE TRAVEL TIME(MIN.) =   0.64    Tc(MIN.) =   11.73
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     90.00 =    1110.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.73
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.387
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.39      0.25     0.200    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.39      SUBAREA RUNOFF(CFS) =    0.47
  EFFECTIVE AREA(ACRES) =      8.09   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        8.4       PEAK FLOW RATE(CFS) =       9.74

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.73
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.387
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.48      0.25     0.200    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.48      SUBAREA RUNOFF(CFS) =    0.58
  EFFECTIVE AREA(ACRES) =      8.57   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        8.9       PEAK FLOW RATE(CFS) =      10.32

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.73
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.387
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        1.05      0.25     0.200    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    1.05      SUBAREA RUNOFF(CFS) =    1.26
  EFFECTIVE AREA(ACRES) =      9.62   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        9.9       PEAK FLOW RATE(CFS) =      11.58

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE    100.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     4.44  DOWNSTREAM(FEET) =     3.29
  FLOW LENGTH(FEET) =   340.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  18.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.51
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.58
  PIPE TRAVEL TIME(MIN.) =   1.26    Tc(MIN.) =   12.99
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    100.00 =    1450.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.99
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.309
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.39      0.25     0.200    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.39      SUBAREA RUNOFF(CFS) =    0.44
  EFFECTIVE AREA(ACRES) =     10.01   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =       10.3       PEAK FLOW RATE(CFS) =      11.58
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.99
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.309
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        1.00      0.25     0.200    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    1.00      SUBAREA RUNOFF(CFS) =    1.13
  EFFECTIVE AREA(ACRES) =     11.01   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =       11.3       PEAK FLOW RATE(CFS) =      12.48

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.99
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.309
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        1.05      0.25     0.200    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    1.05      SUBAREA RUNOFF(CFS) =    1.19
  EFFECTIVE AREA(ACRES) =     12.06   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =       12.4       PEAK FLOW RATE(CFS) =      13.67

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    105.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     3.29  DOWNSTREAM(FEET) =     2.99
  FLOW LENGTH(FEET) =    88.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.79
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.67
  PIPE TRAVEL TIME(MIN.) =   0.31    Tc(MIN.) =   13.29
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    105.00 =    1538.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   13.29
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.291
  SUBAREA LOSS RATE DATA(AMC  I ):
```

```
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.44      0.25     0.200    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.44      SUBAREA RUNOFF(CFS) =    0.49
  EFFECTIVE AREA(ACRES) =     12.50   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =       12.8       PEAK FLOW RATE(CFS) =      13.97

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    110.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.99  DOWNSTREAM(FEET) =     2.81
  FLOW LENGTH(FEET) =    53.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.80
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.97
  PIPE TRAVEL TIME(MIN.) =   0.18    Tc(MIN.) =   13.48
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    110.00 =    1591.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   13.48
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.281
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.64      0.25     0.200    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.64      SUBAREA RUNOFF(CFS) =    0.71
  EFFECTIVE AREA(ACRES) =     13.14   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =       13.5       PEAK FLOW RATE(CFS) =      14.56

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    120.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.81  DOWNSTREAM(FEET) =     2.47
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  19.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.84
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      14.56
  PIPE TRAVEL TIME(MIN.) =   0.34    Tc(MIN.) =   13.82
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    120.00 =    1691.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    120.00 IS CODE =  10
```

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

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    140.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =     17.60  DOWNSTREAM(FEET) =     16.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.568
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.560
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        1.19      0.25     0.200    50    9.57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.62
  TOTAL AREA(ACRES) =      1.19   PEAK FLOW RATE(CFS) =      1.62

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    140.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.57
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.560
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.21      0.25     0.200    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.21      SUBAREA RUNOFF(CFS) =    0.29
  EFFECTIVE AREA(ACRES) =      1.40   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        1.4       PEAK FLOW RATE(CFS) =       1.90

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    150.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    10.70  DOWNSTREAM(FEET) =     9.57
  FLOW LENGTH(FEET) =   140.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.07
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.90
  PIPE TRAVEL TIME(MIN.) =   0.57    Tc(MIN.) =   10.14
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    150.00 =     470.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    150.00 IS CODE =  81
```

```
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.14
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.508
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        1.05      0.25     0.200    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    1.05      SUBAREA RUNOFF(CFS) =    1.38
  EFFECTIVE AREA(ACRES) =      2.45   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        2.5       PEAK FLOW RATE(CFS) =       3.22

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    150.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.14
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.508
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.60      0.25     0.200    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.60      SUBAREA RUNOFF(CFS) =    0.79
  EFFECTIVE AREA(ACRES) =      3.05   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        3.1       PEAK FLOW RATE(CFS) =       4.00

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 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) =     9.57  DOWNSTREAM(FEET) =     7.37
  FLOW LENGTH(FEET) =   275.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   9.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.88
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.00
  PIPE TRAVEL TIME(MIN.) =   0.94    Tc(MIN.) =   11.08
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    160.00 =     745.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.08
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.434
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        1.39      0.25     0.200    50
```

```
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    1.39      SUBAREA RUNOFF(CFS) =    1.73
  EFFECTIVE AREA(ACRES) =      4.44   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        4.4       PEAK FLOW RATE(CFS) =       5.53

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    170.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     7.37  DOWNSTREAM(FEET) =     6.09
  FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.31
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.53
  PIPE TRAVEL TIME(MIN.) =   0.50    Tc(MIN.) =   11.58
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    170.00 =     905.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    170.00 TO NODE    170.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.58
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.398
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.41      0.25     0.200    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.41      SUBAREA RUNOFF(CFS) =    0.50
  EFFECTIVE AREA(ACRES) =      4.85   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        4.8       PEAK FLOW RATE(CFS) =       5.88

****************************************************************************
  FLOW PROCESS FROM NODE    170.00 TO NODE    180.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     6.09  DOWNSTREAM(FEET) =     4.81
  FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.39
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.88
  PIPE TRAVEL TIME(MIN.) =   0.49    Tc(MIN.) =   12.08
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    180.00 =    1065.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
```

```
  MAINLINE Tc(MIN.) =   12.08
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.365
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.47      0.25     0.200    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.47      SUBAREA RUNOFF(CFS) =    0.56
  EFFECTIVE AREA(ACRES) =      5.32   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        5.3       PEAK FLOW RATE(CFS) =       6.29

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.08
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.365
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.82      0.25     0.200    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.82      SUBAREA RUNOFF(CFS) =    0.97
  EFFECTIVE AREA(ACRES) =      6.14   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        6.1       PEAK FLOW RATE(CFS) =       7.26

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.08
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.365
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.93      0.25     0.200    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.93      SUBAREA RUNOFF(CFS) =    1.10
  EFFECTIVE AREA(ACRES) =      7.07   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        7.1       PEAK FLOW RATE(CFS) =       8.36

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    185.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     4.81  DOWNSTREAM(FEET) =     3.73
  FLOW LENGTH(FEET) =   135.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  13.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.73
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
```

```
  PIPE-FLOW(CFS) =       8.36
  PIPE TRAVEL TIME(MIN.) =   0.39    Tc(MIN.) =   12.47
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    185.00 =    1200.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    185.00 TO NODE    185.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.47
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.340
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        1.15      0.25     0.200    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    1.15      SUBAREA RUNOFF(CFS) =    1.33
  EFFECTIVE AREA(ACRES) =      8.22   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        8.2       PEAK FLOW RATE(CFS) =       9.54

****************************************************************************
  FLOW PROCESS FROM NODE    185.00 TO NODE    190.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     3.73  DOWNSTREAM(FEET) =     2.81
  FLOW LENGTH(FEET) =   115.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.07
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.54
  PIPE TRAVEL TIME(MIN.) =   0.32    Tc(MIN.) =   12.79
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    190.00 =    1315.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    190.00 TO NODE    190.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.79
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.321
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.51      0.25     0.200    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.51      SUBAREA RUNOFF(CFS) =    0.58
  EFFECTIVE AREA(ACRES) =      8.73   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        8.7       PEAK FLOW RATE(CFS) =       9.98

****************************************************************************
  FLOW PROCESS FROM NODE    190.00 TO NODE    120.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
```

```
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.81  DOWNSTREAM(FEET) =     2.47
  FLOW LENGTH(FEET) =    10.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  11.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.39
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.98
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =   12.80
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    120.00 =    1325.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    120.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
==============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        9.98   12.80    1.320  0.25( 0.05) 0.20       8.7     130.00
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    120.00 =    1325.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       14.56   13.82    1.263  0.25( 0.05) 0.20      13.1      40.00
      2       13.77   15.74    1.172  0.25( 0.05) 0.20      13.5      10.00
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    120.00 =    1691.00 FEET.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       24.10   12.80    1.320  0.25( 0.05) 0.20      20.9     130.00
      2       24.10   13.82    1.263  0.25( 0.05) 0.20      21.9      40.00
      3       22.59   15.74    1.172  0.25( 0.05) 0.20      22.2      10.00
    TOTAL AREA(ACRES) =        22.2

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       24.10  Tc(MIN.) =   12.802
  EFFECTIVE AREA(ACRES) =     20.90  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =       22.2
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    120.00 =    1691.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    210.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.47  DOWNSTREAM(FEET) =     1.84
  FLOW LENGTH(FEET) =   185.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  22.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.50
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      24.10
  PIPE TRAVEL TIME(MIN.) =   0.56    Tc(MIN.) =   13.36
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    210.00 =    1876.00 FEET.

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

```
  FLOW PROCESS FROM NODE    210.00 TO NODE    210.00 IS CODE =  82
----------------------------------------------------------------------------
  >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
  >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   530.00
  ELEVATION DATA: UPSTREAM(FEET) =     12.00  DOWNSTREAM(FEET) =      9.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.628
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.394
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        0.60      0.25     0.200    50   11.63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.60   INITIAL SUBAREA RUNOFF(CFS) =    0.73

  ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
  MAINLINE Tc(MIN.) =   13.36
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.288
  SUBAREA AREA(ACRES) =    0.60      SUBAREA RUNOFF(CFS) =    0.67
  EFFECTIVE AREA(ACRES) =     21.50   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =       22.8       PEAK FLOW RATE(CFS) =      24.10
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    210.00 IS CODE =  82
----------------------------------------------------------------------------
  >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
  >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   440.00
  ELEVATION DATA: UPSTREAM(FEET) =     12.00  DOWNSTREAM(FEET) =      9.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.400
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.487
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        0.51      0.25     0.200    50   10.40
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.51   INITIAL SUBAREA RUNOFF(CFS) =    0.66

  ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
  MAINLINE Tc(MIN.) =   13.36
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.288
  SUBAREA AREA(ACRES) =    0.51      SUBAREA RUNOFF(CFS) =    0.57
  EFFECTIVE AREA(ACRES) =     22.01   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =       23.3       PEAK FLOW RATE(CFS) =      24.52

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    220.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.25  DOWNSTREAM(FEET) =     2.00
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  26.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.81
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      24.52
  PIPE TRAVEL TIME(MIN.) =   0.35    Tc(MIN.) =   13.71
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    220.00 =    1976.00 FEET.
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       23.3  TC(MIN.) =     13.71
  EFFECTIVE AREA(ACRES) =     22.01  AREA-AVERAGED Fm(INCH/HR)=  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.200
  PEAK FLOW RATE(CFS)   =      24.52

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       24.52   13.71    1.269  0.25( 0.05) 0.20      22.0     130.00
      2       24.50   14.73    1.218  0.25( 0.05) 0.20      23.0      40.00
      3       23.01   16.67    1.134  0.25( 0.05) 0.20      23.3      10.00
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
____________________________________________________________________________
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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                           Analysis prepared by:

                              Fuscoe Engineering
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                                 Irvine
                                CA 92606

 ************************** DESCRIPTION OF STUDY **************************
* Magnolia Tank Farm - Commercial                                          *
* Proposed 25 Year Hydrology - Area A                                      *
* OUTPUT:MTFAPC25.OUT INPUT:MTFAPC25.DAT                                   *
 ***************************************************************************

  FILE NAME: MTFAPC25.DAT
  TIME/DATE OF STUDY: 13:19 08/01/2018
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   20.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0312 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.60 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  5.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   285.00
  ELEVATION DATA: UPSTREAM(FEET) =     14.10  DOWNSTREAM(FEET) =     12.54

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.807
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.501
```

```
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        1.36      0.25     0.200    69    8.81
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      4.22
  TOTAL AREA(ACRES) =      1.36   PEAK FLOW RATE(CFS) =      4.22

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     20.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    8.81
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.501
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.13      0.25     0.200    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.13      SUBAREA RUNOFF(CFS) =    0.40
  EFFECTIVE AREA(ACRES) =      1.49   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        1.5       PEAK FLOW RATE(CFS) =       4.63

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   12.54  DOWNSTREAM ELEVATION(FEET) =   10.70
  STREET LENGTH(FEET) =   140.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

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

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  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 =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.86
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.31
    HALFSTREET FLOOD WIDTH(FEET) =    9.30
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.47
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.77
  STREET FLOW TRAVEL TIME(MIN.) =   0.94   Tc(MIN.) =    9.75
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.305
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.16      0.25     0.200    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
```

```
  SUBAREA AREA(ACRES) =    0.16      SUBAREA RUNOFF(CFS) =    0.47
  EFFECTIVE AREA(ACRES) =      1.65    AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        1.6        PEAK FLOW RATE(CFS) =       4.83

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.31   HALFSTREET FLOOD WIDTH(FEET) =   9.30
  FLOW VELOCITY(FEET/SEC.) =  2.46   DEPTH*VELOCITY(FT*FT/SEC.) =   0.77
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     30.00 =     425.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     30.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.75
  RAINFALL INTENSITY(INCH/HR) =   3.31
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       1.65
  TOTAL STREAM AREA(ACRES) =       1.65
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.83

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     50.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   310.00
  ELEVATION DATA: UPSTREAM(FEET) =     14.10  DOWNSTREAM(FEET) =     11.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.074
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.678
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        1.07      0.25     0.200    69    8.07
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      3.49
  TOTAL AREA(ACRES) =      1.07   PEAK FLOW RATE(CFS) =      3.49

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     30.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.07
  RAINFALL INTENSITY(INCH/HR) =   3.68
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
```

```
  EFFECTIVE STREAM AREA(ACRES) =       1.07
  TOTAL STREAM AREA(ACRES) =       1.07
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.49

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        4.83    9.75    3.305  0.25( 0.05) 0.20       1.6      10.00
      2        3.49    8.07    3.678  0.25( 0.05) 0.20       1.1      40.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        7.95    8.07    3.678  0.25( 0.05) 0.20       2.4      40.00
      2        7.97    9.75    3.305  0.25( 0.05) 0.20       2.7      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       7.97    Tc(MIN.) =     9.75
  EFFECTIVE AREA(ACRES) =       2.72   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        2.7
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     30.00 =     425.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     60.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   10.70  DOWNSTREAM ELEVATION(FEET) =    9.80
  STREET LENGTH(FEET) =   145.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

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

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  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 =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       8.48
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.40
    HALFSTREET FLOOD WIDTH(FEET) =   13.71
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.12
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.85
  STREET FLOW TRAVEL TIME(MIN.) =   1.14   Tc(MIN.) =   10.89
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.105
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.37      0.25     0.200    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.37      SUBAREA RUNOFF(CFS) =    1.02
```

```
  EFFECTIVE AREA(ACRES) =      3.09    AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        3.1        PEAK FLOW RATE(CFS) =       8.50

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.40   HALFSTREET FLOOD WIDTH(FEET) =  13.71
  FLOW VELOCITY(FEET/SEC.) =  2.13   DEPTH*VELOCITY(FT*FT/SEC.) =   0.85
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     60.00 =     570.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     60.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.89
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.105
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        1.13      0.25     0.200    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    1.13      SUBAREA RUNOFF(CFS) =    3.11
  EFFECTIVE AREA(ACRES) =      4.22   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        4.2       PEAK FLOW RATE(CFS) =      11.60

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       11.92    9.21    3.414  0.25( 0.05) 0.20       3.9      40.00
      2       11.60   10.89    3.105  0.25( 0.05) 0.20       4.2      10.00
  NEW PEAK FLOW DATA ARE:
  PEAK FLOW RATE(CFS) =      11.92  Tc(MIN.) =    9.21
  AREA-AVERAGED Fm(INCH/HR) =  0.05  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20  EFFECTIVE AREA(ACRES) =       3.94

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     60.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.21
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.414
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.51      0.25     0.200    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.51      SUBAREA RUNOFF(CFS) =    1.54
  EFFECTIVE AREA(ACRES) =      4.45   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        4.7       PEAK FLOW RATE(CFS) =      13.46

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     65.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
```

```
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     6.13  DOWNSTREAM(FEET) =     5.71
  FLOW LENGTH(FEET) =   120.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  17.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.83
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.46
  PIPE TRAVEL TIME(MIN.) =   0.41    Tc(MIN.) =    9.62
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     65.00 =     690.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     65.00 TO NODE     65.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
  MAINLINE Tc(MIN.) =    9.62
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.330
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.47      0.25     0.200    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.47      SUBAREA RUNOFF(CFS) =    1.39
  EFFECTIVE AREA(ACRES) =      4.92   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        5.2       PEAK FLOW RATE(CFS) =      14.51

****************************************************************************
  FLOW PROCESS FROM NODE     65.00 TO NODE     70.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     5.71  DOWNSTREAM(FEET) =     5.17
  FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  19.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.82
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      14.51
  PIPE TRAVEL TIME(MIN.) =   0.55    Tc(MIN.) =   10.18
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     70.00 =     850.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     70.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
  MAINLINE Tc(MIN.) =   10.18
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.226
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.42      0.25     0.200    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.42      SUBAREA RUNOFF(CFS) =    1.20
  EFFECTIVE AREA(ACRES) =      5.34   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        5.6       PEAK FLOW RATE(CFS) =      15.25
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     70.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.18
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.226
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        1.04      0.25     0.200    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    1.04      SUBAREA RUNOFF(CFS) =    2.97
  EFFECTIVE AREA(ACRES) =      6.38   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        6.7       PEAK FLOW RATE(CFS) =      18.23

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     70.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.18
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.226
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.34      0.25     0.200    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.34      SUBAREA RUNOFF(CFS) =    0.97
  EFFECTIVE AREA(ACRES) =      6.72   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        7.0       PEAK FLOW RATE(CFS) =      19.20

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     80.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     5.17  DOWNSTREAM(FEET) =     5.02
  FLOW LENGTH(FEET) =    90.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  25.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.92
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      19.20
  PIPE TRAVEL TIME(MIN.) =   0.38    Tc(MIN.) =   10.56
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     80.00 =     940.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     80.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.56
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.160
  SUBAREA LOSS RATE DATA(AMC  II):
```

```
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
APARTMENTS                 C        0.28      0.25     0.200    69
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
SUBAREA AREA(ACRES) =    0.28      SUBAREA RUNOFF(CFS) =    0.78
EFFECTIVE AREA(ACRES) =      7.00   AREA-AVERAGED Fm(INCH/HR) =  0.05
AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
TOTAL AREA(ACRES) =        7.3       PEAK FLOW RATE(CFS) =      19.58

****************************************************************************
FLOW PROCESS FROM NODE     80.00 TO NODE     80.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
MAINLINE Tc(MIN.) =   10.56
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.160
SUBAREA LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
APARTMENTS                 C        0.73      0.25     0.200    69
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
SUBAREA AREA(ACRES) =    0.73      SUBAREA RUNOFF(CFS) =    2.04
EFFECTIVE AREA(ACRES) =      7.73   AREA-AVERAGED Fm(INCH/HR) =  0.05
AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
TOTAL AREA(ACRES) =        8.0       PEAK FLOW RATE(CFS) =      21.62

****************************************************************************
FLOW PROCESS FROM NODE     80.00 TO NODE     90.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =     5.02  DOWNSTREAM(FEET) =     4.44
FLOW LENGTH(FEET) =   170.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  30.0 INCH PIPE IS  23.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   5.27
ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =      21.62
PIPE TRAVEL TIME(MIN.) =   0.54    Tc(MIN.) =   11.10
LONGEST FLOWPATH FROM NODE     10.00 TO NODE     90.00 =    1110.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
MAINLINE Tc(MIN.) =   11.10
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.072
SUBAREA LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
APARTMENTS                 C        0.39      0.25     0.200    69
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
SUBAREA AREA(ACRES) =    0.39      SUBAREA RUNOFF(CFS) =    1.06
EFFECTIVE AREA(ACRES) =      8.12   AREA-AVERAGED Fm(INCH/HR) =  0.05
AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
TOTAL AREA(ACRES) =        8.4       PEAK FLOW RATE(CFS) =      22.08
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.10
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.072
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.48      0.25     0.200    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.48      SUBAREA RUNOFF(CFS) =    1.31
  EFFECTIVE AREA(ACRES) =      8.60   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        8.9       PEAK FLOW RATE(CFS) =      23.38

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.10
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.072
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        1.05      0.25     0.200    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    1.05      SUBAREA RUNOFF(CFS) =    2.86
  EFFECTIVE AREA(ACRES) =      9.65   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        9.9       PEAK FLOW RATE(CFS) =      26.24

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE    100.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     4.44  DOWNSTREAM(FEET) =     3.29
  FLOW LENGTH(FEET) =   340.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  24.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.56
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      26.24
  PIPE TRAVEL TIME(MIN.) =   1.02    Tc(MIN.) =   12.12
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    100.00 =    1450.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.12
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.923
  SUBAREA LOSS RATE DATA(AMC  II):
```

```
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
APARTMENTS                 C        0.39      0.25     0.200    69
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
SUBAREA AREA(ACRES) =    0.39      SUBAREA RUNOFF(CFS) =    1.01
EFFECTIVE AREA(ACRES) =     10.04   AREA-AVERAGED Fm(INCH/HR) =  0.05
AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
TOTAL AREA(ACRES) =       10.3       PEAK FLOW RATE(CFS) =      26.24
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
MAINLINE Tc(MIN.) =   12.12
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.923
SUBAREA LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
APARTMENTS                 C        1.00      0.25     0.200    69
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
SUBAREA AREA(ACRES) =    1.00      SUBAREA RUNOFF(CFS) =    2.59
EFFECTIVE AREA(ACRES) =     11.04   AREA-AVERAGED Fm(INCH/HR) =  0.05
AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
TOTAL AREA(ACRES) =       11.3       PEAK FLOW RATE(CFS) =      28.54

****************************************************************************
FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
MAINLINE Tc(MIN.) =   12.12
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.923
SUBAREA LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
APARTMENTS                 C        1.05      0.25     0.200    69
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
SUBAREA AREA(ACRES) =    1.05      SUBAREA RUNOFF(CFS) =    2.71
EFFECTIVE AREA(ACRES) =     12.09   AREA-AVERAGED Fm(INCH/HR) =  0.05
AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
TOTAL AREA(ACRES) =       12.4       PEAK FLOW RATE(CFS) =      31.25

****************************************************************************
FLOW PROCESS FROM NODE    100.00 TO NODE    105.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =     3.29  DOWNSTREAM(FEET) =     2.99
FLOW LENGTH(FEET) =    88.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  36.0 INCH PIPE IS  25.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   5.86
ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =      31.25
PIPE TRAVEL TIME(MIN.) =   0.25    Tc(MIN.) =   12.37
```

```
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    105.00 =    1538.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.37
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.889
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.44      0.25     0.200    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.44      SUBAREA RUNOFF(CFS) =    1.12
  EFFECTIVE AREA(ACRES) =     12.53   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =       12.8       PEAK FLOW RATE(CFS) =      32.01

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    110.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.99  DOWNSTREAM(FEET) =     2.81
  FLOW LENGTH(FEET) =    53.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  25.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.87
  ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      32.01
  PIPE TRAVEL TIME(MIN.) =   0.15    Tc(MIN.) =   12.52
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    110.00 =    1591.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.52
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.870
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.64      0.25     0.200    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.64      SUBAREA RUNOFF(CFS) =    1.62
  EFFECTIVE AREA(ACRES) =     13.17   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =       13.5       PEAK FLOW RATE(CFS) =      33.41

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    120.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.81  DOWNSTREAM(FEET) =     2.47
```

```
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  26.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.91
  ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      33.41
  PIPE TRAVEL TIME(MIN.) =   0.28    Tc(MIN.) =   12.80
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    120.00 =    1691.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    120.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    140.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =     17.60  DOWNSTREAM(FEET) =     16.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.568
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.341
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        1.19      0.25     0.200    69    9.57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      3.52
  TOTAL AREA(ACRES) =      1.19   PEAK FLOW RATE(CFS) =      3.52

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    140.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.57
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.341
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.21      0.25     0.200    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.21      SUBAREA RUNOFF(CFS) =    0.62
  EFFECTIVE AREA(ACRES) =      1.40   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        1.4       PEAK FLOW RATE(CFS) =       4.15

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    150.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    10.70  DOWNSTREAM(FEET) =     9.57
```

```
  FLOW LENGTH(FEET) =   140.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   9.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.93
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.15
  PIPE TRAVEL TIME(MIN.) =   0.47    Tc(MIN.) =   10.04
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    150.00 =     470.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    150.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.04
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.251
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        1.05      0.25     0.200    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    1.05      SUBAREA RUNOFF(CFS) =    3.02
  EFFECTIVE AREA(ACRES) =      2.45   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        2.5       PEAK FLOW RATE(CFS) =       7.06

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    150.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.04
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.251
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.60      0.25     0.200    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.60      SUBAREA RUNOFF(CFS) =    1.73
  EFFECTIVE AREA(ACRES) =      3.05   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        3.1       PEAK FLOW RATE(CFS) =       8.79

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 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) =     9.57  DOWNSTREAM(FEET) =     7.37
  FLOW LENGTH(FEET) =   275.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  14.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.75
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.79
  PIPE TRAVEL TIME(MIN.) =   0.80    Tc(MIN.) =   10.84
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    160.00 =     745.00 FEET.

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

```
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.84
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.113
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        1.39      0.25     0.200    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    1.39      SUBAREA RUNOFF(CFS) =    3.83
  EFFECTIVE AREA(ACRES) =      4.44   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        4.4       PEAK FLOW RATE(CFS) =      12.24

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    170.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     7.37  DOWNSTREAM(FEET) =     6.09
  FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.34
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.24
  PIPE TRAVEL TIME(MIN.) =   0.42    Tc(MIN.) =   11.26
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    170.00 =     905.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    170.00 TO NODE    170.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.26
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.047
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.41      0.25     0.200    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.41      SUBAREA RUNOFF(CFS) =    1.11
  EFFECTIVE AREA(ACRES) =      4.85   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        4.8       PEAK FLOW RATE(CFS) =      13.08

****************************************************************************
  FLOW PROCESS FROM NODE    170.00 TO NODE    180.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     6.09  DOWNSTREAM(FEET) =     4.81
  FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  16.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.37
```

```
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.08
  PIPE TRAVEL TIME(MIN.) =   0.42    Tc(MIN.) =   11.68
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    180.00 =    1065.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.68
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.985
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.47      0.25     0.200    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.47      SUBAREA RUNOFF(CFS) =    1.24
  EFFECTIVE AREA(ACRES) =      5.32   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        5.3       PEAK FLOW RATE(CFS) =      14.05

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.68
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.985
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.82      0.25     0.200    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.82      SUBAREA RUNOFF(CFS) =    2.17
  EFFECTIVE AREA(ACRES) =      6.14   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        6.1       PEAK FLOW RATE(CFS) =      16.22

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.68
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.985
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.93      0.25     0.200    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.93      SUBAREA RUNOFF(CFS) =    2.46
  EFFECTIVE AREA(ACRES) =      7.07   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        7.1       PEAK FLOW RATE(CFS) =      18.67

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

```
  FLOW PROCESS FROM NODE    180.00 TO NODE    185.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     4.81  DOWNSTREAM(FEET) =     3.73
  FLOW LENGTH(FEET) =   135.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  19.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.96
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      18.67
  PIPE TRAVEL TIME(MIN.) =   0.32    Tc(MIN.) =   12.00
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    185.00 =    1200.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    185.00 TO NODE    185.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.00
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.939
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        1.15      0.25     0.200    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    1.15      SUBAREA RUNOFF(CFS) =    2.99
  EFFECTIVE AREA(ACRES) =      8.22   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        8.2       PEAK FLOW RATE(CFS) =      21.37

****************************************************************************
  FLOW PROCESS FROM NODE    185.00 TO NODE    190.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     3.73  DOWNSTREAM(FEET) =     2.81
  FLOW LENGTH(FEET) =   115.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.37
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      21.37
  PIPE TRAVEL TIME(MIN.) =   0.26    Tc(MIN.) =   12.26
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    190.00 =    1315.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    190.00 TO NODE    190.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.26
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.903
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.51      0.25     0.200    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
```

```
  SUBAREA AREA(ACRES) =    0.51      SUBAREA RUNOFF(CFS) =    1.31
  EFFECTIVE AREA(ACRES) =      8.73   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        8.7       PEAK FLOW RATE(CFS) =      22.42

****************************************************************************
  FLOW PROCESS FROM NODE    190.00 TO NODE    120.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.81  DOWNSTREAM(FEET) =     2.47
  FLOW LENGTH(FEET) =    10.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.83
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      22.42
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =   12.27
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    120.00 =    1325.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    120.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       22.42   12.27    2.902  0.25( 0.05) 0.20       8.7     130.00
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    120.00 =    1325.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       33.41   12.80    2.834  0.25( 0.05) 0.20      13.2      40.00
      2       31.71   14.50    2.640  0.25( 0.05) 0.20      13.5      10.00
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    120.00 =    1691.00 FEET.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       55.24   12.27    2.902  0.25( 0.05) 0.20      21.4     130.00
      2       55.30   12.80    2.834  0.25( 0.05) 0.20      21.9      40.00
      3       52.07   14.50    2.640  0.25( 0.05) 0.20      22.2      10.00
    TOTAL AREA(ACRES) =        22.2

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       55.30  Tc(MIN.) =   12.798
  EFFECTIVE AREA(ACRES) =     21.90  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =       22.2
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    120.00 =    1691.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    210.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =     2.47  DOWNSTREAM(FEET) =     1.84
  FLOW LENGTH(FEET) =   185.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  42.0 INCH PIPE IS  34.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.60
  ESTIMATED PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      55.30
  PIPE TRAVEL TIME(MIN.) =   0.47    Tc(MIN.) =   13.27
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    210.00 =    1876.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    210.00 IS CODE =  82
----------------------------------------------------------------------------
  >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
  >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   530.00
  ELEVATION DATA: UPSTREAM(FEET) =     12.00  DOWNSTREAM(FEET) =      9.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.628
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.992
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        0.60      0.25     0.200    69   11.63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.60   INITIAL SUBAREA RUNOFF(CFS) =    1.59

  ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
  MAINLINE Tc(MIN.) =   13.27
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.777
  SUBAREA AREA(ACRES) =    0.60      SUBAREA RUNOFF(CFS) =    1.47
  EFFECTIVE AREA(ACRES) =     22.50   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =       22.8       PEAK FLOW RATE(CFS) =      55.30
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    210.00 IS CODE =  82
----------------------------------------------------------------------------
  >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
  >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   440.00
  ELEVATION DATA: UPSTREAM(FEET) =     12.00  DOWNSTREAM(FEET) =      9.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.400
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.187
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        0.51      0.25     0.200    69   10.40
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.51   INITIAL SUBAREA RUNOFF(CFS) =    1.44

  ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
  MAINLINE Tc(MIN.) =   13.27
```

```
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.777
  SUBAREA AREA(ACRES) =    0.51      SUBAREA RUNOFF(CFS) =    1.25
  EFFECTIVE AREA(ACRES) =     23.01   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =       23.3       PEAK FLOW RATE(CFS) =      56.46

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    220.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.25  DOWNSTREAM(FEET) =     2.00
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  45.0 INCH PIPE IS  36.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.92
  ESTIMATED PIPE DIAMETER(INCH) =  45.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      56.46
  PIPE TRAVEL TIME(MIN.) =   0.28    Tc(MIN.) =   13.55
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    220.00 =    1976.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       23.3  TC(MIN.) =     13.55
  EFFECTIVE AREA(ACRES) =     23.01  AREA-AVERAGED Fm(INCH/HR)=  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.200
  PEAK FLOW RATE(CFS)   =      56.46

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       56.43   13.02    2.806  0.25( 0.05) 0.20      22.5     130.00
      2       56.46   13.55    2.744  0.25( 0.05) 0.20      23.0      40.00
      3       53.30   15.26    2.566  0.25( 0.05) 0.20      23.3      10.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
____________________________________________________________________________
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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             Ver. 23.0  Release Date: 07/01/2016  License ID 1355

                           Analysis prepared by:

                              Fuscoe Engineering
                        16795 Von Karman, Suite 100
                                 Irvine
                                CA 92606

 ************************** DESCRIPTION OF STUDY **************************
* Magnolia Tank Farm - Commercial                                          *
* Proposed 100 Year Hydrology - Area A                                     *
* OUTPUT:MTFAC100.OUT INPUT:MTFAC100.DAT                                   *
 ****************************************************************************

  FILE NAME: MTFAC100.DAT
  TIME/DATE OF STUDY: 13:27 08/01/2018
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   20.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.60 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  5.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   285.00
  ELEVATION DATA: UPSTREAM(FEET) =     14.10  DOWNSTREAM(FEET) =     12.54

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.807
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.473
```

```
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        1.36      0.25     0.200    86    8.81
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      5.41
  TOTAL AREA(ACRES) =      1.36   PEAK FLOW RATE(CFS) =      5.41

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     20.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    8.81
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.473
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.13      0.25     0.200    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.13      SUBAREA RUNOFF(CFS) =    0.52
  EFFECTIVE AREA(ACRES) =      1.49   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        1.5       PEAK FLOW RATE(CFS) =       5.93

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   12.54  DOWNSTREAM ELEVATION(FEET) =   10.70
  STREET LENGTH(FEET) =   140.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

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

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  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 =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.23
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.33
    HALFSTREET FLOOD WIDTH(FEET) =   10.35
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.62
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.87
  STREET FLOW TRAVEL TIME(MIN.) =   0.89   Tc(MIN.) =    9.70
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.233
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.16      0.25     0.200    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
```

```
  SUBAREA AREA(ACRES) =    0.16      SUBAREA RUNOFF(CFS) =    0.60
  EFFECTIVE AREA(ACRES) =      1.65    AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        1.6        PEAK FLOW RATE(CFS) =       6.21

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) =  10.35
  FLOW VELOCITY(FEET/SEC.) =  2.61   DEPTH*VELOCITY(FT*FT/SEC.) =   0.87
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     30.00 =     425.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     30.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.70
  RAINFALL INTENSITY(INCH/HR) =   4.23
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       1.65
  TOTAL STREAM AREA(ACRES) =       1.65
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       6.21

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     50.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   310.00
  ELEVATION DATA: UPSTREAM(FEET) =     14.10  DOWNSTREAM(FEET) =     11.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.074
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.702
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        1.07      0.25     0.200    86    8.07
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      4.48
  TOTAL AREA(ACRES) =      1.07   PEAK FLOW RATE(CFS) =      4.48

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     30.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.07
  RAINFALL INTENSITY(INCH/HR) =   4.70
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
```

```
  EFFECTIVE STREAM AREA(ACRES) =       1.07
  TOTAL STREAM AREA(ACRES) =       1.07
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.48

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        6.21    9.70    4.233  0.25( 0.05) 0.20       1.6      10.00
      2        4.48    8.07    4.702  0.25( 0.05) 0.20       1.1      40.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       10.23    8.07    4.702  0.25( 0.05) 0.20       2.4      40.00
      2       10.24    9.70    4.233  0.25( 0.05) 0.20       2.7      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      10.24    Tc(MIN.) =     9.70
  EFFECTIVE AREA(ACRES) =       2.72   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        2.7
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     30.00 =     425.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     60.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   10.70  DOWNSTREAM ELEVATION(FEET) =    9.80
  STREET LENGTH(FEET) =   145.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

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

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  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 =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      10.90
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.43
    HALFSTREET FLOOD WIDTH(FEET) =   15.20
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.24
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.97
  STREET FLOW TRAVEL TIME(MIN.) =   1.08   Tc(MIN.) =   10.77
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.985
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.37      0.25     0.200    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.37      SUBAREA RUNOFF(CFS) =    1.31
```

```
  EFFECTIVE AREA(ACRES) =      3.09    AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        3.1        PEAK FLOW RATE(CFS) =      10.94

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.43   HALFSTREET FLOOD WIDTH(FEET) =  15.20
  FLOW VELOCITY(FEET/SEC.) =  2.25   DEPTH*VELOCITY(FT*FT/SEC.) =   0.97

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       10.96    9.15    4.378  0.25( 0.05) 0.20       2.8      40.00
      2       10.94   10.77    3.985  0.25( 0.05) 0.20       3.1      10.00
  NEW PEAK FLOW DATA ARE:
  PEAK FLOW RATE(CFS) =      10.96  Tc(MIN.) =    9.15
  AREA-AVERAGED Fm(INCH/HR) =  0.05  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20  EFFECTIVE AREA(ACRES) =       2.81
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     60.00 =     570.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     60.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.15
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.378
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        1.13      0.25     0.200    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    1.13      SUBAREA RUNOFF(CFS) =    4.40
  EFFECTIVE AREA(ACRES) =      3.94   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        4.2       PEAK FLOW RATE(CFS) =      15.36

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     60.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.15
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.378
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.51      0.25     0.200    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.51      SUBAREA RUNOFF(CFS) =    1.99
  EFFECTIVE AREA(ACRES) =      4.45   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        4.7       PEAK FLOW RATE(CFS) =      17.35

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     65.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
```

```
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     6.13  DOWNSTREAM(FEET) =     5.71
  FLOW LENGTH(FEET) =   120.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  22.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.98
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      17.35
  PIPE TRAVEL TIME(MIN.) =   0.40    Tc(MIN.) =    9.55
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     65.00 =     690.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     65.00 TO NODE     65.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
  MAINLINE Tc(MIN.) =    9.55
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.271
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.47      0.25     0.200    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.47      SUBAREA RUNOFF(CFS) =    1.79
  EFFECTIVE AREA(ACRES) =      4.92   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        5.2       PEAK FLOW RATE(CFS) =      18.71

****************************************************************************
  FLOW PROCESS FROM NODE     65.00 TO NODE     70.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     5.71  DOWNSTREAM(FEET) =     5.17
  FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  20.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.15
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      18.71
  PIPE TRAVEL TIME(MIN.) =   0.52    Tc(MIN.) =   10.06
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     70.00 =     850.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     70.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
  MAINLINE Tc(MIN.) =   10.06
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.144
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.42      0.25     0.200    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.42      SUBAREA RUNOFF(CFS) =    1.55
  EFFECTIVE AREA(ACRES) =      5.34   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        5.6       PEAK FLOW RATE(CFS) =      19.69
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     70.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.06
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.144
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        1.04      0.25     0.200    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    1.04      SUBAREA RUNOFF(CFS) =    3.83
  EFFECTIVE AREA(ACRES) =      6.38   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        6.7       PEAK FLOW RATE(CFS) =      23.52

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     70.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.06
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.144
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.34      0.25     0.200    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.34      SUBAREA RUNOFF(CFS) =    1.25
  EFFECTIVE AREA(ACRES) =      6.72   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        7.0       PEAK FLOW RATE(CFS) =      24.77

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     80.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     5.17  DOWNSTREAM(FEET) =     5.02
  FLOW LENGTH(FEET) =    90.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  28.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.16
  ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      24.77
  PIPE TRAVEL TIME(MIN.) =   0.36    Tc(MIN.) =   10.43
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     80.00 =     940.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     80.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.43
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.061
  SUBAREA LOSS RATE DATA(AMC III):
```

```
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
APARTMENTS                 C        0.28      0.25     0.200    86
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
SUBAREA AREA(ACRES) =    0.28      SUBAREA RUNOFF(CFS) =    1.01
EFFECTIVE AREA(ACRES) =      7.00   AREA-AVERAGED Fm(INCH/HR) =  0.05
AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
TOTAL AREA(ACRES) =        7.3       PEAK FLOW RATE(CFS) =      25.28

****************************************************************************
FLOW PROCESS FROM NODE     80.00 TO NODE     80.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
MAINLINE Tc(MIN.) =   10.43
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.061
SUBAREA LOSS RATE DATA(AMC III):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
APARTMENTS                 C        0.73      0.25     0.200    86
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
SUBAREA AREA(ACRES) =    0.73      SUBAREA RUNOFF(CFS) =    2.64
EFFECTIVE AREA(ACRES) =      7.73   AREA-AVERAGED Fm(INCH/HR) =  0.05
AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
TOTAL AREA(ACRES) =        8.0       PEAK FLOW RATE(CFS) =      27.92

****************************************************************************
FLOW PROCESS FROM NODE     80.00 TO NODE     90.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =     5.02  DOWNSTREAM(FEET) =     4.44
FLOW LENGTH(FEET) =   170.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  33.0 INCH PIPE IS  25.7 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   5.62
ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =      27.92
PIPE TRAVEL TIME(MIN.) =   0.50    Tc(MIN.) =   10.93
LONGEST FLOWPATH FROM NODE     10.00 TO NODE     90.00 =    1110.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
MAINLINE Tc(MIN.) =   10.93
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.953
SUBAREA LOSS RATE DATA(AMC III):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
APARTMENTS                 C        0.39      0.25     0.200    86
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
SUBAREA AREA(ACRES) =    0.39      SUBAREA RUNOFF(CFS) =    1.37
EFFECTIVE AREA(ACRES) =      8.12   AREA-AVERAGED Fm(INCH/HR) =  0.05
AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
TOTAL AREA(ACRES) =        8.4       PEAK FLOW RATE(CFS) =      28.53
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.93
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.953
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.48      0.25     0.200    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.48      SUBAREA RUNOFF(CFS) =    1.69
  EFFECTIVE AREA(ACRES) =      8.60   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        8.9       PEAK FLOW RATE(CFS) =      30.22

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.93
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.953
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        1.05      0.25     0.200    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    1.05      SUBAREA RUNOFF(CFS) =    3.69
  EFFECTIVE AREA(ACRES) =      9.65   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        9.9       PEAK FLOW RATE(CFS) =      33.91

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE    100.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     4.44  DOWNSTREAM(FEET) =     3.29
  FLOW LENGTH(FEET) =   340.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  27.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.91
  ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      33.91
  PIPE TRAVEL TIME(MIN.) =   0.96    Tc(MIN.) =   11.89
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    100.00 =    1450.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.89
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.767
  SUBAREA LOSS RATE DATA(AMC III):
```

```
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.39      0.25     0.200    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.39      SUBAREA RUNOFF(CFS) =    1.30
  EFFECTIVE AREA(ACRES) =     10.04   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =       10.3       PEAK FLOW RATE(CFS) =      33.91
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.89
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.767
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        1.00      0.25     0.200    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    1.00      SUBAREA RUNOFF(CFS) =    3.34
  EFFECTIVE AREA(ACRES) =     11.04   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =       11.3       PEAK FLOW RATE(CFS) =      36.94

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.89
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.767
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        1.05      0.25     0.200    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    1.05      SUBAREA RUNOFF(CFS) =    3.51
  EFFECTIVE AREA(ACRES) =     12.09   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =       12.4       PEAK FLOW RATE(CFS) =      40.45

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    105.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     3.29  DOWNSTREAM(FEET) =     2.99
  FLOW LENGTH(FEET) =    88.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  39.0 INCH PIPE IS  28.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.22
  ESTIMATED PIPE DIAMETER(INCH) =  39.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      40.45
  PIPE TRAVEL TIME(MIN.) =   0.24    Tc(MIN.) =   12.12
```

```
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    105.00 =    1538.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.12
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.725
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.44      0.25     0.200    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.44      SUBAREA RUNOFF(CFS) =    1.46
  EFFECTIVE AREA(ACRES) =     12.53   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =       12.8       PEAK FLOW RATE(CFS) =      41.45

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    110.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.99  DOWNSTREAM(FEET) =     2.81
  FLOW LENGTH(FEET) =    53.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  39.0 INCH PIPE IS  29.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.23
  ESTIMATED PIPE DIAMETER(INCH) =  39.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      41.45
  PIPE TRAVEL TIME(MIN.) =   0.14    Tc(MIN.) =   12.27
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    110.00 =    1591.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.27
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.700
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.64      0.25     0.200    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.64      SUBAREA RUNOFF(CFS) =    2.10
  EFFECTIVE AREA(ACRES) =     13.17   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =       13.5       PEAK FLOW RATE(CFS) =      43.27

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    120.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.81  DOWNSTREAM(FEET) =     2.47
```

```
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  39.0 INCH PIPE IS  30.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.26
  ESTIMATED PIPE DIAMETER(INCH) =  39.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      43.27
  PIPE TRAVEL TIME(MIN.) =   0.27    Tc(MIN.) =   12.53
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    120.00 =    1691.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    120.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    140.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =     17.60  DOWNSTREAM(FEET) =     16.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.568
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.266
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        1.19      0.25     0.200    86    9.57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      4.52
  TOTAL AREA(ACRES) =      1.19   PEAK FLOW RATE(CFS) =      4.52

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    140.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.57
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.266
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.21      0.25     0.200    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.21      SUBAREA RUNOFF(CFS) =    0.80
  EFFECTIVE AREA(ACRES) =      1.40   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        1.4       PEAK FLOW RATE(CFS) =       5.31

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    150.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    10.70  DOWNSTREAM(FEET) =     9.57
```

```
  FLOW LENGTH(FEET) =   140.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  11.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.11
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.31
  PIPE TRAVEL TIME(MIN.) =   0.46    Tc(MIN.) =   10.02
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    150.00 =     470.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    150.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.02
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.153
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        1.05      0.25     0.200    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    1.05      SUBAREA RUNOFF(CFS) =    3.88
  EFFECTIVE AREA(ACRES) =      2.45   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        2.5       PEAK FLOW RATE(CFS) =       9.05

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    150.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.02
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.153
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.60      0.25     0.200    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.60      SUBAREA RUNOFF(CFS) =    2.22
  EFFECTIVE AREA(ACRES) =      3.05   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        3.1       PEAK FLOW RATE(CFS) =      11.26

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 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) =     9.57  DOWNSTREAM(FEET) =     7.37
  FLOW LENGTH(FEET) =   275.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.26
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.26
  PIPE TRAVEL TIME(MIN.) =   0.73    Tc(MIN.) =   10.76
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    160.00 =     745.00 FEET.

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

```
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.76
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.989
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        1.39      0.25     0.200    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    1.39      SUBAREA RUNOFF(CFS) =    4.93
  EFFECTIVE AREA(ACRES) =      4.44   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        4.4       PEAK FLOW RATE(CFS) =      15.74

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    170.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     7.37  DOWNSTREAM(FEET) =     6.09
  FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  16.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.82
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      15.74
  PIPE TRAVEL TIME(MIN.) =   0.39    Tc(MIN.) =   11.15
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    170.00 =     905.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    170.00 TO NODE    170.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.15
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.908
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.41      0.25     0.200    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.41      SUBAREA RUNOFF(CFS) =    1.42
  EFFECTIVE AREA(ACRES) =      4.85   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        4.8       PEAK FLOW RATE(CFS) =      16.84

****************************************************************************
  FLOW PROCESS FROM NODE    170.00 TO NODE    180.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     6.09  DOWNSTREAM(FEET) =     4.81
  FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.89
```

```
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      16.84
  PIPE TRAVEL TIME(MIN.) =   0.39    Tc(MIN.) =   11.54
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    180.00 =    1065.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.54
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.832
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.47      0.25     0.200    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.47      SUBAREA RUNOFF(CFS) =    1.60
  EFFECTIVE AREA(ACRES) =      5.32   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        5.3       PEAK FLOW RATE(CFS) =      18.11

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.54
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.832
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.82      0.25     0.200    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.82      SUBAREA RUNOFF(CFS) =    2.79
  EFFECTIVE AREA(ACRES) =      6.14   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        6.1       PEAK FLOW RATE(CFS) =      20.90

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.54
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.832
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.93      0.25     0.200    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.93      SUBAREA RUNOFF(CFS) =    3.17
  EFFECTIVE AREA(ACRES) =      7.07   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        7.1       PEAK FLOW RATE(CFS) =      24.07

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

```
  FLOW PROCESS FROM NODE    180.00 TO NODE    185.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     4.81  DOWNSTREAM(FEET) =     3.73
  FLOW LENGTH(FEET) =   135.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  20.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.50
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      24.07
  PIPE TRAVEL TIME(MIN.) =   0.30    Tc(MIN.) =   11.84
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    185.00 =    1200.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    185.00 TO NODE    185.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.84
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.776
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        1.15      0.25     0.200    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    1.15      SUBAREA RUNOFF(CFS) =    3.86
  EFFECTIVE AREA(ACRES) =      8.22   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        8.2       PEAK FLOW RATE(CFS) =      27.57

****************************************************************************
  FLOW PROCESS FROM NODE    185.00 TO NODE    190.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     3.73  DOWNSTREAM(FEET) =     2.81
  FLOW LENGTH(FEET) =   115.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  20.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.86
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      27.57
  PIPE TRAVEL TIME(MIN.) =   0.24    Tc(MIN.) =   12.08
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    190.00 =    1315.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    190.00 TO NODE    190.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.08
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.732
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 C        0.51      0.25     0.200    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
```

```
  SUBAREA AREA(ACRES) =    0.51      SUBAREA RUNOFF(CFS) =    1.69
  EFFECTIVE AREA(ACRES) =      8.73   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        8.7       PEAK FLOW RATE(CFS) =      28.93

****************************************************************************
  FLOW PROCESS FROM NODE    190.00 TO NODE    120.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.81  DOWNSTREAM(FEET) =     2.47
  FLOW LENGTH(FEET) =    10.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.75
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      28.93
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =   12.09
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    120.00 =    1325.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    120.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       28.93   12.09    3.730  0.25( 0.05) 0.20       8.7     130.00
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    120.00 =    1325.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       43.27   12.53    3.655  0.25( 0.05) 0.20      13.2      40.00
      2       41.06   14.18    3.405  0.25( 0.05) 0.20      13.5      10.00
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    120.00 =    1691.00 FEET.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       71.56   12.09    3.730  0.25( 0.05) 0.20      21.4     130.00
      2       71.61   12.53    3.655  0.25( 0.05) 0.20      21.9      40.00
      3       67.44   14.18    3.405  0.25( 0.05) 0.20      22.2      10.00
    TOTAL AREA(ACRES) =        22.2

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       71.61  Tc(MIN.) =   12.532
  EFFECTIVE AREA(ACRES) =     21.90  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =       22.2
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    120.00 =    1691.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    210.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =     2.47  DOWNSTREAM(FEET) =     1.84
  FLOW LENGTH(FEET) =   185.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  48.0 INCH PIPE IS  35.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.16
  ESTIMATED PIPE DIAMETER(INCH) =  48.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      71.61
  PIPE TRAVEL TIME(MIN.) =   0.43    Tc(MIN.) =   12.96
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    210.00 =    1876.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    210.00 IS CODE =  82
----------------------------------------------------------------------------
  >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
  >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   530.00
  ELEVATION DATA: UPSTREAM(FEET) =     12.00  DOWNSTREAM(FEET) =      9.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.628
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.815
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        0.60      0.25     0.200    86   11.63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.60   INITIAL SUBAREA RUNOFF(CFS) =    2.03

  ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
  MAINLINE Tc(MIN.) =   12.96
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.585
  SUBAREA AREA(ACRES) =    0.60      SUBAREA RUNOFF(CFS) =    1.91
  EFFECTIVE AREA(ACRES) =     22.50   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =       22.8       PEAK FLOW RATE(CFS) =      71.61
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    210.00 IS CODE =  82
----------------------------------------------------------------------------
  >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
  >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   440.00
  ELEVATION DATA: UPSTREAM(FEET) =     12.00  DOWNSTREAM(FEET) =      9.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.400
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.067
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 C        0.51      0.25     0.200    86   10.40
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.51   INITIAL SUBAREA RUNOFF(CFS) =    1.84

  ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
  MAINLINE Tc(MIN.) =   12.96
```

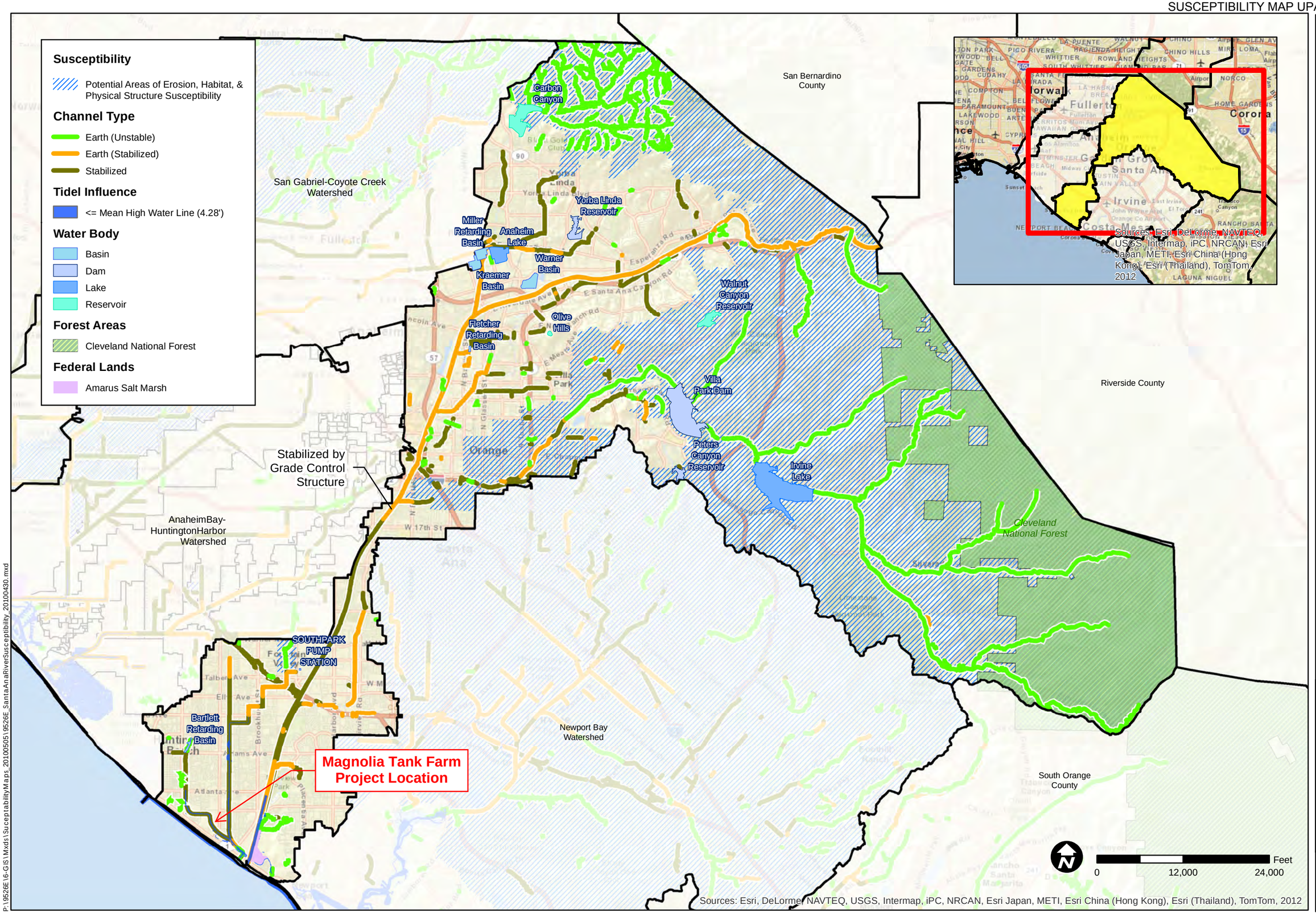
```
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.585
  SUBAREA AREA(ACRES) =    0.51      SUBAREA RUNOFF(CFS) =    1.62
  EFFECTIVE AREA(ACRES) =     23.01   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =       23.3       PEAK FLOW RATE(CFS) =      73.21

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    220.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     2.25  DOWNSTREAM(FEET) =     2.00
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  51.0 INCH PIPE IS  38.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.40
  ESTIMATED PIPE DIAMETER(INCH) =  51.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      73.21
  PIPE TRAVEL TIME(MIN.) =   0.26    Tc(MIN.) =   13.22
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    220.00 =    1976.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       23.3  TC(MIN.) =     13.22
  EFFECTIVE AREA(ACRES) =     23.01  AREA-AVERAGED Fm(INCH/HR)=  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.200
  PEAK FLOW RATE(CFS)   =      73.21

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       73.19   12.78    3.613  0.25( 0.05) 0.20      22.6     130.00
      2       73.21   13.22    3.544  0.25( 0.05) 0.20      23.0      40.00
      3       69.10   14.88    3.313  0.25( 0.05) 0.20      23.3      10.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

APPENDIX B

HYDROMODIFICATION EXHIBIT



TITLE
SUSCEPTIBILITY ANALYIS
SANTA ANA RIVER

JOB
ORANGE COUNTY
WATERSHED
MASTER PLANNING
ORANGE CO.
CA

SCALE	1" = 12000'
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/30/10
JOB NO.	9526-E

PACE
Advanced Water Engineering

FIGURE
3

P:\9526E\6-GIS\Mxds\SuceptabilityMaps_20100505\9526E_SantaAnaRiverSusceptibility_20100430.mxd

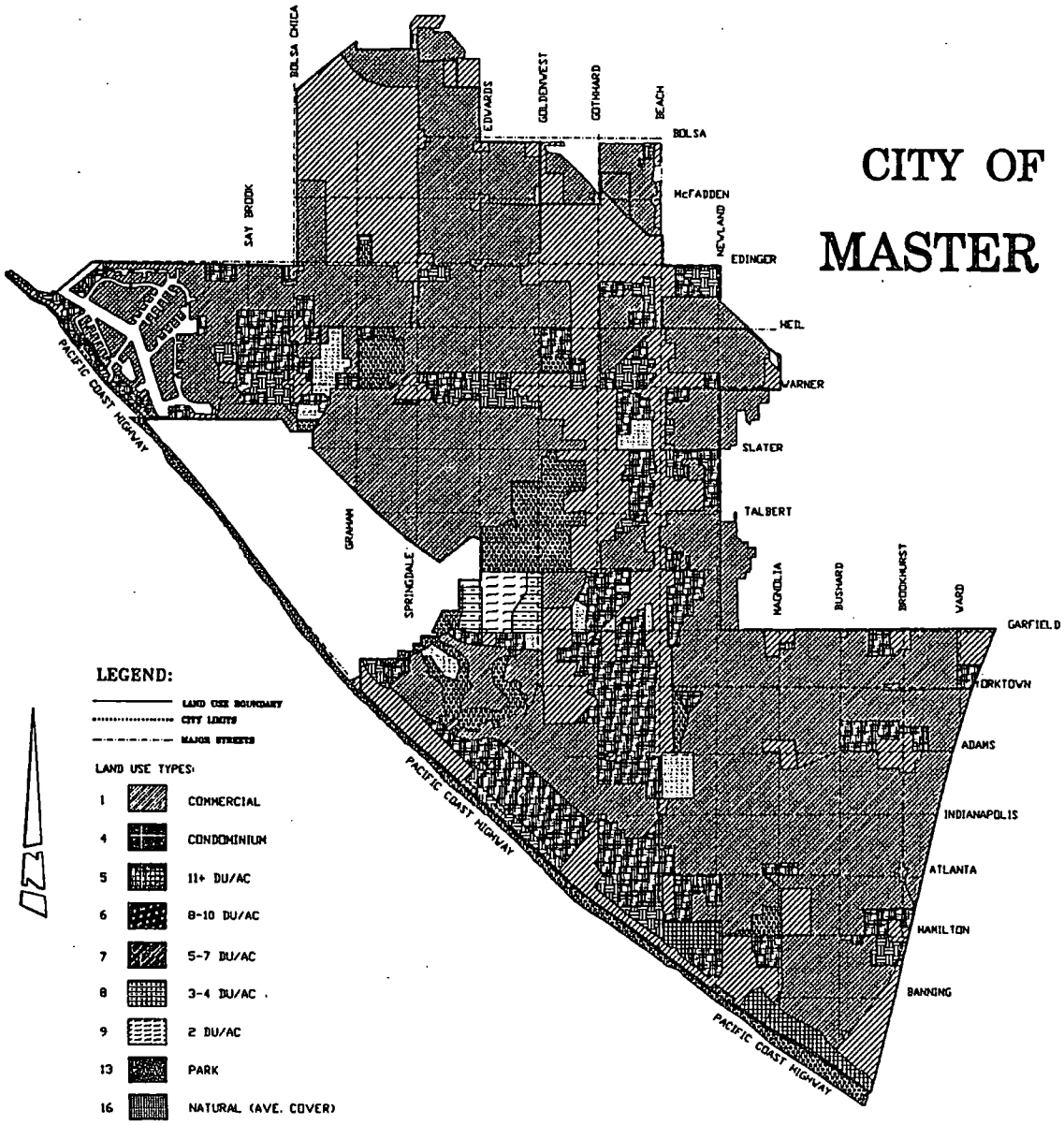
APPENDIX C

PROJECT LAND USE FOR HUNTINGTON BEACH CHANNEL IMPROVEMENTS

TABLE 2.1
LAND USE CATEGORIES

General Plan	Hydrologic
Residential	
Estate ≤ 2 UN/GAC	Res. 1 DU/AC
Estate ≤ 3 UN/GAC	Res. 2 DU/AC
Estate ≤ 4 UN/GAC	Res. 3-4 DU/AC
Low Density	Res. 5-7 DU/AC
Medium Density	Res. 8-10 DU/AC
Medium High Density	Res. Condominium
High Density	Res. Apt/11 + DU/AC
Senior Residential	Res. Condominium
Commercial	
General	Commercial
Visitor - Serving	Commercial
Office Professional	Commercial
Mixed Uses	
Mixed Development	Commercial
Office/Residential	Commercial
Commercial/Support Recreation	Commercial
Industrial	
General	Commercial
Resource Production	Commercial
Industrial Energy Production	Commercial
Open Space	
Water	N/A
Conservation	Nat. Avg. Cover
Recreation	Park
Other Uses	
Public, Quasi-Public, Institutional	Commercial
Solid Waste Facility	Commercial
Planned Community	Res. Condominium
Planning Reserve	Nat. Avg. Cover
Conservation Overlay	Nat. Avg. Cover

WILLIAMSON & SCHMID CONSULTING CIVIL ENGINEERS AND LAND SURVEYORS



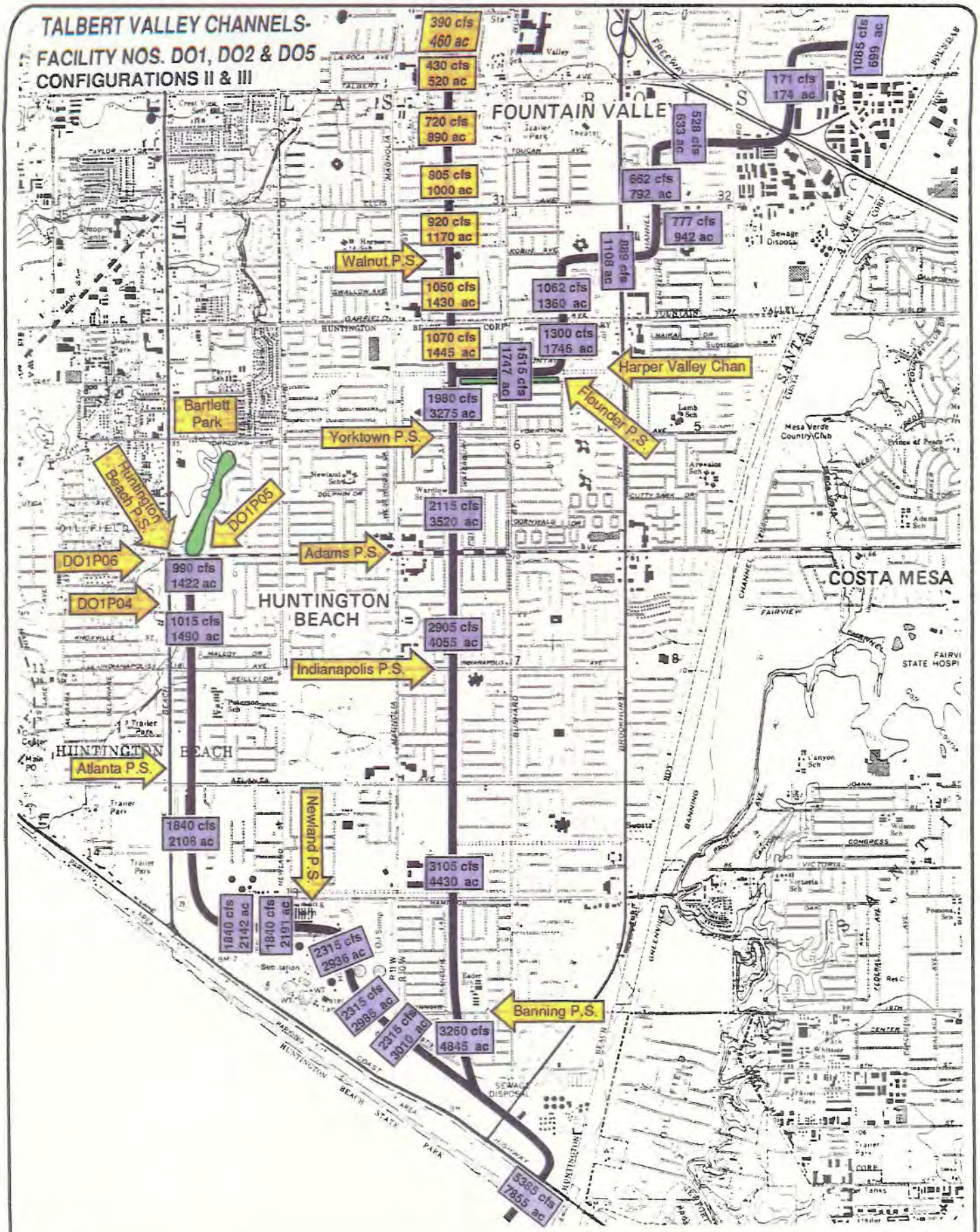
CITY OF HUNTINGTON BEACH

MASTER PLAN OF DRAINAGE

NOTE: MAP REDUCED
SEE FULL SIZE MAP FOR DETAILS

FIGURE 2.2 – LAND USE MAP

FIGURE 2.2



Recommended Design Discharges with Edison Basin

Robert Bein, William Frost & Associates

4-89

JN 24462 2295

EXHIBIT LL

APPENDIX D

CHANNEL HYDRAULICS

MTF DESIGN-A

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00020	ft/ft
Discharge	2315.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	11.50
0+09	5.00
0+19	3.00
0+33	-1.83
0+85	-0.37
0+85	13.30

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 11.50)	(0+85, 13.30)	0.023

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	10.45	ft
Elevation Range	-1.83 to 13.30 ft	
Flow Area	672.68	ft²
Wetted Perimeter	92.02	ft
Hydraulic Radius	7.31	ft
Top Width	80.83	ft
Normal Depth	10.45	ft

MTF DESIGN-A

Results

Critical Depth		4.42	ft
Critical Slope		0.00552	ft/ft
Velocity		3.44	ft/s
Velocity Head		0.18	ft
Specific Energy		10.64	ft
Froude Number		0.21	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	10.45	ft
Critical Depth	4.42	ft
Channel Slope	0.00020	ft/ft
Critical Slope	0.00552	ft/ft

MTF DESIGN-B

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00020	ft/ft
Discharge	2315.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	9.40
0+21	3.00
0+39	3.00
0+61	5.20
0+95	2.38
1+79	2.38
2+25	5.20
2+39	2.38
3+38	2.38
3+57	5.20
5+84	2.38
7+01	2.38
7+01	2.40
7+32	2.38
7+79	2.38
7+86	5.20
9+03	5.20
9+10	2.38
9+10	2.40
9+88	2.40
9+88	2.38
10+25	2.38
10+58	4.38
10+97	2.38
11+73	2.38
11+73	2.38

Roughness Segment Definitions

MTF DESIGN-B

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth		2.24	ft
Elevation Range	2.38 to 9.40 ft		
Flow Area		1722.70	ft²
Wetted Perimeter		965.76	ft
Hydraulic Radius		1.78	ft
Top Width		961.59	ft
Normal Depth		2.24	ft
Critical Depth		0.78	ft
Critical Slope		0.00875	ft/ft
Velocity		1.34	ft/s
Velocity Head		0.03	ft
Specific Energy		2.27	ft
Froude Number		0.18	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.24	ft
Critical Depth	0.78	ft
Channel Slope	0.00020	ft/ft
Critical Slope	0.00875	ft/ft

MTF TOTAL-A

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00020	ft/ft
Discharge	2369.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	11.50
0+09	5.00
0+19	3.00
0+33	-1.83
0+85	-0.37
0+85	13.30

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 11.50)	(0+85, 13.30)	0.023

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	10.58	ft
Elevation Range	-1.83 to 13.30 ft	
Flow Area	683.62	ft²
Wetted Perimeter	92.55	ft
Hydraulic Radius	7.39	ft
Top Width	81.19	ft
Normal Depth	10.58	ft

MTF TOTAL-A

Results

Critical Depth		4.49	ft
Critical Slope		0.00550	ft/ft
Velocity		3.47	ft/s
Velocity Head		0.19	ft
Specific Energy		10.77	ft
Froude Number		0.21	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	10.58	ft
Critical Depth	4.49	ft
Channel Slope	0.00020	ft/ft
Critical Slope	0.00550	ft/ft

MTF TOTAL-B

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00020	ft/ft
Discharge	2369.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	9.40
0+21	3.00
0+39	3.00
0+61	5.20
0+95	2.38
1+79	2.38
2+25	5.20
2+39	2.38
3+38	2.38
3+57	5.20
5+84	2.38
7+01	2.38
7+01	2.40
7+32	2.38
7+79	2.38
7+86	5.20
9+03	5.20
9+10	2.38
9+10	2.40
9+88	2.40
9+88	2.38
10+25	2.38
10+58	4.38
10+97	2.38
11+73	2.38
11+73	2.38

Roughness Segment Definitions

MTF TOTAL-B

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

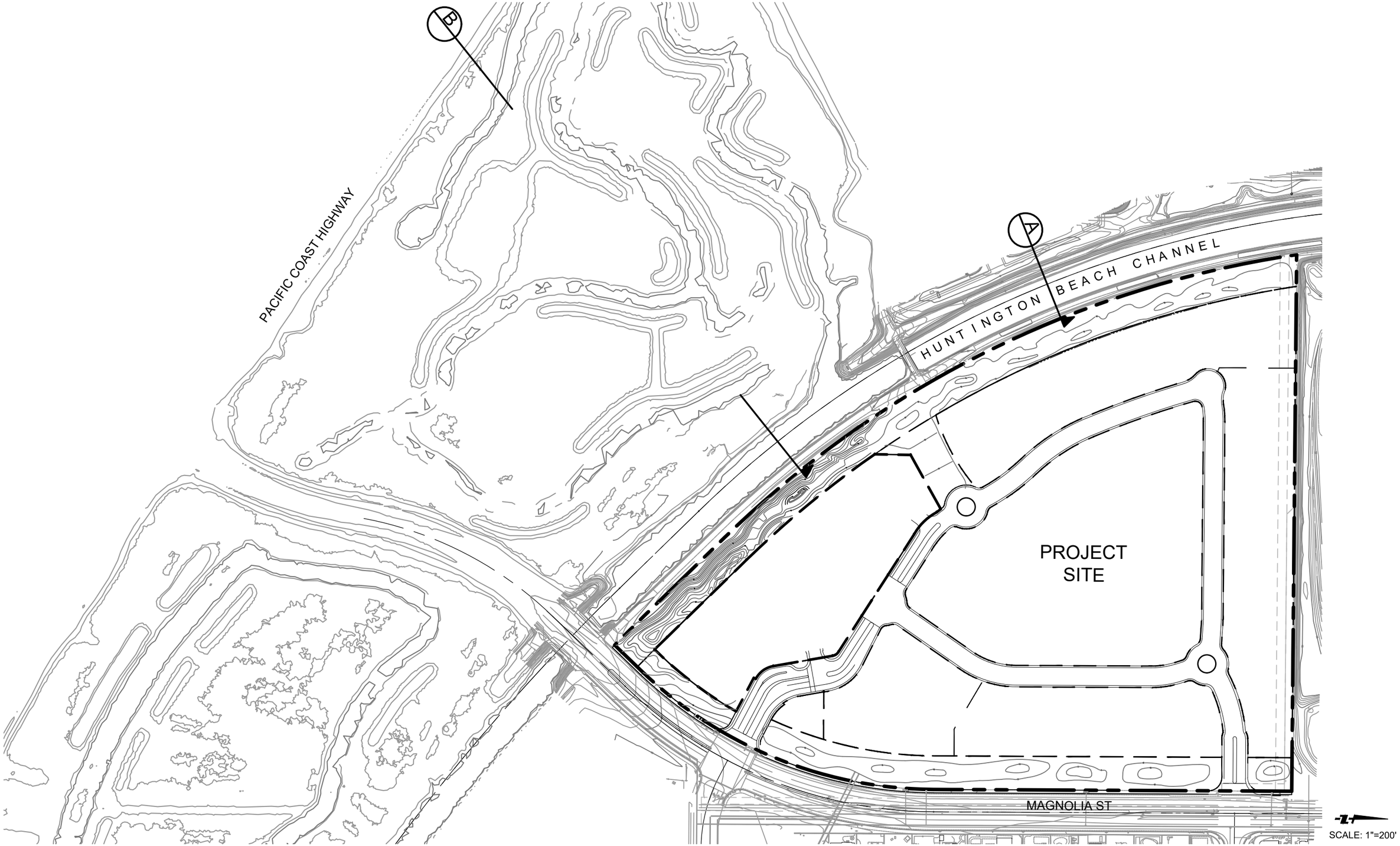
Normal Depth		2.27	ft
Elevation Range	2.38 to 9.40 ft		
Flow Area		1749.45	ft²
Wetted Perimeter		969.66	ft
Hydraulic Radius		1.80	ft
Top Width		965.45	ft
Normal Depth		2.27	ft
Critical Depth		0.79	ft
Critical Slope		0.00871	ft/ft
Velocity		1.35	ft/s
Velocity Head		0.03	ft
Specific Energy		2.30	ft
Froude Number		0.18	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

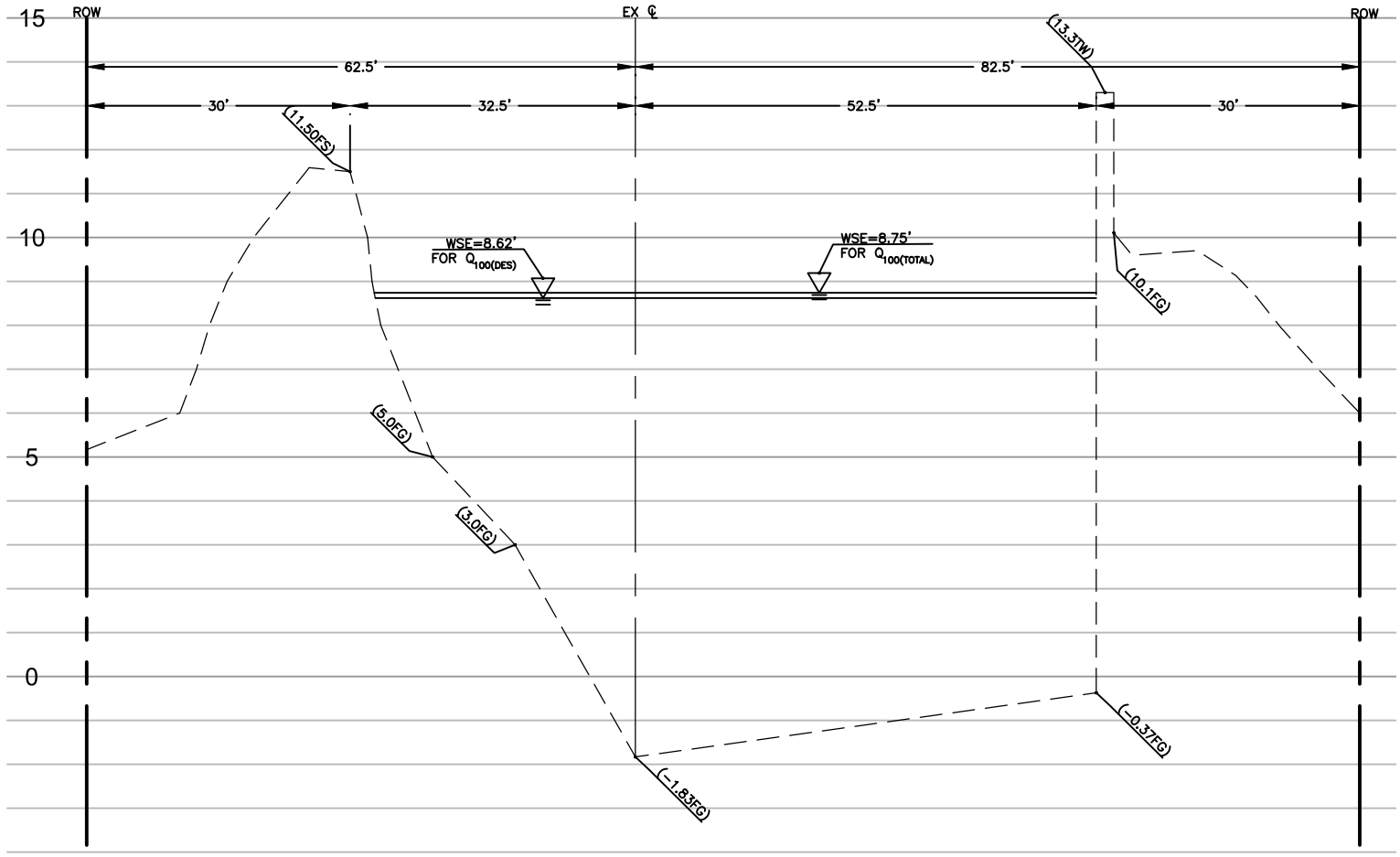
GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.27	ft
Critical Depth	0.79	ft
Channel Slope	0.00020	ft/ft
Critical Slope	0.00871	ft/ft



MAGNOLIA TANK FARMS
HUNTINGTON BEACH, CA

HUNTINGTON BEACH CHANNEL SECTIONS
PLAN VIEW



HB CHANNEL STA 40+00 (A)

VERT: 1"=4' HORIZONTAL: 1"=20'

DISCHARGES

CHANNEL DESIGN $Q_{100(DES)}$ = 2315CFS

TOTAL DEVELOPED

$Q_{100(TOTAL)} = Q_{100(DES)} + [Q_{100(PROP)} - Q_{100(EX)}]$

$= 2315CFS + [85.76CFS - 31.42CFS]$

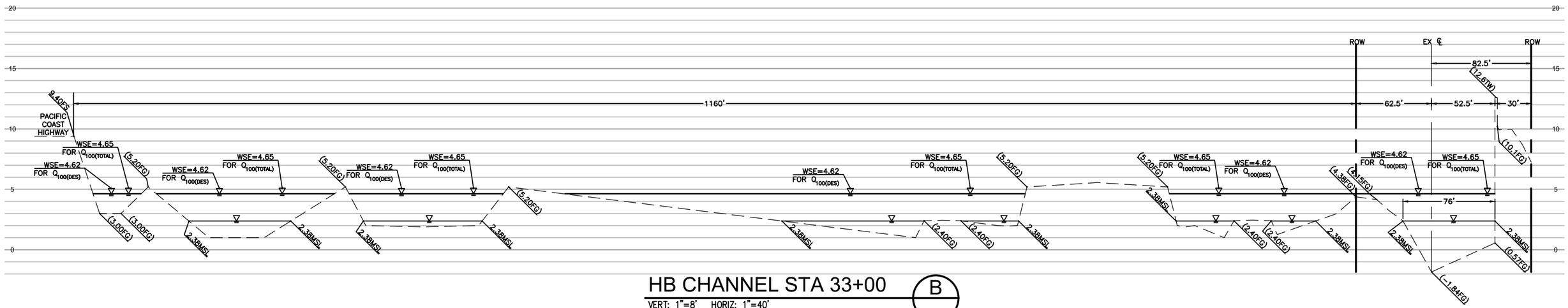
$Q_{100(TOTAL)}$ = 2369CFS

LEGEND

FG	FINISHED GRADE
FS	FINISHED SURFACE
TW	TOP OF WALL
WSE	WATER SURFACE ELEVATION

MAGNOLIA TANK FARMS
HUNTINGTON BEACH, CA

HUNTINGTON BEACH CHANNEL SECTION
STA 40+00.00



HB CHANNEL STA 33+00

VERT: 1"=8' HORIZ: 1"=40'

B

DISCHARGES

CHANNEL DESIGN $Q_{100(DES)}$ = 2315CFS

TOTAL DEVELOPED

$Q_{100(TOTAL)} = Q_{100(DES)} + [Q_{100(PROP)} - Q_{100(EX)}]$

$= 2315CFS + [85.76CFS - 31.42CFS]$

$Q_{100(TOTAL)}$ = 2369CFS

LEGEND

FG	FINISHED GRADE
FS	FINISHED SURFACE
MSL	MEAN SEA LEVEL
TW	TOP OF WALL
WSE	WATER SURFACE ELEVATION

MAGNOLIA TANK FARMS
HUNTINGTON BEACH, CA

HUNTINGTON BEACH CHANNEL SECTION
STA 33+00.00

APPENDIX E

EVEREST CONSULTANTS HYDROMODIFICATION ASSESSMENT

MAGNOLIA TANK FARM REDEVELOPMENT PROJECT

HYDROMODIFICATION ASSESSMENT

Prepared For:

SLF-HB Magnolia, LLC
2 Park Plaza, Suite 700
Irvine, California 92614

Contact: James O'Malley, Vice President Development

Prepared By:

Everest International Consultants, Inc.
444 West Ocean Boulevard, Suite 1104
Long Beach, CA 90802

Contact: David Cannon

October 2018

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Figure 9. Maximum Velocities resulted from a 25-Year Storm for the Existing and Proposed Conditions 3.6

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Table 1. Fluvial Flood Modeling Scenarios 3.1

LIST OF ACRONYMS

2D	Two-dimensional
CEQA	California Environmental Quality Act
cfs	cubic feet per second
City	City of Huntington Beach
EIR	Environmental Impact Report
Everest	Everest International Consultants, Inc.
Ex	Existing
ft	feet
HB Channel	Huntington Beach Channel
HB	Huntington Beach
HBW	Huntington Beach Wetlands
Max	Maximum
MTF	Magnolia Tank Farm
N	north
NAVD88	North American Datum of 1988
NOAA	National Oceanic and Atmospheric Administration
PCH	Pacific Coast Highway
Pr	Proposed
S	south or second
SD	storm drain
sec	second
SLF-HB	SLF-HB Magnolia, LLC
USACE	U.S. Army Corps of Engineers
WSE	water surface elevation
yr or Y	year

1. INTRODUCTION

1.1 BACKGROUND

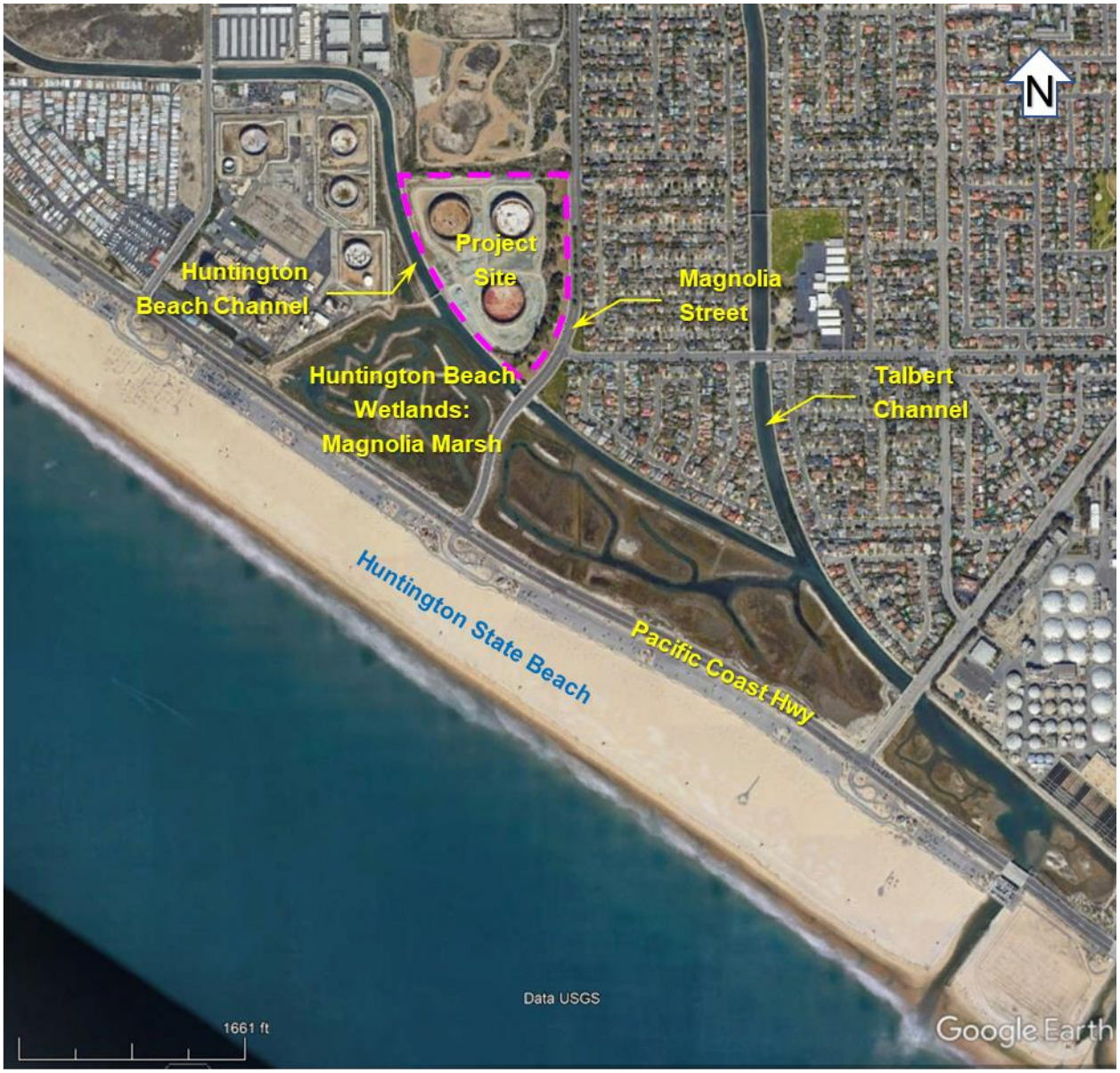
The City of Huntington Beach (City) occupies approximately 27.3 square miles of land area, and it is surrounded by the cities of Westminster to the north; Seal Beach to the northwest; Fountain Valley to the east; and Costa Mesa to the southeast. The Pacific Ocean borders the City to the southwest. Regional access to the City is provided by Interstate 405 to the north; Pacific Coast Highway (PCH) to the southwest; and State Route 39, which bisects the City running north to south.

The City is preparing a programmatic Environmental Impact Report (EIR) for California Environmental Quality Act (CEQA) compliance for a proposed development project to be located at 21845 Magnolia Street in Huntington Beach. The proposed project (Project), known as the Magnolia Tank Farm (MTF), includes new development across an area of 29 acres. The project site previously contained three oil storage tanks used to provide fuel to the adjacent power station. The property currently serves as a staging area for the construction of a new power plant on the same site as the existing power plant. The location of the proposed project within the City is shown in Figure 1. A close-up view of the project site and associated infrastructure (e.g., roads, flood control channels, wetlands, beach, housing) in the vicinity of the project site are shown in Figure 2.

A review of the most current County of Orange Technical Guidance Document (County of Orange, 2013) indicates that the project site is not susceptible to hydromodification impacts (Susceptibility Map Update 2012 – Susceptibility Analysis Santa Ana River). However, the map identifies a portion of the channel downstream of the project site as “unstable.” Out of an abundance of caution, the City expressed concern regarding the potential for the project to cause hydromodifications in the Huntington Beach Channel and Magnolia Marsh portion of the Huntington Beach Wetlands (HBW). Specifically, the City is concerned that changes in rainfall runoff and storm drain outlet configurations from the project site might increase water velocities within these areas, thereby leading to increases in scour of the earthen bottom. To address this issue, SLF-HB Magnolia, LLC (SLF-HB) retained Everest International Consultants (Everest) to conduct a hydromodification assessment, which is summarized in this report.

Map Source: Google Earth Pro

Figure 1. Project Location Map



Map Source: Google Earth Pro

Figure 2. Project Site Vicinity Map

1.2 PURPOSE

The purpose of the work presented in this report was to conduct a hydromodification assessment to determine the potential for the project to increase scour in the Huntington Beach Channel and Magnolia Marsh.

1.3 OBJECTIVES

The objectives below were identified to meet the purpose presented above.

- Select an appropriate fluvial flood model
- Define the model domain
- Identify the appropriate tidal series and flood hydrographs
- Set up the fluvial flood model
- Conduct fluvial flood modeling under Existing Condition and Proposed Condition.
- Analyze the fluvial flood modeling results to determine what, if any, impacts the project would have on scour in the Huntington Beach Channel and Magnolia Marsh.

2. MODEL SELECTION AND DEVELOPMENT

The selection and development of the fluvial flood model used to support the hydromodification assessment are described in this section.

2.1 MODEL SELECTION

The two-dimensional unsteady flow simulation component of the U. S. Army Corps of Engineers (USACE) Hydrologic Engineering Center's River Analysis System software (HEC-RAS) was selected to conduct the fluvial flood modeling utilized to support the hydromodification assessment. The two-dimensional version (5.0.5) of HEC-RAS (HEC-RAS 2D) was selected to analyze the more complicated flow patterns that would likely occur within the Magnolia Marsh portion of the Huntington Beach Wetlands (HBW) located along the southwest boundary of the project site along the far side of the Huntington Beach Channel (HB Channel). Detailed information regarding HEC-RAS 2D can be found in the document titled, "HEC-RAS River Analysis System 2D Modeling User's Manual" (USACE 2016).

2.2 MODEL DEVELOPMENT

2.2.1 Model Domain

To properly simulate velocity changes within the HB Channel and Magnolia Marsh the model domain needs to cover the full area that could be impacted by the project at a resolution fine enough to provide velocity results within the small channel network located within the Magnolia Marsh. Although the project site is located adjacent to the HB Channel, it is located within the lower reaches of the Talbert Channel Watershed, which is drained by both the HB Channel and Talbert Channel. The HB Channel drains the western portion of the watershed while the Talbert Channel drains the larger, eastern portion of the watershed. The HB Channel empties into the Talbert Channel just downstream from the project site where the combined flows of both channels continue to flow out to the ocean through the Talbert Channel ocean outlet just northwest of the Santa Ana River mouth. The domain selected for the fluvial flood model covers the middle and lower reaches of both channels as well as the nearshore portion of the ocean immediately upcoast and downcoast from Talbert Channel ocean outlet. The model domain boundary is shown in Figure 3, along with major points of interest and the existing topography/bathymetry, which are described in the following.

Figure 3. HEC-RAS 2D Model Domain and Topography/Bathymetry

Fuscoe Engineering, Inc. (Fuscoe 2018b) provided the storm drain locations for the Existing Condition (No Project) and Proposed Condition (With Project) as shown in Figure 4. Under the Existing Condition, local (rainfall) runoff is discharged from the project site into the HB Channel through a pipe at Location A. Under the Proposed Condition, local runoff would be discharged from the project site into the HB Channel via two pipes with one at Location A&C and the other at Location B. The relatively narrow, shallow tidal channel network located within Magnolia Marsh is also shown in Figure 4. This tidal channel network and the portion of the HB Channel shown in Figure 4 are the focus of the analysis presented in this report.

2.2.2 Topographic Conditions

Project Site Topography

The topographic conditions of the project site were selected to represent both existing and proposed conditions. The Existing Condition was represented by a topographic survey base map prepared by Fuscoe Engineering, Inc. (Fuscoe 2018a). The project site topography under Proposed Condition was represented by the proposed Mass Grading Master Plan prepared by Fuscoe (Fuscoe 2018a). Relevant to fluvial flooding modeling, the major difference between Existing and Proposed Conditions is the addition of approximately 93,000 cubic yards of fill placed within the project site as part of the Proposed Condition.

Topography/Bathymetry within Model Domain Area

As-built drawings containing elevation information of the top and bottom of the channels within the study area for the Talbert Channel and HB Channel were obtained from Orange County Public Works Department and Fuscoe Engineering Inc.

As-built Topographic/Bathymetric data of the Huntington Beach Wetlands - Magnolia Marsh was obtained from Moffatt and Nichol in the form of 0.25 ft contour lines in AutoCAD format. Topographic raster data for the rest of the area within the model domain was obtained from NOAA Data Access Viewer website (NOAA 2018a). Topographic data selected for the fluvial flood model includes “NOAA Office for Coastal Management Coastal Inundation Digital Elevation Model: Aggregate Record”, and “2014 USACE NCMP Topobathy Lidar DEM: California”.

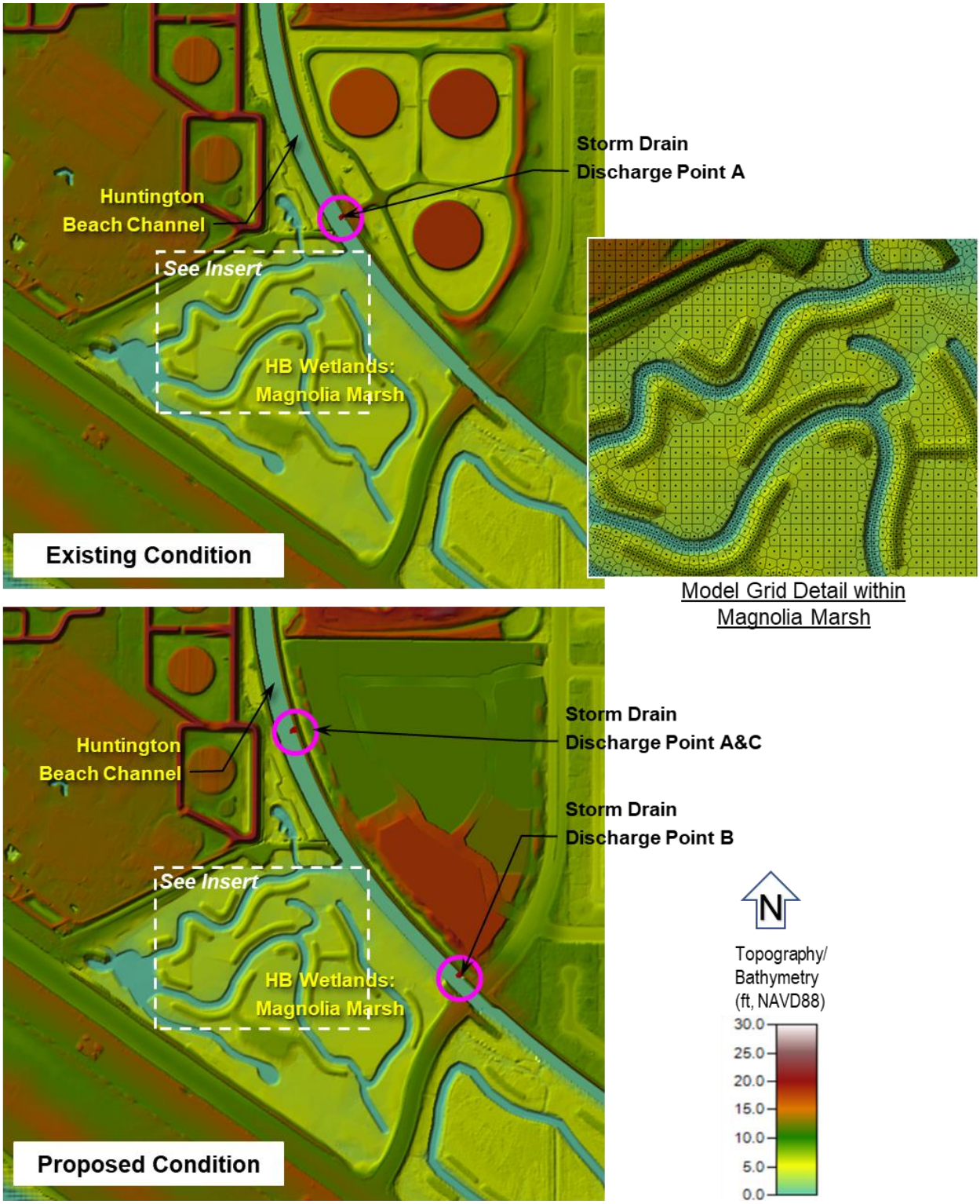


Figure 4. HEC-RAS 2D Model Set-up for Magnolia Marsh and Storm Drain Discharge Points along the Huntington Beach Channel

2.2.3 Ocean Water Level and Local Runoff Flood Hydrographs

A water level time series was developed to represent the ocean water level variation offshore of the Talbert Channel ocean outlet. In 2014, the City of Huntington Beach completed a sea-level rise vulnerability assessment that included fluvial flood modeling for the HB Channel and Talbert Channel. That work, which was performed by Moffatt & Nichol (Moffatt & Nichol, 2014), utilized a maximum ocean water level of 6.44 feet (ft) above the North American Vertical Datum of 1988 (NAVD 88). That maximum ocean water level value was selected for this fluvial flood modeling effort to provide consistency with that prior work. To capture the time-varying nature of the ocean water level fluctuations, a spring tide ocean water level time series of December 3 to December 4, 2017 was selected from NOAA Los Angeles Station 9410660 (NOAA 2018b) and the peak higher high water was adjusted to match the maximum ocean water level of +6.44 ft, NAVD 88.

To assess the potential for adverse hydromodifications due to increased velocities and associated scour of the earthen channel bottoms, the City requested an evaluation of the 2-year and 25-year local runoff flood events. Flood hydrographs for these two peak discharges and the locations of the discharges for both Existing and Proposed Condition were obtained from Fuscoe (Fuscoe 2018b). The fluvial flood flows within the HB Channel and Talbert Channel were not included in the model because storm discharge flowing from the project site to the HB Channel happens almost immediately after rainfall and much sooner than the arrival of fluvial flood flows from the HB Channel and Talbert Channel.

The ocean water level time series and storm (drain) discharge hydrographs for the 2-year storm discharge are depicted in the four panels shown in Figure 5. The 2-year storm discharge for Existing Condition (No Project) is shown in the top two panels with the peak discharge applied at two different times (Time=Hour 24.0; Time=Hour 27.5). Likewise, the 2-year storm discharge for Proposed Condition (With Project) is shown in the bottom two panels with the peak discharge applied at the same two times (Time=Hour 24.0; Time=Hour 27.5).

The ocean water level time series and storm (drain) discharge hydrographs for the 25-year storm discharge are depicted in the four panels shown in Figure 6. The 25-year storm discharge for Existing Condition (No Project) is shown in the top two panels with the peak discharge applied at two different times (Time=Hour 24.0; Time=Hour 27.5). Likewise, the 25-year storm discharge for Proposed Condition (With Project) is shown in the bottom two panels with the peak discharge applied at the same two times (Time=Hour 24; Time=Hour 27.5).

The peak storm discharges were timed to occur when the ocean water level would hit the maximum level of +6.44 ft NAVD 88. This assumption tends to yield a high flood water level compared to an assumption of low tide or slack tide co-occurrence. In addition, the peak storm discharges were timed to occur when the ocean water level would be dropping due to ebb tides. This assumption tends to yield a high water velocity compared to an assumption of high tide co-occurrence, which is important for assessing changes in scour potential.

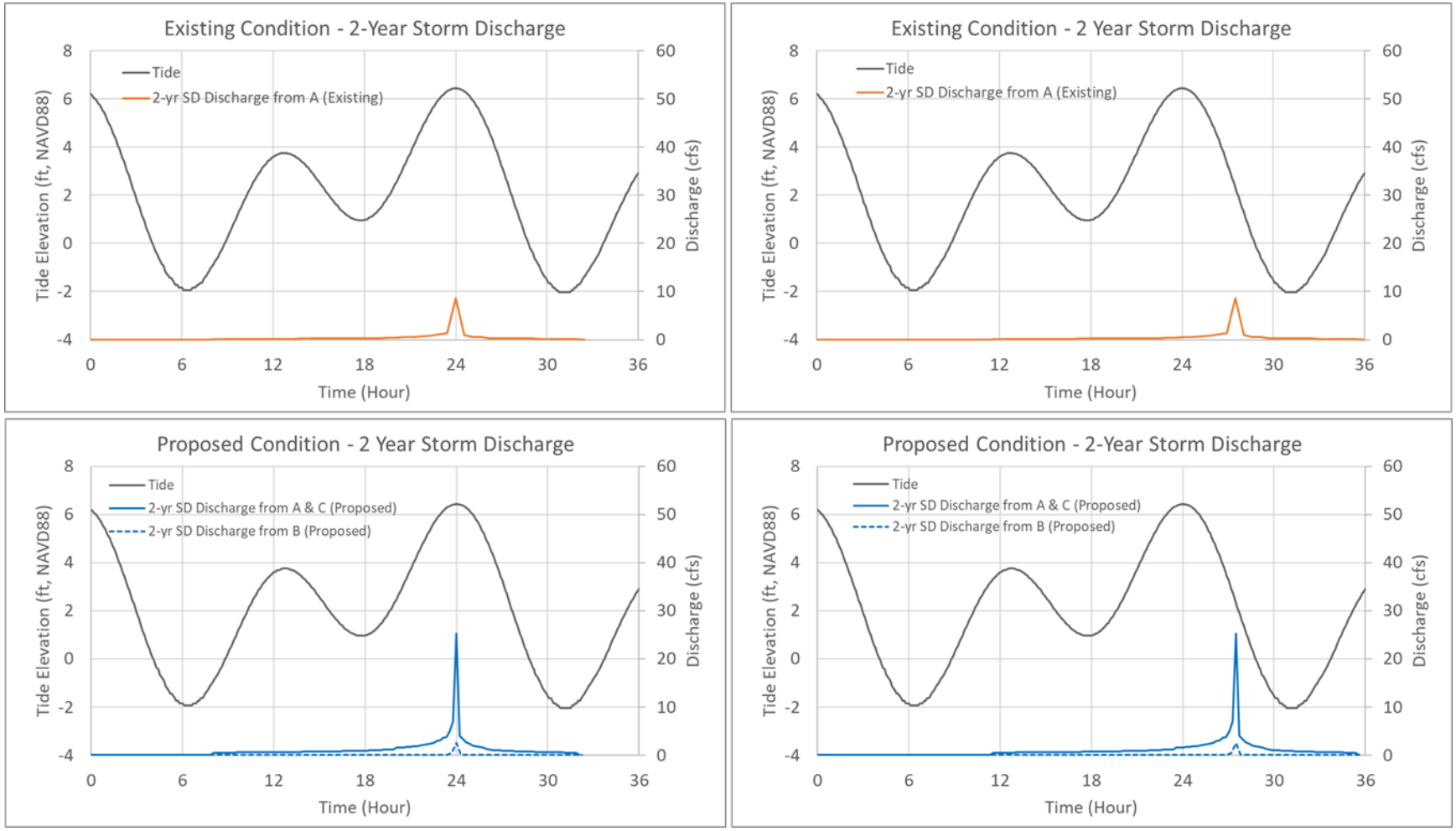


Figure 5. HEC-RAS Model Boundary Conditions of 2-Year Storm Discharge Scenarios under the Existing and Proposed Conditions

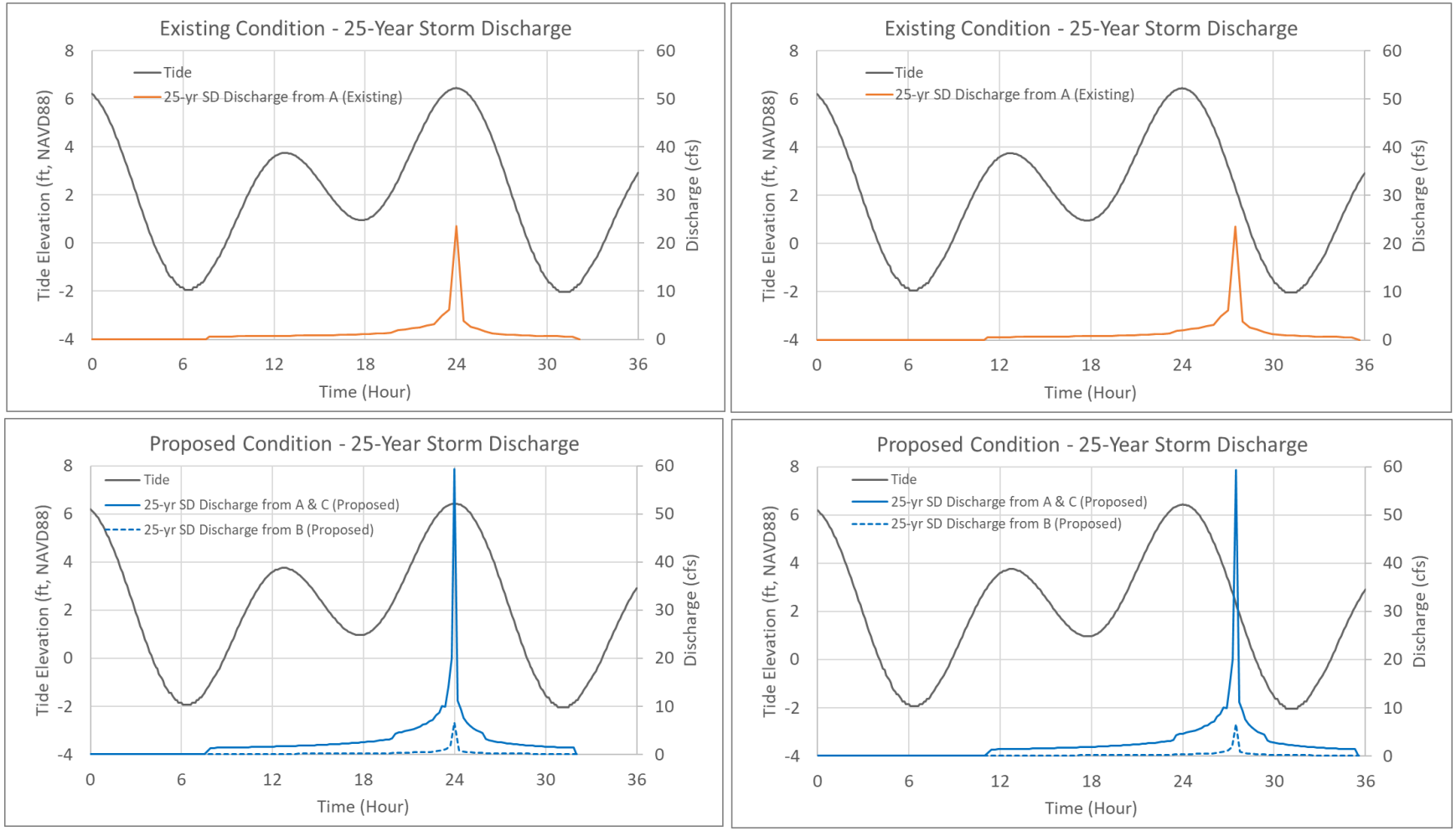


Figure 6. HEC-RAS Model Boundary Conditions of 25-Year Storm Discharge Scenarios under the Existing and Proposed Conditions

3. HYDROMODIFCATION ASSESSMENT RESULTS

The two-dimensional unsteady flow component of the fluvial flood model HEC-RAS (HEC-RAS 2D) presented in Section 2 was used to analyze changes in water velocities due to local runoff changes for the Existing Condition (No Project) and Proposed Condition (With Project). This was done by running the model for several different scenarios as presented in Table 1. The results (water velocities) were then analyzed and compared to determine what, if any, potential impact the project would have on water velocities and associated scour potential of the earthen bottom channels. The results are presented below first for the 2-year storm discharge and then for the 25-year storm discharge.

Table 1. Fluvial Flood Modeling Scenarios

MODEL SIMULATION NO.	PROJECT SITE CONDITION	STORM DRAIN DISCHARGE EVENT	STORM DRAIN DISCHARGE TIMING
1	Existing	2-Year	Hour 24.0
2	Existing	2-Year	Hour 27.5
3	Proposed	2-Year	Hour 24.0
4	Proposed	2-Year	Hour 27.5
5	Existing	25-Year	Hour 24.0
6	Existing	25-Year	Hour 27.5
7	Proposed	25-Year	Hour 24.0
8	Proposed	25-Year	Hour 27.5
9	Existing/Proposed	None (Tide Only)	Not Applicable

3.1 RESULTS FOR THE 2-YEAR STORM DISCHARGE

The maximum water velocity results for the 2-year storm (drain) discharge are presented in Figure 7 for the Existing Condition (No Project) and Proposed Condition (With Project). For the Existing Condition (No Project), the results indicate that the maximum water velocities in the HB Channel would range from approximately 3.5 feet per second under the Magnolia Street Bridge to approximately 1.5 feet per second near the northern boundary of the project site. For the Proposed Condition (With Project), the results appear visually identical to the results for Existing Conditions (No Project).

The maximum water velocities along a profile running through one of the narrow, shallow tidal channels within the Magnolia Marsh are presented in Figure 8 for the Existing Condition (No Project) and Proposed Condition (With Project). The graph shows the results for the two different peak discharge times (Hour=24.0; Hour=27.5) as well as the results for the model simulation conducted without any storm discharge (i.e., tide only). The results show that the maximum water velocity within the narrow, shallow tidal channel ranged from approximately 0.8 feet per second to 1.6 feet per second. There is no visually discernable difference in the results for any of the modeling scenarios, which indicates two key points. First, there is no increase in maximum water velocity between the Existing Condition (No Project) and Proposed Condition (With Project) indicating that the proposed project would not increase maximum water velocities relative to existing conditions. Second, there is no increase in maximum water velocity with the storm discharge for both Existing Condition (No Project) and Proposed Condition (With Project) indicating that the maximum water velocities are driven by tidal velocities with little influence from the small storm discharges resulting from the local runoff being discharged into the HB Channel.

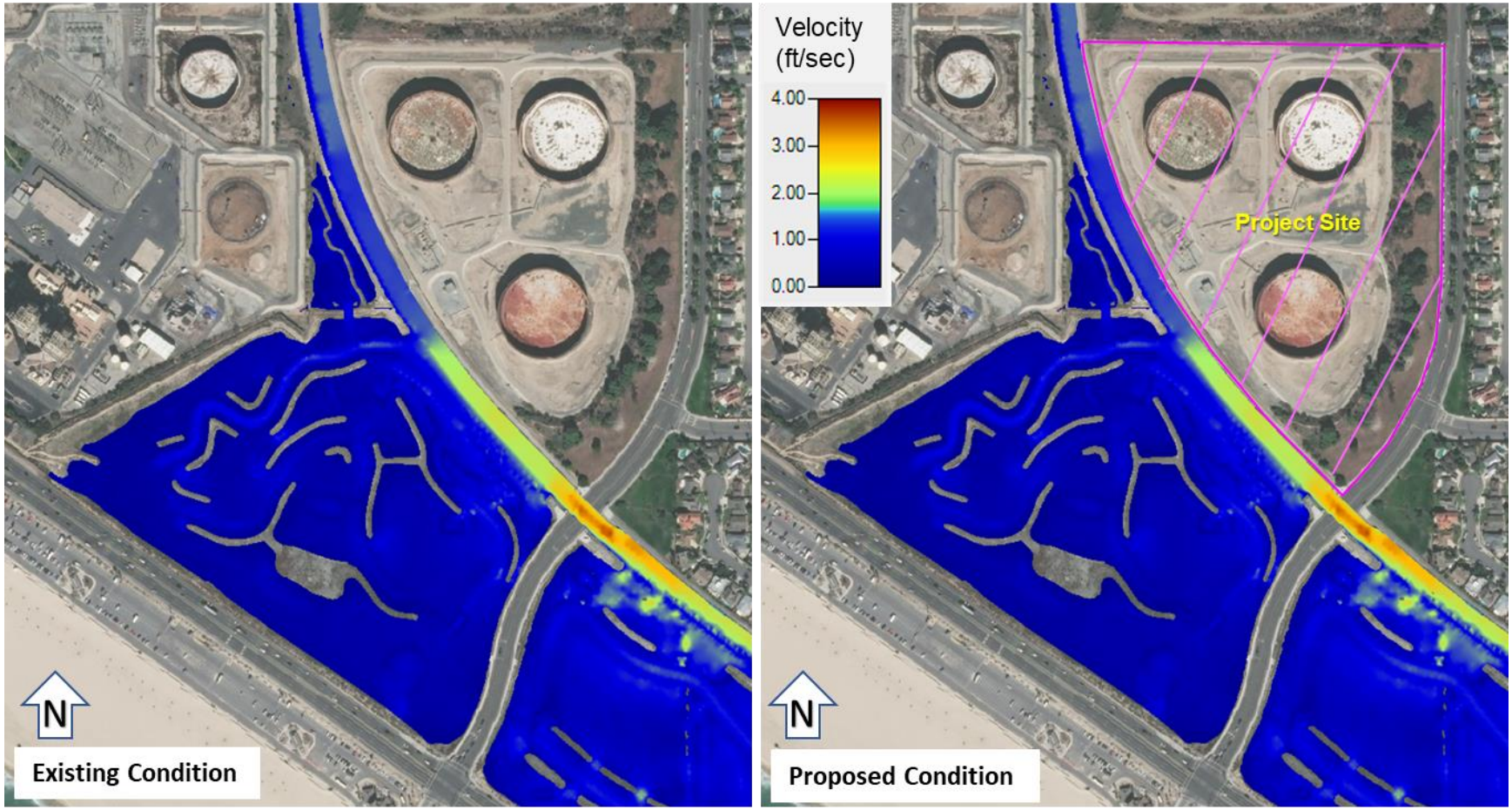


Figure 7. Maximum Velocities resulted from a 2-Year Storm for the Existing and Proposed Conditions

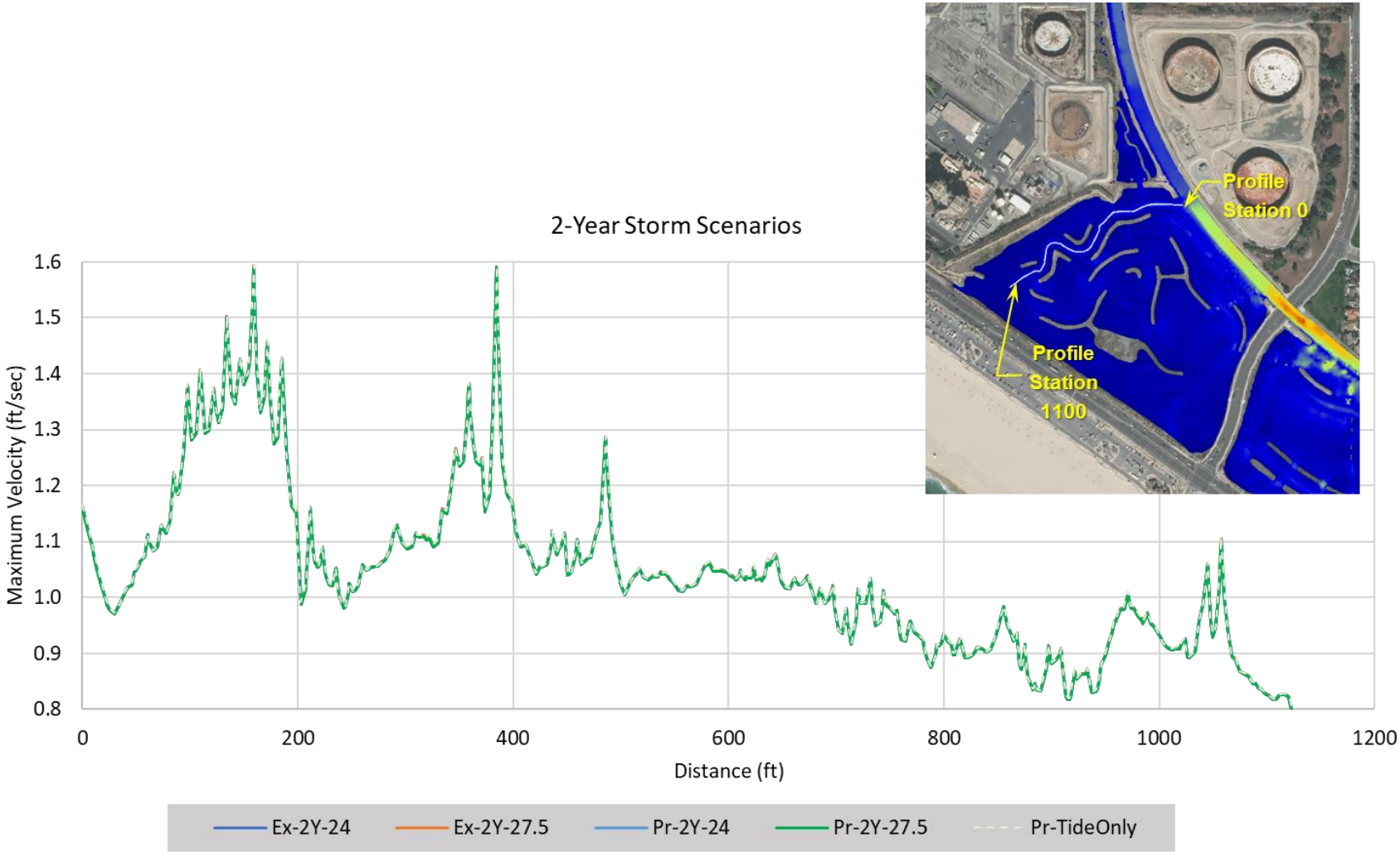


Figure 8. Maximum Velocity Profile along Magnolia Marsh Channel resulted from a 2-Year Storm for the Existing and Proposed Conditions

3.2 RESULTS FOR THE 25-YEAR STORM DISCHARGE

The maximum water velocity results for the 25-year storm (drain) discharge are presented in Figure 9 for the Existing Condition (No Project) and Proposed Condition (With Project). For the Existing Condition (No Project), the results indicate that the maximum water velocities in the HB Channel would range from approximately 3.5 feet per second under the Magnolia Street Bridge to approximately 1.5 feet per second near the northern boundary of the project site. Again, for the Proposed Condition (With Project), the results appear visually identical to the results for Existing Conditions (No Project) similar to the results presented previously for the 2-year storm discharge.

The maximum water velocities along a profile running through one of the narrow, shallow tidal channels within the Magnolia Marsh are presented in Figure 10 for the Existing Condition (No Project) and Proposed Condition (With Project). The graph shows the results for the two different peak discharge times (Hour=24.0; Hour=27.5) as well as the results for the model simulation conducted without any storm discharge (i.e., tide only). The results show that the maximum water velocity within the narrow, shallow tidal channel ranged from approximately 0.8 feet per second to 1.6 feet per second. There is no visually discernable difference in the results for any of the modeling scenarios, which indicates two key points. First, there is no increase in maximum water velocity between the Existing Condition (No Project) and Proposed Condition (With Project) indicating that the proposed project would not increase maximum water velocities relative to existing conditions. Second, there is no increase in maximum water velocity with the storm discharge for both Existing Condition (No Project) and Proposed Condition (With Project) indicating that the maximum water velocities are driven by tidal velocities with little influence from the small storm discharges resulting from the local runoff being discharged into the HB Channel. This result matches the results for the 2-year storm discharge presented previously further supporting tidal dominance.

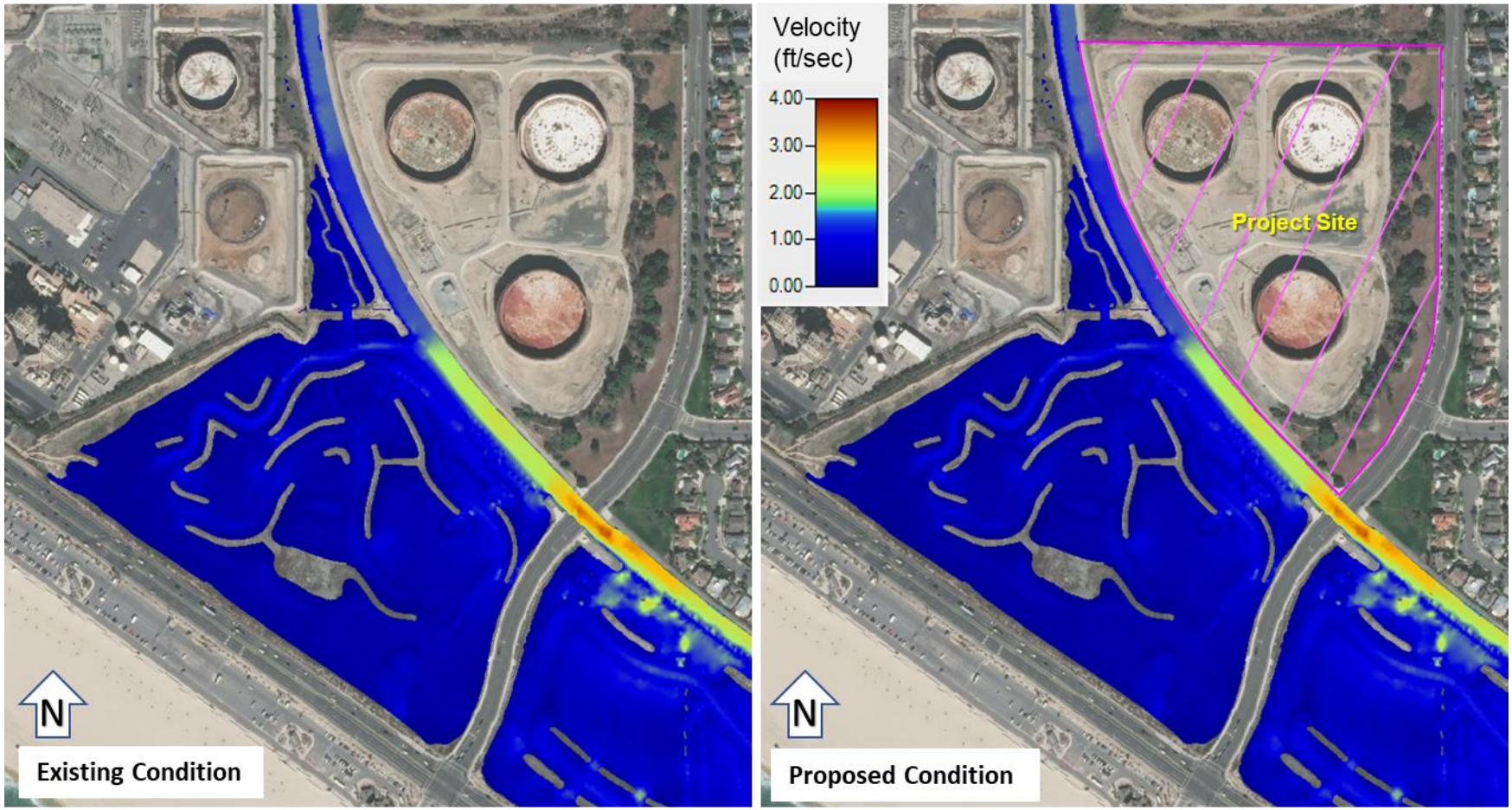


Figure 9. Maximum Velocities resulted from a 25-Year Storm for the Existing and Proposed Conditions

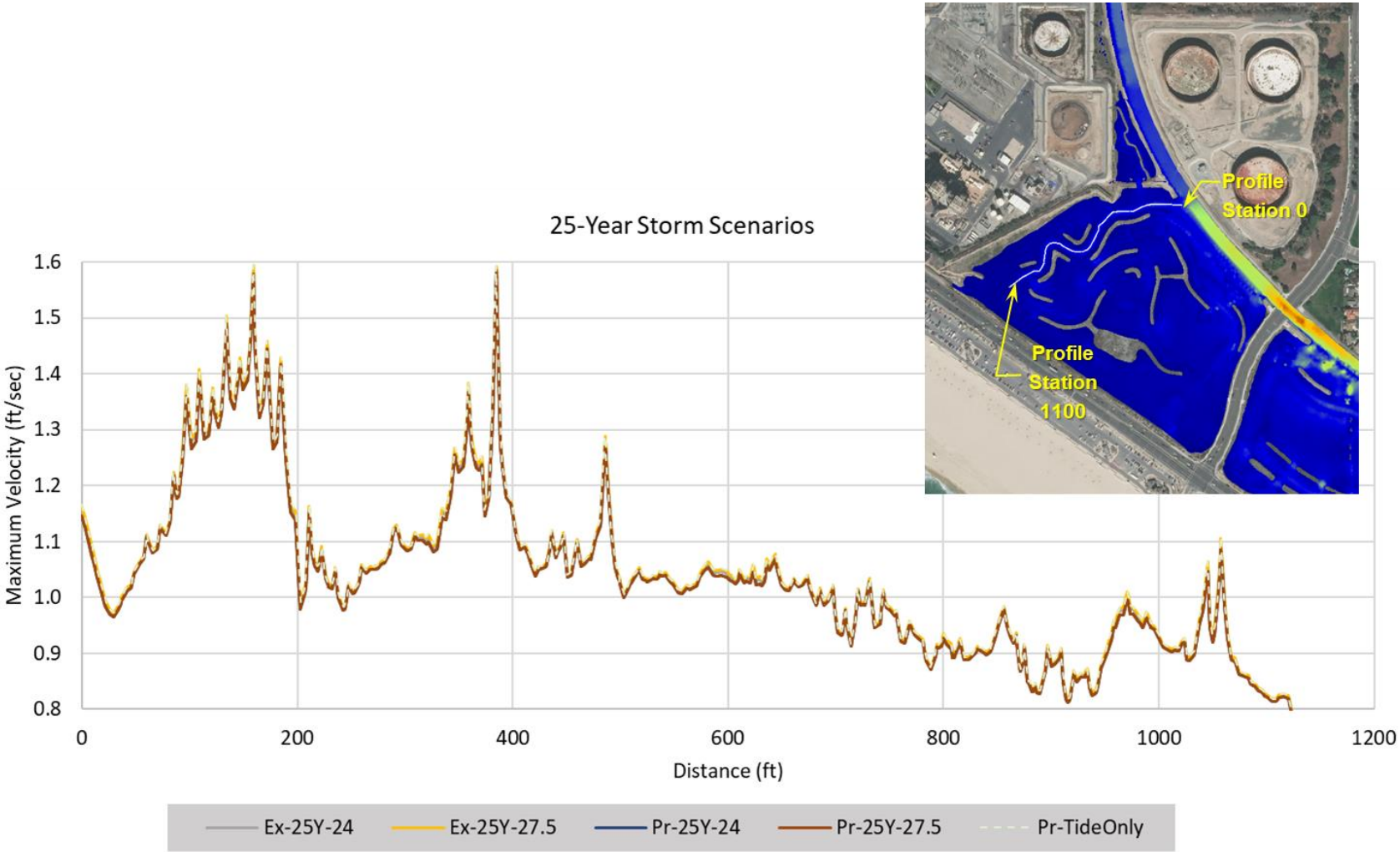


Figure 10. Maximum Velocity Profile along Magnolia Marsh Channel resulted from a 25-Year Storm for the Existing and Proposed Conditions

4. CONCLUSION

The purpose of the work presented in this report was to conduct a hydromodification assessment to determine the potential for the project to increase scour in the Huntington Beach Channel and Magnolia Marsh. The two-dimensional fluvial flood model HEC-RAS 2D was selected for use in conducting flood modeling to support the hydromodification assessment. A HEC-RAS 2D model was setup for a domain consisting of the lower and middle portions of the Huntington Beach Channel and Talbert Channel as well as the nearshore area just offshore from the Talbert Channel ocean outlet/inlet. The results (maximum water velocities) for the Existing Condition (No Project) and Proposed Condition (With Project) under both 2-year and 25-year storm discharges were analyzed and compared to determine what, if any, impact the project would have on increasing scour potential within the earthen bottom portions of the HB Channel and Magnolia Marsh. Comparison of the results under Existing Condition (No Project) and Proposed Condition (With Project) revealed that the project would not have any measurable impact on maximum water velocities for either the 2-year storm discharge or 25-year storm discharge. Based on these results it is concluded that implementation of the Magnolia Tank Farm Redevelopment Project would not increase the potential for scour of the earthen channel bottoms within the HB Channel or Magnolia Marsh due to changes in local rainfall runoff associated with the proposed project.

5. REFERENCES

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