Appendix K –
Preliminary Drainage Reports for Esperanza Hills Property, Option 1 and Option 2
Prepared by KWC Engineers dated May 2013

PRELIMINARY DRAINAGE REPORT PA12-0037

for the ESPERANZA HILLS PROJECT STONEHAVEN DRIVE OPTION 1 in the Yorba Linda Area

in the Unincorporated Area of County of Orange, California



PREPARED FOR :

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APN Numbers:
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June 20, 2013

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ESPERANZA HILLS – OPTION 1
PRELIMINARY DRAINAGE REPORT
EXECUTIVE SUMMARY

The Esperanza Hills project consists of approximately 469 acres of undeveloped land north of Stonehaven Drive, east of San Antonio Road and Casino Ridge and west of Chino Hills State Park. The project proposes to construct single family residential on approximately 340 acres of graded land. Existing topography consists of steep hillsides and canyons with offsite areas draining through the site from east to southwest. Refer to the attached Exhibit "A" for a vicinity map, project location, existing topography and existing blueline streams of the site.

The Esperanza Hills project has been designed with two (2) entry street options:

- Option 1 – Stonehaven Drive: Entry to the site will be from the south, a connection to Stonehaven Drive, down, across and up Blue Mud Canyon. Proposes 334 residential lots.
- Option 2 – Aspen Way: Entry to the site will be from the west, an extension of the existing Aspen Way over the un-named canyon. Proposes 340 residential lots.

These entry street options will be evaluated in the Specific Plan and EIR process and chosen by the discretionary approval process.

METHODOLOGY / CONCEPTUAL DRAINAGE DESIGN

The Esperanza Hills project has been designed per the Orange County Public Works standards for local storm drain systems. Peak flows were calculated per the 1986 Orange County Hydrology Manual, Modified Rational Method and runoff volumes were calculated using the Unit Hydrograph Method. The CivilD 2005 computer software was used to generate the models and aerial topography was used to create the hydrology maps. Debris basins were sized using the Army Corps. of Engineers Los Angeles District Method. Refer to the attached Exhibit "B" for the conceptual drainage design and proposed storm drain facilities.

Conceptual drainage design facilities include:

- **Debris Basins**: Offsite flows from the east will be accepted in four (4) debris basins which will be maintained by the H.O.A. Local private storm drain laterals will connect into the public mainline.

- **WQMP Basins**: For water quality treatment the 2-year flow from the local storm drain systems will be directed into private WQMP basins (Dry Extended Detention Basins with Sediment Forebays). After the 2-year volume has been treated flow shall be conveyed to the public storm drain mainline via an inlet riser/headwall system.

- **Detention Basin**: Two of the four proposed debris basins will also serve as the detention basins for the site, sized large enough to detain the increase in peak flow generated by development. This Detention Basin will utilize a restricted outlet riser designed per Orange County Public Works standards.

- **Storm Drain Mainline Pipes**: Storm drain mainline pipes within private streets designed per Orange County Public Works guidelines, will convey the 100-year offsite flow southwesterly within the project.

- **Private Storm Drain Lateral Pipes**: Local private storm drain laterals will connect curb opening catch basins to the public mainline. The private storm drain laterals (including pipes to and from the WQMP basins) and catch basins will be maintained by the H.O.A.

- **Outlet Structure:** At the outlet of the public storm drain system **an energy dissipator** and erosion protection rip-rap pad designed per Orange County Public Works and other agencies standard guidelines will reduce the discharge velocity to slower than the existing condition to reduce the potential for erosion of the downstream properties, the Cielo Vista project and the City of Yorba Linda Open Space property. **With the construction of the Outlet Structure the Esperanza Hills project will not erode the downstream canyons.**

Stormwater discharge from the storm drain will flow through the existing downstream natural canyon prior to flowing into the existing OCFC facility E06, a 13' wide by 11' high reinforced concrete box located southwest of the project site adjacent to San Antonio Road.

RESOURCE AGENCIES

The Esperanza Hills project will process an application through the following resource agencies and **obtain approval prior to the final approval of this project**. The following agencies have given preliminary indications that the project is feasible as currently planned:

- U.S. Army Corps of Engineers (ACOE) approval of permits under Section 404 of the Clean Water Act
- California Department of Fish and Game (CDFG) approval of future potential streambed alteration agreements, pursuant to Section 1600 of the Fish and Game Code
- U.S. Fish and Wildlife Services consultation related to biological impact assessments, if requested by ACOE
- Regional Water Quality Control Board (RWQCB), National Pollutant Discharge Elimination System (NPDES) permits under Section 402 of the Clean Water Act as well as approval of Section 401 Water Quality Certification

DIFFERENCES BETWEEN OPTION 1 AND OPTION 2

Option 1: Esperanza Hills Option 1 proposes to outlet the public storm drain mainline prior to exiting the project site. Stormwater discharge will flow through the existing natural canyons on the adjacent Cielo Vista property prior to flowing into the City of Yorba Linda Open Space property and facility E06.

Option 2: Esperanza Hills Option 2 proposes a storm drain mainline westerly through the Cielo Vista property via the proposed extension of Aspen Way discharging into the existing natural canyon just prior to the City of Yorba Linda Open Space property which flows into facility E06.

SUMMARY OF DRAINAGE FACILITIES

The following table provides a listing of the proposed drainage facilities and the maintenance responsibility entity for Esperanza Hills Option 1:

TABLE E-1 – SUMMARY OF DRAINAGE FACILITIES

Type of Storm Drain Facility	Street Name	Approximate Length of Facility	Approximate Size of Facility	Maintenance Responsibility
Debris Basins (3)	-	-	3± acres total	H.O.A.
Detention \ Debris Basin #3	-	-	10.33 acre park	H.O.A.
Water Quality Basins (4)	-	-	3± acres total	H.O.A.
SD Pipe	Outlet Structure #1 to Debris Basin #3	4710’	78”	O.C.P.W.*
SD Pipe	“S” Street	720’	24”-36”	O.C.P.W.*
SD Pipe	“X” Street	770’	24”-36”	O.C.P.W.*
SD Pipe	“W” Street	1540’	42”	O.C.P.W.*
SD Pipe	”EE” Street	810’	18”-30”	O.C.P.W.*
SD Pipe	“W” Street to Debris Basin #1	170’	24”	O.C.P.W.*
SD Pipe	“W” Street to Debris Basin #2	240’	36”	O.C.P.W.*
SD Pipe	Outlet Structure #2 to Esperanza Hills Parkway	1360’	54”	O.C.P.W.*
SD Pipe	Esperanza Hills	440’	30”-36”	O.C.P.W.*
SD Pipe	“B” & “C” Streets	460’	18”-24”	O.C.P.W.*
SD Pipe	“G” & “K” Streets	3130’	54”	O.C.P.W.*
SD Pipe	“G” Street	1600’	24’’-36’’	O.C.P.W.*

SD Pipe	All other laterals and catch basins	-	18”	H.O.A.
SD Pipe	All pipes to & from WQ basins	-	18”	H.O.A.

* pending approval from O.C.P.W.

SUMMARY

The following table provides a summary of the calculations for Esperanza Hills Option 1:

TABLE E-2 – SUMMARY AT OUTLET STRUCTURE #1

	Existing Condition	Proposed Condition **without** Mitigation	Difference (Prop.-Exist)	Proposed Condition **with** Mitigation
Area (ac.)	676.4	677.2	0.8	677.2
Q_{25} (cfs)	1041.7	1167.7	126.0	1041.7
Q_{100} (cfs)	1393.6	1551.2	157.6	1393.6
Vol. $_{25}$ (ac.-ft.)	165.2	135.9	-29.2	135.9
Vol. $_{100}$ (ac.-ft.)	288.9	252.2	-36.7	252.2
Vel. $_{25}$ (fps)	12.7	12.4	-0.3	5 *
Vel. $_{100}$ (fps)	13.7	13.3	-0.4	5 *

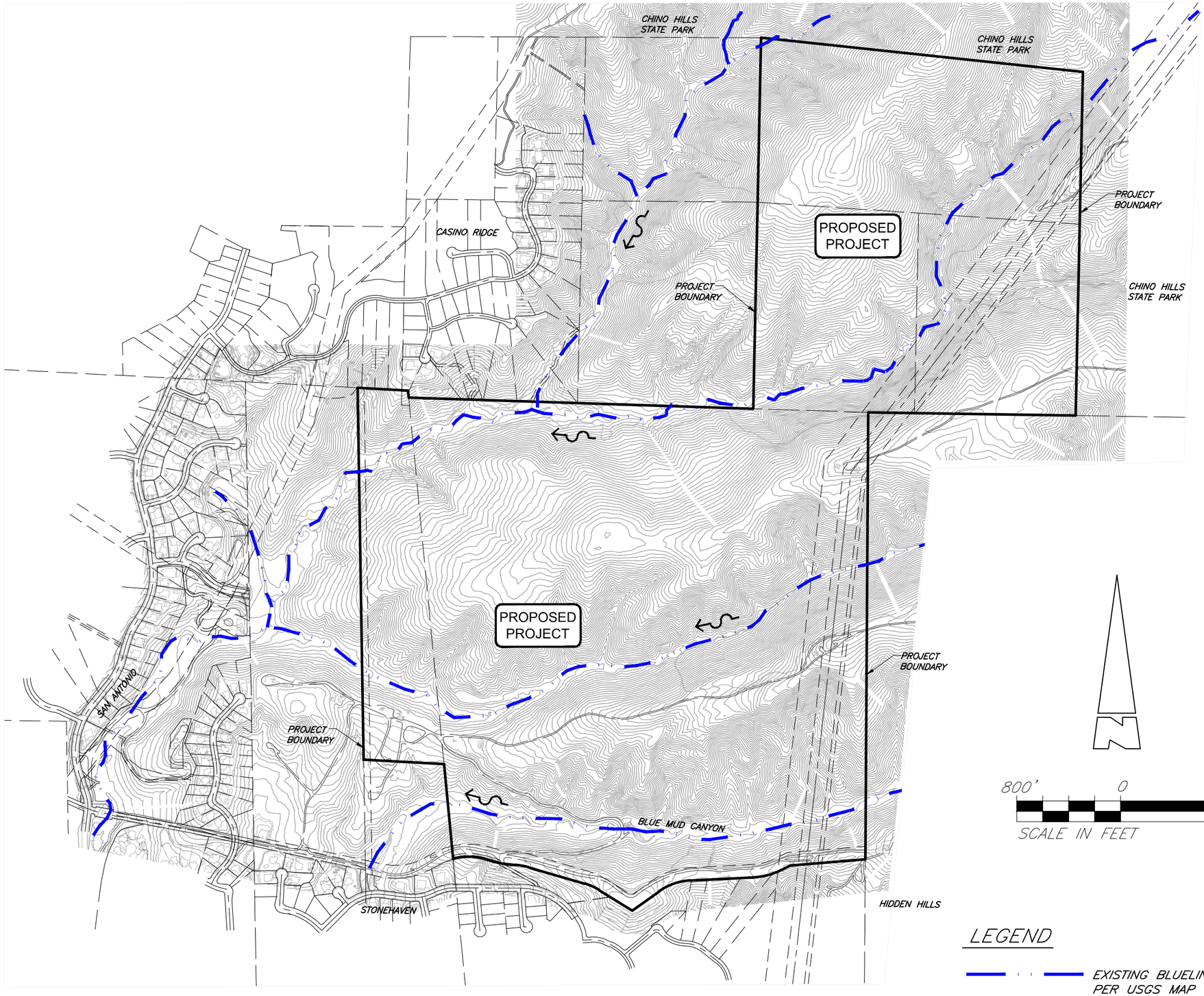
SUMMARY AT OUTLET STRUCTURE #2

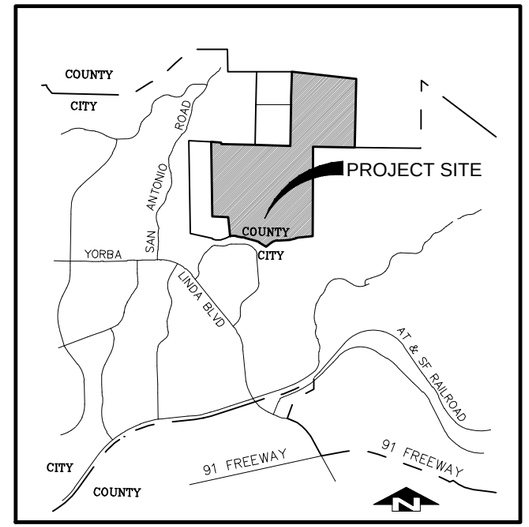
	Existing Condition	Proposed Condition **without** Mitigation	Difference (Prop.-Exist)	Proposed Condition **with** Mitigation
Area (ac.)	206.4	212.5	6.1	212.5
Q_{25} (cfs)	332.2	431.0	98.8	332.2
Q_{100} (cfs)	444.5	561.6	117.1	444.5
Vol. $_{25}$ (ac.-ft.)	52.3	45.2	-7.1	45.2
Vol. $_{100}$ (ac.-ft.)	91.2	80.8	-10.3	80.8
Vel. $_{25}$ (fps)	10.2	69.5	59.3	5 *
Vel. $_{100}$ (fps)	11.0	73.8	62.8	5 *

* Energy Dissipator and erosion protection rip rap pad shall be designed in Final Engineering to mitigate the velocity in the proposed condition with mitigation.

CONCLUSION

The Esperanza Hills project conceptual drainage design conforms to Orange County guidelines. A final Hydrology and Hydraulics Report and storm drain improvement plans designed per Orange County Public Works guidelines will be prepared in the final engineering stage of the Esperanza Hills project.





VICINITY MAP

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SCALE IN FEET

LEGEND

EXISTING BLUELINE STREAM PER USGS MAP

ESPERANZA HILLS

EXHIBIT A

EXISTING TOPOGRAPHY AND BLUELINE STREAMS

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SAN ANTONIO ROAD
CITY PROPERTY OPEN SPACE
(24")
(30")
(36")
CITY PROPERTY OPEN SPACE
PARK SITE
EX. INLET
EXISTING 13Wx11H CHANNEL
(18")
(36")
(36")
(36")
EXISTING 7Wx8H RCB
OUTLET STRUCTURE #1
OUTLET STRUCTURE #2
CIELO VISTA PROPERTY
DEBRIS BASIN #1
DEBRIS BASIN #2
24"
36"
42"
42"
78"
78"
78"
WQMP
WQMP
DEBRIS/DETENTION BASIN #3
DEBRIS/DETENTION BASIN #4
36"
54"
54"
54"
54"
54"
54"
WQMP
24"
INLET
(33")
STONEHAVEN DRIVE
BLUE MUD CANYON

LEGEND

- EXISTING BLUELINE STREAM PER USGS MAP
- PROPOSED PUBLIC STORM DRAIN LINE
- PROPOSED PRIVATE STORM DRAIN LINE
- EXISTING STORM DRAIN PIPE
- 12" PIPE SIZE (INCHES)

N

800' 0 800'

SCALE IN FEET

NOTES:
1. PIPE SIZES BASED ON 100 YEAR STORM EVENT
2. FILL OVER BLUELINE STREAMS IS SUBJECT TO RESOURCE AGENCY APPROVAL.

STONEHAVEN – OPTION 1

EXHIBIT "B"

ESPERANZA HILLS
PROPOSED STORM DRAIN FACILITIES

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Section

1
INTRODUCTION

1.1 PURPOSE OF STUDY

The Esperanza Hills project, previously known as the Murdock Property, is located within the unincorporated area of Orange County, California, south and west of the Chino Hills State Park and surrounded on all other sides by the City of Yorba Linda. The site is within the sphere of influence for the City of Yorba Linda with potential annexation as the site is developed. The purpose of this study is to hydrologically model the project site's onsite and offsite tributary watersheds and to determine the existing and proposed peak runoffs and volumes in order to analyze stormwater mitigation. The hydrologic analysis was prepared using the Modified Rational Method as specified in the Orange County Hydrology Manual. This report also approximates the peak storage required to mitigate any increased runoff due to development for the most critical storm and duration event using the Unit Hydrograph Method. The flows were used to estimate the above and below ground drainage facilities to support the Esperanza Hills project. The storm drain mainlines are proposed as being owned and maintained by Orange County Public Works. Laterals and inlets will be maintained by the H.O.A.

Development of permanent improved drainage facilities relies in part, on early identification of any adverse drainage conditions that are caused or worsened by new development projects. To avoid sub-standard drainage facilities (difficult and costly to replace) sufficient information is needed early, when the project is being considered for approval. The Orange County and City of Yorba Linda subdivision, zoning and other related ordinances provides for incorporation of drainage facility protection in design of private projects from the early start. The County's application process provides for a preliminary hydrology report / drainage study on all development projects at the time of application. This study provides the needed information to ensure proposed drainage facilities are located appropriately. This preliminary hydrology/ drainage study is also part of the full CEQA and public hearing reviews on all discretionary projects. This eliminates the need for CEQA reviews later on when proposed drainage facilities conform to what was previously reviewed and when circumstances have not changed. Orange County Planning shall review this preliminary hydrology / drainage study as part of the overall project application. Information from the study shall be used in formulating department CEQA responses and conditions of approval for the project.

1.2 PROJECT DESCRIPTION

The Esperanza Hills site is comprised of approximately 469 acres of undeveloped land that is currently vacant. **Figure 1** in **Appendix A** shows a vicinity map of the area. Upstream adjacent land uses to this project are also undeveloped, designated as open space and downstream adjacent land uses are developed residential tracts. Refer to **Figures 2 & 2a** for land uses of the surrounding area. The Esperanza Hills project by Yorba Linda Estates, L.L.C. (A.P.N. 351-031-006) is partnered with Yorba

Trails, L.L.C. (351-031-004) and Yorba Linda Estates North (326-031-006) owners of the remaining lots. The site is planned for a multifaceted community consisting of open space with a trail system and low density residential lots, totaling about 334 acres of graded land. The project proposes to construct 334 residential lots: 185 – 9,800 minimum s.f. pad size on the Esperanza Hills property, 122 – 9,900 minimum s.f. pad size on the Yorba Linda Estates North property and 27 – 9,100 minimum s.f. pad size on the Yorba Trails, L.L.C. property, with lot sizes being larger. San Antonio Road is the main north-south thoroughfare into the community connecting to Yorba Linda Boulevard and the Interstate 91 Freeway The project site will take entry off of Stonehaven Drive for which the developer as access rights. Offsite grading onto another property, Bridal Hills L.L.C., will also be required to grade the collector road to the YLE North site. The development of the Esperanza Hills project will enhance the north area of the City of Yorba Linda.

1.3 STUDY AREA

The project site is located within the Santa Ana River Watershed, the largest watershed in Orange County, covering 153.2 square miles. The river begins almost 75 miles away in the San Bernardino Mountains, crossing central Orange County before emptying into the Pacific Ocean. The Orange County portion of the watershed includes portions of the cities of Anaheim, Brea, Huntington Beach, Orange, Placentia, Santa Ana, Villa Park, and Yorba Linda. The river serves as the main tributary to the watershed. Refer to **Figure 3** for a map of the Santa Ana River Watershed.

There are several USGS designated blueline streams onsite (refer to Executive Summary Exhibit A). Two un-named streams confluence to the west of the project site, at the end of Aspen Way, prior to flowing into the Orange County Esperanza Channel (Facility number E06 Orange County Flood Control District) located along San Antonio Road between Via Corzo and Alder Ave. The entry is a rip-rap protected pad entrance to a 13' wide x 11' high trapezoidal channel about one (1) mile downstream from the property line, refer to **Figure 6**. On the southern edge of the site, a stream flows at the base of Blue Mud Canyon, however development is not proposed in this tributary area and therefore will not be analyzed in this report.

The site is currently undeveloped consisting of rolling hills with fairly steep slopes covered with native grasses and deep canyons having chaparral in the canyon bottoms. The site generally drains from northeast to southwest, in a natural canyon flow condition, with the flowline of the streams having an average slope of about 15%-25%. Being undeveloped, there are no major drainage improvements on-site. Stormwater runoff ultimately discharges into the Santa Ana River – Reach 2, located approximately 1.25 miles south of the project site.

1.4 PROPOSED MASTER DRAINAGE FACILITIES

The Orange County Esperanza Master Plan of Drainage (Adopted by the Board of Supervisors April 4, 1973) identifies drainage facilities for the Esperanza Hills project site area. The Esperanza Channel is the regional drainage facility planned to improve flood control and conveyance from the southern slopes of the Puente Hills to the Santa Ana River. The following proposed county facilities identified in the report: E06- P07, P08, P04 and S01 are within the proposed project site. The County of Orange prepared in 1977, a Hydrology Report for the Esperanza Channel, providing preliminary pipe sizing for

these facilities, also shown in **Figure 7.** This report provides 25-year storm event hydrology used to size the E06 facility now constructed.

The City of Yorba Linda has also prepared a Master Plan of Drainage, dated February 2000, prepared by Berryman & Henigar. This study includes a hydrologic analysis for the 10 year storm return frequency event for the project area. The master plan of drainage is based on the General Plan ultimate land use of Open Space with a small portion of the site as 0.5-18 du/ac. The calculated 10 year proposed flow at Aspen Way was determined to be 1813 cfs, with an area of 956 acres, refer to **Figure 15b,** node #115.5. This results in a ratio of 1.9:1 between the peak flow rate and the drainage area for the 10-year event. This study also includes Capital Improvement Project master plan drainage facilities, M-1 (P07 of county study) and M-2 (P08 of county study) through the project site. The alignment of these facilities with pipe sizes, sized for the 10 year event, are shown in **Figure 13** overlaid onto the current site plan for this project. In order to account for minor losses and to provide adequate inlet capacity to the facilities, hydraulic grade lines were calculated at 85% of pipe diameter, using a RCP roughness coefficient of 0.013. **Figure 14** shows the summary of master plans facilities in the City of Yorba Linda.

The City of Yorba Linda's criteria for a storm drain to be considered as master planned facility, is that the storm drain facility should provide protection to prevent flood damage to properties, and require a minimum of a 39-inch diameter reinforced concrete pipe. The master plan provided an estimated cost analysis and concluded that the development fee for these proposed facilities is $14,000 per acre. Storm Drainage mitigation fees and reimbursements will be determined in Final Engineering.

1.5 FLOODPLAIN MAPPING

The National Flood Insurance Act (1968) established the National Flood Insurance Program, which is based on the minimal requirements for floodplain management and is designed to minimize flood damage within Special Flood Hazard Areas. The Federal Emergency Management Agency (FEMA) is the agency which administrates the National Flood Insurance Program. Special Flood Hazard Areas (SFHA) are defined as areas that have a 1% chance of flooding within a given year. This is also referred to as the 100-year flood. Flood Insurance Rate Maps (FIRMs) were developed to identify areas of flood hazards within a community.

According to the Flood Insurance Rate Map (FIRM) catalog, there are FIRMs produced by FEMA for the project site:

MAP Number: 06059C0069J and 06059C0090J

MAP Revised: both maps were revised on December 3, 2009

Figure 5 shows the flood zones designated for the Esperanza Hills project site. The complete site is located within Zone X (white), which is an area outside the 0.2% annual chance of flood (500-year). However, these areas may be subject to flooding from severe storm activity or local drainage problems.

As shown in Figure 5, there are no floodways recognized by FEMA within the vicinity of the project site.

1.6 DESIGN CRITERIA

Public Storm Drain Lines
Facilities that are to be owned and maintained by the Orange County Public Works department shall be designed to convey the 100-year storm event.

Private Storm Drain Lines
The following are design criteria for this project, based on the Orange County Local Drainage Manual since the site is within the unincorporated area of Orange County.

Protection Levels

1. Storm Drain with tributary area less than 640 acres are to be designed for a minimum of 10-year storm frequency below top of curb using a combination of street and storm drain flow.

2. In sump conditions, catch basins and the connecting storm drains should be designed to a 25-year frequency.

3. Habitable structures shall have 100-year flood protection.

4. Minimum acceptable freeboard for catch basins from gutter flowline and detention basins from top of slope is 2.0 feet.

Section

2

HYDROLOGIC DATA AND MODEL DEVELOPMENT

2.1 EXISTING CONDITION MODEL

KWC Engineers has performed a hydrologic analysis for the Esperanza Hills project and its tributary watershed to the Orange County Esperanza Channel System located along San Antonio Road north of the 91 Freeway.

The Esperanza Hills project site can be divided into 2 sub-drainage areas to further describe the existing drainage conditions. Refer to the Existing Condition Hydrology Key Map **Figure 9** in **Appendix F** for locations of the drainage sub-areas, and peak flows at each sub-area. Hydrologic calculations to evaluate surface water runoff associated with the 100-year, 25-year, and 10-year high confidence storm frequency were performed for the drainage areas both on- and off-site. The Orange County Modified Rational Method Hydrologic calculations (as described in the Orange County Hydrology Manual) were performed using the CivilDesign Hydrology / Hydraulics computer program package 2005 by Bonadiman and Associates, Inc. The existing condition watershed boundaries were delineated using aerial topography and US Geological Survey (USGS) topographic maps, see **Figure 4**. Soil types were determined by overlaying the Hydrologic Classification of Soils from the hydrology manual onto the existing topography and calculating the areas of each soil type within each sub-area, refer to **Figure 8.** Currently a site soil investigation has not been performed to verify the soil types. Results of the existing condition hydrologic analysis are summarized in **Table 4** in **Appendix E** along with detailed calculations.

Under existing conditions, the two drainage streams into the site have a total drainage area of 882.75 acres and generates 1838 cfs in the 100-year event, 1374 cfs in the 25-year event, and 1091 cfs in the 10-year event which must be accepted and conveyed through the site. This corresponds generally to a 1.2:1 ratio for the 10-year between the peak flow rate and the drainage area. As previously mentioned, there are no existing drainage facilities upstream or within the project boundaries, and storm water runoff is conveyed via natural channel flow through the project site.

2.2 PROPOSED CONDITION MODEL

The Esperanza Hills project proposes to accept offsite flows from the existing upstream canyons into 4 proposed detention / debris basins which serve as the upstream end of the onsite storm drain system. The downstream end of the onsite storm drain system will outlet into the existing natural canyons at the property line via energy dissipaters with rip-rap (per APWA standard 384-1) to mitigate the velocity. Street catch basins onsite connect to the onsite storm drain system. In order to treat the urban runoff for water quality requirements lowflows will be bypassed via private storm drain pipes into HOA maintained WQMP Basins prior to connecting to the remaining onsite system. The proposed hydrology

model uses the combination of the Offsite Condition (**Figure 10**) and the Proposed Condition (**Figure 11**) Hydrology Key Maps in **Appendix H.** The land use types of *2 dwelling units per acre* was used for the developed areas and *undeveloped (dense cover)* was used for the open space/landscaped areas in the model to represent the proposed project. The same soils map from the hydrology manual was overlaid on the proposed condition hydrology maps and soil type areas were calculated for each sub-area.

Results of the proposed condition hydrologic analysis are summarized in **Table 5** in **Appendix G** along with detailed calculations. The total proposed drainage area comprises of 889.65 acres and generates 2112.8 cfs in the 100-year event, 1598.8 cfs in the 25-year event and 1283.5 cfs in the 10-year event which is conveyed through the site and outlets at the property line. This corresponds generally to a 1.4:1 ratio between the peak flow rate and the drainage area for the 10-year event which is below the master planned ratio. Therefore, the proposed discharge from the project site is in conformance with the master plan. It may be concluded that the master plan predicted more development in this tributary area than is currently being proposed.

The below **Table 1** is a comparison between the Existing Condition and Proposed Condition Hydrology results.

TABLE 1 – PEAK FLOW COMPARISON
AT OUTLET STRUCTURE #1

	Existing Condition	Proposed Condition	Difference (Prop-Exist)
Area (ac.)	676.4	677.2	0.8
Q_{10} (cfs)	827.8	936.0	108.2
Q_{25} (cfs)	1041.7	1167.7	126.0
Q_{100} (cfs)	1393.6	1551.2	157.6

AT OUTLET STRUCTURE #2

	Existing Condition	Proposed Condition	Difference (Prop-Exist)
Area (ac.)	206.4	212.5	6.1*
Q_{10} (cfs)	263.5	347.5	84.0
Q_{25} (cfs)	332.2	431.0	98.8
Q_{100} (cfs)	444.5	561.6	117.1

* Area diverted into project Tributary Area B from Blue Mud Canyon is within the same Watershed, OCFC facility E06

The existing condition results were adjusted by interpolation to make the area match the proposed condition area.

2.3 ONSITE STORM DRAIN SYSTEM

The onsite storm drain system shall be owned and maintained by the Orange County Public Works. Preliminary onsite drainage facilities for the proposed Esperanza Hills project were calculated by the rational method hydrology program and are presented in **Figure 12, Appendix N,** titled Proposed Storm

Drain Facilities. The estimated sizes of these facilities and their approximate locations are intended for conceptual purposes only and will be refined in the design review and final engineering process. Pipe sizes from the Debris Basins are based on the 100-year storm event and pipes not downstream of the Debris Basins are based on the 25-year event. Pipes were designed as reinforced concrete pipe in an open channel flow condition, with a roughness coefficient of 0.013 per the master plan. Hydraulic calculations will be performed in the Final Engineering phase.

Catch basins and storm drain laterals were placed at locations to keep the 25 year flow below the top of curb and the 100 year flow below the right of way. Catch basins were also placed in locations so that a single 21 foot long (the largest size) catch basin can collect a majority of the current street flow without bypassing to the next downstream catch basin. Preliminary sizing calculations are included in **Table 7** in **Appendix L.** Catch basins will also be sized in Final Engineering.

2.4 STREET CAPACITY ANALYSIS

Preliminary onsite street capacities for the proposed Esperanza Hills project were calculated using the computer program FlowMaster by Bentley. The street sections as shown on the TTM were analyzed with variable street grades. Flow to the top of curb was determined for the 25-year storm event street capacity and flow to the right of way was determined for the 100-year storm event, for both the full street and half street. Results are summarized in **Table 6, Appendix K.** By using this street capacity analysis with the rational method flows, it's concluded that the street sections are sufficient to provide the level of protection required by Orange County as previously discussed. (The street capacity is also capable of conveying the flow if the proposed water tanks were to rupture.) **Since, the storm drain mainline pipes were sized for the 100-year storm event, the street will only contain local flows until catch basins intercept the 100-year flow.**

2.5 OUTLET ANALYSIS

The storm drain is proposed to outlet at two (2) locations into existing natural canyons prior to the property boundary. At the outlet of the public storm drain systems, an **energy dissipator** and erosion protection rip-rap pad designed per Orange County Public Works and other agency standard guidelines will reduce the discharge velocity to slower than the existing condition to reduce the potential for erosion of the downstream properties, the Cielo Vista project and the City of Yorba Linda Open Space property. **With the construction of the Outlet Structure the Esperanza Hills project will not erode the downstream canyon.**

The differences in volume in acre-feet between the 10-year and 25-year 24-hour storms are minor with the proposed condition a little less than the existing condition. The 100-year proposed volume is less than the existing condition as well. Therefore, no mitigation for volume is required. Note that the existing tributary area is almost 900 acres and the proposed development is adding 77.2 acres of impervious surface, or about 8.5% of the total tributary area. The existing condition is steep hillsides with clayey soils which does not allow for much infiltration and yields a high runoff coefficient. Therefore, it seems reasonable for the volume to be similar or less in the proposed condition as the existing condition.

However, the difference in peak flow for the worst case scenario is the 10-year 24-hour event at 174 cfs between the proposed and existing condition. Comparing the proposed and existing condition hydrograph result's in a detention volume of 5.5 acre-feet to mitigate the peak flow. The following **Table 2A** summarizes the detention basins proposed to mitigate the increase in peak flow.

TABLE 2A – DETENTION BASIN SUMMARY

Tributary Area	Basin #	Area of Basin	Depth of Basin	Volume Provided
A	3	19,000 sf	6 ft.	2.6 ac-ft.
B	4	21,000 sf	6 ft.	2.9 ac-ft.

Section

3

DETENTION ANALYSIS

3.1 DETENTION ANALYSIS

The overall tributary area at the most downstream point of the two proposed storm drain systems were analyzed for both the existing and proposed condition. The 10-year, 25-year and 100-year 24-hour storms were analyzed using the Orange County Unit Hydrograph Method. The difference in peak flow and volume were compared to determine if and how much mitigation would be necessary. Refer to the following pages for the results of the Detention Analysis.

The following table provides a summary of the **Detention Basin Analysis** for Esperanza Hills Option 1:

TABLE 2 – SUMMARY AT OUTLET STRUCTURE #1

	Existing Condition	Proposed Condition **without** Mitigation	Difference (Prop.-Exist)	Proposed Condition **with** Mitigation
Area (ac.)	676.4	677.2	0.8	677.2
Q 25 (cfs)	1041.7	1167.7	126.0	1041.7
Q 100 (cfs)	1393.6	1551.2	157.6	1393.6
Vol. 25 (ac.-ft.)	165.2	135.9	-29.2	135.9
Vol. 100 (ac.-ft.)	288.9	252.2	-36.7	252.2
Vel. 25 (fps)	12.7	12.4	-0.3	5 *
Vel. 100 (fps)	13.7	13.3	-0.4	5 *

SUMMARY AT OUTLET STRUCTURE #2

	Existing Condition	Proposed Condition **without** Mitigation	Difference (Prop.-Exist)	Proposed Condition **with** Mitigation
Area (ac.)	206.4	212.5	6.1	212.5
Q 25 (cfs)	332.2	431.0	98.8	332.2
Q 100 (cfs)	444.5	561.6	117.1	444.5
Vol. 25 (ac.-ft.)	52.3	45.2	-7.1	45.2
Vol. 100 (ac.-ft.)	91.2	80.8	-10.3	80.8
Vel. 25 (fps)	10.2	69.5	59.3	5 *
Vel. 100 (fps)	11.0	73.8	62.8	5 *

* Energy Dissipator and erosion protection rip rap pad shall be designed in Final Engineering to mitigate the velocity in the proposed condition with mitigation.

ESPERANZA HILLS - OPTION 1 STONEHAVEN DRIVE
DETENTION BASIN ANALYSIS
DATE OF LATEST REVISION: 10/26/2012
AREA A/OUTLET #1 - DETENTION BASIN #3

	Area (ac)	**Soil B Area (ac)**	**Soil C Area (ac)**	**Soil D Area (ac)**
Total Site	677.2	17.0	404.75	255.5
Perviousness	Existing:	0.99	Proposed:	812.7/889.7 0.91

10-Year 24-H	Rational Method		Unit Hydrograph		Basin
	Tc	**Tc**	**Volume**	**Peak Flow**	Volume
Condition	**(min.)**	**(hr)**	**(ac.ft.)**	**(cfs)**	**(ac.ft.)**
Proposed	19.98	0.33	98.95	1046.27	
Existing	21.92	0.37	124.5	960.6	
Difference			-25.55	85.67	2.6

25-Year 24-H	Rational Method		Unit Hydrograph	
	Tc	**Tc**	**Volume**	**Peak Flow**
Condition	**(min.)**	**(hr)**	**(ac.ft.)**	**(cfs)**
Proposed	20.84	0.35	135.94	1249.41
Existing	21.22	0.35	165.15	1241.18
Difference			-29.21	8.23

100-Year 24-H	Rational Method		Unit Hydrograph	
	Tc	**Tc**	**Volume**	**Peak Flow**
Condition	**(min.)**	**(hr)**	**(ac.ft.)**	**(cfs)**
Proposed	20.1	0.34	252.2	1669.47
Existing	20.37	0.34	288.9	1706.08
Difference			-36.7	-36.61

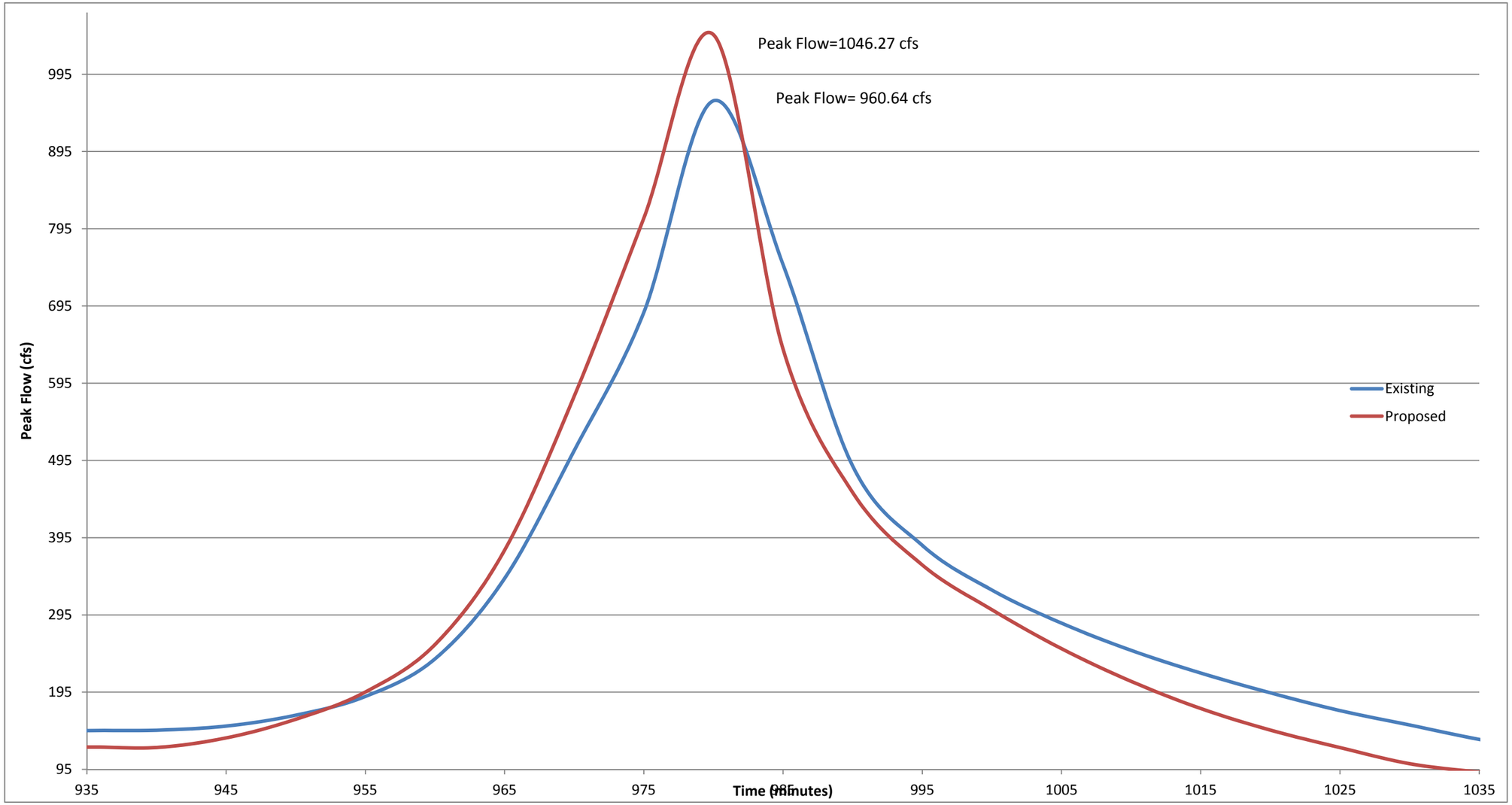
ESPERANZA HILLS - OPTION 1 STONEHAVEN DRIVE
DETENTION BASIN ANALYSIS
DATE OF LATEST REVISION: 10/26/2012
AREA B/OUTLET #2 - DETENTION BASIN #4

	Area (ac)	**Soil B Area (ac)**	**Soil C Area (ac)**	**Soil D Area (ac)**
Total Site	212.5	0.0	123.5	89.0
Perviousness	Existing:	0.99	Proposed:	0.87

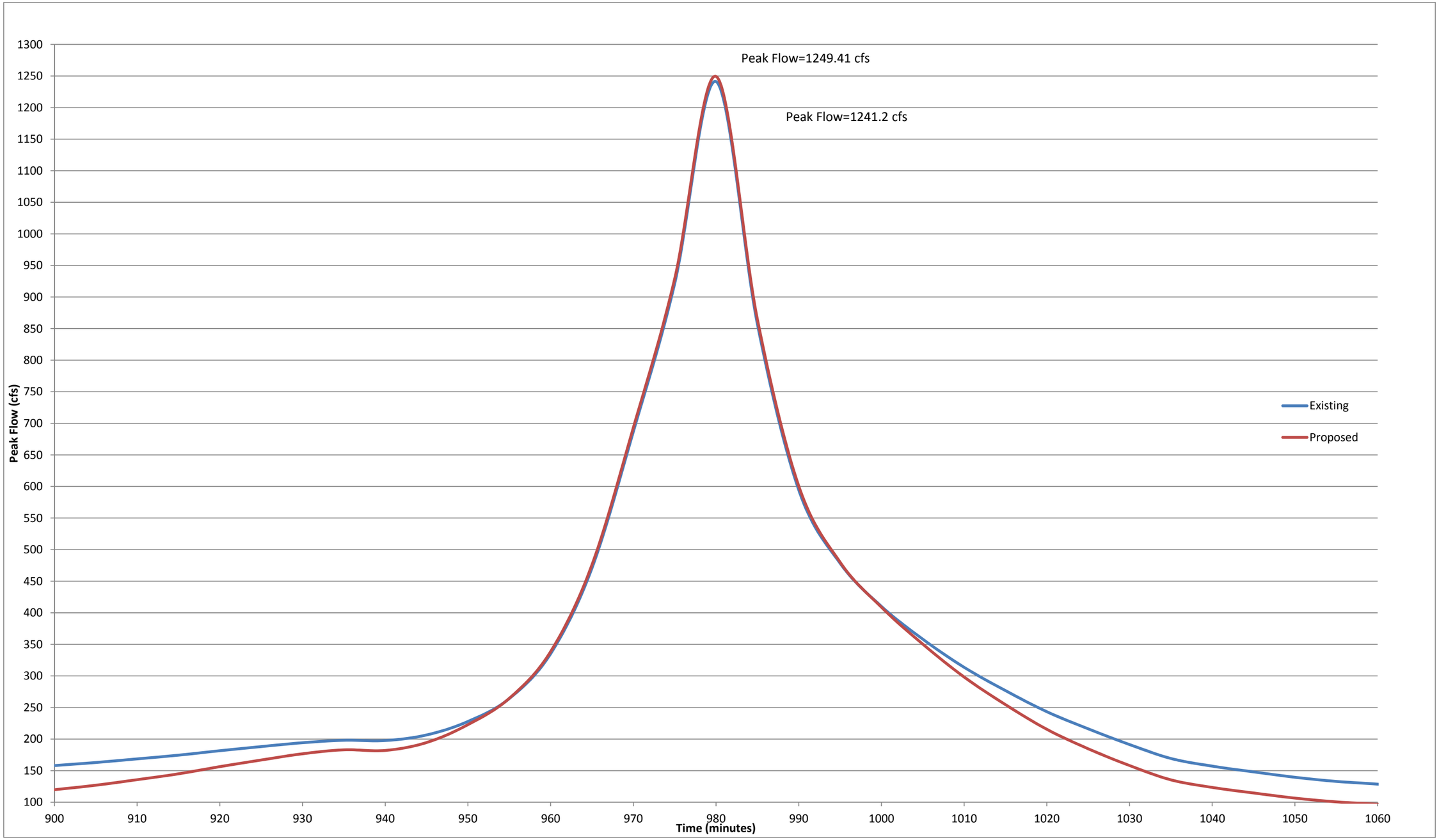
10-Year 24-H	Rational Method		Unit Hydrograph		Basin
	Tc	**Tc**	**Volume**	**Peak Flow**	Volume
Condition	**(min.)**	**(hr)**	**(ac.ft.)**	**(cfs)**	**(ac.ft.)**
Proposed	15.7	0.26	33.33	365.6	
Existing	24.13	0.40	39.49	277.38	
Difference			-6.16	88.22	2.9

25-Year 24-H	Rational Method		Unit Hydrograph	
	Tc	**Tc**	**Volume**	**Peak Flow**
Condition	**(min.)**	**(hr)**	**(ac.ft.)**	**(cfs)**
Proposed	17.19	0.29	45.16	392.14
Existing	23.33	0.39	52.31	354.65
Difference			-7.15	37.49

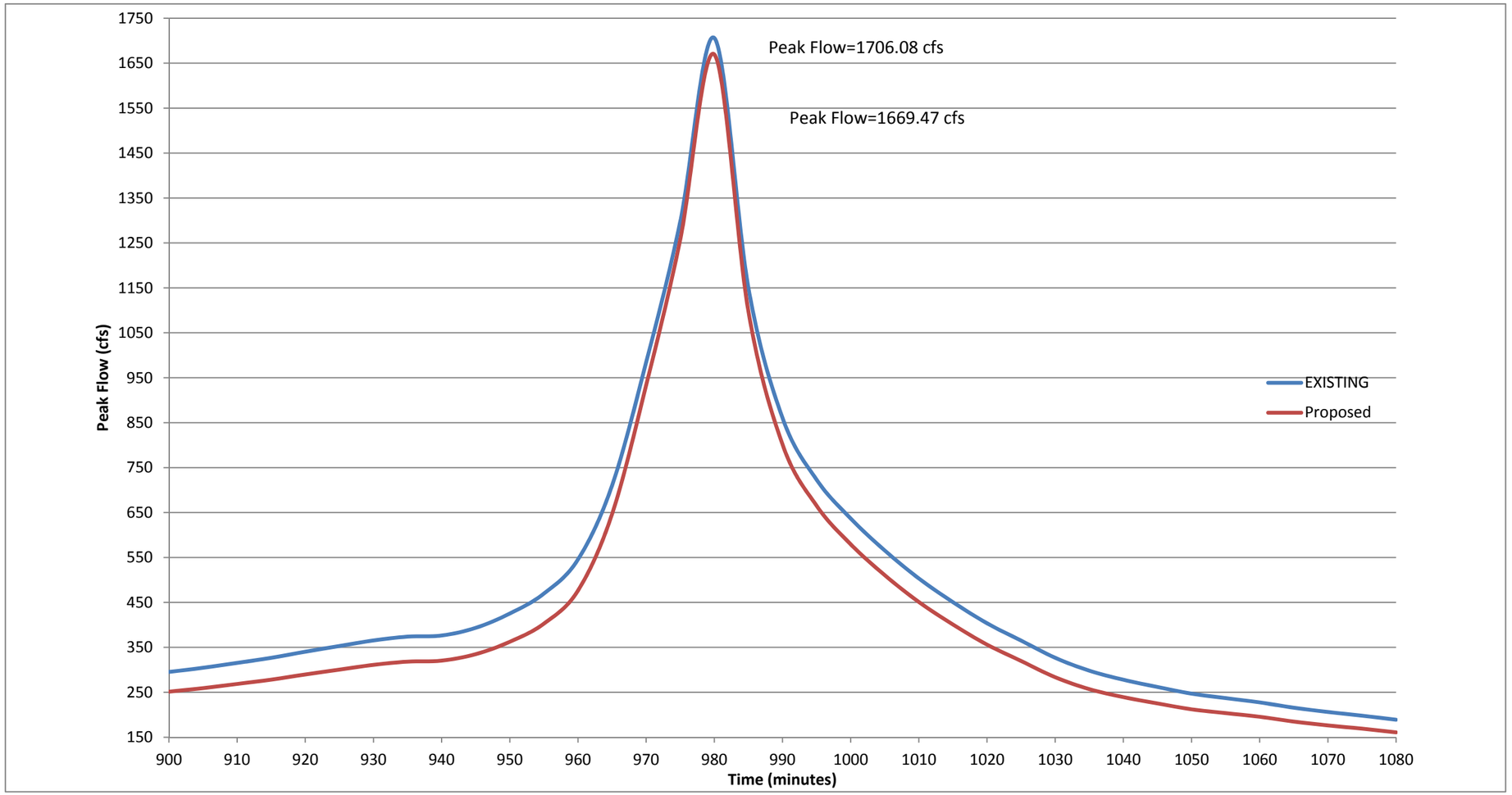
100-Year 24-H	Rational Method		Unit Hydrograph	
	Tc	**Tc**	**Volume**	**Peak Flow**
Condition	**(min.)**	**(hr)**	**(ac.ft.)**	**(cfs)**
Proposed	16.55	0.28	80.81	533.94
Existing	22.37	0.37	91.15	512.83
Difference			-10.34	21.11


Peak Flow=1046.27 cfs
Peak Flow= 960.64 cfs
Peak Flow (cfs)
995
895
795
695
595
495
395
295
195
95
935
945
955
965
975
985
995
1005
1015
1025
1035
Time (minutes)
Existing
Proposed

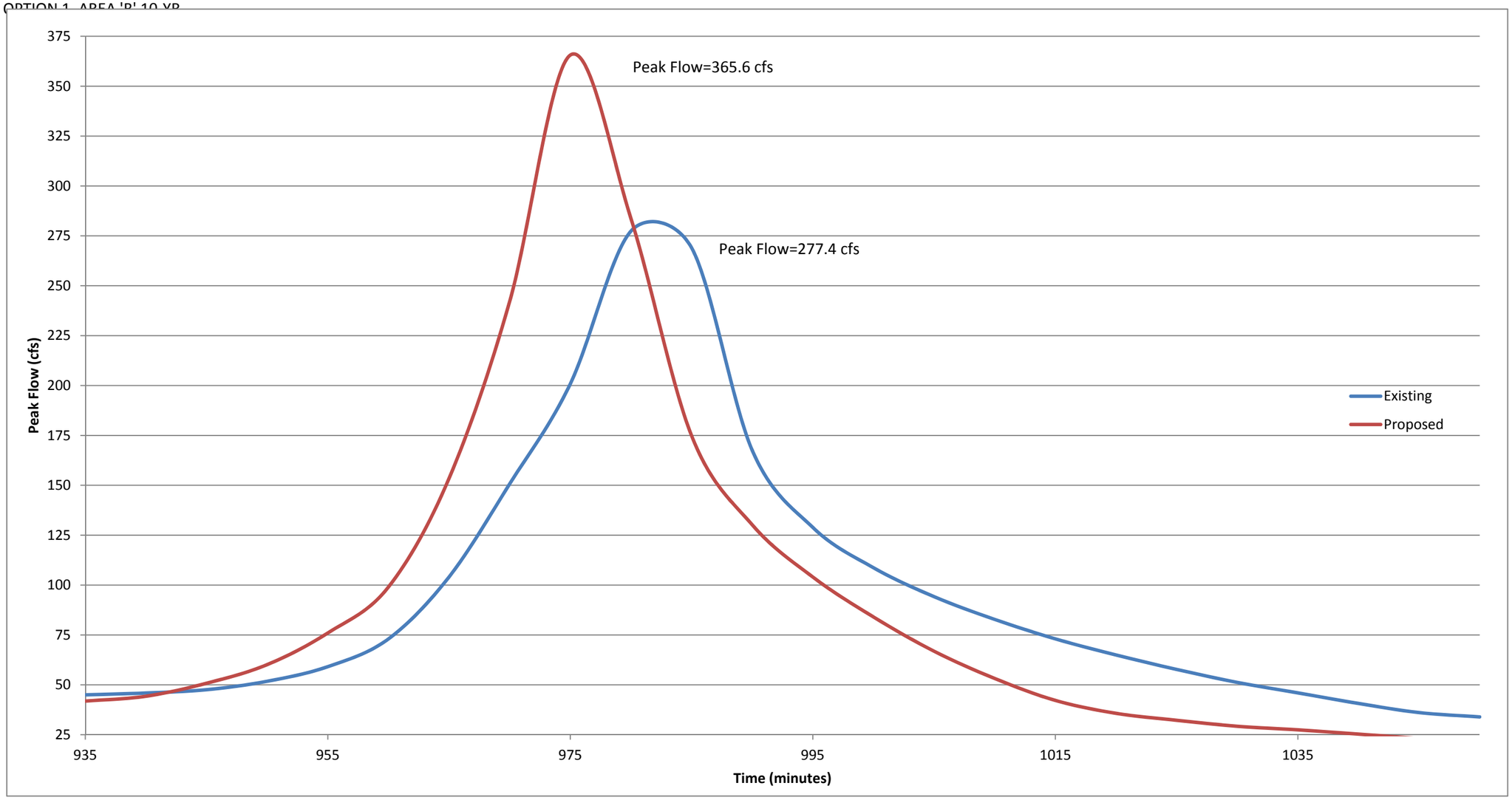
ESPERANZA HILLS
HYDROGRAPH COMPARISON
OPTION 1, AREA 'A' 25-YR



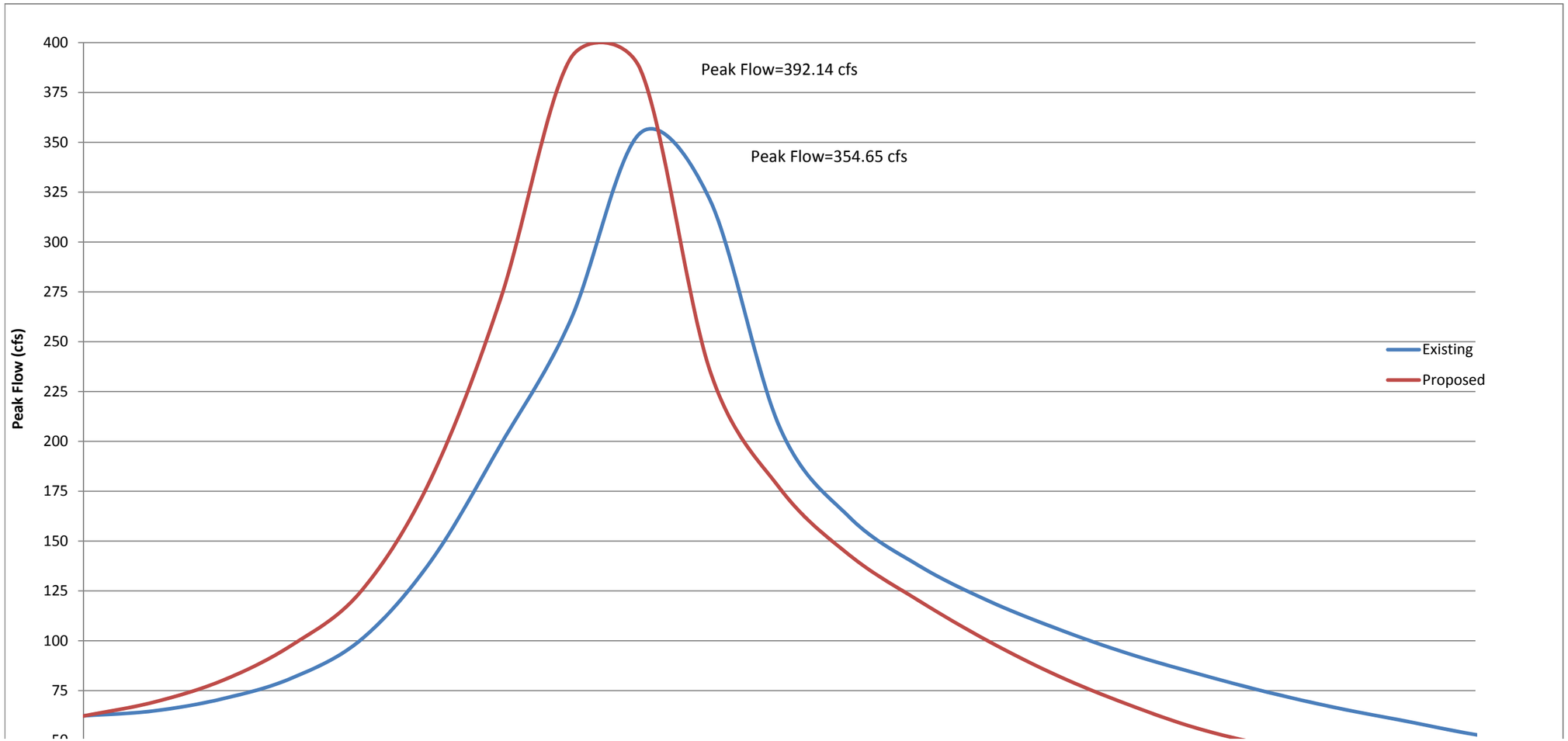
ESPERANZA HILLS
HYDROGRAPH COMPARISON
OPTION 1, AREA 'A' 100-YR



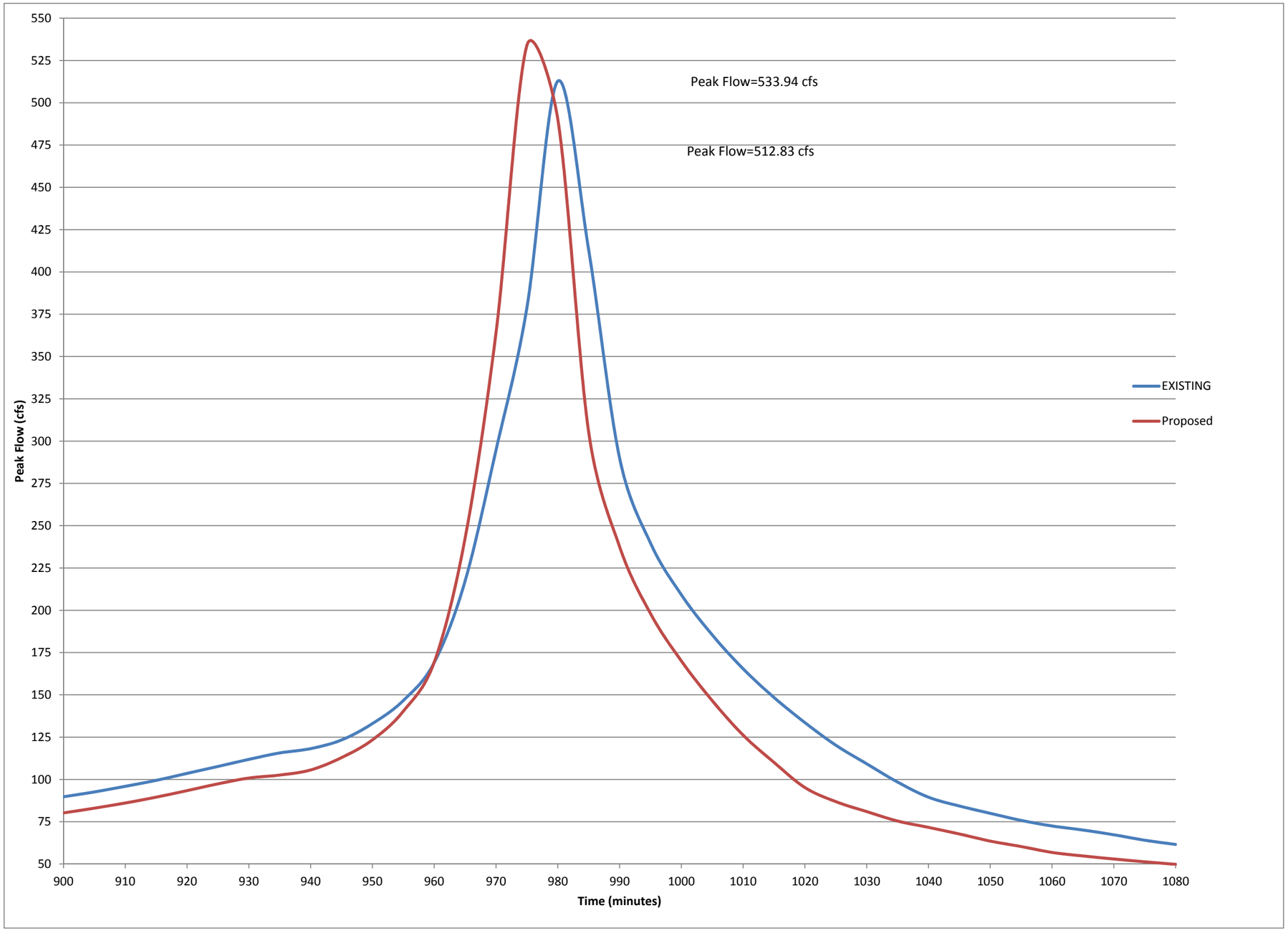
ESPERANZA HILLS
HYDROGRAPH COMPARISON
OPTION 1, AREA 'B' 10 YR



ESPERANZA HILLS
HYDROGRAPH COMPARISON
OPTION 1, AREA 'B' 25-YR



ESPERANZA HILLS
HYDROGRAPH COMPARISON
OPTION 1, AREA 'B' 100-YR



Section

4

DEBRIS BASIN ANALYSIS

4.1 DESIGN CRITERIA

This section determines the debris yield for the undeveloped tributary watershed areas upstream of the development. The corresponding calculated debris yield is then used to determine the size of the debris basin required upstream of the drainage watersheds. To predict debris yield the US Army Corps of Engineers Los Angeles District Method for Prediction of Debris Yield was used as shown below.

4.2 DEBRIS YIELD

LOS ANGELES DISTIRCT METHOD FOR PREDICTION OF DEBRIS YIELD
February 1992, updated February 2000

For Watershed areas from 0.1 square mile to 3.0 square miles, use equation 1 as shown on page 15

LOG Dy = 0.65(LOG P) + 0.62(LOG RR) + 0.18(LOG A) + 0.12(FF)

Where:

Dy = Unit Debris Yield (yd^3/mi^2)
P = Maximum 1-Hour Precipitation (inches, taken to two decimal places after the decimal points, times 100)
RR = Relief Ratio (ft/mi) (Highest Watershed Elev-Basin Elev)/Maximum Length
A = Drainage Area (ac)
FF = Non-Dimensional Fire factor

Refer to Appendix O for detailed calculations

Section

5
CONCLUSIONS

This preliminary drainage report has evaluated the potential effects of runoff for the proposed project. In addition, this report has addressed the methodology used to analyze the existing and proposed conditions, which was based on the Orange County Hydrology and Local Drainage Manuals. This section provides a summary discussion that evaluates the potential effects of the proposed project.

- The proposed project will not significantly alter drainage patterns on the site. The project will add approximately 77.2-acres of impervious area, which is about 16% of the site, or about 5% of the total tributary area, in the form of rooftops, driveways, sidewalks and streets.
- The Rational Method results illustrates that there is an increase in peak flowrate. Thus, with the existing drainage pattern flowing into a downstream property, detention basins were sized for the project site to mitigate the increase in flowrate. The pre- and post-developed conditions will be met at the outlet of the project.
- The onsite storm drain mainlines shall be owned and maintained by Orange County Public Works. (If the area is annexed into the City of Yorba Linda than ownership and maintenance would need to be accepted by the City of Yorba Linda Public Works Department.)
- Preliminary alignment and pipe sizes of storm drain lines were presented. Storm drain lines larger than 39" diameter follow the criteria of Master Planned Facilities.
- A Final Hydrology & Hydraulics Report must be conducted to determine the proposed hydraulic grade lines throughout the storm drain system, size outlet structures and final detention basin sizing.

All stormwater run-off will be carried via typical street sections and an onsite storm drain system. The computed 25 year storm event is contained below the top of curb and the computed 100 year storm event is contained with-in the street right-of-way.

The proposed peak flow rate, volume, time of concentration and flow velocity will be match the existing condition at the downstream end of the drainage flowline at the property line prior to discharging into the downstream properties. Therefore, Esperanza Hills and Cielo Vista will not share any drainage improvements. Furthermore, downstream OCFC facilities shall not be affected from the development of this project and shall not need to be upsized.

Potential Hydrologic Impacts

Without properly designed and constructed stormwater mitigation measures the following items could be impacted due to the development of this project:

1. Runoff – increase in runoff peak flow and volume will be mitigated by the detention basin
2. Erosion – of existing natural downstream canyons and hillsides will be mitigated by properly designed grading, energy dissipator and erosion protection rip-rap pad at the outlet of storm drain system
3. Flooding – of structures due to the 100-year storm event will be mitigated with properly designed grading and sized storm drain system
4. Debris – from existing upstream canyons into the development will be mitigated by debris basins and debris from site into downstream properties will be mitigated by WQMP basins, trash racks and properly maintained storm drain facilities.
5. Landslides – the project site is located in a potential landslide area that will be mitigated with properly designed grading and mitigation measures recommended by geotechnical engineer
6. Groundwater – is deep based on regional maps. The WQMP basins will mitigate any potential pollutants due to development prior to discharging onsite. WQMP and detention basins will allow for groundwater replenishment to the extent feasible to mitigate the increase in permeable area.

Section

6
REFERENCES

City of Yorba Linda, City of Yorba Linda Master Drainage Plan, dated February 2000.

County of Orange, Esperanza Area Master Plan of Drainage, Approved by the Board of Supervisors April 4, 1973.

County of Orange, Hydrology Report, Esperanza Channel, Facility No. E06, entire drainage system. June 1977.

County of Orange. Local Drainage Manual. January 1996 plus subsequent errata.

Orange County Flood Control District. *Hydrology Manual*. 1986

US Army Corps of Engineers, Los Angeles District Method for Prediction of Debris Yield, February 1992, Updated February 2000.

Appendix

A
VICINITY MAPS

- Thomas Brothers Map
- Surrounding Planning Areas Exhibit
- City of Yorba Linda Land Use Map
- Santa Ana River Watershed
- USGS Topography Yorba Linda Quadrangle

VICINITY MAP

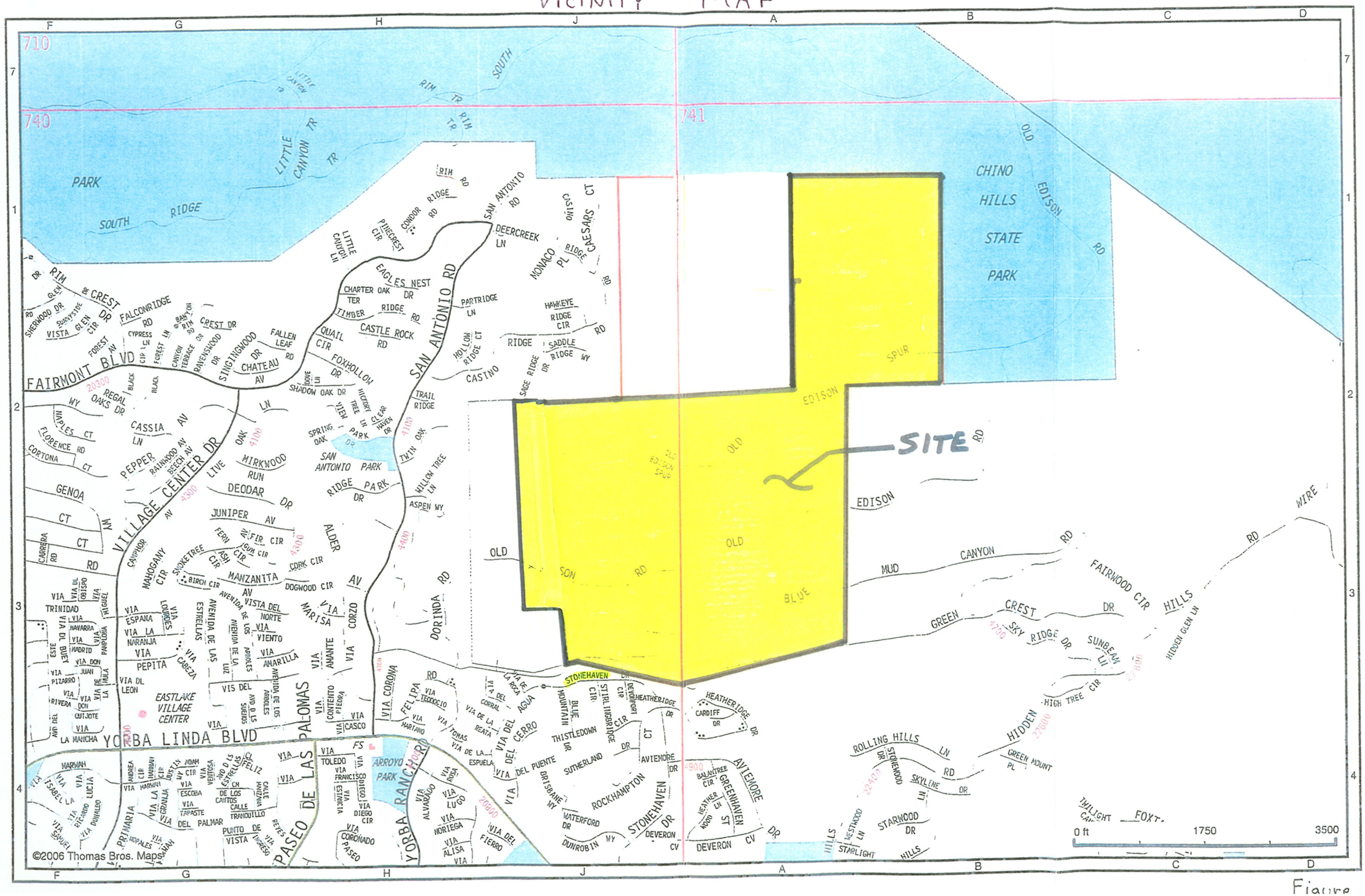
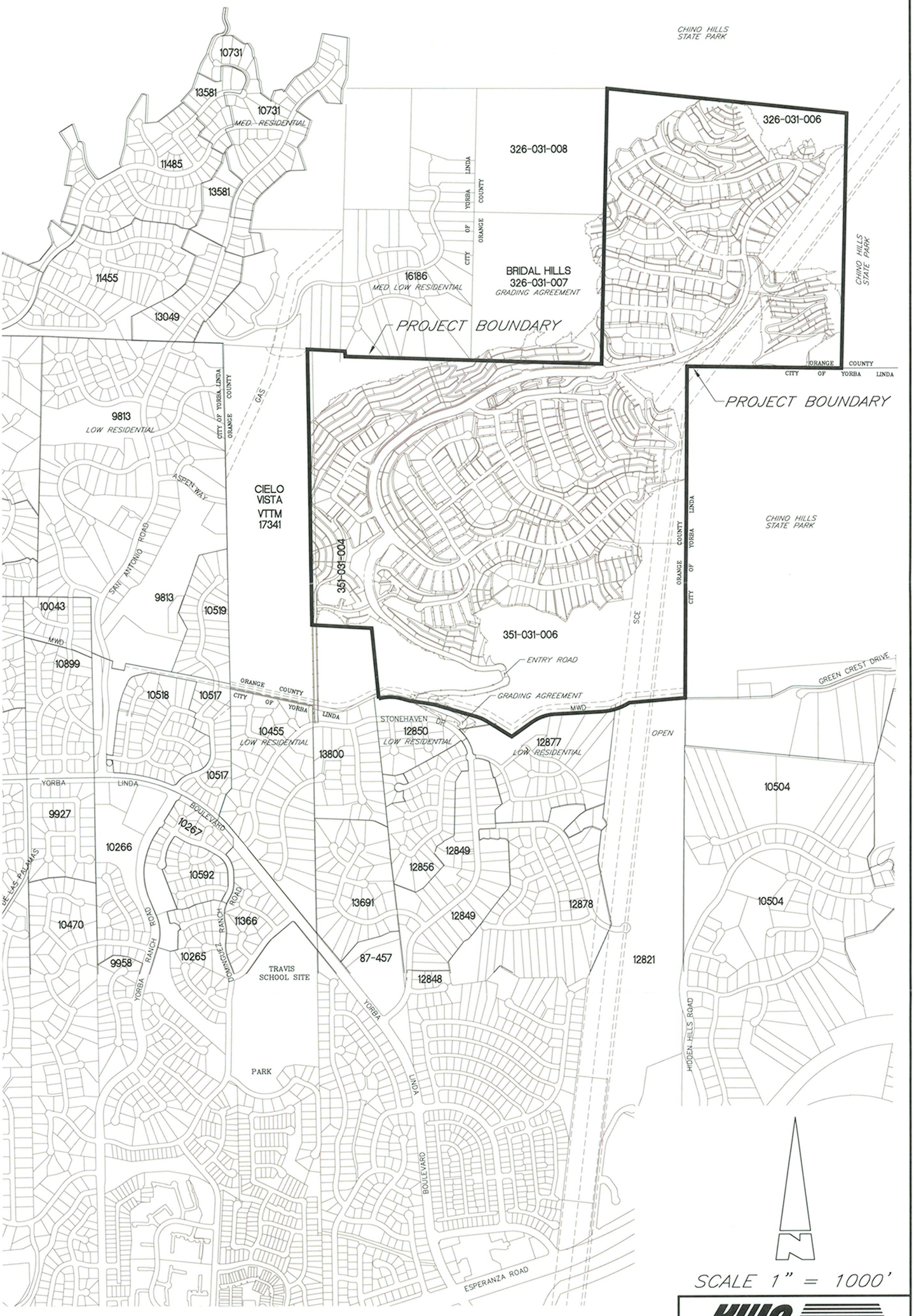


Figure 1

R:\09\1200\PRELIM REPORTS\PRELIM WQMP Option 1\WQMP Surrounding Planning Areas.dwg (12/11/2012 5:04 PM) Plotted by: Victor Elia

ESPERANZA HILLS – OPTION 1
SURROUNDING PLANNING AREAS



KWC ENGINEERS
CIVIL ENGINEERS • PLANNERS • SURVEYORS
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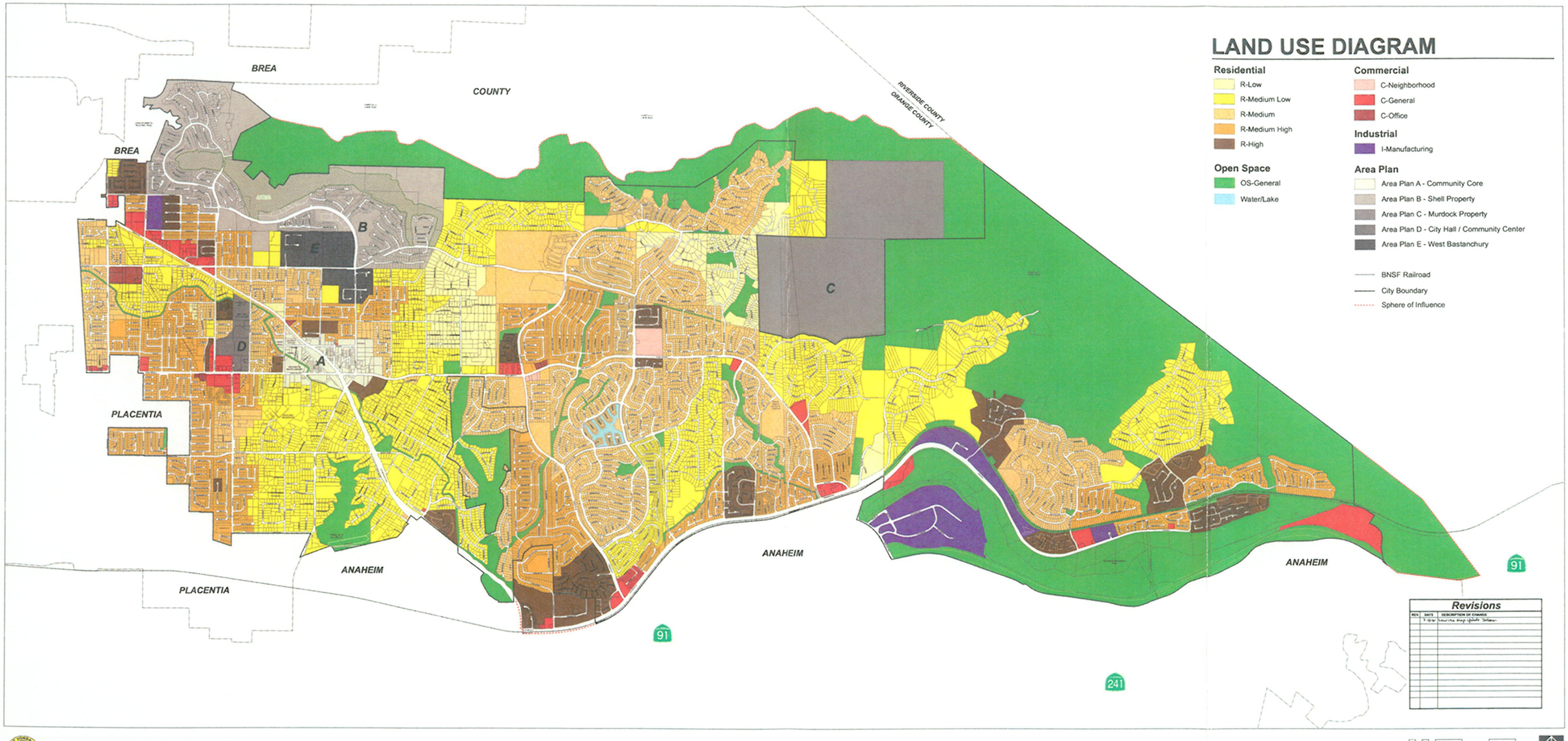
Figure 2



CITY OF YORBA LINDA LAND USE MAP

Figure 2a



http://www.ocwatersheds.com/watersheds/aerials/aerial_santaana.gif Figure 3 2/4/2008



1 MILE
7000 FEET
1 KILOMETER

CALIF
QUADRANGLE LOCATION

DARDS
STON, VIRGINIA 22092
ON REQUEST

Revisions shown in purple and woodland compiled from aerial photographs taken 1978 and other sources
This information not field checked. Map edited 1981
Purple tint indicates extension of urban areas

ROAD CLASSIFICATION

Heavy-duty
Medium-duty
Light-duty
Unimproved dirt
State Route

YORBA LINDA, CALIF
N3352.5—W11745/7.5

1964
PHOTOREVISED 1981
DMA 2451 IV NE—SERIES V895

Mapped, edited, and published by the Geological Survey

Control by USGS and NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1946 and planetable surveys 1933 and 1949. Revised from aerial photographs taken 1966. Field checked 1967

Polyconic projection. 10,000-foot grid ticks based on California coordinate system, zones 5 and 6. 1000-meter Universal Transverse Mercator grid ticks, zone 11, shown in blue
1927 North American Datum. To place on the predicted North American Datum 1983 move the projection lines 1 meter north and 84 meters east as shown by dashed corner ticks

Fine red dashed lines indicate selected fence lines

Areas covered by dashed light-blue pattern are subject to controlled inundation

There may be private inholdings within the boundaries of the National or State reservations shown on this map

Revisions shown in purple and woodland compiled from aerial photographs taken 1978 and other sources. This information not field checked. Map edited 1981
Purple tint indicates extension of urban areas

GN MN
0°23'
7 MILS
14°
249 MILS

UTM GRID AND 1981 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

1000 0 1000

CO
DOTTED L
NATIONAL

THIS MAP COMPLIE
FOR SALE BY U.S. GEOLOGICAL SU
A FOLDER DESCRIBING TOPO

Figure 4

Appendix

B

FEMA FIRM PANELS



Federal Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

50 0 500 1000

FEET

METERS

NFIP

PANEL 0069J

FIRM

FLOOD INSURANCE RATE MAP

ORANGE COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 69 OF 539

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ANAHEIM, CITY OF	060213	0069	J
ORANGE COUNTY	060212	0069	J
YORBA LINDA, CITY OF	060238	0069	J

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

MAP NUMBER
06059C0069J

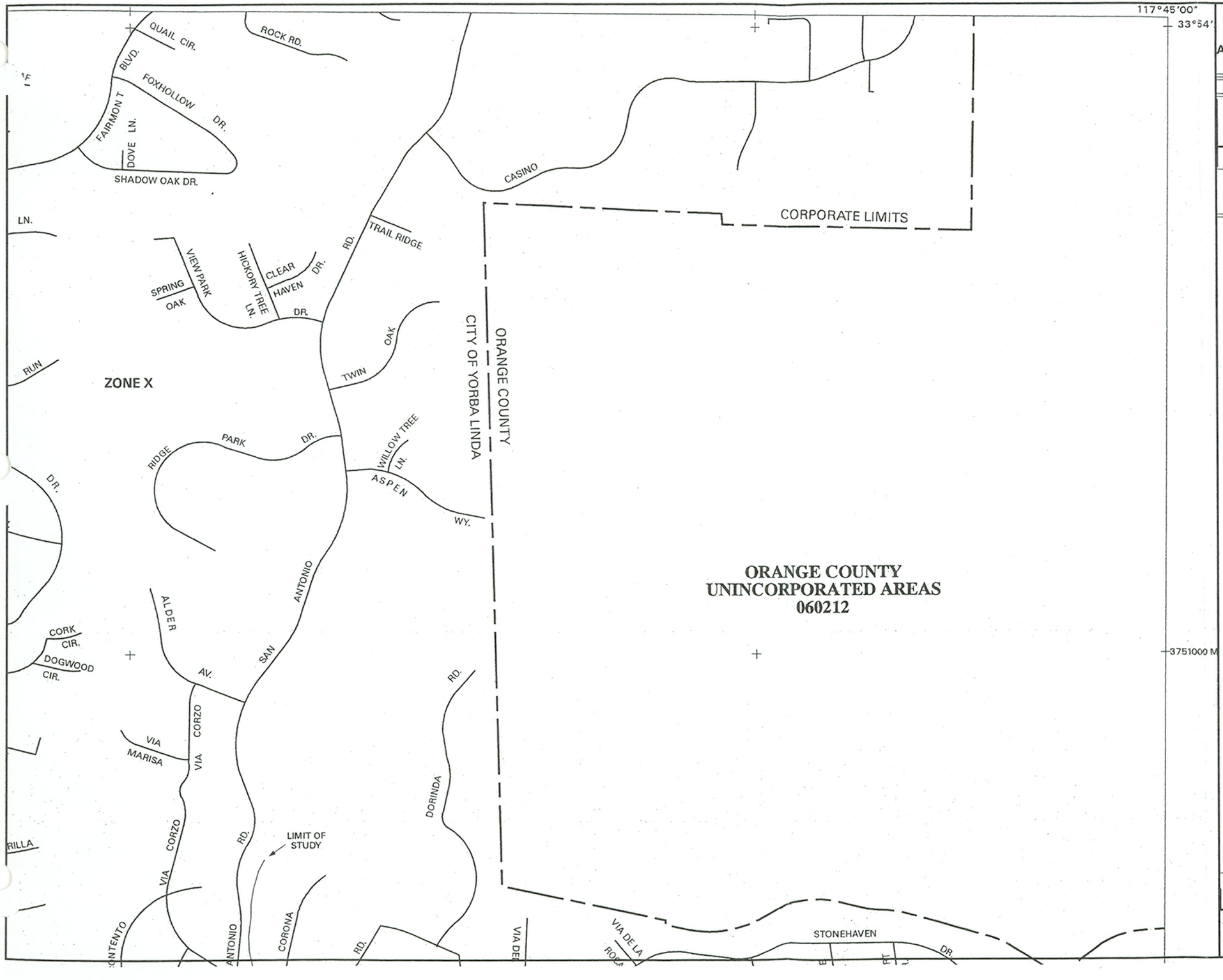
MAP REVISED
DECEMBER 3, 2009

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Figure 5a



MAP SCALE 1" = 500'

500 1000 FEET

METERS

PANEL 0069H

FIRM

FLOOD INSURANCE RATE MAP

ORANGE COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 69 OF 550

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ORANGE COUNTY, UNINCORPORATED AREAS	060212	0069	H
YORBA LINDA, CITY OF	060238	0069	H
ANAHEIM, CITY OF	060213	0069	H

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

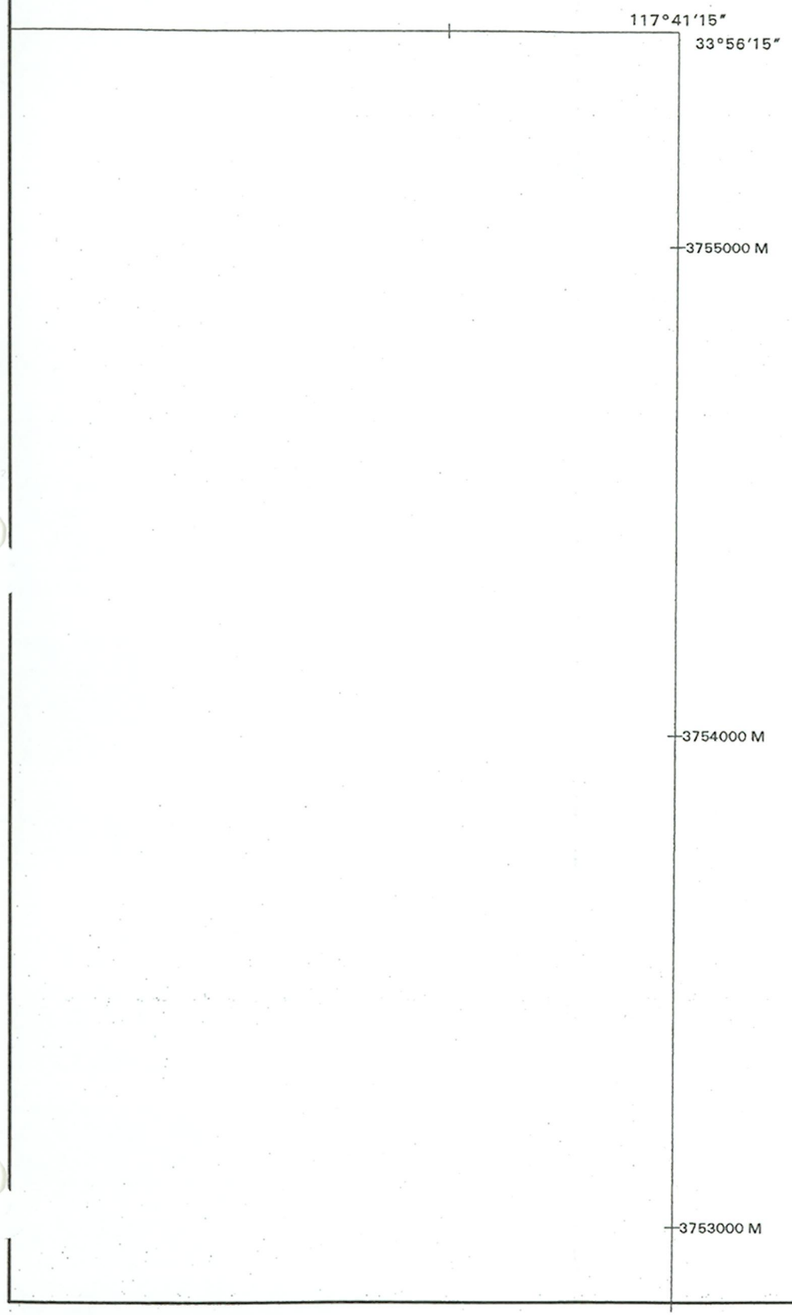
MAP NUMBER
06059C0069H

MAP REVISED:
FEBRUARY 18, 2004

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Figure 5b



LEGEND

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

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 Area of special flood hazard formerly protected from the 1% annual chance flood event 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 event.

ZONE A99 Area to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no base flood elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no base flood elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

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

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

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 velocities.

513 Base Flood Elevation line and value; elevation in feet*

AP SCALE 1" = 1000'

1000 2000 FEET

PANEL 0090H

FIRM

FLOOD INSURANCE RATE MAP

ORANGE COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 90 OF 550

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ORANGE COUNTY, UNINCORPORATED AREAS	060212	0090	H
YORBA LINDA, CITY OF	060238	0090	H
ANAHEIM, CITY OF	060213	0090	H

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

MAP NUMBER 06059C0090H

MAP REVISED: FEBRUARY 18, 2004

Federal Emergency Management Agency

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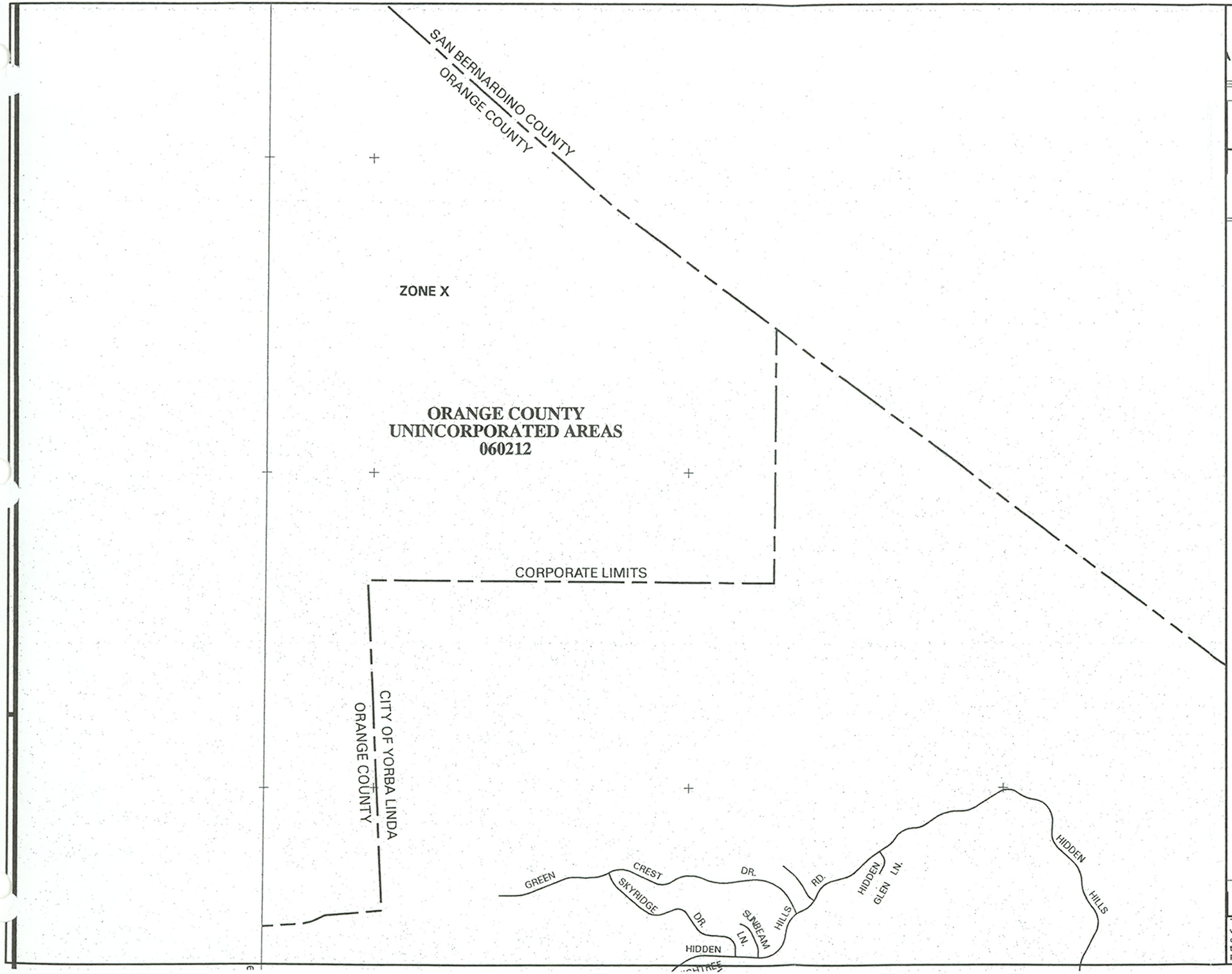
Figure 5d



AP SCALE 1" = 1000'

1000 2000 FEET

PANEL 0090H

FIRM

FLOOD INSURANCE RATE MAP

ORANGE COUNTY,
CALIFORNIA
AND INCORPORATED AREAS

PANEL 90 OF 550

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ORANGE COUNTY, UNINCORPORATED AREAS	060212	0090	H
YORBA LINDA, CITY OF	060238	0090	H
ANAHEIM, CITY OF	060213	0090	H

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

MAP NUMBER
06059C0090H

MAP REVISED:
FEBRUARY 18, 2004

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Figure 5c

Appendix

C

ORANGE COUNTY FLOOD CONTROL EXISTING FACILITIES

E 6100907.322

N 2276545.278

E 6122407.468

N 2276545.165

N 2260745.163

E 6100907.413

E 6122407.550

N 2260745.045

SAN BERNARDINO COUNTY


transition from 20x13.79
transition from 20x12.01 to 20x13.79
transition from I-13x11 to 20x12.01
trans from I-13x13.79 to I-13x11
trans from I-13x12 to I-13x10
trans to I-12x10.5
trans to I-12x12.71
trans to I-13x15.66
trans to I-13x9
trans to I-13x5.91
trans to I-13x11.5
trans to I-13x12
trans to I-13x14.74
trans to I-13x10
trans to I-13x12
trans to I-13x12
trans to I-13x12

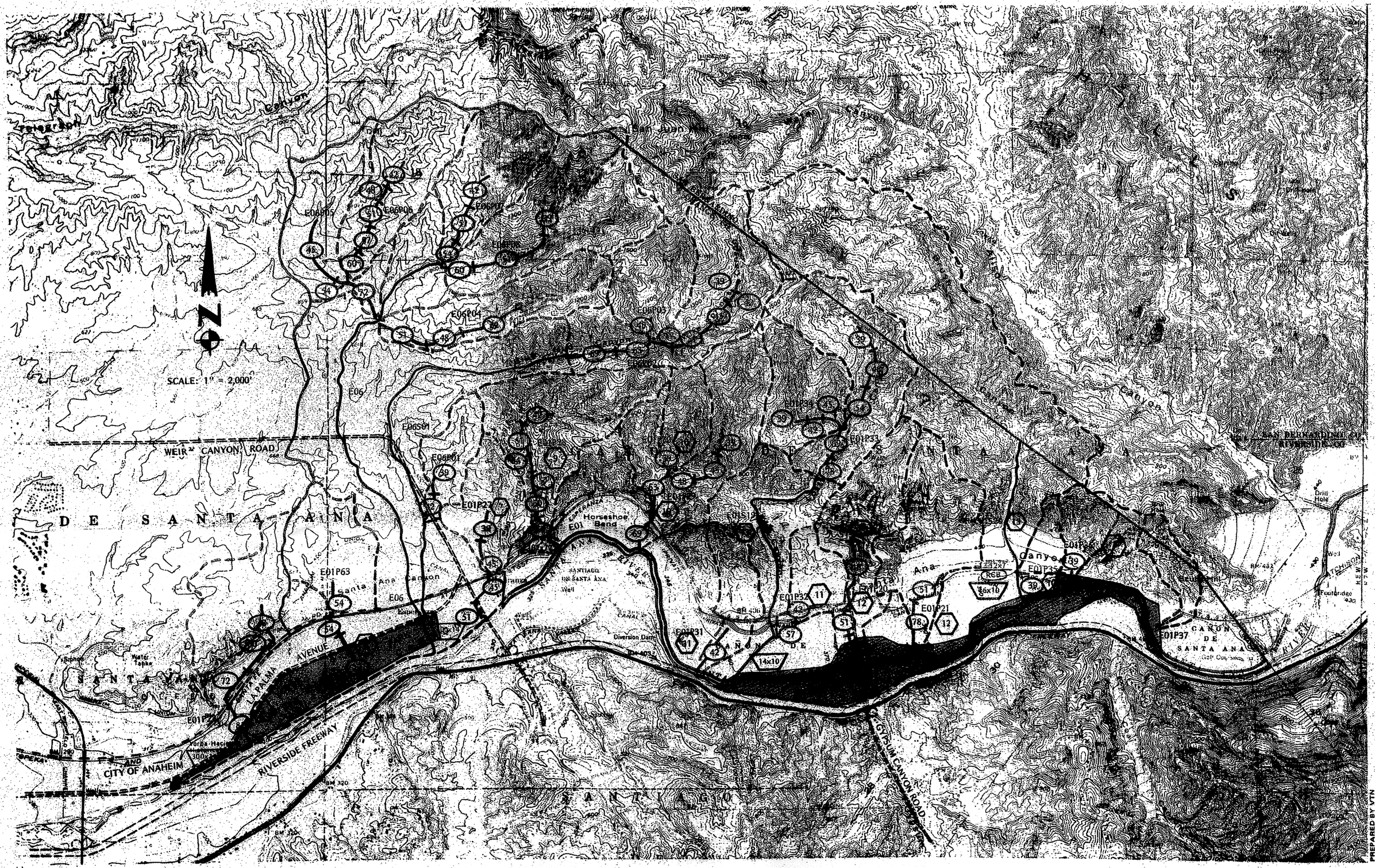


PLATE 2

FACILITY SIZE LEGEND

- PROPOSED REGIONAL FACILITY (INTERIM IMPROVEMENT REQUIRED) TRAPEZOIDAL CHANNEL, BASE WIDTH AND HEIGHT IN FEET
- PROPOSED REINFORCED CONCRETE BOX, (RCB), NUMBER OF BARRELS AND SPAN BY HEIGHT IN FEET
- PROPOSED LOCAL DRAINAGE FACILITY RCP, SIZE IN INCHES
- PROPOSED CITY DRAINAGE FACILITY RCP, SIZE IN INCHES
- EXISTING O.C.F.C.D. FACILITY, TRAPEZOIDAL CHANNEL, BASE WIDTH AND HEIGHT IN FEET
- EXISTING R.C. ARCH, BASE WIDTH BY HEIGHT IN INCHES

PROPOSED MASTER PLAN DRAINAGE FACILITIES

LEGEND

- STUDY AREA BOUNDARY
- DRAINAGE SUB–AREA BOUNDARIES
- REGIONAL WATERCOURSES
- EXISTING O.C.F.C.D. FACILITIES
- PROPOSED LOCAL DRAINAGE FACILITIES
- EXISTING GREENBELT LOCAL DRAINAGE FACILITIES
- PROPOSED CITY DRAINAGE FACILITY
- PLATE NUMBER OF PRELIMINARY PLAN AND PROFILE

Figure 7

Appendix

D

HYDROLOGIC CLASSIFICATION OF SOILS

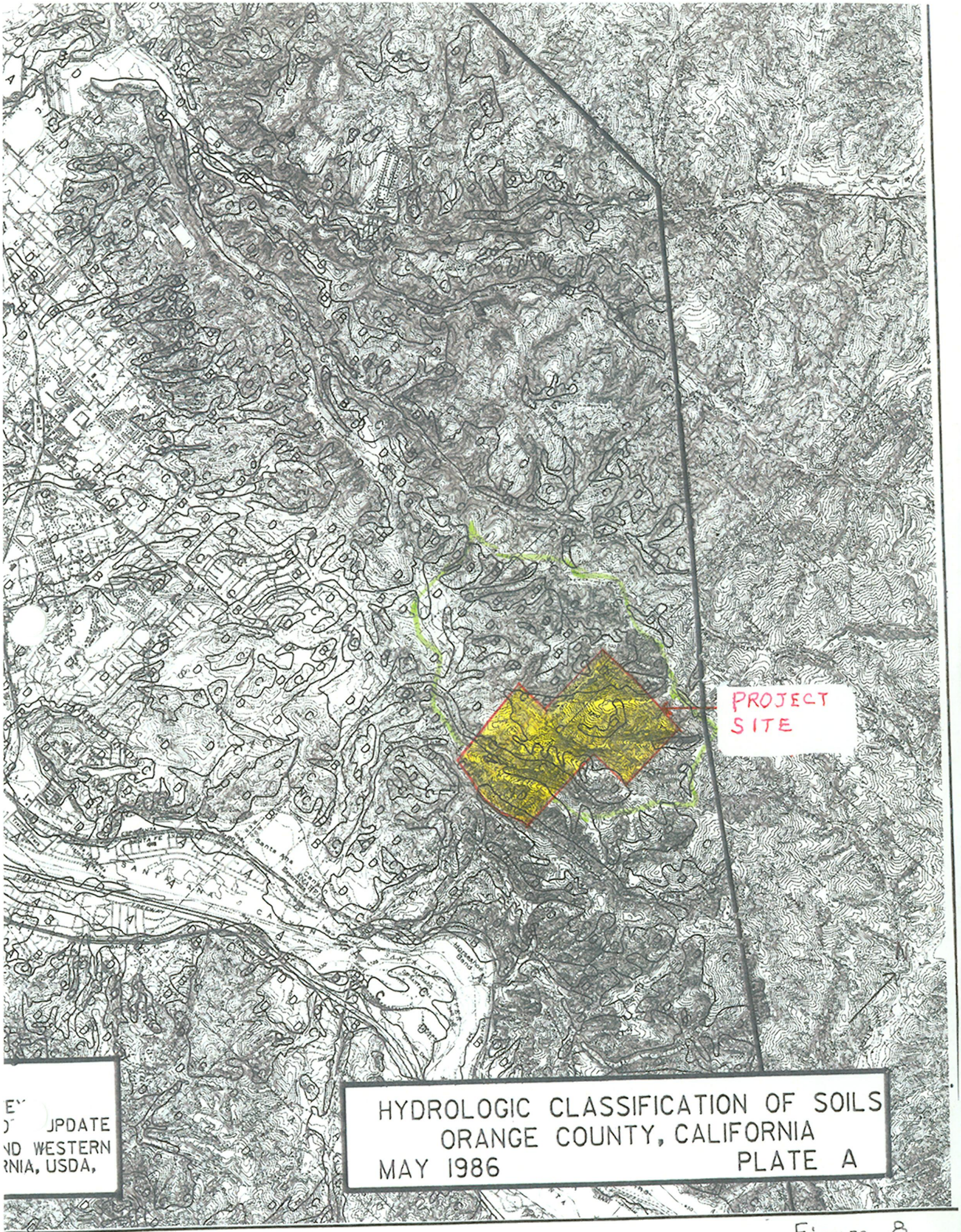

PROJECT SITE
HYDROLOGIC CLASSIFICATION OF SOILS
ORANGE COUNTY, CALIFORNIA
MAY 1986
PLATE A

Figure 8

Appendix

E

EXISTING CONDITION HYDROLOGY RATIONAL METHOD

TABLE 4
ESPERANZA HILLS
EXISTING CONDITION HYDROLOGY SUMMARY TABLE

Area A	Area (ac)	Total Area (ac)	Q100 (cfs)	100-Y Tc (min)	Q25 (cfs)	25-Y Tc (min)
1	0.93	0.93	3.06	11.19	2.35	11.19
2	3.52	4.45	13.92	12.12	10.65	12.21
3	5.63	10.08	29.90	13.27	22.79	13.47
4	12.43	22.51	64.13	14.23	48.75	14.52
5	13.55	36.06	102.52	14.23	77.87	14.52
6	10.74	46.80	128.12	15.15	97.08	15.52
7	13.21	60.01	157.40	16.21	118.90	16.66
8	2.19	2.19	6.99	11.74	5.37	11.74
9	6.53	8.72	26.66	12.58	20.41	12.66
10	11.71	20.43	59.33	13.67	45.22	13.85
11	9.15	29.58	83.17	14.41	63.23	14.65
Confluence		***89.59***	***234.70***	***16.21***	***177.22***	***16.66***
12	28.38	117.97	286.75	18.31	215.60	18.92
13	2.72	2.72	8.11	13.10	6.23	13.10
14	10.31	13.03	36.93	14.30	28.26	14.41
15	13.31	26.34	69.98	15.86	53.26	16.11
16	1.26	1.26	4.18	11.00	3.22	11.00
17	3.35	4.61	14.44	12.09	11.05	12.20
18	6.83	11.44	35.84	12.09	27.41	12.20
19	10.78	22.22	66.95	12.88	51.03	13.06
20	16.19	38.41	111.11	13.76	84.43	14.01
Confluence		***64.75***	***177.39***	***13.76***	***134.96***	***14.01***
21	64.95	129.70	327.54	16.43	247.32	16.89
Confluence		***244.18***	***602.81***	***16.43***	***454.05***	***16.89***
22	46.58	290.76	666.15	18.78	499.57	19.42
23	84.91	375.67	796.78	21.57	594.88	22.42
24	1.35	1.35	4.84	9.70	3.73	9.70
25	7.02	8.37	23.98	10.37	22.09	10.43
26	12.25	20.62	66.40	11.61	50.65	11.79
27	13.04	33.66	108.29	11.61	82.57	11.79
28	27.41	61.07	179.96	13.48	136.53	13.80
29	34.65	95.72	282.32	13.48	214.26	13.80
30	56.03	151.75	411.42	15.50	310.90	15.98
31	61.84	213.59	518.22	18.57	389.42	19.28
Confluence		***526.67***	***1271.83***	***18.57***	***952.68***	***19.28***
32	5.72	532.38	1271.83	19.29	952.68	20.05
33	1.20	1.20	3.52	13.10	2.70	13.10
34	37.36	38.56	98.05	16.57	70.80	17.10
Confluence		***567.85***	***1356.98***	***19.29***	***1016.87***	***20.05***
35	39.36	607.21	29.16	20.37	19.24	21.22
Area A Total	**676.39**	**610.30**	**1393.57**	**20.37**	**1041.71**	**21.22**
B1	0.91	0.91	3.09	10.59	2.38	10.59
B2	4.36	5.27	17.31	11.28	13.28	11.35
B3	7.36	12.63	38.96	12.49	29.73	12.67
B4	31.28	43.91	131.37	13.19	100.10	13.43
B5	66.47	110.38	285.23	16.70	215.29	17.21
B6	70.76	181.14	402.16	21.30	301.00	22.17
B7	25.22	206.36	444.52	22.37	332.24	23.33
Area B Total	**206.36**	***206.36***	***444.52***	***22.37***	***332.24***	***23.33***
TOTAL	***882.75***	***816.66***	***1838.09***		***1373.95***	

* Effective Area after confluence

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2004 Version 8.0
Rational Hydrology Study, Date: 10/23/12 File Name: 1200A100.roc

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ESPERANZA HILLS
EXISTING CONDITION
100 YEAR
R/09/1200/PRELIM/REPORTS/HYDRO OPTION 1/RATIONAL/1200A100

Program License Serial Number 6062

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 100.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

++
Process from Point/Station 10.000 to Point/Station 15.000
**** INITIAL AREA EVALUATION ****

A1

UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 74.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.250(In/Hr)
Max Catchment Loss (Fm) = 0.250(In/Hr)
Initial subarea data:
Initial area flow distance = 300.000(Ft.)
Top (of initial area) elevation = 1780.000(Ft.)
Bottom (of initial area) elevation = 1670.000(Ft.)
Difference in elevation = 110.000(Ft.)
Slope = 0.36667 s(%)= 36.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.189 min.
Rainfall intensity = 3.900(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.842
Subarea runoff = 3.055(CFS)
Total initial stream area = 0.930(Ac.)

++
Process from Point/Station 15.000 to Point/Station 20.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

```
Estimated mean flow rate at midpoint of channel =      8.532(CFS)
Depth of flow =   0.269(Ft.), Average velocity =   5.736(Ft/s)
      ******* Irregular Channel Data ***********
--------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
--------------------------------------------------------------
Sub-Channel flow  =      8.532(CFS)
   '      '    flow top width =      6.074(Ft.)
   '      '     velocity=    5.736(Ft/s)
   '      '    area =      1.487(Sq.Ft)
   '      '    Froude number =     2.043

Upstream point elevation =  1670.000(Ft.)
Downstream point elevation =  1590.000(Ft.)
Flow length =   320.000(Ft.)
Travel time  =    0.93 min.
Time of concentration =   12.12 min.
Depth of flow =   0.269(Ft.)
Average velocity =   5.736(Ft/s)
Total irregular channel flow =     8.532(CFS)
Irregular channel normal depth above invert elev. =   0.269(Ft.)
Average velocity of channel(s) =   5.736(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      3.725(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.840
Subarea runoff =     10.864(CFS) for    3.520(Ac.)
Total runoff =     13.919(CFS)    Total area =        4.45(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.358(Ft.), Average velocity =   6.805(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       25.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
--------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     21.937(CFS)
Depth of flow =   0.464(Ft.), Average velocity =   7.983(Ft/s)
      ******* Irregular Channel Data ***********
--------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
```

```
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =     21.937(CFS)
  '     '    flow top width =      6.854(Ft.)
  '     '     velocity=    7.983(Ft/s)
  '     '    area =      2.748(Sq.Ft)
  '     '    Froude number =     2.222

Upstream point elevation =  1590.000(Ft.)
Downstream point elevation =  1450.000(Ft.)
Flow length =   550.000(Ft.)
Travel time  =    1.15 min.
Time of concentration =   13.27 min.
Depth of flow =   0.464(Ft.)
Average velocity =   7.983(Ft/s)
Total irregular channel flow =    21.937(CFS)
Irregular channel normal depth above invert elev. =   0.464(Ft.)
Average velocity of channel(s) =   7.983(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.680
Decimal fraction soil group D = 0.320
SCS curve number for soil(AMC 2)  = 75.92
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.234(In/Hr)
Max Catchment Loss (Fm) =     0.234(In/Hr)
Rainfall intensity =      3.537(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.839
Subarea runoff =     15.983(CFS) for    5.630(Ac.)
Total runoff =     29.902(CFS)    Total area =       10.08(Ac.)
Area averaged Fm value =    0.241(In/Hr)
Depth of flow =   0.554(Ft.), Average velocity =   8.838(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       25.000 to Point/Station       30.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     47.060(CFS)
Depth of flow =   0.707(Ft.), Average velocity =  10.374(Ft/s)
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =     47.060(CFS)
  '     '    flow top width =      7.829(Ft.)
  '     '     velocity=   10.374(Ft/s)
  '     '    area =      4.536(Sq.Ft)
```

```
   '      '    Froude number =      2.402

Upstream point elevation =  1450.000(Ft.)
Downstream point elevation =  1290.000(Ft.)
Flow length =   600.000(Ft.)
Travel time  =    0.96 min.
Time of concentration =   14.23 min.
Depth of flow =   0.707(Ft.)
Average velocity =  10.374(Ft/s)
Total irregular channel flow =    47.060(CFS)
Irregular channel normal depth above invert elev. =   0.707(Ft.)
Average velocity of channel(s) =  10.374(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.500
SCS curve number for soil(AMC 2)  = 77.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.225(In/Hr)
Max Catchment Loss (Fm) =     0.225(In/Hr)
Rainfall intensity =      3.398(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.838
Subarea runoff =     34.230(CFS) for   12.430(Ac.)
Total runoff =     64.132(CFS)    Total area =       22.51(Ac.)
Area averaged Fm value =    0.232(In/Hr)
Depth of flow =   0.841(Ft.), Average velocity =  11.414(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       27.000 to Point/Station       30.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 79.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Time of concentration =    14.23 min.
Rainfall intensity =      3.398(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.837
Subarea runoff =     38.388(CFS) for   13.550(Ac.)
Total runoff =    102.520(CFS)    Total area =       36.06(Ac.)
Area averaged Fm value =    0.239(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.000 to Point/Station       40.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    115.360(CFS)
Depth of flow =   1.294(Ft.), Average velocity =  11.743(Ft/s)
      ******* Irregular Channel Data ***********
```

```
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    115.360(CFS)
   '      '    flow top width =     10.178(Ft.)
   '      '     velocity=   11.743(Ft/s)
   '      '    area =      9.823(Sq.Ft)
   '      '    Froude number =     2.107

Upstream point elevation =  1290.000(Ft.)
Downstream point elevation =  1175.000(Ft.)
Flow length =   650.000(Ft.)
Travel time  =    0.92 min.
Time of concentration =   15.15 min.
Depth of flow =   1.294(Ft.)
Average velocity =  11.743(Ft/s)
Total irregular channel flow =   115.360(CFS)
Irregular channel normal depth above invert elev. =   1.294(Ft.)
Average velocity of channel(s) =  11.743(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.520
Decimal fraction soil group D = 0.480
SCS curve number for soil(AMC 2)  = 76.88
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.226(In/Hr)
Max Catchment Loss (Fm) =     0.226(In/Hr)
Rainfall intensity =      3.278(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.835
Subarea runoff =     25.600(CFS) for   10.740(Ac.)
Total runoff =    128.120(CFS)    Total area =       46.80(Ac.)
Area averaged Fm value =    0.236(In/Hr)
Depth of flow =   1.369(Ft.), Average velocity =  12.099(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       40.000 to Point/Station       50.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    142.789(CFS)
Depth of flow =   1.493(Ft.), Average velocity =  11.975(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
```

```
------------------------------------------------------------------
Sub-Channel flow  =    142.789(CFS)
  '      '    flow top width =     10.972(Ft.)
  '      '     velocity=   11.975(Ft/s)
  '      '    area =     11.924(Sq.Ft)
  '      '    Froude number =     2.024

Upstream point elevation =  1175.000(Ft.)
Downstream point elevation =  1055.000(Ft.)
Flow length =   760.000(Ft.)
Travel time  =    1.06 min.
Time of concentration =   16.21 min.
Depth of flow =   1.493(Ft.)
Average velocity =  11.975(Ft/s)
Total irregular channel flow =   142.789(CFS)
Irregular channel normal depth above invert elev. =   1.493(Ft.)
Average velocity of channel(s) =  11.975(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      3.153(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.832
Subarea runoff =     29.283(CFS) for   13.210(Ac.)
Total runoff =    157.403(CFS)    Total area =       60.01(Ac.)
Area averaged Fm value =    0.239(In/Hr)
Depth of flow =   1.571(Ft.), Average velocity =  12.305(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       50.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     60.010(Ac.)
Runoff from this stream =    157.403(CFS)
Time of concentration =   16.21 min.
Rainfall intensity =     3.153(In/Hr)
Area averaged loss rate (Fm) =    0.2390(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     60.01   157.403     16.21    0.239      3.153
Qmax(1) =
        1.000 *    1.000 *   157.403) + =     157.403

Total of 1 streams to confluence:
Flow rates before confluence point:
```

```
     157.403
Maximum flow rates at confluence using above data:
      157.403
Area of streams before confluence:
       60.010
Effective area values after confluence:
       60.010
Results of confluence:
Total flow rate =    157.403(CFS)
Time of concentration =    16.212 min.
Effective stream area after confluence =     60.010(Ac.)
Study area average Pervious fraction(Ap) =  1.000
Study area average soil loss rate(Fm) =    0.239(In/Hr)
Study area total (this main stream) =      60.01(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       60.000 to Point/Station       70.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   320.000(Ft.)
Top (of initial area) elevation =  1655.000(Ft.)
Bottom (of initial area) elevation =  1550.000(Ft.)
Difference in elevation =   105.000(Ft.)
Slope =    0.32813  s(%)=      32.81
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.740 min.
Rainfall intensity =      3.794(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.841
Subarea runoff =      6.985(CFS)
Total initial stream area =        2.190(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       70.000 to Point/Station       75.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     16.858(CFS)
Depth of flow =   0.334(Ft.), Average velocity =   8.919(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
```

```
Sub-Channel flow  =     16.858(CFS)
  '     '    flow top width =      6.334(Ft.)
  '     '     velocity=    8.919(Ft/s)
  '     '    area =      1.890(Sq.Ft)
  '     '    Froude number =     2.877

Upstream point elevation =  1550.000(Ft.)
Downstream point elevation =  1340.000(Ft.)
Flow length =   450.000(Ft.)
Travel time  =    0.84 min.
Time of concentration =   12.58 min.
Depth of flow =   0.334(Ft.)
Average velocity =   8.919(Ft/s)
Total irregular channel flow =    16.858(CFS)
Irregular channel normal depth above invert elev. =   0.334(Ft.)
Average velocity of channel(s) =   8.919(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      3.647(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.838
Subarea runoff =     19.671(CFS) for    6.530(Ac.)
Total runoff =     26.656(CFS)    Total area =        8.72(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.435(Ft.), Average velocity =  10.426(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       75.000 to Point/Station       80.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     43.017(CFS)
Depth of flow =   0.682(Ft.), Average velocity =   9.917(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     43.017(CFS)
  '     '    flow top width =      7.727(Ft.)
  '     '     velocity=    9.917(Ft/s)
  '     '    area =      4.338(Sq.Ft)
  '     '    Froude number =     2.332

Upstream point elevation =  1340.000(Ft.)
Downstream point elevation =  1175.000(Ft.)
```

```
Flow length =   650.000(Ft.)
Travel time  =    1.09 min.
Time of concentration =   13.67 min.
Depth of flow =   0.682(Ft.)
Average velocity =   9.917(Ft/s)
Total irregular channel flow =    43.017(CFS)
Irregular channel normal depth above invert elev. =   0.682(Ft.)
Average velocity of channel(s) =   9.917(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      3.477(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.835
Subarea runoff =     32.672(CFS) for   11.710(Ac.)
Total runoff =     59.328(CFS)    Total area =       20.43(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.816(Ft.), Average velocity =  10.957(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       80.000 to Point/Station       50.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     71.292(CFS)
Depth of flow =   0.918(Ft.), Average velocity =  11.360(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     71.292(CFS)
  '     '    flow top width =      8.672(Ft.)
  '     '     velocity=   11.360(Ft/s)
  '     '    area =      6.276(Sq.Ft)
  '     '    Froude number =     2.353

Upstream point elevation =  1175.000(Ft.)
Downstream point elevation =  1055.000(Ft.)
Flow length =   500.000(Ft.)
Travel time  =    0.73 min.
Time of concentration =   14.41 min.
Depth of flow =   0.918(Ft.)
Average velocity =  11.360(Ft/s)
Total irregular channel flow =    71.292(CFS)
Irregular channel normal depth above invert elev. =   0.918(Ft.)
Average velocity of channel(s) =  11.360(Ft/s)
```

```
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      3.374(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.833
Subarea runoff =     23.841(CFS) for    9.150(Ac.)
Total runoff =     83.168(CFS)     Total area =       29.58(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.999(Ft.), Average velocity =  11.895(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       60.000 to Point/Station       50.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     29.580(Ac.)
Runoff from this stream =     83.168(CFS)
Time of concentration =   14.41 min.
Rainfall intensity =     3.374(In/Hr)
Area averaged loss rate (Fm) =    0.2500(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     60.01   157.403     16.21    0.239      3.153
2     29.58    83.168     14.41    0.250      3.374
Qmax(1) =
         1.000 *    1.000 *   157.403) +
         0.929 *    1.000 *    83.168) + =     234.698
Qmax(2) =
         1.076 *    0.889 *   157.403) +
         1.000 *    1.000 *    83.168) + =     233.638

Total of 2 streams to confluence:
Flow rates before confluence point:
     157.403      83.168
Maximum flow rates at confluence using above data:
      234.698      233.638
Area of streams before confluence:
       60.010       29.580
Effective area values after confluence:
       89.590       82.909
Results of confluence:
Total flow rate =    234.698(CFS)
Time of concentration =    16.212 min.
Effective stream area after confluence =     89.590(Ac.)
Study area average Pervious fraction(Ap) =  1.000
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Study area average soil loss rate(Fm) =     0.243(In/Hr)
Study area total (this main stream) =      89.59(Ac.)


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Process from Point/Station       50.000 to Point/Station       90.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    260.770(CFS)
Depth of flow =   2.652(Ft.), Average velocity =   9.544(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =    260.770(CFS)
   '      '    flow top width =     15.607(Ft.)
   '      '     velocity=    9.544(Ft/s)
   '      '    area =     27.324(Sq.Ft)
   '      '    Froude number =     1.271

Upstream point elevation =  1055.000(Ft.)
Downstream point elevation =   990.000(Ft.)
Flow length =  1200.000(Ft.)
Travel time  =    2.10 min.
Time of concentration =   18.31 min.
Depth of flow =   2.652(Ft.)
Average velocity =   9.544(Ft/s)
Total irregular channel flow =   260.770(CFS)
Irregular channel normal depth above invert elev. =   2.652(Ft.)
Average velocity of channel(s) =   9.544(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.670
Decimal fraction soil group D = 0.330
SCS curve number for soil(AMC 2)  = 75.98
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.234(In/Hr)
Max Catchment Loss (Fm) =     0.234(In/Hr)
Rainfall intensity =      2.941(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.826
Subarea runoff =     52.052(CFS) for   28.380(Ac.)
Total runoff =    286.749(CFS)    Total area =      117.97(Ac.)
Area averaged Fm value =    0.240(In/Hr)
Depth of flow =   2.777(Ft.), Average velocity =   9.785(Ft/s)


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Process from Point/Station       10.000 to Point/Station       90.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
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The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    117.970(Ac.)
Runoff from this stream =    286.749(CFS)
Time of concentration =   18.31 min.
Rainfall intensity =     2.941(In/Hr)
Area averaged loss rate (Fm) =    0.2404(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Program is now starting with Main Stream No. 2


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Process from Point/Station      100.000 to Point/Station      110.000
**** INITIAL AREA EVALUATION ****

------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1610.000(Ft.)
Bottom (of initial area) elevation =  1560.000(Ft.)
Difference in elevation =    50.000(Ft.)
Slope =    0.16667  s(%)=      16.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.101 min.
Rainfall intensity =      3.563(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.837
Subarea runoff =      8.110(CFS)
Total initial stream area =        2.720(Ac.)


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Process from Point/Station      110.000 to Point/Station      115.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     22.551(CFS)
Depth of flow =   0.457(Ft.), Average velocity =   8.350(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     22.551(CFS)
  '      '    flow top width =      6.827(Ft.)
  '      '     velocity=    8.350(Ft/s)
  '      '    area =      2.701(Sq.Ft)
  '      '    Froude number =     2.340
```

```
Upstream point elevation =  1560.000(Ft.)
Downstream point elevation =  1390.000(Ft.)
Flow length =   600.000(Ft.)
Travel time  =    1.20 min.
Time of concentration =   14.30 min.
Depth of flow =   0.457(Ft.)
Average velocity =   8.350(Ft/s)
Total irregular channel flow =    22.551(CFS)
Irregular channel normal depth above invert elev. =   0.457(Ft.)
Average velocity of channel(s) =   8.350(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.740
Decimal fraction soil group D = 0.260
SCS curve number for soil(AMC 2)  = 75.56
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.237(In/Hr)
Max Catchment Loss (Fm) =     0.237(In/Hr)
Rainfall intensity =      3.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.836
Subarea runoff =     28.818(CFS) for   10.310(Ac.)
Total runoff =     36.928(CFS)    Total area =       13.03(Ac.)
Area averaged Fm value =    0.240(In/Hr)
Depth of flow =   0.606(Ft.), Average velocity =   9.809(Ft/s)


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Process from Point/Station      115.000 to Point/Station      120.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     53.493(CFS)
Depth of flow =   0.801(Ft.), Average velocity =  10.117(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     53.493(CFS)
  '     '    flow top width =      8.204(Ft.)
  '     '     velocity=   10.117(Ft/s)
  '     '    area =      5.287(Sq.Ft)
  '     '    Froude number =     2.221

Upstream point elevation =  1390.000(Ft.)
Downstream point elevation =  1180.000(Ft.)
Flow length =   950.000(Ft.)
Travel time  =    1.56 min.
Time of concentration =   15.86 min.
Depth of flow =   0.801(Ft.)
Average velocity =  10.117(Ft/s)
```

```
Total irregular channel flow =    53.493(CFS)
Irregular channel normal depth above invert elev. =   0.801(Ft.)
Average velocity of channel(s) =  10.117(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.840
Decimal fraction soil group D = 0.160
SCS curve number for soil(AMC 2)  = 74.96
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.242(In/Hr)
Max Catchment Loss (Fm) =     0.242(In/Hr)
Rainfall intensity =      3.193(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.832
Subarea runoff =     33.053(CFS) for   13.310(Ac.)
Total runoff =     69.981(CFS)    Total area =       26.34(Ac.)
Area averaged Fm value =    0.241(In/Hr)
Depth of flow =   0.929(Ft.), Average velocity =  10.977(Ft/s)


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Process from Point/Station      100.000 to Point/Station      120.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     26.340(Ac.)
Runoff from this stream =     69.981(CFS)
Time of concentration =   15.86 min.
Rainfall intensity =     3.193(In/Hr)
Area averaged loss rate (Fm) =    0.2409(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


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Process from Point/Station      122.000 to Point/Station      124.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1615.000(Ft.)
Bottom (of initial area) elevation =  1495.000(Ft.)
Difference in elevation =   120.000(Ft.)
Slope =    0.40000  s(%)=      40.00
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.996 min.
Rainfall intensity =      3.939(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.843
Subarea runoff =      4.183(CFS)
Total initial stream area =        1.260(Ac.)
```

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Process from Point/Station      124.000 to Point/Station      126.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      9.341(CFS)
Depth of flow =   0.275(Ft.), Average velocity =   6.109(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =      9.341(CFS)
   '      '    flow top width =      6.102(Ft.)
   '      '     velocity=    6.109(Ft/s)
   '      '    area =      1.529(Sq.Ft)
   '      '    Froude number =     2.150

Upstream point elevation =  1495.000(Ft.)
Downstream point elevation =  1385.000(Ft.)
Flow length =   400.000(Ft.)
Travel time  =    1.09 min.
Time of concentration =   12.09 min.
Depth of flow =   0.275(Ft.)
Average velocity =   6.109(Ft/s)
Total irregular channel flow =     9.341(CFS)
Irregular channel normal depth above invert elev. =   0.275(Ft.)
Average velocity of channel(s) =   6.109(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      3.731(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.840
Subarea runoff =     10.260(CFS) for    3.350(Ac.)
Total runoff =     14.443(CFS)    Total area =        4.61(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.356(Ft.), Average velocity =   7.111(Ft/s)


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Process from Point/Station      126.000 to Point/Station      126.000
**** SUBAREA FLOW ADDITION ****

------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
```

```
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Time of concentration =    12.09 min.
Rainfall intensity =      3.731(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.840
Subarea runoff =     21.398(CFS) for    6.830(Ac.)
Total runoff =     35.840(CFS)    Total area =       11.44(Ac.)
Area averaged Fm value =    0.250(In/Hr)


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Process from Point/Station      126.000 to Point/Station      128.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     51.437(CFS)
Depth of flow =   0.819(Ft.), Average velocity =   9.466(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =     51.437(CFS)
  '     '    flow top width =      8.275(Ft.)
  '     '     velocity=    9.466(Ft/s)
  '     '    area =      5.434(Sq.Ft)
  '     '    Froude number =     2.059

Upstream point elevation =  1385.000(Ft.)
Downstream point elevation =  1300.000(Ft.)
Flow length =   450.000(Ft.)
Travel time  =    0.79 min.
Time of concentration =   12.88 min.
Depth of flow =   0.819(Ft.)
Average velocity =   9.466(Ft/s)
Total irregular channel flow =    51.437(CFS)
Irregular channel normal depth above invert elev. =   0.819(Ft.)
Average velocity of channel(s) =   9.466(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      3.598(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
```

```
rational method)(Q=KCIA) is C = 0.837
Subarea runoff =     31.107(CFS) for   10.780(Ac.)
Total runoff =     66.948(CFS)     Total area =       22.22(Ac.)
Area averaged Fm value =     0.250(In/Hr)
Depth of flow =   0.947(Ft.), Average velocity =  10.252(Ft/s)


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Process from Point/Station      128.000 to Point/Station      120.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     89.068(CFS)
Depth of flow =   1.090(Ft.), Average velocity =  11.382(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =     89.068(CFS)
  '      '    flow top width =      9.360(Ft.)
  '      '     velocity=   11.382(Ft/s)
  '      '    area =      7.825(Sq.Ft)
  '      '    Froude number =     2.194

Upstream point elevation =  1300.000(Ft.)
Downstream point elevation =  1180.000(Ft.)
Flow length =   600.000(Ft.)
Travel time  =    0.88 min.
Time of concentration =   13.76 min.
Depth of flow =   1.090(Ft.)
Average velocity =  11.382(Ft/s)
Total irregular channel flow =    89.068(CFS)
Irregular channel normal depth above invert elev. =   1.090(Ft.)
Average velocity of channel(s) =  11.382(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      3.464(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.835
Subarea runoff =     44.165(CFS) for   16.190(Ac.)
Total runoff =    111.113(CFS)     Total area =       38.41(Ac.)
Area averaged Fm value =     0.250(In/Hr)
Depth of flow =   1.228(Ft.), Average velocity =  12.137(Ft/s)


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Process from Point/Station      122.000 to Point/Station      120.000
**** CONFLUENCE OF MINOR STREAMS ****
--------------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     38.410(Ac.)
Runoff from this stream =    111.113(CFS)
Time of concentration =   13.76 min.
Rainfall intensity =     3.464(In/Hr)
Area averaged loss rate (Fm) =    0.2500(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     26.34    69.981     15.86    0.241      3.193
2     38.41   111.113     13.76    0.250      3.464
Qmax(1) =
         1.000 *    1.000 *    69.981) +
         0.916 *    1.000 *   111.113) + =     171.715
Qmax(2) =
         1.092 *    0.867 *    69.981) +
         1.000 *    1.000 *   111.113) + =     177.388

Total of 2 streams to confluence:
Flow rates before confluence point:
      69.981     111.113
Maximum flow rates at confluence using above data:
      171.715      177.388
Area of streams before confluence:
       26.340       38.410
Effective area values after confluence:
       64.750       61.256
Results of confluence:
Total flow rate =    177.388(CFS)
Time of concentration =    13.759 min.
Effective stream area after confluence =     61.256(Ac.)
Study area average Pervious fraction(Ap) =  1.000
Study area average soil loss rate(Fm) =    0.246(In/Hr)
Study area total (this main stream) =      64.75(Ac.)


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Process from Point/Station      120.000 to Point/Station       90.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
--------------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    252.508(CFS)
Depth of flow =   2.245(Ft.), Average velocity =  11.854(Ft/s)
      ******* Irregular Channel Data ***********
--------------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
```

```
------------------------------------------------------------------
Sub-Channel flow  =    252.508(CFS)
  '      '    flow top width =     13.979(Ft.)
  '      '     velocity=   11.854(Ft/s)
  '      '    area =     21.302(Sq.Ft)
  '      '    Froude number =     1.692

Upstream point elevation =  1180.000(Ft.)
Downstream point elevation =   990.000(Ft.)
Flow length =  1900.000(Ft.)
Travel time  =    2.67 min.
Time of concentration =   16.43 min.
Depth of flow =   2.245(Ft.)
Average velocity =  11.854(Ft/s)
Total irregular channel flow =   252.508(CFS)
Irregular channel normal depth above invert elev. =   2.245(Ft.)
Average velocity of channel(s) =  11.854(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.100
SCS curve number for soil(AMC 2)  = 74.60
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.245(In/Hr)
Max Catchment Loss (Fm) =     0.245(In/Hr)
Rainfall intensity =      3.129(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.829
Subarea runoff =    150.155(CFS) for   64.950(Ac.)
Total runoff =    327.543(CFS)    Total area =      126.21(Ac.)
Area averaged Fm value =    0.246(In/Hr)
Depth of flow =   2.552(Ft.), Average velocity =  12.702(Ft/s)


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Process from Point/Station      100.000 to Point/Station       90.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =    126.206(Ac.)
Runoff from this stream =    327.543(CFS)
Time of concentration =   16.43 min.
Rainfall intensity =     3.129(In/Hr)
Area averaged loss rate (Fm) =    0.2456(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    117.97   286.749     18.31    0.240      2.941
2    126.21   327.543     16.43    0.246      3.129
Qmax(1) =
        1.000 *    1.000 *   286.749) +
        0.935 *    1.000 *   327.543) + =     592.929
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Qmax(2) =
        1.070 *    0.897 *   286.749) +
        1.000 *    1.000 *   327.543) + =     602.813

Total of 2 main streams to confluence:
Flow rates before confluence point:
     287.749     328.543
Maximum flow rates at confluence using above data:
      592.929      602.813
Area of streams before confluence:
      117.970      126.206
Effective area values after confluence:
      244.176      232.080


Results of confluence:
Total flow rate =    602.813(CFS)
Time of concentration =    16.430 min.
Effective stream area after confluence  =    232.080(Ac.)
Study area average Pervious fraction(Ap) =  1.000
Study area average soil loss rate(Fm) =    0.243(In/Hr)
Study area total =     244.18(Ac.)


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Process from Point/Station       90.000 to Point/Station      130.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    634.514(CFS)
Depth of flow =   3.761(Ft.), Average velocity =  13.474(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    634.514(CFS)
  '     '    flow top width =     20.044(Ft.)
  '     '     velocity=   13.474(Ft/s)
  '     '    area =     47.093(Sq.Ft)
  '     '    Froude number =     1.549

Upstream point elevation =   990.000(Ft.)
Downstream point elevation =   850.000(Ft.)
Flow length =  1900.000(Ft.)
Travel time  =    2.35 min.
Time of concentration =   18.78 min.
Depth of flow =   3.761(Ft.)
Average velocity =  13.474(Ft/s)
Total irregular channel flow =   634.514(CFS)
Irregular channel normal depth above invert elev. =   3.761(Ft.)
Average velocity of channel(s) =  13.474(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
```

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Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.770
Decimal fraction soil group D = 0.230
SCS curve number for soil(AMC 2)  = 75.38
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.239(In/Hr)
Max Catchment Loss (Fm) =     0.239(In/Hr)
Rainfall intensity =      2.899(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.825
Subarea runoff =     63.339(CFS) for   46.580(Ac.)
Total runoff =    666.152(CFS)    Total area =      278.66(Ac.)
Area averaged Fm value =    0.242(In/Hr)
Depth of flow =   3.847(Ft.), Average velocity =  13.643(Ft/s)


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Process from Point/Station      130.000 to Point/Station      140.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    731.504(CFS)
Depth of flow =   4.267(Ft.), Average velocity =  12.668(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =    731.503(CFS)
  '      '    flow top width =     22.067(Ft.)
  '      '     velocity=   12.668(Ft/s)
  '      '    area =     57.746(Sq.Ft)
  '      '    Froude number =     1.380

Upstream point elevation =   850.000(Ft.)
Downstream point elevation =   730.000(Ft.)
Flow length =  2120.000(Ft.)
Travel time  =    2.79 min.
Time of concentration =   21.57 min.
Depth of flow =   4.267(Ft.)
Average velocity =  12.668(Ft/s)
Total irregular channel flow =   731.504(CFS)
Irregular channel normal depth above invert elev. =   4.267(Ft.)
Average velocity of channel(s) =  12.668(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.850
Decimal fraction soil group D = 0.150
SCS curve number for soil(AMC 2)  = 74.90
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.242(In/Hr)
Max Catchment Loss (Fm) =     0.242(In/Hr)
Rainfall intensity =      2.677(In/Hr) for a   100.0 year storm
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Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.819
Subarea runoff =    130.624(CFS) for   84.910(Ac.)
Total runoff =    796.777(CFS)    Total area =      363.57(Ac.)
Area averaged Fm value =    0.242(In/Hr)
Depth of flow =   4.436(Ft.), Average velocity =  12.947(Ft/s)


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Process from Point/Station       10.000 to Point/Station      140.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    363.570(Ac.)
Runoff from this stream =    796.777(CFS)
Time of concentration =   21.57 min.
Rainfall intensity =     2.677(In/Hr)
Area averaged loss rate (Fm) =    0.2424(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


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Process from Point/Station      150.000 to Point/Station      160.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1575.000(Ft.)
Bottom (of initial area) elevation =  1350.000(Ft.)
Difference in elevation =   225.000(Ft.)
Slope =    0.75000  s(%)=      75.00
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.697 min.
Rainfall intensity =      4.233(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.847
Subarea runoff =      4.839(CFS)
Total initial stream area =        1.350(Ac.)


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Process from Point/Station      160.000 to Point/Station      162.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     16.866(CFS)
Depth of flow =   0.342(Ft.), Average velocity =   8.675(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
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      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =     16.866(CFS)
  '     '    flow top width =      6.368(Ft.)
  '     '     velocity=    8.675(Ft/s)
  '     '    area =      1.944(Sq.Ft)
  '     '    Froude number =     2.767

Upstream point elevation =  1350.000(Ft.)
Downstream point elevation =  1200.000(Ft.)
Flow length =   350.000(Ft.)
Travel time  =    0.67 min.
Time of concentration =   10.37 min.
Depth of flow =   0.342(Ft.)
Average velocity =   8.675(Ft/s)
Total irregular channel flow =    16.866(CFS)
Irregular channel normal depth above invert elev. =   0.342(Ft.)
Average velocity of channel(s) =   8.675(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.960
Decimal fraction soil group D = 0.040
SCS curve number for soil(AMC 2)  = 74.24
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.248(In/Hr)
Max Catchment Loss (Fm) =     0.248(In/Hr)
Rainfall intensity =      4.074(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.845
Subarea runoff =     23.976(CFS) for    7.020(Ac.)
Total runoff =     28.816(CFS)    Total area =        8.37(Ac.)
Area averaged Fm value =    0.248(In/Hr)
Depth of flow =   0.467(Ft.), Average velocity =  10.401(Ft/s)


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Process from Point/Station      162.000 to Point/Station      164.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_________________________________________________________________
Estimated mean flow rate at midpoint of channel =     47.648(CFS)
Depth of flow =   0.734(Ft.), Average velocity =  10.043(Ft/s)
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =     47.649(CFS)
  '     '    flow top width =      7.934(Ft.)
  '     '     velocity=   10.044(Ft/s)
```

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'      '    area =      4.744(Sq.Ft)
'      '    Froude number =     2.289

Upstream point elevation =  1200.000(Ft.)
Downstream point elevation =  1020.000(Ft.)
Flow length =   750.000(Ft.)
Travel time  =    1.24 min.
Time of concentration =   11.61 min.
Depth of flow =   0.734(Ft.)
Average velocity =  10.043(Ft/s)
Total irregular channel flow =    47.648(CFS)
Irregular channel normal depth above invert elev. =   0.734(Ft.)
Average velocity of channel(s) =  10.043(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.660
Decimal fraction soil group D = 0.340
SCS curve number for soil(AMC 2)  = 76.04
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.233(In/Hr)
Max Catchment Loss (Fm) =     0.233(In/Hr)
Rainfall intensity =      3.817(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.844
Subarea runoff =     37.589(CFS) for   12.250(Ac.)
Total runoff =     66.404(CFS)    Total area =       20.62(Ac.)
Area averaged Fm value =    0.239(In/Hr)
Depth of flow =   0.883(Ft.), Average velocity =  11.120(Ft/s)


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Process from Point/Station      163.000 to Point/Station      164.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.970
Decimal fraction soil group D = 0.030
SCS curve number for soil(AMC 2)  = 74.18
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.249(In/Hr)
Max Catchment Loss (Fm) =     0.249(In/Hr)
Time of concentration =    11.61 min.
Rainfall intensity =      3.817(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.843
Subarea runoff =     41.885(CFS) for   13.040(Ac.)
Total runoff =    108.289(CFS)    Total area =       33.66(Ac.)
Area averaged Fm value =    0.243(In/Hr)


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Process from Point/Station      164.000 to Point/Station      170.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    144.158(CFS)
Depth of flow =   1.732(Ft.), Average velocity =   9.836(Ft/s)
```

```
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    144.158(CFS)
   '      '    flow top width =     11.927(Ft.)
   '      '     velocity=    9.836(Ft/s)
   '      '    area =     14.656(Sq.Ft)
   '      '    Froude number =     1.564

Upstream point elevation =  1020.000(Ft.)
Downstream point elevation =   920.000(Ft.)
Flow length =  1100.000(Ft.)
Travel time  =    1.86 min.
Time of concentration =   13.48 min.
Depth of flow =   1.732(Ft.)
Average velocity =   9.836(Ft/s)
Total irregular channel flow =   144.158(CFS)
Irregular channel normal depth above invert elev. =   1.732(Ft.)
Average velocity of channel(s) =   9.836(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.340
Decimal fraction soil group D = 0.660
SCS curve number for soil(AMC 2)  = 77.96
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.217(In/Hr)
Max Catchment Loss (Fm) =     0.217(In/Hr)
Rainfall intensity =      3.505(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.841
Subarea runoff =     71.667(CFS) for   27.410(Ac.)
Total runoff =    179.956(CFS)    Total area =       61.07(Ac.)
Area averaged Fm value =    0.231(In/Hr)
Depth of flow =   1.939(Ft.), Average velocity =  10.450(Ft/s)


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Process from Point/Station      168.000 to Point/Station      170.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.460
Decimal fraction soil group D = 0.540
SCS curve number for soil(AMC 2)  = 81.70
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.223(In/Hr)
Max Catchment Loss (Fm) =     0.223(In/Hr)
Time of concentration =    13.48 min.
Rainfall intensity =      3.505(In/Hr) for a   100.0 year storm
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Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.841
Subarea runoff =    102.360(CFS) for   34.650(Ac.)
Total runoff =    282.316(CFS)    Total area =       95.72(Ac.)
Area averaged Fm value =    0.228(In/Hr)


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Process from Point/Station      170.000 to Point/Station      175.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    346.909(CFS)
Depth of flow =   3.025(Ft.), Average velocity =  10.380(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =    346.909(CFS)
  '      '    flow top width =     17.098(Ft.)
  '      '     velocity=   10.380(Ft/s)
  '      '    area =     33.419(Sq.Ft)
  '      '    Froude number =     1.308

Upstream point elevation =   920.000(Ft.)
Downstream point elevation =   850.000(Ft.)
Flow length =  1260.000(Ft.)
Travel time  =    2.02 min.
Time of concentration =   15.50 min.
Depth of flow =   3.025(Ft.)
Average velocity =  10.380(Ft/s)
Total irregular channel flow =   346.909(CFS)
Irregular channel normal depth above invert elev. =   3.025(Ft.)
Average velocity of channel(s) =  10.380(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.280
Decimal fraction soil group D = 0.720
SCS curve number for soil(AMC 2)  = 78.32
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.214(In/Hr)
Max Catchment Loss (Fm) =     0.214(In/Hr)
Rainfall intensity =      3.235(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.838
Subarea runoff =    129.107(CFS) for   56.030(Ac.)
Total runoff =    411.423(CFS)    Total area =      151.75(Ac.)
Area averaged Fm value =    0.223(In/Hr)
Depth of flow =   3.280(Ft.), Average velocity =  10.851(Ft/s)


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Process from Point/Station      175.000 to Point/Station      140.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    464.857(CFS)
Depth of flow =   3.447(Ft.), Average velocity =  11.336(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =    464.857(CFS)
   '      '    flow top width =     18.790(Ft.)
   '      '     velocity=   11.336(Ft/s)
   '      '    area =     41.006(Sq.Ft)
   '      '    Froude number =     1.352

Upstream point elevation =   850.000(Ft.)
Downstream point elevation =   730.000(Ft.)
Flow length =  2090.000(Ft.)
Travel time  =    3.07 min.
Time of concentration =   18.57 min.
Depth of flow =   3.447(Ft.)
Average velocity =  11.336(Ft/s)
Total irregular channel flow =   464.857(CFS)
Irregular channel normal depth above invert elev. =   3.447(Ft.)
Average velocity of channel(s) =  11.336(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.100
Decimal fraction soil group C = 0.130
Decimal fraction soil group D = 0.770
SCS curve number for soil(AMC 2)  = 77.32
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.217(In/Hr)
Max Catchment Loss (Fm) =     0.217(In/Hr)
Rainfall intensity =      2.917(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.832
Subarea runoff =    106.800(CFS) for   61.840(Ac.)
Total runoff =    518.223(CFS)    Total area =      213.59(Ac.)
Area averaged Fm value =    0.221(In/Hr)
Depth of flow =   3.627(Ft.), Average velocity =  11.658(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      150.000 to Point/Station      140.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =    213.590(Ac.)
Runoff from this stream =    518.223(CFS)
Time of concentration =   18.57 min.
Rainfall intensity =     2.917(In/Hr)
```

```
Area averaged loss rate (Fm) =    0.2211(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    363.57   796.777     21.57    0.242      2.677
2    213.59   518.223     18.57    0.221      2.917
Qmax(1) =
         1.000 *    1.000 *   796.777) +
         0.911 *    1.000 *   518.223) + =    1268.958
Qmax(2) =
         1.098 *    0.861 *   796.777) +
         1.000 *    1.000 *   518.223) + =    1271.826

Total of 2 streams to confluence:
Flow rates before confluence point:
     796.777     518.223
Maximum flow rates at confluence using above data:
     1268.958     1271.826
Area of streams before confluence:
      363.570      213.590
Effective area values after confluence:
      577.160      526.665
Results of confluence:
Total flow rate =   1271.826(CFS)
Time of concentration =    18.574 min.
Effective stream area after confluence =    526.665(Ac.)
Study area average Pervious fraction(Ap) =  1.000
Study area average soil loss rate(Fm) =    0.235(In/Hr)
Study area total (this main stream) =     577.16(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      140.000 to Point/Station      178.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =   1271.853(CFS)
Depth of flow =   5.785(Ft.), Average velocity =  13.270(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =   1271.853(CFS)
  '      '    flow top width =     28.138(Ft.)
  '      '     velocity=   13.270(Ft/s)
  '      '    area =     95.844(Sq.Ft)
  '      '    Froude number =     1.267

Upstream point elevation =   730.000(Ft.)
```

```
Downstream point elevation =   705.000(Ft.)
Flow length =   568.000(Ft.)
Travel time  =    0.71 min.
Time of concentration =   19.29 min.
Depth of flow =   5.785(Ft.)
Average velocity =  13.270(Ft/s)
Total irregular channel flow =  1271.853(CFS)
Irregular channel normal depth above invert elev. =   5.785(Ft.)
Average velocity of channel(s) =  13.270(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.650
Decimal fraction soil group D = 0.350
SCS curve number for soil(AMC 2)  = 76.10
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.232(In/Hr)
Max Catchment Loss (Fm) =     0.232(In/Hr)
The area added to the existing stream with this TC
does not add flow per Para 6b, Page D-15 of the OCHM,
therefore the upstream flow rate of Q =   1271.826(CFS) is being used
Rainfall intensity =      2.855(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.826
Subarea runoff =      0.000(CFS) for    5.720(Ac.)
Total runoff =   1271.826(CFS)    Total area =      532.38(Ac.)
Area averaged Fm value =    0.234(In/Hr)
Depth of flow =   5.784(Ft.), Average velocity =  13.270(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station      178.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    532.385(Ac.)
Runoff from this stream =   1271.826(CFS)
Time of concentration =   19.29 min.
Rainfall intensity =     2.855(In/Hr)
Area averaged loss rate (Fm) =    0.2345(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      176.000 to Point/Station      177.000
**** INITIAL AREA EVALUATION ****
                                                              A33
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 61.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.300(In/Hr)
Max Catchment Loss (Fm) =     0.300(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1225.000(Ft.)
```

```
Bottom (of initial area) elevation =  1175.000(Ft.)
Difference in elevation =    50.000(Ft.)
Slope =    0.16667  s(%)=      16.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.101 min.
Rainfall intensity =      3.563(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.824
Subarea runoff =      3.524(CFS)
Total initial stream area =        1.200(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      177.000 to Point/Station      178.000
**** STREET INLET + AREA  + PIPE  TRAVEL TIME ****
```

A34

```
Top of street segment elevation =  1175.000(Ft.)
End of street segment elevation =   915.000(Ft.)
Length of street segment  =  2250.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  13.000(Ft.)
Distance from crown to crossfall grade break  =   5.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.017
Slope from grade break to crown (v/hz)  =   0.017
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   2.000(Ft.)
Slope from curb to property line (v/hz) =   0.017
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
No street inlet installed at this point
Estimated mean flow rate at midpoint of street =     52.608(CFS)
Depth of flow =   0.420(Ft.), Average velocity =  10.794(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  13.000(Ft.)
Flow velocity =  10.79(Ft/s)
Travel time =    3.47 min.     TC =   16.57  min.
 Adding area flow to street
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.290
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.710
SCS curve number for soil(AMC 2)  = 69.49
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=     0.229(In/Hr)
Max Catchment Loss (Fm) =     0.183(In/Hr)
Rainfall intensity =      3.114(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.846
Subarea runoff =     98.048(CFS) for   37.360(Ac.)
Total runoff =    101.571(CFS)    Total area =       38.56(Ac.)
Area averaged Fm value =    0.187(In/Hr)
Street flow at end of street =    101.571(CFS)
Half street flow at end of street =     50.786(CFS)
Depth of flow =   0.521(Ft.), Average velocity =  13.537(Ft/s)
Warning: depth of flow exceeds top of curb
```

```
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =     1.21(Ft.)
Flow width (from curb towards crown)=  13.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      176.000 to Point/Station      178.000
**** CONFLUENCE OF MINOR STREAMS ****

----------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      38.560(Ac.)
Runoff from this stream =     101.571(CFS)
Time of concentration =   16.57 min.
Rainfall intensity =     3.114(In/Hr)
Area averaged loss rate (Fm) =     0.1868(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8062
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    532.38  1271.826     19.29    0.234      2.855
2     38.56   101.571     16.57    0.187      3.114
Qmax(1) =
         1.000 *    1.000 *  1271.826) +
         0.912 *    1.000 *   101.571) + =    1364.410
Qmax(2) =
         1.099 *    0.859 *  1271.826) +
         1.000 *    1.000 *   101.571) + =    1302.568

Total of 2 streams to confluence:
Flow rates before confluence point:
    1271.826     101.571
Maximum flow rates at confluence using above data:
     1364.410     1302.568
Area of streams before confluence:
      532.385       38.560
Effective area values after confluence:
      570.945      496.070
Results of confluence:
Total flow rate =   1364.410(CFS)
Time of concentration =    19.287 min.
Effective stream area after confluence =     570.945(Ac.)
Study area average Pervious fraction(Ap) =  0.987
Study area average soil loss rate(Fm) =    0.231(In/Hr)
Study area total (this main stream) =     570.94(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      178.000 to Point/Station      180.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                              A35
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =   1379.022(CFS)
Depth of flow =   5.966(Ft.), Average velocity =  13.650(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
```

```
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =   1379.021(CFS)
  '     '    flow top width =     28.866(Ft.)
  '     '     velocity=   13.650(Ft/s)
  '     '    area =    101.028(Sq.Ft)
  '     '    Froude number =     1.286

Upstream point elevation =   705.000(Ft.)
Downstream point elevation =   665.000(Ft.)
Flow length =   890.000(Ft.)
Travel time  =    1.09 min.
Time of concentration =   20.37 min.
Depth of flow =   5.966(Ft.)
Average velocity =  13.650(Ft/s)
Total irregular channel flow =  1379.022(CFS)
Irregular channel normal depth above invert elev. =   5.966(Ft.)
Average velocity of channel(s) =  13.650(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 80.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.200(In/Hr)
Rainfall intensity =      2.766(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.825
Subarea runoff =     29.159(CFS) for   39.360(Ac.)
Total runoff =   1393.568(CFS)    Total area =      610.30(Ac.)
Area averaged Fm value =    0.229(In/Hr)
Depth of flow =   5.994(Ft.), Average velocity =  13.686(Ft/s)
End of computations, total study area =          676.39 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.989
Area averaged SCS curve number (AMC 2) =  76.0
```

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2004 Version 8.0
Rational Hydrology Study, Date: 10/23/12 File Name: 1200B100.roc

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ESPERANZA HILLS
AREA B EXISTING CONDITION
100-YEAR
R:\09\1200\PRELIM\REPORTS\HYDRO OPTION 1\RATIONAL\1200B100

Program License Serial Number 6062

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 100.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

++

Process from Point/Station 200.000 to Point/Station 210.000
**** INITIAL AREA EVALUATION ****

B1

UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 74.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.250(In/Hr)
Max Catchment Loss (Fm) = 0.250(In/Hr)
Initial subarea data:
Initial area flow distance = 300.000(Ft.)
Top (of initial area) elevation = 1515.000(Ft.)
Bottom (of initial area) elevation = 1370.000(Ft.)
Difference in elevation = 145.000(Ft.)
Slope = 0.48333 s(%)= 48.33
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.588 min.
Rainfall intensity = 4.025(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.844
Subarea runoff = 3.092(CFS)
Total initial stream area = 0.910(Ac.)

++

Process from Point/Station 210.000 to Point/Station 214.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

B2

```
Estimated mean flow rate at midpoint of channel =     10.238(CFS)
Depth of flow =   0.257(Ft.), Average velocity =   7.216(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     10.238(CFS)
  '      '    flow top width =      6.029(Ft.)
  '      '     velocity=    7.216(Ft/s)
  '      '    area =      1.419(Sq.Ft)
  '      '    Froude number =     2.621

Upstream point elevation =  1370.000(Ft.)
Downstream point elevation =  1245.000(Ft.)
Flow length =   300.000(Ft.)
Travel time  =    0.69 min.
Time of concentration =   11.28 min.
Depth of flow =   0.257(Ft.)
Average velocity =   7.216(Ft/s)
Total irregular channel flow =    10.238(CFS)
Irregular channel normal depth above invert elev. =   0.257(Ft.)
Average velocity of channel(s) =   7.216(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.580
Decimal fraction soil group D = 0.420
SCS curve number for soil(AMC 2)  = 76.52
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.229(In/Hr)
Max Catchment Loss (Fm) =     0.229(In/Hr)
Rainfall intensity =      3.882(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.846
Subarea runoff =     14.215(CFS) for    4.360(Ac.)
Total runoff =     17.307(CFS)    Total area =        5.27(Ac.)
Area averaged Fm value =    0.233(In/Hr)
Depth of flow =   0.350(Ft.), Average velocity =   8.673(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      214.000 to Point/Station      216.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                              B3
------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     28.175(CFS)
Depth of flow =   0.598(Ft.), Average velocity =   7.602(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
```

```
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =     28.175(CFS)
  '      '    flow top width =      7.392(Ft.)
  '      '     velocity=    7.602(Ft/s)
  '      '    area =      3.706(Sq.Ft)
  '      '    Froude number =     1.892

Upstream point elevation =  1245.000(Ft.)
Downstream point elevation =  1150.000(Ft.)
Flow length =   550.000(Ft.)
Travel time  =    1.21 min.
Time of concentration =   12.49 min.
Depth of flow =   0.598(Ft.)
Average velocity =   7.602(Ft/s)
Total irregular channel flow =    28.175(CFS)
Irregular channel normal depth above invert elev. =   0.598(Ft.)
Average velocity of channel(s) =   7.602(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.730
Decimal fraction soil group D = 0.270
SCS curve number for soil(AMC 2)  = 75.62
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.236(In/Hr)
Max Catchment Loss (Fm) =     0.236(In/Hr)
Rainfall intensity =      3.662(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.842
Subarea runoff =     21.651(CFS) for    7.360(Ac.)
Total runoff =     38.959(CFS)    Total area =       12.63(Ac.)
Area averaged Fm value =    0.235(In/Hr)
Depth of flow =   0.719(Ft.), Average velocity =   8.423(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      216.000 to Point/Station      220.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                  B4
-----------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     85.198(CFS)
Depth of flow =   1.052(Ft.), Average velocity =  11.398(Ft/s)
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =     85.198(CFS)
  '      '    flow top width =      9.209(Ft.)
  '      '     velocity=   11.398(Ft/s)
  '      '    area =      7.475(Sq.Ft)
```

```
   '      '    Froude number =      2.229

Upstream point elevation =  1150.000(Ft.)
Downstream point elevation =  1050.000(Ft.)
Flow length =   480.000(Ft.)
Travel time  =    0.70 min.
Time of concentration =   13.19 min.
Depth of flow =   1.052(Ft.)
Average velocity =  11.398(Ft/s)
Total irregular channel flow =    85.198(CFS)
Irregular channel normal depth above invert elev. =   1.052(Ft.)
Average velocity of channel(s) =  11.398(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.420
Decimal fraction soil group D = 0.580
SCS curve number for soil(AMC 2)  = 77.48
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.221(In/Hr)
Max Catchment Loss (Fm) =     0.221(In/Hr)
Rainfall intensity =      3.549(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.843
Subarea runoff =     92.413(CFS) for   31.280(Ac.)
Total runoff =    131.372(CFS)    Total area =       43.91(Ac.)
Area averaged Fm value =    0.225(In/Hr)
Depth of flow =   1.328(Ft.), Average velocity =  12.920(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      220.000 to Point/Station      230.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                    B5
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    208.330(CFS)
Depth of flow =   2.179(Ft.), Average velocity =  10.219(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    208.330(CFS)
   '      '    flow top width =     13.715(Ft.)
   '      '     velocity=   10.219(Ft/s)
   '      '    area =     20.387(Sq.Ft)
   '      '    Froude number =     1.477

Upstream point elevation =  1050.000(Ft.)
Downstream point elevation =   885.000(Ft.)
Flow length =  2150.000(Ft.)
Travel time  =    3.51 min.
Time of concentration =   16.70 min.
Depth of flow =   2.179(Ft.)
```

```
Average velocity =  10.219(Ft/s)
Total irregular channel flow =   208.330(CFS)
Irregular channel normal depth above invert elev. =   2.179(Ft.)
Average velocity of channel(s) =  10.219(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.650
Decimal fraction soil group D = 0.350
SCS curve number for soil(AMC 2)  = 76.10
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.232(In/Hr)
Max Catchment Loss (Fm) =     0.232(In/Hr)
Rainfall intensity =      3.101(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.833
Subarea runoff =    153.863(CFS) for   66.470(Ac.)
Total runoff =    285.234(CFS)    Total area =      110.38(Ac.)
Area averaged Fm value =    0.230(In/Hr)
Depth of flow =   2.545(Ft.), Average velocity =  11.110(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      230.000 to Point/Station      240.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                    B6
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    343.737(CFS)
Depth of flow =   2.918(Ft.), Average velocity =  10.870(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------------
Sub-Channel flow  =    343.737(CFS)
  '     '    flow top width =     16.673(Ft.)
  '     '     velocity=   10.870(Ft/s)
  '     '    area =     31.624(Sq.Ft)
  '     '    Froude number =     1.391

Upstream point elevation =   885.000(Ft.)
Downstream point elevation =   695.000(Ft.)
Flow length =  3000.000(Ft.)
Travel time  =    4.60 min.
Time of concentration =   21.30 min.
Depth of flow =   2.918(Ft.)
Average velocity =  10.870(Ft/s)
Total irregular channel flow =   343.737(CFS)
Irregular channel normal depth above invert elev. =   2.918(Ft.)
Average velocity of channel(s) =  10.870(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
```

```
Decimal fraction soil group C = 0.630
Decimal fraction soil group D = 0.370
SCS curve number for soil(AMC 2)  = 76.22
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.231(In/Hr)
Max Catchment Loss (Fm) =     0.231(In/Hr)
Rainfall intensity =      2.697(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.823
Subarea runoff =    116.928(CFS) for   70.760(Ac.)
Total runoff =    402.163(CFS)    Total area =      181.14(Ac.)
Area averaged Fm value =    0.230(In/Hr)
Depth of flow =   3.146(Ft.), Average velocity =  11.323(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      240.000 to Point/Station      250.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                    B7
Estimated mean flow rate at midpoint of channel =    423.368(CFS)
Depth of flow =   3.314(Ft.), Average velocity =  10.988(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    423.367(CFS)
  '      '    flow top width =     18.255(Ft.)
  '      '     velocity=   10.988(Ft/s)
  '      '    area =     38.530(Sq.Ft)
  '      '    Froude number =     1.333

Upstream point elevation =   695.000(Ft.)
Downstream point elevation =   655.000(Ft.)
Flow length =   710.000(Ft.)
Travel time  =    1.08 min.
Time of concentration =   22.37 min.
Depth of flow =   3.314(Ft.)
Average velocity =  10.988(Ft/s)
Total irregular channel flow =   423.368(CFS)
Irregular channel normal depth above invert elev. =   3.314(Ft.)
Average velocity of channel(s) =  10.988(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.320
Decimal fraction soil group D = 0.680
SCS curve number for soil(AMC 2)  = 78.08
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.216(In/Hr)
Max Catchment Loss (Fm) =     0.216(In/Hr)
Rainfall intensity =      2.622(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.822
```

```
Subarea runoff =     42.355(CFS) for   25.220(Ac.)
Total runoff =    444.518(CFS)    Total area =      206.36(Ac.)
Area averaged Fm value =    0.229(In/Hr)
Depth of flow =   3.391(Ft.), Average velocity =  11.127(Ft/s)
End of computations, total study area =          206.36 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged SCS curve number (AMC 2) =  76.6
```

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2004 Version 8.0
Rational Hydrology Study, Date: 10/23/12 File Name: 1200B25.roc

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ESPERANZA HILLS
AREA B EXISTING CONDITION
25-YEAR
R:\09\1200\PRELIM\REPORTS\HYDRO OPTION 1\RATIONAL\1200B25

Program License Serial Number 6062

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 25.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

++

Process from Point/Station 200.000 to Point/Station 210.000
**** INITIAL AREA EVALUATION ****

B1

UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 74.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.250(In/Hr)
Max Catchment Loss (Fm) = 0.250(In/Hr)
Initial subarea data:
Initial area flow distance = 300.000(Ft.)
Top (of initial area) elevation = 1515.000(Ft.)
Bottom (of initial area) elevation = 1370.000(Ft.)
Difference in elevation = 145.000(Ft.)
Slope = 0.48333 s(%)= 48.33
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.588 min.
Rainfall intensity = 3.155(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.829
Subarea runoff = 2.379(CFS)
Total initial stream area = 0.910(Ac.)

++

Process from Point/Station 210.000 to Point/Station 214.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

B2

```
Estimated mean flow rate at midpoint of channel =      7.862(CFS)
Depth of flow =   0.220(Ft.), Average velocity =   6.564(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =      7.863(CFS)
  '     '    flow top width =      5.881(Ft.)
  '     '     velocity=    6.564(Ft/s)
  '     '    area =      1.198(Sq.Ft)
  '     '    Froude number =     2.563

Upstream point elevation =  1370.000(Ft.)
Downstream point elevation =  1245.000(Ft.)
Flow length =   300.000(Ft.)
Travel time  =    0.76 min.
Time of concentration =   11.35 min.
Depth of flow =   0.220(Ft.)
Average velocity =   6.564(Ft/s)
Total irregular channel flow =     7.862(CFS)
Irregular channel normal depth above invert elev. =   0.220(Ft.)
Average velocity of channel(s) =   6.564(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.580
Decimal fraction soil group D = 0.420
SCS curve number for soil(AMC 2)  = 76.52
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.229(In/Hr)
Max Catchment Loss (Fm) =     0.229(In/Hr)
Rainfall intensity =      3.033(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.831
Subarea runoff =     10.903(CFS) for    4.360(Ac.)
Total runoff =     13.282(CFS)    Total area =        5.27(Ac.)
Area averaged Fm value =    0.233(In/Hr)
Depth of flow =   0.300(Ft.), Average velocity =   7.911(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      214.000 to Point/Station      216.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

B3

```
Estimated mean flow rate at midpoint of channel =     21.542(CFS)
Depth of flow =   0.513(Ft.), Average velocity =   6.969(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
```

```
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =     21.542(CFS)
   '      '    flow top width =      7.052(Ft.)
   '      '     velocity=    6.969(Ft/s)
   '      '    area =      3.091(Sq.Ft)
   '      '    Froude number =     1.855

Upstream point elevation =  1245.000(Ft.)
Downstream point elevation =  1150.000(Ft.)
Flow length =   550.000(Ft.)
Travel time  =    1.32 min.
Time of concentration =   12.67 min.
Depth of flow =   0.513(Ft.)
Average velocity =   6.969(Ft/s)
Total irregular channel flow =    21.542(CFS)
Irregular channel normal depth above invert elev. =   0.513(Ft.)
Average velocity of channel(s) =   6.969(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.730
Decimal fraction soil group D = 0.270
SCS curve number for soil(AMC 2)  = 75.62
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.236(In/Hr)
Max Catchment Loss (Fm) =     0.236(In/Hr)
Rainfall intensity =      2.851(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.826
Subarea runoff =     16.450(CFS) for    7.360(Ac.)
Total runoff =     29.732(CFS)    Total area =       12.63(Ac.)
Area averaged Fm value =    0.235(In/Hr)
Depth of flow =   0.617(Ft.), Average velocity =   7.734(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      216.000 to Point/Station      220.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                              B4
-----------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     64.942(CFS)
Depth of flow =   0.907(Ft.), Average velocity =  10.513(Ft/s)
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =     64.942(CFS)
   '      '    flow top width =      8.627(Ft.)
   '      '     velocity=   10.513(Ft/s)
   '      '    area =      6.177(Sq.Ft)
```

```
  '      '    Froude number =      2.189

Upstream point elevation =  1150.000(Ft.)
Downstream point elevation =  1050.000(Ft.)
Flow length =   480.000(Ft.)
Travel time  =    0.76 min.
Time of concentration =   13.43 min.
Depth of flow =   0.907(Ft.)
Average velocity =  10.513(Ft/s)
Total irregular channel flow =    64.942(CFS)
Irregular channel normal depth above invert elev. =   0.907(Ft.)
Average velocity of channel(s) =  10.513(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.420
Decimal fraction soil group D = 0.580
SCS curve number for soil(AMC 2)  = 77.48
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.221(In/Hr)
Max Catchment Loss (Fm) =     0.221(In/Hr)
Rainfall intensity =      2.758(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.827
Subarea runoff =     70.367(CFS) for   31.280(Ac.)
Total runoff =    100.099(CFS)    Total area =       43.91(Ac.)
Area averaged Fm value =    0.225(In/Hr)
Depth of flow =   1.148(Ft.), Average velocity =  11.948(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      220.000 to Point/Station      230.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                  B5
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    157.736(CFS)
Depth of flow =   1.894(Ft.), Average velocity =   9.480(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =    157.736(CFS)
  '      '    flow top width =     12.574(Ft.)
  '      '     velocity=    9.480(Ft/s)
  '      '    area =     16.640(Sq.Ft)
  '      '    Froude number =     1.452

Upstream point elevation =  1050.000(Ft.)
Downstream point elevation =   885.000(Ft.)
Flow length =  2150.000(Ft.)
Travel time  =    3.78 min.
Time of concentration =   17.21 min.
Depth of flow =   1.894(Ft.)
```

```
Average velocity =   9.480(Ft/s)
Total irregular channel flow =   157.736(CFS)
Irregular channel normal depth above invert elev. =   1.894(Ft.)
Average velocity of channel(s) =   9.480(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.650
Decimal fraction soil group D = 0.350
SCS curve number for soil(AMC 2)  = 76.10
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.232(In/Hr)
Max Catchment Loss (Fm) =     0.232(In/Hr)
Rainfall intensity =      2.397(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.814
Subarea runoff =    115.189(CFS) for   66.470(Ac.)
Total runoff =    215.288(CFS)    Total area =      110.38(Ac.)
Area averaged Fm value =    0.230(In/Hr)
Depth of flow =   2.215(Ft.), Average velocity =  10.309(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      230.000 to Point/Station      240.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                    B6
Estimated mean flow rate at midpoint of channel =    258.172(CFS)
Depth of flow =   2.540(Ft.), Average velocity =  10.083(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------
Sub-Channel flow  =    258.172(CFS)
  '     '    flow top width =     15.161(Ft.)
  '     '     velocity=   10.083(Ft/s)
  '     '    area =     25.606(Sq.Ft)
  '     '    Froude number =     1.367

Upstream point elevation =   885.000(Ft.)
Downstream point elevation =   695.000(Ft.)
Flow length =  3000.000(Ft.)
Travel time  =    4.96 min.
Time of concentration =   22.17 min.
Depth of flow =   2.540(Ft.)
Average velocity =  10.083(Ft/s)
Total irregular channel flow =   258.172(CFS)
Irregular channel normal depth above invert elev. =   2.540(Ft.)
Average velocity of channel(s) =  10.083(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
```

```
Decimal fraction soil group C = 0.630
Decimal fraction soil group D = 0.370
SCS curve number for soil(AMC 2)  = 76.22
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.231(In/Hr)
Max Catchment Loss (Fm) =     0.231(In/Hr)
Rainfall intensity =      2.077(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.800
Subarea runoff =     85.707(CFS) for   70.760(Ac.)
Total runoff =    300.995(CFS)    Total area =      181.14(Ac.)
Area averaged Fm value =    0.230(In/Hr)
Depth of flow =   2.737(Ft.), Average velocity =  10.498(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      240.000 to Point/Station      250.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

B7

```
Estimated mean flow rate at midpoint of channel =    316.659(CFS)
Depth of flow =   2.885(Ft.), Average velocity =  10.189(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    316.659(CFS)
  '      '    flow top width =     16.542(Ft.)
  '      '     velocity=   10.189(Ft/s)
  '      '    area =     31.079(Sq.Ft)
  '      '    Froude number =     1.310

Upstream point elevation =   695.000(Ft.)
Downstream point elevation =   655.000(Ft.)
Flow length =   710.000(Ft.)
Travel time  =    1.16 min.
Time of concentration =   23.33 min.
Depth of flow =   2.885(Ft.)
Average velocity =  10.189(Ft/s)
Total irregular channel flow =   316.659(CFS)
Irregular channel normal depth above invert elev. =   2.885(Ft.)
Average velocity of channel(s) =  10.189(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.320
Decimal fraction soil group D = 0.680
SCS curve number for soil(AMC 2)  = 78.08
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.216(In/Hr)
Max Catchment Loss (Fm) =     0.216(In/Hr)
Rainfall intensity =      2.017(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.798
```

```
Subarea runoff =     31.243(CFS) for   25.220(Ac.)
Total runoff =    332.238(CFS)    Total area =      206.36(Ac.)
Area averaged Fm value =    0.229(In/Hr)
Depth of flow =   2.953(Ft.), Average velocity =  10.317(Ft/s)
End of computations, total study area =          206.36 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged SCS curve number (AMC 2) =  76.6
```

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2004 Version 8.0
Rational Hydrology Study, Date: 10/23/12 File Name: 1200B10.roc

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ESPERANZA HILLS
AREA B EXISTING CONDITION
10-YEAR
R:\09\1200\PRELIM\REPORTS\HYDRO OPTION 1\RATIONAL\1200B10

Program License Serial Number 6062

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 10.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

++
Process from Point/Station 200.000 to Point/Station 210.000
**** INITIAL AREA EVALUATION ****

B1

UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 74.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.250(In/Hr)
Max Catchment Loss (Fm) = 0.250(In/Hr)
Initial subarea data:
Initial area flow distance = 300.000(Ft.)
Top (of initial area) elevation = 1515.000(Ft.)
Bottom (of initial area) elevation = 1370.000(Ft.)
Difference in elevation = 145.000(Ft.)
Slope = 0.48333 s(%)= 48.33
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.588 min.
Rainfall intensity = 2.641(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.815
Subarea runoff = 1.958(CFS)
Total initial stream area = 0.910(Ac.)

++
Process from Point/Station 210.000 to Point/Station 214.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

B2

```
Estimated mean flow rate at midpoint of channel =      6.457(CFS)
Depth of flow =   0.196(Ft.), Average velocity =   6.111(Ft/s)
      ******* Irregular Channel Data ***********
--------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
--------------------------------------------------------------------
Sub-Channel flow  =      6.457(CFS)
   '      '    flow top width =      5.784(Ft.)
   '      '     velocity=    6.111(Ft/s)
   '      '    area =      1.057(Sq.Ft)
   '      '    Froude number =     2.520

Upstream point elevation =  1370.000(Ft.)
Downstream point elevation =  1245.000(Ft.)
Flow length =   300.000(Ft.)
Travel time  =    0.82 min.
Time of concentration =   11.41 min.
Depth of flow =   0.196(Ft.)
Average velocity =   6.111(Ft/s)
Total irregular channel flow =     6.457(CFS)
Irregular channel normal depth above invert elev. =   0.196(Ft.)
Average velocity of channel(s) =   6.111(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.580
Decimal fraction soil group D = 0.420
SCS curve number for soil(AMC 2)  = 76.52
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.229(In/Hr)
Max Catchment Loss (Fm) =     0.229(In/Hr)
Rainfall intensity =      2.531(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.817
Subarea runoff =      8.942(CFS) for    4.360(Ac.)
Total runoff =     10.900(CFS)    Total area =        5.27(Ac.)
Area averaged Fm value =    0.233(In/Hr)
Depth of flow =   0.267(Ft.), Average velocity =   7.378(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      214.000 to Point/Station      216.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                              B3
Estimated mean flow rate at midpoint of channel =     17.603(CFS)
Depth of flow =   0.457(Ft.), Average velocity =   6.519(Ft/s)
      ******* Irregular Channel Data ***********
--------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
```

```
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =    0.050
-----------------------------------------------------------------
Sub-Channel flow  =     17.603(CFS)
  '     '    flow top width =      6.827(Ft.)
  '     '     velocity=    6.519(Ft/s)
  '     '    area =      2.700(Sq.Ft)
  '     '    Froude number =     1.827

Upstream point elevation =  1245.000(Ft.)
Downstream point elevation =  1150.000(Ft.)
Flow length =   550.000(Ft.)
Travel time  =    1.41 min.
Time of concentration =   12.81 min.
Depth of flow =   0.457(Ft.)
Average velocity =   6.519(Ft/s)
Total irregular channel flow =    17.603(CFS)
Irregular channel normal depth above invert elev. =   0.457(Ft.)
Average velocity of channel(s) =   6.519(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.730
Decimal fraction soil group D = 0.270
SCS curve number for soil(AMC 2)  = 75.62
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.236(In/Hr)
Max Catchment Loss (Fm) =     0.236(In/Hr)
Rainfall intensity =      2.368(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.811
Subarea runoff =     13.343(CFS) for    7.360(Ac.)
Total runoff =     24.243(CFS)    Total area =       12.63(Ac.)
Area averaged Fm value =    0.235(In/Hr)
Depth of flow =   0.549(Ft.), Average velocity =   7.243(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      216.000 to Point/Station      220.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                  B4
-----------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     52.890(CFS)
Depth of flow =   0.809(Ft.), Average velocity =   9.877(Ft/s)
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =     52.890(CFS)
  '     '    flow top width =      8.236(Ft.)
  '     '     velocity=    9.877(Ft/s)
  '     '    area =      5.355(Sq.Ft)
```

```
  '      '    Froude number =      2.159

Upstream point elevation =  1150.000(Ft.)
Downstream point elevation =  1050.000(Ft.)
Flow length =   480.000(Ft.)
Travel time  =    0.81 min.
Time of concentration =   13.62 min.
Depth of flow =   0.809(Ft.)
Average velocity =   9.877(Ft/s)
Total irregular channel flow =    52.890(CFS)
Irregular channel normal depth above invert elev. =   0.809(Ft.)
Average velocity of channel(s) =   9.877(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.420
Decimal fraction soil group D = 0.580
SCS curve number for soil(AMC 2)  = 77.48
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.221(In/Hr)
Max Catchment Loss (Fm) =     0.221(In/Hr)
Rainfall intensity =      2.286(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.811
Subarea runoff =     57.203(CFS) for   31.280(Ac.)
Total runoff =     81.446(CFS)    Total area =       43.91(Ac.)
Area averaged Fm value =    0.225(In/Hr)
Depth of flow =   1.027(Ft.), Average velocity =  11.247(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      220.000 to Point/Station      230.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                    B5
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    127.304(CFS)
Depth of flow =   1.697(Ft.), Average velocity =   8.939(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    127.304(CFS)
  '      '    flow top width =     11.787(Ft.)
  '      '     velocity=    8.939(Ft/s)
  '      '    area =     14.241(Sq.Ft)
  '      '    Froude number =     1.433

Upstream point elevation =  1050.000(Ft.)
Downstream point elevation =   885.000(Ft.)
Flow length =  2150.000(Ft.)
Travel time  =    4.01 min.
Time of concentration =   17.63 min.
Depth of flow =   1.697(Ft.)
```

```
Average velocity =   8.939(Ft/s)
Total irregular channel flow =   127.304(CFS)
Irregular channel normal depth above invert elev. =   1.697(Ft.)
Average velocity of channel(s) =   8.939(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.650
Decimal fraction soil group D = 0.350
SCS curve number for soil(AMC 2)  = 76.10
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.232(In/Hr)
Max Catchment Loss (Fm) =     0.232(In/Hr)
Rainfall intensity =      1.972(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.795
Subarea runoff =     91.640(CFS) for   66.470(Ac.)
Total runoff =    173.086(CFS)    Total area =      110.38(Ac.)
Area averaged Fm value =    0.230(In/Hr)
Depth of flow =   1.985(Ft.), Average velocity =   9.721(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      230.000 to Point/Station      240.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                    B6
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    206.181(CFS)
Depth of flow =   2.274(Ft.), Average velocity =   9.498(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------------
Sub-Channel flow  =    206.181(CFS)
  '     '    flow top width =     14.095(Ft.)
  '     '     velocity=    9.498(Ft/s)
  '     '    area =     21.707(Sq.Ft)
  '     '    Froude number =     1.349

Upstream point elevation =   885.000(Ft.)
Downstream point elevation =   695.000(Ft.)
Flow length =  3000.000(Ft.)
Travel time  =    5.26 min.
Time of concentration =   22.89 min.
Depth of flow =   2.274(Ft.)
Average velocity =   9.498(Ft/s)
Total irregular channel flow =   206.181(CFS)
Irregular channel normal depth above invert elev. =   2.274(Ft.)
Average velocity of channel(s) =   9.498(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
```

```
Decimal fraction soil group C = 0.630
Decimal fraction soil group D = 0.370
SCS curve number for soil(AMC 2)  = 76.22
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.231(In/Hr)
Max Catchment Loss (Fm) =     0.231(In/Hr)
Rainfall intensity =      1.698(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.778
Subarea runoff =     66.136(CFS) for   70.760(Ac.)
Total runoff =    239.222(CFS)    Total area =      181.14(Ac.)
Area averaged Fm value =    0.230(In/Hr)
Depth of flow =   2.447(Ft.), Average velocity =   9.881(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      240.000 to Point/Station      250.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                    B7
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    251.402(CFS)
Depth of flow =   2.580(Ft.), Average velocity =   9.590(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------------
Sub-Channel flow  =    251.402(CFS)
  '      '    flow top width =     15.321(Ft.)
  '      '     velocity=    9.590(Ft/s)
  '      '    area =     26.215(Sq.Ft)
  '      '    Froude number =     1.292

Upstream point elevation =   695.000(Ft.)
Downstream point elevation =   655.000(Ft.)
Flow length =   710.000(Ft.)
Travel time  =    1.23 min.
Time of concentration =   24.13 min.
Depth of flow =   2.580(Ft.)
Average velocity =   9.590(Ft/s)
Total irregular channel flow =   251.402(CFS)
Irregular channel normal depth above invert elev. =   2.580(Ft.)
Average velocity of channel(s) =   9.590(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.320
Decimal fraction soil group D = 0.680
SCS curve number for soil(AMC 2)  = 78.08
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.216(In/Hr)
Max Catchment Loss (Fm) =     0.216(In/Hr)
Rainfall intensity =      1.647(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.775
```

```
Subarea runoff =     24.288(CFS) for   25.220(Ac.)
Total runoff =    263.510(CFS)    Total area =      206.36(Ac.)
Area averaged Fm value =    0.229(In/Hr)
Depth of flow =   2.640(Ft.), Average velocity =   9.710(Ft/s)
End of computations, total study area =          206.36 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged SCS curve number (AMC 2) =  76.6
```

BLUE MUD CANYON
100-YEAR EXISTING CONDITION

TABLE 2A
ESPERANZA HILLS
EXISTING CONDITION HYDROLOGY SUMMARY TABLE

	Area (sf)	Area (ac)	Total Area (ac)	Q100 (cfs)	100-Y Tc (min)	Q25 (cfs)	25-Y Tc (min)
K1	55900	1.28	1.28	4.10	11.65	3.16	11.65
K2	171993	3.95	5.23	15.97	12.60	12.22	12.69
K3	1208368	27.74	32.97	95.31	13.77	72.60	13.97
K4	612345	14.06	47.03	136.12	13.77	103.73	13.97
K5	2206918	50.66	97.69	259.54	16.01	196.98	16.38
K6	3521778	80.85	178.54	430.84	18.66	324.99	19.23
K7	2818961	64.71	243.26	535.47	21.57	401.65	22.36
Subtotal		***243.26***	***243.26***	**535.47**	**21.57**	***401.65***	***22.36***
K8	101421	2.33	2.33	8.23	10.15	6.36	10.15
K9	1768408	40.60	42.93	139.04	11.64	106.55	11.77
K10	4558293	104.64	147.57	404.86	15.16	306.64	15.55
Subtotal		***390.83***	***390.83***	***873.40***	***15.16***	***657.74***	***15.55***
K11	2843268	65.27	456.10	956.67	17.68	717.26	18.26
K12	5545250	127.30	583.40	1092.81	22.61	813.70	23.58
K13	2794732	64.16	647.56	1139.94	25.47	845.57	26.66
Total		***647.56***	***647.56***	***1139.94***	***25.47***	***845.57***	***26.66***

Culvert Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. Tuesday, Oct 30 2012

Box Culvert

Invert Elev Dn (ft)	=	650.00
Pipe Length (ft)	=	100.00
Slope (%)	=	35.00
Invert Elev Up (ft)	=	685.00
Rise (in)	=	120.0
Shape	=	Box
Span (in)	=	120.0
No. Barrels	=	1
n-Value	=	0.012
Inlet Edge	=	Sq Edge
Coeff. K,M,c,Y,k	=	0.061, 0.75, 0.04, 0.8, 0.5

Embankment

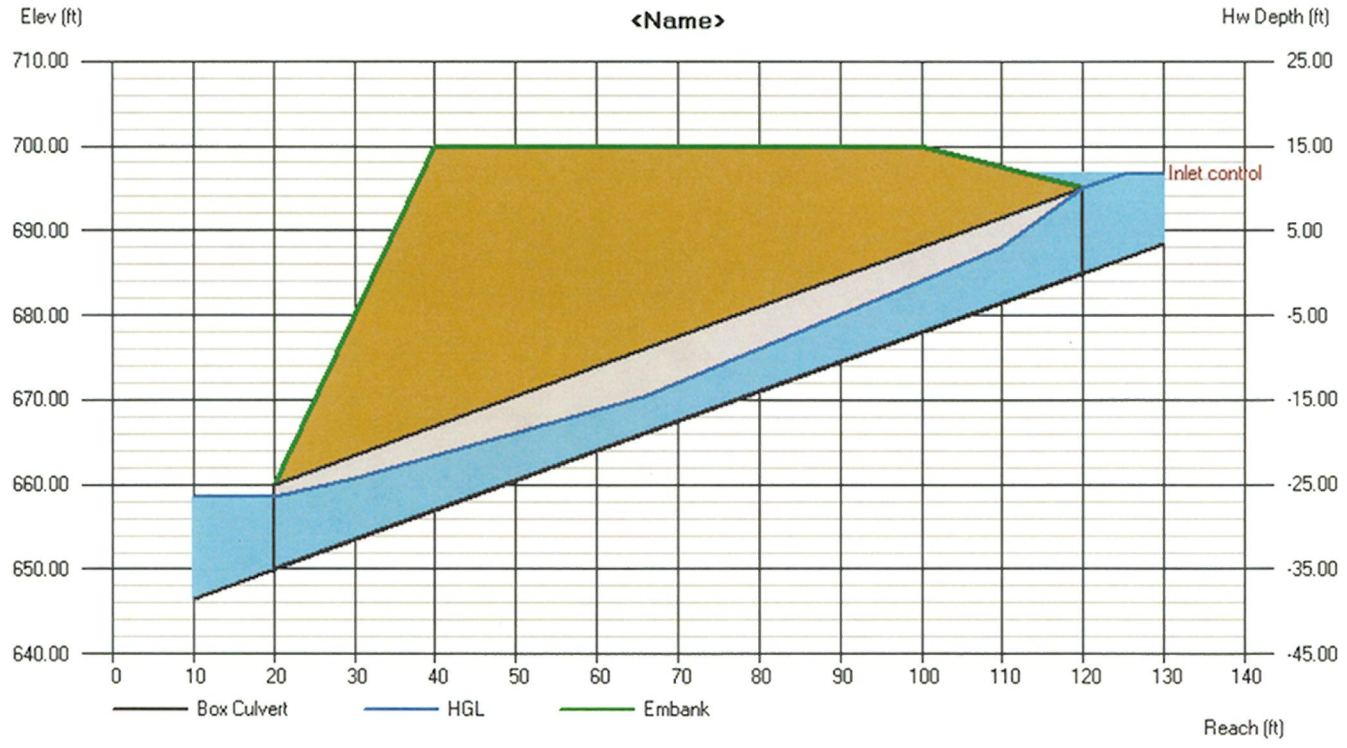
Top Elevation (ft)	=	700.00
Top Width (ft)	=	60.00
Crest Width (ft)	=	50.00

Calculations

Qmin (cfs)	=	1092.81
Qmax (cfs)	=	1092.81
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	1092.81
Qpipe (cfs)	=	1092.81
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	12.73
Veloc Up (ft/s)	=	15.23
HGL Dn (ft)	=	658.59
HGL Up (ft)	=	692.17
Hw Elev (ft)	=	696.72
Hw/D (ft)	=	1.17
Flow Regime	=	Inlet Control



Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2004 Version 8.0
Rational Hydrology Study, Date: 10/30/12 File Name: 1200K100.roc

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ESPERANZA HILLS
EXISTING CONDITION
BLUE MUD CANYON 100 YEAR
R/09/1200/PRELIM/REPORTS/HYDRO OPTION 1/RATIONAL/EXISTING/1200K100

Program License Serial Number 6062

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 100.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

++
Process from Point/Station 250.000 to Point/Station 251.000
**** INITIAL AREA EVALUATION ****

K1

UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 74.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.250(In/Hr)
Max Catchment Loss (Fm) = 0.250(In/Hr)
Initial subarea data:
Initial area flow distance = 300.000(Ft.)
Top (of initial area) elevation = 1645.000(Ft.)
Bottom (of initial area) elevation = 1555.000(Ft.)
Difference in elevation = 90.000(Ft.)
Slope = 0.30000 s(%)= 30.00
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.648 min.
Rainfall intensity = 3.811(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.841
Subarea runoff = 4.102(CFS)
Total initial stream area = 1.280(Ac.)

++
Process from Point/Station 251.000 to Point/Station 252.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

K2

```
Estimated mean flow rate at midpoint of channel =     10.063(CFS)
Depth of flow =   0.260(Ft.), Average velocity =   7.006(Ft/s)
      ******* Irregular Channel Data ***********
--------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
--------------------------------------------------------------
Sub-Channel flow  =     10.063(CFS)
  '      '    flow top width =      6.041(Ft.)
  '      '     velocity=    7.006(Ft/s)
  '      '    area =      1.436(Sq.Ft)
  '      '    Froude number =     2.532

Upstream point elevation =  1555.000(Ft.)
Downstream point elevation =  1400.000(Ft.)
Flow length =   400.000(Ft.)
Travel time  =    0.95 min.
Time of concentration =   12.60 min.
Depth of flow =   0.260(Ft.)
Average velocity =   7.006(Ft/s)
Total irregular channel flow =    10.063(CFS)
Irregular channel normal depth above invert elev. =   0.260(Ft.)
Average velocity of channel(s) =   7.006(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      3.643(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.838
Subarea runoff =     11.871(CFS) for    3.950(Ac.)
Total runoff =     15.973(CFS)    Total area =        5.23(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.341(Ft.), Average velocity =   8.238(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      252.000 to Point/Station      253.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                          K3
--------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     55.686(CFS)
Depth of flow =   0.907(Ft.), Average velocity =   9.006(Ft/s)
      ******* Irregular Channel Data ***********
--------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
```

```
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =     55.686(CFS)
   '      '    flow top width =      8.629(Ft.)
   '      '     velocity=    9.006(Ft/s)
   '      '    area =      6.183(Sq.Ft)
   '      '    Froude number =     1.875

Upstream point elevation =  1400.000(Ft.)
Downstream point elevation =  1303.000(Ft.)
Flow length =   635.000(Ft.)
Travel time  =    1.18 min.
Time of concentration =   13.77 min.
Depth of flow =   0.907(Ft.)
Average velocity =   9.006(Ft/s)
Total irregular channel flow =    55.686(CFS)
Irregular channel normal depth above invert elev. =   0.907(Ft.)
Average velocity of channel(s) =   9.006(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      3.462(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.835
Subarea runoff =     79.336(CFS) for   27.740(Ac.)
Total runoff =     95.309(CFS)    Total area =       32.97(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   1.216(Ft.), Average velocity =  10.550(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      253.000 to Point/Station      253.000
**** SUBAREA FLOW ADDITION ****                                  K4
-----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.730
Decimal fraction soil group D = 0.270
SCS curve number for soil(AMC 2)  = 75.62
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.236(In/Hr)
Max Catchment Loss (Fm) =     0.236(In/Hr)
Time of concentration =    13.77 min.
Rainfall intensity =      3.462(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.836
Subarea runoff =     40.815(CFS) for   14.060(Ac.)
Total runoff =    136.124(CFS)    Total area =       47.03(Ac.)
Area averaged Fm value =    0.246(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      253.000 to Point/Station      254.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

K5

```
Estimated mean flow rate at midpoint of channel =    197.857(CFS)
Depth of flow =   2.091(Ft.), Average velocity =  10.307(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------
Sub-Channel flow  =    197.857(CFS)
   '      '   flow top width =     13.363(Ft.)
   '      '    velocity=   10.307(Ft/s)
   '      '   area =     19.197(Sq.Ft)
   '      '   Froude number =     1.515

Upstream point elevation =  1303.000(Ft.)
Downstream point elevation =  1190.000(Ft.)
Flow length =  1385.000(Ft.)
Travel time  =    2.24 min.
Time of concentration =   16.01 min.
Depth of flow =   2.091(Ft.)
Average velocity =  10.307(Ft/s)
Total irregular channel flow =   197.857(CFS)
Irregular channel normal depth above invert elev. =   2.091(Ft.)
Average velocity of channel(s) =  10.307(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.060
Decimal fraction soil group D = 0.940
SCS curve number for soil(AMC 2)  = 79.64
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.203(In/Hr)
Max Catchment Loss (Fm) =     0.203(In/Hr)
Rainfall intensity =      3.176(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.837
Subarea runoff =    123.415(CFS) for   50.660(Ac.)
Total runoff =    259.539(CFS)    Total area =       97.69(Ac.)
Area averaged Fm value =    0.224(In/Hr)
Depth of flow =   2.393(Ft.), Average velocity =  11.082(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      254.000 to Point/Station      255.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

K6

```
Estimated mean flow rate at midpoint of channel =    345.237(CFS)
Depth of flow =   2.819(Ft.), Average velocity =  11.512(Ft/s)
      ******* Irregular Channel Data ***********
```

```
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    345.237(CFS)
  '     '   flow top width =     16.276(Ft.)
  '     '    velocity=   11.512(Ft/s)
  '     '   area =     29.988(Sq.Ft)
  '     '   Froude number =     1.495

Upstream point elevation =  1190.000(Ft.)
Downstream point elevation =  1055.000(Ft.)
Flow length =  1830.000(Ft.)
Travel time  =    2.65 min.
Time of concentration =   18.66 min.
Depth of flow =   2.819(Ft.)
Average velocity =  11.512(Ft/s)
Total irregular channel flow =   345.237(CFS)
Irregular channel normal depth above invert elev. =   2.819(Ft.)
Average velocity of channel(s) =  11.512(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.650
Decimal fraction soil group D = 0.350
SCS curve number for soil(AMC 2)  = 76.10
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.232(In/Hr)
Max Catchment Loss (Fm) =     0.232(In/Hr)
Rainfall intensity =      2.909(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.830
Subarea runoff =    171.301(CFS) for   80.850(Ac.)
Total runoff =   430.840(CFS)    Total area =      178.54(Ac.)
Area averaged Fm value =    0.228(In/Hr)
Depth of flow =   3.135(Ft.), Average velocity =  12.197(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      255.000 to Point/Station      260.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                              K7
------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    483.182(CFS)
Depth of flow =   3.564(Ft.), Average velocity =  11.180(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
```

```
------------------------------------------------------------------
Sub-Channel flow  =    483.182(CFS)
  '      '    flow top width =     19.255(Ft.)
  '      '     velocity=   11.180(Ft/s)
  '      '    area =     43.217(Sq.Ft)
  '      '    Froude number =     1.315

Upstream point elevation =  1055.000(Ft.)
Downstream point elevation =   950.000(Ft.)
Flow length =  1950.000(Ft.)
Travel time  =    2.91 min.
Time of concentration =   21.57 min.
Depth of flow =   3.564(Ft.)
Average velocity =  11.180(Ft/s)
Total irregular channel flow =   483.182(CFS)
Irregular channel normal depth above invert elev. =   3.564(Ft.)
Average velocity of channel(s) =  11.180(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.840
Decimal fraction soil group D = 0.160
SCS curve number for soil(AMC 2)  = 74.96
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.242(In/Hr)
Max Catchment Loss (Fm) =     0.242(In/Hr)
Rainfall intensity =      2.677(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.822
Subarea runoff =    104.629(CFS) for   64.710(Ac.)
Total runoff =    535.469(CFS)    Total area =      243.25(Ac.)
Area averaged Fm value =    0.231(In/Hr)
Depth of flow =   3.738(Ft.), Average velocity =  11.480(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      255.000 to Point/Station      260.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    243.250(Ac.)
Runoff from this stream =    535.469(CFS)
Time of concentration =   21.57 min.
Rainfall intensity =     2.677(In/Hr)
Area averaged loss rate (Fm) =    0.2315(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      256.000 to Point/Station      257.000
**** INITIAL AREA EVALUATION ****
                                                              K8
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 80.00
```

```
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.200(In/Hr)
Initial subarea data:
Initial area flow distance =   275.000(Ft.)
Top (of initial area) elevation =  1688.000(Ft.)
Bottom (of initial area) elevation =  1550.000(Ft.)
Difference in elevation =   138.000(Ft.)
Slope =    0.50182  s(%)=      50.18
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.149 min.
Rainfall intensity =      4.124(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.856
Subarea runoff =      8.229(CFS)
Total initial stream area =        2.330(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      257.000 to Point/Station      258.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                  K9
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     73.662(CFS)
Depth of flow =   0.858(Ft.), Average velocity =  12.788(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------------
Sub-Channel flow  =     73.662(CFS)
  '     '    flow top width =      8.431(Ft.)
  '     '     velocity=   12.788(Ft/s)
  '     '    area =      5.760(Sq.Ft)
  '     '    Froude number =     2.726

Upstream point elevation =  1550.000(Ft.)
Downstream point elevation =  1175.000(Ft.)
Flow length =  1145.000(Ft.)
Travel time  =    1.49 min.
Time of concentration =   11.64 min.
Depth of flow =   0.858(Ft.)
Average velocity =  12.788(Ft/s)
Total irregular channel flow =    73.662(CFS)
Irregular channel normal depth above invert elev. =   0.858(Ft.)
Average velocity of channel(s) =  12.788(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.290
Decimal fraction soil group D = 0.710
SCS curve number for soil(AMC 2)  = 78.26
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.214(In/Hr)
Max Catchment Loss (Fm) =     0.214(In/Hr)
Rainfall intensity =      3.812(In/Hr) for a   100.0 year storm
```

```
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.850
Subarea runoff =    130.809(CFS) for   40.600(Ac.)
Total runoff =    139.038(CFS)    Total area =      42.93(Ac.)
Area averaged Fm value =    0.214(In/Hr)
Depth of flow =   1.213(Ft.), Average velocity =  15.431(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      258.000 to Point/Station      260.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                  K10
Estimated mean flow rate at midpoint of channel =    271.996(CFS)
Depth of flow =   2.382(Ft.), Average velocity =  11.693(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    271.996(CFS)
   '      '    flow top width =     14.529(Ft.)
   '      '     velocity=   11.693(Ft/s)
   '      '    area =     23.262(Sq.Ft)
   '      '    Froude number =     1.628

Upstream point elevation =  1175.000(Ft.)
Downstream point elevation =   950.000(Ft.)
Flow length =  2465.000(Ft.)
Travel time  =    3.51 min.
Time of concentration =   15.16 min.
Depth of flow =   2.382(Ft.)
Average velocity =  11.693(Ft/s)
Total irregular channel flow =   271.996(CFS)
Irregular channel normal depth above invert elev. =   2.382(Ft.)
Average velocity of channel(s) =  11.693(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.710
Decimal fraction soil group D = 0.290
SCS curve number for soil(AMC 2)  = 75.74
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.235(In/Hr)
Max Catchment Loss (Fm) =     0.235(In/Hr)
Rainfall intensity =      3.278(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.837
Subarea runoff =    265.826(CFS) for  104.640(Ac.)
Total runoff =    404.864(CFS)    Total area =     147.57(Ac.)
Area averaged Fm value =    0.229(In/Hr)
Depth of flow =   2.892(Ft.), Average velocity =  12.984(Ft/s)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      258.000 to Point/Station      260.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     147.570(Ac.)
Runoff from this stream =     404.864(CFS)
Time of concentration =   15.16 min.
Rainfall intensity =     3.278(In/Hr)
Area averaged loss rate (Fm) =     0.2292(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    243.25   535.469     21.57    0.231      2.677
2    147.57   404.864     15.16    0.229      3.278
Qmax(1) =
         1.000 *    1.000 *   535.469) +
         0.803 *    1.000 *   404.864) + =     860.625
Qmax(2) =
         1.245 *    0.703 *   535.469) +
         1.000 *    1.000 *   404.864) + =     873.397

Total of 2 streams to confluence:
Flow rates before confluence point:
     535.469     404.864
Maximum flow rates at confluence using above data:
      860.625      873.397
Area of streams before confluence:
      243.250      147.570
Effective area values after confluence:
      390.820      318.477
Results of confluence:
Total flow rate =     873.397(CFS)
Time of concentration =    15.155 min.
Effective stream area after confluence =     318.477(Ac.)
Study area average Pervious fraction(Ap) =  1.000
Study area average soil loss rate(Fm) =    0.231(In/Hr)
Study area total (this main stream) =     390.82(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      260.000 to Point/Station      261.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                  K11
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     915.067(CFS)
Depth of flow =   4.916(Ft.), Average velocity =  12.549(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
```

```
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =    915.067(CFS)
  '     '    flow top width =     24.665(Ft.)
  '     '     velocity=   12.549(Ft/s)
  '     '    area =     72.921(Sq.Ft)
  '     '    Froude number =     1.286

Upstream point elevation =   950.000(Ft.)
Downstream point elevation =   860.000(Ft.)
Flow length =  1900.000(Ft.)
Travel time  =    2.52 min.
Time of concentration =   17.68 min.
Depth of flow =   4.916(Ft.)
Average velocity =  12.549(Ft/s)
Total irregular channel flow =   915.067(CFS)
Irregular channel normal depth above invert elev. =   4.916(Ft.)
Average velocity of channel(s) =  12.549(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.620
Decimal fraction soil group D = 0.380
SCS curve number for soil(AMC 2)  = 76.28
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.231(In/Hr)
Max Catchment Loss (Fm) =     0.231(In/Hr)
Rainfall intensity =      3.001(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.831
Subarea runoff =     83.289(CFS) for   65.270(Ac.)
Total runoff =    956.685(CFS)    Total area =      383.75(Ac.)
Area averaged Fm value =    0.231(In/Hr)
Depth of flow =   5.015(Ft.), Average velocity =  12.691(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      261.000 to Point/Station      262.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                              K12
-----------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =   1024.777(CFS)
Depth of flow =   5.154(Ft.), Average velocity =  12.990(Ft/s)
     ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =   1024.777(CFS)
  '     '    flow top width =     25.615(Ft.)
  '     '     velocity=   12.990(Ft/s)
  '     '    area =     78.891(Sq.Ft)
  '     '    Froude number =     1.304
```

```
Upstream point elevation =   860.000(Ft.)
Downstream point elevation =   675.000(Ft.)
Flow length =  3845.000(Ft.)
Travel time  =    4.93 min.
Time of concentration =   22.61 min.
Depth of flow =   5.154(Ft.)
Average velocity =  12.990(Ft/s)
Total irregular channel flow =  1024.777(CFS)
Irregular channel normal depth above invert elev. =   5.154(Ft.)
Average velocity of channel(s) =  12.990(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.560
Decimal fraction soil group D = 0.440
SCS curve number for soil(AMC 2)  = 76.64
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.228(In/Hr)
Max Catchment Loss (Fm) =     0.228(In/Hr)
Rainfall intensity =      2.606(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.821
Subarea runoff =    136.129(CFS) for  127.300(Ac.)
Total runoff =   1092.814(CFS)    Total area =      511.05(Ac.)
Area averaged Fm value =    0.230(In/Hr)
Depth of flow =   5.303(Ft.), Average velocity =  13.203(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      262.000 to Point/Station      265.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                  K13
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =   1116.423(CFS)
Depth of flow =   5.391(Ft.), Average velocity =  13.124(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------------
Sub-Channel flow  =   1116.424(CFS)
  '      '    flow top width =     26.562(Ft.)
  '      '     velocity=   13.124(Ft/s)
  '      '    area =     85.068(Sq.Ft)
  '      '    Froude number =     1.292

Upstream point elevation =   675.000(Ft.)
Downstream point elevation =   570.000(Ft.)
Flow length =  2250.000(Ft.)
Travel time  =    2.86 min.
Time of concentration =   25.47 min.
Depth of flow =   5.391(Ft.)
Average velocity =  13.124(Ft/s)
Total irregular channel flow =  1116.423(CFS)
```

```
Irregular channel normal depth above invert elev. =   5.391(Ft.)
Average velocity of channel(s) =  13.124(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.434(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.814
Subarea runoff =     47.123(CFS) for   64.160(Ac.)
Total runoff =   1139.937(CFS)    Total area =     575.21(Ac.)
Area averaged Fm value =    0.232(In/Hr)
Depth of flow =   5.441(Ft.), Average velocity =  13.193(Ft/s)
End of computations, total study area =          647.55 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged SCS curve number (AMC 2) =  76.2
```

BLUE MUD CANYON
25-YEAR EXISTING CONDITION

BLUE MUD CANYON
25-YEAR EXISTING CONDITION

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2004 Version 8.0
Rational Hydrology Study, Date: 10/30/12 File Name: 1200K25.roc

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ESPERANZA HILLS
EXISTING CONDITION
BLUE MUD CANYON 25 YEAR
R/09/1200/PRELIM/REPORTS/HYDRO OPTION 1/RATIONAL/EXISTING/1200K25

Program License Serial Number 6062

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 25.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

++
Process from Point/Station 250.000 to Point/Station 251.000
**** INITIAL AREA EVALUATION ****

K1

UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 74.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.250(In/Hr)
Max Catchment Loss (Fm) = 0.250(In/Hr)
Initial subarea data:
Initial area flow distance = 300.000(Ft.)
Top (of initial area) elevation = 1645.000(Ft.)
Bottom (of initial area) elevation = 1555.000(Ft.)
Difference in elevation = 90.000(Ft.)
Slope = 0.30000 s(%)= 30.00
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.648 min.
Rainfall intensity = 2.989(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.825
Subarea runoff = 3.155(CFS)
Total initial stream area = 1.280(Ac.)

++
Process from Point/Station 251.000 to Point/Station 252.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

K2

```
Estimated mean flow rate at midpoint of channel =      7.733(CFS)
Depth of flow =   0.223(Ft.), Average velocity =   6.375(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number     'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =      7.733(CFS)
   '      '    flow top width =      5.891(Ft.)
   '      '     velocity=    6.375(Ft/s)
   '      '    area =      1.213(Sq.Ft)
   '      '    Froude number =     2.476

Upstream point elevation =  1555.000(Ft.)
Downstream point elevation =  1400.000(Ft.)
Flow length =   400.000(Ft.)
Travel time  =    1.05 min.
Time of concentration =   12.69 min.
Depth of flow =   0.223(Ft.)
Average velocity =   6.375(Ft/s)
Total irregular channel flow =     7.733(CFS)
Irregular channel normal depth above invert elev. =   0.223(Ft.)
Average velocity of channel(s) =   6.375(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.847(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.821
Subarea runoff =      9.069(CFS) for    3.950(Ac.)
Total runoff =     12.224(CFS)    Total area =        5.23(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.292(Ft.), Average velocity =   7.505(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      252.000 to Point/Station      253.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                              K3
------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     42.449(CFS)
Depth of flow =   0.780(Ft.), Average velocity =   8.291(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number     'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
```

```
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =     42.449(CFS)
   '      '   flow top width =      8.121(Ft.)
   '      '    velocity=    8.291(Ft/s)
   '      '   area =      5.120(Sq.Ft)
   '      '   Froude number =     1.840

Upstream point elevation =  1400.000(Ft.)
Downstream point elevation =  1303.000(Ft.)
Flow length =   635.000(Ft.)
Travel time  =    1.28 min.
Time of concentration =   13.97 min.
Depth of flow =   0.780(Ft.)
Average velocity =   8.291(Ft/s)
Total irregular channel flow =    42.449(CFS)
Irregular channel normal depth above invert elev. =   0.780(Ft.)
Average velocity of channel(s) =   8.291(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.697(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.817
Subarea runoff =     60.375(CFS) for   27.740(Ac.)
Total runoff =     72.599(CFS)    Total area =       32.97(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   1.049(Ft.), Average velocity =   9.746(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      253.000 to Point/Station      253.000
**** SUBAREA FLOW ADDITION ****
                                                              K4
-----------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.730
Decimal fraction soil group D = 0.270
SCS curve number for soil(AMC 2)  = 75.62
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.236(In/Hr)
Max Catchment Loss (Fm) =     0.236(In/Hr)
Time of concentration =    13.97 min.
Rainfall intensity =      2.697(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.818
Subarea runoff =     31.131(CFS) for   14.060(Ac.)
Total runoff =    103.730(CFS)    Total area =       47.03(Ac.)
Area averaged Fm value =    0.246(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      253.000 to Point/Station      254.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

K5

```
Estimated mean flow rate at midpoint of channel =    150.396(CFS)
Depth of flow =   1.820(Ft.), Average velocity =   9.568(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------
Sub-Channel flow  =    150.396(CFS)
   '      '   flow top width =     12.278(Ft.)
   '      '    velocity=    9.568(Ft/s)
   '      '   area =     15.719(Sq.Ft)
   '      '   Froude number =     1.490

Upstream point elevation =  1303.000(Ft.)
Downstream point elevation =  1190.000(Ft.)
Flow length =  1385.000(Ft.)
Travel time  =    2.41 min.
Time of concentration =   16.38 min.
Depth of flow =   1.820(Ft.)
Average velocity =   9.568(Ft/s)
Total irregular channel flow =   150.396(CFS)
Irregular channel normal depth above invert elev. =   1.820(Ft.)
Average velocity of channel(s) =   9.568(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.060
Decimal fraction soil group D = 0.940
SCS curve number for soil(AMC 2)  = 79.64
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.203(In/Hr)
Max Catchment Loss (Fm) =     0.203(In/Hr)
Rainfall intensity =      2.464(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.818
Subarea runoff =     93.252(CFS) for   50.660(Ac.)
Total runoff =    196.982(CFS)    Total area =       97.69(Ac.)
Area averáged Fm value =    0.224(In/Hr)
Depth of flow =   2.086(Ft.), Average velocity =  10.294(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      254.000 to Point/Station      255.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

K6

```
Estimated mean flow rate at midpoint of channel =    261.023(CFS)
Depth of flow =   2.460(Ft.), Average velocity =  10.695(Ft/s)
      ******* Irregular Channel Data ***********
```

```
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    261.023(CFS)
  '     '    flow top width =     14.841(Ft.)
  '     '     velocity=   10.695(Ft/s)
  '     '    area =     24.405(Sq.Ft)
  '     '    Froude number =     1.470

Upstream point elevation =  1190.000(Ft.)
Downstream point elevation =  1055.000(Ft.)
Flow length =  1830.000(Ft.)
Travel time  =    2.85 min.
Time of concentration =   19.23 min.
Depth of flow =   2.460(Ft.)
Average velocity =  10.695(Ft/s)
Total irregular channel flow =   261.023(CFS)
Irregular channel normal depth above invert elev. =   2.460(Ft.)
Average velocity of channel(s) =  10.695(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.650
Decimal fraction soil group D = 0.350
SCS curve number for soil(AMC 2)  = 76.10
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.232(In/Hr)
Max Catchment Loss (Fm) =     0.232(In/Hr)
Rainfall intensity =      2.250(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.809
Subarea runoff =    128.005(CFS) for   80.850(Ac.)
Total runoff =    324.987(CFS)    Total area =      178.54(Ac.)
Area averaged Fm value =    0.228(In/Hr)
Depth of flow =   2.738(Ft.), Average velocity =  11.332(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      255.000 to Point/Station      260.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                              K7
------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    363.364(CFS)
Depth of flow =   3.115(Ft.), Average velocity =  10.386(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
```

```
------------------------------------------------------------------
Sub-Channel flow  =    363.364(CFS)
  '      '    flow top width =     17.461(Ft.)
  '      '     velocity=   10.386(Ft/s)
  '      '    area =     34.987(Sq.Ft)
  '      '    Froude number =     1.293

Upstream point elevation =  1055.000(Ft.)
Downstream point elevation =   950.000(Ft.)
Flow length =  1950.000(Ft.)
Travel time  =    3.13 min.
Time of concentration =   22.36 min.
Depth of flow =   3.115(Ft.)
Average velocity =  10.386(Ft/s)
Total irregular channel flow =   363.364(CFS)
Irregular channel normal depth above invert elev. =   3.115(Ft.)
Average velocity of channel(s) =  10.386(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.840
Decimal fraction soil group D = 0.160
SCS curve number for soil(AMC 2)  = 74.96
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.242(In/Hr)
Max Catchment Loss (Fm) =     0.242(In/Hr)
Rainfall intensity =      2.066(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.799
Subarea runoff =     76.667(CFS) for   64.710(Ac.)
Total runoff =    401.653(CFS)    Total area =      243.25(Ac.)
Area averaged Fm value =    0.231(In/Hr)
Depth of flow =   3.267(Ft.), Average velocity =  10.659(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      255.000 to Point/Station      260.000
**** CONFLUENCE OF MINOR STREAMS ****
--------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    243.250(Ac.)
Runoff from this stream =    401.653(CFS)
Time of concentration =   22.36 min.
Rainfall intensity =     2.066(In/Hr)
Area averaged loss rate (Fm) =    0.2315(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      256.000 to Point/Station      257.000
**** INITIAL AREA EVALUATION ****
                                                              K8
--------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 80.00
```

```
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.200(In/Hr)
Initial subarea data:
Initial area flow distance =   275.000(Ft.)
Top (of initial area) elevation =  1688.000(Ft.)
Bottom (of initial area) elevation =  1550.000(Ft.)
Difference in elevation =   138.000(Ft.)
Slope =    0.50182  s(%)=      50.18
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.149 min.
Rainfall intensity =      3.231(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.844
Subarea runoff =      6.356(CFS)
Total initial stream area =        2.330(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      257.000 to Point/Station      258.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                    K9
Estimated mean flow rate at midpoint of channel =     56.502(CFS)
Depth of flow =   0.740(Ft.), Average velocity =  11.787(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     56.502(CFS)
  '     '    flow top width =      7.959(Ft.)
  '     '     velocity=   11.787(Ft/s)
  '     '    area =      4.793(Sq.Ft)
  '     '    Froude number =     2.677

Upstream point elevation =  1550.000(Ft.)
Downstream point elevation =  1175.000(Ft.)
Flow length =  1145.000(Ft.)
Travel time  =    1.62 min.
Time of concentration =   11.77 min.
Depth of flow =   0.740(Ft.)
Average velocity =  11.787(Ft/s)
Total irregular channel flow =    56.502(CFS)
Irregular channel normal depth above invert elev. =   0.740(Ft.)
Average velocity of channel(s) =  11.787(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.290
Decimal fraction soil group D = 0.710
SCS curve number for soil(AMC 2)  = 78.26
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.214(In/Hr)
Max Catchment Loss (Fm) =     0.214(In/Hr)
Rainfall intensity =      2.972(In/Hr) for a    25.0 year storm
```

```
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.835
Subarea runoff =    100.197(CFS) for   40.600(Ac.)
Total runoff =    106.553(CFS)    Total area =      42.93(Ac.)
Area averaged Fm value =    0.214(In/Hr)
Depth of flow =   1.051(Ft.), Average velocity =  14.280(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      258.000 to Point/Station      260.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                  K10
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    206.633(CFS)
Depth of flow =   2.078(Ft.), Average velocity =  10.864(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------------
Sub-Channel flow  =    206.633(CFS)
   '      '    flow top width =     13.310(Ft.)
   '      '     velocity=   10.864(Ft/s)
   '      '    area =     19.020(Sq.Ft)
   '      '    Froude number =     1.602

Upstream point elevation =  1175.000(Ft.)
Downstream point elevation =   950.000(Ft.)
Flow length =  2465.000(Ft.)
Travel time  =    3.78 min.
Time of concentration =   15.55 min.
Depth of flow =   2.078(Ft.)
Average velocity =  10.864(Ft/s)
Total irregular channel flow =   206.633(CFS)
Irregular channel normal depth above invert elev. =   2.078(Ft.)
Average velocity of channel(s) =  10.864(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.710
Decimal fraction soil group D = 0.290
SCS curve number for soil(AMC 2)  = 75.74
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.235(In/Hr)
Max Catchment Loss (Fm) =     0.235(In/Hr)
Rainfall intensity =      2.538(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.819
Subarea runoff =    200.085(CFS) for  104.640(Ac.)
Total runoff =    306.638(CFS)    Total area =     147.57(Ac.)
Area averaged Fm value =    0.229(In/Hr)
Depth of flow =   2.527(Ft.), Average velocity =  12.070(Ft/s)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      258.000 to Point/Station      260.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     147.570(Ac.)
Runoff from this stream =     306.638(CFS)
Time of concentration =   15.55 min.
Rainfall intensity =     2.538(In/Hr)
Area averaged loss rate (Fm) =     0.2292(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    243.25   401.653     22.36    0.231      2.066
2    147.57   306.638     15.55    0.229      2.538
Qmax(1) =
         1.000 *    1.000 *   401.653) +
         0.796 *    1.000 *   306.638) + =     645.629
Qmax(2) =
         1.257 *    0.695 *   401.653) +
         1.000 *    1.000 *   306.638) + =     657.737

Total of 2 streams to confluence:
Flow rates before confluence point:
     401.653     306.638
Maximum flow rates at confluence using above data:
      645.629      657.737
Area of streams before confluence:
      243.250      147.570
Effective area values after confluence:
      390.820      316.707
Results of confluence:
Total flow rate =     657.737(CFS)
Time of concentration =     15.550 min.
Effective stream area after confluence =     316.707(Ac.)
Study area average Pervious fraction(Ap) =  1.000
Study area average soil loss rate(Fm) =     0.231(In/Hr)
Study area total (this main stream) =     390.82(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      260.000 to Point/Station      261.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                    K11
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     687.542(CFS)
Depth of flow =   4.320(Ft.), Average velocity =  11.669(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
```

```
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =    687.542(CFS)
  '     '    flow top width =     22.280(Ft.)
  '     '     velocity=   11.669(Ft/s)
  '     '    area =     58.923(Sq.Ft)
  '     '    Froude number =     1.264

Upstream point elevation =   950.000(Ft.)
Downstream point elevation =   860.000(Ft.)
Flow length =  1900.000(Ft.)
Travel time  =    2.71 min.
Time of concentration =   18.26 min.
Depth of flow =   4.320(Ft.)
Average velocity =  11.669(Ft/s)
Total irregular channel flow =   687.542(CFS)
Irregular channel normal depth above invert elev. =   4.320(Ft.)
Average velocity of channel(s) =  11.669(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.620
Decimal fraction soil group D = 0.380
SCS curve number for soil(AMC 2)  = 76.28
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.231(In/Hr)
Max Catchment Loss (Fm) =     0.231(In/Hr)
Rainfall intensity =      2.317(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.810
Subarea runoff =     59.527(CFS) for   65.270(Ac.)
Total runoff =    717.264(CFS)    Total area =      381.98(Ac.)
Area averaged Fm value =    0.231(In/Hr)
Depth of flow =   4.404(Ft.), Average velocity =  11.795(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      261.000 to Point/Station      262.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                              K12
-----------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    765.526(CFS)
Depth of flow =   4.520(Ft.), Average velocity =  12.062(Ft/s)
     ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =    765.526(CFS)
  '     '    flow top width =     23.080(Ft.)
  '     '     velocity=   12.062(Ft/s)
  '     '    area =     63.464(Sq.Ft)
  '     '    Froude number =     1.282
```

```
Upstream point elevation =   860.000(Ft.)
Downstream point elevation =   675.000(Ft.)
Flow length =  3845.000(Ft.)
Travel time  =    5.31 min.
Time of concentration =   23.58 min.
Depth of flow =   4.520(Ft.)
Average velocity =  12.062(Ft/s)
Total irregular channel flow =   765.526(CFS)
Irregular channel normal depth above invert elev. =   4.520(Ft.)
Average velocity of channel(s) =  12.062(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.560
Decimal fraction soil group D = 0.440
SCS curve number for soil(AMC 2)  = 76.64
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.228(In/Hr)
Max Catchment Loss (Fm) =     0.228(In/Hr)
Rainfall intensity =      2.005(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.797
Subarea runoff =     96.440(CFS) for  127.300(Ac.)
Total runoff =    813.704(CFS)    Total area =      509.28(Ac.)
Area averaged Fm value =    0.230(In/Hr)
Depth of flow =   4.647(Ft.), Average velocity =  12.251(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      262.000 to Point/Station      265.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                  K13
Estimated mean flow rate at midpoint of channel =    829.673(CFS)
Depth of flow =   4.720(Ft.), Average velocity =  12.172(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    829.674(CFS)
  '      '    flow top width =     23.881(Ft.)
  '      '     velocity=   12.172(Ft/s)
  '      '    area =     68.160(Sq.Ft)
  '      '    Froude number =     1.270

Upstream point elevation =   675.000(Ft.)
Downstream point elevation =   570.000(Ft.)
Flow length =  2250.000(Ft.)
Travel time  =    3.08 min.
Time of concentration =   26.66 min.
Depth of flow =   4.720(Ft.)
Average velocity =  12.172(Ft/s)
Total irregular channel flow =   829.673(CFS)
```

```
Irregular channel normal depth above invert elev. =    4.720(Ft.)
Average velocity of channel(s) =  12.172(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      1.871(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.788
Subarea runoff =     31.863(CFS) for   64.160(Ac.)
Total runoff =    845.567(CFS)    Total area =      573.44(Ac.)
Area averaged Fm value =    0.232(In/Hr)
Depth of flow =   4.761(Ft.), Average velocity =  12.231(Ft/s)
End of computations, total study area =       647.55 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged SCS curve number (AMC 2) =  76.2
```

BLUE MUD CANYON
10-YEAR EXISTING CONDITION

BLUE MUD CANYON
10-YEAR EXISTING CONDITION

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2004 Version 8.0
Rational Hydrology Study, Date: 10/30/12 File Name: 1200K10.roc

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ESPERANZA HILLS
EXISTING CONDITION
BLUE MUD CANYON 10 YEAR
R/09/1200/PRELIM/REPORTS/HYDRO OPTION 1/RATIONAL/EXISTING/1200K10

Program License Serial Number 6062

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 10.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

++

Process from Point/Station 250.000 to Point/Station 251.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 74.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.250(In/Hr)
Max Catchment Loss (Fm) = 0.250(In/Hr)
Initial subarea data:
Initial area flow distance = 300.000(Ft.)
Top (of initial area) elevation = 1645.000(Ft.)
Bottom (of initial area) elevation = 1555.000(Ft.)
Difference in elevation = 90.000(Ft.)
Slope = 0.30000 s(%)= 30.00
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.648 min.
Rainfall intensity = 2.501(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.810
Subarea runoff = 2.593(CFS)
Total initial stream area = 1.280(Ac.)

++

Process from Point/Station 251.000 to Point/Station 252.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

```
Estimated mean flow rate at midpoint of channel =      6.329(CFS)
Depth of flow =   0.198(Ft.), Average velocity =   5.929(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =      6.329(CFS)
   '      '    flow top width =      5.791(Ft.)
   '      '     velocity=    5.929(Ft/s)
   '      '    area =      1.068(Sq.Ft)
   '      '    Froude number =     2.433

Upstream point elevation =  1555.000(Ft.)
Downstream point elevation =  1400.000(Ft.)
Flow length =   400.000(Ft.)
Travel time  =    1.12 min.
Time of concentration =   12.77 min.
Depth of flow =   0.198(Ft.)
Average velocity =   5.929(Ft/s)
Total irregular channel flow =     6.329(CFS)
Irregular channel normal depth above invert elev. =   0.198(Ft.)
Average velocity of channel(s) =   5.929(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.372(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.805
Subarea runoff =      7.395(CFS) for    3.950(Ac.)
Total runoff =      9.988(CFS)    Total area =        5.23(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.259(Ft.), Average velocity =   6.987(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      252.000 to Point/Station      253.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     34.525(CFS)
Depth of flow =   0.695(Ft.), Average velocity =   7.775(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
```

```
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =     34.525(CFS)
   '      '    flow top width =      7.780(Ft.)
   '      '     velocity=    7.775(Ft/s)
   '      '    area =      4.440(Sq.Ft)
   '      '    Froude number =     1.814

Upstream point elevation =  1400.000(Ft.)
Downstream point elevation =  1303.000(Ft.)
Flow length =   635.000(Ft.)
Travel time  =    1.36 min.
Time of concentration =   14.13 min.
Depth of flow =   0.695(Ft.)
Average velocity =   7.775(Ft/s)
Total irregular channel flow =    34.525(CFS)
Irregular channel normal depth above invert elev. =   0.695(Ft.)
Average velocity of channel(s) =   7.775(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.238(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.799
Subarea runoff =     49.008(CFS) for   27.740(Ac.)
Total runoff =     58.995(CFS)    Total area =       32.97(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.937(Ft.), Average velocity =   9.163(Ft/s)


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Process from Point/Station      253.000 to Point/Station      253.000
**** SUBAREA FLOW ADDITION ****
_________________________________________________________________________
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.730
Decimal fraction soil group D = 0.270
SCS curve number for soil(AMC 2)  = 75.62
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.236(In/Hr)
Max Catchment Loss (Fm) =     0.236(In/Hr)
Time of concentration =    14.13 min.
Rainfall intensity =      2.238(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.801
Subarea runoff =     25.329(CFS) for   14.060(Ac.)
Total runoff =     84.325(CFS)    Total area =       47.03(Ac.)
Area averaged Fm value =    0.246(In/Hr)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      253.000 to Point/Station      254.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    121.814(CFS)
Depth of flow =   1.632(Ft.), Average velocity =   9.029(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =    121.814(CFS)
   '      '   flow top width =     11.530(Ft.)
   '      '    velocity=    9.029(Ft/s)
   '      '   area =     13.492(Sq.Ft)
   '      '   Froude number =     1.471

Upstream point elevation =  1303.000(Ft.)
Downstream point elevation =  1190.000(Ft.)
Flow length =  1385.000(Ft.)
Travel time  =    2.56 min.
Time of concentration =   16.69 min.
Depth of flow =   1.632(Ft.)
Average velocity =   9.029(Ft/s)
Total irregular channel flow =   121.814(CFS)
Irregular channel normal depth above invert elev. =   1.632(Ft.)
Average velocity of channel(s) =   9.029(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.060
Decimal fraction soil group D = 0.940
SCS curve number for soil(AMC 2)  = 79.64
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=    0.203(In/Hr)
Max Catchment Loss (Fm) =     0.203(In/Hr)
Rainfall intensity =      2.035(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.801
Subarea runoff =     74.909(CFS) for   50.660(Ac.)
Total runoff =    159.234(CFS)    Total area =       97.69(Ac.)
Area averaged Fm value =    0.224(In/Hr)
Depth of flow =   1.873(Ft.), Average velocity =   9.718(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      254.000 to Point/Station      255.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    209.971(CFS)
Depth of flow =   2.209(Ft.), Average velocity =  10.093(Ft/s)
      ******* Irregular Channel Data ***********
```

```
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    209.971(CFS)
   '      '    flow top width =     13.836(Ft.)
   '      '     velocity=   10.093(Ft/s)
   '      '    area =     20.803(Sq.Ft)
   '      '    Froude number =     1.451

Upstream point elevation =  1190.000(Ft.)
Downstream point elevation =  1055.000(Ft.)
Flow length =  1830.000(Ft.)
Travel time  =    3.02 min.
Time of concentration =   19.71 min.
Depth of flow =   2.209(Ft.)
Average velocity =  10.093(Ft/s)
Total irregular channel flow =   209.971(CFS)
Irregular channel normal depth above invert elev. =   2.209(Ft.)
Average velocity of channel(s) =  10.093(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.650
Decimal fraction soil group D = 0.350
SCS curve number for soil(AMC 2)  = 76.10
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.232(In/Hr)
Max Catchment Loss (Fm) =     0.232(In/Hr)
Rainfall intensity =      1.850(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.789
Subarea runoff =    101.407(CFS) for   80.850(Ac.)
Total runoff =    260.641(CFS)    Total area =     178.54(Ac.)
Area averaged Fm value =    0.228(In/Hr)
Depth of flow =   2.458(Ft.), Average velocity =  10.691(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      255.000 to Point/Station      260.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    290.226(CFS)
Depth of flow =   2.797(Ft.), Average velocity =   9.794(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
```

```
------------------------------------------------------------------
Sub-Channel flow  =    290.225(CFS)
  '      '    flow top width =     16.188(Ft.)
  '      '     velocity=    9.794(Ft/s)
  '      '    area =     29.633(Sq.Ft)
  '      '    Froude number =     1.276

Upstream point elevation =  1055.000(Ft.)
Downstream point elevation =   950.000(Ft.)
Flow length =  1950.000(Ft.)
Travel time  =    3.32 min.
Time of concentration =   23.03 min.
Depth of flow =   2.797(Ft.)
Average velocity =   9.794(Ft/s)
Total irregular channel flow =   290.226(CFS)
Irregular channel normal depth above invert elev. =   2.797(Ft.)
Average velocity of channel(s) =   9.794(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.840
Decimal fraction soil group D = 0.160
SCS curve number for soil(AMC 2)  = 74.96
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.242(In/Hr)
Max Catchment Loss (Fm) =     0.242(In/Hr)
Rainfall intensity =      1.692(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.777
Subarea runoff =     59.093(CFS) for   64.710(Ac.)
Total runoff =    319.734(CFS)    Total area =     243.25(Ac.)
Area averaged Fm value =    0.231(In/Hr)
Depth of flow =   2.931(Ft.), Average velocity =  10.045(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      255.000 to Point/Station      260.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    243.250(Ac.)
Runoff from this stream =    319.734(CFS)
Time of concentration =   23.03 min.
Rainfall intensity =     1.692(In/Hr)
Area averaged loss rate (Fm) =    0.2315(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      256.000 to Point/Station      257.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 80.00
```

```
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.200(In/Hr)
Initial subarea data:
Initial area flow distance =   275.000(Ft.)
Top (of initial area) elevation =  1688.000(Ft.)
Bottom (of initial area) elevation =  1550.000(Ft.)
Difference in elevation =   138.000(Ft.)
Slope =    0.50182  s(%)=      50.18
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.149 min.
Rainfall intensity =      2.706(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.833
Subarea runoff =      5.255(CFS)
Total initial stream area =       2.330(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      257.000 to Point/Station      258.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     46.323(CFS)
Depth of flow =   0.661(Ft.), Average velocity =  11.076(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =     46.323(CFS)
  '     '    flow top width =      7.646(Ft.)
  '     '     velocity=   11.076(Ft/s)
  '     '    area =      4.182(Sq.Ft)
  '     '    Froude number =     2.639

Upstream point elevation =  1550.000(Ft.)
Downstream point elevation =  1175.000(Ft.)
Flow length =  1145.000(Ft.)
Travel time  =    1.72 min.
Time of concentration =   11.87 min.
Depth of flow =   0.661(Ft.)
Average velocity =  11.076(Ft/s)
Total irregular channel flow =    46.323(CFS)
Irregular channel normal depth above invert elev. =   0.661(Ft.)
Average velocity of channel(s) =  11.076(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.290
Decimal fraction soil group D = 0.710
SCS curve number for soil(AMC 2)  = 78.26
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.214(In/Hr)
Max Catchment Loss (Fm) =     0.214(In/Hr)
Rainfall intensity =      2.473(In/Hr) for a    10.0 year storm
```

```
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.822
Subarea runoff =     82.049(CFS) for   40.600(Ac.)
Total runoff =     87.304(CFS)    Total area =      42.93(Ac.)
Area averaged Fm value =    0.214(In/Hr)
Depth of flow =   0.942(Ft.), Average velocity =  13.460(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      258.000 to Point/Station      260.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =    167.523(CFS)
Depth of flow =   1.868(Ft.), Average velocity =  10.264(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    167.523(CFS)
  '     '    flow top width =     12.473(Ft.)
  '     '     velocity=   10.264(Ft/s)
  '     '    area =     16.322(Sq.Ft)
  '     '    Froude number =     1.581

Upstream point elevation =  1175.000(Ft.)
Downstream point elevation =   950.000(Ft.)
Flow length =  2465.000(Ft.)
Travel time  =    4.00 min.
Time of concentration =   15.87 min.
Depth of flow =   1.868(Ft.)
Average velocity =  10.264(Ft/s)
Total irregular channel flow =   167.523(CFS)
Irregular channel normal depth above invert elev. =   1.868(Ft.)
Average velocity of channel(s) =  10.264(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.710
Decimal fraction soil group D = 0.290
SCS curve number for soil(AMC 2)  = 75.74
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.235(In/Hr)
Max Catchment Loss (Fm) =     0.235(In/Hr)
Rainfall intensity =      2.094(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.802
Subarea runoff =    160.370(CFS) for  104.640(Ac.)
Total runoff =    247.674(CFS)    Total area =      147.57(Ac.)
Area averaged Fm value =    0.229(In/Hr)
Depth of flow =   2.274(Ft.), Average velocity =  11.405(Ft/s)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      258.000 to Point/Station      260.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     147.570(Ac.)
Runoff from this stream =     247.674(CFS)
Time of concentration =   15.87 min.
Rainfall intensity =     2.094(In/Hr)
Area averaged loss rate (Fm) =     0.2292(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    243.25   319.734     23.03    0.231      1.692
2    147.57   247.674     15.87    0.229      2.094
Qmax(1) =
         1.000 *    1.000 *   319.734) +
         0.784 *    1.000 *   247.674) + =     514.012
Qmax(2) =
         1.275 *    0.689 *   319.734) +
         1.000 *    1.000 *   247.674) + =     528.743

Total of 2 streams to confluence:
Flow rates before confluence point:
     319.734     247.674
Maximum flow rates at confluence using above data:
      514.012      528.743
Area of streams before confluence:
      243.250      147.570
Effective area values after confluence:
      390.820      315.246
Results of confluence:
Total flow rate =     528.743(CFS)
Time of concentration =     15.875 min.
Effective stream area after confluence =     315.246(Ac.)
Study area average Pervious fraction(Ap) =  1.000
Study area average soil loss rate(Fm) =     0.231(In/Hr)
Study area total (this main stream) =      390.82(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      260.000 to Point/Station      261.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     550.879(CFS)
Depth of flow =   3.902(Ft.), Average velocity =  11.026(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
```

```
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =    550.879(CFS)
  '     '   flow top width =     20.608(Ft.)
  '     '    velocity=   11.026(Ft/s)
  '     '   area =     49.963(Sq.Ft)
  '     '   Froude number =     1.248

Upstream point elevation =   950.000(Ft.)
Downstream point elevation =   860.000(Ft.)
Flow length =  1900.000(Ft.)
Travel time  =    2.87 min.
Time of concentration =   18.75 min.
Depth of flow =   3.902(Ft.)
Average velocity =  11.026(Ft/s)
Total irregular channel flow =   550.879(CFS)
Irregular channel normal depth above invert elev. =   3.902(Ft.)
Average velocity of channel(s) =  11.026(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.620
Decimal fraction soil group D = 0.380
SCS curve number for soil(AMC 2)  = 76.28
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.231(In/Hr)
Max Catchment Loss (Fm) =     0.231(In/Hr)
Rainfall intensity =      1.904(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.791
Subarea runoff =     44.201(CFS) for   65.270(Ac.)
Total runoff =    572.944(CFS)    Total area =      380.52(Ac.)
Area averaged Fm value =    0.231(In/Hr)
Depth of flow =   3.973(Ft.), Average velocity =  11.137(Ft/s)


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Process from Point/Station      261.000 to Point/Station      262.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
-------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    608.164(CFS)
Depth of flow =   4.069(Ft.), Average velocity =  11.375(Ft/s)
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1             0.00              50.00
      2           100.00               0.00
      3           105.00               0.00
      4           205.00              50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =    608.165(CFS)
  '     '   flow top width =     21.278(Ft.)
  '     '    velocity=   11.375(Ft/s)
  '     '   area =     53.467(Sq.Ft)
  '     '   Froude number =     1.265
```

```
Upstream point elevation =   860.000(Ft.)
Downstream point elevation =   675.000(Ft.)
Flow length =  3845.000(Ft.)
Travel time  =    5.63 min.
Time of concentration =   24.38 min.
Depth of flow =   4.069(Ft.)
Average velocity =  11.375(Ft/s)
Total irregular channel flow =   608.164(CFS)
Irregular channel normal depth above invert elev. =   4.069(Ft.)
Average velocity of channel(s) =  11.375(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.560
Decimal fraction soil group D = 0.440
SCS curve number for soil(AMC 2)  = 76.64
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.228(In/Hr)
Max Catchment Loss (Fm) =     0.228(In/Hr)
Rainfall intensity =      1.638(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.774
Subarea runoff =     70.368(CFS) for  127.300(Ac.)
Total runoff =    643.312(CFS)    Total area =      507.82(Ac.)
Area averaged Fm value =    0.230(In/Hr)
Depth of flow =   4.176(Ft.), Average velocity =  11.539(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      262.000 to Point/Station      265.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    654.054(CFS)
Depth of flow =   4.237(Ft.), Average velocity =  11.457(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =    654.054(CFS)
  '     '    flow top width =     21.948(Ft.)
  '     '     velocity=   11.457(Ft/s)
  '     '    area =     57.088(Sq.Ft)
  '     '    Froude number =     1.252

Upstream point elevation =   675.000(Ft.)
Downstream point elevation =   570.000(Ft.)
Flow length =  2250.000(Ft.)
Travel time  =    3.27 min.
Time of concentration =   27.65 min.
Depth of flow =   4.237(Ft.)
Average velocity =  11.457(Ft/s)
Total irregular channel flow =   654.054(CFS)
```

```
Irregular channel normal depth above invert elev. =    4.237(Ft.)
Average velocity of channel(s) =  11.457(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      1.524(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.763
Subarea runoff =     21.420(CFS) for   64.160(Ac.)
Total runoff =    664.732(CFS)    Total area =      571.98(Ac.)
Area averaged Fm value =    0.232(In/Hr)
Depth of flow =   4.268(Ft.), Average velocity =  11.504(Ft/s)
End of computations, total study area =          647.55 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged SCS curve number (AMC 2) =  76.2
```

Appendix

F

EXISTING CONDITION HYDROLOGIC KEY MAP

FIGURE 9

EXISTING CONDITION HYDROLOGY KEY MAP

FOR

ESPERANZA HILLS OPTION 1

COUNTY OF ORANGE

HWG: WE | DRAFT: WE | CHECK: MCT

HWG ENGINEERS
180 Grand Avenue, Suite 150 • Oakland, CA 94612 • (510) 488-3538
www.hwgengineers.com

SHEET 1 OF 1

SCALE IN FEET
300 0 300 600 900

LEGEND

- EXISTING MAJOR WATERSHED BOUNDARY
- EXISTING MINOR WATERSHED BOUNDARY
- EXISTING SUB DRAINAGE AREA BOUNDARY
- EXISTING FLOW PATH
- SOIL TYPE BOUNDARY
- DIRECTION OF FLOW
- D17 / 70.21 — DRAINAGE AREA DESIGNATION / ACRES
- 540 — NODE DESIGNATION
- L=300' — LENGTH OF EXISTING FLOW PATH
- Q_{10} — CALCULATED 10-YEAR STORM RUNOFF
- Q_{25} — CALCULATED 25-YEAR STORM RUNOFF

Area A	Area (sq)	Total Area (ac)	Q100 (cfs)	100-Y Tc (min)	Q25 (cfs)	25-Y Tc (min)
1	6.93	6.93	7.06	11.19	2.35	11.19
2	2.42	4.45	13.92	12.12	10.63	12.21
3	5.63	10.08	29.90	13.27	22.79	13.47
4	1.43	2.23	6.71	11.43	4.79	11.52
5	13.55	36.06	102.52	14.23	77.97	14.52
6	10.74	46.80	128.12	15.15	97.06	15.52
7	13.21	60.01	157.40	16.21	118.90	16.66
8	2.19	2.19	6.99	11.14	5.37	11.24
9	6.23	6.72	20.66	12.49	15.41	12.66
10	11.71	20.43	59.53	13.67	45.32	13.85
11	9.15	29.58	83.17	14.41	63.23	14.65
12	2.58	117.97	286.75	18.31	215.60	18.92
Confluence	**2.78**	**16.27**	**4.27**	**18.31**	**3.23**	**18.92**
13	7.72	7.72	8.11	13.10	6.23	13.10
14	10.21	13.03	36.93	14.30	28.36	14.41
15	13.31	26.34	69.98	15.66	53.16	15.77
16	6.83	11.44	35.64	12.99	27.41	13.20
17	3.35	4.61	14.44	12.09	11.05	12.20
18	1.26	1.26	4.19	11.00	3.22	11.00
19	10.78	22.22	66.90	12.88	51.03	13.06
20	16.19	38.41	111.11	13.76	86.43	14.01
Confluence	**6.75**	**111.39**	**13.86**	**13.76**	**10.61**	**14.01**
21	6.54	129.70	327.54	16.43	247.32	16.89
Confluence	**2.44.18**	**602.81**	**16.43**	**246.05**	**184.88**	**16.89**
22	8.91	375.67	796.78	21.37	594.88	22.42
23	4.55	380.76	666.15	18.78	498.57	19.42
24	1.35	4.84	9.70	9.73	6.70	9.70
25	7.22	6.37	23.56	10.37	22.09	10.43
26	12.25	20.62	66.40	11.61	60.63	11.79
27	13.04	33.66	108.29	11.61	82.57	11.79
28	27.41	61.07	179.96	13.48	144.53	13.80
29	34.65	95.72	282.37	13.48	214.26	13.80
30	56.03	151.75	411.42	13.50	310.90	13.98
31	3.20	3.20	9.52	10.10	7.20	10.10
32	9.72	512.36	1271.83	19.30	952.68	20.05
Confluence	**2.56.87**	**1271.83**	**17.87**	**952.68**	**19.28**
33	1.20	1.20	3.52	10.10	2.70	10.10
34	37.36	98.05	286.52	16.57	215.42	16.89
Confluence	**2.56.88**	**1284.88**	**18.07**	**962.87**	**19.24**	**21.22**
35	39.36	607.71	286.16	20.37	19.24	21.22
Area B Total	**616.30**	**1393.37**	**20.37**	**1054.71**	**21.22**
B1	0.91	0.91	3.09	10.59	2.38	10.59
B2	4.36	5.27	17.31	11.28	13.26	11.35
B3	7.36	12.63	38.56	12.49	29.73	12.67
B4	31.28	43.91	131.37	13.19	100.10	13.43
B5	66.47	110.38	285.23	16.10	215.39	17.21
B6	70.76	181.14	402.16	21.10	301.00	22.17
B7	25.22	206.36	444.52	22.37	332.24	23.55
TOTAL	**682.75**	**816.66**	**1838.09**	**22.37**	**1373.85**	**23.55**

* Effective Area After Confluence

EXISTING CONDITION HYDROLOGIC KEY MAP

Appendix

G

PROPOSED CONDITION HYDROLOGY RATIONAL METHOD

TABLE 5
ESPERANZA HILLS
PROPOSED CONDITION HYDROLOGY SUMMARY TABLE

Subarea	Area (sf)	Area (ac)	Total Area (ac)	Q100 (cfs)	100-Y Tc (min)	Q25 (cfs)	25-Y Tc (min)
C1	40276	0.93	0.93	3.06	11.19	2.35	11.19
C2	153696	3.52	4.45	13.92	12.12	10.65	12.21
C3	245017	5.63	10.08	29.90	13.27	22.79	13.47
C4	541255	12.43	22.51	64.13	14.23	48.75	14.52
C5	590281	13.55	36.06	102.52	14.23	77.87	14.52
C6	712621	16.32	52.38	140.65	15.62	106.43	16.18
Confluence			***52.38***	***140.65***	***15.77***	***106.43***	***16.18***
C7	94983	2.19	2.19	7.15	11.29	5.50	11.29
C8	284026	6.53	8.72	27.19	12.18	20.82	12.26
C9	694064	15.93	24.65	72.06	13.53	54.86	13.73
Confluence			***77.03***	***206.48***	***15.77***	***156.17***	***16.18***
G1	33456	0.77	0.77	2.70	10.45	2.09	10.45
G2	1281003	29.41	30.18	76.62	17.78	58.28	18.28
G3	47364	1.09	1.09	3.73	11.00	2.89	11.00
G4	1210199	27.78	28.87	77.74	16.20	59.44	16.54
Confluence			***136.08***	***357.76***	***16.49***	***271.33***	***16.95***
C10	119359	2.74	2.72	8.17	13.10	6.23	13.10
C11	447407	10.27	13.01	36.87	14.30	28.26	14.41
C12	578963	13.29	26.30	69.87	15.86	53.26	16.11
C13	54947	1.26	1.26	4.18	11.00	3.22	11.00
C14	145800	3.35	4.61	14.44	12.09	11.05	12.20
C15	297650	6.83	11.44	35.84	12.09	27.41	12.20
C16	468859	10.76	22.20	66.95	12.88	51.03	13.06
C17	705321	16.19	38.41	111.11	13.76	84.43	14.01
Confluence			***64.71***	***177.28***	***16.62***	***134.88***	***14.01***
C18	2700791	62.00	123.27	314.85	16.84	237.51	17.32
Confluence			***257.23***	***666.08***	***16.62***	***503.75***	***17.08***
G5	798709	18.34	268.79	12.67	17.36	8.13	17.89
G6	47177	1.08	1.08	3.88	9.96	3.00	9.96
G7	1141199	26.20	27.28	82.74	13.25	63.42	13.46
Confluence			***295.70***	***749.00***	***17.36***	***565.26***	***17.89***
G8	455595	10.46	306.53	775.41	17.36	585.19	17.89
G9	145744	3.35	309.88	775.41	17.67	585.19	17.89
G10	309027	7.09	316.97	775.41	17.67	598.33	17.89
G11	349076	8.01	324.98	793.17	18.51	598.33	19.12
Confluence			***324.98***	***793.17***	***18.51***	***598.33***	***19.12***
G12	55568	1.28	1.28	4.43	10.77	3.44	10.77
G13	1355824	31.13	32.41	95.50	14.03	73.37	14.24
G14	397864	9.13	41.54	122.50	14.03	94.14	14.24
Confluence			***366.52***	***897.03***	***18.51***	***677.27***	***19.13***
E1	62064	1.42	1.42	5.09	9.70	3.92	9.70
E2	307291	7.05	8.47	29.17	10.37	22.36	10.43
E3	534719	12.28	20.75	66.85	11.61	50.99	11.78
E4	571436	13.12	33.87	109.01	11.61	83.12	11.78
E5	1194188	27.41	61.28	180.65	13.47	137.07	13.79
E6	1392749	31.97	93.26	275.21	13.47	208.89	13.79
E7	2011890	46.19	139.44	378.04	15.52	285.74	16.00
E8	2685704	61.66	201.10	486.96	18.65	365.97	19.37
E9	1397313	32.08	233.18	563.76	18.65	423.46	19.37
E10	343435	7.88	241.06	567.20	18.65	425.46	20.26
E11	56743	1.30	1.30	3.82	13.10	2.92	13.10
E12	1627562	37.36	35.46	101.85	16.57	77.56	16.96

TABLE 5
ESPERANZA HILLS
PROPOSED CONDITION HYDROLOGY SUMMARY TABLE

Confluence			**638.04**	***1551.06***	***18.82***	***1167.68***	***19.46***
E13	810330	18.60	656.64	1551.06	20.10	1167.68	20.84
Confluence			***677.18***	***1551.06***	***20.10***	***1167.68***	***20.84***
H1	31336	0.72	0.72	2.72	9.32	2.11	9.32
H2	2702155	62.03	62.75	183.3	14.3	140.04	14.63
D1	39566	0.91	0.91	3.67	8.00	2.82	8.00
D2	188912	4.34	5.25	20.26	8.65	15.54	8.71
D3	320438	7.36	12.63	45.09	9.80	34.38	9.97
D4	1309219	30.06	42.67	146.87	10.48	111.78	10.70
D5	2507862	57.57	100.24	292.88	13.66	220.77	14.13
Confluence			***162.99***	***463.96***	***15.84***	***350.36***	***16.43***
H3	1370572	31.46	194.45	520.86	16.02	398.46	16.62
H4	27112	0.62	0.62	2.68	7.20	2.07	7.20
H5	275276	6.32	6.94	26.47	8.87	20.32	8.97
H6	196333	4.51	11.45	40.68	9.41	31.14	9.53
Confluence			***205.90***	***551.10***	***16.34***	***423.06***	***16.97***
H7	286251	6.57	212.47	561.64	16.55	431.02	17.19
Confluence			***212.47***	***561.64***	***16.55***	***431.02***	***17.19***
Total		***889.64***	***889.64***	***2112.70***		***1598.70***	

* Effective Area after confluence

6

PROPOSED CONDITION HYDROLOGY RATIONAL METHOD

TABLE 4
ESPERANZA HILLS
PROPOSED CONDITION HYDROLOGY SUMMARY TABLE

Subtotal			**638.04**	***1551.17***	***18.82***	***1167.76***	***19.46***
E13	810330	18.60	656.64	1551.17	20.10	1167.76	20.84
Subtotal			***677.18***	***1551.17***	***20.10***	***1167.76***	***20.84***
H1	31336	0.72	0.72	2.72	9.32	2.11	9.32
H2	2702155	62.03	62.75	183.3	14.13	140.04	14.45
D1	39566	0.91	0.91	3.67	8.00	2.82	8.00
D2	188912	4.34	5.25	20.26	8.65	15.54	8.71
D3	320438	7.36	12.63	45.09	9.80	34.38	9.97
D4	1309219	30.06	42.67	146.87	10.48	111.78	10.70
D5	2507862	57.57	100.24	292.88	13.66	220.77	14.13
Subtotal			***162.99***	***463.96***	***15.84***	***350.33***	***16.43***
H3	1370572	31.46	194.45	520.86	16.02	398.46	14.64
H4	27112	0.62	0.62	2.69	7.24	2.07	7.24
H5	275276	6.32	6.94	26.48	8.93	20.32	9.03
H6	196333	4.51	11.45	40.68	10.03	31.14	10.82
Subtotal			***205.90***	***551.10***	***16.34***	***423.06***	***15.01***
H7	286251	6.57	212.47	561.64	16.36	431.02	15.01
Subtotal			***212.47***	***561.64***	***16.36***	***431.02***	***15.01***
Total		***889.64***	***889.64***	***2112.81***		***1598.78***	

* Effective Area after confluence

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2004 Version 8.0
Rational Hydrology Study, Date: 12/12/12 File Name: 1200PROP100EG.roc

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ESPERANZA HILLS
PROPOSED CONDITION (ONSITE AND OFFSITE)
100-YEAR AREA G-E
R:\09\1200\PRELIM\REPORTS\HYDRO OPTION 1\RATIONAL\PROPOSED\1200PROP100

Program License Serial Number 6062

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 100.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

++

Process from Point/Station 10.000 to Point/Station 15.000
**** INITIAL AREA EVALUATION ****

C1

UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 74.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.250(In/Hr)
Max Catchment Loss (Fm) = 0.250(In/Hr)
Initial subarea data:
Initial area flow distance = 300.000(Ft.)
Top (of initial area) elevation = 1780.000(Ft.)
Bottom (of initial area) elevation = 1670.000(Ft.)
Difference in elevation = 110.000(Ft.)
Slope = 0.36667 s(%)= 36.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.189 min.
Rainfall intensity = 3.900(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.842
Subarea runoff = 3.055(CFS)
Total initial stream area = 0.930(Ac.)

++

Process from Point/Station 15.000 to Point/Station 20.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

C2

```
Estimated mean flow rate at midpoint of channel =      8.532(CFS)
Depth of flow =   0.269(Ft.), Average velocity =   5.736(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number   'X' coordinate    'Y' coordinate
      1            0.00            50.00
      2          100.00             0.00
      3          105.00             0.00
      4          205.00            50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------
Sub-Channel flow  =      8.532(CFS)
   '      '    flow top width =      6.074(Ft.)
   '      '     velocity=    5.736(Ft/s)
   '      '    area =      1.487(Sq.Ft)
   '      '    Froude number =     2.043

Upstream point elevation =  1670.000(Ft.)
Downstream point elevation =  1590.000(Ft.)
Flow length =   320.000(Ft.)
Travel time  =    0.93 min.
Time of concentration =  12.12 min.
Depth of flow =   0.269(Ft.)
Average velocity =   5.736(Ft/s)
Total irregular channel flow =     8.532(CFS)
Irregular channel normal depth above invert elev. =   0.269(Ft.)
Average velocity of channel(s) =   5.736(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=    0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      3.725(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.840
Subarea runoff =     10.864(CFS) for    3.520(Ac.)
Total runoff =     13.919(CFS)   Total area =      4.45(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.358(Ft.), Average velocity =   6.805(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      20.000 to Point/Station      25.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                              C3
----------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     21.937(CFS)
Depth of flow =   0.464(Ft.), Average velocity =   7.983(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate    'Y' coordinate
      1             0.00            50.00
      2           100.00             0.00
```

```
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =     21.937(CFS)
  '     '    flow top width =      6.854(Ft.)
  '     '     velocity=    7.983(Ft/s)
  '     '    area =      2.748(Sq.Ft)
  '     '    Froude number =     2.222

Upstream point elevation =  1590.000(Ft.)
Downstream point elevation =  1450.000(Ft.)
Flow length =   550.000(Ft.)
Travel time  =    1.15 min.
Time of concentration =   13.27 min.
Depth of flow =   0.464(Ft.)
Average velocity =   7.983(Ft/s)
Total irregular channel flow =    21.937(CFS)
Irregular channel normal depth above invert elev. =   0.464(Ft.)
Average velocity of channel(s) =   7.983(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.680
Decimal fraction soil group D = 0.320
SCS curve number for soil(AMC 2)  = 75.92
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.234(In/Hr)
Max Catchment Loss (Fm) =     0.234(In/Hr)
Rainfall intensity =      3.537(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.839
Subarea runoff =     15.983(CFS) for    5.630(Ac.)
Total runoff =     29.902(CFS)    Total area =       10.08(Ac.)
Area averaged Fm value =    0.241(In/Hr)
Depth of flow =   0.554(Ft.), Average velocity =   8.838(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       25.000 to Point/Station     30.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                              C4
-----------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     47.060(CFS)
Depth of flow =   0.707(Ft.), Average velocity =  10.374(Ft/s)
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =     47.060(CFS)
  '     '    flow top width =      7.829(Ft.)
  '     '     velocity=   10.374(Ft/s)
  '     '    area =      4.536(Sq.Ft)
```

```
'      '    Froude number =      2.402

Upstream point elevation =  1450.000(Ft.)
Downstream point elevation =  1290.000(Ft.)
Flow length =   600.000(Ft.)
Travel time  =    0.96 min.
Time of concentration =   14.23 min.
Depth of flow =   0.707(Ft.)
Average velocity =  10.374(Ft/s)
Total irregular channel flow =    47.060(CFS)
Irregular channel normal depth above invert elev. =   0.707(Ft.)
Average velocity of channel(s) =  10.374(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.500
SCS curve number for soil(AMC 2)  = 77.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.225(In/Hr)
Max Catchment Loss (Fm) =     0.225(In/Hr)
Rainfall intensity =      3.398(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.838
Subarea runoff =     34.230(CFS) for   12.430(Ac.)
Total runoff =     64.132(CFS)    Total area =      22.51(Ac.)
Area averaged Fm value =    0.232(In/Hr)
Depth of flow =   0.841(Ft.), Average velocity =  11.414(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       28.000 to Point/Station      30.000
**** SUBAREA FLOW ADDITION ****
                                                                  C5
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Time of concentration =   14.23 min.
Rainfall intensity =      3.398(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.837
Subarea runoff =     38.388(CFS) for   13.550(Ac.)
Total runoff =    102.520(CFS)    Total area =      36.06(Ac.)
Area averaged Fm value =    0.239(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.000 to Point/Station      40.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                  C6
Estimated mean flow rate at midpoint of channel =   121.618(CFS)
Depth of flow =   1.435(Ft.), Average velocity =  10.772(Ft/s)
      ******* Irregular Channel Data ***********
```

```
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    121.618(CFS)
   '      '    flow top width =     10.739(Ft.)
   '      '     velocity=   10.772(Ft/s)
   '      '    area =     11.290(Sq.Ft)
   '      '    Froude number =     1.851

Upstream point elevation =  1290.000(Ft.)
Downstream point elevation =  1170.000(Ft.)
Flow length =   900.000(Ft.)
Travel time  =    1.39 min.
Time of concentration =   15.62 min.
Depth of flow =   1.435(Ft.)
Average velocity =  10.772(Ft/s)
Total irregular channel flow =   121.618(CFS)
Irregular channel normal depth above invert elev. =   1.435(Ft.)
Average velocity of channel(s) =  10.772(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.680
Decimal fraction soil group D = 0.320
SCS curve number for soil(AMC 2)  = 75.92
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.234(In/Hr)
Max Catchment Loss (Fm) =     0.234(In/Hr)
Rainfall intensity =      3.221(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.834
Subarea runoff =     38.127(CFS) for   16.320(Ac.)
Total runoff =    140.648(CFS)    Total area =     52.38(Ac.)
Area averaged Fm value =    0.237(In/Hr)
Depth of flow =   1.548(Ft.), Average velocity =  11.220(Ft/s)


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Process from Point/Station       40.000 to Point/Station       85.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1170.000(Ft.)
Downstream point/station elevation =  1162.000(Ft.)
Pipe length  =   198.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   140.648(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =  140.648(CFS)
Normal flow depth in pipe =   27.56(In.)
Flow top width inside pipe =   35.52(In.)
Critical depth could not be calculated.
Pipe flow velocity =     22.45(Ft/s)
Travel time through pipe =    0.15 min.
```

```
Time of concentration (TC) =    15.77 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       85.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     52.380(Ac.)
Runoff from this stream =    140.648(CFS)
Time of concentration =   15.77 min.
Rainfall intensity =     3.204(In/Hr)
Area averaged loss rate (Fm) =    0.2374(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       60.000 to Point/Station       70.000
**** INITIAL AREA EVALUATION ****
                                                                C7
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1655.000(Ft.)
Bottom (of initial area) elevation =  1550.000(Ft.)
Difference in elevation =   105.000(Ft.)
Slope =    0.35000  s(%)=      35.00
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.294 min.
Rainfall intensity =      3.879(In/Hr) for a  100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.842
Subarea runoff =    7.153(CFS)
Total initial stream area =        2.190(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       70.000 to Point/Station       75.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                C8
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     17.215(CFS)
Depth of flow =   0.342(Ft.), Average velocity =   8.857(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
```

```
Sub-Channel flow  =     17.215(CFS)
  '     '    flow top width =      6.368(Ft.)
  '     '     velocity=    8.857(Ft/s)
  '     '    area =      1.944(Sq.Ft)
  '     '    Froude number =     2.825

Upstream point elevation =  1550.000(Ft.)
Downstream point elevation =  1340.000(Ft.)
Flow length =   470.000(Ft.)
Travel time  =    0.88 min.
Time of concentration =   12.18 min.
Depth of flow =   0.342(Ft.)
Average velocity =   8.857(Ft/s)
Total irregular channel flow =    17.215(CFS)
Irregular channel normal depth above invert elev. =   0.342(Ft.)
Average velocity of channel(s) =   8.857(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      3.715(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.839
Subarea runoff =     20.041(CFS) for    6.530(Ac.)
Total runoff =     27.194(CFS)    Total area =        8.72(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.446(Ft.), Average velocity =  10.345(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      75.000 to Point/Station      80.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                  C9
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    49.666(CFS)
Depth of flow =   0.785(Ft.), Average velocity =   9.636(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------------
Sub-Channel flow  =     49.666(CFS)
  '     '    flow top width =      8.138(Ft.)
  '     '     velocity=    9.636(Ft/s)
  '     '    area =      5.154(Sq.Ft)
  '     '    Froude number =     2.134

Upstream point elevation =  1340.000(Ft.)
Downstream point elevation =  1180.000(Ft.)
```

```
Flow length =   780.000(Ft.)
Travel time  =    1.35 min.
Time of concentration =   13.53 min.
Depth of flow =   0.785(Ft.)
Average velocity =   9.636(Ft/s)
Total irregular channel flow =    49.666(CFS)
Irregular channel normal depth above invert elev. =   0.785(Ft.)
Average velocity of channel(s) =   9.636(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=    0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      3.498(In/Hr) for a  100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.836
Subarea runoff =     44.864(CFS) for   15.930(Ac.)
Total runoff =     72.057(CFS)    Total area =      24.65(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.964(Ft.), Average velocity =  10.787(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       80.000 to Point/Station       85.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =  1180.000(Ft.)
Downstream point/station elevation =  1162.000(Ft.)
Pipe length  =   165.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    72.057(CFS)
Nearest computed pipe diameter  =    24.00(In.)
Calculated individual pipe flow  =    72.057(CFS)
Normal flow depth in pipe =   18.94(In.)
Flow top width inside pipe =   19.57(In.)
Critical depth could not be calculated.
Pipe flow velocity =   27.09(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =    13.63 min.


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Process from Point/Station       60.000 to Point/Station       85.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     24.650(Ac.)
Runoff from this stream =     72.057(CFS)
Time of concentration =   13.63 min.
Rainfall intensity =     3.483(In/Hr)
Area averaged loss rate (Fm) =    0.2500(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm     Rainfall Intensity
```

```
 No.     (Ac.)    (CFS)        (min) (In/Hr)      (In/Hr)

1      52.38   140.648      15.77     0.237       3.204
2      24.65    72.057      13.63     0.250       3.483
Qmax(1) =
        1.000 *    1.000 *   140.648) +
        0.914 *    1.000 *    72.057) + =     206.476
Qmax(2) =
        1.094 *    0.864 *   140.648) +
        1.000 *    1.000 *    72.057) + =     205.055

Total of 2 streams to confluence:
Flow rates before confluence point:
     140.648      72.057
Maximum flow rates at confluence using above data:
      206.476      205.055
Area of streams before confluence:
       52.380       24.650
Effective area values after confluence:
       77.030       69.916
Results of confluence:
Total flow rate =     206.476(CFS)
Time of concentration =    15.771 min.
Effective stream area after confluence =     77.030(Ac.)
Study area average Pervious fraction(Ap) =  1.000
Study area average soil loss rate(Fm) =    0.241(In/Hr)
Study area total (this main stream) =      77.03(Ac.)


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Process from Point/Station       85.000 to Point/Station      302.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1162.000(Ft.)
Downstream point/station elevation =  1100.000(Ft.)
Pipe length  =  1177.00(Ft.)  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   206.476(CFS)
Nearest computed pipe diameter  =     42.00(In.)
Calculated individual pipe flow  =   206.476(CFS)
Normal flow depth in pipe =   30.98(In.)
Flow top width inside pipe =   36.95(In.)
Critical depth could not be calculated.
Pipe flow velocity =     27.14(Ft/s)
Travel time through pipe =    0.72 min.
Time of concentration (TC) =    16.49 min.


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Process from Point/Station       85.000 to Point/Station      302.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     77.030(Ac.)
Runoff from this stream =    206.476(CFS)
Time of concentration =   16.49 min.
Rainfall intensity =     3.122(In/Hr)
```

```
Area averaged loss rate (Fm) =    0.2414(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      300.000 to Point/Station      301.000
**** INITIAL AREA EVALUATION ****
```

G1

```
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.500
SCS curve number for soil(AMC 2)  = 72.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.225(In/Hr)
Max Catchment Loss (Fm) =     0.158(In/Hr)
Initial subarea data:
Initial area flow distance =   285.000(Ft.)
Top (of initial area) elevation =  1275.000(Ft.)
Bottom (of initial area) elevation =  1272.000(Ft.)
Difference in elevation =     3.000(Ft.)
Slope =    0.01053  s(%)=       1.05
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.446 min.
Rainfall intensity =      4.056(In/Hr) for a  100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.865
Subarea runoff =      2.702(CFS)
Total initial stream area =        0.770(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
```

G2

```
Top of street segment elevation =  1272.000(Ft.)
End of street segment elevation =  1115.300(Ft.)
Length of street segment   =  3270.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   8.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0130
 Manning's N from gutter to grade break =  0.0130
 Manning's N from grade break to crown =  0.0130
Estimated mean flow rate at midpoint of street =     39.771(CFS)
Depth of flow =   0.445(Ft.), Average velocity =   7.457(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  15.938(Ft.)
Flow velocity =   7.46(Ft/s)
Travel time =    7.31 min.     TC =   17.75  min.
 Adding area flow to street
```

```
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.880
Decimal fraction soil group D = 0.120
SCS curve number for soil(AMC 2)  = 69.72
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.244(In/Hr)
Max Catchment Loss (Fm) =     0.171(In/Hr)
Rainfall intensity =   2.993(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.849
Subarea runoff =     73.972(CFS) for   29.410(Ac.)
Total runoff =    76.674(CFS)    Total area =      30.18(Ac.)
Area averaged Fm value =    0.170(In/Hr)
Street flow at end of street =     76.674(CFS)
Half street flow at end of street =     38.337(CFS)
Depth of flow =   0.537(Ft.), Average velocity =   8.888(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    1.87(Ft.)
Flow width (from curb towards crown)=  18.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      300.000 to Point/Station      302.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     30.180(Ac.)
Runoff from this stream =     76.674(CFS)
Time of concentration =   17.75 min.
Rainfall intensity =    2.993(In/Hr)
Area averaged loss rate (Fm) =    0.1705(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)      (min) (In/Hr)      (In/Hr)


1     77.03   206.476     16.49    0.241      3.122
2     30.18    76.674     17.75    0.170      2.993
Qmax(1) =
         1.000 *    1.000 *   206.476) +
         1.046 *    0.929 *    76.674) + =     280.961
Qmax(2) =
         0.955 *    1.000 *   206.476) +
         1.000 *    1.000 *    76.674) + =     273.898

Total of 2 main streams to confluence:
Flow rates before confluence point:
     207.476      77.674
Maximum flow rates at confluence using above data:
      280.961      273.898
Area of streams before confluence:
       77.030       30.180
Effective area values after confluence:
```

```
      105.066      107.210

Results of confluence:
Total flow rate =     280.961(CFS)
Time of concentration =     16.494 min.
Effective stream area after confluence  =     105.066(Ac.)
Study area average Pervious fraction(Ap) =  0.916
Study area average soil loss rate(Fm) =     0.221(In/Hr)
Study area total =     107.21(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      303.000 to Point/Station      304.000
**** INITIAL AREA EVALUATION ****
                                                                G3
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.140(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1275.200(Ft.)
Bottom (of initial area) elevation =  1272.500(Ft.)
Difference in elevation =     2.700(Ft.)
Slope =    0.00900  s(%)=       0.90
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.002 min.
Rainfall intensity =      3.938(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.868
Subarea runoff =      3.726(CFS)
Total initial stream area =        1.090(Ac.)


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Process from Point/Station      304.000 to Point/Station      302.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
                                                                G4
Top of street segment elevation =  1272.500(Ft.)
End of street segment elevation =  1115.300(Ft.)
Length of street segment  =  2562.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   8.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0130
 Manning's N from gutter to grade break =  0.0130
 Manning's N from grade break to crown =  0.0130
```

```
Estimated mean flow rate at midpoint of street =    40.809(CFS)
Depth of flow =   0.433(Ft.), Average velocity =   8.241(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  15.328(Ft.)
Flow velocity =   8.24(Ft/s)
Travel time =    5.18 min.     TC =   16.18  min.
 Adding area flow to street
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.680
Decimal fraction soil group D = 0.320
SCS curve number for soil(AMC 2)  = 70.92
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=    0.234(In/Hr)
Max Catchment Loss (Fm) =     0.164(In/Hr)
Rainfall intensity =      3.157(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.854
Subarea runoff =     74.057(CFS) for   27.780(Ac.)
Total runoff =     77.783(CFS)    Total area =      28.87(Ac.)
Area averaged Fm value =  0.163(In/Hr)
Street flow at end of street =    77.783(CFS)
Half street flow at end of street =   38.891(CFS)
Depth of flow =   0.520(Ft.), Average velocity =   9.800(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    0.98(Ft.)
Flow width (from curb towards crown)=  18.000(Ft.)


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Process from Point/Station     303.000 to Point/Station     302.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =     28.870(Ac.)
Runoff from this stream =     77.783(CFS)
Time of concentration =   16.18 min.
Rainfall intensity =     3.157(In/Hr)
Area averaged loss rate (Fm) =    0.1629(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm     Rainfall Intensity
 No.    (Ac.)   (CFS)      (min) (In/Hr)      (In/Hr)


1     77.03   206.476     16.49    0.241      3.122
2     30.18    76.674     17.75    0.170      2.993
3     28.87    77.783     16.18    0.163      3.157
Qmax(1) =
         1.000 *    1.000 *   206.476) +
         1.046 *    0.929 *    76.674) +
         0.989 *    1.000 *    77.783) + =     357.857
Qmax(2) =
         0.955 *    1.000 *   206.476) +
         1.000 *    1.000 *    76.674) +
```

```
         0.945 *    1.000 *   77.783) + =    347.440
Qmax(3) =
         1.012 *    0.981 *  206.476) +
         1.058 *    0.912 *   76.674) +
         1.000 *    1.000 *   77.783) + =    356.709

Total of 3 main streams to confluence:
Flow rates before confluence point:
     207.476      77.674      78.783
Maximum flow rates at confluence using above data:
      357.857      347.440      356.709
Area of streams before confluence:
       77.030       30.180       28.870
Effective area values after confluence:
      133.936      136.080      131.962


Results of confluence:
Total flow rate =    357.857(CFS)
Time of concentration =    16.494 min.
Effective stream area after confluence  =   133.936(Ac.)
Study area average Pervious fraction(Ap) =  0.870
Study area average soil loss rate(Fm) =   0.209(In/Hr)
Study area total =   136.08(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      132.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1100.000(Ft.)
Downstream point/station elevation =  1048.000(Ft.)
Pipe length  =   344.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   357.857(CFS)
Nearest computed pipe diameter  =   42.00(In.)
Calculated individual pipe flow  =   357.857(CFS)
Normal flow depth in pipe =   31.59(In.)
Flow top width inside pipe =   36.27(In.)
Critical depth could not be calculated.
Pipe flow velocity =     46.10(Ft/s)
Travel time through pipe =   0.12 min.
Time of concentration (TC) =    16.62 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station      132.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    133.936(Ac.)
Runoff from this stream =    357.857(CFS)
Time of concentration =   16.62 min.
Rainfall intensity =     3.109(In/Hr)
Area averaged loss rate (Fm) =    0.2090(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8698
Program is now starting with Main Stream No. 2
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      110.000
**** INITIAL AREA EVALUATION ****
```

C10

```
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1610.000(Ft.)
Bottom (of initial area) elevation =  1560.000(Ft.)
Difference in elevation =    50.000(Ft.)
Slope =    0.16667  s(%)=      16.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.101 min.
Rainfall intensity =      3.563(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.837
Subarea runoff =     8.170(CFS)
Total initial stream area =      2.740(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      115.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

C11

```
Estimated mean flow rate at midpoint of channel =     22.552(CFS)
Depth of flow =   0.457(Ft.), Average velocity =   8.350(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     22.552(CFS)
  '     '    flow top width =      6.827(Ft.)
  '     '     velocity=    8.350(Ft/s)
  '     '    area =      2.701(Sq.Ft)
  '     '    Froude number =     2.340

Upstream point elevation =  1560.000(Ft.)
Downstream point elevation =  1390.000(Ft.)
Flow length =   600.000(Ft.)
Travel time  =    1.20 min.
Time of concentration =   14.30 min.
Depth of flow =   0.457(Ft.)
Average velocity =   8.350(Ft/s)
Total irregular channel flow =    22.552(CFS)
Irregular channel normal depth above invert elev. =   0.457(Ft.)
```

```
Average velocity of channel(s) =   8.350(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.740
Decimal fraction soil group D = 0.260
SCS curve number for soil(AMC 2)  = 75.56
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=    0.237(In/Hr)
Max Catchment Loss (Fm) =     0.237(In/Hr)
Rainfall intensity =     3.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.836
Subarea runoff =     28.702(CFS) for   10.270(Ac.)
Total runoff =     36.871(CFS)    Total area =     13.01(Ac.)
Area averaged Fm value =    0.240(In/Hr)
Depth of flow =   0.605(Ft.), Average velocity =   9.804(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      115.000 to Point/Station      129.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                  C13
Estimated mean flow rate at midpoint of channel =    53.411(CFS)
Depth of flow =   0.800(Ft.), Average velocity =  10.113(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------
Sub-Channel flow  =     53.411(CFS)
  '      '    flow top width =      8.201(Ft.)
  '      '     velocity=   10.113(Ft/s)
  '      '    area =      5.282(Sq.Ft)
  '      '    Froude number =     2.221

Upstream point elevation =  1390.000(Ft.)
Downstream point elevation =  1180.000(Ft.)
Flow length =   950.000(Ft.)
Travel time  =    1.57 min.
Time of concentration =   15.86 min.
Depth of flow =   0.800(Ft.)
Average velocity =  10.113(Ft/s)
Total irregular channel flow =    53.411(CFS)
Irregular channel normal depth above invert elev. =   0.800(Ft.)
Average velocity of channel(s) =  10.113(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.840
Decimal fraction soil group D = 0.160
SCS curve number for soil(AMC 2)  = 74.96
```

```
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.242(In/Hr)
Max Catchment Loss (Fm) =     0.242(In/Hr)
Rainfall intensity =      3.193(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.832
Subarea runoff =     33.001(CFS) for   13.290(Ac.)
Total runoff =     69.873(CFS)     Total area =     26.30(Ac.)
Area averaged Fm value =     0.241(In/Hr)
Depth of flow =   0.929(Ft.), Average velocity =  10.972(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      129.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     26.300(Ac.)
Runoff from this stream =     69.873(CFS)
Time of concentration =   15.86 min.
Rainfall intensity =     3.193(In/Hr)
Area averaged loss rate (Fm) =    0.2409(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      122.000 to Point/Station      124.000
**** INITIAL AREA EVALUATION ****                              C13
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1615.000(Ft.)
Bottom (of initial area) elevation =  1495.000(Ft.)
Difference in elevation =   120.000(Ft.)
Slope =    0.40000  s(%)=      40.00
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =  10.996 min.
Rainfall intensity =      3.939(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.843
Subarea runoff =      4.183(CFS)
Total initial stream area =        1.260(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      124.000 to Point/Station      126.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****                    C14
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     9.341(CFS)
Depth of flow =   0.275(Ft.), Average velocity =   6.109(Ft/s)
     ******* Irregular Channel Data ***********
----------------------------------------------------------------------
```

```
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00               50.00
      2            100.00                0.00
      3            105.00                0.00
      4            205.00               50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow =    9.341(CFS)
   '      '    flow top width =      6.102(Ft.)
   '      '     velocity=    6.109(Ft/s)
   '      '    area =     1.529(Sq.Ft)
   '      '    Froude number =   2.150

Upstream point elevation =  1495.000(Ft.)
Downstream point elevation =  1385.000(Ft.)
Flow length =   400.000(Ft.)
Travel time  =    1.09 min.
Time of concentration =   12.09 min.
Depth of flow =   0.275(Ft.)
Average velocity =   6.109(Ft/s)
Total irregular channel flow =     9.341(CFS)
Irregular channel normal depth above invert elev. =   0.275(Ft.)
Average velocity of channel(s) =   6.109(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=    0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      3.731(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.840
Subarea runoff =     10.260(CFS) for    3.350(Ac.)
Total runoff =     14.443(CFS)    Total area =      4.61(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.356(Ft.), Average velocity =   7.111(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      125.000 to Point/Station      126.000
**** SUBAREA FLOW ADDITION ****
                                                              C15
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=    0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Time of concentration =    12.09 min.
Rainfall intensity =      3.731(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.840
```

```
Subarea runoff =     21.398(CFS) for    6.830(Ac.)
Total runoff =    35.840(CFS)    Total area =    11.44(Ac.)
Area averaged Fm value =    0.250(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      126.000 to Point/Station      128.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

C16

```
Estimated mean flow rate at midpoint of channel =    51.437(CFS)
Depth of flow =   0.819(Ft.), Average velocity =   9.466(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------
Sub-Channel flow  =     51.437(CFS)
  '     '   flow top width =      8.275(Ft.)
  '     '    velocity=    9.466(Ft/s)
  '     '   area =      5.434(Sq.Ft)
  '     '   Froude number =     2.059

Upstream point elevation =  1385.000(Ft.)
Downstream point elevation =  1300.000(Ft.)
Flow length =   450.000(Ft.)
Travel time  =    0.79 min.
Time of concentration =   12.88 min.
Depth of flow =   0.819(Ft.)
Average velocity =   9.466(Ft/s)
Total irregular channel flow =    51.437(CFS)
Irregular channel normal depth above invert elev. =   0.819(Ft.)
Average velocity of channel(s) =   9.466(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      3.598(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.837
Subarea runoff =     31.107(CFS) for   10.780(Ac.)
Total runoff =     66.948(CFS)    Total area =      22.22(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.947(Ft.), Average velocity =  10.252(Ft/s)


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Process from Point/Station    128.000 to Point/Station      129.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

C17

```
Estimated mean flow rate at midpoint of channel =    89.068(CFS)
Depth of flow =   1.090(Ft.), Average velocity =  11.382(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     89.068(CFS)
   '      '    flow top width =      9.360(Ft.)
   '      '     velocity=   11.382(Ft/s)
   '      '    area =      7.825(Sq.Ft)
   '      '    Froude number =     2.194

Upstream point elevation =  1300.000(Ft.)
Downstream point elevation =  1180.000(Ft.)
Flow length =   600.000(Ft.)
Travel time  =    0.88 min.
Time of concentration =   13.76 min.
Depth of flow =   1.090(Ft.)
Average velocity =  11.382(Ft/s)
Total irregular channel flow =    89.068(CFS)
Irregular channel normal depth above invert elev. =   1.090(Ft.)
Average velocity of channel(s) =  11.382(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      3.464(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.835
Subarea runoff =     44.165(CFS) for   16.190(Ac.)
Total runoff =    111.113(CFS)    Total area =      38.41(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   1.228(Ft.), Average velocity =  12.137(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      122.000 to Point/Station     129.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =   38.410(Ac.)
Runoff from this stream =    111.113(CFS)
Time of concentration =   13.76 min.
Rainfall intensity =    3.464(In/Hr)
Area averaged loss rate (Fm) =    0.2500(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
```

```
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     26.30    69.873     15.86    0.241      3.193
2     38.41   111.113     13.76    0.250      3.464
Qmax(1) =
         1.000 *    1.000 *    69.873) +
         0.916 *    1.000 *   111.113) + =    171.603
Qmax(2) =
         1.092 *    0.867 *    69.873) +
         1.000 *    1.000 *   111.113) + =    177.284

Total of 2 streams to confluence:
Flow rates before confluence point:
      69.873      111.113
Maximum flow rates at confluence using above data:
      171.603      177.284
Area of streams before confluence:
       26.300       38.410
Effective area values after confluence:
       64.710       61.220
Results of confluence:
Total flow rate =    177.284(CFS)
Time of concentration =  13.759 min.
Effective stream area after confluence =    61.220(Ac.)
Study area average Pervious fraction(Ap) =  1.000
Study area average soil loss rate(Fm) =    0.246(In/Hr)
Study area total (this main stream) =    64.71(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     129.000 to Point/Station     130.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                              C18
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =   246.117(CFS)
Depth of flow =   2.454(Ft.), Average velocity =  10.125(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------------
Sub-Channel flow  =    246.116(CFS)
  '     '    flow top width =     14.814(Ft.)
  '     '     velocity=   10.125(Ft/s)
  '     '    area =     24.307(Sq.Ft)
  '     '    Froude number =     1.393

Upstream point elevation =  1180.000(Ft.)
Downstream point elevation =  1056.000(Ft.)
Flow length =  1870.000(Ft.)
```

```
Travel time  =    3.08 min.
Time of concentration =   16.84 min.
Depth of flow =   2.454(Ft.)
Average velocity =  10.125(Ft/s)
Total irregular channel flow =   246.117(CFS)
Irregular channel normal depth above invert elev. =   2.454(Ft.)
Average velocity of channel(s) =  10.125(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.940
Decimal fraction soil group D = 0.060
SCS curve number for soil(AMC 2)  = 74.36
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.247(In/Hr)
Max Catchment Loss (Fm) =     0.247(In/Hr)
Rainfall intensity =      3.086(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.828
Subarea runoff =    137.569(CFS) for   62.000(Ac.)
Total runoff =    314.853(CFS)    Total area =    123.22(Ac.)
Area averaged Fm value =    0.247(In/Hr)
Depth of flow =   2.767(Ft.), Average velocity =  10.804(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      130.000 to Point/Station      132.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1050.000(Ft.)
Downstream point/station elevation =  1048.000(Ft.)
Pipe length  =   500.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   314.853(CFS)
Nearest computed pipe diameter  =    78.00(In.)
Calculated individual pipe flow  =  314.853(CFS)
Normal flow depth in pipe =   60.66(In.)
Flow top width inside pipe =   64.86(In.)
Critical Depth =   57.16(In.)
Pipe flow velocity =    11.37(Ft/s)
Travel time through pipe =    0.73 min.
Time of concentration (TC) =    17.57 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      130.000 to Point/Station      132.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =    123.220(Ac.)
Runoff from this stream =    314.853(CFS)
Time of concentration =   17.57 min.
Rainfall intensity =     3.011(In/Hr)
Area averaged loss rate (Fm) =    0.2466(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
```

```
 No.     (Ac.)    (CFS)        (min)  (In/Hr)      (In/Hr)

1     133.94    357.857      16.62     0.209       3.109
2     123.22    314.853      17.57     0.247       3.011
Qmax(1) =
         1.000 *     1.000 *    357.857) +
         1.035 *     0.946 *    314.853) + =      666.174
Qmax(2) =
         0.966 *     1.000 *    357.857) +
         1.000 *     1.000 *    314.853) + =      660.663

Total of 2 main streams to confluence:
Flow rates before confluence point:
     358.857      315.853
Maximum flow rates at confluence using above data:
      666.174       660.663
Area of streams before confluence:
      133.936       123.220
Effective area values after confluence:
      250.482       257.156


Results of confluence:
Total flow rate =     666.174(CFS)
Time of concentration =     16.618 min.
Effective stream area after confluence  =     250.482(Ac.)
Study area average Pervious fraction(Ap) =  0.932
Study area average soil loss rate(Fm) =     0.227(In/Hr)
Study area total =      257.16(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      132.000 to Point/Station      305.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1048.000(Ft.)
Downstream point/station elevation =  1032.000(Ft.)
Pipe length  =  1025.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   666.174(CFS)
Nearest computed pipe diameter  =    81.00(In.)
Calculated individual pipe flow  =  666.174(CFS)
Normal flow depth in pipe =   61.20(In.)
Flow top width inside pipe =   69.62(In.)
Critical Depth =   76.44(In.)
Pipe flow velocity =     22.97(Ft/s)
Travel time through pipe =   0.74 min.
Time of concentration (TC) =    17.36 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      132.000 to Point/Station      305.000
**** SUBAREA FLOW ADDITION ****
                                                              G5
------------------------------------------------------------------------
RESIDENTIAL(2.5 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.750
```

```
Decimal fraction soil group D = 0.250
SCS curve number for soil(AMC 2)  = 70.50
Pervious ratio(Ap) = 0.9000  Max loss rate(Fp)=     0.237(In/Hr)
Max Catchment Loss (Fm) =     0.214(In/Hr)
Time of concentration =   17.36 min.
Rainfall intensity =      3.032(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.833
Subarea runoff =     12.662(CFS) for   18.340(Ac.)
Total runoff =    678.837(CFS)    Total area =    268.82(Ac.)
Area averaged Fm value =    0.226(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station      305.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    268.822(Ac.)
Runoff from this stream =    678.837(CFS)
Time of concentration =   17.36 min.
Rainfall intensity =     3.032(In/Hr)
Area averaged loss rate (Fm) =    0.2261(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9300


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     306.000 to Point/Station      307.000
**** INITIAL AREA EVALUATION ****
                                                              G6
----------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.175(In/Hr)
Initial subarea data:
Initial area flow distance =   330.000(Ft.)
Top (of initial area) elevation =  1127.400(Ft.)
Bottom (of initial area) elevation =  1120.000(Ft.)
Difference in elevation =     7.400(Ft.)
Slope =    0.02242  s(%)=       2.24
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.522 min.
NOTE: Distance EXCEEDS recommended maximum value of   328.084(Ft.)
for this Development Type
Rainfall intensity =      4.278(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.863
Subarea runoff =      3.988(CFS)
Total initial stream area =      1.080(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      307.000 to Point/Station      305.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
                                                              G7
----------------------------------------------------------------------
```

```
Top of street segment elevation =  1120.000(Ft.)
End of street segment elevation =  1042.000(Ft.)
Length of street segment =  1423.000(Ft.)
Height of curb above gutter flowline =    6.0(In.)
Width of half street (curb to crown) =  18.000(Ft.)
Distance from crown to crossfall grade break =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz) =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line =  8.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =    44.298(CFS)
Depth of flow =   0.469(Ft.), Average velocity =  7.227(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  17.141(Ft.)
Flow velocity =   7.23(Ft/s)
Travel time =   3.28 min.     TC =  12.80  min.
 Adding area flow to street
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.860
Decimal fraction soil group D = 0.140
SCS curve number for soil(AMC 2)  = 69.84
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=    0.243(In/Hr)
Max Catchment Loss (Fm) =    0.170(In/Hr)
Rainfall intensity =     3.610(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.858
Subarea runoff =    80.463(CFS) for   26.200(Ac.)
Total runoff =    84.451(CFS)    Total area =      27.28(Ac.)
Area averaged Fm value =    0.170(In/Hr)
Street flow at end of street =    84.451(CFS)
Half street flow at end of street =    42.225(CFS)
Depth of flow =   0.567(Ft.), Average velocity =  8.584(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =   3.34(Ft.)
Flow width (from curb towards crown)=  18.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      306.000 to Point/Station      305.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     27.280(Ac.)
Runoff from this stream =     84.451(CFS)
Time of concentration =  12.80 min.
Rainfall intensity =    3.610(In/Hr)
Area averaged loss rate (Fm) =    0.1703(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7000
Summary of stream data:
```

```
Stream  Area  Flow rate      TC     Fm      Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    268.82   678.837     17.36    0.226      3.032
2     27.28    84.451     12.80    0.170      3.610
Qmax(1) =
        1.000 *    1.000 *   678.837) +
        0.832 *    1.000 *    84.451) + =     749.096
Qmax(2) =
        1.206 *    0.737 *   678.837) +
        1.000 *    1.000 *    84.451) + =     688.207

Total of 2 streams to confluence:
Flow rates before confluence point:
     678.837      84.451
Maximum flow rates at confluence using above data:
      749.096      688.207
Area of streams before confluence:
      268.822       27.280
Effective area values after confluence:
      296.102      225.529
Results of confluence:
Total flow rate =    749.096(CFS)
Time of concentration =    17.362 min.
Effective stream area after confluence =    296.102(Ac.)
Study area average Pervious fraction(Ap) =  0.909
Study area average soil loss rate(Fm) =    0.221(In/Hr)
Study area total (this main stream) =     296.10(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      305.000 to Point/Station      305.000
**** SUBAREA FLOW ADDITION ****                                    GB
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.550
Decimal fraction soil group D = 0.450
SCS curve number for soil(AMC 2)  = 76.70
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=    0.228(In/Hr)
Max Catchment Loss (Fm) =    0.228(In/Hr)
Time of concentration =    17.36 min.
Rainfall intensity =      3.032(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.834
Subarea runoff =     26.401(CFS) for   10.460(Ac.)
Total runoff =    775.497(CFS)    Total area =      306.56(Ac.)
Area averaged Fm value =    0.221(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      305.000 to Point/Station      308.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =  1032.000(Ft.)
```

```
Downstream point/station elevation =   989.000(Ft.)
Pipe length  =   673.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =   775.497(CFS)
Nearest computed pipe diameter  =     69.00(In.)
Calculated individual pipe flow  =   775.497(CFS)
Normal flow depth in pipe =   52.97(In.)
Flow top width inside pipe =   58.27(In.)
Critical depth could not be calculated.
Pipe flow velocity =     36.25(Ft/s)
Travel time through pipe =    0.31 min.
Time of concentration (TC) =    17.67 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      308.000 to Point/Station      308.000
**** SUBAREA FLOW ADDITION ****
                                                                G9
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.640
Decimal fraction soil group D = 0.360
SCS curve number for soil(AMC 2)  = 76.16
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.232(In/Hr)
Max Catchment Loss (Fm) =     0.232(In/Hr)
The area added to the existing stream with this TC
does not add flow per Para 6b, Page D-15 of the OCHM,
therefore the upstream flow rate of Q =    775.497(CFS) is being used
Time of concentration =    17.67 min.
Rainfall intensity =      3.001(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.834
Subarea runoff =      0.000(CFS) for    3.350(Ac.)
Total runoff =    775.497(CFS)    Total area =      309.91(Ac.)
Area averaged Fm value =    0.221(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      308.000 to Point/Station      308.000
**** SUBAREA FLOW ADDITION ****
                                                                G10
PARK subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.850
Decimal fraction soil group D = 0.150
SCS curve number for soil(AMC 2)  = 69.90
Pervious ratio(Ap) = 0.8500  Max loss rate(Fp)=     0.242(In/Hr)
Max Catchment Loss (Fm) =     0.206(In/Hr)
Time of concentration =    17.67 min.
Rainfall intensity =      3.001(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.834
Subarea runoff =     17.762(CFS) for    7.090(Ac.)
Total runoff =    793.259(CFS)    Total area =      317.00(Ac.)
Area averaged Fm value =    0.221(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      308.000 to Point/Station      312.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =    989.000(Ft.)
Downstream point/station elevation =    920.000(Ft.)
Pipe length  =  1587.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =   793.259(CFS)
Nearest computed pipe diameter  =     75.00(In.)
Calculated individual pipe flow  =   793.259(CFS)
Normal flow depth in pipe =   57.21(In.)
Flow top width inside pipe =   63.81(In.)
Critical depth could not be calculated.
Pipe flow velocity =     31.59(Ft/s)
Travel time through pipe =    0.84 min.
Time of concentration (TC) =    18.51 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      308.000 to Point/Station      312.000
**** SUBAREA FLOW ADDITION ****
                                                                    G11
------------------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.175(In/Hr)
The area added to the existing stream with this TC
does not add flow per Para 6b, Page D-15 of the OCHM,
therefore the upstream flow rate of Q =    793.259(CFS) is being used
Time of concentration =    18.51 min.
Rainfall intensity =      2.923(In/Hr) for a  100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.832
Subarea runoff =      0.000(CFS) for     8.010(Ac.)
Total runoff =    793.259(CFS)   Total area =    325.01(Ac.)
Area averaged Fm value =    0.220(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      308.000 to Point/Station      312.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    325.012(Ac.)
Runoff from this stream =    793.259(CFS)
Time of concentration =   18.51 min.
Rainfall intensity =     2.923(In/Hr)
Area averaged loss rate (Fm) =    0.2199(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9063


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      309.000 to Point/Station      310.000
**** INITIAL AREA EVALUATION ****
```

G12

```
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2) = 75.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.140(In/Hr)
Initial subarea data:
Initial area flow distance =   330.000(Ft.)
Top (of initial area) elevation =  1077.000(Ft.)
Bottom (of initial area) elevation =  1070.000(Ft.)
Difference in elevation =     7.000(Ft.)
Slope =    0.02121  s(%)=     2.12
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.629 min.
NOTE: Distance EXCEEDS recommended maximum value of   328.084(Ft.)
for this Development Type
Rainfall intensity =      4.250(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
Subarea runoff =      4.735(CFS)
Total initial stream area =        1.280(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      310.000 to Point/Station    311.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
```

G13

```
Top of street segment elevation =  1070.000(Ft.)
End of street segment elevation =  932.000(Ft.)
Length of street segment  =  1705.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =    0.020
Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =    8.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
Gutter width =    2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown = 0.0150
Estimated mean flow rate at midpoint of street =    52.711(CFS)
Depth of flow =   0.467(Ft.), Average velocity =   8.737(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  16.999(Ft.)
Flow velocity =   8.74(Ft/s)
Travel time =    3.25 min.     TC =   12.88  min.
 Adding area flow to street
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.360
Decimal fraction soil group D = 0.640
SCS curve number for soil(AMC 2) = 72.84
```

```
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.218(In/Hr)
Max Catchment Loss (Fm) =     0.153(In/Hr)
Rainfall intensity =      3.598(In/Hr) for a  100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.862
Subarea runoff =     95.766(CFS) for   31.130(Ac.)
Total runoff =    100.501(CFS)    Total area =     32.41(Ac.)
Area averaged Fm value =    0.152(In/Hr)
Street flow at end of street =    100.501(CFS)
Half street flow at end of street =     50.250(CFS)
Depth of flow =   0.563(Ft.), Average velocity =  10.379(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    3.15(Ft.)
Flow width (from curb towards crown)=  18.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      311.000 to Point/Station     311.000
**** SUBAREA FLOW ADDITION ****
                                                              G-14
------------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.140(In/Hr)
Time of concentration =    12.88 min.
Rainfall intensity =      3.598(In/Hr) for a  100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.863
Subarea runoff =     28.411(CFS) for    9.130(Ac.)
Total runoff =   128.912(CFS)    Total area =     41.54(Ac.)
Area averaged Fm value =    0.149(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      311.000 to Point/Station     312.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =    922.000(Ft.)
Downstream point/station elevation =    920.000(Ft.)
Pipe length  =    50.00(Ft.)  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   128.912(CFS)
Nearest computed pipe diameter  =    36.00(In.)
Calculated individual pipe flow  =   128.912(CFS)
Normal flow depth in pipe =   28.47(In.)
Flow top width inside pipe =   29.28(In.)
Critical depth could not be calculated.
Pipe flow velocity =     21.50(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    12.92 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      309.000 to Point/Station     312.000
```

**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 41.540(Ac.)
Runoff from this stream = 128.912(CFS)
Time of concentration = 12.92 min.
Rainfall intensity = 3.591(In/Hr)
Area averaged loss rate (Fm) = 0.1494(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7000
Summary of stream data:

Stream No.	Area (Ac.)	Flow rate (CFS)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
1	325.01	793.259	18.51	0.220	2.923
2	41.54	128.912	12.92	0.149	3.591

Qmax(1) =
1.000 * 1.000 * 793.259) +
0.806 * 1.000 * 128.912) + = 897.132
Qmax(2) =
1.247 * 0.698 * 793.259) +
1.000 * 1.000 * 128.912) + = 819.596

Total of 2 streams to confluence:
Flow rates before confluence point:
793.259 128.912
Maximum flow rates at confluence using above data:
897.132 819.596
Area of streams before confluence:
325.012 41.540
Effective area values after confluence:
366.552 268.413
Results of confluence:
Total flow rate = 897.132(CFS)
Time of concentration = 18.508 min.
Effective stream area after confluence = 366.552(Ac.)
Study area average Pervious fraction(Ap) = 0.883
Study area average soil loss rate(Fm) = 0.212(In/Hr)
Study area total (this main stream) = 366.55(Ac.)

++
Process from Point/Station 312.000 to Point/Station 184.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 920.000(Ft.)
Downstream point/station elevation = 705.000(Ft.)
Pipe length = 1170.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 897.132(CFS)
Nearest computed pipe diameter = 57.00(In.)
Calculated individual pipe flow = 897.132(CFS)
Normal flow depth in pipe = 43.14(In.)
Flow top width inside pipe = 48.91(In.)
Critical depth could not be calculated.
Pipe flow velocity = 62.35(Ft/s)
Travel time through pipe = 0.31 min.
Time of concentration (TC) = 18.82 min.

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      312.000 to Point/Station      184.000
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     366.552(Ac.)
Runoff from this stream =     897.132(CFS)
Time of concentration =   18.82 min.
Rainfall intensity =   2.895(In/Hr)
Area averaged loss rate (Fm) =     0.2119(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8829
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      150.000 to Point/Station      160.000
**** INITIAL AREA EVALUATION ****
                                                                  E1
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=    0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1575.000(Ft.)
Bottom (of initial area) elevation =  1350.000(Ft.)
Difference in elevation =   225.000(Ft.)
Slope =    0.75000  s(%)=      75.00
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =     9.697 min.
Rainfall intensity =     4.233(In/Hr) for a  100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.847
Subarea runoff =     5.090(CFS)
Total initial stream area =       1.420(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      160.000 to Point/Station      162.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                  E2
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    17.167(CFS)
Depth of flow =   0.346(Ft.), Average velocity =   8.729(Ft/s)
     ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
```

```
------------------------------------------------------------------
Sub-Channel flow  =     17.167(CFS)
  '     '    flow top width =      6.382(Ft.)
  '     '     velocity=    8.729(Ft/s)
  '     '    area =      1.967(Sq.Ft)
  '     '    Froude number =     2.771

Upstream point elevation =  1350.000(Ft.)
Downstream point elevation =  1200.000(Ft.)
Flow length =   350.000(Ft.)
Travel time  =    0.67 min.
Time of concentration =   10.37 min.
Depth of flow =   0.346(Ft.)
Average velocity =   8.729(Ft/s)
Total irregular channel flow =    17.167(CFS)
Irregular channel normal depth above invert elev. =   0.346(Ft.)
Average velocity of channel(s) =   8.729(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.960
Decimal fraction soil group D = 0.040
SCS curve number for soil(AMC 2)  = 74.24
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.248(In/Hr)
Max Catchment Loss (Fm) =     0.248(In/Hr)
Rainfall intensity =      4.075(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.845
Subarea runoff =     24.077(CFS) for    7.050(Ac.)
Total runoff =     29.167(CFS)    Total area =        8.47(Ac.)
Area averaged Fm value =    0.248(In/Hr)
Depth of flow =   0.470(Ft.), Average velocity =  10.443(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      162.000 to Point/Station     164.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                              E3
------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     48.046(CFS)
Depth of flow =   0.737(Ft.), Average velocity =  10.069(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number     'X' coordinate     'Y' coordinate
      1             0.00              50.00
      2           100.00               0.00
      3           105.00               0.00
      4           205.00              50.00
Manning's 'N' friction factor =  0.050
------------------------------------------------------------------
Sub-Channel flow  =     48.046(CFS)
  '     '    flow top width =      7.948(Ft.)
  '     '     velocity=   10.069(Ft/s)
  '     '    area =      4.771(Sq.Ft)
  '     '    Froude number =     2.290

Upstream point elevation =  1200.000(Ft.)
```

```
Downstream point elevation =  1020.000(Ft.)
Flow length =   750.000(Ft.)
Travel time  =    1.24 min.
Time of concentration =   11.61 min.
Depth of flow =   0.737(Ft.)
Average velocity =  10.069(Ft/s)
Total irregular channel flow =    48.046(CFS)
Irregular channel normal depth above invert elev. =   0.737(Ft.)
Average velocity of channel(s) =  10.069(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.660
Decimal fraction soil group D = 0.340
SCS curve number for soil(AMC 2)  = 76.04
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.233(In/Hr)
Max Catchment Loss (Fm) =     0.233(In/Hr)
Rainfall intensity =      3.819(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.844
Subarea runoff =     37.681(CFS) for   12.280(Ac.)
Total runoff =     66.848(CFS)    Total area =    20.75(Ac.)
Area averaged Fm value =    0.239(In/Hr)
Depth of flow =  0.886(Ft.), Average velocity =  11.142(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      163.000 to Point/Station     164.000
**** SUBAREA FLOW ADDITION ****
                                                                  E4
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.970
Decimal fraction soil group D = 0.030
SCS curve number for soil(AMC 2)  = 74.18
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.249(In/Hr)
Max Catchment Loss (Fm) =     0.249(In/Hr)
Time of concentration =   11.61 min.
Rainfall intensity =     3.819(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.843
Subarea runoff =     42.158(CFS) for   13.120(Ac.)
Total runoff =    109.006(CFS)    Total area =     33.87(Ac.)
Area averaged Fm value =    0.243(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      164.000 to Point/Station     170.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                  E5
Estimated mean flow rate at midpoint of channel =    144.865(CFS)
Depth of flow =   1.736(Ft.), Average velocity =   9.849(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
```

```
      1              0.00           50.00
      2            100.00            0.00
      3            105.00            0.00
      4            205.00           50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =    144.865(CFS)
   '      '    flow top width =     11.944(Ft.)
   '      '     velocity=    9.849(Ft/s)
   '      '    area =     14.708(Sq.Ft)
   '      '    Froude number =     1.564

Upstream point elevation =  1020.000(Ft.)
Downstream point elevation =   920.000(Ft.)
Flow length =  1100.000(Ft.)
Travel time  =    1.86 min.
Time of concentration =   13.47 min.
Depth of flow =   1.736(Ft.)
Average velocity =   9.849(Ft/s)
Total irregular channel flow =   144.865(CFS)
Irregular channel normal depth above invert elev. =   1.736(Ft.)
Average velocity of channel(s) =   9.849(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.340
Decimal fraction soil group D = 0.660
SCS curve number for soil(AMC 2)  = 77.96
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.217(In/Hr)
Max Catchment Loss (Fm) =     0.217(In/Hr)
Rainfall intensity =      3.507(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.841
Subarea runoff =     71.646(CFS) for   27.410(Ac.)
Total runoff =    180.652(CFS)    Total area =     61.28(Ac.)
Area averaged Fm value =    0.231(In/Hr)
Depth of flow =   1.943(Ft.), Average velocity =  10.461(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      168.000 to Point/Station      170.000
**** SUBAREA FLOW ADDITION ****                                  E6
-------------------------------------------------------------------------
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.410
Decimal fraction soil group D = 0.590
SCS curve number for soil(AMC 2)  = 81.95
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.220(In/Hr)
Max Catchment Loss (Fm) =     0.220(In/Hr)
Time of concentration =    13.47 min.
Rainfall intensity =      3.507(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.842
Subarea runoff =     94.557(CFS) for   31.970(Ac.)
Total runoff =    275.210(CFS)    Total area =     93.25(Ac.)
```

```
Area averaged Fm value =     0.228(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      170.000 to Point/Station     175.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

E7

```
Estimated mean flow rate at midpoint of channel =    326.659(CFS)
Depth of flow =   2.939(Ft.), Average velocity =  10.219(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    326.659(CFS)
  '     '   flow top width =    16.755(Ft.)
  '     '    velocity=   10.219(Ft/s)
  '     '   area =     31.966(Sq.Ft)
  '     '   Froude number =     1.304

Upstream point elevation =   920.000(Ft.)
Downstream point elevation =   850.000(Ft.)
Flow length =  1260.000(Ft.)
Travel time  =    2.05 min.
Time of concentration =   15.52 min.
Depth of flow =   2.939(Ft.)
Average velocity =  10.219(Ft/s)
Total irregular channel flow =   326.659(CFS)
Irregular channel normal depth above invert elev. =   2.939(Ft.)
Average velocity of channel(s) =  10.219(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.120
Decimal fraction soil group D = 0.880
SCS curve number for soil(AMC 2)  = 79.28
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=    0.206(In/Hr)
Max Catchment Loss (Fm) =     0.206(In/Hr)
Rainfall intensity =      3.233(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.839
Subarea runoff =    102.827(CFS) for   46.190(Ac.)
Total runoff =    378.037(CFS)    Total area =     139.44(Ac.)
Area averaged Fm value =    0.220(In/Hr)
Depth of flow =   3.151(Ft.), Average velocity =  10.615(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      175.000 to Point/Station     180.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

E8

```
Estimated mean flow rate at midpoint of channel =    432.532(CFS)
```

```
Depth of flow =  3.332(Ft.), Average velocity =  11.127(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number   'X' coordinate    'Y' coordinate
      1            0.00            50.00
      2          100.00             0.00
      3          105.00             0.00
      4          205.00            50.00
Manning's 'N' friction factor =  0.050
------------------------------------------------------------------
Sub-Channel flow  =    432.532(CFS)
   '      ' flow top width =    18.330(Ft.)
   '      '  velocity=  11.127(Ft/s)
   '      '  area =     38.872(Sq.Ft)
   '      '  Froude number =    1.347

Upstream point elevation =  850.000(Ft.)
Downstream point elevation =   730.000(Ft.)
Flow length =  2090.000(Ft.)
Travel time  =    3.13 min.
Time of concentration =   18.65 min.
Depth of flow =   3.332(Ft.)
Average velocity =  11.127(Ft/s)
Total irregular channel flow =   432.532(CFS)
Irregular channel normal depth above invert elev. =   3.332(Ft.)
Average velocity of channel(s) =  11.127(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.100
Decimal fraction soil group C = 0.130
Decimal fraction soil group D = 0.770
SCS curve number for soil(AMC 2)  = 77.32
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.217(In/Hr)
Max Catchment Loss (Fm) =     0.217(In/Hr)
Rainfall intensity =      2.910(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.832
Subarea runoff =    108.926(CFS) for   61.660(Ac.)
Total runoff =    486.962(CFS)    Total area =     201.10(Ac.)
Area averaged Fm value =    0.219(In/Hr)
Depth of flow =   3.523(Ft.), Average velocity =  11.473(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      178.000 to Point/Station      180.000
**** SUBAREA FLOW ADDITION ****
```

E9

```
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Time of concentration =    18.65 min.
```

```
Rainfall intensity =     2.910(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.831
Subarea runoff =     76.793(CFS) for   32.080(Ac.)
Total runoff =    563.755(CFS)   Total area =    233.18(Ac.)
Area averaged Fm value =    0.223(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      180.000 to Point/Station     184.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

E10

```
Estimated mean flow rate at midpoint of channel =   565.511(CFS)
Depth of flow =   3.981(Ft.), Average velocity =  10.961(Ft/s)
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate    'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =    565.510(CFS)
  '     '   flow top width =    20.923(Ft.)
  '     '    velocity=   10.961(Ft/s)
  '     '   area =     51.594(Sq.Ft)
  '     '   Froude number =     1.230

Upstream point elevation =   730.000(Ft.)
Downstream point elevation =   705.000(Ft.)
Flow length =   546.000(Ft.)
Travel time  =    0.83 min.
Time of concentration =   19.48 min.
Depth of flow =   3.981(Ft.)
Average velocity =  10.961(Ft/s)
Total irregular channel flow =   565.511(CFS)
Irregular channel normal depth above invert elev. =   3.981(Ft.)
Average velocity of channel(s) =  10.961(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.600
Decimal fraction soil group D = 0.400
SCS curve number for soil(AMC 2)  = 76.40
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=    0.230(In/Hr)
Max Catchment Loss (Fm) =     0.230(In/Hr)
Rainfall intensity =     2.838(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.829
Subarea runoff =      3.448(CFS) for    7.880(Ac.)
Total runoff =    567.204(CFS)    Total area =    241.06(Ac.)
Area averaged Fm value =    0.224(In/Hr)
Depth of flow =   3.986(Ft.), Average velocity =  10.969(Ft/s)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      180.000 to Point/Station      184.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     241.060(Ac.)
Runoff from this stream =      567.204(CFS)
Time of concentration =   19.48 min.
Rainfall intensity =     2.838(In/Hr)
Area averaged loss rate (Fm) =    0.2237(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      181.000 to Point/Station      182.000
**** INITIAL AREA EVALUATION ****                                    E11
------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 61.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.300(In/Hr)
Max Catchment Loss (Fm) =     0.300(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1225.000(Ft.)
Bottom (of initial area) elevation =  1175.000(Ft.)
Difference in elevation =    50.000(Ft.)
Slope =    0.16667  s(%)=    16.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.101 min.
Rainfall intensity =     3.563(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.824
Subarea runoff =      3.818(CFS)
Total initial stream area =        1.300(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      182.000 to Point/Station      184.000
**** STREET INLET + AREA  + PIPE  TRAVEL TIME ****                   E12
------------------------------------------------------------------------------
Top of street segment elevation =  1175.000(Ft.)
End of street segment elevation =   915.000(Ft.)
Length of street segment  =  2250.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  13.000(Ft.)
Distance from crown to crossfall grade break  =   5.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.017
Slope from grade break to crown (v/hz)  =   0.017
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   2.000(Ft.)
Slope from curb to property line (v/hz) =   0.017
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
```

```
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
No street inlet installed at this point
Estimated mean flow rate at midpoint of street =    52.895(CFS)
Depth of flow =   0.421(Ft.), Average velocity =  10.817(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  13.000(Ft.)
Flow velocity =  10.82(Ft/s)
Travel time =    3.47 min.   TC =  16.57  min.
 Adding area flow to street
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.290
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.710
SCS curve number for soil(AMC 2)  = 69.49
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=     0.229(In/Hr)
Max Catchment Loss (Fm) =     0.183(In/Hr)
Rainfall intensity =      3.114(In/Hr) for a  100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.846
Subarea runoff =     98.035(CFS) for   37.360(Ac.)
Total runoff =    101.853(CFS)    Total area =    38.66(Ac.)
Area averaged Fm value =    0.187(In/Hr)
Street flow at end of street =    101.853(CFS)
Half street flow at end of street =     50.926(CFS)
Depth of flow =   0.521(Ft.), Average velocity =  13.536(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    1.25(Ft.)
Flow width (from curb towards crown)=  13.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station    183.000 to Point/Station    184.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =     38.660(Ac.)
Runoff from this stream =    101.853(CFS)
Time of concentration =   16.57 min.
Rainfall intensity =     3.114(In/Hr)
Area averaged loss rate (Fm) =    0.1871(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8067
Summary of stream data:

Stream  Area  Flow rate     TC     Fm     Rainfall Intensity
 No.    (Ac.)   (CFS)     (min) (In/Hr)     (In/Hr)


1    366.55   897.132     18.82    0.212     2.895
2    241.06   567.204     19.48    0.224     2.838
3     38.66   101.853     16.57    0.187     3.114
Qmax(1) =
        1.000 *    1.000 *   897.132) +
```

```
         1.022 *    0.966 *   567.204) +
         0.925 *    1.000 *   101.853) + =    1551.168
Qmax(2) =
         0.979 *    1.000 *   897.132) +
         1.000 *    1.000 *   567.204) +
         0.906 *    1.000 *   101.853) + =    1537.563
Qmax(3) =
         1.082 *    0.880 *   897.132) +
         1.106 *    0.850 *   567.204) +
         1.000 *    1.000 *   101.853) + =    1489.430

Total of 3 main streams to confluence:
Flow rates before confluence point:
     898.132     568.204     102.853
Maximum flow rates at confluence using above data:
     1551.168     1537.563     1489.430
Area of streams before confluence:
      366.552      241.060       38.660
Effective area values after confluence:
      638.071      646.272      566.288


Results of confluence:
Total flow rate =  1551.168(CFS)
Time of concentration =  18.821 min.
Effective stream area after confluence  =    638.071(Ac.)
Study area average Pervious fraction(Ap) =  0.922
Study area average soil loss rate(Fm) =  0.215(In/Hr)
Study area total =  646.27(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      184.000 to Point/Station      190.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                    E13
Estimated mean flow rate at midpoint of channel =   1551.212(CFS)
Depth of flow =   6.478(Ft.), Average velocity =  13.337(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =   1551.213(CFS)
  '     '   flow top width =     30.910(Ft.)
  '     '    velocity=   13.337(Ft/s)
  '     '   area =    116.307(Sq.Ft)
  '     '   Froude number =     1.212

Upstream point elevation =   705.000(Ft.)
Downstream point elevation =   665.000(Ft.)
Flow length =  1025.000(Ft.)
Travel time  =    1.28 min.
Time of concentration =   20.10 min.
```

```
Depth of flow =   6.478(Ft.)
Average velocity =  13.337(Ft/s)
Total irregular channel flow =  1551.212(CFS)
Irregular channel normal depth above invert elev. =   6.478(Ft.)
Average velocity of channel(s) =  13.337(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 80.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=    0.200(In/Hr)
Max Catchment Loss (Fm) =     0.200(In/Hr)
The area added to the existing stream with this TC
does not add flow per Para 6b, Page D-15 of the OCHM,
therefore the upstream flow rate of Q =  1551.168(CFS) is being used
Rainfall intensity =     2.788(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.831
Subarea runoff =      0.000(CFS) for   18.600(Ac.)
Total runoff =   1551.168(CFS)    Total area =      656.67(Ac.)
Area averaged Fm value =    0.214(In/Hr)
Depth of flow =   6.478(Ft.), Average velocity =  13.337(Ft/s)
End of computations, total study area =    677.18 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.924
Area averaged SCS curve number (AMC 2) =  74.7
```

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2004 Version 8.0
Rational Hydrology Study, Date: 12/12/12 File Name: 1200PROP25EG.roc

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ESPERANZA HILLS
PROPOSED CONDITION (ONSITE AND OFFSITE)
25-YEAR AREA G-E
R:\09\1200\PRELIM\REPORTS\HYDRO OPTION 1\RATIONAL\PROPOSED\1200PROP25

Program License Serial Number 6062

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 25.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

++

Process from Point/Station 10.000 to Point/Station 15.000
**** INITIAL AREA EVALUATION ****

C1

UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 74.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.250(In/Hr)
Max Catchment Loss (Fm) = 0.250(In/Hr)
Initial subarea data:
Initial area flow distance = 300.000(Ft.)
Top (of initial area) elevation = 1780.000(Ft.)
Bottom (of initial area) elevation = 1670.000(Ft.)
Difference in elevation = 110.000(Ft.)
Slope = 0.36667 s(%)= 36.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.189 min.
Rainfall intensity = 3.058(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.826
Subarea runoff = 2.350(CFS)
Total initial stream area = 0.930(Ac.)

++

Process from Point/Station 15.000 to Point/Station 20.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

C2

```
Estimated mean flow rate at midpoint of channel =      6.540(CFS)
Depth of flow =   0.230(Ft.), Average velocity =   5.217(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number     'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------
Sub-Channel flow  =      6.540(CFS)
   '      '    flow top width =      5.919(Ft.)
   '      '     velocity=    5.217(Ft/s)
   '      '    area =      1.254(Sq.Ft)
   '      '    Froude number =     1.998

Upstream point elevation =  1670.000(Ft.)
Downstream point elevation =  1590.000(Ft.)
Flow length =   320.000(Ft.)
Travel time  =    1.02 min.
Time of concentration =   12.21 min.
Depth of flow =   0.230(Ft.)
Average velocity =   5.217(Ft/s)
Total irregular channel flow =     6.540(CFS)
Irregular channel normal depth above invert elev. =   0.230(Ft.)
Average velocity of channel(s) =   5.217(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.910(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.823
Subarea runoff =      8.303(CFS) for    3.520(Ac.)
Total runoff =     10.653(CFS)    Total area =        4.45(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.306(Ft.), Average velocity =   6.203(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       25.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                              C3
----------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     16.764(CFS)
Depth of flow =   0.397(Ft.), Average velocity =   7.294(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number     'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
```

```
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =     16.764(CFS)
  '      '    flow top width =      6.587(Ft.)
  '      '     velocity=    7.294(Ft/s)
  '      '    area =      2.298(Sq.Ft)
  '      '    Froude number =     2.176

Upstream point elevation =  1590.000(Ft.)
Downstream point elevation =  1450.000(Ft.)
Flow length =   550.000(Ft.)
Travel time  =    1.26 min.
Time of concentration =   13.47 min.
Depth of flow =   0.397(Ft.)
Average velocity =   7.294(Ft/s)
Total irregular channel flow =    16.764(CFS)
Irregular channel normal depth above invert elev. =   0.397(Ft.)
Average velocity of channel(s) =   7.294(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.680
Decimal fraction soil group D = 0.320
SCS curve number for soil(AMC 2)  = 75.92
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.234(In/Hr)
Max Catchment Loss (Fm) =     0.234(In/Hr)
Rainfall intensity =      2.753(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.821
Subarea runoff =     12.135(CFS) for    5.630(Ac.)
Total runoff =     22.788(CFS)    Total area =       10.08(Ac.)
Area averaged Fm value =    0.241(In/Hr)
Depth of flow =   0.474(Ft.), Average velocity =   8.085(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       25.000 to Point/Station       30.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****                    C4
-----------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     35.802(CFS)
Depth of flow =   0.606(Ft.), Average velocity =   9.514(Ft/s)
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =     35.802(CFS)
  '      '    flow top width =      7.423(Ft.)
  '      '     velocity=    9.514(Ft/s)
  '      '    area =      3.763(Sq.Ft)
```

```
  '      '    Froude number =      2.355

Upstream point elevation =  1450.000(Ft.)
Downstream point elevation =  1290.000(Ft.)
Flow length =   600.000(Ft.)
Travel time  =    1.05 min.
Time of concentration =   14.52 min.
Depth of flow =   0.606(Ft.)
Average velocity =   9.514(Ft/s)
Total irregular channel flow =    35.802(CFS)
Irregular channel normal depth above invert elev. =   0.606(Ft.)
Average velocity of channel(s) =   9.514(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.500
SCS curve number for soil(AMC 2)  = 77.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.225(In/Hr)
Max Catchment Loss (Fm) =     0.225(In/Hr)
Rainfall intensity =      2.638(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.821
Subarea runoff =     25.958(CFS) for   12.430(Ac.)
Total runoff =     48.747(CFS)     Total area =       22.51(Ac.)
Area averaged Fm value =    0.232(In/Hr)
Depth of flow =   0.721(Ft.), Average velocity =  10.489(Ft/s)


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Process from Point/Station       28.000 to Point/Station       30.000
**** SUBAREA FLOW ADDITION ****
                                                                  C5
______________________________________________________________________
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Time of concentration =    14.52 min.
Rainfall intensity =      2.638(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.819
Subarea runoff =     29.126(CFS) for   13.550(Ac.)
Total runoff =     77.873(CFS)     Total area =       36.06(Ac.)
Area averaged Fm value =    0.239(In/Hr)


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Process from Point/Station       30.000 to Point/Station       40.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                  C6
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =     92.178(CFS)
Depth of flow =   1.238(Ft.), Average velocity =   9.955(Ft/s)
      ******* Irregular Channel Data ***********
```

```
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     92.178(CFS)
  '     '    flow top width =      9.954(Ft.)
  '     '     velocity=    9.955(Ft/s)
  '     '    area =      9.259(Sq.Ft)
  '     '    Froude number =     1.819

Upstream point elevation =  1290.000(Ft.)
Downstream point elevation =  1170.000(Ft.)
Flow length =   900.000(Ft.)
Travel time  =    1.51 min.
Time of concentration =   16.03 min.
Depth of flow =   1.238(Ft.)
Average velocity =   9.955(Ft/s)
Total irregular channel flow =    92.178(CFS)
Irregular channel normal depth above invert elev. =   1.238(Ft.)
Average velocity of channel(s) =   9.955(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.680
Decimal fraction soil group D = 0.320
SCS curve number for soil(AMC 2)  = 75.92
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.234(In/Hr)
Max Catchment Loss (Fm) =     0.234(In/Hr)
Rainfall intensity =      2.495(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.814
Subarea runoff =     28.555(CFS) for   16.320(Ac.)
Total runoff =    106.428(CFS)    Total area =     52.38(Ac.)
Area averaged Fm value =    0.237(In/Hr)
Depth of flow =   1.337(Ft.), Average velocity =  10.373(Ft/s)


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Process from Point/Station       40.000 to Point/Station       85.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1170.000(Ft.)
Downstream point/station elevation =  1162.000(Ft.)
Pipe length  =   198.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   106.428(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =   106.428(CFS)
Normal flow depth in pipe =   24.22(In.)
Flow top width inside pipe =   33.78(In.)
Critical depth could not be calculated.
Pipe flow velocity =     21.04(Ft/s)
Travel time through pipe =    0.16 min.
```

```
Time of concentration (TC) =    16.18 min.

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       85.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     52.380(Ac.)
Runoff from this stream =    106.428(CFS)
Time of concentration =   16.18 min.
Rainfall intensity =     2.481(In/Hr)
Area averaged loss rate (Fm) =    0.2374(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       60.000 to Point/Station       70.000
**** INITIAL AREA EVALUATION ****                                  C7
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1655.000(Ft.)
Bottom (of initial area) elevation =  1550.000(Ft.)
Difference in elevation =   105.000(Ft.)
Slope =    0.35000  s(%)=      35.00
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.294 min.
Rainfall intensity =      3.042(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.826
Subarea runoff =     5.502(CFS)
Total initial stream area =        2.190(Ac.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       70.000 to Point/Station       75.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****                        C8
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     13.196(CFS)
Depth of flow =   0.293(Ft.), Average velocity =   8.074(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------------
```

```
Sub-Channel flow  =     13.196(CFS)
  '     '    flow top width =      6.171(Ft.)
  '     '     velocity=    8.074(Ft/s)
  '     '    area =      1.635(Sq.Ft)
  '     '    Froude number =     2.764

Upstream point elevation =  1550.000(Ft.)
Downstream point elevation =  1340.000(Ft.)
Flow length =   470.000(Ft.)
Travel time  =    0.97 min.
Time of concentration =   12.26 min.
Depth of flow =   0.293(Ft.)
Average velocity =   8.074(Ft/s)
Total irregular channel flow =    13.196(CFS)
Irregular channel normal depth above invert elev. =   0.293(Ft.)
Average velocity of channel(s) =   8.074(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.903(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.822
Subarea runoff =     15.318(CFS) for    6.530(Ac.)
Total runoff =     20.820(CFS)    Total area =        8.72(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.382(Ft.), Average velocity =   9.454(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     75.000 to Point/Station     80.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                    C9
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    37.875(CFS)
Depth of flow =   0.674(Ft.), Average velocity =   8.856(Ft/s)
     ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------
Sub-Channel flow  =     37.875(CFS)
  '     '    flow top width =      7.695(Ft.)
  '     '     velocity=    8.856(Ft/s)
  '     '    area =      4.277(Sq.Ft)
  '     '    Froude number =     2.094

Upstream point elevation =  1340.000(Ft.)
Downstream point elevation =  1180.000(Ft.)
```

```
Flow length =   780.000(Ft.)
Travel time  =    1.47 min.
Time of concentration =   13.73 min.
Depth of flow =   0.674(Ft.)
Average velocity =   8.856(Ft/s)
Total irregular channel flow =    37.875(CFS)
Irregular channel normal depth above invert elev. =   0.674(Ft.)
Average velocity of channel(s) =   8.856(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=    0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.723(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.817
Subarea runoff =     34.043(CFS) for   15.930(Ac.)
Total runoff =     54.863(CFS)    Total area =       24.65(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.829(Ft.), Average velocity =   9.935(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       80.000 to Point/Station       85.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1180.000(Ft.)
Downstream point/station elevation =  1162.000(Ft.)
Pipe length  =   165.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    54.863(CFS)
Nearest computed pipe diameter  =    24.00(In.)
Calculated individual pipe flow  =    54.863(CFS)
Normal flow depth in pipe =   15.28(In.)
Flow top width inside pipe =   23.09(In.)
Critical depth could not be calculated.
Pipe flow velocity =    25.99(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =    13.84 min.


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Process from Point/Station       60.000 to Point/Station       85.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     24.650(Ac.)
Runoff from this stream =     54.863(CFS)
Time of concentration =   13.84 min.
Rainfall intensity =     2.711(In/Hr)
Area averaged loss rate (Fm) =    0.2500(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC    Fm     Rainfall Intensity
```

```
 No.     (Ac.)    (CFS)        (min) (In/Hr)     (In/Hr)


1      52.38   106.428      16.18     0.237       2.481
2      24.65    54.863      13.84     0.250       2.711
Qmax(1) =
         1.000 *    1.000 *   106.428) +
         0.907 *    1.000 *    54.863) + =     156.166
Qmax(2) =
         1.102 *    0.855 *   106.428) +
         1.000 *    1.000 *    54.863) + =     155.192

Total of 2 streams to confluence:
Flow rates before confluence point:
     106.428      54.863
Maximum flow rates at confluence using above data:
      156.166      155.192
Area of streams before confluence:
       52.380       24.650
Effective area values after confluence:
       77.030       69.439
Results of confluence:
Total flow rate =     156.166(CFS)
Time of concentration =    16.183 min.
Effective stream area after confluence =     77.030(Ac.)
Study area average Pervious fraction(Ap) =  1.000
Study area average soil loss rate(Fm) =    0.241(In/Hr)
Study area total (this main stream) =      77.03(Ac.)


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Process from Point/Station       85.000 to Point/Station      302.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1162.000(Ft.)
Downstream point/station elevation =  1100.000(Ft.)
Pipe length  =  1177.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   156.166(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =   156.166(CFS)
Normal flow depth in pipe =   26.97(In.)
Flow top width inside pipe =   36.02(In.)
Critical depth could not be calculated.
Pipe flow velocity =     25.51(Ft/s)
Travel time through pipe =    0.77 min.
Time of concentration (TC) =    16.95 min.


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Process from Point/Station       85.000 to Point/Station      302.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     77.030(Ac.)
Runoff from this stream =    156.166(CFS)
Time of concentration =   16.95 min.
Rainfall intensity =     2.417(In/Hr)
```

```
Area averaged loss rate (Fm) =    0.2414(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      300.000 to Point/Station      301.000
**** INITIAL AREA EVALUATION ****
```

G1

```
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.500
SCS curve number for soil(AMC 2)  = 72.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.225(In/Hr)
Max Catchment Loss (Fm) =     0.158(In/Hr)
Initial subarea data:
Initial area flow distance =   285.000(Ft.)
Top (of initial area) elevation =  1275.000(Ft.)
Bottom (of initial area) elevation =  1272.000(Ft.)
Difference in elevation =     3.000(Ft.)
Slope =    0.01053  s(%)=       1.05
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.446 min.
Rainfall intensity =      3.179(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.855
Subarea runoff =      2.094(CFS)
Total initial stream area =        0.770(Ac.)


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Process from Point/Station      301.000 to Point/Station      302.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
```

G2

```
Top of street segment elevation =  1272.000(Ft.)
End of street segment elevation =  1115.300(Ft.)
Length of street segment   =  3270.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   8.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0130
 Manning's N from gutter to grade break =  0.0130
 Manning's N from grade break to crown =  0.0130
Estimated mean flow rate at midpoint of street =     30.280(CFS)
Depth of flow =   0.412(Ft.), Average velocity =  6.982(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  14.289(Ft.)
Flow velocity =   6.98(Ft/s)
Travel time =    7.81 min.     TC =   18.25  min.
 Adding area flow to street
```

```
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.880
Decimal fraction soil group D = 0.120
SCS curve number for soil(AMC 2)  = 69.72
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=    0.244(In/Hr)
Max Catchment Loss (Fm) =     0.171(In/Hr)
Rainfall intensity =      2.318(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.834
Subarea runoff =    56.236(CFS) for   29.410(Ac.)
Total runoff =     58.330(CFS)    Total area =     30.18(Ac.)
Area averaged Fm value =    0.170(In/Hr)
Street flow at end of street =     58.330(CFS)
Half street flow at end of street =     29.165(CFS)
Depth of flow =   0.495(Ft.), Average velocity =   8.280(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  18.000(Ft.)


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Process from Point/Station      300.000 to Point/Station      302.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     30.180(Ac.)
Runoff from this stream =     58.330(CFS)
Time of concentration =   18.25 min.
Rainfall intensity =     2.318(In/Hr)
Area averaged loss rate (Fm) =    0.1705(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)      (min) (In/Hr)      (In/Hr)


1     77.03   156.166     16.95    0.241      2.417
2     30.18    58.330     18.25    0.170      2.318
Qmax(1) =
         1.000 *    1.000 *   156.166) +
         1.046 *    0.929 *    58.330) + =     212.840
Qmax(2) =
         0.955 *    1.000 *   156.166) +
         1.000 *    1.000 *    58.330) + =     207.392

Total of 2 main streams to confluence:
Flow rates before confluence point:
     157.166      59.330
Maximum flow rates at confluence using above data:
      212.840      207.392
Area of streams before confluence:
       77.030       30.180
Effective area values after confluence:
      105.061      107.210
```

```
Results of confluence:
Total flow rate =    212.840(CFS)
Time of concentration =    16.952 min.
Effective stream area after confluence  =    105.061(Ac.)
Study area average Pervious fraction(Ap) =  0.916
Study area average soil loss rate(Fm) =   0.221(In/Hr)
Study area total =     107.21(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      303.000 to Point/Station      304.000
**** INITIAL AREA EVALUATION ****
```

G3

```
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.140(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1275.200(Ft.)
Bottom (of initial area) elevation =  1272.500(Ft.)
Difference in elevation =     2.700(Ft.)
Slope =    0.00900  s(%)=       0.90
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.002 min.
Rainfall intensity =      3.087(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.859
Subarea runoff =      2.891(CFS)
Total initial stream area =        1.090(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      304.000 to Point/Station      302.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
```

G4

```
Top of street segment elevation =  1272.500(Ft.)
End of street segment elevation =  1115.300(Ft.)
Length of street segment  =  2562.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   8.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0130
 Manning's N from gutter to grade break =  0.0130
 Manning's N from grade break to crown =  0.0130
Estimated mean flow rate at midpoint of street =    31.270(CFS)
Depth of flow =   0.402(Ft.), Average velocity =   7.730(Ft/s)
```

```
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  13.770(Ft.)
Flow velocity =   7.73(Ft/s)
Travel time =    5.52 min.     TC =   16.53  min.
 Adding area flow to street
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.680
Decimal fraction soil group D = 0.320
SCS curve number for soil(AMC 2)  = 70.92
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.234(In/Hr)
Max Catchment Loss (Fm) =     0.164(In/Hr)
Rainfall intensity =      2.452(In/Hr) for a   25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.840
Subarea runoff =     56.586(CFS) for   27.780(Ac.)
Total runoff =     59.477(CFS)    Total area =     28.87(Ac.)
Area averaged Fm value =    0.163(In/Hr)
Street flow at end of street =     59.477(CFS)
Half street flow at end of street =     29.738(CFS)
Depth of flow =   0.483(Ft.), Average velocity =   9.030(Ft/s)
Flow width (from curb towards crown)=  17.795(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     303.000 to Point/Station     302.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =     28.870(Ac.)
Runoff from this stream =     59.477(CFS)
Time of concentration =   16.53 min.
Rainfall intensity =     2.452(In/Hr)
Area averaged loss rate (Fm) =    0.1629(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm      Rainfall Intensity
 No.    (Ac.)   (CFS)      (min) (In/Hr)      (In/Hr)


1     77.03   156.166     16.95    0.241      2.417
2     30.18    58.330     18.25    0.170      2.318
3     28.87    59.477     16.53    0.163      2.452
Qmax(1) =
         1.000 *    1.000 *   156.166) +
         1.046 *    0.929 *    58.330) +
         0.985 *    1.000 *    59.477) + =     271.406
Qmax(2) =
         0.955 *    1.000 *   156.166) +
         1.000 *    1.000 *    58.330) +
         0.941 *    1.000 *    59.477) + =     263.387
Qmax(3) =
         1.016 *    0.975 *   156.166) +
         1.062 *    0.905 *    58.330) +
         1.000 *    1.000 *    59.477) + =     270.285
```

```
Total of 3 main streams to confluence:
Flow rates before confluence point:
     157.166      59.330      60.477
Maximum flow rates at confluence using above data:
      271.406      263.387      270.285
Area of streams before confluence:
       77.030       30.180       28.870
Effective area values after confluence:
      133.931      136.080      131.292


Results of confluence:
Total flow rate =    271.406(CFS)
Time of concentration =   16.952 min.
Effective stream area after confluence  =    133.931(Ac.)
Study area average Pervious fraction(Ap) =  0.870
Study area average soil loss rate(Fm) =    0.209(In/Hr)
Study area total =     136.08(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      132.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1100.000(Ft.)
Downstream point/station elevation =  1048.000(Ft.)
Pipe length  =   344.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   271.406(CFS)
Nearest computed pipe diameter  =    39.00(In.)
Calculated individual pipe flow  =   271.406(CFS)
Normal flow depth in pipe =   27.51(In.)
Flow top width inside pipe =   35.56(In.)
Critical depth could not be calculated.
Pipe flow velocity =     43.40(Ft/s)
Travel time through pipe =   0.13 min.
Time of concentration (TC) =    17.08 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station      132.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    133.931(Ac.)
Runoff from this stream =    271.406(CFS)
Time of concentration =   17.08 min.
Rainfall intensity =     2.406(In/Hr)
Area averaged loss rate (Fm) =    0.2090(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8698
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      110.000
**** INITIAL AREA EVALUATION ****
```

C10

```
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1610.000(Ft.)
Bottom (of initial area) elevation =  1560.000(Ft.)
Difference in elevation =    50.000(Ft.)
Slope =    0.16667  s(%)=      16.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.101 min.
Rainfall intensity =      2.796(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.820
Subarea runoff =     6.280(CFS)
Total initial stream area =        2.740(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     110.000 to Point/Station      115.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                  C11
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     17.275(CFS)
Depth of flow =   0.391(Ft.), Average velocity =   7.634(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------------
Sub-Channel flow  =     17.275(CFS)
  '     '    flow top width =      6.565(Ft.)
  '     '     velocity=    7.634(Ft/s)
  '     '    area =      2.263(Sq.Ft)
  '     '    Froude number =     2.292

Upstream point elevation =  1560.000(Ft.)
Downstream point elevation =  1390.000(Ft.)
Flow length =   600.000(Ft.)
Travel time  =    1.31 min.
Time of concentration =   14.41 min.
Depth of flow =   0.391(Ft.)
Average velocity =   7.634(Ft/s)
Total irregular channel flow =    17.275(CFS)
Irregular channel normal depth above invert elev. =   0.391(Ft.)
Average velocity of channel(s) =   7.634(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
```

```
Decimal fraction soil group C = 0.740
Decimal fraction soil group D = 0.260
SCS curve number for soil(AMC 2)  = 75.56
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.237(In/Hr)
Max Catchment Loss (Fm) =     0.237(In/Hr)
Rainfall intensity =      2.650(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.819
Subarea runoff =     21.938(CFS) for   10.270(Ac.)
Total runoff =     28.218(CFS)    Total area =     13.01(Ac.)
Area averaged Fm value =    0.240(In/Hr)
Depth of flow =   0.520(Ft.), Average velocity =   8.991(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     115.000 to Point/Station     129.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                  C12
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     40.728(CFS)
Depth of flow =   0.687(Ft.), Average velocity =   9.296(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------------
Sub-Channel flow  =     40.728(CFS)
  '     '    flow top width =      7.749(Ft.)
  '     '     velocity=    9.296(Ft/s)
  '     '    area =      4.381(Sq.Ft)
  '     '    Froude number =     2.179

Upstream point elevation =  1390.000(Ft.)
Downstream point elevation =  1180.000(Ft.)
Flow length =   950.000(Ft.)
Travel time  =    1.70 min.
Time of concentration =   16.11 min.
Depth of flow =   0.687(Ft.)
Average velocity =   9.296(Ft/s)
Total irregular channel flow =    40.728(CFS)
Irregular channel normal depth above invert elev. =   0.687(Ft.)
Average velocity of channel(s) =   9.296(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.840
Decimal fraction soil group D = 0.160
SCS curve number for soil(AMC 2)  = 74.96
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.242(In/Hr)
Max Catchment Loss (Fm) =     0.242(In/Hr)
Rainfall intensity =      2.487(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.813
```

```
Subarea runoff =     24.955(CFS) for   13.290(Ac.)
Total runoff =     53.173(CFS)     Total area =     26.30(Ac.)
Area averaged Fm value =    0.241(In/Hr)
Depth of flow =   0.798(Ft.), Average velocity =  10.099(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      129.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     26.300(Ac.)
Runoff from this stream =     53.173(CFS)
Time of concentration =   16.11 min.
Rainfall intensity =     2.487(In/Hr)
Area averaged loss rate (Fm) =    0.2409(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      122.000 to Point/Station      124.000
**** INITIAL AREA EVALUATION ****
                                                              C13
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1615.000(Ft.)
Bottom (of initial area) elevation =  1495.000(Ft.)
Difference in elevation =   120.000(Ft.)
Slope =    0.40000  s(%)=      40.00
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.996 min.
Rainfall intensity =     3.088(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.827
Subarea runoff =     3.218(CFS)
Total initial stream area =       1.260(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      124.000 to Point/Station      126.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                              C14
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     7.179(CFS)
Depth of flow =   0.236(Ft.), Average velocity =   5.562(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number     'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
```

```
      4            205.00          50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow =     7.179(CFS)
   '      '    flow top width =      5.944(Ft.)
   '      '     velocity=    5.562(Ft/s)
   '      '    area =      1.291(Sq.Ft)
   '      '    Froude number =    2.103

Upstream point elevation =  1495.000(Ft.)
Downstream point elevation =  1385.000(Ft.)
Flow length =   400.000(Ft.)
Travel time  =    1.20 min.
Time of concentration =   12.20 min.
Depth of flow =   0.236(Ft.)
Average velocity =   5.562(Ft/s)
Total irregular channel flow =    7.179(CFS)
Irregular channel normal depth above invert elev. =   0.236(Ft.)
Average velocity of channel(s) =   5.562(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.912(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.823
Subarea runoff =      7.827(CFS) for    3.350(Ac.)
Total runoff =     11.045(CFS)    Total area =       4.61(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.304(Ft.), Average velocity =   6.479(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     125.000 to Point/Station     126.000
**** SUBAREA FLOW ADDITION ****                              C15
-----------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Time of concentration =    12.20 min.
Rainfall intensity =      2.912(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.823
Subarea runoff =     16.365(CFS) for    6.830(Ac.)
Total runoff =     27.410(CFS)    Total area =      11.44(Ac.)
Area averaged Fm value =    0.250(In/Hr)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      126.000 to Point/Station      128.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

C16

```
Estimated mean flow rate at midpoint of channel =    39.257(CFS)
Depth of flow =   0.704(Ft.), Average velocity =   8.707(Ft/s)
      ******* Irregular Channel Data ***********
--------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00               50.00
      2            100.00                0.00
      3            105.00                0.00
      4            205.00               50.00
Manning's 'N' friction factor =   0.050
--------------------------------------------------------------------
Sub-Channel flow  =     39.257(CFS)
  '      '    flow top width =      7.815(Ft.)
  '      '     velocity=    8.707(Ft/s)
  '      '    area =      4.509(Sq.Ft)
  '      '    Froude number =     2.020

Upstream point elevation =  1385.000(Ft.)
Downstream point elevation =  1300.000(Ft.)
Flow length =   450.000(Ft.)
Travel time  =    0.86 min.
Time of concentration =   13.06 min.
Depth of flow =   0.704(Ft.)
Average velocity =   8.707(Ft/s)
Total irregular channel flow =    39.257(CFS)
Irregular channel normal depth above invert elev. =   0.704(Ft.)
Average velocity of channel(s) =   8.707(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=    0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.802(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.820
Subarea runoff =     23.622(CFS) for   10.780(Ac.)
Total runoff =     51.032(CFS)    Total area =       22.22(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.815(Ft.), Average velocity =   9.443(Ft/s)


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Process from Point/Station      128.000 to Point/Station      129.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

C17

```
Estimated mean flow rate at midpoint of channel =     67.762(CFS)
Depth of flow =   0.939(Ft.), Average velocity =  10.497(Ft/s)
      ******* Irregular Channel Data ***********
--------------------------------------------------------------------
```

```
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00               50.00
      2            100.00                0.00
      3            105.00                0.00
      4            205.00               50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =     67.762(CFS)
   '      '    flow top width =      8.755(Ft.)
   '      '     velocity=   10.497(Ft/s)
   '      '    area =      6.455(Sq.Ft)
   '      '    Froude number =     2.154

Upstream point elevation =  1300.000(Ft.)
Downstream point elevation =  1180.000(Ft.)
Flow length =   600.000(Ft.)
Travel time  =    0.95 min.
Time of concentration =   14.01 min.
Depth of flow =   0.939(Ft.)
Average velocity =  10.497(Ft/s)
Total irregular channel flow =    67.762(CFS)
Irregular channel normal depth above invert elev. =   0.939(Ft.)
Average velocity of channel(s) =  10.497(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.692(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.816
Subarea runoff =     33.398(CFS) for   16.190(Ac.)
Total runoff =     84.430(CFS)     Total area =     38.41(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   1.059(Ft.), Average velocity =  11.205(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      122.000 to Point/Station      129.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =    38.410(Ac.)
Runoff from this stream =     84.430(CFS)
Time of concentration =   14.01 min.
Rainfall intensity =     2.692(In/Hr)
Area averaged loss rate (Fm) =    0.2500(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm      Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)
```

```
1     26.30    53.173     16.11    0.241      2.487
2     38.41    84.430     14.01    0.250      2.692
Qmax(1) =
        1.000 *    1.000 *    53.173) +
        0.916 *    1.000 *    84.430) + =     130.514
Qmax(2) =
        1.091 *    0.869 *    53.173) +
        1.000 *    1.000 *    84.430) + =     134.877

Total of 2 streams to confluence:
Flow rates before confluence point:
     53.173    84.430
Maximum flow rates at confluence using above data:
     130.514     134.877
Area of streams before confluence:
      26.300      38.410
Effective area values after confluence:
      64.710      61.275
Results of confluence:
Total flow rate =   134.877(CFS)
Time of concentration =   14.009 min.
Effective stream area after confluence =    61.275(Ac.)
Study area average Pervious fraction(Ap) =  1.000
Study area average soil loss rate(Fm) =    0.246(In/Hr)
Study area total (this main stream) =      64.71(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      129.000 to Point/Station      130.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

C18

```
Estimated mean flow rate at midpoint of channel =    186.230(CFS)
Depth of flow =   2.137(Ft.), Average velocity =   9.400(Ft/s)
     ******* Irregular Channel Data **********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =  0.050
------------------------------------------------------------------
Sub-Channel flow  =    186.230(CFS)
  '     '    flow top width =     13.546(Ft.)
  '     '     velocity=    9.400(Ft/s)
  '     '    area =     19.812(Sq.Ft)
  '     '    Froude number =     1.370

Upstream point elevation =  1180.000(Ft.)
Downstream point elevation =  1056.000(Ft.)
Flow length =  1870.000(Ft.)
Travel time  =    3.32 min.
Time of concentration =   17.32 min.
Depth of flow =   2.137(Ft.)
Average velocity =   9.400(Ft/s)
Total irregular channel flow =   186.230(CFS)
```

```
Irregular channel normal depth above invert elev. =    2.137(Ft.)
Average velocity of channel(s) =    9.400(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.940
Decimal fraction soil group D = 0.060
SCS curve number for soil(AMC 2)  = 74.36
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=      0.247(In/Hr)
Max Catchment Loss (Fm) =      0.247(In/Hr)
Rainfall intensity =      2.387(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.807
Subarea runoff =    102.627(CFS) for   62.000(Ac.)
Total runoff =    237.505(CFS)     Total area =    123.27(Ac.)
Area averaged Fm value =    0.247(In/Hr)
Depth of flow =   2.411(Ft.), Average velocity =  10.030(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      130.000 to Point/Station      132.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1050.000(Ft.)
Downstream point/station elevation =  1048.000(Ft.)
Pipe length  =   500.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   237.505(CFS)
Nearest computed pipe diameter  =     69.00(In.)
Calculated individual pipe flow  =  237.505(CFS)
Normal flow depth in pipe =   56.14(In.)
Flow top width inside pipe =   53.74(In.)
Critical Depth =   51.16(In.)
Pipe flow velocity =     10.50(Ft/s)
Travel time through pipe =    0.79 min.
Time of concentration (TC) =    18.12 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      130.000 to Point/Station      132.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =    123.275(Ac.)
Runoff from this stream =    237.505(CFS)
Time of concentration =   18.12 min.
Rainfall intensity =     2.328(In/Hr)
Area averaged loss rate (Fm) =    0.2466(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    133.93   271.406     17.08    0.209      2.406
2    123.27   237.505     18.12    0.247      2.328
```

```
Qmax(1) =
        1.000 *    1.000 *   271.406) +
        1.038 *    0.943 *   237.505) + =     503.825
Qmax(2) =
        0.964 *    1.000 *   271.406) +
        1.000 *    1.000 *   237.505) + =     499.183

Total of 2 main streams to confluence:
Flow rates before confluence point:
     272.406     238.505
Maximum flow rates at confluence using above data:
      503.825      499.183
Area of streams before confluence:
      133.931      123.275
Effective area values after confluence:
      250.168      257.206


Results of confluence:
Total flow rate =    503.825(CFS)
Time of concentration =    17.084 min.
Effective stream area after confluence  =    250.168(Ac.)
Study area average Pervious fraction(Ap) =  0.932
Study area average soil loss rate(Fm) =    0.227(In/Hr)
Study area total =     257.21(Ac.)


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Process from Point/Station      132.000 to Point/Station      305.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1048.000(Ft.)
Downstream point/station elevation =  1032.000(Ft.)
Pipe length  =  1025.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   503.825(CFS)
Nearest computed pipe diameter  =   72.00(In.)
Calculated individual pipe flow  =   503.825(CFS)
Normal flow depth in pipe =   56.14(In.)
Flow top width inside pipe =   59.68(In.)
Critical Depth =   68.12(In.)
Pipe flow velocity =     21.30(Ft/s)
Travel time through pipe =    0.80 min.
Time of concentration (TC) =    17.89 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      132.000 to Point/Station      305.000
**** SUBAREA FLOW ADDITION ****
                                                              G5
------------------------------------------------------------------------
RESIDENTIAL(2.5 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.750
Decimal fraction soil group D = 0.250
SCS curve number for soil(AMC 2)  = 70.50
Pervious ratio(Ap) = 0.9000  Max loss rate(Fp)=     0.237(In/Hr)
Max Catchment Loss (Fm) =    0.214(In/Hr)
Time of concentration =   17.89 min.
```

```
Rainfall intensity =      2.345(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.813
Subarea runoff =      8.123(CFS) for   18.340(Ac.)
Total runoff =    511.949(CFS)    Total area =     268.51(Ac.)
Area averaged Fm value =  0.226(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station      305.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    268.508(Ac.)
Runoff from this stream =    511.949(CFS)
Time of concentration =   17.89 min.
Rainfall intensity =     2.345(In/Hr)
Area averaged loss rate (Fm) =    0.2261(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9300


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     306.000 to Point/Station      307.000
**** INITIAL AREA EVALUATION ****                                  G6
------------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.175(In/Hr)
Initial subarea data:
Initial area flow distance =   330.000(Ft.)
Top (of initial area) elevation =  1127.400(Ft.)
Bottom (of initial area) elevation =  1120.000(Ft.)
Difference in elevation =     7.400(Ft.)
Slope =    0.02242  s(%)=       2.24
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.522 min.
NOTE: Distance EXCEEDS recommended maximum value of   328.084(Ft.)
for this Development Type
Rainfall intensity =      3.350(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.853
Subarea runoff =      3.086(CFS)
Total initial stream area =       1.080(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      307.000 to Point/Station      305.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
                                                                   G7
------------------------------------------------------------------------
Top of street segment elevation =  1120.000(Ft.)
End of street segment elevation =  1042.000(Ft.)
Length of street segment  =  1423.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
```

```
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   8.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =    33.963(CFS)
Depth of flow =   0.435(Ft.), Average velocity =   6.776(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  15.425(Ft.)
Flow velocity =   6.78(Ft/s)
Travel time =    3.50 min.     TC =   13.02  min.
 Adding area flow to street
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.860
Decimal fraction soil group D = 0.140
SCS curve number for soil(AMC 2)  = 69.84
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=    0.243(In/Hr)
Max Catchment Loss (Fm) =     0.170(In/Hr)
Rainfall intensity =      2.806(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.845
Subarea runoff =     61.626(CFS) for   26.200(Ac.)
Total runoff =     64.712(CFS)    Total area =      27.28(Ac.)
Area averaged Fm value =    0.170(In/Hr)
Street flow at end of street =     64.712(CFS)
Half street flow at end of street =     32.356(CFS)
Depth of flow =   0.522(Ft.), Average velocity =   8.057(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    1.10(Ft.)
Flow width (from curb towards crown)=  18.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      306.000 to Point/Station     305.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     27.280(Ac.)
Runoff from this stream =     64.712(CFS)
Time of concentration =   13.02 min.
Rainfall intensity =    2.806(In/Hr)
Area averaged loss rate (Fm) =    0.1703(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm     Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)
```

```
1     268.51    511.949      17.89     0.226      2.345
2      27.28     64.712      13.02     0.170      2.806
Qmax(1) =
         1.000 *     1.000 *    511.949) +
         0.825 *     1.000 *     64.712) + =     565.333
Qmax(2) =
         1.218 *     0.728 *    511.949) +
         1.000 *     1.000 *     64.712) + =     518.616

Total of 2 streams to confluence:
Flow rates before confluence point:
     511.949       64.712
Maximum flow rates at confluence using above data:
      565.333       518.616
Area of streams before confluence:
      268.508        27.280
Effective area values after confluence:
      295.788       222.770
Results of confluence:
Total flow rate =     565.333(CFS)
Time of concentration =     17.886 min.
Effective stream area after confluence =     295.788(Ac.)
Study area average Pervious fraction(Ap) =  0.909
Study area average soil loss rate(Fm) =     0.221(In/Hr)
Study area total (this main stream) =      295.79(Ac.)


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Process from Point/Station      305.000 to Point/Station      305.000
**** SUBAREA FLOW ADDITION ****                                    G8
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.550
Decimal fraction soil group D = 0.450
SCS curve number for soil(AMC 2)  = 76.70
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.228(In/Hr)
Max Catchment Loss (Fm) =     0.228(In/Hr)
Time of concentration =     17.89 min.
Rainfall intensity =      2.345(In/Hr) for a     25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.815
Subarea runoff =      19.931(CFS) for   10.460(Ac.)
Total runoff =     585.264(CFS)     Total area =      306.25(Ac.)
Area averaged Fm value =     0.221(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      305.000 to Point/Station      308.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =  1032.000(Ft.)
Downstream point/station elevation =   989.000(Ft.)
Pipe length  =   673.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =   585.264(CFS)
Nearest computed pipe diameter  =     63.00(In.)
Calculated individual pipe flow  =   585.264(CFS)
```

```
Normal flow depth in pipe =   46.75(In.)
Flow top width inside pipe =   55.12(In.)
Critical depth could not be calculated.
Pipe flow velocity =     33.97(Ft/s)
Travel time through pipe =   0.33 min.
Time of concentration (TC) =    18.22 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      308.000 to Point/Station      308.000
**** SUBAREA FLOW ADDITION ****
```

G-9

```
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.640
Decimal fraction soil group D = 0.360
SCS curve number for soil(AMC 2)  = 76.16
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.232(In/Hr)
Max Catchment Loss (Fm) =     0.232(In/Hr)
The area added to the existing stream with this TC
does not add flow per Para 6b, Page D-15 of the OCHM,
therefore the upstream flow rate of Q =    585.264(CFS) is being used
Time of concentration =    18.22 min.
Rainfall intensity =      2.320(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.814
Subarea runoff =      0.000(CFS) for    3.350(Ac.)
Total runoff =    585.264(CFS)    Total area =      309.60(Ac.)
Area averaged Fm value =    0.221(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      308.000 to Point/Station      308.000
**** SUBAREA FLOW ADDITION ****
```

G-10

```
PARK subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.850
Decimal fraction soil group D = 0.150
SCS curve number for soil(AMC 2)  = 69.90
Pervious ratio(Ap) = 0.8500  Max loss rate(Fp)=     0.242(In/Hr)
Max Catchment Loss (Fm) =     0.206(In/Hr)
Time of concentration =    18.22 min.
Rainfall intensity =      2.320(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.814
Subarea runoff =     13.133(CFS) for    7.090(Ac.)
Total runoff =    598.397(CFS)    Total area =      316.69(Ac.)
Area averaged Fm value =    0.221(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      308.000 to Point/Station      312.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
```

```
Upstream point/station elevation =   989.000(Ft.)
```

```
Downstream point/station elevation =   920.000(Ft.)
Pipe length  =  1587.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =   598.397(CFS)
Nearest computed pipe diameter  =     66.00(In.)
Calculated individual pipe flow  =   598.397(CFS)
Normal flow depth in pipe =   53.28(In.)
Flow top width inside pipe =   52.06(In.)
Critical depth could not be calculated.
Pipe flow velocity =    29.12(Ft/s)
Travel time through pipe =    0.91 min.
Time of concentration (TC) =    19.12 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      308.000 to Point/Station      312.000
**** SUBAREA FLOW ADDITION ****
```

G11

```
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.175(In/Hr)
The area added to the existing stream with this TC
does not add flow per Para 6b, Page D-15 of the OCHM,
therefore the upstream flow rate of Q =   598.397(CFS) is being used
Time of concentration =    19.12 min.
Rainfall intensity =      2.257(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.812
Subarea runoff =      0.000(CFS) for    8.010(Ac.)
Total runoff =    598.397(CFS)    Total area =     324.70(Ac.)
Area averaged Fm value =    0.220(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      308.000 to Point/Station      312.000
**** CONFLUENCE OF MINOR STREAMS ****
Along Main Stream number: 1 in normal stream number 1
Stream flow area =   324.698(Ac.)
Runoff from this stream =    598.397(CFS)
Time of concentration =   19.12 min.
Rainfall intensity =     2.257(In/Hr)
Area averaged loss rate (Fm) =    0.2199(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9062


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      309.000 to Point/Station      310.000
**** INITIAL AREA EVALUATION ****
```

G12

```
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
```

```
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.140(In/Hr)
Initial subarea data:
Initial area flow distance =   330.000(Ft.)
Top (of initial area) elevation =  1077.000(Ft.)
Bottom (of initial area) elevation =  1070.000(Ft.)
Difference in elevation =     7.000(Ft.)
Slope =    0.02121  s(%)=    2.12
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.629 min.
NOTE: Distance EXCEEDS recommended maximum value of   328.084(Ft.)
for this Development Type
Rainfall intensity =      3.329(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.862
Subarea runoff =      3.674(CFS)
Total initial stream area =        1.280(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      310.000 to Point/Station      311.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
                                                              G13
----------------------------------------------------------------------
Top of street segment elevation =  1070.000(Ft.)
End of street segment elevation =   932.000(Ft.)
Length of street segment  =  1705.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   8.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown = 0.0150
Estimated mean flow rate at midpoint of street =    40.489(CFS)
Depth of flow =   0.433(Ft.), Average velocity =   8.196(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  15.308(Ft.)
Flow velocity =   8.20(Ft/s)
Travel time =    3.47 min.     TC =   13.10  min.
 Adding area flow to street
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.360
Decimal fraction soil group D = 0.640
SCS curve number for soil(AMC 2)  = 72.84
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.218(In/Hr)
Max Catchment Loss (Fm) =     0.153(In/Hr)
Rainfall intensity =      2.797(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.851
```

```
Subarea runoff =     73.478(CFS) for   31.130(Ac.)
Total runoff =     77.151(CFS)     Total area =      32.41(Ac.)
Area averaged Fm value =    0.152(In/Hr)
Street flow at end of street =     77.151(CFS)
Half street flow at end of street =     38.576(CFS)
Depth of flow =   0.519(Ft.), Average velocity =   9.747(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    0.95(Ft.)
Flow width (from curb towards crown)=  18.000(Ft.)


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Process from Point/Station      311.000 to Point/Station      311.000
**** SUBAREA FLOW ADDITION ****
                                                              G14
------------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=    0.200(In/Hr)
Max Catchment Loss (Fm) =     0.140(In/Hr)
Time of concentration =    13.10 min.
Rainfall intensity =      2.797(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.852
Subarea runoff =     21.833(CFS) for    9.130(Ac.)
Total runoff =     98.985(CFS)     Total area =     41.54(Ac.)
Area averaged Fm value =    0.149(In/Hr)


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Process from Point/Station      311.000 to Point/Station      312.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   922.000(Ft.)
Downstream point/station elevation =   920.000(Ft.)
Pipe length  =    50.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   98.985(CFS)
Nearest computed pipe diameter  =   33.00(In.)
Calculated individual pipe flow  =   98.985(CFS)
Normal flow depth in pipe =   25.32(In.)
Flow top width inside pipe =   27.89(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.24(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    13.14 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      309.000 to Point/Station      312.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     41.540(Ac.)
Runoff from this stream =     98.985(CFS)
```

```
Time of concentration =   13.14 min.
Rainfall intensity =     2.792(In/Hr)
Area averaged loss rate (Fm) =    0.1494(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm      Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    324.70   598.397     19.12    0.220      2.257
2     41.54    98.985     13.14    0.149      2.792
Qmax(1) =
        1.000 *    1.000 *   598.397) +
        0.798 *    1.000 *    98.985) + =     677.355
Qmax(2) =
        1.262 *    0.687 *   598.397) +
        1.000 *    1.000 *    98.985) + =     617.886

Total of 2 streams to confluence:
Flow rates before confluence point:
     598.397      98.985
Maximum flow rates at confluence using above data:
      677.355      617.886
Area of streams before confluence:
      324.698       41.540
Effective area values after confluence:
      366.238      264.577
Results of confluence:
Total flow rate =    677.355(CFS)
Time of concentration =    19.125 min.
Effective stream area after confluence =    366.238(Ac.)
Study area average Pervious fraction(Ap) =  0.883
Study area average soil loss rate(Fm) =    0.212(In/Hr)
Study area total (this main stream) =     366.24(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      312.000 to Point/Station      184.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   920.000(Ft.)
Downstream point/station elevation =   705.000(Ft.)
Pipe length  =  1170.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   677.355(CFS)
Nearest computed pipe diameter  =     51.00(In.)
Calculated individual pipe flow  =   677.355(CFS)
Normal flow depth in pipe =   39.13(In.)
Flow top width inside pipe =   43.10(In.)
Critical depth could not be calculated.
Pipe flow velocity =     57.99(Ft/s)
Travel time through pipe =    0.34 min.
Time of concentration (TC) =    19.46 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      312.000 to Point/Station      184.000
**** CONFLUENCE OF MAIN STREAMS ****
```

```
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     366.238(Ac.)
Runoff from this stream =     677.355(CFS)
Time of concentration =    19.46 min.
Rainfall intensity =     2.235(In/Hr)
Area averaged loss rate (Fm) =     0.2119(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8829
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      150.000 to Point/Station      160.000
**** INITIAL AREA EVALUATION ****
                                                                    E1
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =    300.000(Ft.)
Top (of initial area) elevation =   1575.000(Ft.)
Bottom (of initial area) elevation =   1350.000(Ft.)
Difference in elevation =    225.000(Ft.)
Slope =    0.75000  s(%)=       75.00
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =     9.697 min.
Rainfall intensity =      3.316(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.832
Subarea runoff =      3.918(CFS)
Total initial stream area =        1.420(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      160.000 to Point/Station      162.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                    E2
Estimated mean flow rate at midpoint of channel =     13.172(CFS)
Depth of flow =   0.296(Ft.), Average velocity =   7.960(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     13.172(CFS)
   '     '   flow top width =      6.184(Ft.)
   '     '    velocity=    7.960(Ft/s)
   '     '   area =      1.655(Sq.Ft)
```

```
  '      '    Froude number =      2.712

Upstream point elevation =  1350.000(Ft.)
Downstream point elevation =  1200.000(Ft.)
Flow length =   350.000(Ft.)
Travel time  =    0.73 min.
Time of concentration =   10.43 min.
Depth of flow =   0.296(Ft.)
Average velocity =   7.960(Ft/s)
Total irregular channel flow =    13.172(CFS)
Irregular channel normal depth above invert elev. =   0.296(Ft.)
Average velocity of channel(s) =   7.960(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.960
Decimal fraction soil group D = 0.040
SCS curve number for soil(AMC 2)  = 74.24
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.248(In/Hr)
Max Catchment Loss (Fm) =     0.248(In/Hr)
Rainfall intensity =      3.182(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.830
Subarea runoff =     18.443(CFS) for    7.050(Ac.)
Total runoff =     22.361(CFS)    Total area =        8.47(Ac.)
Area averaged Fm value =    0.248(In/Hr)
Depth of flow =   0.403(Ft.), Average velocity =   9.553(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      162.000 to Point/Station      164.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                  E3
Estimated mean flow rate at midpoint of channel =     36.708(CFS)
Depth of flow =   0.633(Ft.), Average velocity =   9.252(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     36.708(CFS)
  '      '    flow top width =      7.533(Ft.)
  '      '     velocity=    9.252(Ft/s)
  '      '    area =      3.967(Sq.Ft)
  '      '    Froude number =     2.247

Upstream point elevation =  1200.000(Ft.)
Downstream point elevation =  1020.000(Ft.)
Flow length =   750.000(Ft.)
Travel time  =    1.35 min.
Time of concentration =   11.78 min.
Depth of flow =   0.633(Ft.)
```

```
Average velocity =   9.252(Ft/s)
Total irregular channel flow =    36.708(CFS)
Irregular channel normal depth above invert elev. =   0.633(Ft.)
Average velocity of channel(s) =   9.252(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.660
Decimal fraction soil group D = 0.340
SCS curve number for soil(AMC 2)  = 76.04
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=    0.233(In/Hr)
Max Catchment Loss (Fm) =     0.233(In/Hr)
Rainfall intensity =      2.970(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.827
Subarea runoff =     28.630(CFS) for   12.280(Ac.)
Total runoff =     50.991(CFS)    Total area =       20.75(Ac.)
Area averaged Fm value =    0.239(In/Hr)
Depth of flow =  0.762(Ft.), Average velocity =  10.257(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      163.000 to Point/Station      164.000
**** SUBAREA FLOW ADDITION ****
                                                                  E4
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.970
Decimal fraction soil group D = 0.030
SCS curve number for soil(AMC 2)  = 74.18
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=    0.249(In/Hr)
Max Catchment Loss (Fm) =     0.249(In/Hr)
Time of concentration =   11.78 min.
Rainfall intensity =      2.970(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.826
Subarea runoff =     32.132(CFS) for   13.120(Ac.)
Total runoff =     83.122(CFS)    Total area =       33.87(Ac.)
Area averaged Fm value =    0.243(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      164.000 to Point/Station      170.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                  E5
Estimated mean flow rate at midpoint of channel =    110.124(CFS)
Depth of flow =   1.506(Ft.), Average velocity =   9.128(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
```

```
------------------------------------------------------------------
Sub-Channel flow  =    110.124(CFS)
   '      '  flow top width =    11.023(Ft.)
   '      '   velocity=    9.128(Ft/s)
   '      '  area =     12.064(Sq.Ft)
   '      '  Froude number =     1.538

Upstream point elevation =  1020.000(Ft.)
Downstream point elevation =   920.000(Ft.)
Flow length =  1100.000(Ft.)
Travel time  =    2.01 min.
Time of concentration =   13.79 min.
Depth of flow =   1.506(Ft.)
Average velocity =   9.128(Ft/s)
Total irregular channel flow =   110.124(CFS)
Irregular channel normal depth above invert elev. =   1.506(Ft.)
Average velocity of channel(s) =   9.128(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.340
Decimal fraction soil group D = 0.660
SCS curve number for soil(AMC 2)  = 77.96
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.217(In/Hr)
Max Catchment Loss (Fm) =     0.217(In/Hr)
Rainfall intensity =      2.717(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.823
Subarea runoff =     53.944(CFS) for   27.410(Ac.)
Total runoff =    137.067(CFS)    Total area =    61.28(Ac.)
Area averaged Fm value =    0.231(In/Hr)
Depth of flow =   1.687(Ft.), Average velocity =   9.700(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      168.000 to Point/Station      170.000
**** SUBAREA FLOW ADDITION ****
                                                              E6
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.410
Decimal fraction soil group D = 0.590
SCS curve number for soil(AMC 2)  = 81.95
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.220(In/Hr)
Max Catchment Loss (Fm) =     0.220(In/Hr)
Time of concentration =    13.79 min.
Rainfall intensity =      2.717(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.825
Subarea runoff =     71.818(CFS) for   31.970(Ac.)
Total runoff =    208.885(CFS)    Total area =    93.25(Ac.)
Area averaged Fm value =    0.228(In/Hr)


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Process from Point/Station      170.000 to Point/Station      175.000
```

```
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****                    E7
Estimated mean flow rate at midpoint of channel =   247.339(CFS)
Depth of flow =   2.568(Ft.), Average velocity =   9.500(Ft/s)
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =    247.339(CFS)
   '      '   flow top width =    15.274(Ft.)
   '      '    velocity=    9.500(Ft/s)
   '      '   area =     26.036(Sq.Ft)
   '      '   Froude number =     1.282

Upstream point elevation =   920.000(Ft.)
Downstream point elevation =   850.000(Ft.)
Flow length =  1260.000(Ft.)
Travel time  =    2.21 min.
Time of concentration =   16.00 min.
Depth of flow =   2.568(Ft.)
Average velocity =   9.500(Ft/s)
Total irregular channel flow =   247.339(CFS)
Irregular channel normal depth above invert elev. =   2.568(Ft.)
Average velocity of channel(s) =   9.500(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.120
Decimal fraction soil group D = 0.880
SCS curve number for soil(AMC 2)  = 79.28
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=    0.206(In/Hr)
Max Catchment Loss (Fm) =     0.206(In/Hr)
Rainfall intensity =      2.497(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.821
Subarea runoff =     76.849(CFS) for   46.190(Ac.)
Total runoff =    285.735(CFS)    Total area =      139.44(Ac.)
Area averaged Fm value =    0.220(In/Hr)
Depth of flow =   2.755(Ft.), Average velocity =   9.867(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     175.000 to Point/Station     180.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****                    E8
Estimated mean flow rate at midpoint of channel =   325.876(CFS)
Depth of flow =   2.912(Ft.), Average velocity =  10.338(Ft/s)
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
```

```
      1              0.00            50.00
      2            100.00             0.00
      3            105.00             0.00
      4            205.00            50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =    325.876(CFS)
   '      '   flow top width =     16.649(Ft.)
   '      '    velocity=   10.338(Ft/s)
   '      '   area =     31.523(Sq.Ft)
   '      '   Froude number =     1.324

Upstream point elevation =   850.000(Ft.)
Downstream point elevation =   730.000(Ft.)
Flow length =  2090.000(Ft.)
Travel time  =    3.37 min.
Time of concentration =   19.37 min.
Depth of flow =   2.912(Ft.)
Average velocity =  10.338(Ft/s)
Total irregular channel flow =   325.876(CFS)
Irregular channel normal depth above invert elev. =   2.912(Ft.)
Average velocity of channel(s) =  10.338(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.100
Decimal fraction soil group C = 0.130
Decimal fraction soil group D = 0.770
SCS curve number for soil(AMC 2)  = 77.32
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.217(In/Hr)
Max Catchment Loss (Fm) =     0.217(In/Hr)
Rainfall intensity =      2.241(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.812
Subarea runoff =     80.230(CFS) for   61.660(Ac.)
Total runoff =    365.965(CFS)    Total area =     201.10(Ac.)
Area averaged Fm value =    0.219(In/Hr)
Depth of flow =   3.078(Ft.), Average velocity =  10.655(Ft/s)


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Process from Point/Station      178.000 to Point/Station     180.000
**** SUBAREA FLOW ADDITION ****
                                                          E9
-----------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Time of concentration =    19.37 min.
Rainfall intensity =      2.241(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.810
Subarea runoff =     57.491(CFS) for   32.080(Ac.)
Total runoff =    423.456(CFS)    Total area =     233.18(Ac.)
```

```
Area averaged Fm value =     0.223(In/Hr)

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Process from Point/Station      180.000 to Point/Station      184.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

E10

```
Estimated mean flow rate at midpoint of channel =   424.508(CFS)
Depth of flow =   3.484(Ft.), Average velocity =  10.182(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------
Sub-Channel flow  =    424.508(CFS)
  '     '   flow top width =     18.935(Ft.)
  '     '    velocity=   10.182(Ft/s)
  '     '   area =     41.692(Sq.Ft)
  '     '   Froude number =     1.209

Upstream point elevation =   730.000(Ft.)
Downstream point elevation =   705.000(Ft.)
Flow length =   546.000(Ft.)
Travel time  =    0.89 min.
Time of concentration =   20.26 min.
Depth of flow =   3.484(Ft.)
Average velocity =  10.182(Ft/s)
Total irregular channel flow =   424.508(CFS)
Irregular channel normal depth above invert elev. =   3.484(Ft.)
Average velocity of channel(s) =  10.182(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.600
Decimal fraction soil group D = 0.400
SCS curve number for soil(AMC 2)  = 76.40
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=    0.230(In/Hr)
Max Catchment Loss (Fm) =     0.230(In/Hr)
Rainfall intensity =      2.185(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.808
Subarea runoff =      2.006(CFS) for    7.880(Ac.)
Total runoff =    425.462(CFS)    Total area =     241.06(Ac.)
Area averaged Fm value =    0.224(In/Hr)
Depth of flow =   3.487(Ft.), Average velocity =  10.188(Ft/s)


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Process from Point/Station      180.000 to Point/Station      184.000
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------
The following data inside Main Stream is listed:
```

```
In Main Stream number: 2
Stream flow area =    241.060(Ac.)
Runoff from this stream =    425.462(CFS)
Time of concentration =   20.26 min.
Rainfall intensity =     2.185(In/Hr)
Area averaged loss rate (Fm) =   0.2237(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      181.000 to Point/Station     182.000
**** INITIAL AREA EVALUATION ****
```

E11

```
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 61.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.300(In/Hr)
Max Catchment Loss (Fm) =     0.300(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1225.000(Ft.)
Bottom (of initial area) elevation =  1175.000(Ft.)
Difference in elevation =    50.000(Ft.)
Slope =    0.16667  s(%)=      16.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.101 min.
Rainfall intensity =      2.796(In/Hr) for a     25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.803
Subarea runoff =      2.921(CFS)
Total initial stream area =        1.300(Ac.)


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Process from Point/Station      182.000 to Point/Station     184.000
**** STREET INLET + AREA  + PIPE  TRAVEL TIME ****
```

E12

```
Top of street segment elevation =  1175.000(Ft.)
End of street segment elevation =   915.000(Ft.)
Length of street segment  =  2250.000(Ft.)
Height of curb above gutter flowline =    6.0(In.)
Width of half street (curb to crown)  =  13.000(Ft.)
Distance from crown to crossfall grade break  =   5.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.017
Slope from grade break to crown (v/hz)  =   0.017
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   2.000(Ft.)
Slope from curb to property line (v/hz) =   0.017
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
No street inlet installed at this point
Estimated mean flow rate at midpoint of street =     40.333(CFS)
```

```
Depth of flow =   0.393(Ft.), Average velocity =   9.714(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  13.000(Ft.)
Flow velocity =   9.71(Ft/s)
Travel time =    3.86 min.    TC =   16.96  min.
 Adding area flow to street
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.290
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.710
SCS curve number for soil(AMC 2)  = 69.49
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=     0.229(In/Hr)
Max Catchment Loss (Fm) =     0.183(In/Hr)
Rainfall intensity =      2.416(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.830
Subarea runoff =     74.637(CFS) for   37.360(Ac.)
Total runoff =     77.558(CFS)    Total area =     38.66(Ac.)
Area averaged Fm value =    0.187(In/Hr)
Street flow at end of street =    77.558(CFS)
Half street flow at end of street =     38.779(CFS)
Depth of flow =   0.470(Ft.), Average velocity =  12.589(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  13.000(Ft.)


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Process from Point/Station     183.000 to Point/Station     184.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =     38.660(Ac.)
Runoff from this stream =     77.558(CFS)
Time of concentration =  16.96 min.
Rainfall intensity =    2.416(In/Hr)
Area averaged loss rate (Fm) =    0.1871(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8067
Summary of stream data:

Stream  Area  Flow rate      TC    Fm      Rainfall Intensity
 No.    (Ac.)   (CFS)      (min) (In/Hr)      (In/Hr)


1    366.24   677.355     19.46    0.212      2.235
2    241.06   425.462     20.26    0.224      2.185
3     38.66    77.558     16.96    0.187      2.416
Qmax(1) =
         1.000 *    1.000 *   677.355) +
         1.026 *    0.960 *   425.462) +
         0.919 *    1.000 *    77.558) + =    1167.763
Qmax(2) =
         0.975 *    1.000 *   677.355) +
         1.000 *    1.000 *   425.462) +
         0.896 *    1.000 *    77.558) + =    1155.404
Qmax(3) =
```

```
         1.089 *    0.872 *   677.355) +
         1.118 *    0.837 *   425.462) +
         1.000 *    1.000 *    77.558) + =    1118.833

Total of 3 main streams to confluence:
Flow rates before confluence point:
     678.355     426.462      78.558
Maximum flow rates at confluence using above data:
     1167.763     1155.404     1118.833
Area of streams before confluence:
      366.238      241.060       38.660
Effective area values after confluence:
      636.412      645.958      559.628


Results of confluence:
Total flow rate =  1167.763(CFS)
Time of concentration =  19.461 min.
Effective stream area after confluence  =    636.412(Ac.)
Study area average Pervious fraction(Ap) =  0.922
Study area average soil loss rate(Fm) =  0.215(In/Hr)
Study area total =  645.96(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      184.000 to Point/Station      190.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

E13

```
Estimated mean flow rate at midpoint of channel =   1167.797(CFS)
Depth of flow =   5.721(Ft.), Average velocity =  12.416(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =   1167.798(CFS)
   '      '    flow top width =     27.883(Ft.)
   '      '     velocity=   12.416(Ft/s)
   '      '    area =     94.056(Sq.Ft)
   '      '    Froude number =     1.191

Upstream point elevation =   705.000(Ft.)
Downstream point elevation =   665.000(Ft.)
Flow length =  1025.000(Ft.)
Travel time  =    1.38 min.
Time of concentration =   20.84 min.
Depth of flow =   5.721(Ft.)
Average velocity =  12.416(Ft/s)
Total irregular channel flow =  1167.797(CFS)
Irregular channel normal depth above invert elev. =   5.721(Ft.)
Average velocity of channel(s) =  12.416(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
```

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 80.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.200(In/Hr)
The area added to the existing stream with this TC
does not add flow per Para 6b, Page D-15 of the OCHM,
therefore the upstream flow rate of Q =   1167.763(CFS) is being used
Rainfall intensity =      2.151(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.810
Subarea runoff =      0.000(CFS) for   18.600(Ac.)
Total runoff =   1167.763(CFS)    Total area =      655.01(Ac.)
Area averaged Fm value =    0.214(In/Hr)
Depth of flow =   5.721(Ft.), Average velocity =  12.416(Ft/s)
End of computations, total study area =    677.18 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.924
Area averaged SCS curve number (AMC 2) =  74.7
```

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2004 Version 8.0
Rational Hydrology Study, Date: 12/12/12 File Name: 1200PROP10EG.roc

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ESPERANZA HILLS
PROPOSED CONDITION (ONSITE AND OFFSITE)
10-YEAR AREA G-E
R:\09\1200\PRELIM\REPORTS\HYDRO OPTION 1\RATIONAL\PROPOSED\1200PROP10

Program License Serial Number 6062

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 10.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

++

Process from Point/Station 10.000 to Point/Station 15.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 74.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.250(In/Hr)
Max Catchment Loss (Fm) = 0.250(In/Hr)
Initial subarea data:
Initial area flow distance = 300.000(Ft.)
Top (of initial area) elevation = 1780.000(Ft.)
Bottom (of initial area) elevation = 1670.000(Ft.)
Difference in elevation = 110.000(Ft.)
Slope = 0.36667 s(%)= 36.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.189 min.
Rainfall intensity = 2.559(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.812
Subarea runoff = 1.932(CFS)
Total initial stream area = 0.930(Ac.)

++

Process from Point/Station 15.000 to Point/Station 20.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

```
Estimated mean flow rate at midpoint of channel =      5.356(CFS)
Depth of flow =   0.204(Ft.), Average velocity =   4.853(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number     'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =      5.356(CFS)
   '      '    flow top width =      5.816(Ft.)
   '      '     velocity=    4.853(Ft/s)
   '      '    area =      1.104(Sq.Ft)
   '      '    Froude number =     1.963

Upstream point elevation =  1670.000(Ft.)
Downstream point elevation =  1590.000(Ft.)
Flow length =   320.000(Ft.)
Travel time  =    1.10 min.
Time of concentration =  12.29 min.
Depth of flow =   0.204(Ft.)
Average velocity =   4.853(Ft/s)
Total irregular channel flow =     5.356(CFS)
Irregular channel normal depth above invert elev. =   0.204(Ft.)
Average velocity of channel(s) =   4.853(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.425(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.807
Subarea runoff =      6.778(CFS) for    3.520(Ac.)
Total runoff =      8.711(CFS)    Total area =      4.45(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.272(Ft.), Average velocity =   5.779(Ft/s)


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Process from Point/Station      20.000 to Point/Station       25.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     13.664(CFS)
Depth of flow =   0.352(Ft.), Average velocity =   6.802(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number     'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
```

```
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =     13.664(CFS)
   '      '    flow top width =      6.409(Ft.)
   '      '     velocity=    6.802(Ft/s)
   '      '    area =      2.009(Sq.Ft)
   '      '    Froude number =     2.141

Upstream point elevation =  1590.000(Ft.)
Downstream point elevation =  1450.000(Ft.)
Flow length =   550.000(Ft.)
Travel time  =    1.35 min.
Time of concentration =   13.64 min.
Depth of flow =   0.352(Ft.)
Average velocity =   6.802(Ft/s)
Total irregular channel flow =    13.664(CFS)
Irregular channel normal depth above invert elev. =   0.352(Ft.)
Average velocity of channel(s) =   6.802(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.680
Decimal fraction soil group D = 0.320
SCS curve number for soil(AMC 2)  = 75.92
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=    0.234(In/Hr)
Max Catchment Loss (Fm) =     0.234(In/Hr)
Rainfall intensity =      2.285(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.805
Subarea runoff =      9.828(CFS) for    5.630(Ac.)
Total runoff =     18.539(CFS)    Total area =      10.08(Ac.)
Area averaged Fm value =    0.241(In/Hr)
Depth of flow =   0.421(Ft.), Average velocity =   7.546(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       25.000 to Point/Station       30.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_________________________________________________________________
Estimated mean flow rate at midpoint of channel =     29.063(CFS)
Depth of flow =   0.538(Ft.), Average velocity =   8.895(Ft/s)
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number     'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =  0.050
-----------------------------------------------------------------
Sub-Channel flow  =     29.063(CFS)
   '      '    flow top width =      7.151(Ft.)
   '      '     velocity=    8.895(Ft/s)
   '      '    area =      3.267(Sq.Ft)
```

```
'      '    Froude number =      2.319

Upstream point elevation =  1450.000(Ft.)
Downstream point elevation =  1290.000(Ft.)
Flow length =   600.000(Ft.)
Travel time  =    1.12 min.
Time of concentration =   14.76 min.
Depth of flow =   0.538(Ft.)
Average velocity =   8.895(Ft/s)
Total irregular channel flow =    29.063(CFS)
Irregular channel normal depth above invert elev. =   0.538(Ft.)
Average velocity of channel(s) =   8.895(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.500
SCS curve number for soil(AMC 2)  = 77.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.225(In/Hr)
Max Catchment Loss (Fm) =     0.225(In/Hr)
Rainfall intensity =      2.183(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.804
Subarea runoff =     20.987(CFS) for   12.430(Ac.)
Total runoff =     39.525(CFS)    Total area =     22.51(Ac.)
Area averaged Fm value =    0.232(In/Hr)
Depth of flow =   0.641(Ft.), Average velocity =   9.819(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       28.000 to Point/Station       30.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Time of concentration =   14.76 min.
Rainfall intensity =      2.183(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.802
Subarea runoff =     23.575(CFS) for   13.550(Ac.)
Total runoff =     63.101(CFS)    Total area =     36.06(Ac.)
Area averaged Fm value =    0.239(In/Hr)


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Process from Point/Station       30.000 to Point/Station       40.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    74.512(CFS)
Depth of flow =   1.104(Ft.), Average velocity =   9.360(Ft/s)
      ******* Irregular Channel Data ***********
```

```
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =  0.050
------------------------------------------------------------------
Sub-Channel flow  =     74.512(CFS)
  '     '    flow top width =      9.417(Ft.)
  '     '     velocity=    9.360(Ft/s)
  '     '    area =      7.961(Sq.Ft)
  '     '    Froude number =     1.794

Upstream point elevation =  1290.000(Ft.)
Downstream point elevation =  1170.000(Ft.)
Flow length =   900.000(Ft.)
Travel time  =    1.60 min.
Time of concentration =   16.36 min.
Depth of flow =   1.104(Ft.)
Average velocity =   9.360(Ft/s)
Total irregular channel flow =    74.512(CFS)
Irregular channel normal depth above invert elev. =   1.104(Ft.)
Average velocity of channel(s) =   9.360(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.680
Decimal fraction soil group D = 0.320
SCS curve number for soil(AMC 2)  = 75.92
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.234(In/Hr)
Max Catchment Loss (Fm) =     0.234(In/Hr)
Rainfall intensity =     2.058(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.796
Subarea runoff =    22.727(CFS) for  16.320(Ac.)
Total runoff =     85.828(CFS)    Total area =     52.38(Ac.)
Area averaged Fm value =    0.237(In/Hr)
Depth of flow =   1.192(Ft.), Average velocity =   9.753(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       40.000 to Point/Station       85.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1170.000(Ft.)
Downstream point/station elevation =  1162.000(Ft.)
Pipe length  =   198.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    85.828(CFS)
Nearest computed pipe diameter  =    33.00(In.)
Calculated individual pipe flow  =   85.828(CFS)
Normal flow depth in pipe =   22.48(In.)
Flow top width inside pipe =   30.76(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.92(Ft/s)
Travel time through pipe =    0.17 min.
```

```
Time of concentration (TC) =    16.53 min.

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       85.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     52.380(Ac.)
Runoff from this stream =     85.828(CFS)
Time of concentration =   16.53 min.
Rainfall intensity =     2.046(In/Hr)
Area averaged loss rate (Fm) =    0.2374(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       60.000 to Point/Station       70.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1655.000(Ft.)
Bottom (of initial area) elevation =  1550.000(Ft.)
Difference in elevation =   105.000(Ft.)
Slope =    0.35000  s(%)=      35.00
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.294 min.
Rainfall intensity =      2.545(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.812
Subarea runoff =     4.524(CFS)
Total initial stream area =        2.190(Ac.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       70.000 to Point/Station       75.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     10.808(CFS)
Depth of flow =   0.260(Ft.), Average velocity =   7.524(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
```

```
Sub-Channel flow  =     10.808(CFS)
  '     '    flow top width =      6.041(Ft.)
  '     '     velocity=    7.524(Ft/s)
  '     '    area =      1.437(Sq.Ft)
  '     '    Froude number =     2.719

Upstream point elevation =  1550.000(Ft.)
Downstream point elevation =  1340.000(Ft.)
Flow length =   470.000(Ft.)
Travel time  =    1.04 min.
Time of concentration =   12.34 min.
Depth of flow =   0.260(Ft.)
Average velocity =   7.524(Ft/s)
Total irregular channel flow =    10.808(CFS)
Irregular channel normal depth above invert elev. =   0.260(Ft.)
Average velocity of channel(s) =   7.524(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=    0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.420(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.807
Subarea runoff =     12.504(CFS) for    6.530(Ac.)
Total runoff =     17.028(CFS)    Total area =       8.72(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.340(Ft.), Average velocity =   8.823(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       75.000 to Point/Station      80.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    30.833(CFS)
Depth of flow =   0.600(Ft.), Average velocity =   8.296(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =     30.833(CFS)
  '     '    flow top width =      7.398(Ft.)
  '     '     velocity=    8.296(Ft/s)
  '     '    area =      3.717(Sq.Ft)
  '     '    Froude number =     2.063

Upstream point elevation =  1340.000(Ft.)
Downstream point elevation =  1180.000(Ft.)
```

```
Flow length =   780.000(Ft.)
Travel time  =    1.57 min.
Time of concentration =   13.90 min.
Depth of flow =   0.600(Ft.)
Average velocity =   8.296(Ft/s)
Total irregular channel flow =    30.833(CFS)
Irregular channel normal depth above invert elev. =   0.600(Ft.)
Average velocity of channel(s) =   8.296(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=    0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.259(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.800
Subarea runoff =     27.551(CFS) for   15.930(Ac.)
Total runoff =     44.579(CFS)    Total area =       24.65(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.739(Ft.), Average velocity =   9.320(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       80.000 to Point/Station       85.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1180.000(Ft.)
Downstream point/station elevation =  1162.000(Ft.)
Pipe length  =   165.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    44.579(CFS)
Nearest computed pipe diameter  =    21.00(In.)
Calculated individual pipe flow  =    44.579(CFS)
Normal flow depth in pipe =   14.90(In.)
Flow top width inside pipe =   19.07(In.)
Critical depth could not be calculated.
Pipe flow velocity =   24.43(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =    14.01 min.


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Process from Point/Station       60.000 to Point/Station       85.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     24.650(Ac.)
Runoff from this stream =     44.579(CFS)
Time of concentration =   14.01 min.
Rainfall intensity =     2.249(In/Hr)
Area averaged loss rate (Fm) =    0.2500(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm      Rainfall Intensity
```

```
 No.     (Ac.)    (CFS)        (min)  (In/Hr)      (In/Hr)


1      52.38     85.828      16.53     0.237       2.046
2      24.65     44.579      14.01     0.250       2.249
Qmax(1) =
         1.000 *     1.000 *     85.828) +
         0.899 *     1.000 *     44.579) + =     125.883
Qmax(2) =
         1.112 *     0.848 *     85.828) +
         1.000 *     1.000 *     44.579) + =     125.516

Total of 2 streams to confluence:
Flow rates before confluence point:
      85.828      44.579
Maximum flow rates at confluence using above data:
      125.883      125.516
Area of streams before confluence:
       52.380       24.650
Effective area values after confluence:
       77.030       69.064
Results of confluence:
Total flow rate =     125.883(CFS)
Time of concentration =    16.528 min.
Effective stream area after confluence =      77.030(Ac.)
Study area average Pervious fraction(Ap) =  1.000
Study area average soil loss rate(Fm) =     0.241(In/Hr)
Study area total (this main stream) =       77.03(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        85.000 to Point/Station      302.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1162.000(Ft.)
Downstream point/station elevation =  1100.000(Ft.)
Pipe length  =  1177.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =  125.883(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =   125.883(CFS)
Normal flow depth in pipe =   24.86(In.)
Flow top width inside pipe =  33.28(In.)
Critical depth could not be calculated.
Pipe flow velocity =     24.18(Ft/s)
Travel time through pipe =   0.81 min.
Time of concentration (TC) =    17.34 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        85.000 to Point/Station      302.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     77.030(Ac.)
Runoff from this stream =    125.883(CFS)
Time of concentration =   17.34 min.
Rainfall intensity =     1.991(In/Hr)
```

```
Area averaged loss rate (Fm) =    0.2414(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Program is now starting with Main Stream No. 2


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Process from Point/Station      300.000 to Point/Station      301.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.500
SCS curve number for soil(AMC 2)  = 72.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.225(In/Hr)
Max Catchment Loss (Fm) =     0.158(In/Hr)
Initial subarea data:
Initial area flow distance =   285.000(Ft.)
Top (of initial area) elevation =  1275.000(Ft.)
Bottom (of initial area) elevation =  1272.000(Ft.)
Difference in elevation =     3.000(Ft.)
Slope =    0.01053  s(%)=       1.05
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.446 min.
Rainfall intensity =      2.661(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.847
Subarea runoff =      1.735(CFS)
Total initial stream area =        0.770(Ac.)


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Process from Point/Station      301.000 to Point/Station      302.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1272.000(Ft.)
End of street segment elevation =  1115.300(Ft.)
Length of street segment   =  3270.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   8.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0130
 Manning's N from gutter to grade break =  0.0130
 Manning's N from grade break to crown =  0.0130
Estimated mean flow rate at midpoint of street =     24.541(CFS)
Depth of flow =   0.389(Ft.), Average velocity =   6.640(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  13.120(Ft.)
Flow velocity =   6.64(Ft/s)
Travel time =    8.21 min.     TC =   18.65  min.
 Adding area flow to street
```

```
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.880
Decimal fraction soil group D = 0.120
SCS curve number for soil(AMC 2)  = 69.72
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.244(In/Hr)
Max Catchment Loss (Fm) =     0.171(In/Hr)
Rainfall intensity =      1.909(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.820
Subarea runoff =     45.490(CFS) for   29.410(Ac.)
Total runoff =     47.226(CFS)    Total area =       30.18(Ac.)
Area averaged Fm value =    0.170(In/Hr)
Street flow at end of street =     47.226(CFS)
Half street flow at end of street =     23.613(CFS)
Depth of flow =   0.468(Ft.), Average velocity =   7.774(Ft/s)
Flow width (from curb towards crown)=  17.060(Ft.)


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Process from Point/Station      300.000 to Point/Station      302.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     30.180(Ac.)
Runoff from this stream =     47.226(CFS)
Time of concentration =   18.65 min.
Rainfall intensity =     1.909(In/Hr)
Area averaged loss rate (Fm) =    0.1705(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)      (min) (In/Hr)      (In/Hr)


1     77.03   125.883     17.34    0.241      1.991
2     30.18    47.226     18.65    0.170      1.909
Qmax(1) =
        1.000 *    1.000 *   125.883) +
        1.047 *    0.930 *    47.226) + =     171.843
Qmax(2) =
        0.953 *    1.000 *   125.883) +
        1.000 *    1.000 *    47.226) + =     167.237

Total of 2 main streams to confluence:
Flow rates before confluence point:
     126.883      48.226
Maximum flow rates at confluence using above data:
      171.843      167.237
Area of streams before confluence:
       77.030       30.180
Effective area values after confluence:
      105.084      107.210
```

```
Results of confluence:
Total flow rate =    171.843(CFS)
Time of concentration =    17.340 min.
Effective stream area after confluence  =    105.084(Ac.)
Study area average Pervious fraction(Ap) =  0.916
Study area average soil loss rate(Fm) =    0.221(In/Hr)
Study area total =    107.21(Ac.)


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Process from Point/Station      303.000 to Point/Station      304.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.140(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1275.200(Ft.)
Bottom (of initial area) elevation =  1272.500(Ft.)
Difference in elevation =     2.700(Ft.)
Slope =    0.00900  s(%)=       0.90
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.002 min.
Rainfall intensity =      2.584(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.851
Subarea runoff =      2.397(CFS)
Total initial stream area =        1.090(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      304.000 to Point/Station      302.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1272.500(Ft.)
End of street segment elevation =  1115.300(Ft.)
Length of street segment  =  2562.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   8.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0130
 Manning's N from gutter to grade break =  0.0130
 Manning's N from grade break to crown =  0.0130
Estimated mean flow rate at midpoint of street =     25.493(CFS)
Depth of flow =   0.380(Ft.), Average velocity =   7.363(Ft/s)
Streetflow hydraulics at midpoint of street travel:
```

```
Halfstreet flow width =  12.667(Ft.)
Flow velocity =   7.36(Ft/s)
Travel time =    5.80 min.     TC =   16.80  min.
 Adding area flow to street
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.680
Decimal fraction soil group D = 0.320
SCS curve number for soil(AMC 2)  = 70.92
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.234(In/Hr)
Max Catchment Loss (Fm) =     0.164(In/Hr)
Rainfall intensity =      2.027(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.828
Subarea runoff =     46.038(CFS) for   27.780(Ac.)
Total runoff =     48.435(CFS)     Total area =      28.87(Ac.)
Area averaged Fm value =    0.163(In/Hr)
Street flow at end of street =     48.435(CFS)
Half street flow at end of street =     24.218(CFS)
Depth of flow =   0.455(Ft.), Average velocity =   8.590(Ft/s)
Flow width (from curb towards crown)=  16.410(Ft.)


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Process from Point/Station      303.000 to Point/Station      302.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =     28.870(Ac.)
Runoff from this stream =     48.435(CFS)
Time of concentration =   16.80 min.
Rainfall intensity =     2.027(In/Hr)
Area averaged loss rate (Fm) =    0.1629(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)      (min) (In/Hr)      (In/Hr)


1     77.03   125.883     17.34    0.241      1.991
2     30.18    47.226     18.65    0.170      1.909
3     28.87    48.435     16.80    0.163      2.027
Qmax(1) =
         1.000 *    1.000 *   125.883) +
         1.047 *    0.930 *    47.226) +
         0.981 *    1.000 *    48.435) + =     219.335
Qmax(2) =
         0.953 *    1.000 *   125.883) +
         1.000 *    1.000 *    47.226) +
         0.937 *    1.000 *    48.435) + =     212.609
Qmax(3) =
         1.021 *    0.969 *   125.883) +
         1.068 *    0.901 *    47.226) +
         1.000 *    1.000 *    48.435) + =     218.363
```

```
Total of 3 main streams to confluence:
Flow rates before confluence point:
     126.883      48.226      49.435
Maximum flow rates at confluence using above data:
      219.335      212.609      218.363
Area of streams before confluence:
       77.030       30.180       28.870
Effective area values after confluence:
      133.954      136.080      130.692


Results of confluence:
Total flow rate =    219.335(CFS)
Time of concentration =   17.340 min.
Effective stream area after confluence  =    133.954(Ac.)
Study area average Pervious fraction(Ap) =  0.870
Study area average soil loss rate(Fm) =    0.209(In/Hr)
Study area total =     136.08(Ac.)


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Process from Point/Station     302.000 to Point/Station     132.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1100.000(Ft.)
Downstream point/station elevation =  1048.000(Ft.)
Pipe length  =   344.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   219.335(CFS)
Nearest computed pipe diameter  =   36.00(In.)
Calculated individual pipe flow  =   219.335(CFS)
Normal flow depth in pipe =   25.40(In.)
Flow top width inside pipe =   32.82(In.)
Critical depth could not be calculated.
Pipe flow velocity =     41.15(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =    17.48 min.


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Process from Point/Station      10.000 to Point/Station     132.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    133.954(Ac.)
Runoff from this stream =    219.335(CFS)
Time of concentration =   17.48 min.
Rainfall intensity =     1.982(In/Hr)
Area averaged loss rate (Fm) =    0.2090(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8698
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     100.000 to Point/Station     110.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
```

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1610.000(Ft.)
Bottom (of initial area) elevation =  1560.000(Ft.)
Difference in elevation =    50.000(Ft.)
Slope =    0.16667  s(%)=      16.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.101 min.
Rainfall intensity =      2.338(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.804
Subarea runoff =      5.148(CFS)
Total initial stream area =      2.740(Ac.)


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Process from Point/Station      110.000 to Point/Station      115.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     14.128(CFS)
Depth of flow =   0.348(Ft.), Average velocity =   7.127(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     14.128(CFS)
  '     '    flow top width =      6.392(Ft.)
  '     '     velocity=    7.127(Ft/s)
  '     '    area =      1.982(Sq.Ft)
  '     '    Froude number =     2.255

Upstream point elevation =  1560.000(Ft.)
Downstream point elevation =  1390.000(Ft.)
Flow length =   600.000(Ft.)
Travel time  =    1.40 min.
Time of concentration =   14.50 min.
Depth of flow =   0.348(Ft.)
Average velocity =   7.127(Ft/s)
Total irregular channel flow =    14.128(CFS)
Irregular channel normal depth above invert elev. =   0.348(Ft.)
Average velocity of channel(s) =   7.127(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.740
```

```
Decimal fraction soil group D = 0.260
SCS curve number for soil(AMC 2)  = 75.56
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.237(In/Hr)
Max Catchment Loss (Fm) =     0.237(In/Hr)
Rainfall intensity =      2.205(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.802
Subarea runoff =     17.866(CFS) for   10.270(Ac.)
Total runoff =     23.014(CFS)    Total area =      13.01(Ac.)
Area averaged Fm value =    0.240(In/Hr)
Depth of flow =   0.462(Ft.), Average velocity =   8.407(Ft/s)


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Process from Point/Station     115.000 to Point/Station     129.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     33.075(CFS)
Depth of flow =   0.611(Ft.), Average velocity =   8.703(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =     33.075(CFS)
  '     '    flow top width =      7.443(Ft.)
  '     '     velocity=    8.703(Ft/s)
  '     '    area =      3.800(Sq.Ft)
  '     '    Froude number =     2.146

Upstream point elevation =  1390.000(Ft.)
Downstream point elevation =  1180.000(Ft.)
Flow length =   950.000(Ft.)
Travel time  =    1.82 min.
Time of concentration =   16.32 min.
Depth of flow =   0.611(Ft.)
Average velocity =   8.703(Ft/s)
Total irregular channel flow =    33.075(CFS)
Irregular channel normal depth above invert elev. =   0.611(Ft.)
Average velocity of channel(s) =   8.703(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.840
Decimal fraction soil group D = 0.160
SCS curve number for soil(AMC 2)  = 74.96
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.242(In/Hr)
Max Catchment Loss (Fm) =     0.242(In/Hr)
Rainfall intensity =      2.061(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.795
Subarea runoff =     20.065(CFS) for   13.290(Ac.)
```

```
Total runoff =     43.079(CFS)     Total area =      26.30(Ac.)
Area averaged Fm value =    0.241(In/Hr)
Depth of flow =   0.709(Ft.), Average velocity =   9.461(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      129.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     26.300(Ac.)
Runoff from this stream =     43.079(CFS)
Time of concentration =   16.32 min.
Rainfall intensity =     2.061(In/Hr)
Area averaged loss rate (Fm) =    0.2409(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


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Process from Point/Station      122.000 to Point/Station      124.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1615.000(Ft.)
Bottom (of initial area) elevation =  1495.000(Ft.)
Difference in elevation =   120.000(Ft.)
Slope =    0.40000  s(%)=      40.00
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.996 min.
Rainfall intensity =      2.584(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.813
Subarea runoff =      2.647(CFS)
Total initial stream area =        1.260(Ac.)


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Process from Point/Station      124.000 to Point/Station      126.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      5.879(CFS)
Depth of flow =   0.210(Ft.), Average velocity =   5.175(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number     'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
```

```
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow =     5.879(CFS)
   '      '    flow top width =      5.839(Ft.)
   '      '    velocity=    5.175(Ft/s)
   '      '    area =      1.136(Sq.Ft)
   '      '    Froude number =     2.067

Upstream point elevation =  1495.000(Ft.)
Downstream point elevation =  1385.000(Ft.)
Flow length =   400.000(Ft.)
Travel time  =    1.29 min.
Time of concentration =   12.28 min.
Depth of flow =   0.210(Ft.)
Average velocity =   5.175(Ft/s)
Total irregular channel flow =     5.879(CFS)
Irregular channel normal depth above invert elev. =    0.210(Ft.)
Average velocity of channel(s) =   5.175(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.425(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.807
Subarea runoff =      6.379(CFS) for    3.350(Ac.)
Total runoff =      9.026(CFS)    Total area =       4.61(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.270(Ft.), Average velocity =   6.035(Ft/s)


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Process from Point/Station     125.000 to Point/Station     126.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Time of concentration =    12.28 min.
Rainfall intensity =     2.425(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.807
Subarea runoff =     13.372(CFS) for    6.830(Ac.)
Total runoff =     22.398(CFS)    Total area =      11.44(Ac.)
Area averaged Fm value =    0.250(In/Hr)


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Process from Point/Station      126.000 to Point/Station      128.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    32.000(CFS)
Depth of flow =   0.627(Ft.), Average velocity =   8.163(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =     32.000(CFS)
  '     '   flow top width =      7.507(Ft.)
  '     '    velocity=    8.163(Ft/s)
  '     '   area =      3.920(Sq.Ft)
  '     '   Froude number =     1.991

Upstream point elevation =  1385.000(Ft.)
Downstream point elevation =  1300.000(Ft.)
Flow length =   450.000(Ft.)
Travel time  =    0.92 min.
Time of concentration =   13.20 min.
Depth of flow =   0.627(Ft.)
Average velocity =   8.163(Ft/s)
Total irregular channel flow =    32.000(CFS)
Irregular channel normal depth above invert elev. =   0.627(Ft.)
Average velocity of channel(s) =   8.163(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=    0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.327(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.803
Subarea runoff =     19.142(CFS) for   10.780(Ac.)
Total runoff =     41.540(CFS)    Total area =       22.22(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.726(Ft.), Average velocity =   8.862(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      128.000 to Point/Station      129.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    55.030(CFS)
Depth of flow =   0.837(Ft.), Average velocity =   9.857(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
```

```
Point number      'X' coordinate      'Y' coordinate
     1               0.00               50.00
     2             100.00                0.00
     3             105.00                0.00
     4             205.00               50.00
Manning's 'N' friction factor =  0.050
-----------------------------------------------------------------
Sub-Channel flow  =     55.030(CFS)
  '     '    flow top width =      8.346(Ft.)
  '     '     velocity=    9.857(Ft/s)
  '     '    area =      5.583(Sq.Ft)
  '     '    Froude number =     2.124

Upstream point elevation =  1300.000(Ft.)
Downstream point elevation =  1180.000(Ft.)
Flow length =   600.000(Ft.)
Travel time  =    1.01 min.
Time of concentration =   14.22 min.
Depth of flow =   0.837(Ft.)
Average velocity =   9.857(Ft/s)
Total irregular channel flow =    55.030(CFS)
Irregular channel normal depth above invert elev. =   0.837(Ft.)
Average velocity of channel(s) =   9.857(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.231(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.799
Subarea runoff =     26.926(CFS) for   16.190(Ac.)
Total runoff =     68.465(CFS)     Total area =      38.41(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =  0.944(Ft.), Average velocity =  10.529(Ft/s)


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Process from Point/Station      122.000 to Point/Station      129.000
**** CONFLUENCE OF MINOR STREAMS ****
_________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =    38.410(Ac.)
Runoff from this stream =     68.465(CFS)
Time of concentration =   14.22 min.
Rainfall intensity =    2.231(In/Hr)
Area averaged loss rate (Fm) =    0.2500(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)
```

```
1      26.30     43.079      16.32     0.241       2.061
2      38.41     68.465      14.22     0.250       2.231
Qmax(1) =
         1.000 *     1.000 *     43.079) +
         0.914 *     1.000 *     68.465) + =      105.678
Qmax(2) =
         1.093 *     0.871 *     43.079) +
         1.000 *     1.000 *     68.465) + =      109.486

Total of 2 streams to confluence:
Flow rates before confluence point:
      43.079      68.465
Maximum flow rates at confluence using above data:
      105.678      109.486
Area of streams before confluence:
       26.300       38.410
Effective area values after confluence:
       64.710       61.318
Results of confluence:
Total flow rate =    109.486(CFS)
Time of concentration =    14.218 min.
Effective stream area after confluence =     61.318(Ac.)
Study area average Pervious fraction(Ap) =  1.000
Study area average soil loss rate(Fm) =    0.246(In/Hr)
Study area total (this main stream) =     64.71(Ac.)


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Process from Point/Station      129.000 to Point/Station      130.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    150.155(CFS)
Depth of flow =   1.917(Ft.), Average velocity =   8.869(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =    150.155(CFS)
  '     '    flow top width =     12.667(Ft.)
  '     '     velocity=    8.869(Ft/s)
  '     '    area =     16.931(Sq.Ft)
  '     '    Froude number =     1.352

Upstream point elevation =  1180.000(Ft.)
Downstream point elevation =  1056.000(Ft.)
Flow length =  1870.000(Ft.)
Travel time  =    3.51 min.
Time of concentration =   17.73 min.
Depth of flow =   1.917(Ft.)
Average velocity =   8.869(Ft/s)
Total irregular channel flow =   150.155(CFS)
Irregular channel normal depth above invert elev. =   1.917(Ft.)
```

```
Average velocity of channel(s) =   8.869(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.940
Decimal fraction soil group D = 0.060
SCS curve number for soil(AMC 2)  = 74.36
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.247(In/Hr)
Max Catchment Loss (Fm) =     0.247(In/Hr)
Rainfall intensity =      1.965(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.787
Subarea runoff =     81.268(CFS) for   62.000(Ac.)
Total runoff =    190.754(CFS)    Total area =      123.32(Ac.)
Area averaged Fm value =    0.247(In/Hr)
Depth of flow =   2.162(Ft.), Average velocity =   9.461(Ft/s)


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Process from Point/Station      130.000 to Point/Station      132.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1050.000(Ft.)
Downstream point/station elevation =  1048.000(Ft.)
Pipe length  =   500.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   190.754(CFS)
Nearest computed pipe diameter  =     66.00(In.)
Calculated individual pipe flow  =  190.754(CFS)
Normal flow depth in pipe =   48.87(In.)
Flow top width inside pipe =   57.87(In.)
Critical Depth =   46.35(In.)
Pipe flow velocity =     10.11(Ft/s)
Travel time through pipe =    0.82 min.
Time of concentration (TC) =    18.56 min.


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Process from Point/Station      130.000 to Point/Station      132.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =    123.318(Ac.)
Runoff from this stream =    190.754(CFS)
Time of concentration =   18.56 min.
Rainfall intensity =     1.915(In/Hr)
Area averaged loss rate (Fm) =    0.2466(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    133.95   219.335     17.48    0.209      1.982
2    123.32   190.754     18.56    0.247      1.915
Qmax(1) =
```

```
        1.000 *    1.000 *   219.335) +
        1.040 *    0.942 *   190.754) + =     406.207
Qmax(2) =
        0.962 *    1.000 *   219.335) +
        1.000 *    1.000 *   190.754) + =     401.832

Total of 2 main streams to confluence:
Flow rates before confluence point:
     220.335     191.754
Maximum flow rates at confluence using above data:
      406.207      401.832
Area of streams before confluence:
      133.954      123.318
Effective area values after confluence:
      250.116      257.272


Results of confluence:
Total flow rate =    406.207(CFS)
Time of concentration =    17.479 min.
Effective stream area after confluence  =    250.116(Ac.)
Study area average Pervious fraction(Ap) =  0.932
Study area average soil loss rate(Fm) =    0.227(In/Hr)
Study area total =     257.27(Ac.)


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Process from Point/Station      132.000 to Point/Station      305.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1048.000(Ft.)
Downstream point/station elevation =  1032.000(Ft.)
Pipe length  =  1025.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   406.207(CFS)
Nearest computed pipe diameter  =    66.00(In.)
Calculated individual pipe flow  =   406.207(CFS)
Normal flow depth in pipe =   52.30(In.)
Flow top width inside pipe =   53.54(In.)
Critical Depth =   62.52(In.)
Pipe flow velocity =     20.12(Ft/s)
Travel time through pipe =    0.85 min.
Time of concentration (TC) =    18.33 min.


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Process from Point/Station      132.000 to Point/Station      305.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
RESIDENTIAL(2.5 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.750
Decimal fraction soil group D = 0.250
SCS curve number for soil(AMC 2)  = 70.50
Pervious ratio(Ap) = 0.9000  Max loss rate(Fp)=     0.237(In/Hr)
Max Catchment Loss (Fm) =     0.214(In/Hr)
Time of concentration =   18.33 min.
Rainfall intensity =     1.928(In/Hr) for a    10.0 year storm
```

```
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.794
Subarea runoff =      5.094(CFS) for   18.340(Ac.)
Total runoff =    411.301(CFS)    Total area =     268.46(Ac.)
Area averaged Fm value =  0.226(In/Hr)


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Process from Point/Station       10.000 to Point/Station      305.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    268.456(Ac.)
Runoff from this stream =    411.301(CFS)
Time of concentration =   18.33 min.
Rainfall intensity =     1.928(In/Hr)
Area averaged loss rate (Fm) =    0.2261(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9300


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Process from Point/Station     306.000 to Point/Station      307.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=    0.250(In/Hr)
Max Catchment Loss (Fm) =    0.175(In/Hr)
Initial subarea data:
Initial area flow distance =   330.000(Ft.)
Top (of initial area) elevation =  1127.400(Ft.)
Bottom (of initial area) elevation =  1120.000(Ft.)
Difference in elevation =     7.400(Ft.)
Slope =    0.02242  s(%)=       2.24
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.522 min.
NOTE: Distance EXCEEDS recommended maximum value of   328.084(Ft.)
for this Development Type
Rainfall intensity =      2.807(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.844
Subarea runoff =      2.558(CFS)
Total initial stream area =       1.080(Ac.)


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Process from Point/Station      307.000 to Point/Station      305.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1120.000(Ft.)
End of street segment elevation =  1042.000(Ft.)
Length of street segment  =  1423.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
```

```
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   8.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     27.825(CFS)
Depth of flow =   0.411(Ft.), Average velocity =   6.459(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  14.239(Ft.)
Flow velocity =   6.46(Ft/s)
Travel time =    3.67 min.     TC =   13.19  min.
 Adding area flow to street
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.860
Decimal fraction soil group D = 0.140
SCS curve number for soil(AMC 2)  = 69.84
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.243(In/Hr)
Max Catchment Loss (Fm) =     0.170(In/Hr)
Rainfall intensity =      2.328(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.834
Subarea runoff =     50.421(CFS) for   26.200(Ac.)
Total runoff =     52.978(CFS)    Total area =      27.28(Ac.)
Area averaged Fm value =    0.170(In/Hr)
Street flow at end of street =     52.978(CFS)
Half street flow at end of street =     26.489(CFS)
Depth of flow =   0.493(Ft.), Average velocity =   7.613(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  18.000(Ft.)


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Process from Point/Station      306.000 to Point/Station      305.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     27.280(Ac.)
Runoff from this stream =     52.978(CFS)
Time of concentration =   13.19 min.
Rainfall intensity =     2.328(In/Hr)
Area averaged loss rate (Fm) =    0.1703(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm      Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    268.46   411.301     18.33    0.226      1.928
2     27.28    52.978     13.19    0.170      2.328
Qmax(1) =
```

```
         1.000 *    1.000 *   411.301) +
         0.815 *    1.000 *    52.978) + =     454.468
Qmax(2) =
         1.235 *    0.720 *   411.301) +
         1.000 *    1.000 *    52.978) + =     418.577

Total of 2 streams to confluence:
Flow rates before confluence point:
     411.301      52.978
Maximum flow rates at confluence using above data:
      454.468      418.577
Area of streams before confluence:
      268.456       27.280
Effective area values after confluence:
      295.736      220.538
Results of confluence:
Total flow rate =    454.468(CFS)
Time of concentration =    18.328 min.
Effective stream area after confluence =    295.736(Ac.)
Study area average Pervious fraction(Ap) =  0.909
Study area average soil loss rate(Fm) =    0.221(In/Hr)
Study area total (this main stream) =    295.74(Ac.)


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Process from Point/Station      305.000 to Point/Station      305.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.550
Decimal fraction soil group D = 0.450
SCS curve number for soil(AMC 2)  = 76.70
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.228(In/Hr)
Max Catchment Loss (Fm) =     0.228(In/Hr)
Time of concentration =    18.33 min.
Rainfall intensity =      1.928(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.797
Subarea runoff =     16.013(CFS) for   10.460(Ac.)
Total runoff =    470.481(CFS)     Total area =      306.20(Ac.)
Area averaged Fm value =    0.221(In/Hr)


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Process from Point/Station      305.000 to Point/Station      308.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1032.000(Ft.)
Downstream point/station elevation =   989.000(Ft.)
Pipe length  =   673.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =   470.481(CFS)
Nearest computed pipe diameter  =     57.00(In.)
Calculated individual pipe flow  =   470.481(CFS)
Normal flow depth in pipe =   44.15(In.)
Flow top width inside pipe =   47.63(In.)
Critical depth could not be calculated.
```

```
Pipe flow velocity =     31.94(Ft/s)
Travel time through pipe =    0.35 min.
Time of concentration (TC) =    18.68 min.


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Process from Point/Station      308.000 to Point/Station      308.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.640
Decimal fraction soil group D = 0.360
SCS curve number for soil(AMC 2)  = 76.16
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.232(In/Hr)
Max Catchment Loss (Fm) =     0.232(In/Hr)
The area added to the existing stream with this TC
does not add flow per Para 6b, Page D-15 of the OCHM,
therefore the upstream flow rate of Q =    470.481(CFS) is being used
Time of concentration =    18.68 min.
Rainfall intensity =     1.908(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.796
Subarea runoff =      0.000(CFS) for    3.350(Ac.)
Total runoff =    470.481(CFS)    Total area =      309.55(Ac.)
Area averaged Fm value =    0.221(In/Hr)


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Process from Point/Station      308.000 to Point/Station      308.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
PARK subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.850
Decimal fraction soil group D = 0.150
SCS curve number for soil(AMC 2)  = 69.90
Pervious ratio(Ap) = 0.8500  Max loss rate(Fp)=     0.242(In/Hr)
Max Catchment Loss (Fm) =     0.206(In/Hr)
Time of concentration =    18.68 min.
Rainfall intensity =     1.908(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.796
Subarea runoff =     10.162(CFS) for    7.090(Ac.)
Total runoff =    480.643(CFS)    Total area =      316.64(Ac.)
Area averaged Fm value =    0.221(In/Hr)


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Process from Point/Station      308.000 to Point/Station      312.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =   989.000(Ft.)
Downstream point/station elevation =   920.000(Ft.)
Pipe length  =  1587.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =   480.643(CFS)
```

```
Nearest computed pipe diameter  =     63.00(In.)
Calculated individual pipe flow  =   480.643(CFS)
Normal flow depth in pipe =   46.58(In.)
Flow top width inside pipe =   55.31(In.)
Critical depth could not be calculated.
Pipe flow velocity =     28.01(Ft/s)
Travel time through pipe =    0.94 min.
Time of concentration (TC) =    19.62 min.


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Process from Point/Station      308.000 to Point/Station      312.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.175(In/Hr)
The area added to the existing stream with this TC
does not add flow per Para 6b, Page D-15 of the OCHM,
therefore the upstream flow rate of Q =    480.643(CFS) is being used
Time of concentration =    19.62 min.
Rainfall intensity =      1.854(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.793
Subarea runoff =      0.000(CFS) for    8.010(Ac.)
Total runoff =    480.643(CFS)    Total area =      324.65(Ac.)
Area averaged Fm value =    0.220(In/Hr)


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Process from Point/Station      308.000 to Point/Station      312.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    324.646(Ac.)
Runoff from this stream =    480.643(CFS)
Time of concentration =   19.62 min.
Rainfall intensity =     1.854(In/Hr)
Area averaged loss rate (Fm) =    0.2199(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9062


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Process from Point/Station      309.000 to Point/Station      310.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.200(In/Hr)
```

```
Max Catchment Loss (Fm) =     0.140(In/Hr)
Initial subarea data:
Initial area flow distance =   330.000(Ft.)
Top (of initial area) elevation =  1077.000(Ft.)
Bottom (of initial area) elevation =  1070.000(Ft.)
Difference in elevation =     7.000(Ft.)
Slope =    0.02121  s(%)=       2.12
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.629 min.
NOTE: Distance EXCEEDS recommended maximum value of   328.084(Ft.)
for this Development Type
Rainfall intensity =      2.789(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.855
Subarea runoff =      3.051(CFS)
Total initial stream area =        1.280(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      310.000 to Point/Station     311.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
Top of street segment elevation =  1070.000(Ft.)
End of street segment elevation =   932.000(Ft.)
Length of street segment   =  1705.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =    0.020
Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =    8.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
Gutter width =    2.000(Ft.)
Gutter hike from flowline =   2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =    33.226(CFS)
Depth of flow =   0.409(Ft.), Average velocity =   7.815(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  14.139(Ft.)
Flow velocity =   7.82(Ft/s)
Travel time =    3.64 min.     TC =   13.26  min.
 Adding area flow to street
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.360
Decimal fraction soil group D = 0.640
SCS curve number for soil(AMC 2)  = 72.84
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.218(In/Hr)
Max Catchment Loss (Fm) =     0.153(In/Hr)
Rainfall intensity =      2.321(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.841
Subarea runoff =     60.214(CFS) for   31.130(Ac.)
Total runoff =     63.265(CFS)    Total area =     32.41(Ac.)
Area averaged Fm value =    0.152(In/Hr)
```

```
Street flow at end of street =    63.265(CFS)
Half street flow at end of street =    31.633(CFS)
Depth of flow =   0.491(Ft.), Average velocity =   9.187(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  18.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     311.000 to Point/Station     311.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.140(In/Hr)
Time of concentration =  13.26 min.
Rainfall intensity =      2.321(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.842
Subarea runoff =     17.921(CFS) for    9.130(Ac.)
Total runoff =     81.187(CFS)    Total area =      41.54(Ac.)
Area averaged Fm value =    0.149(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     311.000 to Point/Station     312.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =   922.000(Ft.)
Downstream point/station elevation =  920.000(Ft.)
Pipe length  =    50.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    81.187(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    81.187(CFS)
Normal flow depth in pipe =   24.31(In.)
Flow top width inside pipe =   23.52(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.05(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    13.31 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     309.000 to Point/Station     312.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     41.540(Ac.)
Runoff from this stream =     81.187(CFS)
Time of concentration =  13.31 min.
Rainfall intensity =     2.317(In/Hr)
Area averaged loss rate (Fm) =    0.1494(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7000
Summary of stream data:
```

```
Stream  Area  Flow rate      TC     Fm     Rainfall Intensity
 No.    (Ac.)   (CFS)      (min) (In/Hr)     (In/Hr)


1    324.65   480.643     19.62    0.220      1.854
2     41.54    81.187     13.31    0.149      2.317
Qmax(1) =
        1.000 *    1.000 *   480.643) +
        0.787 *    1.000 *    81.187) + =     544.515
Qmax(2) =
        1.283 *    0.678 *   480.643) +
        1.000 *    1.000 *    81.187) + =     499.312

Total of 2 streams to confluence:
Flow rates before confluence point:
     480.643      81.187
Maximum flow rates at confluence using above data:
      544.515      499.312
Area of streams before confluence:
      324.646       41.540
Effective area values after confluence:
      366.186      261.708
Results of confluence:
Total flow rate =    544.515(CFS)
Time of concentration =    19.624 min.
Effective stream area after confluence =    366.186(Ac.)
Study area average Pervious fraction(Ap) =  0.883
Study area average soil loss rate(Fm) =    0.212(In/Hr)
Study area total (this main stream) =     366.19(Ac.)


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Process from Point/Station      312.000 to Point/Station      184.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   920.000(Ft.)
Downstream point/station elevation =   705.000(Ft.)
Pipe length  = 1170.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =  544.515(CFS)
Nearest computed pipe diameter  =     48.00(In.)
Calculated individual pipe flow  =  544.515(CFS)
Normal flow depth in pipe =   35.08(In.)
Flow top width inside pipe =   42.57(In.)
Critical depth could not be calculated.
Pipe flow velocity =     55.33(Ft/s)
Travel time through pipe =    0.35 min.
Time of concentration (TC) =    19.98 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      312.000 to Point/Station      184.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    366.186(Ac.)
Runoff from this stream =    544.515(CFS)
```

```
Time of concentration =   19.98 min.
Rainfall intensity =     1.836(In/Hr)
Area averaged loss rate (Fm) =    0.2119(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8828
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      150.000 to Point/Station     160.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1575.000(Ft.)
Bottom (of initial area) elevation =  1350.000(Ft.)
Difference in elevation =   225.000(Ft.)
Slope =    0.75000  s(%)=      75.00
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.697 min.
Rainfall intensity =      2.777(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.819
Subarea runoff =      3.230(CFS)
Total initial stream area =        1.420(Ac.)


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Process from Point/Station      160.000 to Point/Station     162.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    10.822(CFS)
Depth of flow =   0.264(Ft.), Average velocity =   7.427(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------------
Sub-Channel flow  =     10.822(CFS)
  '     '   flow top width =      6.055(Ft.)
  '     '    velocity=    7.427(Ft/s)
  '     '   area =      1.457(Sq.Ft)
  '     '   Froude number =     2.668

Upstream point elevation =  1350.000(Ft.)
Downstream point elevation =  1200.000(Ft.)
Flow length =   350.000(Ft.)
```

```
Travel time  =    0.79 min.
Time of concentration =   10.48 min.
Depth of flow =   0.264(Ft.)
Average velocity =   7.427(Ft/s)
Total irregular channel flow =    10.822(CFS)
Irregular channel normal depth above invert elev. =   0.264(Ft.)
Average velocity of channel(s) =   7.427(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.960
Decimal fraction soil group D = 0.040
SCS curve number for soil(AMC 2)  = 74.24
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.248(In/Hr)
Max Catchment Loss (Fm) =     0.248(In/Hr)
Rainfall intensity =      2.656(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.816
Subarea runoff =     15.125(CFS) for    7.050(Ac.)
Total runoff =     18.355(CFS)    Total area =        8.47(Ac.)
Area averaged Fm value =    0.248(In/Hr)
Depth of flow =   0.359(Ft.), Average velocity =   8.932(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      162.000 to Point/Station      164.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     30.009(CFS)
Depth of flow =   0.564(Ft.), Average velocity =   8.674(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------
Sub-Channel flow  =     30.009(CFS)
  '      '   flow top width =     7.258(Ft.)
  '      '    velocity=    8.674(Ft/s)
  '      '   area =      3.460(Sq.Ft)
  '      '   Froude number =     2.214

Upstream point elevation =  1200.000(Ft.)
Downstream point elevation =  1020.000(Ft.)
Flow length =   750.000(Ft.)
Travel time  =    1.44 min.
Time of concentration =   11.92 min.
Depth of flow =   0.564(Ft.)
Average velocity =   8.674(Ft/s)
Total irregular channel flow =    30.009(CFS)
Irregular channel normal depth above invert elev. =   0.564(Ft.)
Average velocity of channel(s) =   8.674(Ft/s)
 Adding area flow to channel
```

```
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.660
Decimal fraction soil group D = 0.340
SCS curve number for soil(AMC 2)  = 76.04
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.233(In/Hr)
Max Catchment Loss (Fm) =     0.233(In/Hr)
Rainfall intensity =      2.467(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.813
Subarea runoff =     23.251(CFS) for   12.280(Ac.)
Total runoff =     41.606(CFS)    Total area =      20.75(Ac.)
Area averaged Fm value =    0.239(In/Hr)
Depth of flow =   0.680(Ft.), Average velocity =   9.626(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      163.000 to Point/Station      164.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.970
Decimal fraction soil group D = 0.030
SCS curve number for soil(AMC 2)  = 74.18
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.249(In/Hr)
Max Catchment Loss (Fm) =     0.249(In/Hr)
Time of concentration =    11.92 min.
Rainfall intensity =     2.467(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.811
Subarea runoff =     26.198(CFS) for   13.120(Ac.)
Total runoff =     67.804(CFS)    Total area =      33.87(Ac.)
Area averaged Fm value =    0.243(In/Hr)


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Process from Point/Station      164.000 to Point/Station      170.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     89.470(CFS)
Depth of flow =   1.350(Ft.), Average velocity =   8.609(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =     89.470(CFS)
  '     '   flow top width =    10.399(Ft.)
  '     '    velocity=    8.609(Ft/s)
  '     '   area =     10.393(Sq.Ft)
```

```
'      '    Froude number =     1.518

Upstream point elevation =  1020.000(Ft.)
Downstream point elevation =   920.000(Ft.)
Flow length =  1100.000(Ft.)
Travel time  =    2.13 min.
Time of concentration =   14.05 min.
Depth of flow =   1.350(Ft.)
Average velocity =   8.609(Ft/s)
Total irregular channel flow =    89.470(CFS)
Irregular channel normal depth above invert elev. =   1.350(Ft.)
Average velocity of channel(s) =   8.609(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.340
Decimal fraction soil group D = 0.660
SCS curve number for soil(AMC 2)  = 77.96
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.217(In/Hr)
Max Catchment Loss (Fm) =     0.217(In/Hr)
Rainfall intensity =      2.245(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.807
Subarea runoff =     43.282(CFS) for   27.410(Ac.)
Total runoff =    111.086(CFS)    Total area =       61.28(Ac.)
Area averaged Fm value =    0.231(In/Hr)
Depth of flow =   1.513(Ft.), Average velocity =   9.150(Ft/s)


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Process from Point/Station      168.000 to Point/Station      170.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.410
Decimal fraction soil group D = 0.590
SCS curve number for soil(AMC 2)  = 81.95
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.220(In/Hr)
Max Catchment Loss (Fm) =     0.220(In/Hr)
Time of concentration =    14.05 min.
Rainfall intensity =      2.245(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.809
Subarea runoff =     58.264(CFS) for   31.970(Ac.)
Total runoff =    169.350(CFS)    Total area =       93.25(Ac.)
Area averaged Fm value =    0.228(In/Hr)


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Process from Point/Station      170.000 to Point/Station      175.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    199.893(CFS)
Depth of flow =   2.313(Ft.), Average velocity =   8.978(Ft/s)
     ******* Irregular Channel Data ***********
```

```
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    199.893(CFS)
   '      '   flow top width =    14.252(Ft.)
   '      '    velocity=    8.978(Ft/s)
   '      '   area =     22.264(Sq.Ft)
   '      '   Froude number =     1.266

Upstream point elevation =   920.000(Ft.)
Downstream point elevation =   850.000(Ft.)
Flow length =  1260.000(Ft.)
Travel time  =    2.34 min.
Time of concentration =   16.39 min.
Depth of flow =   2.313(Ft.)
Average velocity =   8.978(Ft/s)
Total irregular channel flow =   199.893(CFS)
Irregular channel normal depth above invert elev. =   2.313(Ft.)
Average velocity of channel(s) =   8.978(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.120
Decimal fraction soil group D = 0.880
SCS curve number for soil(AMC 2)  = 79.28
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.206(In/Hr)
Max Catchment Loss (Fm) =     0.206(In/Hr)
Rainfall intensity =      2.056(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.803
Subarea runoff =     60.989(CFS) for   46.190(Ac.)
Total runoff =    230.338(CFS)    Total area =      139.44(Ac.)
Area averaged Fm value =    0.220(In/Hr)
Depth of flow =   2.480(Ft.), Average velocity =   9.323(Ft/s)


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Process from Point/Station      175.000 to Point/Station      180.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    261.559(CFS)
Depth of flow =   2.618(Ft.), Average velocity =   9.758(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
```

```
------------------------------------------------------------------
Sub-Channel flow  =    261.559(CFS)
  '      '   flow top width =     15.473(Ft.)
  '      '    velocity=    9.758(Ft/s)
  '      '   area =     26.803(Sq.Ft)
  '      '   Froude number =     1.307

Upstream point elevation =   850.000(Ft.)
Downstream point elevation =   730.000(Ft.)
Flow length =  2090.000(Ft.)
Travel time  =    3.57 min.
Time of concentration =   19.96 min.
Depth of flow =   2.618(Ft.)
Average velocity =   9.758(Ft/s)
Total irregular channel flow =   261.559(CFS)
Irregular channel normal depth above invert elev. =   2.618(Ft.)
Average velocity of channel(s) =   9.758(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.100
Decimal fraction soil group C = 0.130
Decimal fraction soil group D = 0.770
SCS curve number for soil(AMC 2)  = 77.32
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.217(In/Hr)
Max Catchment Loss (Fm) =     0.217(In/Hr)
Rainfall intensity =      1.836(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.793
Subarea runoff =     62.353(CFS) for   61.660(Ac.)
Total runoff =    292.692(CFS)    Total area =      201.10(Ac.)
Area averaged Fm value =    0.219(In/Hr)
Depth of flow =   2.765(Ft.), Average velocity =  10.051(Ft/s)


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Process from Point/Station      178.000 to Point/Station      180.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Time of concentration =    19.96 min.
Rainfall intensity =      1.836(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.790
Subarea runoff =     45.803(CFS) for   32.080(Ac.)
Total runoff =    338.494(CFS)    Total area =      233.18(Ac.)
Area averaged Fm value =    0.223(In/Hr)


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Process from Point/Station      180.000 to Point/Station      184.000
```

```
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    339.010(CFS)
Depth of flow =   3.133(Ft.), Average velocity =   9.606(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =    339.010(CFS)
  '      '   flow top width =     17.531(Ft.)
  '      '    velocity=    9.606(Ft/s)
  '      '   area =     35.291(Sq.Ft)
  '      '   Froude number =     1.193

Upstream point elevation =   730.000(Ft.)
Downstream point elevation =   705.000(Ft.)
Flow length =   546.000(Ft.)
Travel time  =    0.95 min.
Time of concentration =   20.91 min.
Depth of flow =   3.133(Ft.)
Average velocity =   9.606(Ft/s)
Total irregular channel flow =   339.010(CFS)
Irregular channel normal depth above invert elev. =   3.133(Ft.)
Average velocity of channel(s) =   9.606(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.600
Decimal fraction soil group D = 0.400
SCS curve number for soil(AMC 2)  = 76.40
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=    0.230(In/Hr)
Max Catchment Loss (Fm) =     0.230(In/Hr)
Rainfall intensity =      1.788(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.787
Subarea runoff =      0.947(CFS) for    7.880(Ac.)
Total runoff =    339.442(CFS)    Total area =     241.06(Ac.)
Area averaged Fm value =    0.224(In/Hr)
Depth of flow =   3.135(Ft.), Average velocity =   9.609(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      180.000 to Point/Station      184.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =    241.060(Ac.)
Runoff from this stream =    339.442(CFS)
Time of concentration =   20.91 min.
Rainfall intensity =     1.788(In/Hr)
```

```
Area averaged loss rate (Fm) =    0.2237(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      181.000 to Point/Station      182.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 61.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.300(In/Hr)
Max Catchment Loss (Fm) =     0.300(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1225.000(Ft.)
Bottom (of initial area) elevation =  1175.000(Ft.)
Difference in elevation =    50.000(Ft.)
Slope =    0.16667  s(%)=      16.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.101 min.
Rainfall intensity =      2.338(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.784
Subarea runoff =      2.384(CFS)
Total initial stream area =        1.300(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      182.000 to Point/Station      184.000
**** STREET INLET + AREA  + PIPE  TRAVEL TIME ****
----------------------------------------------------------------------
Top of street segment elevation =  1175.000(Ft.)
End of street segment elevation =   915.000(Ft.)
Length of street segment  =  2250.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  13.000(Ft.)
Distance from crown to crossfall grade break  =   5.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.017
Slope from grade break to crown (v/hz)  =   0.017
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   2.000(Ft.)
Slope from curb to property line (v/hz) =   0.017
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
No street inlet installed at this point
Estimated mean flow rate at midpoint of street =     32.701(CFS)
Depth of flow =   0.374(Ft.), Average velocity =   8.937(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  13.000(Ft.)
Flow velocity =   8.94(Ft/s)
```

```
Travel time =    4.20 min.     TC =   17.30  min.
 Adding area flow to street
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.290
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.710
SCS curve number for soil(AMC 2)  = 69.49
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=     0.229(In/Hr)
Max Catchment Loss (Fm) =     0.183(In/Hr)
Rainfall intensity =     1.994(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.816
Subarea runoff =     60.469(CFS) for   37.360(Ac.)
Total runoff =     62.853(CFS)    Total area =     38.66(Ac.)
Area averaged Fm value =    0.187(In/Hr)
Street flow at end of street =     62.853(CFS)
Half street flow at end of street =     31.427(CFS)
Depth of flow =   0.442(Ft.), Average velocity =  11.583(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  13.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      183.000 to Point/Station      184.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =     38.660(Ac.)
Runoff from this stream =     62.853(CFS)
Time of concentration =   17.30 min.
Rainfall intensity =     1.994(In/Hr)
Area averaged loss rate (Fm) =    0.1871(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8067
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    366.19   544.515     19.98    0.212      1.836
2    241.06   339.442     20.91    0.224      1.788
3     38.66    62.853     17.30    0.187      1.994
Qmax(1) =
         1.000 *    1.000 *   544.515) +
         1.030 *    0.955 *   339.442) +
         0.913 *    1.000 *    62.853) + =     935.992
Qmax(2) =
         0.971 *    1.000 *   544.515) +
         1.000 *    1.000 *   339.442) +
         0.886 *    1.000 *    62.853) + =     923.773
Qmax(3) =
         1.097 *    0.866 *   544.515) +
         1.131 *    0.827 *   339.442) +
         1.000 *    1.000 *    62.853) + =     897.824

Total of 3 main streams to confluence:
```

```
Flow rates before confluence point:
     545.515     340.442      63.853
Maximum flow rates at confluence using above data:
      935.992      923.773      897.824
Area of streams before confluence:
      366.186      241.060       38.660
Effective area values after confluence:
      635.148      645.906      555.137


Results of confluence:
Total flow rate =    935.992(CFS)
Time of concentration =    19.976 min.
Effective stream area after confluence  =    635.148(Ac.)
Study area average Pervious fraction(Ap) =  0.922
Study area average soil loss rate(Fm) =    0.215(In/Hr)
Study area total =     645.91(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      184.000 to Point/Station      190.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    936.019(CFS)
Depth of flow =   5.186(Ft.), Average velocity =  11.740(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =    936.018(CFS)
   '      '    flow top width =     25.745(Ft.)
   '      '     velocity=   11.740(Ft/s)
   '      '    area =     79.726(Sq.Ft)
   '      '    Froude number =     1.176

Upstream point elevation =   705.000(Ft.)
Downstream point elevation =   665.000(Ft.)
Flow length =  1025.000(Ft.)
Travel time  =    1.46 min.
Time of concentration =   21.43 min.
Depth of flow =   5.186(Ft.)
Average velocity =  11.740(Ft/s)
Total irregular channel flow =   936.019(CFS)
Irregular channel normal depth above invert elev. =   5.186(Ft.)
Average velocity of channel(s) =  11.740(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 80.00
```

```
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.200(In/Hr)
The area added to the existing stream with this TC
does not add flow per Para 6b, Page D-15 of the OCHM,
therefore the upstream flow rate of Q =    935.992(CFS) is being used
Rainfall intensity =      1.763(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.791
Subarea runoff =      0.000(CFS) for   18.600(Ac.)
Total runoff =    935.992(CFS)    Total area =      653.75(Ac.)
Area averaged Fm value =    0.214(In/Hr)
Depth of flow =   5.186(Ft.), Average velocity =  11.740(Ft/s)
End of computations, total study area =       677.18 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.924
Area averaged SCS curve number (AMC 2) =  74.7
```

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2004 Version 8.0
Rational Hydrology Study, Date: 12/12/12 File Name: 1200PROP100DH.roc

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ESPERANZA HILLS
PROPOSED CONDITION (ONSITE AND OFFSITE)
100-YEAR AREA D-H
R:\09\1200\PRELIM\REPORTS\HYDRO OPTION 1\RATIONAL\PROPOSED\1200PROP100DH

Program License Serial Number 6062

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 100.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

++
Process from Point/Station 315.000 to Point/Station 316.000
**** INITIAL AREA EVALUATION ****

H1

RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2) = 75.00
Pervious ratio(Ap) = 0.7000 Max loss rate(Fp)= 0.200(In/Hr)
Max Catchment Loss (Fm) = 0.140(In/Hr)
Initial subarea data:
Initial area flow distance = 300.000(Ft.)
Top (of initial area) elevation = 996.200(Ft.)
Bottom (of initial area) elevation = 990.000(Ft.)
Difference in elevation = 6.200(Ft.)
Slope = 0.02067 s(%)= 2.07
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.317 min.
Rainfall intensity = 4.331(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.871
Subarea runoff = 2.716(CFS)
Total initial stream area = 0.720(Ac.)

++
Process from Point/Station 316.000 to Point/Station 317.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

H2

```
Top of street segment elevation =   990.000(Ft.)
End of street segment elevation =   833.000(Ft.)
Length of street segment  =  2624.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   8.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     93.083(CFS)
Depth of flow =   0.576(Ft.), Average velocity =   9.084(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    3.81(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  18.000(Ft.)
Flow velocity =   9.08(Ft/s)
Travel time =    4.81 min.    TC =   14.13  min.
 Adding area flow to street
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.750
Decimal fraction soil group D = 0.250
SCS curve number for soil(AMC 2)  = 70.50
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.237(In/Hr)
Max Catchment Loss (Fm) =     0.166(In/Hr)
Rainfall intensity =      3.412(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.856
Subarea runoff =    180.583(CFS) for   62.030(Ac.)
Total runoff =   183.299(CFS)    Total area =     62.75(Ac.)
Area averaged Fm value =    0.166(In/Hr)
Street flow at end of street =    183.299(CFS)
Half street flow at end of street =    91.650(CFS)
Depth of flow =   0.703(Ft.), Average velocity =  11.120(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =   10.14(Ft.)
Flow width (from curb towards crown)=  18.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      315.000 to Point/Station      317.000
**** CONFLUENCE OF MINOR STREAMS ****

----------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     62.750(Ac.)
Runoff from this stream =    183.299(CFS)
Time of concentration =   14.13 min.
Rainfall intensity =     3.412(In/Hr)
```

```
Area averaged loss rate (Fm) =    0.1659(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      210.000
**** INITIAL AREA EVALUATION ****
```

D1

```
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 79.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1515.000(Ft.)
Bottom (of initial area) elevation =  1370.000(Ft.)
Difference in elevation =   145.000(Ft.)
Slope =    0.48333  s(%)=      48.33
TC = k(0.706)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.995 min.
Rainfall intensity =      4.728(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.852
Subarea runoff =      3.668(CFS)
Total initial stream area =       0.910(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      210.000 to Point/Station      214.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

D2

```
Estimated mean flow rate at midpoint of channel =    11.991(CFS)
Depth of flow =   0.282(Ft.), Average velocity =   7.631(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     11.991(CFS)
  '     '    flow top width =      6.129(Ft.)
  '     '     velocity=    7.631(Ft/s)
  '     '    area =      1.571(Sq.Ft)
  '     '    Froude number =     2.656

Upstream point elevation =  1370.000(Ft.)
Downstream point elevation =  1245.000(Ft.)
Flow length =   300.000(Ft.)
Travel time  =    0.66 min.
Time of concentration =    8.65 min.
Depth of flow =   0.282(Ft.)
```

```
Average velocity =   7.631(Ft/s)
Total irregular channel flow =    11.991(CFS)
Irregular channel normal depth above invert elev. =   0.282(Ft.)
Average velocity of channel(s) =   7.631(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.580
Decimal fraction soil group D = 0.420
SCS curve number for soil(AMC 2)  = 81.10
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.229(In/Hr)
Max Catchment Loss (Fm) =     0.229(In/Hr)
Rainfall intensity =      4.520(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.854
Subarea runoff =     16.588(CFS) for    4.340(Ac.)
Total runoff =     20.256(CFS)    Total area =        5.25(Ac.)
Area averaged Fm value =    0.233(In/Hr)
Depth of flow =   0.384(Ft.), Average velocity =   9.153(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      214.000 to Point/Station      216.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                    D3
Estimated mean flow rate at midpoint of channel =     32.702(CFS)
Depth of flow =   0.651(Ft.), Average velocity =   7.972(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     32.702(CFS)
  '      '    flow top width =      7.604(Ft.)
  '      '     velocity=    7.972(Ft/s)
  '      '    area =      4.102(Sq.Ft)
  '      '    Froude number =     1.913

Upstream point elevation =  1245.000(Ft.)
Downstream point elevation =  1150.000(Ft.)
Flow length =   550.000(Ft.)
Travel time  =    1.15 min.
Time of concentration =    9.80 min.
Depth of flow =   0.651(Ft.)
Average velocity =   7.972(Ft/s)
Total irregular channel flow =    32.702(CFS)
Irregular channel normal depth above invert elev. =   0.651(Ft.)
Average velocity of channel(s) =   7.972(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
```

```
Decimal fraction soil group C = 0.730
Decimal fraction soil group D = 0.270
SCS curve number for soil(AMC 2)  = 80.35
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.236(In/Hr)
Max Catchment Loss (Fm) =     0.236(In/Hr)
Rainfall intensity =      4.208(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.850
Subarea runoff =     24.831(CFS) for    7.360(Ac.)
Total runoff =     45.087(CFS)     Total area =       12.61(Ac.)
Area averaged Fm value =    0.235(In/Hr)
Depth of flow =   0.780(Ft.), Average velocity =   8.813(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      216.000 to Point/Station      220.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                    D4
Estimated mean flow rate at midpoint of channel =     96.024(CFS)
Depth of flow =   1.123(Ft.), Average velocity =  11.804(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     96.024(CFS)
   '      '    flow top width =      9.491(Ft.)
   '      '     velocity=   11.804(Ft/s)
   '      '    area =      8.135(Sq.Ft)
   '      '    Froude number =     2.247

Upstream point elevation =  1150.000(Ft.)
Downstream point elevation =  1050.000(Ft.)
Flow length =   480.000(Ft.)
Travel time  =    0.68 min.
Time of concentration =   10.48 min.
Depth of flow =   1.123(Ft.)
Average velocity =  11.804(Ft/s)
Total irregular channel flow =    96.024(CFS)
Irregular channel normal depth above invert elev. =   1.123(Ft.)
Average velocity of channel(s) =  11.804(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.420
Decimal fraction soil group D = 0.580
SCS curve number for soil(AMC 2)  = 81.90
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.221(In/Hr)
Max Catchment Loss (Fm) =     0.221(In/Hr)
Rainfall intensity =      4.050(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.850
```

```
Subarea runoff =    101.781(CFS) for   30.060(Ac.)
Total runoff =    146.869(CFS)    Total area =       42.67(Ac.)
Area averaged Fm value =    0.225(In/Hr)
Depth of flow =   1.409(Ft.), Average velocity =  13.335(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      220.000 to Point/Station     230.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

D5

```
Estimated mean flow rate at midpoint of channel =    219.907(CFS)
Depth of flow =   2.303(Ft.), Average velocity =   9.941(Ft/s)
     ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------
Sub-Channel flow  =    219.906(CFS)
  '     '   flow top width =     14.212(Ft.)
  '     '    velocity=    9.941(Ft/s)
  '     '   area =     22.122(Sq.Ft)
  '     '   Froude number =     1.404

Upstream point elevation =  1050.000(Ft.)
Downstream point elevation =   920.000(Ft.)
Flow length =  1900.000(Ft.)
Travel time  =    3.19 min.
Time of concentration =   13.66 min.
Depth of flow =   2.303(Ft.)
Average velocity =   9.941(Ft/s)
Total irregular channel flow =   219.907(CFS)
Irregular channel normal depth above invert elev. =   2.303(Ft.)
Average velocity of channel(s) =   9.941(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.730
Decimal fraction soil group D = 0.270
SCS curve number for soil(AMC 2)  = 80.35
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.236(In/Hr)
Max Catchment Loss (Fm) =     0.236(In/Hr)
Rainfall intensity =      3.478(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.840
Subarea runoff =    146.012(CFS) for   57.570(Ac.)
Total runoff =    292.881(CFS)    Total area =     100.24(Ac.)
Area averaged Fm value =    0.232(In/Hr)
Depth of flow =   2.651(Ft.), Average velocity =  10.724(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      230.000 to Point/Station     317.000
```

```
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
-------------------------------------------------------------------------------
Upstream point/station elevation =   920.000(Ft.)
Downstream point/station elevation =   833.000(Ft.)
Pipe length  =  2810.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =   292.881(CFS)
Nearest computed pipe diameter  =    54.00(In.)
Calculated individual pipe flow  =   292.881(CFS)
Normal flow depth in pipe =   43.16(In.)
Flow top width inside pipe =   43.26(In.)
Critical depth could not be calculated.
Pipe flow velocity =     21.49(Ft/s)
Travel time through pipe =    2.18 min.
Time of concentration (TC) =    15.84 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      317.000
**** CONFLUENCE OF MINOR STREAMS ****
-------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =    100.240(Ac.)
Runoff from this stream =    292.881(CFS)
Time of concentration =   15.84 min.
Rainfall intensity =     3.195(In/Hr)
Area averaged loss rate (Fm) =    0.2316(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     62.75   183.299     14.13    0.166      3.412
2    100.24   292.881     15.84    0.232      3.195
Qmax(1) =
         1.000 *    1.000 *   183.299) +
         1.073 *    0.892 *   292.881) + =     463.609
Qmax(2) =
         0.933 *    1.000 *   183.299) +
         1.000 *    1.000 *   292.881) + =     463.964

Total of 2 streams to confluence:
Flow rates before confluence point:
     183.299     292.881
Maximum flow rates at confluence using above data:
      463.609      463.964
Area of streams before confluence:
       62.750      100.240
Effective area values after confluence:
      152.162      162.990
Results of confluence:
Total flow rate =    463.964(CFS)
Time of concentration =    15.842 min.
Effective stream area after confluence =    162.990(Ac.)
Study area average Pervious fraction(Ap) =  0.885
Study area average soil loss rate(Fm) =    0.206(In/Hr)
Study area total (this main stream) =     162.99(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      317.000 to Point/Station      314.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =    827.000(Ft.)
Downstream point/station elevation =    812.000(Ft.)
Pipe length  =    326.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    463.964(CFS)
Nearest computed pipe diameter  =     57.00(In.)
Calculated individual pipe flow  =    463.964(CFS)
Normal flow depth in pipe =    44.45(In.)
Flow top width inside pipe =    47.24(In.)
Critical depth could not be calculated.
Pipe flow velocity =     31.29(Ft/s)
Travel time through pipe =     0.17 min.
Time of concentration (TC) =     16.02 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      312.000 to Point/Station      314.000
**** SUBAREA FLOW ADDITION ****                                    H3
------------------------------------------------------------------------
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.050
Decimal fraction soil group D = 0.950
SCS curve number for soil(AMC 2)  = 74.70
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=     0.203(In/Hr)
Max Catchment Loss (Fm) =     0.162(In/Hr)
Time of concentration =     16.02 min.
Rainfall intensity =      3.175(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.844
Subarea runoff =     56.892(CFS) for   31.460(Ac.)
Total runoff =    520.856(CFS)    Total area =     194.45(Ac.)
Area averaged Fm value =    0.199(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      314.000 to Point/Station      333.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =    812.000(Ft.)
Downstream point/station elevation =    705.000(Ft.)
Pipe length  =    890.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    520.856(CFS)
Nearest computed pipe diameter  =     51.00(In.)
Calculated individual pipe flow  =    520.856(CFS)
Normal flow depth in pipe =    37.46(In.)
Flow top width inside pipe =    45.04(In.)
Critical depth could not be calculated.
Pipe flow velocity =     46.63(Ft/s)
Travel time through pipe =     0.32 min.
Time of concentration (TC) =     16.33 min.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      314.000 to Point/Station      333.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     194.450(Ac.)
Runoff from this stream =     520.856(CFS)
Time of concentration =    16.33 min.
Rainfall intensity =      3.140(In/Hr)
Area averaged loss rate (Fm) =     0.1992(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8708


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      330.000 to Point/Station      331.000
**** INITIAL AREA EVALUATION ****                                  H4
------------------------------------------------------------------------
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.200(In/Hr)
Initial subarea data:
Initial area flow distance =    260.000(Ft.)
Top (of initial area) elevation =    888.000(Ft.)
Bottom (of initial area) elevation =    868.000(Ft.)
Difference in elevation =     20.000(Ft.)
Slope =    0.07692  s(%)=      7.69
TC = k(0.469)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =     7.244 min.
Rainfall intensity =      5.003(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.864
Subarea runoff =      2.680(CFS)
Total initial stream area =      0.620(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      331.000 to Point/Station      332.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
                                                                   H5
------------------------------------------------------------------------
Top of street segment elevation =    868.000(Ft.)
End of street segment elevation =    796.000(Ft.)
Length of street segment  =    710.000(Ft.)
Height of curb above gutter flowline  =     6.0(In.)
Width of half street (curb to crown)  =   18.000(Ft.)
Distance from crown to crossfall grade break  =   10.000(Ft.)
Slope from gutter to grade break (v/hz) =    0.020
Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =    8.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
Gutter width =    2.000(Ft.)
Gutter hike from flowline =   2.000(In.)
 Manning's N in gutter =  0.0150
```

```
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =    14.639(CFS)
Depth of flow =   0.318(Ft.), Average velocity =   7.033(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   9.561(Ft.)
Flow velocity =   7.03(Ft/s)
Travel time =    1.68 min.     TC =    8.93  min.
 Adding area flow to street
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.200(In/Hr)
Rainfall intensity =      4.439(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.859
Subarea runoff =     23.796(CFS) for    6.320(Ac.)
Total runoff =     26.477(CFS)    Total area =        6.94(Ac.)
Area averaged Fm value =    0.200(In/Hr)
Street flow at end of street =     26.477(CFS)
Half street flow at end of street =     13.238(CFS)
Depth of flow =   0.373(Ft.), Average velocity =   8.068(Ft/s)
Flow width (from curb towards crown)=  12.305(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      332.000 to Point/Station      333.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   788.000(Ft.)
Downstream point/station elevation =   705.000(Ft.)
Pipe length  = 1185.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    26.477(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    26.477(CFS)
Normal flow depth in pipe =   14.04(In.)
Flow top width inside pipe =   14.92(In.)
Critical depth could not be calculated.
Pipe flow velocity =    17.91(Ft/s)
Travel time through pipe =    1.10 min.
Time of concentration (TC) =    10.03 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      332.000 to Point/Station      333.000
**** SUBAREA FLOW ADDITION ****
                                                              HG
------------------------------------------------------------------------
PARK subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.8500  Max loss rate(Fp)=     0.250(In/Hr)
```

```
Max Catchment Loss (Fm) =     0.212(In/Hr)
Time of concentration =   10.03 min.
Rainfall intensity =     4.152(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.856
Subarea runoff =     14.201(CFS) for    4.510(Ac.)
Total runoff =     40.677(CFS)     Total area =     11.45(Ac.)
Area averaged Fm value =    0.205(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      332.000 to Point/Station      333.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     11.450(Ac.)
Runoff from this stream =     40.677(CFS)
Time of concentration =   10.03 min.
Rainfall intensity =     4.152(In/Hr)
Area averaged loss rate (Fm) =    0.2049(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8197
Summary of stream data:

Stream  Area  Flow rate      TC     Fm      Rainfall Intensity
 No.    (Ac.)  (CFS)        (min) (In/Hr)    (In/Hr)


1    194.45   520.856     16.33    0.199     3.140
2     11.45    40.677     10.03    0.205     4.152
Qmax(1) =
         1.000 *    1.000 *   520.856) +
         0.744 *    1.000 *    40.677) + =     551.100
Qmax(2) =
         1.344 *    0.614 *   520.856) +
         1.000 *    1.000 *    40.677) + =     470.589

Total of 2 streams to confluence:
Flow rates before confluence point:
     520.856      40.677
Maximum flow rates at confluence using above data:
      551.100      470.589
Area of streams before confluence:
      194.450       11.450
Effective area values after confluence:
      205.900      130.842
Results of confluence:
Total flow rate =     551.100(CFS)
Time of concentration =    16.334 min.
Effective stream area after confluence =     205.900(Ac.)
Study area average Pervious fraction(Ap) =  0.868
Study area average soil loss rate(Fm) =    0.199(In/Hr)
Study area total (this main stream) =     205.90(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      333.000 to Point/Station      335.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
```

```
Upstream point/station elevation =   705.000(Ft.)
Downstream point/station elevation =   660.000(Ft.)
Pipe length  =   115.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   551.100(CFS)
Nearest computed pipe diameter  =     42.00(In.)
Calculated individual pipe flow  =   551.100(CFS)
Normal flow depth in pipe =   30.45(In.)
Flow top width inside pipe =   37.50(In.)
Critical depth could not be calculated.
Pipe flow velocity =     73.76(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =   16.36 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      333.000 to Point/Station     335.000
**** SUBAREA FLOW ADDITION ****
```

H7

```
PARK subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.8500  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.212(In/Hr)
Time of concentration =    16.36 min.
Rainfall intensity =    3.137(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.843
Subarea runoff =     10.536(CFS) for    6.570(Ac.)
Total runoff =    561.636(CFS)    Total area =     212.47(Ac.)
Area averaged Fm value =    0.200(In/Hr)
End of computations, total study area =      212.47 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.867
Area averaged SCS curve number (AMC 2) =  75.9
```

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2004 Version 8.0
Rational Hydrology Study, Date: 12/12/12 File Name: 1200PROP25DH.roc

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ESPERANZA HILLS
PROPOSED CONDITION (ONSITE AND OFFSITE)
25-YEAR AREA D-H
R:\09\1200\PRELIM\REPORTS\HYDRO OPTION 1\RATIONAL\PROPOSED\1200PROP25DH

Program License Serial Number 6062

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 25.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

++
Process from Point/Station 315.000 to Point/Station 316.000
**** INITIAL AREA EVALUATION ****

H1

RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2) = 75.00
Pervious ratio(Ap) = 0.7000 Max loss rate(Fp)= 0.200(In/Hr)
Max Catchment Loss (Fm) = 0.140(In/Hr)
Initial subarea data:
Initial area flow distance = 300.000(Ft.)
Top (of initial area) elevation = 996.200(Ft.)
Bottom (of initial area) elevation = 990.000(Ft.)
Difference in elevation = 6.200(Ft.)
Slope = 0.02067 s(%)= 2.07
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.317 min.
Rainfall intensity = 3.392(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.863
Subarea runoff = 2.107(CFS)
Total initial stream area = 0.720(Ac.)

++
Process from Point/Station 316.000 to Point/Station 317.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

H2

```
Top of street segment elevation =   990.000(Ft.)
End of street segment elevation =   833.000(Ft.)
Length of street segment  =  2624.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =    0.020
Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   8.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     71.133(CFS)
Depth of flow =   0.530(Ft.), Average velocity =   8.520(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    1.51(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  18.000(Ft.)
Flow velocity =   8.52(Ft/s)
Travel time =   5.13 min.     TC =   14.45  min.
 Adding area flow to street
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.750
Decimal fraction soil group D = 0.250
SCS curve number for soil(AMC 2)  = 70.50
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.237(In/Hr)
Max Catchment Loss (Fm) =     0.166(In/Hr)
Rainfall intensity =      2.646(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.844
Subarea runoff =    137.928(CFS) for   62.030(Ac.)
Total runoff =    140.035(CFS)    Total area =    62.75(Ac.)
Area averaged Fm value =    0.166(In/Hr)
Street flow at end of street =    140.035(CFS)
Half street flow at end of street =    70.018(CFS)
Depth of flow =   0.654(Ft.), Average velocity =  10.027(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    7.72(Ft.)
Flow width (from curb towards crown)=  18.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      315.000 to Point/Station      317.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     62.750(Ac.)
Runoff from this stream =    140.035(CFS)
Time of concentration =  14.45 min.
Rainfall intensity =     2.646(In/Hr)
```

```
Area averaged loss rate (Fm) =    0.1659(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      210.000
**** INITIAL AREA EVALUATION ****
```

D1

```
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 79.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1515.000(Ft.)
Bottom (of initial area) elevation =  1370.000(Ft.)
Difference in elevation =   145.000(Ft.)
Slope =    0.48333  s(%)=      48.33
TC = k(0.706)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.995 min.
Rainfall intensity =      3.698(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.839
Subarea runoff =      2.824(CFS)
Total initial stream area =       0.910(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      210.000 to Point/Station      214.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

D2

```
Estimated mean flow rate at midpoint of channel =      9.233(CFS)
Depth of flow =   0.242(Ft.), Average velocity =   6.954(Ft/s)
     ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =      9.233(CFS)
  '     '    flow top width =      5.968(Ft.)
  '     '     velocity=    6.954(Ft/s)
  '     '    area =      1.328(Sq.Ft)
  '     '    Froude number =     2.599

Upstream point elevation =  1370.000(Ft.)
Downstream point elevation =  1245.000(Ft.)
Flow length =   300.000(Ft.)
Travel time  =    0.72 min.
Time of concentration =    8.71 min.
Depth of flow =   0.242(Ft.)
```

```
Average velocity =   6.954(Ft/s)
Total irregular channel flow =     9.233(CFS)
Irregular channel normal depth above invert elev. =   0.242(Ft.)
Average velocity of channel(s) =   6.954(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.580
Decimal fraction soil group D = 0.420
SCS curve number for soil(AMC 2)  = 81.10
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.229(In/Hr)
Max Catchment Loss (Fm) =     0.229(In/Hr)
Rainfall intensity =      3.522(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.841
Subarea runoff =     12.720(CFS) for    4.340(Ac.)
Total runoff =     15.544(CFS)    Total area =        5.25(Ac.)
Area averaged Fm value =    0.233(In/Hr)
Depth of flow =   0.329(Ft.), Average velocity =   8.356(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     214.000 to Point/Station      216.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                    D3
Estimated mean flow rate at midpoint of channel =     25.013(CFS)
Depth of flow =   0.559(Ft.), Average velocity =   7.316(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     25.013(CFS)
  '     '    flow top width =      7.235(Ft.)
  '     '     velocity=    7.316(Ft/s)
  '     '    area =      3.419(Sq.Ft)
  '     '    Froude number =     1.876

Upstream point elevation =  1245.000(Ft.)
Downstream point elevation =  1150.000(Ft.)
Flow length =   550.000(Ft.)
Travel time  =    1.25 min.
Time of concentration =    9.97 min.
Depth of flow =   0.559(Ft.)
Average velocity =   7.316(Ft/s)
Total irregular channel flow =    25.013(CFS)
Irregular channel normal depth above invert elev. =   0.559(Ft.)
Average velocity of channel(s) =   7.316(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
```

```
Decimal fraction soil group C = 0.730
Decimal fraction soil group D = 0.270
SCS curve number for soil(AMC 2)  = 80.35
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.236(In/Hr)
Max Catchment Loss (Fm) =     0.236(In/Hr)
Rainfall intensity =      3.265(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.835
Subarea runoff =     18.839(CFS) for    7.360(Ac.)
Total runoff =     34.384(CFS)    Total area =       12.61(Ac.)
Area averaged Fm value =    0.235(In/Hr)
Depth of flow =   0.670(Ft.), Average velocity =   8.099(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      216.000 to Point/Station      220.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

D4

```
Estimated mean flow rate at midpoint of channel =     73.119(CFS)
Depth of flow =   0.968(Ft.), Average velocity =  10.893(Ft/s)
      ******* Irregular Channel Data ***********
--------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
--------------------------------------------------------------------
Sub-Channel flow  =     73.119(CFS)
  '      '    flow top width =      8.871(Ft.)
  '      '     velocity=   10.893(Ft/s)
  '      '    area =      6.712(Sq.Ft)
  '      '    Froude number =     2.207

Upstream point elevation =  1150.000(Ft.)
Downstream point elevation =  1050.000(Ft.)
Flow length =   480.000(Ft.)
Travel time  =    0.73 min.
Time of concentration =   10.70 min.
Depth of flow =   0.968(Ft.)
Average velocity =  10.893(Ft/s)
Total irregular channel flow =    73.119(CFS)
Irregular channel normal depth above invert elev. =   0.968(Ft.)
Average velocity of channel(s) =  10.893(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.420
Decimal fraction soil group D = 0.580
SCS curve number for soil(AMC 2)  = 81.90
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.221(In/Hr)
Max Catchment Loss (Fm) =     0.221(In/Hr)
Rainfall intensity =      3.136(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.835
```

```
Subarea runoff =     77.395(CFS) for   30.060(Ac.)
Total runoff =    111.779(CFS)    Total area =       42.67(Ac.)
Area averaged Fm value =    0.225(In/Hr)
Depth of flow =   1.218(Ft.), Average velocity =  12.336(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      220.000 to Point/Station     230.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

D5

```
Estimated mean flow rate at midpoint of channel =    166.301(CFS)
Depth of flow =   2.002(Ft.), Average velocity =   9.222(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    166.301(CFS)
   '      '    flow top width =     13.010(Ft.)
   '      '     velocity=    9.222(Ft/s)
   '      '    area =     18.032(Sq.Ft)
   '      '    Froude number =     1.380

Upstream point elevation =  1050.000(Ft.)
Downstream point elevation =   920.000(Ft.)
Flow length =  1900.000(Ft.)
Travel time  =    3.43 min.
Time of concentration =   14.13 min.
Depth of flow =   2.002(Ft.)
Average velocity =   9.222(Ft/s)
Total irregular channel flow =   166.301(CFS)
Irregular channel normal depth above invert elev. =   2.002(Ft.)
Average velocity of channel(s) =   9.222(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.730
Decimal fraction soil group D = 0.270
SCS curve number for soil(AMC 2)  = 80.35
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.236(In/Hr)
Max Catchment Loss (Fm) =     0.236(In/Hr)
Rainfall intensity =      2.679(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.822
Subarea runoff =    108.993(CFS) for   57.570(Ac.)
Total runoff =    220.771(CFS)    Total area =      100.24(Ac.)
Area averaged Fm value =    0.232(In/Hr)
Depth of flow =   2.307(Ft.), Average velocity =   9.951(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      230.000 to Point/Station     317.000
```

```
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =    920.000(Ft.)
Downstream point/station elevation =    833.000(Ft.)
Pipe length  =  2810.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =    220.771(CFS)
Nearest computed pipe diameter  =     51.00(In.)
Calculated individual pipe flow  =    220.771(CFS)
Normal flow depth in pipe =   36.37(In.)
Flow top width inside pipe =   46.14(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.40(Ft/s)
Travel time through pipe =     2.30 min.
Time of concentration (TC) =     16.43 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      317.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     100.240(Ac.)
Runoff from this stream =     220.771(CFS)
Time of concentration =    16.43 min.
Rainfall intensity =     2.460(In/Hr)
Area averaged loss rate (Fm) =     0.2316(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     62.75   140.035     14.45    0.166      2.646
2    100.24   220.771     16.43    0.232      2.460
Qmax(1) =
         1.000 *    1.000 *   140.035) +
         1.083 *    0.879 *   220.771) + =     350.360
Qmax(2) =
         0.925 *    1.000 *   140.035) +
         1.000 *    1.000 *   220.771) + =     350.332

Total of 2 streams to confluence:
Flow rates before confluence point:
     140.035     220.771
Maximum flow rates at confluence using above data:
      350.360      350.332
Area of streams before confluence:
       62.750      100.240
Effective area values after confluence:
      150.909      162.990
Results of confluence:
Total flow rate =     350.360(CFS)
Time of concentration =     14.450 min.
Effective stream area after confluence =     150.909(Ac.)
Study area average Pervious fraction(Ap) =  0.885
Study area average soil loss rate(Fm) =     0.206(In/Hr)
Study area total (this main stream) =     162.99(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      317.000 to Point/Station      314.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =    827.000(Ft.)
Downstream point/station elevation =    812.000(Ft.)
Pipe length  =    326.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    350.360(CFS)
Nearest computed pipe diameter  =     51.00(In.)
Calculated individual pipe flow  =    350.360(CFS)
Normal flow depth in pipe =    40.38(In.)
Flow top width inside pipe =    41.42(In.)
Critical depth could not be calculated.
Pipe flow velocity =     29.09(Ft/s)
Travel time through pipe =     0.19 min.
Time of concentration (TC) =     14.64 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      312.000 to Point/Station      314.000
**** SUBAREA FLOW ADDITION ****                                  H3
------------------------------------------------------------------------
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.050
Decimal fraction soil group D = 0.950
SCS curve number for soil(AMC 2)  = 74.70
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=     0.203(In/Hr)
Max Catchment Loss (Fm) =     0.162(In/Hr)
Time of concentration =    14.64 min.
Rainfall intensity =     2.626(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.832
Subarea runoff =     48.100(CFS) for   31.460(Ac.)
Total runoff =    398.459(CFS)    Total area =     182.37(Ac.)
Area averaged Fm value =    0.199(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      314.000 to Point/Station      333.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =    812.000(Ft.)
Downstream point/station elevation =    705.000(Ft.)
Pipe length  =    890.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    398.459(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =    398.459(CFS)
Normal flow depth in pipe =    35.02(In.)
Flow top width inside pipe =    37.39(In.)
Critical depth could not be calculated.
Pipe flow velocity =     43.20(Ft/s)
Travel time through pipe =     0.34 min.
Time of concentration (TC) =     14.98 min.
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      314.000 to Point/Station      333.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     182.369(Ac.)
Runoff from this stream =     398.459(CFS)
Time of concentration =    14.98 min.
Rainfall intensity =      2.592(In/Hr)
Area averaged loss rate (Fm) =     0.1987(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8699


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      330.000 to Point/Station      331.000
**** INITIAL AREA EVALUATION ****
                                                                      H4
----------------------------------------------------------------------------
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.200(In/Hr)
Initial subarea data:
Initial area flow distance =    260.000(Ft.)
Top (of initial area) elevation =    888.000(Ft.)
Bottom (of initial area) elevation =    868.000(Ft.)
Difference in elevation =     20.000(Ft.)
Slope =    0.07692  s(%)=       7.69
TC = k(0.469)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =     7.244 min.
Rainfall intensity =      3.911(In/Hr) for a     25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.854
Subarea runoff =      2.071(CFS)
Total initial stream area =       0.620(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      331.000 to Point/Station      332.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
                                                                      H5
----------------------------------------------------------------------------
Top of street segment elevation =    868.000(Ft.)
End of street segment elevation =    796.000(Ft.)
Length of street segment  =    710.000(Ft.)
Height of curb above gutter flowline  =     6.0(In.)
Width of half street (curb to crown)  =   18.000(Ft.)
Distance from crown to crossfall grade break  =   10.000(Ft.)
Slope from gutter to grade break (v/hz) =    0.020
Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =    8.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
Gutter width =    2.000(Ft.)
Gutter hike from flowline =   2.000(In.)
 Manning's N in gutter =  0.0150
```

```
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =    11.290(CFS)
Depth of flow =   0.297(Ft.), Average velocity =   6.637(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   8.508(Ft.)
Flow velocity =   6.64(Ft/s)
Travel time =    1.78 min.     TC =    9.03  min.
 Adding area flow to street
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.200(In/Hr)
Rainfall intensity =      3.453(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.848
Subarea runoff =     18.247(CFS) for    6.320(Ac.)
Total runoff =     20.317(CFS)    Total area =       6.94(Ac.)
Area averaged Fm value =    0.200(In/Hr)
Street flow at end of street =     20.317(CFS)
Half street flow at end of street =     10.159(CFS)
Depth of flow =   0.347(Ft.), Average velocity =   7.582(Ft/s)
Flow width (from curb towards crown)=  11.014(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      332.000 to Point/Station      333.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   788.000(Ft.)
Downstream point/station elevation =   705.000(Ft.)
Pipe length  =  1185.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    20.317(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    20.317(CFS)
Normal flow depth in pipe =   11.42(In.)
Flow top width inside pipe =   17.33(In.)
Critical depth could not be calculated.
Pipe flow velocity =     17.18(Ft/s)
Travel time through pipe =    1.15 min.
Time of concentration (TC) =    10.18 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      332.000 to Point/Station      333.000
**** SUBAREA FLOW ADDITION ****                                    H6
------------------------------------------------------------------------
PARK subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.8500  Max loss rate(Fp)=     0.250(In/Hr)
```

```
Max Catchment Loss (Fm) =     0.212(In/Hr)
Time of concentration =    10.18 min.
Rainfall intensity =      3.226(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.843
Subarea runoff =     10.818(CFS) for    4.510(Ac.)
Total runoff =     31.135(CFS)     Total area =      11.45(Ac.)
Area averaged Fm value =    0.205(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      332.000 to Point/Station      333.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     11.450(Ac.)
Runoff from this stream =     31.135(CFS)
Time of concentration =   10.18 min.
Rainfall intensity =     3.226(In/Hr)
Area averaged loss rate (Fm) =    0.2049(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8197
Summary of stream data:

Stream  Area  Flow rate      TC     Fm      Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    182.37   398.459     14.98    0.199      2.592
2     11.45    31.135     10.18    0.205      3.226
Qmax(1) =
         1.000 *    1.000 *   398.459) +
         0.790 *    1.000 *    31.135) + =     423.060
Qmax(2) =
         1.265 *    0.679 *   398.459) +
         1.000 *    1.000 *    31.135) + =     373.536

Total of 2 streams to confluence:
Flow rates before confluence point:
     398.459      31.135
Maximum flow rates at confluence using above data:
      423.060      373.536
Area of streams before confluence:
      182.369       11.450
Effective area values after confluence:
      193.819      135.337
Results of confluence:
Total flow rate =    423.060(CFS)
Time of concentration =    14.980 min.
Effective stream area after confluence =    193.819(Ac.)
Study area average Pervious fraction(Ap) =  0.867
Study area average soil loss rate(Fm) =    0.199(In/Hr)
Study area total (this main stream) =     193.82(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      333.000 to Point/Station      335.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
```

```
Upstream point/station elevation =   705.000(Ft.)
Downstream point/station elevation =   660.000(Ft.)
Pipe length  =   115.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   423.060(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =   423.060(CFS)
Normal flow depth in pipe =   26.85(In.)
Flow top width inside pipe =   36.12(In.)
Critical depth could not be calculated.
Pipe flow velocity =     69.46(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =    15.01 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      333.000 to Point/Station      335.000
**** SUBAREA FLOW ADDITION ****
```

H·7

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PARK subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.8500  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.212(In/Hr)
Time of concentration =    15.01 min.
Rainfall intensity =     2.589(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.831
Subarea runoff =      7.964(CFS) for    6.570(Ac.)
Total runoff =    431.024(CFS)    Total area =     200.39(Ac.)
Area averaged Fm value =    0.200(In/Hr)
End of computations, total study area =      212.47 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.867
Area averaged SCS curve number (AMC 2) =  75.9
```

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2004 Version 8.0
Rational Hydrology Study, Date: 12/12/12 File Name: 1200PROP10DH.roc

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ESPERANZA HILLS
PROPOSED CONDITION (ONSITE AND OFFSITE)
10-YEAR AREA D-H
R:\09\1200\PRELIM\REPORTS\HYDRO OPTION 1\RATIONAL\PROPOSED\1200PROP10DH

Program License Serial Number 6062

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 10.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

++

Process from Point/Station 315.000 to Point/Station 316.000
**** INITIAL AREA EVALUATION ****

RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2) = 75.00
Pervious ratio(Ap) = 0.7000 Max loss rate(Fp)= 0.200(In/Hr)
Max Catchment Loss (Fm) = 0.140(In/Hr)
Initial subarea data:
Initial area flow distance = 300.000(Ft.)
Top (of initial area) elevation = 996.200(Ft.)
Bottom (of initial area) elevation = 990.000(Ft.)
Difference in elevation = 6.200(Ft.)
Slope = 0.02067 s(%)= 2.07
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.317 min.
Rainfall intensity = 2.842(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.856
Subarea runoff = 1.751(CFS)
Total initial stream area = 0.720(Ac.)

++

Process from Point/Station 316.000 to Point/Station 317.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

```
Top of street segment elevation =   990.000(Ft.)
End of street segment elevation =   833.000(Ft.)
Length of street segment  =  2624.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   8.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     58.013(CFS)
Depth of flow =   0.498(Ft.), Average velocity =   8.104(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  18.000(Ft.)
Flow velocity =   8.10(Ft/s)
Travel time =    5.40 min.     TC =   14.71  min.
 Adding area flow to street
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.750
Decimal fraction soil group D = 0.250
SCS curve number for soil(AMC 2)  = 70.50
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.237(In/Hr)
Max Catchment Loss (Fm) =     0.166(In/Hr)
Rainfall intensity =      2.187(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.832
Subarea runoff =    112.397(CFS) for   62.030(Ac.)
Total runoff =    114.148(CFS)    Total area =      62.75(Ac.)
Area averaged Fm value =    0.166(In/Hr)
Street flow at end of street =    114.148(CFS)
Half street flow at end of street =    57.074(CFS)
Depth of flow =   0.614(Ft.), Average velocity =   9.542(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    5.70(Ft.)
Flow width (from curb towards crown)=  18.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      315.000 to Point/Station      317.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     62.750(Ac.)
Runoff from this stream =    114.148(CFS)
Time of concentration =   14.71 min.
Rainfall intensity =     2.187(In/Hr)
Area averaged loss rate (Fm) =    0.1659(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7000
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      210.000
**** INITIAL AREA EVALUATION ****

------------------------------------------------------------------------
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 79.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1515.000(Ft.)
Bottom (of initial area) elevation =  1370.000(Ft.)
Difference in elevation =   145.000(Ft.)
Slope =    0.48333  s(%)=      48.33
TC = k(0.706)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.995 min.
Rainfall intensity =      3.102(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.827
Subarea runoff =      2.336(CFS)
Total initial stream area =        0.910(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      210.000 to Point/Station      214.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     7.614(CFS)
Depth of flow =   0.216(Ft.), Average velocity =   6.488(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =      7.614(CFS)
  '      '    flow top width =      5.864(Ft.)
  '      '     velocity=    6.488(Ft/s)
  '      '    area =      1.174(Sq.Ft)
  '      '    Froude number =     2.556

Upstream point elevation =  1370.000(Ft.)
Downstream point elevation =  1245.000(Ft.)
Flow length =   300.000(Ft.)
Travel time  =    0.77 min.
Time of concentration =    8.77 min.
Depth of flow =   0.216(Ft.)
Average velocity =   6.488(Ft/s)
Total irregular channel flow =     7.614(CFS)
```

```
Irregular channel normal depth above invert elev. =    0.216(Ft.)
Average velocity of channel(s) =    6.488(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.580
Decimal fraction soil group D = 0.420
SCS curve number for soil(AMC 2)  = 81.10
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.229(In/Hr)
Max Catchment Loss (Fm) =     0.229(In/Hr)
Rainfall intensity =      2.943(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.829
Subarea runoff =     10.470(CFS) for    4.340(Ac.)
Total runoff =     12.806(CFS)    Total area =        5.25(Ac.)
Area averaged Fm value =    0.233(In/Hr)
Depth of flow =   0.293(Ft.), Average velocity =   7.810(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      214.000 to Point/Station      216.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     20.510(CFS)
Depth of flow =   0.499(Ft.), Average velocity =   6.857(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     20.510(CFS)
  '     '    flow top width =      6.995(Ft.)
  '     '     velocity=    6.857(Ft/s)
  '     '    area =      2.991(Sq.Ft)
  '     '    Froude number =     1.848

Upstream point elevation =  1245.000(Ft.)
Downstream point elevation =  1150.000(Ft.)
Flow length =   550.000(Ft.)
Travel time  =    1.34 min.
Time of concentration =   10.10 min.
Depth of flow =   0.499(Ft.)
Average velocity =   6.857(Ft/s)
Total irregular channel flow =    20.510(CFS)
Irregular channel normal depth above invert elev. =   0.499(Ft.)
Average velocity of channel(s) =   6.857(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.730
Decimal fraction soil group D = 0.270
```

```
SCS curve number for soil(AMC 2)  = 80.35
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.236(In/Hr)
Max Catchment Loss (Fm) =     0.236(In/Hr)
Rainfall intensity =      2.713(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.822
Subarea runoff =     15.318(CFS) for    7.360(Ac.)
Total runoff =     28.124(CFS)    Total area =       12.61(Ac.)
Area averaged Fm value =    0.235(In/Hr)
Depth of flow =   0.597(Ft.), Average velocity =   7.598(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      216.000 to Point/Station      220.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     59.692(CFS)
Depth of flow =   0.865(Ft.), Average velocity =  10.248(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =     59.692(CFS)
  '     '   flow top width =      8.461(Ft.)
  '     '    velocity=   10.248(Ft/s)
  '     '   area =      5.825(Sq.Ft)
  '     '   Froude number =     2.177

Upstream point elevation =  1150.000(Ft.)
Downstream point elevation =  1050.000(Ft.)
Flow length =   480.000(Ft.)
Travel time  =    0.78 min.
Time of concentration =   10.88 min.
Depth of flow =   0.865(Ft.)
Average velocity =  10.248(Ft/s)
Total irregular channel flow =    59.692(CFS)
Irregular channel normal depth above invert elev. =   0.865(Ft.)
Average velocity of channel(s) =  10.248(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.420
Decimal fraction soil group D = 0.580
SCS curve number for soil(AMC 2)  = 81.90
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.221(In/Hr)
Max Catchment Loss (Fm) =     0.221(In/Hr)
Rainfall intensity =      2.600(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.822
Subarea runoff =     63.069(CFS) for   30.060(Ac.)
Total runoff =     91.194(CFS)    Total area =       42.67(Ac.)
```

```
Area averaged Fm value =     0.225(In/Hr)
Depth of flow =   1.092(Ft.), Average velocity =  11.628(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      220.000 to Point/Station      230.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    134.603(CFS)
Depth of flow =   1.798(Ft.), Average velocity =   8.707(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------------
Sub-Channel flow  =    134.603(CFS)
   '      '    flow top width =     12.193(Ft.)
   '      '     velocity=    8.707(Ft/s)
   '      '    area =     15.459(Sq.Ft)
   '      '    Froude number =     1.363

Upstream point elevation =  1050.000(Ft.)
Downstream point elevation =   920.000(Ft.)
Flow length =  1900.000(Ft.)
Travel time  =    3.64 min.
Time of concentration =   14.52 min.
Depth of flow =   1.798(Ft.)
Average velocity =   8.707(Ft/s)
Total irregular channel flow =   134.603(CFS)
Irregular channel normal depth above invert elev. =   1.798(Ft.)
Average velocity of channel(s) =   8.707(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.730
Decimal fraction soil group D = 0.270
SCS curve number for soil(AMC 2)  = 80.35
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.236(In/Hr)
Max Catchment Loss (Fm) =     0.236(In/Hr)
Rainfall intensity =      2.204(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.805
Subarea runoff =     86.731(CFS) for   57.570(Ac.)
Total runoff =    177.924(CFS)    Total area =      100.24(Ac.)
Area averaged Fm value =    0.232(In/Hr)
Depth of flow =   2.072(Ft.), Average velocity =   9.392(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      230.000 to Point/Station      317.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
```

```
Upstream point/station elevation =    920.000(Ft.)
Downstream point/station elevation =   833.000(Ft.)
Pipe length  =  2810.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =   177.924(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =   177.924(CFS)
Normal flow depth in pipe =   35.53(In.)
Flow top width inside pipe =   36.68(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.02(Ft/s)
Travel time through pipe =    2.46 min.
Time of concentration (TC) =    16.98 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      317.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =    100.240(Ac.)
Runoff from this stream =    177.924(CFS)
Time of concentration =   16.98 min.
Rainfall intensity =     2.015(In/Hr)
Area averaged loss rate (Fm) =    0.2316(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     62.75   114.148     14.71    0.166      2.187
2    100.24   177.924     16.98    0.232      2.015
Qmax(1) =
         1.000 *    1.000 *   114.148) +
         1.097 *    0.866 *   177.924) + =     283.221
Qmax(2) =
         0.915 *    1.000 *   114.148) +
         1.000 *    1.000 *   177.924) + =     282.330

Total of 2 streams to confluence:
Flow rates before confluence point:
     114.148     177.924
Maximum flow rates at confluence using above data:
      283.221      282.330
Area of streams before confluence:
       62.750      100.240
Effective area values after confluence:
      149.600      162.990
Results of confluence:
Total flow rate =    283.221(CFS)
Time of concentration =    14.714 min.
Effective stream area after confluence =    149.600(Ac.)
Study area average Pervious fraction(Ap) =  0.885
Study area average soil loss rate(Fm) =    0.206(In/Hr)
Study area total (this main stream) =     162.99(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      317.000 to Point/Station      314.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =   827.000(Ft.)
Downstream point/station elevation =   812.000(Ft.)
Pipe length  =   326.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   283.221(CFS)
Nearest computed pipe diameter  =    48.00(In.)
Calculated individual pipe flow  =   283.221(CFS)
Normal flow depth in pipe =   36.25(In.)
Flow top width inside pipe =   41.28(In.)
Critical depth could not be calculated.
Pipe flow velocity =     27.82(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =   14.91 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      312.000 to Point/Station      314.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.050
Decimal fraction soil group D = 0.950
SCS curve number for soil(AMC 2)  = 74.70
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=     0.203(In/Hr)
Max Catchment Loss (Fm) =     0.162(In/Hr)
Time of concentration =    14.91 min.
Rainfall intensity =      2.171(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.818
Subarea runoff =     38.133(CFS) for   31.460(Ac.)
Total runoff =    321.354(CFS)    Total area =      181.06(Ac.)
Area averaged Fm value =    0.199(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      314.000 to Point/Station      333.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =   812.000(Ft.)
Downstream point/station elevation =   705.000(Ft.)
Pipe length  =   890.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   321.354(CFS)
Nearest computed pipe diameter  =    42.00(In.)
Calculated individual pipe flow  =   321.354(CFS)
Normal flow depth in pipe =   31.78(In.)
Flow top width inside pipe =   36.05(In.)
Critical depth could not be calculated.
Pipe flow velocity =     41.14(Ft/s)
Travel time through pipe =    0.36 min.
Time of concentration (TC) =   15.27 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

```
Process from Point/Station      314.000 to Point/Station      333.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     181.060(Ac.)
Runoff from this stream =     321.354(CFS)
Time of concentration =    15.27 min.
Rainfall intensity =      2.141(In/Hr)
Area averaged loss rate (Fm) =     0.1986(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8698


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      330.000 to Point/Station      331.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.200(In/Hr)
Initial subarea data:
Initial area flow distance =    260.000(Ft.)
Top (of initial area) elevation =    888.000(Ft.)
Bottom (of initial area) elevation =    868.000(Ft.)
Difference in elevation =     20.000(Ft.)
Slope =    0.07692  s(%)=        7.69
TC = k(0.469)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =     7.244 min.
Rainfall intensity =      3.283(In/Hr) for a     10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.845
Subarea runoff =      1.720(CFS)
Total initial stream area =       0.620(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      331.000 to Point/Station      332.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
Top of street segment elevation =    868.000(Ft.)
End of street segment elevation =    796.000(Ft.)
Length of street segment  =    710.000(Ft.)
Height of curb above gutter flowline  =     6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =    0.020
Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =    8.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
Gutter width =    2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
```

```
Estimated mean flow rate at midpoint of street =      9.314(CFS)
Depth of flow =   0.282(Ft.), Average velocity =   6.367(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   7.777(Ft.)
Flow velocity =   6.37(Ft/s)
Travel time =    1.86 min.     TC =    9.10  min.
 Adding area flow to street
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.200(In/Hr)
Rainfall intensity =      2.880(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.838
Subarea runoff =     15.019(CFS) for    6.320(Ac.)
Total runoff =     16.739(CFS)    Total area =        6.94(Ac.)
Area averaged Fm value =    0.200(In/Hr)
Street flow at end of street =     16.739(CFS)
Half street flow at end of street =      8.370(CFS)
Depth of flow =   0.329(Ft.), Average velocity =   7.251(Ft/s)
Flow width (from curb towards crown)=  10.137(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      332.000 to Point/Station      333.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   788.000(Ft.)
Downstream point/station elevation =   705.000(Ft.)
Pipe length  =  1185.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    16.739(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    16.739(CFS)
Normal flow depth in pipe =   12.02(In.)
Flow top width inside pipe =   11.97(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.88(Ft/s)
Travel time through pipe =    1.24 min.
Time of concentration (TC) =    10.35 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      332.000 to Point/Station      333.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
PARK subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.8500  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.212(In/Hr)
Time of concentration =    10.35 min.
```

```
Rainfall intensity =      2.676(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.831
Subarea runoff =      8.727(CFS) for    4.510(Ac.)
Total runoff =     25.467(CFS)     Total area =       11.45(Ac.)
Area averaged Fm value =    0.205(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      332.000 to Point/Station      333.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     11.450(Ac.)
Runoff from this stream =     25.467(CFS)
Time of concentration =   10.35 min.
Rainfall intensity =     2.676(In/Hr)
Area averaged loss rate (Fm) =    0.2049(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8197
Summary of stream data:

Stream  Area  Flow rate      TC     Fm      Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    181.06   321.354     15.27    0.199      2.141
2     11.45    25.467     10.35    0.205      2.676
Qmax(1) =
         1.000 *    1.000 *   321.354) +
         0.783 *    1.000 *    25.467) + =     341.307
Qmax(2) =
         1.275 *    0.678 *   321.354) +
         1.000 *    1.000 *    25.467) + =     303.173

Total of 2 streams to confluence:
Flow rates before confluence point:
     321.354      25.467
Maximum flow rates at confluence using above data:
      341.307      303.173
Area of streams before confluence:
      181.060       11.450
Effective area values after confluence:
      192.510      134.128
Results of confluence:
Total flow rate =    341.307(CFS)
Time of concentration =    15.269 min.
Effective stream area after confluence =    192.510(Ac.)
Study area average Pervious fraction(Ap) =  0.867
Study area average soil loss rate(Fm) =    0.199(In/Hr)
Study area total (this main stream) =     192.51(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      333.000 to Point/Station      335.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   705.000(Ft.)
Downstream point/station elevation =   660.000(Ft.)
```

```
Pipe length  =   115.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   341.307(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =   341.307(CFS)
Normal flow depth in pipe =   24.76(In.)
Flow top width inside pipe =   33.36(In.)
Critical depth could not be calculated.
Pipe flow velocity =     65.84(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =    15.30 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      333.000 to Point/Station      335.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
PARK subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.8500  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.212(In/Hr)
Time of concentration =    15.30 min.
Rainfall intensity =      2.139(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.816
Subarea runoff =      6.176(CFS) for    6.570(Ac.)
Total runoff =    347.483(CFS)    Total area =      199.08(Ac.)
Area averaged Fm value =    0.199(In/Hr)
End of computations, total study area =          212.47 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.867
Area averaged SCS curve number (AMC 2) =  75.9
```

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2004 Version 8.0
Rational Hydrology Study, Date: 10/24/12 File Name: 1200PROP100J.roc

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ESPERANZA HILLS
PROPOSED CONDITION (ONSITE AND OFFSITE)
100-YEAR AREA J
R:\09\1200\PRELIM\REPORTS\HYDRO OPTION 1\RATIONAL\PROPOSED\1200PROP100J

Program License Serial Number 6062

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 100.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

++

Process from Point/Station 317.000 to Point/Station 314.000
**** INITIAL AREA EVALUATION ****

J1

RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2) = 75.00
Pervious ratio(Ap) = 0.8000 Max loss rate(Fp)= 0.200(In/Hr)
Max Catchment Loss (Fm) = 0.160(In/Hr)
Initial subarea data:
Initial area flow distance = 326.000(Ft.)
Top (of initial area) elevation = 833.000(Ft.)
Bottom (of initial area) elevation = 820.000(Ft.)
Difference in elevation = 13.000(Ft.)
Slope = 0.03988 s(%)= 3.99
TC = k(0.469)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.043 min.
Rainfall intensity = 4.406(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.867
Subarea runoff = 2.637(CFS)
Total initial stream area = 0.690(Ac.)

++

Process from Point/Station 314.000 to Point/Station 340.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

J2

```
Top of street segment elevation =   820.000(Ft.)
End of street segment elevation =   670.000(Ft.)
Length of street segment  =  2345.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  14.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   5.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     20.523(CFS)
Depth of flow =   0.370(Ft.), Average velocity =   6.371(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  12.182(Ft.)
Flow velocity =   6.37(Ft/s)
Travel time =    6.13 min.     TC =   15.18  min.
 Adding area flow to street
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.850
Decimal fraction soil group D = 0.150
SCS curve number for soil(AMC 2)  = 69.90
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=     0.242(In/Hr)
Max Catchment Loss (Fm) =     0.194(In/Hr)
Rainfall intensity =      3.275(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.847
Subarea runoff =     35.620(CFS) for   13.100(Ac.)
Total runoff =     38.257(CFS)    Total area =       13.79(Ac.)
Area averaged Fm value =    0.192(In/Hr)
Street flow at end of street =     38.257(CFS)
Half street flow at end of street =     19.128(CFS)
Depth of flow =   0.434(Ft.), Average velocity =   7.729(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  14.000(Ft.)
End of computations, total study area =           13.79 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.800
Area averaged SCS curve number (AMC 2) =  70.2
```

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2004 Version 8.0
Rational Hydrology Study, Date: 10/24/12 File Name: 1200PROP25J.roc

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ESPERANZA HILLS
PROPOSED CONDITION (ONSITE AND OFFSITE)
25-YEAR AREA J
R:\09\1200\PRELIM\REPORTS\HYDRO OPTION 1\RATIONAL\PROPOSED\1200PROP25J

Program License Serial Number 6062

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 25.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

++
Process from Point/Station 317.000 to Point/Station 314.000
**** INITIAL AREA EVALUATION ****

J1

RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2) = 75.00
Pervious ratio(Ap) = 0.8000 Max loss rate(Fp)= 0.200(In/Hr)
Max Catchment Loss (Fm) = 0.160(In/Hr)
Initial subarea data:
Initial area flow distance = 326.000(Ft.)
Top (of initial area) elevation = 833.000(Ft.)
Bottom (of initial area) elevation = 820.000(Ft.)
Difference in elevation = 13.000(Ft.)
Slope = 0.03988 s(%)= 3.99
TC = k(0.469)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.043 min.
Rainfall intensity = 3.449(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.858
Subarea runoff = 2.043(CFS)
Total initial stream area = 0.690(Ac.)

++
Process from Point/Station 314.000 to Point/Station 340.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

J2

```
Top of street segment elevation =   820.000(Ft.)
End of street segment elevation =   670.000(Ft.)
Length of street segment  =  2345.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  14.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   5.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     15.621(CFS)
Depth of flow =   0.344(Ft.), Average velocity =   5.977(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  10.863(Ft.)
Flow velocity =   5.98(Ft/s)
Travel time =    6.54 min.     TC =   15.58  min.
 Adding area flow to street
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.850
Decimal fraction soil group D = 0.150
SCS curve number for soil(AMC 2)  = 69.90
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=     0.242(In/Hr)
Max Catchment Loss (Fm) =     0.194(In/Hr)
Rainfall intensity =      2.535(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.832
Subarea runoff =     27.032(CFS) for   13.100(Ac.)
Total runoff =     29.075(CFS)    Total area =       13.79(Ac.)
Area averaged Fm value =    0.192(In/Hr)
Street flow at end of street =     29.075(CFS)
Half street flow at end of street =     14.538(CFS)
Depth of flow =   0.407(Ft.), Average velocity =   6.931(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  14.000(Ft.)
End of computations, total study area =           13.79 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.800
Area averaged SCS curve number (AMC 2) =  70.2
```

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2004 Version 8.0
Rational Hydrology Study, Date: 10/24/12 File Name: 1200PROP10J.roc

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ESPERANZA HILLS
PROPOSED CONDITION (ONSITE AND OFFSITE)
10-YEAR AREA J
R:\09\1200\PRELIM\REPORTS\HYDRO OPTION 1\RATIONAL\PROPOSED\1200PROP10J

Program License Serial Number 6062

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 10.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

++
Process from Point/Station 317.000 to Point/Station 314.000
**** INITIAL AREA EVALUATION ****

RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2) = 75.00
Pervious ratio(Ap) = 0.8000 Max loss rate(Fp)= 0.200(In/Hr)
Max Catchment Loss (Fm) = 0.160(In/Hr)
Initial subarea data:
Initial area flow distance = 326.000(Ft.)
Top (of initial area) elevation = 833.000(Ft.)
Bottom (of initial area) elevation = 820.000(Ft.)
Difference in elevation = 13.000(Ft.)
Slope = 0.03988 s(%)= 3.99
TC = k(0.469)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.043 min.
Rainfall intensity = 2.891(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff = 1.696(CFS)
Total initial stream area = 0.690(Ac.)

++
Process from Point/Station 314.000 to Point/Station 340.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

```
Top of street segment elevation =   820.000(Ft.)
End of street segment elevation =   670.000(Ft.)
Length of street segment  =  2345.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  14.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   5.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     12.691(CFS)
Depth of flow =   0.325(Ft.), Average velocity =   5.698(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   9.935(Ft.)
Flow velocity =   5.70(Ft/s)
Travel time =    6.86 min.     TC =   15.90  min.
 Adding area flow to street
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.850
Decimal fraction soil group D = 0.150
SCS curve number for soil(AMC 2)  = 69.90
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=     0.242(In/Hr)
Max Catchment Loss (Fm) =     0.194(In/Hr)
Rainfall intensity =      2.092(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.817
Subarea runoff =     21.881(CFS) for   13.100(Ac.)
Total runoff =     23.576(CFS)    Total area =       13.79(Ac.)
Area averaged Fm value =    0.192(In/Hr)
Street flow at end of street =     23.576(CFS)
Half street flow at end of street =     11.788(CFS)
Depth of flow =   0.385(Ft.), Average velocity =   6.584(Ft/s)
Flow width (from curb towards crown)=  12.899(Ft.)
End of computations, total study area =           13.79 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

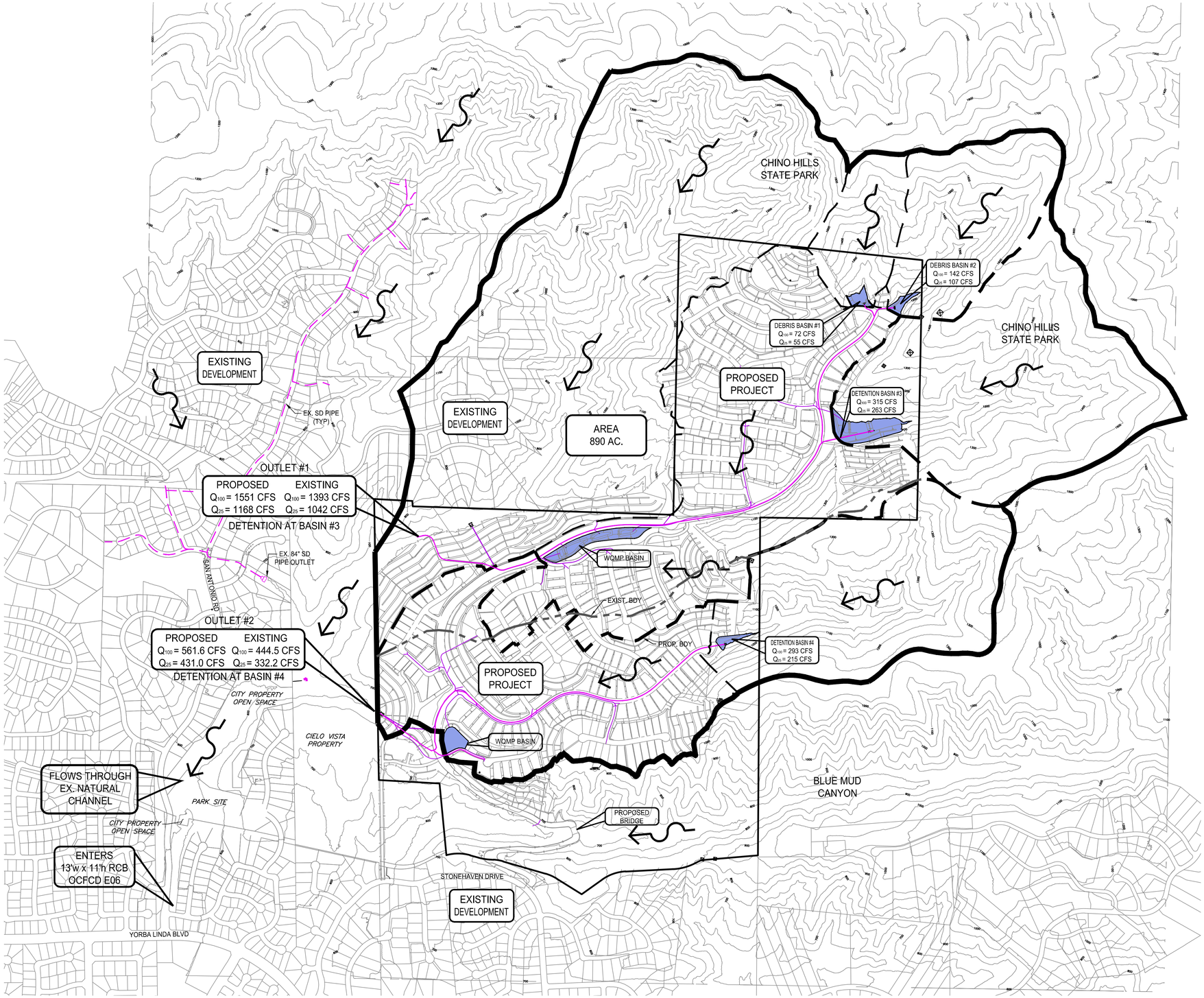
Area averaged pervious area fraction(Ap) = 0.800
Area averaged SCS curve number (AMC 2) =  70.2
```

Appendix

H

PROPOSED CONDITION HYDROLOGIC KEY MAPS (ONSITE AND OFFSITE)

ESPERANZA HILLS OPTION 1 - CONCEPTUAL DRAINAGE EXHIBIT



OPTION 1
DATE: 06-20-2013
FIGURE 10A

KWC ENGINEERS
CIVIL ENGINEERS • PLANNERS • SURVEYORS
880 COMPTON AVENUE, SUITE 100 • CORONA, CA 92881-3370 • 951-734-2130

R:\09\1200\PRELIM\REPORTS\HYDRO Option 1\Conceptual Hydro Exhibit.dwg 06/21/2013 14:14

2009.1200.4

REFER TO OFFSITE HYDROLOGY MAP

REFER TO OFFSITE HYDROLOGY MAP

PROJECT BOUNDARY

PROJECT BOUNDARY

PROJECT BOUNDARY

PROJECT BOUNDARY

REFER TO OFFSITE HYDROLOGY MAP

SOIL C

SOIL D

SOIL C

SOIL C

SOIL D

SOIL C

SOIL D

SOIL C

G1 0.79

G2 29.41 — SOIL C 25.76 AC, SOIL D 3.65 AC

G3 1.09

G4 27.78 — SOIL C 23.23 AC, SOIL D 4.55 AC

G5 18.34 — SOIL C 13.70 AC, SOIL D 4.64 AC

G6 1.08

G7 26.20 — SOIL C 22.64 AC, SOIL D 3.56 AC

G8 10.46 — SOIL C 5.77 AC, SOIL D 4.69 AC

G9 3.35 — SOIL C 2.14 AC, SOIL D 1.21 AC

G10 7.09 — SOIL C 5.99 AC, SOIL D 1.10 AC

G11 8.61

G12 1.28

G13 31.13 — SOIL C 11.33 AC, SOIL D 19.80 AC

G14 9.13 — SOIL D

H1 6.72

H2 62.03 — SOIL C 46.20 AC, SOIL D 15.83 AC

H3 31.46 — SOIL D

H4 0.62 — SOIL C

H5 6.32 — SOIL C

H6 4.81 — SOIL C

H7 6.57 — SOIL C

V1 0.69 — SOIL D

J2 13.10 — SOIL C 11.07, SOIL D 2.03

WQMP BASIN #1

WQMP BASIN #2

WQMP BASIN #3

BASIN #3

BASIN #4

BASIN #2

EL. 1180 BASIN #1 Q_{100} = 22.06 Q_{25} = 34.96

EL. 1170 BASIN #2 Q_{100} = 140.85 Q_{25} = 106.43

EL. 1183 IE. 1169 Q_{100} = 206.45 Q_{25} = 156.13

EL. 1115.3 IE. 1100.0 Q_{100} = 357.86 Q_{25} = 271.41

EL. 1056 IE. 1050 Q_{100} = 314.85 Q_{25} = 237.51

EL. 1083 IE. 1048 Q_{100} = 666.08 Q_{25} = 503.72

EL. 1042.0 IE. 1032.0 Q_{100} = 749.10 Q_{25} = 565.33

EL. 998.0 IE. 989.0

EL. 1124 — EL. 1120

EL. 1272.0 — EL. 1272.5 — EL. 1276.5 — EL. 1272.0

EL. 1072.0 — EL. 1070.0

EL. 996.2 — EL. 990.0

EL. 888.0 — EL. 887.0 — EL. 886.0

EL. 796.0 — EL. 788.0

EL. 720.0 IE. 720.0

EL. 932.0 IE. 922.0

EL. 929.5 IE. 920.0 Q_{100} = 897.13 Q_{25} = 677.36

EL. 921.5 IE. 911.0 Q_{100} = 520.86 Q_{25} = 398.46

EL. 715.0 IE. 705.0

EL. 920 BASIN #4 Q_{100} = 292.97 Q_{25} = 220.84

EL. 670.0 Q_{100} = 1139.94 Q_{25} = 945.87 SEE EXISTING CONDITION MAP

EL. 670.0 Q_{100} = 1178.20 Q_{25} = 874.65

TOTAL EL. 660.0 Q_{100} = 561.64 Q_{25} = 431.02 AREA= 212.47

L=1720'

L=2645'

L=2580'

L=2620'

L=2345'

L=710'

L=400'

L=285'

L=300'

L=1270'

L=330'

L=1320'

L=1650'

L=1760'

STONEHAVEN DR.

LEGEND

- MAJOR WATERSHED BOUNDARY
- MINOR WATERSHED BOUNDARY
- SUBAREA BOUNDARY
- NODAL POINT REFERENCE
- EL. 1172.0 — ELEVATION @ NODE
- IE. 1166.0 — PIPE INVERT ELEVATION
- Q_{100} = 23.26 — FLOW 100-YEAR STORM (CFS)
- Q_{25} = 17.92 — FLOW 25-YEAR STORM (CFS)
- CATCH BASIN & STORM DRAIN
- M2 / 6.36 — SUBAREA DESIGNATION / SUBAREA ACREAGE
- HYDROLOGIC SOILS GROUP BOUNDARY
- SOIL A — HYDROLOGIC SOILS GROUP

200' 0 200' 400' 600'

SCALE IN FEET

PROPOSED CONDITION HYDROLOGY KEY MAP

FOR

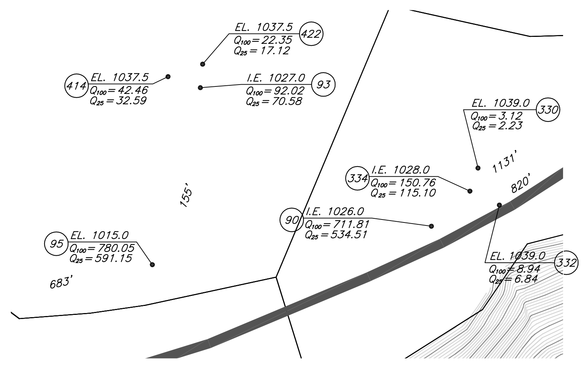
ESPERANZA HILLS OPTION 1

COUNTY OF ORANGE

HYD: VAE	KWC ENGINEERS	SHEET 1 OF 1
DRAFT: VAE	CIVIL ENGINEERING, PLANNING, AND CONSTRUCTION MANAGEMENT	
CHECK: MCT	1880 COMPTON AVENUE, SUITE 100 • CORONA, CA 92881-3370 • 909-734-2130	

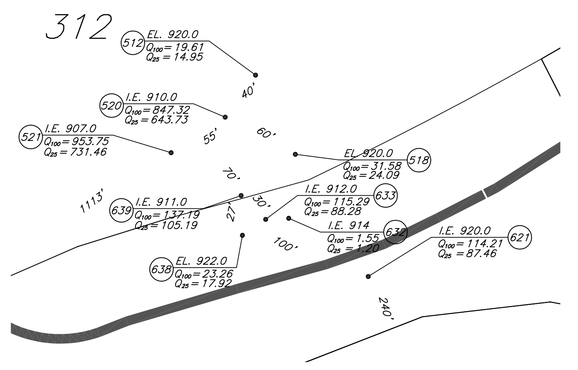
FIGURE 11

R:\JOB\1200\PRELIM\REPORTS\HYDRO Option 1\Proposed Hydro Map.dwg 10/21/2013 2:22 PM Plotted by: Matthew Lohnovich



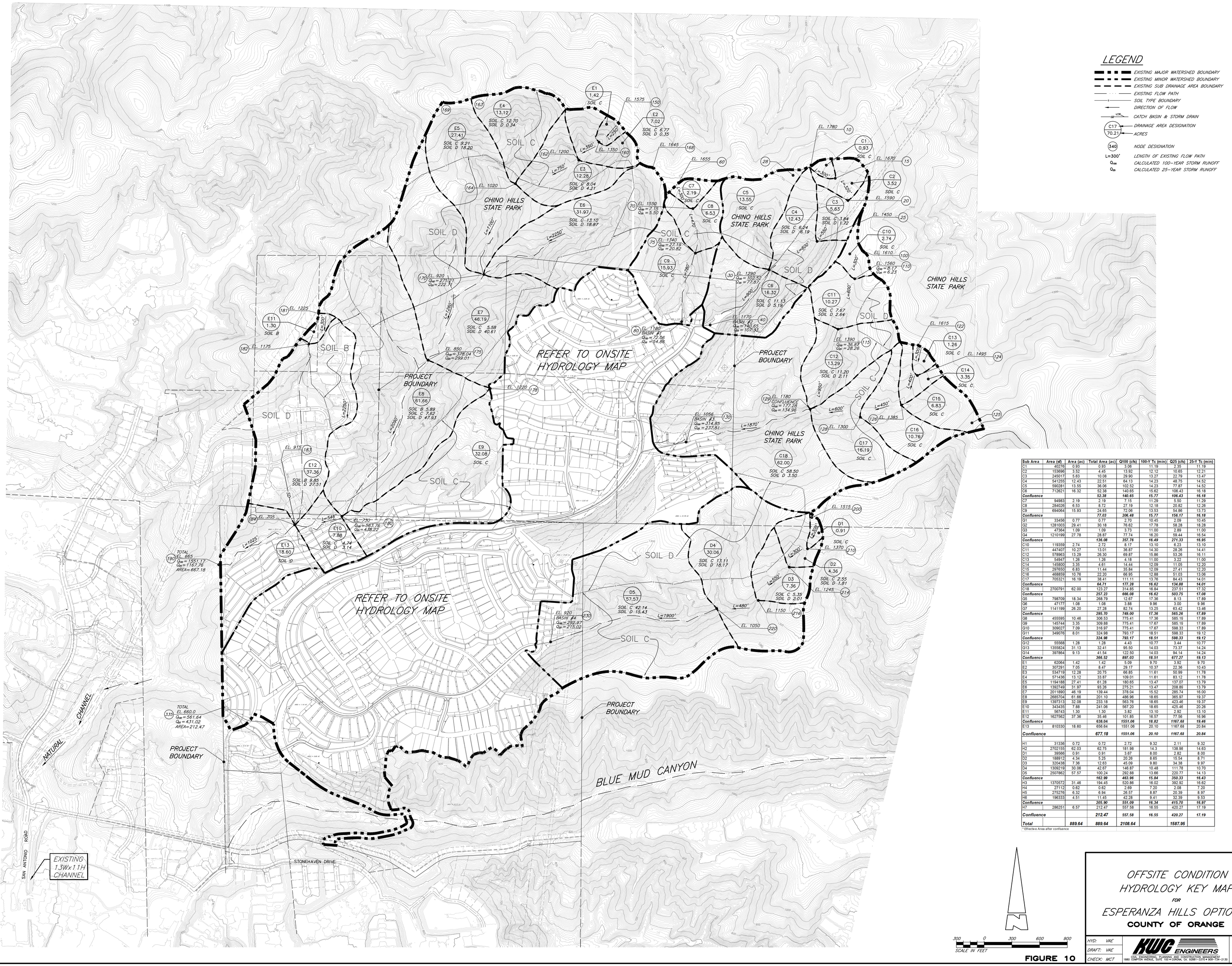
CONFLUENCE DETAIL #1

SCALE 1" = 60'



CONFLUENCE DETAIL #2

SCALE 1" = 60'



Sub Area	Area (sf)	Area (ac)	Total Area (ac)	Q100 (cfs)	100-Y Tc (min)	Q25 (cfs)	25-Y Tc (min)
C1	40276	0.93	0.93	3.06	11.19	2.35	11.19
C2	153696	3.52	4.45	13.92	12.12	10.65	12.21
C3	245017	5.63	10.08	29.90	13.27	22.79	13.47
C4	541255	12.43	22.51	64.13	14.23	48.75	14.52
C5	590281	13.55	36.06	102.52	14.23	77.87	14.52
C6	712621	16.32	52.38	140.65	15.62	106.43	16.18
Confluence			***52.38***	***140.65***	***15.77***	***106.43***	***16.18***
C7	94983	2.19	2.19	7.15	11.29	5.50	11.29
C8	284026	6.53	8.72	27.19	12.18	20.82	12.26
C9	694064	15.93	24.65	72.06	13.53	54.86	13.73
Confluence			***77.03***	***206.48***	***15.77***	***156.17***	***16.18***
G1	33456	0.77	0.77	2.70	10.45	2.09	10.45
G2	1281003	29.41	30.18	76.62	17.78	58.28	18.28
G3	47364	1.09	1.09	3.73	11.00	2.89	11.00
G4	1210199	27.78	28.87	77.74	16.20	59.44	16.54
Confluence			***136.08***	***357.76***	***16.49***	***271.33***	***16.95***
C10	119359	2.74	2.72	8.17	13.10	6.23	13.10
C11	447407	10.27	13.01	36.87	14.30	28.26	14.41
C12	578963	13.29	26.30	69.87	15.86	53.26	16.11
C13	54947	1.26	1.26	4.18	11.00	3.22	11.00
C14	145800	3.35	4.61	14.44	12.09	11.05	12.20
C15	297650	6.83	11.44	35.84	12.09	27.41	12.20
C16	468859	10.76	22.20	66.95	12.88	51.03	13.06
C17	705321	16.19	38.41	111.11	13.76	84.43	14.01
Confluence			***64.71***	***177.28***	***16.62***	***134.88***	***14.01***
C18	2700791	62.00	123.27	314.85	16.84	237.51	17.32
Confluence			***257.23***	***666.08***	***16.62***	***503.75***	***17.08***
G5	798709	18.34	268.79	12.67	17.36	8.13	17.89
G6	47177	1.08	1.08	3.88	9.96	3.00	9.96
G7	1141199	26.20	27.28	82.74	13.25	63.42	13.46
Confluence			***295.70***	***749.00***	***17.36***	***565.26***	***17.89***
G8	455595	10.46	306.53	775.41	17.36	585.16	17.89
G9	145744	3.35	309.88	775.41	17.67	585.16	17.89
G10	309027	7.09	316.97	775.41	17.67	598.33	17.89
G11	349076	8.01	324.98	793.17	18.51	598.33	19.12
Confluence			***324.98***	***793.17***	***18.51***	***598.33***	***19.12***
G12	55568	1.28	1.28	4.43	10.77	3.44	10.77
G13	1355824	31.13	32.41	95.50	14.03	73.37	14.24
G14	397864	9.13	41.54	122.50	14.03	94.14	14.24
Confluence			***366.52***	***897.03***	***18.51***	***677.27***	***19.13***
E1	62064	1.42	1.42	5.09	9.70	3.92	9.70
E2	307291	7.05	8.47	29.17	10.37	22.36	10.43
E3	534719	12.28	20.75	66.85	11.61	50.99	11.78
E4	571436	13.12	33.87	109.01	11.61	83.12	11.78
E5	1194188	27.41	61.28	180.65	13.47	137.07	13.79
E6	1392748	31.97	93.26	275.21	13.47	208.86	13.79
E7	2011890	46.19	139.44	378.04	15.52	285.74	16.00
E8	2685704	61.66	201.10	486.96	18.65	365.97	19.37
E9	1397313	32.08	233.18	563.76	18.65	423.46	19.37
E10	343435	7.88	241.06	567.20	18.65	425.48	20.26
E11	56743	1.30	1.30	3.82	13.10	2.92	13.10
E12	1627562	37.36	35.46	101.85	16.57	77.56	16.96
Confluence			***638.04***	***1551.06***	***16.82***	***1167.68***	***19.46***
E13	810330	18.60	656.64	1551.06	20.10	1167.68	20.84
Confluence			***677.18***	***1551.06***	***20.10***	***1167.68***	***20.84***
H1	31336	0.72	0.72	2.72	9.32	2.11	9.32
H2	2702155	62.03	62.75	181.98	14.3	138.98	14.63
D1	39566	0.91	0.91	3.67	8.00	2.82	8.00
D2	188912	4.34	5.25	20.26	8.65	15.54	8.71
D3	320438	7.36	12.63	45.09	9.80	34.38	9.97
D4	1309219	30.06	42.67	146.87	10.48	111.78	10.70
D5	2507862	57.57	100.24	292.68	13.66	220.77	14.13
Confluence			***162.99***	***463.96***	***15.64***	***350.33***	***16.43***
H3	1370572	31.46	194.45	520.86	16.02	392.92	16.62
H4	27112	0.62	0.62	2.69	7.20	2.08	7.20
H5	275276	6.32	6.94	26.57	8.87	20.39	8.97
H6	196333	4.51	11.45	42.28	9.41	32.39	9.53
Confluence			***205.90***	***551.09***	***16.34***	***415.70***	***16.97***
H7	286251	6.57	212.47	557.58	16.55	420.27	17.19
Confluence			***212.47***	***557.58***	***16.55***	***420.27***	***17.19***
Total		***889.64***	***889.64***	***2108.64***		***1587.95***	

* Effective Area after confluence

SCALE IN FEET

FIGURE 10

OFFSITE CONDITION HYDROLOGY KEY MAP
FOR
ESPERANZA HILLS OPTION 1
COUNTY OF ORANGE

HYD: VAE
DRAFT: VAE
CHECK: MCT

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SHEET 1 OF 1

R:\VAV\2005\PRELIM\ESPERS\HYDRO Option 1\Offsite Proposed Hydro Mapping (6/21/2013 2:38 PM) Plotted by: Matthew Lehnoviich

H

PROPOSED CONDITION HYDROLOGIC KEY MAPS (ONSITE AND OFFSITE)

Appendix

I

EXISTING CONDITION HYDROLOGY UNIT HYDROGRAPH METHOD

U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/26/12 File Name UNIT10Y24HEX1A.out

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Orange County Unit Hydrograph Hydrology Method
Manual Date(s) - October 1986, November 1996

Program License Serial Number 6062

ESPERANZA HILLS OPTION 1
DETENTION BASIN ANALYSIS
EXISTING CONDITION AREA A
10-YEAR 24-HOUR

Storm Event Year = 10

Antecedent Moisture Condition = 2

English (in-lb) Input Units Used

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	Area (Ac.)	Area Fraction	Soil Group	Fp (In/Hr)	Ap (dec.)	Fm (In/Hr)
72.0	17.0	0.03	B	0.300	0.990	0.297
81.0	404.8	0.60	C	0.250	0.990	0.248
86.0	255.4	0.38	D	0.200	0.990	0.198

Area-averaged adjusted loss rate Fm (In/Hr) = 0.230

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC2)	S	Pervious Yield Fr
16.83	0.025	72.0	72.0	3.89	0.337
0.17	0.000	98.0	98.0	0.20	0.936
400.70	0.592	81.0	81.0	2.35	0.504
4.05	0.006	98.0	98.0	0.20	0.936
252.90	0.373	86.0	86.0	1.63	0.614
2.55	0.004	98.0	98.0	0.20	0.936

Area-averaged catchment yield fraction, Y = 0.545
Area-averaged low loss fraction, Yb = 0.455

++

User entry of time of concentration = 0.370 (hours)
Watershed area = 677.20(Ac.)
Catchment Lag time = 0.296 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 28.1532
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.230(In/Hr)
Average low loss rate fraction (Yb) = 0.455 (decimal)
FOOTHILL S-Graph Selected
Computed peak 5-minute rainfall = 0.340(In)
Computed peak 30-minute rainfall = 0.720(In)
Specified peak 1-hour rainfall = 0.950(In)
Computed peak 3-hour rainfall = 1.590(In)
Specified peak 6-hour rainfall = 2.200(In)
Specified peak 24-hour rainfall = 3.680(In)

Rainfall depth area reduction factors:
Using a total area of 677.20(Ac.) (Ref: fig. E-4)

5-minute factor = 0.968 Adjusted rainfall = 0.329(In)
30-minute factor = 0.968 Adjusted rainfall = 0.697(In)
1-hour factor = 0.968 Adjusted rainfall = 0.920(In)
3-hour factor = 0.996 Adjusted rainfall = 1.584(In)
6-hour factor = 0.998 Adjusted rainfall = 2.195(In)
24-hour factor = 0.999 Adjusted rainfall = 3.677(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
(K = 8189.89 (CFS))		
1	1.983	162.399
2	8.187	508.097
3	19.709	943.643
4	45.654	2124.850
5	64.076	1508.774
6	72.961	727.661
7	79.237	513.998
8	83.999	390.025
9	87.711	304.013
10	90.664	241.782
11	93.022	193.154
12	94.874	151.668
13	96.256	113.157
14	97.325	87.553
15	97.989	54.406
16	98.336	28.466
17	98.645	25.290
18	98.924	22.791
19	99.125	16.498
20	99.300	14.331
21	99.517	17.783
22	99.716	16.263
23	99.834	9.672

24	99.923	7.305
25	100.000	6.308

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.3292	0.3292
2	0.4401	0.1109
3	0.5215	0.0814
4	0.5883	0.0668
5	0.6459	0.0576
6	0.6971	0.0512
7	0.7415	0.0443
8	0.7821	0.0407
9	0.8199	0.0377
10	0.8552	0.0353
11	0.8884	0.0332
12	0.9198	0.0315
13	0.9570	0.0371
14	0.9927	0.0357
15	1.0272	0.0345
16	1.0605	0.0333
17	1.0927	0.0323
18	1.1241	0.0313
19	1.1545	0.0305
20	1.1842	0.0297
21	1.2131	0.0289
22	1.2413	0.0282
23	1.2689	0.0276
24	1.2959	0.0270
25	1.3223	0.0264
26	1.3482	0.0259
27	1.3736	0.0254
28	1.3985	0.0249
29	1.4230	0.0245
30	1.4471	0.0241
31	1.4707	0.0237
32	1.4940	0.0233
33	1.5169	0.0229
34	1.5395	0.0226
35	1.5617	0.0222
36	1.5836	0.0219
37	1.6042	0.0206
38	1.6245	0.0203
39	1.6445	0.0200
40	1.6642	0.0197
41	1.6837	0.0195
42	1.7029	0.0192
43	1.7219	0.0190
44	1.7407	0.0188
45	1.7592	0.0185
46	1.7775	0.0183
47	1.7956	0.0181
48	1.8135	0.0179
49	1.8312	0.0177
50	1.8487	0.0175
51	1.8661	0.0173
52	1.8832	0.0172
53	1.9002	0.0170

54	1.9170	0.0168
55	1.9337	0.0166
56	1.9502	0.0165
57	1.9665	0.0163
58	1.9827	0.0162
59	1.9987	0.0160
60	2.0146	0.0159
61	2.0304	0.0158
62	2.0460	0.0156
63	2.0615	0.0155
64	2.0768	0.0154
65	2.0920	0.0152
66	2.1071	0.0151
67	2.1221	0.0150
68	2.1370	0.0149
69	2.1518	0.0148
70	2.1664	0.0146
71	2.1809	0.0145
72	2.1953	0.0144
73	2.2066	0.0113
74	2.2178	0.0112
75	2.2289	0.0111
76	2.2399	0.0110
77	2.2509	0.0109
78	2.2617	0.0108
79	2.2724	0.0107
80	2.2831	0.0107
81	2.2937	0.0106
82	2.3042	0.0105
83	2.3146	0.0104
84	2.3249	0.0103
85	2.3352	0.0103
86	2.3454	0.0102
87	2.3555	0.0101
88	2.3655	0.0100
89	2.3755	0.0100
90	2.3854	0.0099
91	2.3952	0.0098
92	2.4049	0.0098
93	2.4146	0.0097
94	2.4243	0.0096
95	2.4338	0.0096
96	2.4433	0.0095
97	2.4528	0.0094
98	2.4621	0.0094
99	2.4715	0.0093
100	2.4807	0.0093
101	2.4899	0.0092
102	2.4991	0.0091
103	2.5081	0.0091
104	2.5172	0.0090
105	2.5262	0.0090
106	2.5351	0.0089
107	2.5440	0.0089
108	2.5528	0.0088
109	2.5615	0.0088
110	2.5703	0.0087
111	2.5789	0.0087

112	2.5875	0.0086
113	2.5961	0.0086
114	2.6046	0.0085
115	2.6131	0.0085
116	2.6215	0.0084
117	2.6299	0.0084
118	2.6383	0.0083
119	2.6466	0.0083
120	2.6548	0.0083
121	2.6630	0.0082
122	2.6712	0.0082
123	2.6793	0.0081
124	2.6874	0.0081
125	2.6954	0.0080
126	2.7034	0.0080
127	2.7114	0.0080
128	2.7193	0.0079
129	2.7272	0.0079
130	2.7351	0.0078
131	2.7429	0.0078
132	2.7506	0.0078
133	2.7584	0.0077
134	2.7661	0.0077
135	2.7737	0.0077
136	2.7814	0.0076
137	2.7889	0.0076
138	2.7965	0.0076
139	2.8040	0.0075
140	2.8115	0.0075
141	2.8190	0.0075
142	2.8264	0.0074
143	2.8338	0.0074
144	2.8411	0.0074
145	2.8485	0.0073
146	2.8557	0.0073
147	2.8630	0.0073
148	2.8702	0.0072
149	2.8774	0.0072
150	2.8846	0.0072
151	2.8917	0.0071
152	2.8989	0.0071
153	2.9059	0.0071
154	2.9130	0.0071
155	2.9200	0.0070
156	2.9270	0.0070
157	2.9340	0.0070
158	2.9409	0.0069
159	2.9478	0.0069
160	2.9547	0.0069
161	2.9616	0.0069
162	2.9684	0.0068
163	2.9752	0.0068
164	2.9820	0.0068
165	2.9887	0.0068
166	2.9954	0.0067
167	3.0021	0.0067
168	3.0088	0.0067
169	3.0155	0.0067

170	3.0221	0.0066
171	3.0287	0.0066
172	3.0353	0.0066
173	3.0418	0.0066
174	3.0484	0.0065
175	3.0549	0.0065
176	3.0613	0.0065
177	3.0678	0.0065
178	3.0742	0.0064
179	3.0807	0.0064
180	3.0870	0.0064
181	3.0934	0.0064
182	3.0998	0.0063
183	3.1061	0.0063
184	3.1124	0.0063
185	3.1187	0.0063
186	3.1249	0.0063
187	3.1312	0.0062
188	3.1374	0.0062
189	3.1436	0.0062
190	3.1498	0.0062
191	3.1559	0.0062
192	3.1621	0.0061
193	3.1682	0.0061
194	3.1743	0.0061
195	3.1804	0.0061
196	3.1864	0.0061
197	3.1925	0.0060
198	3.1985	0.0060
199	3.2045	0.0060
200	3.2105	0.0060
201	3.2164	0.0060
202	3.2224	0.0059
203	3.2283	0.0059
204	3.2342	0.0059
205	3.2401	0.0059
206	3.2460	0.0059
207	3.2518	0.0059
208	3.2576	0.0058
209	3.2635	0.0058
210	3.2693	0.0058
211	3.2750	0.0058
212	3.2808	0.0058
213	3.2866	0.0057
214	3.2923	0.0057
215	3.2980	0.0057
216	3.3037	0.0057
217	3.3094	0.0057
218	3.3150	0.0057
219	3.3207	0.0056
220	3.3263	0.0056
221	3.3319	0.0056
222	3.3375	0.0056
223	3.3431	0.0056
224	3.3487	0.0056
225	3.3543	0.0056
226	3.3598	0.0055
227	3.3653	0.0055

228	3.3708	0.0055
229	3.3763	0.0055
230	3.3818	0.0055
231	3.3873	0.0055
232	3.3927	0.0054
233	3.3981	0.0054
234	3.4036	0.0054
235	3.4090	0.0054
236	3.4143	0.0054
237	3.4197	0.0054
238	3.4251	0.0054
239	3.4304	0.0053
240	3.4358	0.0053
241	3.4411	0.0053
242	3.4464	0.0053
243	3.4517	0.0053
244	3.4570	0.0053
245	3.4622	0.0053
246	3.4675	0.0053
247	3.4727	0.0052
248	3.4779	0.0052
249	3.4831	0.0052
250	3.4883	0.0052
251	3.4935	0.0052
252	3.4987	0.0052
253	3.5039	0.0052
254	3.5090	0.0051
255	3.5141	0.0051
256	3.5193	0.0051
257	3.5244	0.0051
258	3.5295	0.0051
259	3.5345	0.0051
260	3.5396	0.0051
261	3.5447	0.0051
262	3.5497	0.0050
263	3.5547	0.0050
264	3.5598	0.0050
265	3.5648	0.0050
266	3.5698	0.0050
267	3.5748	0.0050
268	3.5797	0.0050
269	3.5847	0.0050
270	3.5897	0.0050
271	3.5946	0.0049
272	3.5995	0.0049
273	3.6044	0.0049
274	3.6093	0.0049
275	3.6142	0.0049
276	3.6191	0.0049
277	3.6240	0.0049
278	3.6289	0.0049
279	3.6337	0.0049
280	3.6386	0.0048
281	3.6434	0.0048
282	3.6482	0.0048
283	3.6530	0.0048
284	3.6578	0.0048
285	3.6626	0.0048

286	3.6674	0.0048
287	3.6721	0.0048
288	3.6769	0.0048

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0048	0.0022	0.0026
2	0.0048	0.0022	0.0026
3	0.0048	0.0022	0.0026
4	0.0048	0.0022	0.0026
5	0.0048	0.0022	0.0026
6	0.0048	0.0022	0.0026
7	0.0049	0.0022	0.0026
8	0.0049	0.0022	0.0027
9	0.0049	0.0022	0.0027
10	0.0049	0.0022	0.0027
11	0.0049	0.0022	0.0027
12	0.0049	0.0022	0.0027
13	0.0050	0.0023	0.0027
14	0.0050	0.0023	0.0027
15	0.0050	0.0023	0.0027
16	0.0050	0.0023	0.0027
17	0.0050	0.0023	0.0027
18	0.0050	0.0023	0.0027
19	0.0051	0.0023	0.0028
20	0.0051	0.0023	0.0028
21	0.0051	0.0023	0.0028
22	0.0051	0.0023	0.0028
23	0.0051	0.0023	0.0028
24	0.0051	0.0023	0.0028
25	0.0052	0.0024	0.0028
26	0.0052	0.0024	0.0028
27	0.0052	0.0024	0.0028
28	0.0052	0.0024	0.0028
29	0.0053	0.0024	0.0029
30	0.0053	0.0024	0.0029
31	0.0053	0.0024	0.0029
32	0.0053	0.0024	0.0029
33	0.0053	0.0024	0.0029
34	0.0053	0.0024	0.0029
35	0.0054	0.0024	0.0029
36	0.0054	0.0025	0.0029
37	0.0054	0.0025	0.0030
38	0.0054	0.0025	0.0030
39	0.0055	0.0025	0.0030
40	0.0055	0.0025	0.0030
41	0.0055	0.0025	0.0030
42	0.0055	0.0025	0.0030
43	0.0056	0.0025	0.0030
44	0.0056	0.0025	0.0030
45	0.0056	0.0025	0.0031
46	0.0056	0.0026	0.0031
47	0.0056	0.0026	0.0031
48	0.0057	0.0026	0.0031
49	0.0057	0.0026	0.0031
50	0.0057	0.0026	0.0031

51	0.0057	0.0026	0.0031
52	0.0058	0.0026	0.0031
53	0.0058	0.0026	0.0032
54	0.0058	0.0026	0.0032
55	0.0059	0.0027	0.0032
56	0.0059	0.0027	0.0032
57	0.0059	0.0027	0.0032
58	0.0059	0.0027	0.0032
59	0.0060	0.0027	0.0033
60	0.0060	0.0027	0.0033
61	0.0060	0.0027	0.0033
62	0.0060	0.0027	0.0033
63	0.0061	0.0028	0.0033
64	0.0061	0.0028	0.0033
65	0.0061	0.0028	0.0033
66	0.0062	0.0028	0.0034
67	0.0062	0.0028	0.0034
68	0.0062	0.0028	0.0034
69	0.0063	0.0028	0.0034
70	0.0063	0.0029	0.0034
71	0.0063	0.0029	0.0034
72	0.0063	0.0029	0.0035
73	0.0064	0.0029	0.0035
74	0.0064	0.0029	0.0035
75	0.0065	0.0029	0.0035
76	0.0065	0.0029	0.0035
77	0.0065	0.0030	0.0036
78	0.0066	0.0030	0.0036
79	0.0066	0.0030	0.0036
80	0.0066	0.0030	0.0036
81	0.0067	0.0030	0.0036
82	0.0067	0.0030	0.0037
83	0.0068	0.0031	0.0037
84	0.0068	0.0031	0.0037
85	0.0068	0.0031	0.0037
86	0.0069	0.0031	0.0037
87	0.0069	0.0031	0.0038
88	0.0069	0.0032	0.0038
89	0.0070	0.0032	0.0038
90	0.0070	0.0032	0.0038
91	0.0071	0.0032	0.0039
92	0.0071	0.0032	0.0039
93	0.0072	0.0033	0.0039
94	0.0072	0.0033	0.0039
95	0.0073	0.0033	0.0040
96	0.0073	0.0033	0.0040
97	0.0074	0.0033	0.0040
98	0.0074	0.0034	0.0040
99	0.0075	0.0034	0.0041
100	0.0075	0.0034	0.0041
101	0.0076	0.0034	0.0041
102	0.0076	0.0035	0.0041
103	0.0077	0.0035	0.0042
104	0.0077	0.0035	0.0042
105	0.0078	0.0035	0.0042
106	0.0078	0.0036	0.0043
107	0.0079	0.0036	0.0043
108	0.0079	0.0036	0.0043

109	0.0080	0.0036	0.0044
110	0.0080	0.0037	0.0044
111	0.0081	0.0037	0.0044
112	0.0082	0.0037	0.0045
113	0.0083	0.0038	0.0045
114	0.0083	0.0038	0.0045
115	0.0084	0.0038	0.0046
116	0.0084	0.0038	0.0046
117	0.0085	0.0039	0.0046
118	0.0086	0.0039	0.0047
119	0.0087	0.0039	0.0047
120	0.0087	0.0040	0.0048
121	0.0088	0.0040	0.0048
122	0.0089	0.0040	0.0048
123	0.0090	0.0041	0.0049
124	0.0090	0.0041	0.0049
125	0.0091	0.0042	0.0050
126	0.0092	0.0042	0.0050
127	0.0093	0.0042	0.0051
128	0.0094	0.0043	0.0051
129	0.0095	0.0043	0.0052
130	0.0096	0.0043	0.0052
131	0.0097	0.0044	0.0053
132	0.0098	0.0044	0.0053
133	0.0099	0.0045	0.0054
134	0.0100	0.0045	0.0054
135	0.0101	0.0046	0.0055
136	0.0102	0.0046	0.0056
137	0.0103	0.0047	0.0056
138	0.0104	0.0047	0.0057
139	0.0106	0.0048	0.0058
140	0.0107	0.0048	0.0058
141	0.0108	0.0049	0.0059
142	0.0109	0.0050	0.0060
143	0.0111	0.0050	0.0061
144	0.0112	0.0051	0.0061
145	0.0144	0.0066	0.0079
146	0.0145	0.0066	0.0079
147	0.0148	0.0067	0.0080
148	0.0149	0.0068	0.0081
149	0.0151	0.0069	0.0082
150	0.0152	0.0069	0.0083
151	0.0155	0.0070	0.0084
152	0.0156	0.0071	0.0085
153	0.0159	0.0072	0.0087
154	0.0160	0.0073	0.0087
155	0.0163	0.0074	0.0089
156	0.0165	0.0075	0.0090
157	0.0168	0.0076	0.0092
158	0.0170	0.0077	0.0093
159	0.0173	0.0079	0.0095
160	0.0175	0.0080	0.0096
161	0.0179	0.0081	0.0098
162	0.0181	0.0082	0.0099
163	0.0185	0.0084	0.0101
164	0.0188	0.0085	0.0102
165	0.0192	0.0087	0.0105
166	0.0195	0.0089	0.0106

167	0.0200	0.0091	0.0109
168	0.0203	0.0092	0.0111
169	0.0219	0.0100	0.0119
170	0.0222	0.0101	0.0121
171	0.0229	0.0104	0.0125
172	0.0233	0.0106	0.0127
173	0.0241	0.0109	0.0131
174	0.0245	0.0111	0.0133
175	0.0254	0.0115	0.0138
176	0.0259	0.0118	0.0141
177	0.0270	0.0123	0.0147
178	0.0276	0.0125	0.0150
179	0.0289	0.0132	0.0158
180	0.0297	0.0135	0.0162
181	0.0313	0.0142	0.0171
182	0.0323	0.0147	0.0176
183	0.0345	0.0157	0.0188
184	0.0357	0.0162	0.0195
185	0.0315	0.0143	0.0172
186	0.0332	0.0151	0.0181
187	0.0377	0.0172	0.0206
188	0.0407	0.0185	0.0222
189	0.0512	0.0192	0.0321
190	0.0576	0.0192	0.0384
191	0.0814	0.0192	0.0623
192	0.1109	0.0192	0.0917
193	0.3292	0.0192	0.3100
194	0.0668	0.0192	0.0476
195	0.0443	0.0192	0.0252
196	0.0353	0.0160	0.0192
197	0.0371	0.0169	0.0202
198	0.0333	0.0151	0.0182
199	0.0305	0.0139	0.0166
200	0.0282	0.0128	0.0154
201	0.0264	0.0120	0.0144
202	0.0249	0.0113	0.0136
203	0.0237	0.0108	0.0129
204	0.0226	0.0103	0.0123
205	0.0206	0.0094	0.0112
206	0.0197	0.0090	0.0108
207	0.0190	0.0086	0.0104
208	0.0183	0.0083	0.0100
209	0.0177	0.0081	0.0097
210	0.0172	0.0078	0.0094
211	0.0166	0.0076	0.0091
212	0.0162	0.0074	0.0088
213	0.0158	0.0072	0.0086
214	0.0154	0.0070	0.0084
215	0.0150	0.0068	0.0082
216	0.0146	0.0067	0.0080
217	0.0113	0.0051	0.0062
218	0.0110	0.0050	0.0060
219	0.0107	0.0049	0.0059
220	0.0105	0.0048	0.0057
221	0.0103	0.0047	0.0056
222	0.0100	0.0046	0.0055
223	0.0098	0.0045	0.0054
224	0.0096	0.0044	0.0052

225	0.0094	0.0043	0.0051
226	0.0093	0.0042	0.0050
227	0.0091	0.0041	0.0050
228	0.0089	0.0041	0.0049
229	0.0088	0.0040	0.0048
230	0.0086	0.0039	0.0047
231	0.0085	0.0039	0.0046
232	0.0083	0.0038	0.0045
233	0.0082	0.0037	0.0045
234	0.0081	0.0037	0.0044
235	0.0080	0.0036	0.0043
236	0.0078	0.0036	0.0043
237	0.0077	0.0035	0.0042
238	0.0076	0.0035	0.0042
239	0.0075	0.0034	0.0041
240	0.0074	0.0034	0.0040
241	0.0073	0.0033	0.0040
242	0.0072	0.0033	0.0039
243	0.0071	0.0032	0.0039
244	0.0071	0.0032	0.0038
245	0.0070	0.0032	0.0038
246	0.0069	0.0031	0.0038
247	0.0068	0.0031	0.0037
248	0.0067	0.0031	0.0037
249	0.0067	0.0030	0.0036
250	0.0066	0.0030	0.0036
251	0.0065	0.0030	0.0035
252	0.0064	0.0029	0.0035
253	0.0064	0.0029	0.0035
254	0.0063	0.0029	0.0034
255	0.0062	0.0028	0.0034
256	0.0062	0.0028	0.0034
257	0.0061	0.0028	0.0033
258	0.0061	0.0028	0.0033
259	0.0060	0.0027	0.0033
260	0.0059	0.0027	0.0032
261	0.0059	0.0027	0.0032
262	0.0058	0.0027	0.0032
263	0.0058	0.0026	0.0032
264	0.0057	0.0026	0.0031
265	0.0057	0.0026	0.0031
266	0.0056	0.0026	0.0031
267	0.0056	0.0025	0.0030
268	0.0055	0.0025	0.0030
269	0.0055	0.0025	0.0030
270	0.0054	0.0025	0.0030
271	0.0054	0.0025	0.0029
272	0.0054	0.0024	0.0029
273	0.0053	0.0024	0.0029
274	0.0053	0.0024	0.0029
275	0.0052	0.0024	0.0029
276	0.0052	0.0024	0.0028
277	0.0052	0.0023	0.0028
278	0.0051	0.0023	0.0028
279	0.0051	0.0023	0.0028
280	0.0050	0.0023	0.0028
281	0.0050	0.0023	0.0027
282	0.0050	0.0023	0.0027

283	0.0049	0.0022	0.0027
284	0.0049	0.0022	0.0027
285	0.0049	0.0022	0.0027
286	0.0048	0.0022	0.0026
287	0.0048	0.0022	0.0026
288	0.0048	0.0022	0.0026

Total soil rain loss = 1.47(In)
Total effective rainfall = 2.21(In)
Peak flow rate in flood hydrograph = 960.64(CFS)

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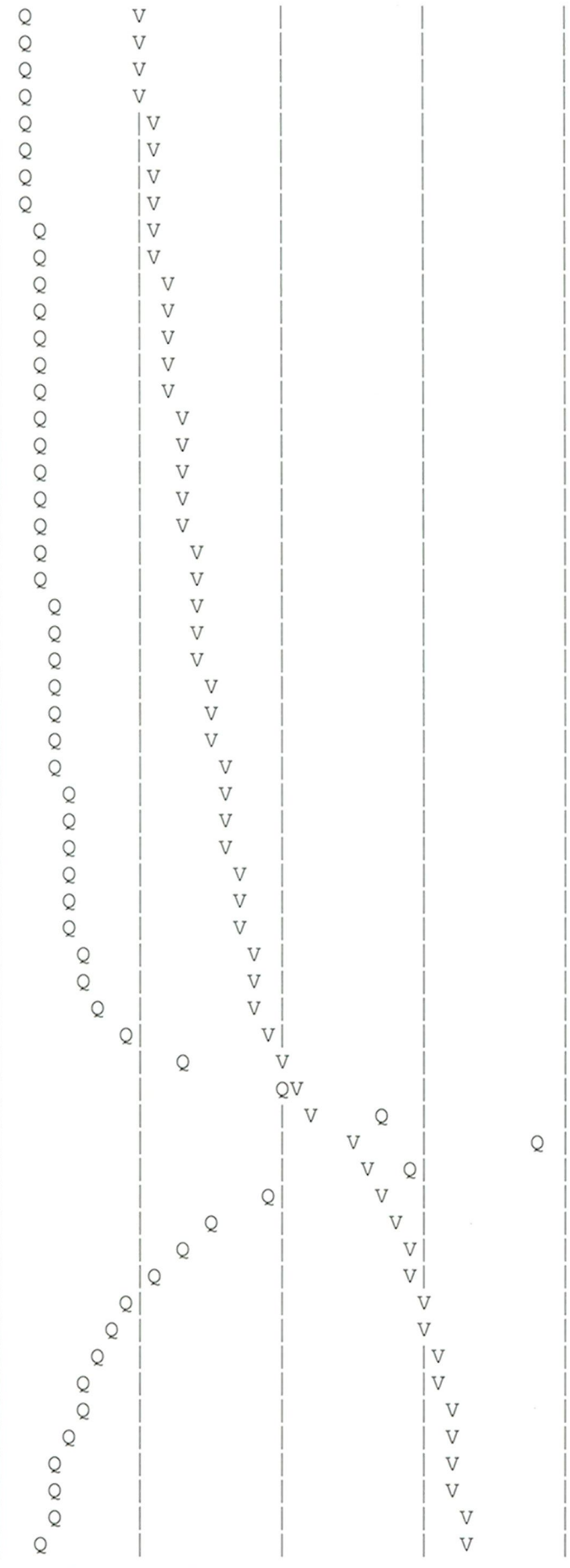
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	250.0	500.0	750.0	1000.0
0+ 5	0.0029	0.42	Q				
0+10	0.0149	1.74	Q				
0+15	0.0437	4.19	Q				
0+20	0.1106	9.71	Q				
0+25	0.2046	13.65	Q				
0+30	0.3119	15.58	Q				
0+35	0.4288	16.96	Q				
0+40	0.5530	18.03	Q				
0+45	0.6830	18.88	Q				
0+50	0.8178	19.57	Q				
0+55	0.9565	20.14	Q				
1+ 0	1.0983	20.60	Q				
1+ 5	1.2427	20.96	Q				
1+10	1.3891	21.26	Q				
1+15	1.5370	21.47	Q				
1+20	1.6859	21.62	Q				
1+25	1.8358	21.76	Q				
1+30	1.9866	21.90	Q				
1+35	2.1382	22.02	Q				
1+40	2.2907	22.13	Q				
1+45	2.4440	22.26	Q				
1+50	2.5981	22.38	Q				
1+55	2.7530	22.48	Q				
2+ 0	2.9085	22.59	Q				
2+ 5	3.0647	22.68	Q				
2+10	3.2215	22.77	QV				
2+15	3.3789	22.85	QV				
2+20	3.5369	22.94	QV				
2+25	3.6954	23.02	QV				
2+30	3.8545	23.11	QV				
2+35	4.0143	23.19	QV				
2+40	4.1746	23.28	QV				
2+45	4.3356	23.37	QV				
2+50	4.4972	23.46	QV				
2+55	4.6593	23.55	QV				
3+ 0	4.8222	23.64	QV				
3+ 5	4.9856	23.73	QV				

3+10	5.1497	23.83	QV	|	|	|	|
3+15	5.3145	23.92	QV	|	|	|	|
3+20	5.4799	24.02	QV	|	|	|	|
3+25	5.6460	24.11	QV	|	|	|	|
3+30	5.8127	24.21	QV	|	|	|	|
3+35	5.9802	24.31	QV	|	|	|	|
3+40	6.1483	24.41	QV	|	|	|	|
3+45	6.3171	24.51	Q V	|	|	|	|
3+50	6.4866	24.61	Q V	|	|	|	|
3+55	6.6568	24.71	Q V	|	|	|	|
4+ 0	6.8277	24.82	Q V	|	|	|	|
4+ 5	6.9993	24.92	Q V	|	|	|	|
4+10	7.1717	25.03	|QV	|	|	|	|
4+15	7.3448	25.13	|QV	|	|	|	|
4+20	7.5187	25.25	|QV	|	|	|	|
4+25	7.6933	25.35	|QV	|	|	|	|
4+30	7.8687	25.47	|QV	|	|	|	|
4+35	8.0448	25.58	|QV	|	|	|	|
4+40	8.2217	25.69	|QV	|	|	|	|
4+45	8.3994	25.80	|QV	|	|	|	|
4+50	8.5780	25.92	|QV	|	|	|	|
4+55	8.7573	26.04	|QV	|	|	|	|
5+ 0	8.9374	26.16	|QV	|	|	|	|
5+ 5	9.1184	26.28	|QV	|	|	|	|
5+10	9.3002	26.40	|QV	|	|	|	|
5+15	9.4829	26.52	|Q V	|	|	|	|
5+20	9.6664	26.65	|Q V	|	|	|	|
5+25	9.8508	26.77	|Q V	|	|	|	|
5+30	10.0361	26.90	|Q V	|	|	|	|
5+35	10.2222	27.03	|Q V	|	|	|	|
5+40	10.4093	27.16	|Q V	|	|	|	|
5+45	10.5972	27.29	|Q V	|	|	|	|
5+50	10.7861	27.43	|Q V	|	|	|	|
5+55	10.9760	27.56	|Q V	|	|	|	|
6+ 0	11.1668	27.70	|Q V	|	|	|	|
6+ 5	11.3585	27.84	|Q V	|	|	|	|
6+10	11.5512	27.98	|Q V	|	|	|	|
6+15	11.7449	28.12	|Q V	|	|	|	|
6+20	11.9396	28.27	|Q V	|	|	|	|
6+25	12.1353	28.42	|Q V	|	|	|	|
6+30	12.3321	28.57	|Q V	|	|	|	|
6+35	12.5299	28.72	|Q V	|	|	|	|
6+40	12.7287	28.87	|Q V	|	|	|	|
6+45	12.9286	29.03	|Q V	|	|	|	|
6+50	13.1297	29.19	|Q V	|	|	|	|
6+55	13.3318	29.34	|Q V	|	|	|	|
7+ 0	13.5350	29.51	|Q V	|	|	|	|
7+ 5	13.7393	29.67	|Q V	|	|	|	|
7+10	13.9448	29.84	|Q V	|	|	|	|
7+15	14.1515	30.01	|Q V	|	|	|	|
7+20	14.3594	30.18	|Q V	|	|	|	|
7+25	14.5684	30.35	|Q V	|	|	|	|
7+30	14.7787	30.53	|Q V	|	|	|	|
7+35	14.9902	30.71	|Q V	|	|	|	|
7+40	15.2030	30.90	|Q V	|	|	|	|
7+45	15.4170	31.08	|Q V	|	|	|	|
7+50	15.6324	31.27	|Q V	|	|	|	|
7+55	15.8491	31.46	|Q V	|	|	|	|

8+ 0	16.0671	31.66	Q V			
8+ 5	16.2864	31.85	Q V			
8+10	16.5072	32.06	Q V			
8+15	16.7294	32.26	Q V			
8+20	16.9530	32.47	Q V			
8+25	17.1780	32.67	Q V			
8+30	17.4045	32.89	Q V			
8+35	17.6325	33.11	Q V			
8+40	17.8621	33.33	Q V			
8+45	18.0932	33.56	Q V			
8+50	18.3259	33.79	Q V			
8+55	18.5602	34.02	Q V			
9+ 0	18.7962	34.26	Q V			
9+ 5	19.0338	34.50	Q V			
9+10	19.2732	34.75	Q V			
9+15	19.5142	35.00	Q V			
9+20	19.7571	35.26	Q V			
9+25	20.0017	35.52	Q V			
9+30	20.2482	35.79	Q V			
9+35	20.4965	36.06	Q V			
9+40	20.7468	36.34	Q V			
9+45	20.9990	36.62	Q V			
9+50	21.2533	36.91	Q V			
9+55	21.5095	37.20	Q V			
10+ 0	21.7678	37.51	Q V			
10+ 5	22.0283	37.81	Q V			
10+10	22.2909	38.13	Q V			
10+15	22.5557	38.45	Q V			
10+20	22.8228	38.78	Q V			
10+25	23.0922	39.11	Q V			
10+30	23.3640	39.46	Q V			
10+35	23.6381	39.81	Q V			
10+40	23.9148	40.17	Q V			
10+45	24.1940	40.54	Q V			
10+50	24.4758	40.92	Q V			
10+55	24.7602	41.30	Q V			
11+ 0	25.0474	41.70	Q V			
11+ 5	25.3374	42.10	Q V			
11+10	25.6303	42.53	Q V			
11+15	25.9260	42.94	Q V			
11+20	26.2249	43.39	Q V			
11+25	26.5267	43.83	Q V			
11+30	26.8319	44.31	Q V			
11+35	27.1402	44.77	Q V			
11+40	27.4520	45.27	Q V			
11+45	27.7672	45.76	Q V			
11+50	28.0860	46.29	Q V			
11+55	28.4085	46.82	Q V			
12+ 0	28.7347	47.38	Q V			
12+ 5	29.0667	48.20	Q V			
12+10	29.4086	49.64	Q V			
12+15	29.7653	51.79	Q V			
12+20	30.1506	55.94	Q V			
12+25	30.5575	59.09	Q V			
12+30	30.9776	61.00	Q V			
12+35	31.4084	62.55	Q V			
12+40	31.8489	63.96	Q V			
12+45	32.2981	65.23	Q V			

12+50	32.7558	66.45	
12+55	33.2213	67.59	
13+ 0	33.6947	68.73	
13+ 5	34.1754	69.81	
13+10	34.6638	70.91	
13+15	35.1594	71.96	
13+20	35.6625	73.05	
13+25	36.1731	74.13	
13+30	36.6917	75.30	
13+35	37.2183	76.47	
13+40	37.7536	77.73	
13+45	38.2977	79.00	
13+50	38.8514	80.39	
13+55	39.4146	81.78	
14+ 0	39.9883	83.30	
14+ 5	40.5732	84.92	
14+10	41.1716	86.89	
14+15	41.7853	89.12	
14+20	42.4202	92.19	
14+25	43.0742	94.96	
14+30	43.7458	97.51	
14+35	44.4344	99.99	
14+40	45.1414	102.66	
14+45	45.8671	105.37	
14+50	46.6134	108.36	
14+55	47.3808	111.43	
15+ 0	48.1721	114.90	
15+ 5	48.9883	118.51	
15+10	49.8329	122.64	
15+15	50.7077	127.01	
15+20	51.6175	132.11	
15+25	52.5609	136.98	
15+30	53.5359	141.57	
15+35	54.5354	145.13	
15+40	55.5390	145.73	
15+45	56.5794	151.06	
15+50	57.7169	165.16	
15+55	59.0214	189.42	
16+ 0	60.6610	238.07	
16+ 5	63.0181	342.25	
16+10	66.5156	507.83	
16+15	71.2444	686.63	
16+20	77.8604	960.64	
16+25	83.0155	748.51	
16+30	86.3751	487.82	
16+35	89.0271	385.06	
16+40	91.2803	327.17	
16+45	93.2384	284.32	
16+50	94.9541	249.11	
16+55	96.4673	219.72	
17+ 0	97.8043	194.13	
17+ 5	98.9828	171.11	
17+10	100.0329	152.48	
17+15	100.9543	133.78	
17+20	101.7703	118.48	
17+25	102.5329	110.73	
17+30	103.2537	104.66	
17+35	103.9320	98.50	

17+40	104.5794	94.00	Q			V
17+45	105.2071	91.14	Q			V
17+50	105.8073	87.14	Q			V
17+55	106.3732	82.17	Q			V
18+ 0	106.9138	78.49	Q			V
18+ 5	107.4313	75.14	Q			V
18+10	107.9158	70.36	Q			V
18+15	108.3752	66.70	Q			V
18+20	108.7982	61.41	Q			V
18+25	109.1929	57.32	Q			V
18+30	109.5692	54.63	Q			V
18+35	109.9301	52.41	Q			V
18+40	110.2779	50.49	Q			V
18+45	110.6140	48.81	Q			V
18+50	110.9397	47.30	Q			V
18+55	111.2561	45.94	Q			V
19+ 0	111.5641	44.72	Q			V
19+ 5	111.8645	43.61	Q			V
19+10	112.1579	42.60	Q			V
19+15	112.4450	41.69	Q			V
19+20	112.7264	40.86	Q			V
19+25	113.0025	40.08	Q			V
19+30	113.2734	39.34	Q			V
19+35	113.5395	38.63	Q			V
19+40	113.8009	37.97	Q			V
19+45	114.0580	37.32	Q			V
19+50	114.3107	36.70	Q			V
19+55	114.5595	36.12	Q			V
20+ 0	114.8044	35.56	Q			V
20+ 5	115.0457	35.03	Q			V
20+10	115.2835	34.53	Q			V
20+15	115.5179	34.04	Q			V
20+20	115.7491	33.57	Q			V
20+25	115.9772	33.12	Q			V
20+30	116.2024	32.69	Q			V
20+35	116.4246	32.27	Q			V
20+40	116.6440	31.86	Q			V
20+45	116.8607	31.47	Q			V
20+50	117.0748	31.08	Q			V
20+55	117.2863	30.71	Q			V
21+ 0	117.4954	30.36	Q			V
21+ 5	117.7020	30.01	Q			V
21+10	117.9064	29.67	Q			V
21+15	118.1085	29.34	Q			V
21+20	118.3083	29.02	Q			V
21+25	118.5061	28.71	Q			V
21+30	118.7018	28.41	Q			V
21+35	118.8955	28.12	Q			V
21+40	119.0872	27.84	Q			V
21+45	119.2769	27.56	Q			V
21+50	119.4649	27.29	Q			V
21+55	119.6510	27.02	Q			V
22+ 0	119.8353	26.76	Q			V
22+ 5	120.0179	26.51	Q			V
22+10	120.1988	26.27	Q			V
22+15	120.3781	26.03	Q			V
22+20	120.5557	25.80	Q			V
22+25	120.7318	25.57	Q			V

22+30	120.9064	25.34	|Q	|	|	|	V |
22+35	121.0794	25.13	|Q	|	|	|	V |
22+40	121.2510	24.91	Q	|	|	|	V |
22+45	121.4211	24.70	Q	|	|	|	V|
22+50	121.5898	24.50	Q	|	|	|	V|
22+55	121.7572	24.30	Q	|	|	|	V|
23+ 0	121.9232	24.10	Q	|	|	|	V|
23+ 5	122.0879	23.91	Q	|	|	|	V|
23+10	122.2513	23.72	Q	|	|	|	V|
23+15	122.4134	23.54	Q	|	|	|	V|
23+20	122.5743	23.36	Q	|	|	|	V|
23+25	122.7340	23.18	Q	|	|	|	V|
23+30	122.8924	23.01	Q	|	|	|	V|
23+35	123.0497	22.84	Q	|	|	|	V|
23+40	123.2059	22.67	Q	|	|	|	V|
23+45	123.3609	22.51	Q	|	|	|	V|
23+50	123.5148	22.35	Q	|	|	|	V|
23+55	123.6677	22.19	Q	|	|	|	V|
24+ 0	123.8194	22.04	Q	|	|	|	V|
24+ 5	123.9673	21.46	Q	|	|	|	V|
24+10	124.1050	20.00	Q	|	|	|	V|
24+15	124.2251	17.43	Q	|	|	|	V|
24+20	124.3064	11.81	Q	|	|	|	V|
24+25	124.3603	7.83	Q	|	|	|	V|
24+30	124.4009	5.89	Q	|	|	|	V|
24+35	124.4321	4.52	Q	|	|	|	V|
24+40	124.4561	3.49	Q	|	|	|	V|
24+45	124.4745	2.68	Q	|	|	|	V|
24+50	124.4885	2.03	Q	|	|	|	V|
24+55	124.4990	1.52	Q	|	|	|	V|
25+ 0	124.5067	1.12	Q	|	|	|	V|
25+ 5	124.5123	0.82	Q	|	|	|	V|
25+10	124.5163	0.58	Q	|	|	|	V|
25+15	124.5193	0.44	Q	|	|	|	V|
25+20	124.5218	0.36	Q	|	|	|	V|
25+25	124.5238	0.29	Q	|	|	|	V|
25+30	124.5254	0.23	Q	|	|	|	V|
25+35	124.5267	0.19	Q	|	|	|	V|
25+40	124.5278	0.15	Q	|	|	|	V|
25+45	124.5285	0.10	Q	|	|	|	V|
25+50	124.5289	0.06	Q	|	|	|	V|
25+55	124.5292	0.04	Q	|	|	|	V|
26+ 0	124.5293	0.02	Q	|	|	|	V|

U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/26/12 File Name UNIT25Y24HEX1A.out

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Orange County Unit Hydrograph Hydrology Method
Manual Date(s) - October 1986, November 1996

Program License Serial Number 6062

ESPERANZA HILLS OPTION 1
DETENTION BASIN ANALYSIS
EXISTING CONDITION AREA A
25-YEAR 24-HOUR

Storm Event Year = 25

Antecedent Moisture Condition = 2

English (in-lb) Input Units Used

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	Area (Ac.)	Area Fraction	Soil Group	Fp (In/Hr)	Ap (dec.)	Fm (In/Hr)
72.0	17.0	0.03	B	0.300	0.990	0.297
81.0	404.8	0.60	C	0.250	0.990	0.248
86.0	255.4	0.38	D	0.200	0.990	0.198

Area-averaged adjusted loss rate Fm (In/Hr) = 0.230

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC2)	S	Pervious Yield Fr
16.83	0.025	72.0	72.0	3.89	0.404
0.17	0.000	98.0	98.0	0.20	0.947
400.70	0.592	81.0	81.0	2.35	0.566
4.05	0.006	98.0	98.0	0.20	0.947
252.90	0.373	86.0	86.0	1.63	0.667
2.55	0.004	98.0	98.0	0.20	0.947

Area-averaged catchment yield fraction, Y = 0.603
Area-averaged low loss fraction, Yb = 0.397

++

User entry of time of concentration = 0.350 (hours)
Watershed area = 677.20(Ac.)
Catchment Lag time = 0.280 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 29.7619
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.230(In/Hr)
Average low loss rate fraction (Yb) = 0.397 (decimal)
FOOTHILL S-Graph Selected
Computed peak 5-minute rainfall = 0.400(In)
Computed peak 30-minute rainfall = 0.870(In)
Specified peak 1-hour rainfall = 1.150(In)
Computed peak 3-hour rainfall = 1.940(In)
Specified peak 6-hour rainfall = 2.710(In)
Specified peak 24-hour rainfall = 4.490(In)

Rainfall depth area reduction factors:
Using a total area of 677.20(Ac.) (Ref: fig. E-4)

5-minute factor = 0.968 Adjusted rainfall = 0.387(In)
30-minute factor = 0.968 Adjusted rainfall = 0.842(In)
1-hour factor = 0.968 Adjusted rainfall = 1.113(In)
3-hour factor = 0.996 Adjusted rainfall = 1.932(In)
6-hour factor = 0.998 Adjusted rainfall = 2.704(In)
24-hour factor = 0.999 Adjusted rainfall = 4.486(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
(K = 8189.89 (CFS))		
1	2.128	174.298
2	8.922	556.404
3	22.234	1090.197
4	51.048	2359.915
5	66.754	1286.255
6	75.119	685.054
7	81.149	493.854
8	85.674	370.604
9	89.229	291.139
10	92.005	227.414
11	94.197	179.491
12	95.822	133.066
13	97.052	100.790
14	97.875	67.399
15	98.279	33.025
16	98.613	27.362
17	98.908	24.215
18	99.125	17.745
19	99.312	15.284
20	99.543	18.938
21	99.739	16.060
22	99.859	9.812
23	99.939	6.595

24	100.000	4.972

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.3873	0.3873
2	0.5231	0.1358
3	0.6237	0.1006
4	0.7066	0.0829
5	0.7783	0.0718
6	0.8424	0.0640
7	0.8963	0.0539
8	0.9458	0.0495
9	0.9917	0.0459
10	1.0347	0.0430
11	1.0752	0.0405
12	1.1135	0.0383
13	1.1591	0.0456
14	1.2030	0.0439
15	1.2454	0.0424
16	1.2864	0.0410
17	1.3261	0.0397
18	1.3647	0.0386
19	1.4022	0.0375
20	1.4388	0.0366
21	1.4744	0.0357
22	1.5092	0.0348
23	1.5433	0.0340
24	1.5766	0.0333
25	1.6092	0.0326
26	1.6412	0.0320
27	1.6725	0.0314
28	1.7033	0.0308
29	1.7336	0.0303
30	1.7633	0.0297
31	1.7926	0.0292
32	1.8213	0.0288
33	1.8497	0.0283
34	1.8776	0.0279
35	1.9051	0.0275
36	1.9322	0.0271
37	1.9580	0.0258
38	1.9835	0.0255
39	2.0087	0.0251
40	2.0335	0.0248
41	2.0580	0.0245
42	2.0822	0.0242
43	2.1061	0.0239
44	2.1297	0.0236
45	2.1530	0.0233
46	2.1761	0.0231
47	2.1989	0.0228
48	2.2215	0.0226
49	2.2438	0.0223
50	2.2659	0.0221
51	2.2878	0.0219
52	2.3094	0.0216
53	2.3309	0.0214
54	2.3521	0.0212

55	2.3731	0.0210
56	2.3939	0.0208
57	2.4146	0.0206
58	2.4350	0.0205
59	2.4553	0.0203
60	2.4754	0.0201
61	2.4953	0.0199
62	2.5151	0.0198
63	2.5347	0.0196
64	2.5541	0.0194
65	2.5734	0.0193
66	2.5925	0.0191
67	2.6115	0.0190
68	2.6303	0.0188
69	2.6490	0.0187
70	2.6676	0.0186
71	2.6860	0.0184
72	2.7043	0.0183
73	2.7179	0.0137
74	2.7315	0.0135
75	2.7449	0.0134
76	2.7582	0.0133
77	2.7714	0.0132
78	2.7845	0.0131
79	2.7974	0.0130
80	2.8103	0.0129
81	2.8231	0.0128
82	2.8358	0.0127
83	2.8484	0.0126
84	2.8608	0.0125
85	2.8732	0.0124
86	2.8855	0.0123
87	2.8977	0.0122
88	2.9098	0.0121
89	2.9219	0.0120
90	2.9338	0.0119
91	2.9457	0.0119
92	2.9575	0.0118
93	2.9692	0.0117
94	2.9808	0.0116
95	2.9923	0.0115
96	3.0038	0.0115
97	3.0152	0.0114
98	3.0265	0.0113
99	3.0377	0.0112
100	3.0489	0.0112
101	3.0600	0.0111
102	3.0710	0.0110
103	3.0820	0.0110
104	3.0929	0.0109
105	3.1037	0.0108
106	3.1144	0.0108
107	3.1251	0.0107
108	3.1358	0.0106
109	3.1463	0.0106
110	3.1569	0.0105
111	3.1673	0.0104
112	3.1777	0.0104

113	3.1880	0.0103
114	3.1983	0.0103
115	3.2085	0.0102
116	3.2187	0.0102
117	3.2288	0.0101
118	3.2388	0.0100
119	3.2488	0.0100
120	3.2588	0.0099
121	3.2687	0.0099
122	3.2785	0.0098
123	3.2883	0.0098
124	3.2980	0.0097
125	3.3077	0.0097
126	3.3173	0.0096
127	3.3269	0.0096
128	3.3365	0.0095
129	3.3460	0.0095
130	3.3554	0.0094
131	3.3648	0.0094
132	3.3742	0.0094
133	3.3835	0.0093
134	3.3927	0.0093
135	3.4020	0.0092
136	3.4111	0.0092
137	3.4203	0.0091
138	3.4294	0.0091
139	3.4384	0.0091
140	3.4474	0.0090
141	3.4564	0.0090
142	3.4653	0.0089
143	3.4742	0.0089
144	3.4831	0.0089
145	3.4919	0.0088
146	3.5007	0.0088
147	3.5094	0.0087
148	3.5181	0.0087
149	3.5268	0.0087
150	3.5354	0.0086
151	3.5440	0.0086
152	3.5525	0.0086
153	3.5610	0.0085
154	3.5695	0.0085
155	3.5780	0.0084
156	3.5864	0.0084
157	3.5948	0.0084
158	3.6031	0.0083
159	3.6114	0.0083
160	3.6197	0.0083
161	3.6279	0.0082
162	3.6361	0.0082
163	3.6443	0.0082
164	3.6525	0.0081
165	3.6606	0.0081
166	3.6687	0.0081
167	3.6767	0.0081
168	3.6848	0.0080
169	3.6927	0.0080
170	3.7007	0.0080

171	3.7086	0.0079
172	3.7165	0.0079
173	3.7244	0.0079
174	3.7323	0.0078
175	3.7401	0.0078
176	3.7479	0.0078
177	3.7556	0.0078
178	3.7634	0.0077
179	3.7711	0.0077
180	3.7788	0.0077
181	3.7864	0.0077
182	3.7940	0.0076
183	3.8016	0.0076
184	3.8092	0.0076
185	3.8167	0.0075
186	3.8243	0.0075
187	3.8318	0.0075
188	3.8392	0.0075
189	3.8467	0.0074
190	3.8541	0.0074
191	3.8615	0.0074
192	3.8689	0.0074
193	3.8762	0.0073
194	3.8835	0.0073
195	3.8908	0.0073
196	3.8981	0.0073
197	3.9053	0.0073
198	3.9126	0.0072
199	3.9198	0.0072
200	3.9270	0.0072
201	3.9341	0.0072
202	3.9412	0.0071
203	3.9484	0.0071
204	3.9555	0.0071
205	3.9625	0.0071
206	3.9696	0.0070
207	3.9766	0.0070
208	3.9836	0.0070
209	3.9906	0.0070
210	3.9975	0.0070
211	4.0045	0.0069
212	4.0114	0.0069
213	4.0183	0.0069
214	4.0252	0.0069
215	4.0320	0.0069
216	4.0389	0.0068
217	4.0457	0.0068
218	4.0525	0.0068
219	4.0593	0.0068
220	4.0660	0.0068
221	4.0728	0.0067
222	4.0795	0.0067
223	4.0862	0.0067
224	4.0929	0.0067
225	4.0995	0.0067
226	4.1062	0.0066
227	4.1128	0.0066
228	4.1194	0.0066

229	4.1260	0.0066
230	4.1326	0.0066
231	4.1391	0.0066
232	4.1456	0.0065
233	4.1522	0.0065
234	4.1587	0.0065
235	4.1651	0.0065
236	4.1716	0.0065
237	4.1780	0.0064
238	4.1845	0.0064
239	4.1909	0.0064
240	4.1973	0.0064
241	4.2037	0.0064
242	4.2100	0.0064
243	4.2164	0.0063
244	4.2227	0.0063
245	4.2290	0.0063
246	4.2353	0.0063
247	4.2416	0.0063
248	4.2478	0.0063
249	4.2541	0.0062
250	4.2603	0.0062
251	4.2665	0.0062
252	4.2727	0.0062
253	4.2789	0.0062
254	4.2851	0.0062
255	4.2912	0.0062
256	4.2974	0.0061
257	4.3035	0.0061
258	4.3096	0.0061
259	4.3157	0.0061
260	4.3218	0.0061
261	4.3278	0.0061
262	4.3339	0.0060
263	4.3399	0.0060
264	4.3459	0.0060
265	4.3519	0.0060
266	4.3579	0.0060
267	4.3639	0.0060
268	4.3698	0.0060
269	4.3758	0.0059
270	4.3817	0.0059
271	4.3876	0.0059
272	4.3935	0.0059
273	4.3994	0.0059
274	4.4053	0.0059
275	4.4112	0.0059
276	4.4170	0.0059
277	4.4229	0.0058
278	4.4287	0.0058
279	4.4345	0.0058
280	4.4403	0.0058
281	4.4461	0.0058
282	4.4518	0.0058
283	4.4576	0.0058
284	4.4633	0.0057
285	4.4691	0.0057
286	4.4748	0.0057

287	4.4805	0.0057
288	4.4862	0.0057

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0057	0.0023	0.0034
2	0.0057	0.0023	0.0034
3	0.0057	0.0023	0.0035
4	0.0057	0.0023	0.0035
5	0.0058	0.0023	0.0035
6	0.0058	0.0023	0.0035
7	0.0058	0.0023	0.0035
8	0.0058	0.0023	0.0035
9	0.0059	0.0023	0.0035
10	0.0059	0.0023	0.0035
11	0.0059	0.0023	0.0036
12	0.0059	0.0023	0.0036
13	0.0059	0.0024	0.0036
14	0.0059	0.0024	0.0036
15	0.0060	0.0024	0.0036
16	0.0060	0.0024	0.0036
17	0.0060	0.0024	0.0036
18	0.0060	0.0024	0.0036
19	0.0061	0.0024	0.0037
20	0.0061	0.0024	0.0037
21	0.0061	0.0024	0.0037
22	0.0061	0.0024	0.0037
23	0.0062	0.0024	0.0037
24	0.0062	0.0024	0.0037
25	0.0062	0.0025	0.0037
26	0.0062	0.0025	0.0037
27	0.0062	0.0025	0.0038
28	0.0063	0.0025	0.0038
29	0.0063	0.0025	0.0038
30	0.0063	0.0025	0.0038
31	0.0063	0.0025	0.0038
32	0.0064	0.0025	0.0038
33	0.0064	0.0025	0.0039
34	0.0064	0.0025	0.0039
35	0.0064	0.0026	0.0039
36	0.0065	0.0026	0.0039
37	0.0065	0.0026	0.0039
38	0.0065	0.0026	0.0039
39	0.0066	0.0026	0.0040
40	0.0066	0.0026	0.0040
41	0.0066	0.0026	0.0040
42	0.0066	0.0026	0.0040
43	0.0067	0.0026	0.0040
44	0.0067	0.0027	0.0040
45	0.0067	0.0027	0.0041
46	0.0067	0.0027	0.0041
47	0.0068	0.0027	0.0041
48	0.0068	0.0027	0.0041
49	0.0068	0.0027	0.0041
50	0.0069	0.0027	0.0041
51	0.0069	0.0027	0.0042

52	0.0069	0.0027	0.0042
53	0.0070	0.0028	0.0042
54	0.0070	0.0028	0.0042
55	0.0070	0.0028	0.0042
56	0.0070	0.0028	0.0043
57	0.0071	0.0028	0.0043
58	0.0071	0.0028	0.0043
59	0.0072	0.0028	0.0043
60	0.0072	0.0028	0.0043
61	0.0072	0.0029	0.0044
62	0.0073	0.0029	0.0044
63	0.0073	0.0029	0.0044
64	0.0073	0.0029	0.0044
65	0.0074	0.0029	0.0044
66	0.0074	0.0029	0.0045
67	0.0074	0.0030	0.0045
68	0.0075	0.0030	0.0045
69	0.0075	0.0030	0.0045
70	0.0075	0.0030	0.0046
71	0.0076	0.0030	0.0046
72	0.0076	0.0030	0.0046
73	0.0077	0.0030	0.0046
74	0.0077	0.0031	0.0046
75	0.0078	0.0031	0.0047
76	0.0078	0.0031	0.0047
77	0.0078	0.0031	0.0047
78	0.0079	0.0031	0.0048
79	0.0079	0.0031	0.0048
80	0.0080	0.0032	0.0048
81	0.0080	0.0032	0.0048
82	0.0081	0.0032	0.0049
83	0.0081	0.0032	0.0049
84	0.0081	0.0032	0.0049
85	0.0082	0.0033	0.0050
86	0.0082	0.0033	0.0050
87	0.0083	0.0033	0.0050
88	0.0083	0.0033	0.0050
89	0.0084	0.0033	0.0051
90	0.0084	0.0034	0.0051
91	0.0085	0.0034	0.0051
92	0.0086	0.0034	0.0052
93	0.0086	0.0034	0.0052
94	0.0087	0.0034	0.0052
95	0.0087	0.0035	0.0053
96	0.0088	0.0035	0.0053
97	0.0089	0.0035	0.0053
98	0.0089	0.0035	0.0054
99	0.0090	0.0036	0.0054
100	0.0090	0.0036	0.0054
101	0.0091	0.0036	0.0055
102	0.0091	0.0036	0.0055
103	0.0092	0.0037	0.0056
104	0.0093	0.0037	0.0056
105	0.0094	0.0037	0.0056
106	0.0094	0.0037	0.0057
107	0.0095	0.0038	0.0057
108	0.0095	0.0038	0.0058
109	0.0096	0.0038	0.0058

110	0.0097	0.0038	0.0058
111	0.0098	0.0039	0.0059
112	0.0098	0.0039	0.0059
113	0.0099	0.0039	0.0060
114	0.0100	0.0040	0.0060
115	0.0101	0.0040	0.0061
116	0.0102	0.0040	0.0061
117	0.0103	0.0041	0.0062
118	0.0103	0.0041	0.0062
119	0.0104	0.0041	0.0063
120	0.0105	0.0042	0.0063
121	0.0106	0.0042	0.0064
122	0.0107	0.0042	0.0065
123	0.0108	0.0043	0.0065
124	0.0109	0.0043	0.0066
125	0.0110	0.0044	0.0067
126	0.0111	0.0044	0.0067
127	0.0112	0.0045	0.0068
128	0.0113	0.0045	0.0068
129	0.0115	0.0045	0.0069
130	0.0115	0.0046	0.0070
131	0.0117	0.0046	0.0071
132	0.0118	0.0047	0.0071
133	0.0119	0.0047	0.0072
134	0.0120	0.0048	0.0073
135	0.0122	0.0048	0.0074
136	0.0123	0.0049	0.0074
137	0.0125	0.0050	0.0075
138	0.0126	0.0050	0.0076
139	0.0128	0.0051	0.0077
140	0.0129	0.0051	0.0078
141	0.0131	0.0052	0.0079
142	0.0132	0.0052	0.0080
143	0.0134	0.0053	0.0081
144	0.0135	0.0054	0.0082
145	0.0183	0.0073	0.0110
146	0.0184	0.0073	0.0111
147	0.0187	0.0074	0.0113
148	0.0188	0.0075	0.0114
149	0.0191	0.0076	0.0115
150	0.0193	0.0076	0.0116
151	0.0196	0.0078	0.0118
152	0.0198	0.0078	0.0119
153	0.0201	0.0080	0.0121
154	0.0203	0.0080	0.0122
155	0.0206	0.0082	0.0124
156	0.0208	0.0083	0.0126
157	0.0212	0.0084	0.0128
158	0.0214	0.0085	0.0129
159	0.0219	0.0087	0.0132
160	0.0221	0.0088	0.0133
161	0.0226	0.0090	0.0136
162	0.0228	0.0091	0.0138
163	0.0233	0.0093	0.0141
164	0.0236	0.0094	0.0142
165	0.0242	0.0096	0.0146
166	0.0245	0.0097	0.0148
167	0.0251	0.0100	0.0152

168	0.0255	0.0101	0.0154
169	0.0271	0.0108	0.0164
170	0.0275	0.0109	0.0166
171	0.0283	0.0112	0.0171
172	0.0288	0.0114	0.0174
173	0.0297	0.0118	0.0179
174	0.0303	0.0120	0.0182
175	0.0314	0.0124	0.0189
176	0.0320	0.0127	0.0193
177	0.0333	0.0132	0.0201
178	0.0340	0.0135	0.0205
179	0.0357	0.0141	0.0215
180	0.0366	0.0145	0.0220
181	0.0386	0.0153	0.0233
182	0.0397	0.0158	0.0240
183	0.0424	0.0168	0.0256
184	0.0439	0.0174	0.0265
185	0.0383	0.0152	0.0231
186	0.0405	0.0161	0.0244
187	0.0459	0.0182	0.0277
188	0.0495	0.0192	0.0303
189	0.0640	0.0192	0.0449
190	0.0718	0.0192	0.0526
191	0.1006	0.0192	0.0814
192	0.1358	0.0192	0.1166
193	0.3873	0.0192	0.3681
194	0.0829	0.0192	0.0637
195	0.0539	0.0192	0.0348
196	0.0430	0.0170	0.0259
197	0.0456	0.0181	0.0275
198	0.0410	0.0163	0.0247
199	0.0375	0.0149	0.0226
200	0.0348	0.0138	0.0210
201	0.0326	0.0129	0.0197
202	0.0308	0.0122	0.0186
203	0.0292	0.0116	0.0176
204	0.0279	0.0111	0.0168
205	0.0258	0.0103	0.0156
206	0.0248	0.0098	0.0150
207	0.0239	0.0095	0.0144
208	0.0231	0.0092	0.0139
209	0.0223	0.0089	0.0135
210	0.0216	0.0086	0.0131
211	0.0210	0.0083	0.0127
212	0.0205	0.0081	0.0123
213	0.0199	0.0079	0.0120
214	0.0194	0.0077	0.0117
215	0.0190	0.0075	0.0114
216	0.0186	0.0074	0.0112
217	0.0137	0.0054	0.0082
218	0.0133	0.0053	0.0080
219	0.0130	0.0052	0.0078
220	0.0127	0.0050	0.0076
221	0.0124	0.0049	0.0075
222	0.0121	0.0048	0.0073
223	0.0119	0.0047	0.0072
224	0.0116	0.0046	0.0070
225	0.0114	0.0045	0.0069

226	0.0112	0.0044	0.0067
227	0.0110	0.0043	0.0066
228	0.0108	0.0043	0.0065
229	0.0106	0.0042	0.0064
230	0.0104	0.0041	0.0063
231	0.0102	0.0041	0.0062
232	0.0100	0.0040	0.0061
233	0.0099	0.0039	0.0060
234	0.0097	0.0039	0.0059
235	0.0096	0.0038	0.0058
236	0.0094	0.0037	0.0057
237	0.0093	0.0037	0.0056
238	0.0092	0.0036	0.0055
239	0.0091	0.0036	0.0055
240	0.0089	0.0035	0.0054
241	0.0088	0.0035	0.0053
242	0.0087	0.0035	0.0052
243	0.0086	0.0034	0.0052
244	0.0085	0.0034	0.0051
245	0.0084	0.0033	0.0051
246	0.0083	0.0033	0.0050
247	0.0082	0.0032	0.0049
248	0.0081	0.0032	0.0049
249	0.0080	0.0032	0.0048
250	0.0079	0.0031	0.0048
251	0.0078	0.0031	0.0047
252	0.0077	0.0031	0.0047
253	0.0077	0.0030	0.0046
254	0.0076	0.0030	0.0046
255	0.0075	0.0030	0.0045
256	0.0074	0.0029	0.0045
257	0.0073	0.0029	0.0044
258	0.0073	0.0029	0.0044
259	0.0072	0.0029	0.0043
260	0.0071	0.0028	0.0043
261	0.0071	0.0028	0.0043
262	0.0070	0.0028	0.0042
263	0.0069	0.0028	0.0042
264	0.0069	0.0027	0.0041
265	0.0068	0.0027	0.0041
266	0.0068	0.0027	0.0041
267	0.0067	0.0027	0.0040
268	0.0066	0.0026	0.0040
269	0.0066	0.0026	0.0040
270	0.0065	0.0026	0.0039
271	0.0065	0.0026	0.0039
272	0.0064	0.0026	0.0039
273	0.0064	0.0025	0.0038
274	0.0063	0.0025	0.0038
275	0.0063	0.0025	0.0038
276	0.0062	0.0025	0.0038
277	0.0062	0.0025	0.0037
278	0.0061	0.0024	0.0037
279	0.0061	0.0024	0.0037
280	0.0060	0.0024	0.0036
281	0.0060	0.0024	0.0036
282	0.0060	0.0024	0.0036
283	0.0059	0.0023	0.0036

284	0.0059	0.0023	0.0035
285	0.0058	0.0023	0.0035
286	0.0058	0.0023	0.0035
287	0.0058	0.0023	0.0035
288	0.0057	0.0023	0.0034

Total soil rain loss = 1.56(In)
Total effective rainfall = 2.93(In)
Peak flow rate in flood hydrograph = 1241.18(CFS)

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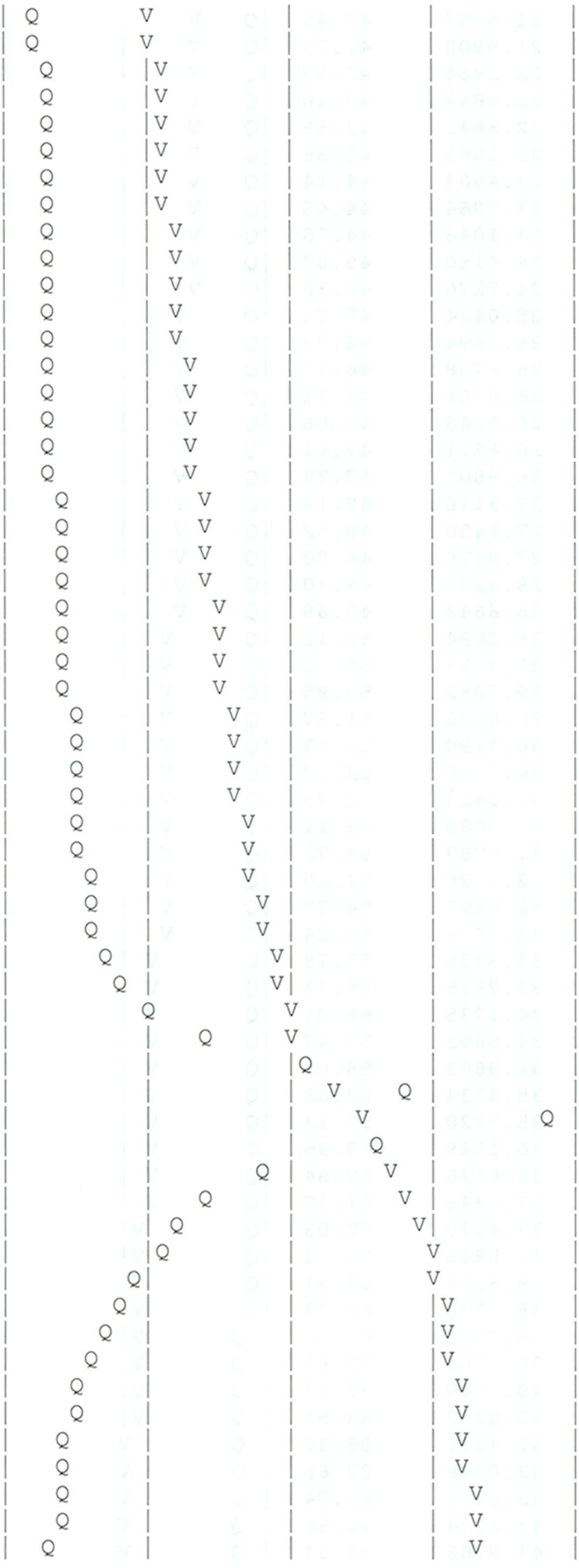
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	325.0	650.0	975.0	1300.0
0+ 5	0.0041	0.60	Q				
0+10	0.0214	2.51	Q				
0+15	0.0645	6.26	Q				
0+20	0.1636	14.39	Q				
0+25	0.2934	18.84	Q				
0+30	0.4398	21.26	Q				
0+35	0.5984	23.03	Q				
0+40	0.7663	24.38	Q				
0+45	0.9416	25.46	Q				
0+50	1.1229	26.33	Q				
0+55	1.3091	27.03	Q				
1+ 0	1.4991	27.58	Q				
1+ 5	1.6920	28.02	Q				
1+10	1.8873	28.35	Q				
1+15	2.0840	28.56	Q				
1+20	2.2821	28.76	Q				
1+25	2.4814	28.94	Q				
1+30	2.6818	29.11	Q				
1+35	2.8833	29.26	Q				
1+40	3.0860	29.43	Q				
1+45	3.2898	29.59	Q				
1+50	3.4946	29.73	Q				
1+55	3.7003	29.86	Q				
2+ 0	3.9068	29.99	Q				
2+ 5	4.1141	30.10	Q				
2+10	4.3222	30.21	QV				
2+15	4.5310	30.32	QV				
2+20	4.7407	30.44	QV				
2+25	4.9511	30.55	QV				
2+30	5.1623	30.67	QV				
2+35	5.3743	30.78	QV				
2+40	5.5872	30.91	QV				
2+45	5.8008	31.02	QV				
2+50	6.0153	31.15	QV				
2+55	6.2306	31.26	QV				
3+ 0	6.4468	31.39	QV				
3+ 5	6.6638	31.51	QV				
3+10	6.8817	31.64	QV				

3+15	7.1005	31.76	QV
3+20	7.3202	31.90	QV
3+25	7.5407	32.02	QV
3+30	7.7621	32.16	QV
3+35	7.9845	32.28	QV
3+40	8.2078	32.42	QV
3+45	8.4320	32.55	|QV
3+50	8.6571	32.69	|QV
3+55	8.8832	32.83	|QV
4+ 0	9.1103	32.97	|QV
4+ 5	9.3383	33.11	|QV
4+10	9.5673	33.25	|QV
4+15	9.7973	33.39	|QV
4+20	10.0283	33.54	|QV
4+25	10.2603	33.69	|QV
4+30	10.4934	33.84	|QV
4+35	10.7275	33.99	|QV
4+40	10.9626	34.14	|QV
4+45	11.1988	34.29	|QV
4+50	11.4361	34.46	|QV
4+55	11.6745	34.61	|QV
5+ 0	11.9140	34.77	|QV
5+ 5	12.1545	34.93	|QV
5+10	12.3963	35.10	|Q V
5+15	12.6391	35.26	|Q V
5+20	12.8831	35.43	|Q V
5+25	13.1283	35.60	|Q V
5+30	13.3747	35.78	|Q V
5+35	13.6222	35.94	|Q V
5+40	13.8710	36.13	|Q V
5+45	14.1210	36.30	|Q V
5+50	14.3723	36.49	|Q V
5+55	14.6248	36.66	|Q V
6+ 0	14.8786	36.85	|Q V
6+ 5	15.1337	37.04	|Q V
6+10	15.3901	37.23	|Q V
6+15	15.6478	37.42	|Q V
6+20	15.9069	37.62	|Q V
6+25	16.1674	37.81	|Q V
6+30	16.4292	38.02	|Q V
6+35	16.6925	38.22	|Q V
6+40	16.9571	38.43	|Q V
6+45	17.2232	38.64	|Q V
6+50	17.4908	38.86	|Q V
6+55	17.7599	39.06	|Q V
7+ 0	18.0305	39.29	|Q V
7+ 5	18.3025	39.51	|Q V
7+10	18.5762	39.74	|Q V
7+15	18.8514	39.96	|Q V
7+20	19.1283	40.20	|Q V
7+25	19.4067	40.43	|Q V
7+30	19.6868	40.67	|Q V
7+35	19.9685	40.91	|Q V
7+40	20.2520	41.16	|Q V
7+45	20.5372	41.40	|Q V
7+50	20.8241	41.67	|Q V
7+55	21.1128	41.92	|Q V
8+ 0	21.4034	42.19	|Q V

8+ 5	21.6957	42.45	|Q V |	|	|	|
8+10	21.9900	42.73	|Q V |	|	|	|
8+15	22.2861	42.99	|Q V |	|	|	|
8+20	22.5842	43.28	|Q V |	|	|	|
8+25	22.8842	43.56	|Q V |	|	|	|
8+30	23.1862	43.86	|Q V |	|	|	|
8+35	23.4903	44.14	|Q V |	|	|	|
8+40	23.7964	44.45	|Q V |	|	|	|
8+45	24.1046	44.75	|Q V |	|	|	|
8+50	24.4150	45.07	|Q V |	|	|	|
8+55	24.7276	45.38	|Q V |	|	|	|
9+ 0	25.0424	45.71	|Q V |	|	|	|
9+ 5	25.3594	46.03	|Q V |	|	|	|
9+10	25.6788	46.37	|Q V |	|	|	|
9+15	26.0004	46.71	|Q V |	|	|	|
9+20	26.3246	47.06	|Q V |	|	|	|
9+25	26.6511	47.41	|Q V |	|	|	|
9+30	26.9801	47.78	|Q V |	|	|	|
9+35	27.3116	48.14	|Q V |	|	|	|
9+40	27.6458	48.52	|Q V |	|	|	|
9+45	27.9826	48.90	|Q V |	|	|	|
9+50	28.3221	49.30	|Q V |	|	|	|
9+55	28.6643	49.69	|Q V |	|	|	|
10+ 0	29.0094	50.11	|Q V |	|	|	|
10+ 5	29.3573	50.51	|Q V |	|	|	|
10+10	29.7082	50.95	|Q V |	|	|	|
10+15	30.0620	51.37	|Q V |	|	|	|
10+20	30.4190	51.83	|Q V |	|	|	|
10+25	30.7790	52.27	|Q V |	|	|	|
10+30	31.1423	52.75	|Q V |	|	|	|
10+35	31.5088	53.21	|Q V |	|	|	|
10+40	31.8787	53.72	|Q V |	|	|	|
10+45	32.2520	54.20	|Q V |	|	|	|
10+50	32.6290	54.73	|Q V |	|	|	|
10+55	33.0094	55.24	|Q V |	|	|	|
11+ 0	33.3936	55.79	|Q V |	|	|	|
11+ 5	33.7815	56.33	|Q V |	|	|	|
11+10	34.1735	56.91	|Q V |	|	|	|
11+15	34.5693	57.47	|Q V |	|	|	|
11+20	34.9693	58.09	|Q V |	|	|	|
11+25	35.3734	58.68	|Q V |	|	|	|
11+30	35.7820	59.33	|Q V |	|	|	|
11+35	36.1949	59.95	|Q V |	|	|	|
11+40	36.6126	60.64	|Q V |	|	|	|
11+45	37.0348	61.30	|Q V |	|	|	|
11+50	37.4620	62.03	|Q V|	|	|	|
11+55	37.8940	62.73	|Q V|	|	|	|
12+ 0	38.3314	63.51	|Q V|	|	|	|
12+ 5	38.7772	64.73	|Q V|	|	|	|
12+10	39.2390	67.06	| Q V|	|	|	|
12+15	39.7268	70.83	| Q V|	|	|	|
12+20	40.2649	78.13	| Q V|	|	|	|
12+25	40.8332	82.51	| Q V|	|	|	|
12+30	41.4211	85.36	| Q V	|	|	|
12+35	42.0248	87.66	| Q V	|	|	|
12+40	42.6428	89.74	| Q V	|	|	|
12+45	43.2734	91.56	| Q V	|	|	|
12+50	43.9162	93.33	| Q V	|	|	|

12+55	44.5700	94.93	
13+ 0	45.2348	96.53	
13+ 5	45.9098	98.01	
13+10	46.5953	99.53	
13+15	47.2904	100.92	
13+20	47.9959	102.44	
13+25	48.7116	103.92	
13+30	49.4385	105.55	
13+35	50.1763	107.13	
13+40	50.9263	108.90	
13+45	51.6882	110.63	
13+50	52.4634	112.55	
13+55	53.2514	114.43	
14+ 0	54.0540	116.53	
14+ 5	54.8714	118.69	
14+10	55.7070	121.32	
14+15	56.5625	124.22	
14+20	57.4448	128.11	
14+25	58.3499	131.41	
14+30	59.2780	134.75	
14+35	60.2283	137.99	
14+40	61.2035	141.60	
14+45	62.2033	145.18	
14+50	63.2313	149.26	
14+55	64.2876	153.38	
15+ 0	65.3767	158.14	
15+ 5	66.4992	162.99	
15+10	67.6611	168.70	
15+15	68.8636	174.60	
15+20	70.1149	181.69	
15+25	71.4111	188.21	
15+30	72.7492	194.29	
15+35	74.1140	198.17	
15+40	75.4757	197.73	
15+45	76.8987	206.61	
15+50	78.4687	227.97	
15+55	80.2888	264.27	
16+ 0	82.5983	335.35	
16+ 5	85.8417	470.93	
16+10	90.5719	686.83	
16+15	96.9171	921.33	
16+20	105.4651	1241.18	
16+25	111.3655	856.73	
16+30	115.4600	594.51	
16+35	118.7554	478.50	
16+40	121.5800	410.13	
16+45	124.0471	358.22	
16+50	126.2075	313.69	
16+55	128.1138	276.79	
17+ 0	129.7902	243.42	
17+ 5	131.2801	216.33	
17+10	132.5984	191.42	
17+15	133.7648	169.36	
17+20	134.8475	157.21	
17+25	135.8677	148.13	
17+30	136.8290	139.58	
17+35	137.7454	133.06	
17+40	138.6316	128.68	

17+45	139.4764	122.67	Q			V	
17+50	140.2759	116.08	Q			V	
17+55	141.0388	110.78	Q			V	
18+ 0	141.7716	106.40	Q			V	
18+ 5	142.4685	101.18	Q			V	
18+10	143.1347	96.73	Q			V	
18+15	143.7629	91.22	Q			V	
18+20	144.3310	82.50	Q			V	
18+25	144.8605	76.88	Q			V	
18+30	145.3638	73.08	Q			V	
18+35	145.8455	69.94	Q			V	
18+40	146.3088	67.26	Q			V	
18+45	146.7558	64.91	Q			V	
18+50	147.1886	62.84	Q			V	
18+55	147.6086	60.98	Q			V	
19+ 0	148.0172	59.33	Q			V	
19+ 5	148.4156	57.85	Q			V	
19+10	148.8048	56.52	Q			V	
19+15	149.1860	55.34	Q			V	
19+20	149.5595	54.23	Q			V	
19+25	149.9257	53.18	Q			V	
19+30	150.2852	52.19	Q			V	
19+35	150.6382	51.26	Q			V	
19+40	150.9849	50.35	Q			V	
19+45	151.3258	49.48	Q			V	
19+50	151.6610	48.67	Q			V	
19+55	151.9909	47.90	Q			V	
20+ 0	152.3157	47.16	Q			V	
20+ 5	152.6357	46.47	Q			V	
20+10	152.9511	45.80	Q			V	
20+15	153.2620	45.15	Q			V	
20+20	153.5687	44.53	Q			V	
20+25	153.8712	43.93	Q			V	
20+30	154.1698	43.35	Q			V	
20+35	154.4645	42.79	Q			V	
20+40	154.7554	42.24	Q			V	
20+45	155.0427	41.72	Q			V	
20+50	155.3265	41.21	Q			V	
20+55	155.6070	40.72	Q			V	
21+ 0	155.8841	40.24	Q			V	
21+ 5	156.1581	39.78	Q			V	
21+10	156.4289	39.33	Q			V	
21+15	156.6968	38.89	Q			V	
21+20	156.9617	38.47	Q			V	
21+25	157.2238	38.05	Q			V	
21+30	157.4831	37.65	Q			V	
21+35	157.7397	37.26	Q			V	
21+40	157.9937	36.88	Q			V	
21+45	158.2452	36.51	Q			V	
21+50	158.4941	36.15	Q			V	
21+55	158.7407	35.80	Q			V	
22+ 0	158.9849	35.45	Q			V	
22+ 5	159.2267	35.12	Q			V	
22+10	159.4664	34.79	Q			V	
22+15	159.7038	34.47	Q			V	
22+20	159.9391	34.16	Q			V	
22+25	160.1722	33.86	Q			V	
22+30	160.4034	33.56	Q			V	

22+35	160.6325	33.27	|Q	|	|	|	V |
22+40	160.8597	32.98	|Q	|	|	|	V |
22+45	161.0849	32.71	|Q	|	|	|	V|
22+50	161.3083	32.43	Q	|	|	|	V|
22+55	161.5298	32.17	Q	|	|	|	V|
23+ 0	161.7496	31.91	Q	|	|	|	V|
23+ 5	161.9676	31.65	Q	|	|	|	V|
23+10	162.1838	31.40	Q	|	|	|	V|
23+15	162.3984	31.16	Q	|	|	|	V|
23+20	162.6113	30.92	Q	|	|	|	V|
23+25	162.8226	30.68	Q	|	|	|	V|
23+30	163.0323	30.45	Q	|	|	|	V|
23+35	163.2404	30.22	Q	|	|	|	V|
23+40	163.4470	30.00	Q	|	|	|	V|
23+45	163.6521	29.78	Q	|	|	|	V|
23+50	163.8558	29.57	Q	|	|	|	V|
23+55	164.0580	29.36	Q	|	|	|	V|
24+ 0	164.2587	29.15	Q	|	|	|	V|
24+ 5	164.4540	28.35	Q	|	|	|	V|
24+10	164.6347	26.25	Q	|	|	|	V|
24+15	164.7886	22.33	Q	|	|	|	V|
24+20	164.8856	14.09	Q	|	|	|	V|
24+25	164.9517	9.59	Q	|	|	|	V|
24+30	165.0011	7.18	Q	|	|	|	V|
24+35	165.0385	5.44	Q	|	|	|	V|
24+40	165.0670	4.13	Q	|	|	|	V|
24+45	165.0883	3.10	Q	|	|	|	V|
24+50	165.1042	2.30	Q	|	|	|	V|
24+55	165.1157	1.67	Q	|	|	|	V|
25+ 0	165.1240	1.20	Q	|	|	|	V|
25+ 5	165.1298	0.85	Q	|	|	|	V|
25+10	165.1341	0.61	Q	|	|	|	V|
25+15	165.1375	0.50	Q	|	|	|	V|
25+20	165.1402	0.40	Q	|	|	|	V|
25+25	165.1424	0.31	Q	|	|	|	V|
25+30	165.1441	0.25	Q	|	|	|	V|
25+35	165.1455	0.20	Q	|	|	|	V|
25+40	165.1464	0.13	Q	|	|	|	V|
25+45	165.1469	0.07	Q	|	|	|	V|
25+50	165.1472	0.04	Q	|	|	|	V|
25+55	165.1473	0.02	Q	|	|	|	V|

U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/26/12 File Name UNIT100Y24HEX1A.out

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Orange County Unit Hydrograph Hydrology Method
Manual Date(s) - October 1986, November 1996

Program License Serial Number 6062

ESPERANZA HILLS OPTION 1
DETENTION BASIN ANALYSIS
EXISTING CONDITION AREA A
100-YEAR 24-HOUR

Storm Event Year = 100

Antecedent Moisture Condition = 3

English (in-lb) Input Units Used

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	Area (Ac.)	Area Fraction	Soil Group	Fp (In/Hr)	Ap (dec.)	Fm (In/Hr)
72.0	17.0	0.03	B	0.300	0.990	0.297
81.0	404.8	0.60	C	0.250	0.990	0.248
86.0	255.4	0.38	D	0.200	0.990	0.198

Area-averaged adjusted loss rate Fm (In/Hr) = 0.230

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC3)	S	Pervious Yield Fr
16.83	0.025	72.0	88.6	1.29	0.770
0.17	0.000	98.0	98.0	0.20	0.958
400.70	0.592	81.0	94.6	0.57	0.888
4.05	0.006	98.0	98.0	0.20	0.958
252.90	0.373	86.0	97.2	0.29	0.941
2.55	0.004	98.0	98.0	0.20	0.958

Area-averaged catchment yield fraction, Y = 0.906
Area-averaged low loss fraction, Yb = 0.094

++

User entry of time of concentration = 0.340 (hours)
Watershed area = 677.20(Ac.)
Catchment Lag time = 0.272 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 30.6373
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.230(In/Hr)
Average low loss rate fraction (Yb) = 0.094 (decimal)
FOOTHILL S-Graph Selected
Computed peak 5-minute rainfall = 0.520(In)
Computed peak 30-minute rainfall = 1.090(In)
Specified peak 1-hour rainfall = 1.450(In)
Computed peak 3-hour rainfall = 2.430(In)
Specified peak 6-hour rainfall = 3.360(In)
Specified peak 24-hour rainfall = 5.630(In)

Rainfall depth area reduction factors:
Using a total area of 677.20(Ac.) (Ref: fig. E-4)

5-minute factor = 0.968 Adjusted rainfall = 0.503(In)
30-minute factor = 0.968 Adjusted rainfall = 1.055(In)
1-hour factor = 0.968 Adjusted rainfall = 1.404(In)
3-hour factor = 0.996 Adjusted rainfall = 2.420(In)
6-hour factor = 0.998 Adjusted rainfall = 3.353(In)
24-hour factor = 0.999 Adjusted rainfall = 5.625(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
(K = 8189.89 (CFS))		
1	2.209	180.887
2	9.338	583.891
3	23.817	1185.837
4	53.629	2441.555
5	68.080	1183.500
6	76.201	665.114
7	82.106	483.577
8	86.530	362.351
9	89.990	283.405
10	92.674	219.756
11	94.751	170.093
12	96.271	124.530
13	97.412	93.475
14	98.062	53.236
15	98.428	29.929
16	98.749	26.279
17	99.027	22.771
18	99.217	15.575
19	99.434	17.799
20	99.669	19.205
21	99.812	11.748
22	99.916	8.494
23	100.000	6.882

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.5035	0.5035
2	0.6704	0.1669
3	0.7926	0.1222
4	0.8926	0.1000
5	0.9788	0.0862
6	1.0554	0.0766
7	1.1246	0.0692
8	1.1881	0.0636
9	1.2471	0.0590
10	1.3024	0.0553
11	1.3546	0.0521
12	1.4040	0.0494
13	1.4608	0.0568
14	1.5155	0.0547
15	1.5682	0.0527
16	1.6192	0.0510
17	1.6685	0.0494
18	1.7165	0.0479
19	1.7631	0.0466
20	1.8085	0.0454
21	1.8528	0.0443
22	1.8960	0.0432
23	1.9383	0.0422
24	1.9796	0.0413
25	2.0200	0.0405
26	2.0597	0.0397
27	2.0986	0.0389
28	2.1368	0.0382
29	2.1743	0.0375
30	2.2111	0.0368
31	2.2473	0.0362
32	2.2830	0.0356
33	2.3181	0.0351
34	2.3526	0.0346
35	2.3867	0.0340
36	2.4202	0.0336
37	2.4516	0.0314
38	2.4826	0.0309
39	2.5131	0.0305
40	2.5432	0.0301
41	2.5729	0.0297
42	2.6022	0.0293
43	2.6311	0.0290
44	2.6597	0.0286
45	2.6880	0.0283
46	2.7159	0.0279
47	2.7435	0.0276
48	2.7708	0.0273
49	2.7978	0.0270
50	2.8245	0.0267
51	2.8510	0.0264
52	2.8771	0.0262
53	2.9030	0.0259
54	2.9286	0.0256
55	2.9540	0.0254

56	2.9792	0.0251
57	3.0041	0.0249
58	3.0287	0.0247
59	3.0532	0.0244
60	3.0774	0.0242
61	3.1014	0.0240
62	3.1252	0.0238
63	3.1488	0.0236
64	3.1722	0.0234
65	3.1954	0.0232
66	3.2185	0.0230
67	3.2413	0.0228
68	3.2640	0.0227
69	3.2865	0.0225
70	3.3088	0.0223
71	3.3309	0.0221
72	3.3529	0.0220
73	3.3702	0.0173
74	3.3874	0.0172
75	3.4044	0.0170
76	3.4212	0.0169
77	3.4380	0.0167
78	3.4546	0.0166
79	3.4710	0.0165
80	3.4874	0.0163
81	3.5036	0.0162
82	3.5197	0.0161
83	3.5356	0.0160
84	3.5515	0.0158
85	3.5672	0.0157
86	3.5828	0.0156
87	3.5983	0.0155
88	3.6137	0.0154
89	3.6289	0.0153
90	3.6441	0.0152
91	3.6592	0.0151
92	3.6741	0.0150
93	3.6890	0.0149
94	3.7037	0.0148
95	3.7184	0.0147
96	3.7330	0.0146
97	3.7474	0.0145
98	3.7618	0.0144
99	3.7761	0.0143
100	3.7903	0.0142
101	3.8044	0.0141
102	3.8184	0.0140
103	3.8323	0.0139
104	3.8462	0.0138
105	3.8599	0.0138
106	3.8736	0.0137
107	3.8872	0.0136
108	3.9007	0.0135
109	3.9142	0.0134
110	3.9275	0.0134
111	3.9408	0.0133
112	3.9540	0.0132
113	3.9672	0.0131

114	3.9803	0.0131
115	3.9932	0.0130
116	4.0062	0.0129
117	4.0190	0.0129
118	4.0318	0.0128
119	4.0445	0.0127
120	4.0572	0.0127
121	4.0698	0.0126
122	4.0823	0.0125
123	4.0948	0.0125
124	4.1071	0.0124
125	4.1195	0.0123
126	4.1318	0.0123
127	4.1440	0.0122
128	4.1561	0.0121
129	4.1682	0.0121
130	4.1802	0.0120
131	4.1922	0.0120
132	4.2041	0.0119
133	4.2160	0.0119
134	4.2278	0.0118
135	4.2395	0.0117
136	4.2512	0.0117
137	4.2629	0.0116
138	4.2745	0.0116
139	4.2860	0.0115
140	4.2975	0.0115
141	4.3089	0.0114
142	4.3203	0.0114
143	4.3316	0.0113
144	4.3429	0.0113
145	4.3541	0.0112
146	4.3653	0.0112
147	4.3765	0.0111
148	4.3875	0.0111
149	4.3986	0.0110
150	4.4096	0.0110
151	4.4205	0.0109
152	4.4314	0.0109
153	4.4423	0.0109
154	4.4531	0.0108
155	4.4639	0.0108
156	4.4746	0.0107
157	4.4853	0.0107
158	4.4959	0.0106
159	4.5065	0.0106
160	4.5171	0.0106
161	4.5276	0.0105
162	4.5381	0.0105
163	4.5485	0.0104
164	4.5589	0.0104
165	4.5693	0.0104
166	4.5796	0.0103
167	4.5899	0.0103
168	4.6001	0.0102
169	4.6103	0.0102
170	4.6205	0.0102
171	4.6306	0.0101

172	4.6407	0.0101
173	4.6507	0.0101
174	4.6608	0.0100
175	4.6707	0.0100
176	4.6807	0.0099
177	4.6906	0.0099
178	4.7005	0.0099
179	4.7103	0.0098
180	4.7201	0.0098
181	4.7299	0.0098
182	4.7396	0.0097
183	4.7493	0.0097
184	4.7590	0.0097
185	4.7686	0.0096
186	4.7782	0.0096
187	4.7878	0.0096
188	4.7973	0.0095
189	4.8069	0.0095
190	4.8163	0.0095
191	4.8258	0.0094
192	4.8352	0.0094
193	4.8446	0.0094
194	4.8539	0.0094
195	4.8633	0.0093
196	4.8725	0.0093
197	4.8818	0.0093
198	4.8910	0.0092
199	4.9003	0.0092
200	4.9094	0.0092
201	4.9186	0.0091
202	4.9277	0.0091
203	4.9368	0.0091
204	4.9459	0.0091
205	4.9549	0.0090
206	4.9639	0.0090
207	4.9729	0.0090
208	4.9818	0.0090
209	4.9908	0.0089
210	4.9997	0.0089
211	5.0085	0.0089
212	5.0174	0.0088
213	5.0262	0.0088
214	5.0350	0.0088
215	5.0438	0.0088
216	5.0525	0.0087
217	5.0612	0.0087
218	5.0699	0.0087
219	5.0786	0.0087
220	5.0872	0.0086
221	5.0958	0.0086
222	5.1044	0.0086
223	5.1130	0.0086
224	5.1216	0.0085
225	5.1301	0.0085
226	5.1386	0.0085
227	5.1471	0.0085
228	5.1555	0.0085
229	5.1639	0.0084

230	5.1723	0.0084
231	5.1807	0.0084
232	5.1891	0.0084
233	5.1974	0.0083
234	5.2057	0.0083
235	5.2140	0.0083
236	5.2223	0.0083
237	5.2305	0.0082
238	5.2388	0.0082
239	5.2470	0.0082
240	5.2552	0.0082
241	5.2633	0.0082
242	5.2715	0.0081
243	5.2796	0.0081
244	5.2877	0.0081
245	5.2958	0.0081
246	5.3038	0.0081
247	5.3119	0.0080
248	5.3199	0.0080
249	5.3279	0.0080
250	5.3358	0.0080
251	5.3438	0.0080
252	5.3517	0.0079
253	5.3597	0.0079
254	5.3676	0.0079
255	5.3754	0.0079
256	5.3833	0.0079
257	5.3911	0.0078
258	5.3989	0.0078
259	5.4068	0.0078
260	5.4145	0.0078
261	5.4223	0.0078
262	5.4300	0.0077
263	5.4378	0.0077
264	5.4455	0.0077
265	5.4532	0.0077
266	5.4608	0.0077
267	5.4685	0.0077
268	5.4761	0.0076
269	5.4837	0.0076
270	5.4913	0.0076
271	5.4989	0.0076
272	5.5065	0.0076
273	5.5140	0.0075
274	5.5216	0.0075
275	5.5291	0.0075
276	5.5366	0.0075
277	5.5441	0.0075
278	5.5515	0.0075
279	5.5590	0.0074
280	5.5664	0.0074
281	5.5738	0.0074
282	5.5812	0.0074
283	5.5886	0.0074
284	5.5959	0.0074
285	5.6033	0.0073
286	5.6106	0.0073
287	5.6179	0.0073

288 5.6252 0.0073

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0073	0.0007	0.0066
2	0.0073	0.0007	0.0066
3	0.0073	0.0007	0.0067
4	0.0074	0.0007	0.0067
5	0.0074	0.0007	0.0067
6	0.0074	0.0007	0.0067
7	0.0074	0.0007	0.0067
8	0.0075	0.0007	0.0068
9	0.0075	0.0007	0.0068
10	0.0075	0.0007	0.0068
11	0.0075	0.0007	0.0068
12	0.0076	0.0007	0.0069
13	0.0076	0.0007	0.0069
14	0.0076	0.0007	0.0069
15	0.0077	0.0007	0.0069
16	0.0077	0.0007	0.0069
17	0.0077	0.0007	0.0070
18	0.0077	0.0007	0.0070
19	0.0078	0.0007	0.0070
20	0.0078	0.0007	0.0070
21	0.0078	0.0007	0.0071
22	0.0078	0.0007	0.0071
23	0.0079	0.0007	0.0071
24	0.0079	0.0007	0.0072
25	0.0079	0.0007	0.0072
26	0.0080	0.0008	0.0072
27	0.0080	0.0008	0.0072
28	0.0080	0.0008	0.0073
29	0.0081	0.0008	0.0073
30	0.0081	0.0008	0.0073
31	0.0081	0.0008	0.0074
32	0.0081	0.0008	0.0074
33	0.0082	0.0008	0.0074
34	0.0082	0.0008	0.0074
35	0.0082	0.0008	0.0075
36	0.0083	0.0008	0.0075
37	0.0083	0.0008	0.0075
38	0.0083	0.0008	0.0075
39	0.0084	0.0008	0.0076
40	0.0084	0.0008	0.0076
41	0.0085	0.0008	0.0077
42	0.0085	0.0008	0.0077
43	0.0085	0.0008	0.0077
44	0.0085	0.0008	0.0077
45	0.0086	0.0008	0.0078
46	0.0086	0.0008	0.0078
47	0.0087	0.0008	0.0078
48	0.0087	0.0008	0.0079
49	0.0087	0.0008	0.0079
50	0.0088	0.0008	0.0079
51	0.0088	0.0008	0.0080
52	0.0088	0.0008	0.0080

53	0.0089	0.0008	0.0081
54	0.0089	0.0008	0.0081
55	0.0090	0.0008	0.0081
56	0.0090	0.0009	0.0082
57	0.0091	0.0009	0.0082
58	0.0091	0.0009	0.0082
59	0.0091	0.0009	0.0083
60	0.0092	0.0009	0.0083
61	0.0092	0.0009	0.0084
62	0.0093	0.0009	0.0084
63	0.0093	0.0009	0.0084
64	0.0094	0.0009	0.0085
65	0.0094	0.0009	0.0085
66	0.0094	0.0009	0.0086
67	0.0095	0.0009	0.0086
68	0.0095	0.0009	0.0086
69	0.0096	0.0009	0.0087
70	0.0096	0.0009	0.0087
71	0.0097	0.0009	0.0088
72	0.0097	0.0009	0.0088
73	0.0098	0.0009	0.0089
74	0.0098	0.0009	0.0089
75	0.0099	0.0009	0.0090
76	0.0099	0.0009	0.0090
77	0.0100	0.0009	0.0091
78	0.0101	0.0009	0.0091
79	0.0101	0.0010	0.0092
80	0.0102	0.0010	0.0092
81	0.0102	0.0010	0.0093
82	0.0103	0.0010	0.0093
83	0.0104	0.0010	0.0094
84	0.0104	0.0010	0.0094
85	0.0105	0.0010	0.0095
86	0.0105	0.0010	0.0095
87	0.0106	0.0010	0.0096
88	0.0106	0.0010	0.0096
89	0.0107	0.0010	0.0097
90	0.0108	0.0010	0.0098
91	0.0109	0.0010	0.0098
92	0.0109	0.0010	0.0099
93	0.0110	0.0010	0.0100
94	0.0110	0.0010	0.0100
95	0.0111	0.0011	0.0101
96	0.0112	0.0011	0.0101
97	0.0113	0.0011	0.0102
98	0.0113	0.0011	0.0103
99	0.0114	0.0011	0.0104
100	0.0115	0.0011	0.0104
101	0.0116	0.0011	0.0105
102	0.0116	0.0011	0.0105
103	0.0117	0.0011	0.0106
104	0.0118	0.0011	0.0107
105	0.0119	0.0011	0.0108
106	0.0120	0.0011	0.0108
107	0.0121	0.0011	0.0109
108	0.0121	0.0011	0.0110
109	0.0123	0.0012	0.0111
110	0.0123	0.0012	0.0112

111	0.0125	0.0012	0.0113
112	0.0125	0.0012	0.0113
113	0.0127	0.0012	0.0115
114	0.0127	0.0012	0.0115
115	0.0129	0.0012	0.0116
116	0.0129	0.0012	0.0117
117	0.0131	0.0012	0.0118
118	0.0131	0.0012	0.0119
119	0.0133	0.0013	0.0120
120	0.0134	0.0013	0.0121
121	0.0135	0.0013	0.0122
122	0.0136	0.0013	0.0123
123	0.0138	0.0013	0.0125
124	0.0138	0.0013	0.0125
125	0.0140	0.0013	0.0127
126	0.0141	0.0013	0.0128
127	0.0143	0.0013	0.0129
128	0.0144	0.0014	0.0130
129	0.0146	0.0014	0.0132
130	0.0147	0.0014	0.0133
131	0.0149	0.0014	0.0135
132	0.0150	0.0014	0.0135
133	0.0152	0.0014	0.0137
134	0.0153	0.0014	0.0138
135	0.0155	0.0015	0.0140
136	0.0156	0.0015	0.0141
137	0.0158	0.0015	0.0143
138	0.0160	0.0015	0.0145
139	0.0162	0.0015	0.0147
140	0.0163	0.0015	0.0148
141	0.0166	0.0016	0.0150
142	0.0167	0.0016	0.0152
143	0.0170	0.0016	0.0154
144	0.0172	0.0016	0.0155
145	0.0220	0.0021	0.0199
146	0.0221	0.0021	0.0201
147	0.0225	0.0021	0.0204
148	0.0227	0.0021	0.0205
149	0.0230	0.0022	0.0208
150	0.0232	0.0022	0.0210
151	0.0236	0.0022	0.0214
152	0.0238	0.0022	0.0216
153	0.0242	0.0023	0.0219
154	0.0244	0.0023	0.0221
155	0.0249	0.0024	0.0225
156	0.0251	0.0024	0.0228
157	0.0256	0.0024	0.0232
158	0.0259	0.0024	0.0234
159	0.0264	0.0025	0.0239
160	0.0267	0.0025	0.0242
161	0.0273	0.0026	0.0247
162	0.0276	0.0026	0.0250
163	0.0283	0.0027	0.0256
164	0.0286	0.0027	0.0259
165	0.0293	0.0028	0.0266
166	0.0297	0.0028	0.0269
167	0.0305	0.0029	0.0276
168	0.0309	0.0029	0.0280

169	0.0336	0.0032	0.0304
170	0.0340	0.0032	0.0308
171	0.0351	0.0033	0.0318
172	0.0356	0.0034	0.0323
173	0.0368	0.0035	0.0334
174	0.0375	0.0035	0.0339
175	0.0389	0.0037	0.0352
176	0.0397	0.0037	0.0359
177	0.0413	0.0039	0.0374
178	0.0422	0.0040	0.0382
179	0.0443	0.0042	0.0401
180	0.0454	0.0043	0.0411
181	0.0479	0.0045	0.0434
182	0.0494	0.0047	0.0447
183	0.0527	0.0050	0.0477
184	0.0547	0.0052	0.0495
185	0.0494	0.0047	0.0447
186	0.0521	0.0049	0.0472
187	0.0590	0.0056	0.0535
188	0.0636	0.0060	0.0576
189	0.0766	0.0072	0.0693
190	0.0862	0.0081	0.0780
191	0.1222	0.0116	0.1107
192	0.1669	0.0158	0.1511
193	0.5035	0.0192	0.4843
194	0.1000	0.0095	0.0906
195	0.0692	0.0065	0.0626
196	0.0553	0.0052	0.0501
197	0.0568	0.0054	0.0515
198	0.0510	0.0048	0.0462
199	0.0466	0.0044	0.0422
200	0.0432	0.0041	0.0391
201	0.0405	0.0038	0.0366
202	0.0382	0.0036	0.0346
203	0.0362	0.0034	0.0328
204	0.0346	0.0033	0.0313
205	0.0314	0.0030	0.0284
206	0.0301	0.0028	0.0273
207	0.0290	0.0027	0.0262
208	0.0279	0.0026	0.0253
209	0.0270	0.0026	0.0244
210	0.0262	0.0025	0.0237
211	0.0254	0.0024	0.0230
212	0.0247	0.0023	0.0223
213	0.0240	0.0023	0.0217
214	0.0234	0.0022	0.0212
215	0.0228	0.0022	0.0207
216	0.0223	0.0021	0.0202
217	0.0173	0.0016	0.0157
218	0.0169	0.0016	0.0153
219	0.0165	0.0016	0.0149
220	0.0161	0.0015	0.0146
221	0.0157	0.0015	0.0142
222	0.0154	0.0015	0.0139
223	0.0151	0.0014	0.0136
224	0.0148	0.0014	0.0134
225	0.0145	0.0014	0.0131
226	0.0142	0.0013	0.0129

227	0.0139	0.0013	0.0126
228	0.0137	0.0013	0.0124
229	0.0134	0.0013	0.0122
230	0.0132	0.0012	0.0120
231	0.0130	0.0012	0.0118
232	0.0128	0.0012	0.0116
233	0.0126	0.0012	0.0114
234	0.0124	0.0012	0.0112
235	0.0122	0.0012	0.0111
236	0.0120	0.0011	0.0109
237	0.0119	0.0011	0.0107
238	0.0117	0.0011	0.0106
239	0.0115	0.0011	0.0104
240	0.0114	0.0011	0.0103
241	0.0112	0.0011	0.0102
242	0.0111	0.0010	0.0100
243	0.0109	0.0010	0.0099
244	0.0108	0.0010	0.0098
245	0.0107	0.0010	0.0097
246	0.0106	0.0010	0.0096
247	0.0104	0.0010	0.0094
248	0.0103	0.0010	0.0093
249	0.0102	0.0010	0.0092
250	0.0101	0.0010	0.0091
251	0.0100	0.0009	0.0090
252	0.0099	0.0009	0.0089
253	0.0098	0.0009	0.0088
254	0.0097	0.0009	0.0088
255	0.0096	0.0009	0.0087
256	0.0095	0.0009	0.0086
257	0.0094	0.0009	0.0085
258	0.0093	0.0009	0.0084
259	0.0092	0.0009	0.0083
260	0.0091	0.0009	0.0083
261	0.0090	0.0009	0.0082
262	0.0090	0.0008	0.0081
263	0.0089	0.0008	0.0080
264	0.0088	0.0008	0.0080
265	0.0087	0.0008	0.0079
266	0.0086	0.0008	0.0078
267	0.0086	0.0008	0.0078
268	0.0085	0.0008	0.0077
269	0.0084	0.0008	0.0076
270	0.0084	0.0008	0.0076
271	0.0083	0.0008	0.0075
272	0.0082	0.0008	0.0074
273	0.0082	0.0008	0.0074
274	0.0081	0.0008	0.0073
275	0.0080	0.0008	0.0073
276	0.0080	0.0008	0.0072
277	0.0079	0.0007	0.0072
278	0.0079	0.0007	0.0071
279	0.0078	0.0007	0.0071
280	0.0077	0.0007	0.0070
281	0.0077	0.0007	0.0070
282	0.0076	0.0007	0.0069
283	0.0076	0.0007	0.0069
284	0.0075	0.0007	0.0068

285	0.0075	0.0007	0.0068
286	0.0074	0.0007	0.0067
287	0.0074	0.0007	0.0067
288	0.0073	0.0007	0.0066

Total soil rain loss = 0.50(In)
Total effective rainfall = 5.12(In)
Peak flow rate in flood hydrograph = 1706.08(CFS)

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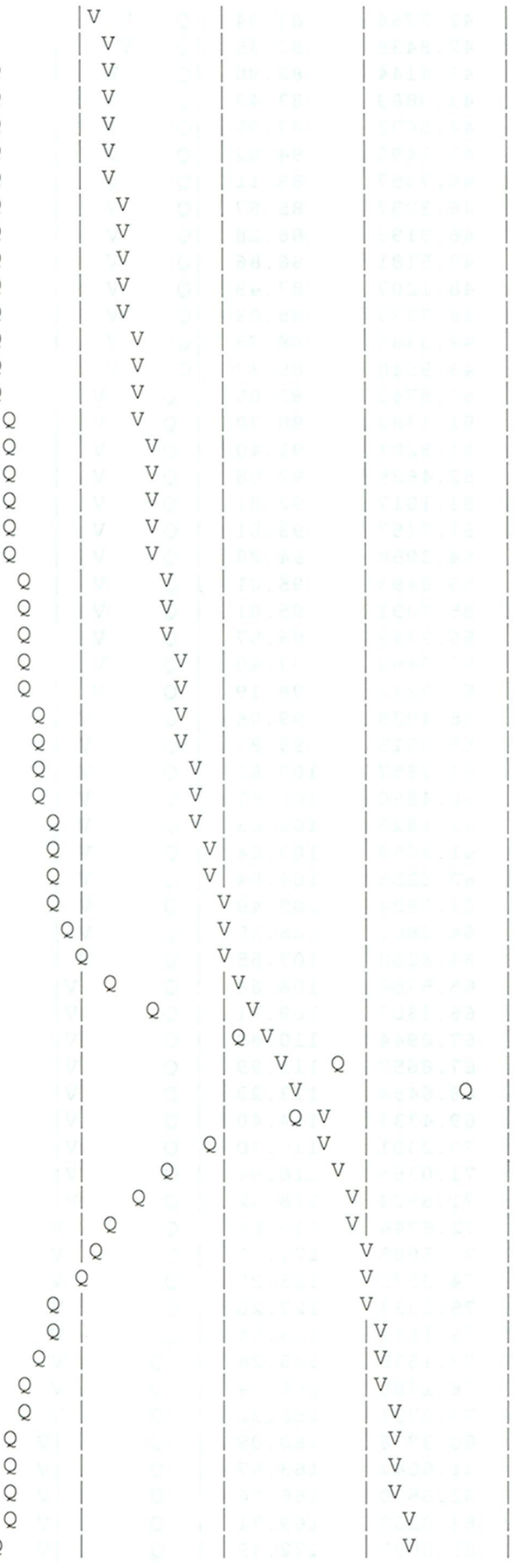
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	450.0	900.0	1350.0	1800.0
0+ 5	0.0082	1.20	Q				
0+10	0.0431	5.06	Q				
0+15	0.1320	12.91	Q				
0+20	0.3322	29.08	Q				
0+25	0.5869	36.98	Q				
0+30	0.8728	41.51	Q				
0+35	1.1816	44.83	Q				
0+40	1.5079	47.38	VQ				
0+45	1.8481	49.40	VQ				
0+50	2.1995	51.03	VQ				
0+55	2.5599	52.32	VQ				
1+ 0	2.9271	53.32	VQ				
1+ 5	3.2998	54.12	VQ				
1+10	3.6762	54.66	VQ				
1+15	4.0553	55.04	VQ				
1+20	4.4369	55.41	VQ				
1+25	4.8208	55.75	VQ				
1+30	5.2068	56.05	VQ				
1+35	5.5950	56.36	VQ				
1+40	5.9854	56.69	VQ				
1+45	6.3777	56.96	VQ				
1+50	6.7719	57.23	VQ				
1+55	7.1677	57.47	VQ				
2+ 0	7.5650	57.69	|Q				
2+ 5	7.9637	57.89	|Q				
2+10	8.3640	58.11	|Q				
2+15	8.7656	58.32	|Q				
2+20	9.1688	58.54	|Q				
2+25	9.5734	58.75	|Q				
2+30	9.9796	58.98	|Q				
2+35	10.3873	59.19	|Q				
2+40	10.7966	59.43	|Q				
2+45	11.2073	59.65	|Q				
2+50	11.6198	59.88	|Q				
2+55	12.0337	60.11	|Q				
3+ 0	12.4493	60.35	|Q				
3+ 5	12.8665	60.58	|Q				
3+10	13.2854	60.82	|Q				
3+15	13.7059	61.05	|Q				

3+20	14.1281	61.31	|Q	|	|	|	|
3+25	14.5519	61.54	|QV	|	|	|	|
3+30	14.9776	61.80	|QV	|	|	|	|
3+35	15.4049	62.04	|QV	|	|	|	|
3+40	15.8340	62.31	|QV	|	|	|	|
3+45	16.2648	62.55	|QV	|	|	|	|
3+50	16.6974	62.82	|QV	|	|	|	|
3+55	17.1318	63.07	|QV	|	|	|	|
4+ 0	17.5681	63.35	|QV	|	|	|	|
4+ 5	18.0061	63.61	|QV	|	|	|	|
4+10	18.4461	63.89	|QV	|	|	|	|
4+15	18.8880	64.15	|QV	|	|	|	|
4+20	19.3317	64.44	|QV	|	|	|	|
4+25	19.7774	64.71	|QV	|	|	|	|
4+30	20.2250	65.00	|QV	|	|	|	|
4+35	20.6746	65.28	|QV	|	|	|	|
4+40	21.1262	65.58	|QV	|	|	|	|
4+45	21.5798	65.86	|QV	|	|	|	|
4+50	22.0355	66.17	|Q V	|	|	|	|
4+55	22.4932	66.46	|Q V	|	|	|	|
5+ 0	22.9530	66.77	|Q V	|	|	|	|
5+ 5	23.4149	67.07	|Q V	|	|	|	|
5+10	23.8790	67.39	|Q V	|	|	|	|
5+15	24.3452	67.69	|Q V	|	|	|	|
5+20	24.8137	68.02	|Q V	|	|	|	|
5+25	25.2843	68.33	|Q V	|	|	|	|
5+30	25.7572	68.67	|Q V	|	|	|	|
5+35	26.2323	68.99	|Q V	|	|	|	|
5+40	26.7099	69.33	|Q V	|	|	|	|
5+45	27.1896	69.66	|Q V	|	|	|	|
5+50	27.6718	70.02	|Q V	|	|	|	|
5+55	28.1563	70.35	|Q V	|	|	|	|
6+ 0	28.6434	70.72	|Q V	|	|	|	|
6+ 5	29.1328	71.06	|Q V	|	|	|	|
6+10	29.6247	71.43	|Q V	|	|	|	|
6+15	30.1192	71.79	|Q V	|	|	|	|
6+20	30.6162	72.17	|Q V	|	|	|	|
6+25	31.1158	72.54	|Q V	|	|	|	|
6+30	31.6180	72.93	|Q V	|	|	|	|
6+35	32.1229	73.30	|Q V	|	|	|	|
6+40	32.6305	73.71	|Q V	|	|	|	|
6+45	33.1408	74.09	|Q V	|	|	|	|
6+50	33.6539	74.51	|Q V	|	|	|	|
6+55	34.1698	74.90	|Q V	|	|	|	|
7+ 0	34.6886	75.33	|Q V	|	|	|	|
7+ 5	35.2102	75.74	|Q V	|	|	|	|
7+10	35.7349	76.18	|Q V	|	|	|	|
7+15	36.2624	76.60	|Q V	|	|	|	|
7+20	36.7931	77.05	|Q V	|	|	|	|
7+25	37.3268	77.48	|Q V	|	|	|	|
7+30	37.8636	77.95	|Q V	|	|	|	|
7+35	38.4035	78.40	|Q V	|	|	|	|
7+40	38.9468	78.88	|Q V	|	|	|	|
7+45	39.4932	79.34	|Q V	|	|	|	|
7+50	40.0430	79.84	|Q V	|	|	|	|
7+55	40.5961	80.31	|Q V	|	|	|	|
8+ 0	41.1528	80.82	|Q V	|	|	|	|
8+ 5	41.7127	81.31	|Q V	|	|	|	|

8+10	42.2764	81.84	|Q V |
8+15	42.8435	82.35	|Q V |
8+20	43.4144	82.90	|Q V |
8+25	43.9889	83.42	|Q V |
8+30	44.5673	83.99	|Q V |
8+35	45.1495	84.52	|Q V |
8+40	45.7357	85.11	|Q V |
8+45	46.3257	85.67	|Q V |
8+50	46.9199	86.28	|Q V |
8+55	47.5181	86.86	|Q V |
9+ 0	48.1207	87.49	|Q V |
9+ 5	48.7273	88.09	|Q V |
9+10	49.3385	88.75	|Q V |
9+15	49.9540	89.37	|Q V |
9+20	50.5742	90.05	| Q V |
9+25	51.1988	90.70	| Q V |
9+30	51.8283	91.40	| Q V |
9+35	52.4625	92.08	| Q V |
9+40	53.1017	92.81	| Q V |
9+45	53.7457	93.51	| Q V |
9+50	54.3950	94.28	| Q V |
9+55	55.0493	95.01	| Q V |
10+ 0	55.7091	95.81	| Q V |
10+ 5	56.3742	96.57	| Q V |
10+10	57.0450	97.40	| Q V |
10+15	57.7212	98.19	| Q V |
10+20	58.4035	99.06	| Q V |
10+25	59.0915	99.89	| Q V |
10+30	59.7857	100.81	| Q V |
10+35	60.4860	101.67	| Q V |
10+40	61.1928	102.63	| Q V |
10+45	61.9058	103.54	| Q V |
10+50	62.6258	104.54	| Q V |
10+55	63.3524	105.49	| Q V |
11+ 0	64.0861	106.55	| Q V |
11+ 5	64.8268	107.55	| Q V |
11+10	65.5752	108.66	| Q V|
11+15	66.3307	109.71	| Q V|
11+20	67.0944	110.88	| Q V|
11+25	67.8657	111.99	| Q V|
11+30	68.6454	113.22	| Q V|
11+35	69.4333	114.40	| Q V|
11+40	70.2301	115.70	| Q V|
11+45	71.0355	116.94	| Q V|
11+50	71.8504	118.32	| Q V|
11+55	72.6744	119.64	| Q V
12+ 0	73.5085	121.11	| Q V
12+ 5	74.3573	123.25	| Q V
12+10	75.2333	127.20	| Q V
12+15	76.1532	133.56	| Q V
12+20	77.1535	145.24	| Q V
12+25	78.1985	151.74	| Q V
12+30	79.2751	156.32	| Q V
12+35	80.3776	160.09	| Q |V
12+40	81.5042	163.57	| Q |V
12+45	82.6520	166.66	| Q |V
12+50	83.8208	169.71	| Q |V
12+55	85.0087	172.49	| Q |V

13+ 0	86.2161	175.32	
13+ 5	87.4417	177.95	
13+10	88.6860	180.67	
13+15	89.9478	183.22	
13+20	91.2292	186.05	
13+25	92.5293	188.78	
13+30	93.8503	191.81	
13+35	95.1916	194.76	
13+40	96.5558	198.08	
13+45	97.9420	201.28	
13+50	99.3530	204.88	
13+55	100.7882	208.39	
14+ 0	102.2506	212.34	
14+ 5	103.7416	216.49	
14+10	105.2691	221.80	
14+15	106.8392	227.97	
14+20	108.4694	236.71	
14+25	110.1461	243.45	
14+30	111.8686	250.11	
14+35	113.6349	256.46	
14+40	115.4496	263.50	
14+45	117.3120	270.41	
14+50	119.2286	278.30	
14+55	121.1994	286.16	
15+ 0	123.2332	295.29	
15+ 5	125.3306	304.54	
15+10	127.5032	315.46	
15+15	129.7531	326.70	
15+20	132.0966	340.27	
15+25	134.5273	352.94	
15+30	137.0436	365.36	
15+35	139.6182	373.83	
15+40	142.2103	376.38	
15+45	144.9198	393.42	
15+50	147.8487	425.27	
15+55	151.0831	469.64	
16+ 0	154.8406	545.59	
16+ 5	159.7319	710.21	
16+10	166.5110	984.33	
16+15	175.4444	1297.14	
16+20	187.1943	1706.08	
16+25	195.1156	1150.18	
16+30	201.0433	860.70	
16+35	206.0239	723.19	
16+40	210.4093	636.75	
16+45	214.3044	565.57	
16+50	217.7709	503.34	
16+55	220.8748	450.68	
17+ 0	223.6545	403.61	
17+ 5	226.1686	365.05	
17+10	228.4193	326.80	
17+15	230.4725	298.12	
17+20	232.3861	277.86	
17+25	234.1893	261.82	
17+30	235.8905	247.02	
17+35	237.5228	237.01	
17+40	239.0897	227.52	
17+45	240.5753	215.70	

17+50	241.9950	206.15	Q			V
17+55	243.3584	197.96	Q			V
18+ 0	244.6591	188.86	Q			V
18+ 5	245.9145	182.29	Q			V
18+10	247.1180	174.75	Q			V
18+15	248.2561	165.25	Q			V
18+20	249.2958	150.97	Q			V
18+25	250.2753	142.22	Q			V
18+30	251.2114	135.92	Q			V
18+35	252.1109	130.61	Q			V
18+40	252.9788	126.02	Q			V
18+45	253.8188	121.97	Q			V
18+50	254.6340	118.36	Q			V
18+55	255.4268	115.12	Q			V
19+ 0	256.1997	112.22	Q			V
19+ 5	256.9544	109.58	Q			V
19+10	257.6928	107.22	Q			V
19+15	258.4165	105.07	Q			V
19+20	259.1261	103.03	Q			V
19+25	259.8223	101.10	Q			V
19+30	260.5061	99.28	Q			V
19+35	261.1778	97.53	Q			V
19+40	261.8380	95.85	Q			V
19+45	262.4872	94.27	Q			V
19+50	263.1260	92.76	Q			V
19+55	263.7550	91.32	Q			V
20+ 0	264.3745	89.96	Q			V
20+ 5	264.9851	88.66	Q			V
20+10	265.5870	87.40	Q			V
20+15	266.1806	86.19	Q			V
20+20	266.7661	85.02	Q			V
20+25	267.3439	83.89	Q			V
20+30	267.9141	82.80	Q			V
20+35	268.4771	81.74	Q			V
20+40	269.0330	80.72	Q			V
20+45	269.5822	79.74	Q			V
20+50	270.1248	78.78	Q			V
20+55	270.6610	77.85	Q			V
21+ 0	271.1910	76.96	Q			V
21+ 5	271.7149	76.08	Q			V
21+10	272.2331	75.24	Q			V
21+15	272.7456	74.41	Q			V
21+20	273.2526	73.61	Q			V
21+25	273.7542	72.84	Q			V
21+30	274.2506	72.08	Q			V
21+35	274.7419	71.34	Q			V
21+40	275.2283	70.63	Q			V
21+45	275.7099	69.93	Q			V
21+50	276.1868	69.25	Q			V
21+55	276.6591	68.58	Q			V
22+ 0	277.1270	67.93	Q			V
22+ 5	277.5905	67.30	Q			V
22+10	278.0498	66.68	Q			V
22+15	278.5049	66.08	Q			V
22+20	278.9559	65.49	Q			V
22+25	279.4030	64.92	Q			V
22+30	279.8463	64.36	Q			V
22+35	280.2857	63.81	Q			V

22+40	280.7214	63.27	|Q	|	|	|	V |
22+45	281.1535	62.74	|Q	|	|	|	V |
22+50	281.5821	62.23	|Q	|	|	|	V |
22+55	282.0072	61.72	|Q	|	|	|	V|
23+ 0	282.4289	61.23	|Q	|	|	|	V|
23+ 5	282.8473	60.75	|Q	|	|	|	V|
23+10	283.2624	60.27	|Q	|	|	|	V|
23+15	283.6743	59.81	|Q	|	|	|	V|
23+20	284.0831	59.36	|Q	|	|	|	V|
23+25	284.4888	58.91	|Q	|	|	|	V|
23+30	284.8915	58.47	|Q	|	|	|	V|
23+35	285.2912	58.04	|Q	|	|	|	V|
23+40	285.6881	57.62	|Q	|	|	|	V|
23+45	286.0821	57.21	|Q	|	|	|	V|
23+50	286.4733	56.80	|Q	|	|	|	V|
23+55	286.8618	56.41	|Q	|	|	|	V|
24+ 0	287.2475	56.01	|Q	|	|	|	V|
24+ 5	287.6225	54.44	|Q	|	|	|	V|
24+10	287.9683	50.22	|Q	|	|	|	V|
24+15	288.2580	42.06	Q	|	|	|	V|
24+20	288.4348	25.68	Q	|	|	|	V|
24+25	288.5567	17.70	Q	|	|	|	V|
24+30	288.6476	13.20	Q	|	|	|	V|
24+35	288.7159	9.92	Q	|	|	|	V|
24+40	288.7673	7.46	Q	|	|	|	V|
24+45	288.8055	5.54	Q	|	|	|	V|
24+50	288.8334	4.06	Q	|	|	|	V|
24+55	288.8534	2.91	Q	|	|	|	V|
25+ 0	288.8676	2.07	Q	|	|	|	V|
25+ 5	288.8775	1.44	Q	|	|	|	V|
25+10	288.8849	1.07	Q	|	|	|	V|
25+15	288.8909	0.87	Q	|	|	|	V|
25+20	288.8957	0.69	Q	|	|	|	V|
25+25	288.8994	0.54	Q	|	|	|	V|
25+30	288.9023	0.43	Q	|	|	|	V|
25+35	288.9045	0.31	Q	|	|	|	V|
25+40	288.9057	0.18	Q	|	|	|	V|
25+45	288.9064	0.10	Q	|	|	|	V|
25+50	288.9067	0.05	Q	|	|	|	V|

U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/26/12 File Name UNIT10Y24HEX1B.out

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Orange County Unit Hydrograph Hydrology Method
Manual Date(s) - October 1986, November 1996

Program License Serial Number 6062

ESPERANZA HILLS OPTION 1
DETENTION BASIN ANALYSIS
EXISTING CONDITION AREA B
10-YEAR 24-HOUR

Storm Event Year = 10

Antecedent Moisture Condition = 2

English (in-lb) Input Units Used

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	Area (Ac.)	Area Fraction	Soil Group	Fp (In/Hr)	Ap (dec.)	Fm (In/Hr)
81.0	123.5	0.58	C	0.250	1.000	0.250
86.0	89.0	0.42	D	0.200	1.000	0.200

Area-averaged adjusted loss rate Fm (In/Hr) = 0.229

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC2)	S	Pervious Yield Fr
123.50	0.581	81.0	81.0	2.35	0.504
89.00	0.419	86.0	86.0	1.63	0.614

Area-averaged catchment yield fraction, Y = 0.550
Area-averaged low loss fraction, Yb = 0.450

++

User entry of time of concentration = 0.400 (hours)
Watershed area = 212.50(Ac.)
Catchment Lag time = 0.320 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 26.0417
Hydrograph baseflow = 0.00(CFS)

Average maximum watershed loss rate(Fm) = 0.229(In/Hr)
Average low loss rate fraction (Yb) = 0.450 (decimal)
FOOTHILL S-Graph Selected
Computed peak 5-minute rainfall = 0.340(In)
Computed peak 30-minute rainfall = 0.720(In)
Specified peak 1-hour rainfall = 0.950(In)
Computed peak 3-hour rainfall = 1.590(In)
Specified peak 6-hour rainfall = 2.200(In)
Specified peak 24-hour rainfall = 3.680(In)

Rainfall depth area reduction factors:
Using a total area of 212.50(Ac.) (Ref: fig. E-4)

5-minute factor = 0.990 Adjusted rainfall = 0.337(In)
30-minute factor = 0.990 Adjusted rainfall = 0.713(In)
1-hour factor = 0.990 Adjusted rainfall = 0.941(In)
3-hour factor = 0.999 Adjusted rainfall = 1.588(In)
6-hour factor = 0.999 Adjusted rainfall = 2.199(In)
24-hour factor = 1.000 Adjusted rainfall = 3.679(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
(K = 2569.92 (CFS))		
1	1.798	46.212
2	7.274	140.731
3	16.833	245.659
4	37.688	535.939
5	59.997	573.335
6	69.792	251.716
7	76.395	169.697
8	81.484	130.792
9	85.434	101.520
10	88.638	82.315
11	91.210	66.103
12	93.310	53.985
13	94.977	42.832
14	96.242	32.518
15	97.248	25.843
16	97.917	17.188
17	98.256	8.725
18	98.555	7.684
19	98.818	6.745
20	99.045	5.836
21	99.203	4.069
22	99.380	4.534
23	99.587	5.344
24	99.748	4.120
25	99.852	2.678
26	99.928	1.955
27	100.000	1.847

Peak Unit Adjusted mass rainfall Unit rainfall

Number	(In)	(In)
1	0.3366	0.3366
2	0.4500	0.1134
3	0.5332	0.0833
4	0.6015	0.0683
5	0.6604	0.0589
6	0.7128	0.0524
7	0.7582	0.0453
8	0.7997	0.0416
9	0.8383	0.0386
10	0.8744	0.0361
11	0.9084	0.0340
12	0.9405	0.0322
13	0.9771	0.0366
14	1.0123	0.0351
15	1.0461	0.0339
16	1.0788	0.0327
17	1.1104	0.0316
18	1.1411	0.0307
19	1.1709	0.0298
20	1.1999	0.0290
21	1.2281	0.0282
22	1.2557	0.0275
23	1.2826	0.0269
24	1.3089	0.0263
25	1.3346	0.0257
26	1.3598	0.0252
27	1.3845	0.0247
28	1.4087	0.0242
29	1.4324	0.0238
30	1.4558	0.0233
31	1.4787	0.0229
32	1.5013	0.0226
33	1.5235	0.0222
34	1.5453	0.0218
35	1.5668	0.0215
36	1.5880	0.0212
37	1.6085	0.0206
38	1.6288	0.0203
39	1.6488	0.0200
40	1.6685	0.0197
41	1.6879	0.0194
42	1.7071	0.0192
43	1.7261	0.0190
44	1.7448	0.0187
45	1.7633	0.0185
46	1.7816	0.0183
47	1.7997	0.0181
48	1.8176	0.0179
49	1.8352	0.0177
50	1.8527	0.0175
51	1.8700	0.0173
52	1.8871	0.0171
53	1.9041	0.0169
54	1.9209	0.0168
55	1.9375	0.0166
56	1.9539	0.0165
57	1.9702	0.0163

58	1.9864	0.0161
59	2.0024	0.0160
60	2.0182	0.0159
61	2.0340	0.0157
62	2.0495	0.0156
63	2.0650	0.0154
64	2.0803	0.0153
65	2.0955	0.0152
66	2.1106	0.0151
67	2.1255	0.0149
68	2.1403	0.0148
69	2.1551	0.0147
70	2.1697	0.0146
71	2.1842	0.0145
72	2.1985	0.0144
73	2.2098	0.0113
74	2.2210	0.0112
75	2.2321	0.0111
76	2.2431	0.0110
77	2.2540	0.0109
78	2.2649	0.0108
79	2.2756	0.0107
80	2.2863	0.0107
81	2.2968	0.0106
82	2.3073	0.0105
83	2.3177	0.0104
84	2.3281	0.0103
85	2.3383	0.0103
86	2.3485	0.0102
87	2.3586	0.0101
88	2.3686	0.0100
89	2.3786	0.0100
90	2.3885	0.0099
91	2.3983	0.0098
92	2.4081	0.0098
93	2.4178	0.0097
94	2.4274	0.0096
95	2.4369	0.0096
96	2.4464	0.0095
97	2.4559	0.0094
98	2.4652	0.0094
99	2.4746	0.0093
100	2.4838	0.0093
101	2.4930	0.0092
102	2.5021	0.0091
103	2.5112	0.0091
104	2.5203	0.0090
105	2.5292	0.0090
106	2.5382	0.0089
107	2.5470	0.0089
108	2.5558	0.0088
109	2.5646	0.0088
110	2.5733	0.0087
111	2.5820	0.0087
112	2.5906	0.0086
113	2.5992	0.0086
114	2.6077	0.0085
115	2.6161	0.0085

116	2.6246	0.0084
117	2.6330	0.0084
118	2.6413	0.0083
119	2.6496	0.0083
120	2.6578	0.0082
121	2.6660	0.0082
122	2.6742	0.0082
123	2.6823	0.0081
124	2.6904	0.0081
125	2.6984	0.0080
126	2.7064	0.0080
127	2.7144	0.0080
128	2.7223	0.0079
129	2.7302	0.0079
130	2.7380	0.0078
131	2.7458	0.0078
132	2.7536	0.0078
133	2.7613	0.0077
134	2.7690	0.0077
135	2.7767	0.0077
136	2.7843	0.0076
137	2.7919	0.0076
138	2.7994	0.0076
139	2.8069	0.0075
140	2.8144	0.0075
141	2.8219	0.0074
142	2.8293	0.0074
143	2.8367	0.0074
144	2.8440	0.0074
145	2.8513	0.0073
146	2.8586	0.0073
147	2.8659	0.0073
148	2.8731	0.0072
149	2.8803	0.0072
150	2.8875	0.0072
151	2.8946	0.0071
152	2.9017	0.0071
153	2.9088	0.0071
154	2.9158	0.0070
155	2.9228	0.0070
156	2.9298	0.0070
157	2.9368	0.0070
158	2.9437	0.0069
159	2.9506	0.0069
160	2.9575	0.0069
161	2.9644	0.0069
162	2.9712	0.0068
163	2.9780	0.0068
164	2.9848	0.0068
165	2.9915	0.0067
166	2.9982	0.0067
167	3.0049	0.0067
168	3.0116	0.0067
169	3.0182	0.0066
170	3.0249	0.0066
171	3.0315	0.0066
172	3.0380	0.0066
173	3.0446	0.0065

174	3.0511	0.0065
175	3.0576	0.0065
176	3.0641	0.0065
177	3.0705	0.0065
178	3.0770	0.0064
179	3.0834	0.0064
180	3.0898	0.0064
181	3.0961	0.0064
182	3.1025	0.0063
183	3.1088	0.0063
184	3.1151	0.0063
185	3.1214	0.0063
186	3.1276	0.0063
187	3.1338	0.0062
188	3.1401	0.0062
189	3.1463	0.0062
190	3.1524	0.0062
191	3.1586	0.0062
192	3.1647	0.0061
193	3.1708	0.0061
194	3.1769	0.0061
195	3.1830	0.0061
196	3.1890	0.0061
197	3.1951	0.0060
198	3.2011	0.0060
199	3.2071	0.0060
200	3.2131	0.0060
201	3.2190	0.0060
202	3.2250	0.0059
203	3.2309	0.0059
204	3.2368	0.0059
205	3.2427	0.0059
206	3.2485	0.0059
207	3.2544	0.0058
208	3.2602	0.0058
209	3.2660	0.0058
210	3.2718	0.0058
211	3.2776	0.0058
212	3.2833	0.0058
213	3.2891	0.0057
214	3.2948	0.0057
215	3.3005	0.0057
216	3.3062	0.0057
217	3.3119	0.0057
218	3.3176	0.0057
219	3.3232	0.0056
220	3.3288	0.0056
221	3.3344	0.0056
222	3.3400	0.0056
223	3.3456	0.0056
224	3.3512	0.0056
225	3.3567	0.0055
226	3.3623	0.0055
227	3.3678	0.0055
228	3.3733	0.0055
229	3.3788	0.0055
230	3.3842	0.0055
231	3.3897	0.0055

232	3.3951	0.0054
233	3.4006	0.0054
234	3.4060	0.0054
235	3.4114	0.0054
236	3.4168	0.0054
237	3.4221	0.0054
238	3.4275	0.0054
239	3.4328	0.0053
240	3.4382	0.0053
241	3.4435	0.0053
242	3.4488	0.0053
243	3.4541	0.0053
244	3.4593	0.0053
245	3.4646	0.0053
246	3.4698	0.0052
247	3.4751	0.0052
248	3.4803	0.0052
249	3.4855	0.0052
250	3.4907	0.0052
251	3.4959	0.0052
252	3.5010	0.0052
253	3.5062	0.0052
254	3.5113	0.0051
255	3.5164	0.0051
256	3.5216	0.0051
257	3.5267	0.0051
258	3.5318	0.0051
259	3.5368	0.0051
260	3.5419	0.0051
261	3.5469	0.0051
262	3.5520	0.0050
263	3.5570	0.0050
264	3.5620	0.0050
265	3.5670	0.0050
266	3.5720	0.0050
267	3.5770	0.0050
268	3.5820	0.0050
269	3.5869	0.0050
270	3.5919	0.0049
271	3.5968	0.0049
272	3.6017	0.0049
273	3.6067	0.0049
274	3.6116	0.0049
275	3.6164	0.0049
276	3.6213	0.0049
277	3.6262	0.0049
278	3.6311	0.0049
279	3.6359	0.0048
280	3.6407	0.0048
281	3.6456	0.0048
282	3.6504	0.0048
283	3.6552	0.0048
284	3.6600	0.0048
285	3.6647	0.0048
286	3.6695	0.0048
287	3.6743	0.0048
288	3.6790	0.0047

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0047	0.0021	0.0026
2	0.0048	0.0021	0.0026
3	0.0048	0.0022	0.0026
4	0.0048	0.0022	0.0026
5	0.0048	0.0022	0.0026
6	0.0048	0.0022	0.0027
7	0.0048	0.0022	0.0027
8	0.0049	0.0022	0.0027
9	0.0049	0.0022	0.0027
10	0.0049	0.0022	0.0027
11	0.0049	0.0022	0.0027
12	0.0049	0.0022	0.0027
13	0.0049	0.0022	0.0027
14	0.0050	0.0022	0.0027
15	0.0050	0.0022	0.0027
16	0.0050	0.0022	0.0027
17	0.0050	0.0023	0.0028
18	0.0050	0.0023	0.0028
19	0.0051	0.0023	0.0028
20	0.0051	0.0023	0.0028
21	0.0051	0.0023	0.0028
22	0.0051	0.0023	0.0028
23	0.0051	0.0023	0.0028
24	0.0051	0.0023	0.0028
25	0.0052	0.0023	0.0028
26	0.0052	0.0023	0.0028
27	0.0052	0.0023	0.0029
28	0.0052	0.0023	0.0029
29	0.0052	0.0024	0.0029
30	0.0053	0.0024	0.0029
31	0.0053	0.0024	0.0029
32	0.0053	0.0024	0.0029
33	0.0053	0.0024	0.0029
34	0.0053	0.0024	0.0029
35	0.0054	0.0024	0.0030
36	0.0054	0.0024	0.0030
37	0.0054	0.0024	0.0030
38	0.0054	0.0024	0.0030
39	0.0055	0.0025	0.0030
40	0.0055	0.0025	0.0030
41	0.0055	0.0025	0.0030
42	0.0055	0.0025	0.0030
43	0.0055	0.0025	0.0031
44	0.0056	0.0025	0.0031
45	0.0056	0.0025	0.0031
46	0.0056	0.0025	0.0031
47	0.0056	0.0025	0.0031
48	0.0057	0.0025	0.0031
49	0.0057	0.0026	0.0031
50	0.0057	0.0026	0.0031
51	0.0057	0.0026	0.0032
52	0.0058	0.0026	0.0032
53	0.0058	0.0026	0.0032
54	0.0058	0.0026	0.0032

55	0.0058	0.0026	0.0032
56	0.0059	0.0026	0.0032
57	0.0059	0.0027	0.0032
58	0.0059	0.0027	0.0033
59	0.0060	0.0027	0.0033
60	0.0060	0.0027	0.0033
61	0.0060	0.0027	0.0033
62	0.0060	0.0027	0.0033
63	0.0061	0.0027	0.0033
64	0.0061	0.0027	0.0034
65	0.0061	0.0028	0.0034
66	0.0062	0.0028	0.0034
67	0.0062	0.0028	0.0034
68	0.0062	0.0028	0.0034
69	0.0063	0.0028	0.0034
70	0.0063	0.0028	0.0035
71	0.0063	0.0028	0.0035
72	0.0063	0.0029	0.0035
73	0.0064	0.0029	0.0035
74	0.0064	0.0029	0.0035
75	0.0065	0.0029	0.0036
76	0.0065	0.0029	0.0036
77	0.0065	0.0029	0.0036
78	0.0065	0.0029	0.0036
79	0.0066	0.0030	0.0036
80	0.0066	0.0030	0.0036
81	0.0067	0.0030	0.0037
82	0.0067	0.0030	0.0037
83	0.0067	0.0030	0.0037
84	0.0068	0.0030	0.0037
85	0.0068	0.0031	0.0038
86	0.0069	0.0031	0.0038
87	0.0069	0.0031	0.0038
88	0.0069	0.0031	0.0038
89	0.0070	0.0031	0.0038
90	0.0070	0.0032	0.0039
91	0.0071	0.0032	0.0039
92	0.0071	0.0032	0.0039
93	0.0072	0.0032	0.0039
94	0.0072	0.0032	0.0040
95	0.0073	0.0033	0.0040
96	0.0073	0.0033	0.0040
97	0.0074	0.0033	0.0040
98	0.0074	0.0033	0.0041
99	0.0074	0.0034	0.0041
100	0.0075	0.0034	0.0041
101	0.0076	0.0034	0.0042
102	0.0076	0.0034	0.0042
103	0.0077	0.0034	0.0042
104	0.0077	0.0035	0.0042
105	0.0078	0.0035	0.0043
106	0.0078	0.0035	0.0043
107	0.0079	0.0035	0.0043
108	0.0079	0.0036	0.0044
109	0.0080	0.0036	0.0044
110	0.0080	0.0036	0.0044
111	0.0081	0.0037	0.0045
112	0.0082	0.0037	0.0045

113	0.0082	0.0037	0.0045
114	0.0083	0.0037	0.0046
115	0.0084	0.0038	0.0046
116	0.0084	0.0038	0.0046
117	0.0085	0.0038	0.0047
118	0.0086	0.0039	0.0047
119	0.0087	0.0039	0.0048
120	0.0087	0.0039	0.0048
121	0.0088	0.0040	0.0048
122	0.0089	0.0040	0.0049
123	0.0090	0.0040	0.0049
124	0.0090	0.0041	0.0050
125	0.0091	0.0041	0.0050
126	0.0092	0.0041	0.0051
127	0.0093	0.0042	0.0051
128	0.0094	0.0042	0.0052
129	0.0095	0.0043	0.0052
130	0.0096	0.0043	0.0053
131	0.0097	0.0044	0.0053
132	0.0098	0.0044	0.0054
133	0.0099	0.0045	0.0054
134	0.0100	0.0045	0.0055
135	0.0101	0.0045	0.0056
136	0.0102	0.0046	0.0056
137	0.0103	0.0046	0.0057
138	0.0104	0.0047	0.0057
139	0.0106	0.0048	0.0058
140	0.0107	0.0048	0.0059
141	0.0108	0.0049	0.0060
142	0.0109	0.0049	0.0060
143	0.0111	0.0050	0.0061
144	0.0112	0.0050	0.0062
145	0.0144	0.0065	0.0079
146	0.0145	0.0065	0.0080
147	0.0147	0.0066	0.0081
148	0.0148	0.0067	0.0082
149	0.0151	0.0068	0.0083
150	0.0152	0.0068	0.0084
151	0.0154	0.0070	0.0085
152	0.0156	0.0070	0.0086
153	0.0159	0.0071	0.0087
154	0.0160	0.0072	0.0088
155	0.0163	0.0073	0.0090
156	0.0165	0.0074	0.0091
157	0.0168	0.0075	0.0092
158	0.0169	0.0076	0.0093
159	0.0173	0.0078	0.0095
160	0.0175	0.0079	0.0096
161	0.0179	0.0080	0.0098
162	0.0181	0.0081	0.0099
163	0.0185	0.0083	0.0102
164	0.0187	0.0084	0.0103
165	0.0192	0.0086	0.0106
166	0.0194	0.0088	0.0107
167	0.0200	0.0090	0.0110
168	0.0203	0.0091	0.0111
169	0.0212	0.0095	0.0117
170	0.0215	0.0097	0.0118

171	0.0222	0.0100	0.0122
172	0.0226	0.0101	0.0124
173	0.0233	0.0105	0.0128
174	0.0238	0.0107	0.0131
175	0.0247	0.0111	0.0136
176	0.0252	0.0113	0.0139
177	0.0263	0.0118	0.0145
178	0.0269	0.0121	0.0148
179	0.0282	0.0127	0.0155
180	0.0290	0.0130	0.0159
181	0.0307	0.0138	0.0169
182	0.0316	0.0142	0.0174
183	0.0339	0.0152	0.0186
184	0.0351	0.0158	0.0193
185	0.0322	0.0145	0.0177
186	0.0340	0.0153	0.0187
187	0.0386	0.0174	0.0212
188	0.0416	0.0187	0.0229
189	0.0524	0.0191	0.0333
190	0.0589	0.0191	0.0398
191	0.0833	0.0191	0.0642
192	0.1134	0.0191	0.0943
193	0.3366	0.0191	0.3175
194	0.0683	0.0191	0.0492
195	0.0453	0.0191	0.0262
196	0.0361	0.0162	0.0198
197	0.0366	0.0165	0.0201
198	0.0327	0.0147	0.0180
199	0.0298	0.0134	0.0164
200	0.0275	0.0124	0.0152
201	0.0257	0.0116	0.0141
202	0.0242	0.0109	0.0133
203	0.0229	0.0103	0.0126
204	0.0218	0.0098	0.0120
205	0.0206	0.0092	0.0113
206	0.0197	0.0089	0.0108
207	0.0190	0.0085	0.0104
208	0.0183	0.0082	0.0101
209	0.0177	0.0080	0.0097
210	0.0171	0.0077	0.0094
211	0.0166	0.0075	0.0091
212	0.0161	0.0073	0.0089
213	0.0157	0.0071	0.0086
214	0.0153	0.0069	0.0084
215	0.0149	0.0067	0.0082
216	0.0146	0.0066	0.0080
217	0.0113	0.0051	0.0062
218	0.0110	0.0050	0.0061
219	0.0107	0.0048	0.0059
220	0.0105	0.0047	0.0058
221	0.0103	0.0046	0.0056
222	0.0100	0.0045	0.0055
223	0.0098	0.0044	0.0054
224	0.0096	0.0043	0.0053
225	0.0094	0.0042	0.0052
226	0.0093	0.0042	0.0051
227	0.0091	0.0041	0.0050
228	0.0089	0.0040	0.0049

229	0.0088	0.0039	0.0048
230	0.0086	0.0039	0.0047
231	0.0085	0.0038	0.0047
232	0.0083	0.0038	0.0046
233	0.0082	0.0037	0.0045
234	0.0081	0.0036	0.0044
235	0.0080	0.0036	0.0044
236	0.0078	0.0035	0.0043
237	0.0077	0.0035	0.0043
238	0.0076	0.0034	0.0042
239	0.0075	0.0034	0.0041
240	0.0074	0.0033	0.0041
241	0.0073	0.0033	0.0040
242	0.0072	0.0033	0.0040
243	0.0071	0.0032	0.0039
244	0.0070	0.0032	0.0039
245	0.0070	0.0031	0.0038
246	0.0069	0.0031	0.0038
247	0.0068	0.0031	0.0037
248	0.0067	0.0030	0.0037
249	0.0066	0.0030	0.0037
250	0.0066	0.0030	0.0036
251	0.0065	0.0029	0.0036
252	0.0064	0.0029	0.0035
253	0.0064	0.0029	0.0035
254	0.0063	0.0028	0.0035
255	0.0062	0.0028	0.0034
256	0.0062	0.0028	0.0034
257	0.0061	0.0027	0.0034
258	0.0061	0.0027	0.0033
259	0.0060	0.0027	0.0033
260	0.0059	0.0027	0.0033
261	0.0059	0.0026	0.0032
262	0.0058	0.0026	0.0032
263	0.0058	0.0026	0.0032
264	0.0057	0.0026	0.0031
265	0.0057	0.0026	0.0031
266	0.0056	0.0025	0.0031
267	0.0056	0.0025	0.0031
268	0.0055	0.0025	0.0030
269	0.0055	0.0025	0.0030
270	0.0054	0.0024	0.0030
271	0.0054	0.0024	0.0030
272	0.0054	0.0024	0.0029
273	0.0053	0.0024	0.0029
274	0.0053	0.0024	0.0029
275	0.0052	0.0024	0.0029
276	0.0052	0.0023	0.0029
277	0.0052	0.0023	0.0028
278	0.0051	0.0023	0.0028
279	0.0051	0.0023	0.0028
280	0.0050	0.0023	0.0028
281	0.0050	0.0023	0.0028
282	0.0050	0.0022	0.0027
283	0.0049	0.0022	0.0027
284	0.0049	0.0022	0.0027
285	0.0049	0.0022	0.0027
286	0.0048	0.0022	0.0027

287	0.0048	0.0022	0.0026
288	0.0048	0.0021	0.0026

Total soil rain loss = 1.45(In)
Total effective rainfall = 2.23(In)
Peak flow rate in flood hydrograph = 277.38(CFS)

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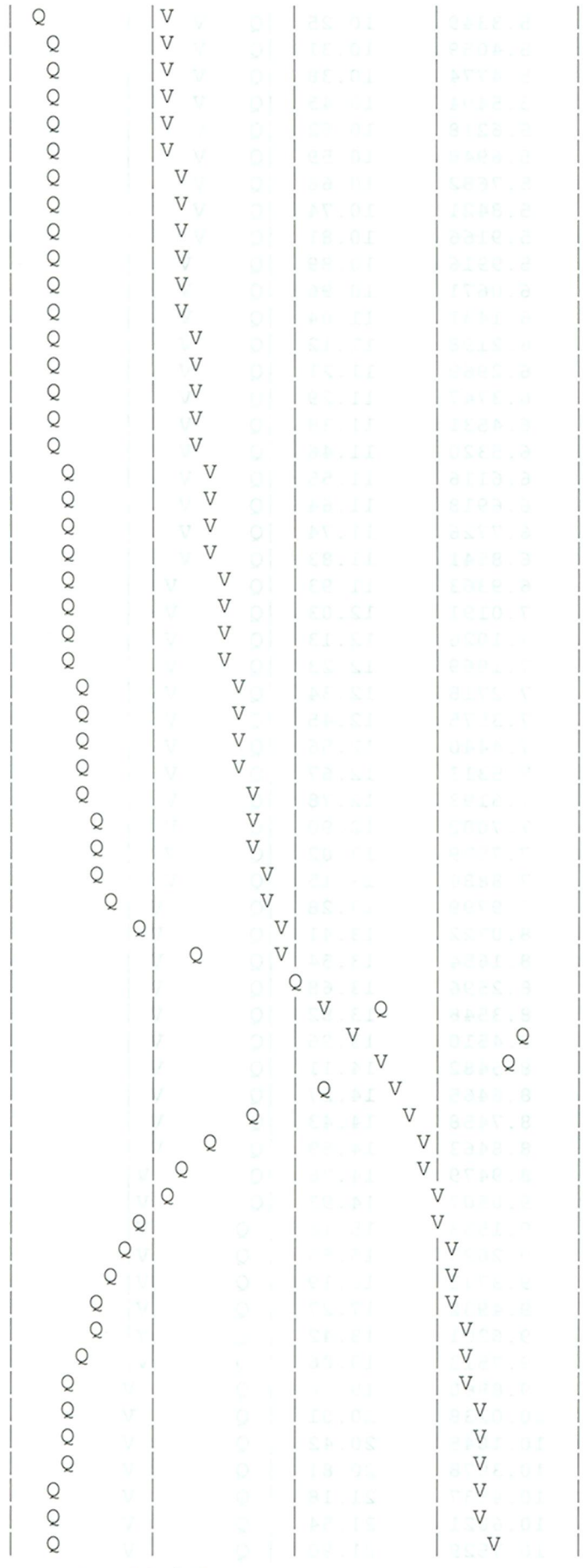
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	75.0	150.0	225.0	300.0
0+ 5	0.0008	0.12	Q				
0+10	0.0042	0.49	Q				
0+15	0.0120	1.13	Q				
0+20	0.0295	2.54	Q				
0+25	0.0573	4.04	Q				
0+30	0.0897	4.71	Q				
0+35	0.1253	5.17	Q				
0+40	0.1634	5.53	Q				
0+45	0.2034	5.81	Q				
0+50	0.2451	6.05	Q				
0+55	0.2880	6.24	Q				
1+ 0	0.3321	6.40	Q				
1+ 5	0.3771	6.54	Q				
1+10	0.4229	6.64	Q				
1+15	0.4692	6.73	Q				
1+20	0.5161	6.80	Q				
1+25	0.5632	6.85	Q				
1+30	0.6107	6.89	Q				
1+35	0.6584	6.93	Q				
1+40	0.7065	6.97	Q				
1+45	0.7547	7.01	Q				
1+50	0.8032	7.05	Q				
1+55	0.8520	7.08	Q				
2+ 0	0.9011	7.12	Q				
2+ 5	0.9503	7.15	Q				
2+10	0.9998	7.18	QV				
2+15	1.0495	7.22	QV				
2+20	1.0994	7.24	QV				
2+25	1.1495	7.27	QV				
2+30	1.1997	7.30	QV				
2+35	1.2502	7.32	QV				
2+40	1.3008	7.35	QV				
2+45	1.3516	7.38	QV				
2+50	1.4026	7.41	QV				
2+55	1.4539	7.44	QV				
3+ 0	1.5053	7.47	QV				
3+ 5	1.5569	7.49	QV				
3+10	1.6087	7.52	|Q				
3+15	1.6607	7.55	|Q				
3+20	1.7130	7.58	|Q				
3+25	1.7654	7.61	|Q				

3+30	1.8181	7.65	|Q	|	|	|	|
3+35	1.8709	7.68	|Q	|	|	|	|
3+40	1.9240	7.71	|Q	|	|	|	|
3+45	1.9773	7.74	|QV	|	|	|	|
3+50	2.0308	7.77	|QV	|	|	|	|
3+55	2.0846	7.80	|QV	|	|	|	|
4+ 0	2.1386	7.84	|QV	|	|	|	|
4+ 5	2.1928	7.87	|QV	|	|	|	|
4+10	2.2472	7.90	|QV	|	|	|	|
4+15	2.3018	7.94	|QV	|	|	|	|
4+20	2.3567	7.97	|QV	|	|	|	|
4+25	2.4119	8.01	|QV	|	|	|	|
4+30	2.4672	8.04	|QV	|	|	|	|
4+35	2.5229	8.08	|QV	|	|	|	|
4+40	2.5787	8.11	|QV	|	|	|	|
4+45	2.6348	8.15	|QV	|	|	|	|
4+50	2.6912	8.18	|QV	|	|	|	|
4+55	2.7478	8.22	|QV	|	|	|	|
5+ 0	2.8047	8.26	|QV	|	|	|	|
5+ 5	2.8618	8.30	|QV	|	|	|	|
5+10	2.9192	8.33	|QV	|	|	|	|
5+15	2.9769	8.37	|Q V	|	|	|	|
5+20	3.0349	8.41	|Q V	|	|	|	|
5+25	3.0931	8.45	|Q V	|	|	|	|
5+30	3.1516	8.49	|Q V	|	|	|	|
5+35	3.2103	8.53	|Q V	|	|	|	|
5+40	3.2694	8.57	|Q V	|	|	|	|
5+45	3.3287	8.62	|Q V	|	|	|	|
5+50	3.3884	8.66	|Q V	|	|	|	|
5+55	3.4483	8.70	|Q V	|	|	|	|
6+ 0	3.5085	8.75	|Q V	|	|	|	|
6+ 5	3.5691	8.79	|Q V	|	|	|	|
6+10	3.6299	8.83	|Q V	|	|	|	|
6+15	3.6911	8.88	|Q V	|	|	|	|
6+20	3.7525	8.92	|Q V	|	|	|	|
6+25	3.8143	8.97	|Q V	|	|	|	|
6+30	3.8764	9.02	|Q V	|	|	|	|
6+35	3.9389	9.07	|Q V	|	|	|	|
6+40	4.0016	9.11	|Q V	|	|	|	|
6+45	4.0647	9.16	|Q V	|	|	|	|
6+50	4.1282	9.21	|Q V	|	|	|	|
6+55	4.1920	9.26	|Q V	|	|	|	|
7+ 0	4.2561	9.31	|Q V	|	|	|	|
7+ 5	4.3206	9.37	|Q V	|	|	|	|
7+10	4.3855	9.42	|Q V	|	|	|	|
7+15	4.4507	9.47	|Q V	|	|	|	|
7+20	4.5163	9.53	|Q V	|	|	|	|
7+25	4.5823	9.58	|Q V	|	|	|	|
7+30	4.6487	9.64	|Q V	|	|	|	|
7+35	4.7155	9.69	|Q V	|	|	|	|
7+40	4.7826	9.75	|Q V	|	|	|	|
7+45	4.8502	9.81	|Q V	|	|	|	|
7+50	4.9182	9.87	|Q V	|	|	|	|
7+55	4.9865	9.93	|Q V	|	|	|	|
8+ 0	5.0553	9.99	|Q V	|	|	|	|
8+ 5	5.1246	10.05	|Q V	|	|	|	|
8+10	5.1942	10.12	|Q V	|	|	|	|
8+15	5.2644	10.18	|Q V	|	|	|	|

8+20	5.3349	10.25	Q V				
8+25	5.4059	10.31	Q V				
8+30	5.4774	10.38	Q V				
8+35	5.5494	10.45	Q V				
8+40	5.6218	10.52	Q V				
8+45	5.6948	10.59	Q V				
8+50	5.7682	10.66	Q V				
8+55	5.8421	10.74	Q V				
9+ 0	5.9166	10.81	Q V				
9+ 5	5.9916	10.89	Q V				
9+10	6.0671	10.96	Q V				
9+15	6.1431	11.04	Q V				
9+20	6.2198	11.12	Q V				
9+25	6.2969	11.21	Q V				
9+30	6.3747	11.29	Q V				
9+35	6.4531	11.38	Q V				
9+40	6.5320	11.46	Q V				
9+45	6.6116	11.55	Q V				
9+50	6.6918	11.64	Q V				
9+55	6.7726	11.74	Q V				
10+ 0	6.8541	11.83	Q V				
10+ 5	6.9363	11.93	Q V				
10+10	7.0191	12.03	Q V				
10+15	7.1026	12.13	Q V				
10+20	7.1869	12.23	Q V				
10+25	7.2718	12.34	Q V				
10+30	7.3575	12.45	Q V				
10+35	7.4440	12.56	Q V				
10+40	7.5313	12.67	Q V				
10+45	7.6193	12.78	Q V				
10+50	7.7082	12.90	Q V				
10+55	7.7979	13.02	Q V				
11+ 0	7.8884	13.15	Q V				
11+ 5	7.9799	13.28	Q V				
11+10	8.0722	13.41	Q V				
11+15	8.1654	13.54	Q V				
11+20	8.2596	13.68	Q V				
11+25	8.3548	13.82	Q V				
11+30	8.4510	13.96	Q V				
11+35	8.5482	14.11	Q V				
11+40	8.6465	14.27	Q V				
11+45	8.7458	14.43	Q V				
11+50	8.8463	14.59	Q V				
11+55	8.9479	14.76	Q V				
12+ 0	9.0507	14.93	Q V				
12+ 5	9.1553	15.18	Q V				
12+10	9.2627	15.60	Q V				
12+15	9.3742	16.19	Q V				
12+20	9.4932	17.27	Q V				
12+25	9.6201	18.42	Q V				
12+30	9.7513	19.06	Q V				
12+35	9.8860	19.56	Q V				
12+40	10.0238	20.01	Q V				
12+45	10.1645	20.42	Q V				
12+50	10.3078	20.81	Q V				
12+55	10.4537	21.18	Q V				
13+ 0	10.6021	21.54	Q V				
13+ 5	10.7529	21.90	Q V				

13+10	10.9061	22.24	
13+15	11.0617	22.59	
13+20	11.2196	22.94	
13+25	11.3800	23.29	
13+30	11.5429	23.65	
13+35	11.7083	24.02	
13+40	11.8764	24.41	
13+45	12.0473	24.81	
13+50	12.2211	25.24	
13+55	12.3980	25.68	
14+ 0	12.5781	26.15	
14+ 5	12.7616	26.65	
14+10	12.9489	27.19	
14+15	13.1402	27.78	
14+20	13.3361	28.45	
14+25	13.5370	29.17	
14+30	13.7426	29.86	
14+35	13.9533	30.59	
14+40	14.1693	31.36	
14+45	14.3909	32.18	
14+50	14.6186	33.07	
14+55	14.8530	34.02	
15+ 0	15.0944	35.06	
15+ 5	15.3436	36.19	
15+10	15.6014	37.43	
15+15	15.8688	38.82	
15+20	16.1467	40.36	
15+25	16.4357	41.95	
15+30	16.7351	43.48	
15+35	17.0448	44.97	
15+40	17.3609	45.91	
15+45	17.6884	47.55	
15+50	18.0451	51.79	
15+55	18.4523	59.13	
16+ 0	18.9552	73.02	
16+ 5	19.6722	104.10	
16+10	20.7102	150.72	
16+15	22.0934	200.85	
16+20	24.0038	277.38	
16+25	25.8566	269.04	
16+30	27.0107	167.57	
16+35	27.8984	128.89	
16+40	28.6470	108.70	
16+45	29.2958	94.20	
16+50	29.8660	82.79	
16+55	30.3690	73.04	
17+ 0	30.8166	64.99	
17+ 5	31.2143	57.74	
17+10	31.5671	51.23	
17+15	31.8837	45.97	
17+20	32.1639	40.68	
17+25	32.4125	36.10	
17+30	32.6461	33.93	
17+35	32.8675	32.14	
17+40	33.0779	30.55	
17+45	33.2772	28.95	
17+50	33.4703	28.03	
17+55	33.6578	27.23	

18+ 0	33.8364	25.93	Q			V	
18+ 5	34.0056	24.57	Q			V	
18+10	34.1662	23.32	Q			V	
18+15	34.3184	22.09	Q			V	
18+20	34.4567	20.08	Q			V	
18+25	34.5844	18.55	Q			V	
18+30	34.7059	17.64	Q			V	
18+35	34.8224	16.91	Q			V	
18+40	34.9344	16.27	Q			V	
18+45	35.0427	15.71	Q			V	
18+50	35.1474	15.21	Q			V	
18+55	35.2491	14.77	Q			V	
19+ 0	35.3480	14.36	Q			V	
19+ 5	35.4443	13.99	Q			V	
19+10	35.5383	13.65	Q			V	
19+15	35.6302	13.34	Q			V	
19+20	35.7201	13.06	Q			V	
19+25	35.8083	12.80	Q			V	
19+30	35.8948	12.56	Q			V	
19+35	35.9797	12.33	Q			V	
19+40	36.0632	12.11	Q			V	
19+45	36.1452	11.91	Q			V	
19+50	36.2258	11.71	Q			V	
19+55	36.3051	11.52	Q			V	
20+ 0	36.3831	11.33	Q			V	
20+ 5	36.4600	11.16	Q			V	
20+10	36.5357	10.99	Q			V	
20+15	36.6103	10.83	Q			V	
20+20	36.6839	10.68	Q			V	
20+25	36.7565	10.54	Q			V	
20+30	36.8281	10.40	Q			V	
20+35	36.8988	10.26	Q			V	
20+40	36.9686	10.13	Q			V	
20+45	37.0375	10.01	Q			V	
20+50	37.1055	9.88	Q			V	
20+55	37.1728	9.76	Q			V	
21+ 0	37.2392	9.65	Q			V	
21+ 5	37.3049	9.54	Q			V	
21+10	37.3699	9.43	Q			V	
21+15	37.4341	9.32	Q			V	
21+20	37.4976	9.22	Q			V	
21+25	37.5604	9.12	Q			V	
21+30	37.6226	9.03	Q			V	
21+35	37.6841	8.93	Q			V	
21+40	37.7450	8.84	Q			V	
21+45	37.8053	8.75	Q			V	
21+50	37.8649	8.67	Q			V	
21+55	37.9240	8.58	Q			V	
22+ 0	37.9826	8.50	Q			V	
22+ 5	38.0405	8.42	Q			V	
22+10	38.0980	8.34	Q			V	
22+15	38.1549	8.26	Q			V	
22+20	38.2113	8.19	Q			V	
22+25	38.2672	8.12	Q			V	
22+30	38.3226	8.04	Q			V	
22+35	38.3775	7.97	Q			V	
22+40	38.4319	7.91	Q			V	
22+45	38.4859	7.84	Q			V	

22+50	38.5395	7.77	|Q	|	|	|	V|
22+55	38.5926	7.71	|Q	|	|	|	V|
23+ 0	38.6452	7.65	|Q	|	|	|	V|
23+ 5	38.6975	7.59	|Q	|	|	|	V|
23+10	38.7493	7.53	|Q	|	|	|	V|
23+15	38.8008	7.47	Q	|	|	|	V|
23+20	38.8518	7.41	Q	|	|	|	V|
23+25	38.9024	7.35	Q	|	|	|	V|
23+30	38.9527	7.30	Q	|	|	|	V|
23+35	39.0026	7.24	Q	|	|	|	V|
23+40	39.0521	7.19	Q	|	|	|	V|
23+45	39.1013	7.14	Q	|	|	|	V|
23+50	39.1501	7.09	Q	|	|	|	V|
23+55	39.1986	7.04	Q	|	|	|	V|
24+ 0	39.2467	6.99	Q	|	|	|	V|
24+ 5	39.2937	6.82	Q	|	|	|	V|
24+10	39.3378	6.41	Q	|	|	|	V|
24+15	39.3772	5.72	Q	|	|	|	V|
24+20	39.4067	4.29	Q	|	|	|	V|
24+25	39.4257	2.76	Q	|	|	|	V|
24+30	39.4401	2.09	Q	|	|	|	V|
24+35	39.4513	1.63	Q	|	|	|	V|
24+40	39.4601	1.28	Q	|	|	|	V|
24+45	39.4670	1.01	Q	|	|	|	V|
24+50	39.4724	0.78	Q	|	|	|	V|
24+55	39.4766	0.61	Q	|	|	|	V|
25+ 0	39.4798	0.46	Q	|	|	|	V|
25+ 5	39.4822	0.35	Q	|	|	|	V|
25+10	39.4840	0.26	Q	|	|	|	V|
25+15	39.4853	0.19	Q	|	|	|	V|
25+20	39.4863	0.14	Q	|	|	|	V|
25+25	39.4871	0.12	Q	|	|	|	V|
25+30	39.4878	0.10	Q	|	|	|	V|
25+35	39.4883	0.08	Q	|	|	|	V|
25+40	39.4888	0.07	Q	|	|	|	V|
25+45	39.4892	0.05	Q	|	|	|	V|
25+50	39.4895	0.04	Q	|	|	|	V|
25+55	39.4896	0.03	Q	|	|	|	V|
26+ 0	39.4898	0.02	Q	|	|	|	V|
26+ 5	39.4898	0.01	Q	|	|	|	V|
26+10	39.4899	0.00	Q	|	|	|	V|

U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/26/12 File Name UNIT25Y24HEX1B.out

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Orange County Unit Hydrograph Hydrology Method
Manual Date(s) - October 1986, November 1996

Program License Serial Number 6062

ESPERANZA HILLS OPTION 1
DETENTION BASIN ANALYSIS
EXISTING CONDITION AREA B
25-YEAR 24-HOUR

Storm Event Year = 25

Antecedent Moisture Condition = 2

English (in-lb) Input Units Used

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	Area (Ac.)	Area Fraction	Soil Group	Fp (In/Hr)	Ap (dec.)	Fm (In/Hr)
81.0	123.5	0.58	C	0.250	1.000	0.250
86.0	89.0	0.42	D	0.200	1.000	0.200

Area-averaged adjusted loss rate Fm (In/Hr) = 0.229

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC2)	S	Pervious Yield Fr
123.50	0.581	81.0	81.0	2.35	0.566
89.00	0.419	86.0	86.0	1.63	0.667

Area-averaged catchment yield fraction, Y = 0.608
Area-averaged low loss fraction, Yb = 0.392

++

User entry of time of concentration = 0.390 (hours)
Watershed area = 212.50(Ac.)
Catchment Lag time = 0.312 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 26.7094
Hydrograph baseflow = 0.00(CFS)

Average maximum watershed loss rate(Fm) = 0.229(In/Hr)
Average low loss rate fraction (Yb) = 0.392 (decimal)
FOOTHILL S-Graph Selected
Computed peak 5-minute rainfall = 0.400(In)
Computed peak 30-minute rainfall = 0.870(In)
Specified peak 1-hour rainfall = 1.150(In)
Computed peak 3-hour rainfall = 1.940(In)
Specified peak 6-hour rainfall = 2.710(In)
Specified peak 24-hour rainfall = 4.490(In)

Rainfall depth area reduction factors:
Using a total area of 212.50(Ac.) (Ref: fig. E-4)

5-minute factor = 0.990 Adjusted rainfall = 0.396(In)
30-minute factor = 0.990 Adjusted rainfall = 0.861(In)
1-hour factor = 0.990 Adjusted rainfall = 1.139(In)
3-hour factor = 0.999 Adjusted rainfall = 1.938(In)
6-hour factor = 0.999 Adjusted rainfall = 2.708(In)
24-hour factor = 1.000 Adjusted rainfall = 4.489(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
(K = 2569.92 (CFS))		
1	1.856	47.692
2	7.556	146.484
3	17.700	260.699
4	40.272	580.073
5	61.390	542.738
6	70.851	243.129
7	77.333	166.579
8	82.319	128.139
9	86.186	99.380
10	89.317	80.476
11	91.817	64.241
12	93.847	52.155
13	95.420	40.425
14	96.622	30.898
15	97.544	23.687
16	98.068	13.474
17	98.388	8.221
18	98.674	7.358
19	98.937	6.756
20	99.125	4.830
21	99.290	4.233
22	99.494	5.251
23	99.692	5.097
24	99.811	3.041
25	99.906	2.443
26	99.962	1.450
27	100.000	0.972

Peak Unit Adjusted mass rainfall Unit rainfall

Number	(In)	(In)
1	0.3960	0.3960
2	0.5349	0.1389
3	0.6377	0.1028
4	0.7224	0.0847
5	0.7959	0.0734
6	0.8613	0.0655
7	0.9165	0.0551
8	0.9671	0.0506
9	1.0140	0.0470
10	1.0580	0.0439
11	1.0994	0.0414
12	1.1385	0.0392
13	1.1835	0.0450
14	1.2267	0.0432
15	1.2684	0.0417
16	1.3086	0.0402
17	1.3476	0.0390
18	1.3854	0.0378
19	1.4221	0.0367
20	1.4579	0.0357
21	1.4927	0.0348
22	1.5267	0.0340
23	1.5599	0.0332
24	1.5923	0.0325
25	1.6241	0.0318
26	1.6552	0.0311
27	1.6857	0.0305
28	1.7157	0.0299
29	1.7451	0.0294
30	1.7739	0.0289
31	1.8023	0.0284
32	1.8302	0.0279
33	1.8577	0.0275
34	1.8847	0.0270
35	1.9113	0.0266
36	1.9376	0.0262
37	1.9634	0.0258
38	1.9888	0.0255
39	2.0139	0.0251
40	2.0387	0.0248
41	2.0632	0.0245
42	2.0874	0.0242
43	2.1112	0.0239
44	2.1348	0.0236
45	2.1581	0.0233
46	2.1811	0.0230
47	2.2039	0.0228
48	2.2264	0.0225
49	2.2487	0.0223
50	2.2708	0.0221
51	2.2926	0.0218
52	2.3142	0.0216
53	2.3356	0.0214
54	2.3568	0.0212
55	2.3778	0.0210
56	2.3986	0.0208
57	2.4192	0.0206

58	2.4396	0.0204
59	2.4598	0.0202
60	2.4799	0.0201
61	2.4997	0.0199
62	2.5195	0.0197
63	2.5390	0.0196
64	2.5584	0.0194
65	2.5776	0.0192
66	2.5967	0.0191
67	2.6157	0.0189
68	2.6344	0.0188
69	2.6531	0.0186
70	2.6716	0.0185
71	2.6900	0.0184
72	2.7082	0.0182
73	2.7219	0.0137
74	2.7354	0.0135
75	2.7488	0.0134
76	2.7621	0.0133
77	2.7753	0.0132
78	2.7884	0.0131
79	2.8014	0.0130
80	2.8142	0.0129
81	2.8270	0.0128
82	2.8397	0.0127
83	2.8522	0.0126
84	2.8647	0.0125
85	2.8771	0.0124
86	2.8894	0.0123
87	2.9016	0.0122
88	2.9137	0.0121
89	2.9257	0.0120
90	2.9377	0.0119
91	2.9495	0.0119
92	2.9613	0.0118
93	2.9730	0.0117
94	2.9846	0.0116
95	2.9961	0.0115
96	3.0076	0.0115
97	3.0190	0.0114
98	3.0303	0.0113
99	3.0415	0.0112
100	3.0527	0.0112
101	3.0638	0.0111
102	3.0748	0.0110
103	3.0858	0.0110
104	3.0966	0.0109
105	3.1075	0.0108
106	3.1182	0.0108
107	3.1289	0.0107
108	3.1395	0.0106
109	3.1501	0.0106
110	3.1606	0.0105
111	3.1711	0.0104
112	3.1814	0.0104
113	3.1918	0.0103
114	3.2020	0.0103
115	3.2122	0.0102

116	3.2224	0.0102
117	3.2325	0.0101
118	3.2425	0.0100
119	3.2525	0.0100
120	3.2625	0.0099
121	3.2723	0.0099
122	3.2822	0.0098
123	3.2920	0.0098
124	3.3017	0.0097
125	3.3114	0.0097
126	3.3210	0.0096
127	3.3306	0.0096
128	3.3401	0.0095
129	3.3496	0.0095
130	3.3590	0.0094
131	3.3684	0.0094
132	3.3778	0.0093
133	3.3871	0.0093
134	3.3964	0.0093
135	3.4056	0.0092
136	3.4147	0.0092
137	3.4239	0.0091
138	3.4330	0.0091
139	3.4420	0.0090
140	3.4510	0.0090
141	3.4600	0.0090
142	3.4689	0.0089
143	3.4778	0.0089
144	3.4866	0.0088
145	3.4954	0.0088
146	3.5042	0.0088
147	3.5129	0.0087
148	3.5216	0.0087
149	3.5303	0.0087
150	3.5389	0.0086
151	3.5475	0.0086
152	3.5560	0.0085
153	3.5645	0.0085
154	3.5730	0.0085
155	3.5814	0.0084
156	3.5899	0.0084
157	3.5982	0.0084
158	3.6066	0.0083
159	3.6149	0.0083
160	3.6231	0.0083
161	3.6314	0.0082
162	3.6396	0.0082
163	3.6478	0.0082
164	3.6559	0.0081
165	3.6640	0.0081
166	3.6721	0.0081
167	3.6801	0.0080
168	3.6881	0.0080
169	3.6961	0.0080
170	3.7041	0.0080
171	3.7120	0.0079
172	3.7199	0.0079
173	3.7278	0.0079

174	3.7356	0.0078
175	3.7434	0.0078
176	3.7512	0.0078
177	3.7590	0.0078
178	3.7667	0.0077
179	3.7744	0.0077
180	3.7821	0.0077
181	3.7897	0.0076
182	3.7973	0.0076
183	3.8049	0.0076
184	3.8125	0.0076
185	3.8200	0.0075
186	3.8275	0.0075
187	3.8350	0.0075
188	3.8425	0.0075
189	3.8499	0.0074
190	3.8573	0.0074
191	3.8647	0.0074
192	3.8721	0.0074
193	3.8794	0.0073
194	3.8867	0.0073
195	3.8940	0.0073
196	3.9013	0.0073
197	3.9085	0.0072
198	3.9158	0.0072
199	3.9230	0.0072
200	3.9301	0.0072
201	3.9373	0.0072
202	3.9444	0.0071
203	3.9515	0.0071
204	3.9586	0.0071
205	3.9657	0.0071
206	3.9727	0.0070
207	3.9797	0.0070
208	3.9867	0.0070
209	3.9937	0.0070
210	4.0007	0.0070
211	4.0076	0.0069
212	4.0145	0.0069
213	4.0214	0.0069
214	4.0283	0.0069
215	4.0351	0.0069
216	4.0420	0.0068
217	4.0488	0.0068
218	4.0556	0.0068
219	4.0623	0.0068
220	4.0691	0.0068
221	4.0758	0.0067
222	4.0825	0.0067
223	4.0892	0.0067
224	4.0959	0.0067
225	4.1025	0.0067
226	4.1092	0.0066
227	4.1158	0.0066
228	4.1224	0.0066
229	4.1290	0.0066
230	4.1355	0.0066
231	4.1421	0.0065

232	4.1486	0.0065
233	4.1551	0.0065
234	4.1616	0.0065
235	4.1681	0.0065
236	4.1745	0.0065
237	4.1810	0.0064
238	4.1874	0.0064
239	4.1938	0.0064
240	4.2002	0.0064
241	4.2066	0.0064
242	4.2129	0.0064
243	4.2193	0.0063
244	4.2256	0.0063
245	4.2319	0.0063
246	4.2382	0.0063
247	4.2444	0.0063
248	4.2507	0.0063
249	4.2569	0.0062
250	4.2632	0.0062
251	4.2694	0.0062
252	4.2756	0.0062
253	4.2817	0.0062
254	4.2879	0.0062
255	4.2940	0.0061
256	4.3002	0.0061
257	4.3063	0.0061
258	4.3124	0.0061
259	4.3185	0.0061
260	4.3245	0.0061
261	4.3306	0.0061
262	4.3366	0.0060
263	4.3427	0.0060
264	4.3487	0.0060
265	4.3547	0.0060
266	4.3607	0.0060
267	4.3666	0.0060
268	4.3726	0.0060
269	4.3785	0.0059
270	4.3844	0.0059
271	4.3904	0.0059
272	4.3963	0.0059
273	4.4021	0.0059
274	4.4080	0.0059
275	4.4139	0.0059
276	4.4197	0.0058
277	4.4255	0.0058
278	4.4314	0.0058
279	4.4372	0.0058
280	4.4430	0.0058
281	4.4487	0.0058
282	4.4545	0.0058
283	4.4602	0.0058
284	4.4660	0.0057
285	4.4717	0.0057
286	4.4774	0.0057
287	4.4831	0.0057
288	4.4888	0.0057

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0057	0.0022	0.0035
2	0.0057	0.0022	0.0035
3	0.0057	0.0022	0.0035
4	0.0057	0.0022	0.0035
5	0.0058	0.0023	0.0035
6	0.0058	0.0023	0.0035
7	0.0058	0.0023	0.0035
8	0.0058	0.0023	0.0035
9	0.0058	0.0023	0.0036
10	0.0059	0.0023	0.0036
11	0.0059	0.0023	0.0036
12	0.0059	0.0023	0.0036
13	0.0059	0.0023	0.0036
14	0.0059	0.0023	0.0036
15	0.0060	0.0023	0.0036
16	0.0060	0.0023	0.0036
17	0.0060	0.0024	0.0037
18	0.0060	0.0024	0.0037
19	0.0061	0.0024	0.0037
20	0.0061	0.0024	0.0037
21	0.0061	0.0024	0.0037
22	0.0061	0.0024	0.0037
23	0.0061	0.0024	0.0037
24	0.0062	0.0024	0.0037
25	0.0062	0.0024	0.0038
26	0.0062	0.0024	0.0038
27	0.0062	0.0024	0.0038
28	0.0063	0.0025	0.0038
29	0.0063	0.0025	0.0038
30	0.0063	0.0025	0.0038
31	0.0063	0.0025	0.0039
32	0.0064	0.0025	0.0039
33	0.0064	0.0025	0.0039
34	0.0064	0.0025	0.0039
35	0.0064	0.0025	0.0039
36	0.0065	0.0025	0.0039
37	0.0065	0.0025	0.0039
38	0.0065	0.0026	0.0040
39	0.0065	0.0026	0.0040
40	0.0066	0.0026	0.0040
41	0.0066	0.0026	0.0040
42	0.0066	0.0026	0.0040
43	0.0067	0.0026	0.0040
44	0.0067	0.0026	0.0041
45	0.0067	0.0026	0.0041
46	0.0067	0.0026	0.0041
47	0.0068	0.0027	0.0041
48	0.0068	0.0027	0.0041
49	0.0068	0.0027	0.0042
50	0.0069	0.0027	0.0042
51	0.0069	0.0027	0.0042
52	0.0069	0.0027	0.0042
53	0.0070	0.0027	0.0042
54	0.0070	0.0027	0.0042

55	0.0070	0.0028	0.0043
56	0.0070	0.0028	0.0043
57	0.0071	0.0028	0.0043
58	0.0071	0.0028	0.0043
59	0.0072	0.0028	0.0043
60	0.0072	0.0028	0.0044
61	0.0072	0.0028	0.0044
62	0.0072	0.0028	0.0044
63	0.0073	0.0029	0.0044
64	0.0073	0.0029	0.0044
65	0.0074	0.0029	0.0045
66	0.0074	0.0029	0.0045
67	0.0074	0.0029	0.0045
68	0.0075	0.0029	0.0045
69	0.0075	0.0029	0.0046
70	0.0075	0.0030	0.0046
71	0.0076	0.0030	0.0046
72	0.0076	0.0030	0.0046
73	0.0077	0.0030	0.0047
74	0.0077	0.0030	0.0047
75	0.0078	0.0030	0.0047
76	0.0078	0.0031	0.0047
77	0.0078	0.0031	0.0048
78	0.0079	0.0031	0.0048
79	0.0079	0.0031	0.0048
80	0.0080	0.0031	0.0048
81	0.0080	0.0031	0.0049
82	0.0080	0.0032	0.0049
83	0.0081	0.0032	0.0049
84	0.0081	0.0032	0.0049
85	0.0082	0.0032	0.0050
86	0.0082	0.0032	0.0050
87	0.0083	0.0033	0.0050
88	0.0083	0.0033	0.0051
89	0.0084	0.0033	0.0051
90	0.0084	0.0033	0.0051
91	0.0085	0.0033	0.0052
92	0.0085	0.0033	0.0052
93	0.0086	0.0034	0.0052
94	0.0087	0.0034	0.0053
95	0.0087	0.0034	0.0053
96	0.0088	0.0034	0.0053
97	0.0088	0.0035	0.0054
98	0.0089	0.0035	0.0054
99	0.0090	0.0035	0.0055
100	0.0090	0.0035	0.0055
101	0.0091	0.0036	0.0055
102	0.0091	0.0036	0.0056
103	0.0092	0.0036	0.0056
104	0.0093	0.0036	0.0056
105	0.0093	0.0037	0.0057
106	0.0094	0.0037	0.0057
107	0.0095	0.0037	0.0058
108	0.0095	0.0037	0.0058
109	0.0096	0.0038	0.0059
110	0.0097	0.0038	0.0059
111	0.0098	0.0038	0.0059
112	0.0098	0.0039	0.0060

113	0.0099	0.0039	0.0060
114	0.0100	0.0039	0.0061
115	0.0101	0.0040	0.0061
116	0.0102	0.0040	0.0062
117	0.0103	0.0040	0.0062
118	0.0103	0.0040	0.0063
119	0.0104	0.0041	0.0063
120	0.0105	0.0041	0.0064
121	0.0106	0.0042	0.0065
122	0.0107	0.0042	0.0065
123	0.0108	0.0042	0.0066
124	0.0109	0.0043	0.0066
125	0.0110	0.0043	0.0067
126	0.0111	0.0043	0.0067
127	0.0112	0.0044	0.0068
128	0.0113	0.0044	0.0069
129	0.0115	0.0045	0.0070
130	0.0115	0.0045	0.0070
131	0.0117	0.0046	0.0071
132	0.0118	0.0046	0.0072
133	0.0119	0.0047	0.0073
134	0.0120	0.0047	0.0073
135	0.0122	0.0048	0.0074
136	0.0123	0.0048	0.0075
137	0.0125	0.0049	0.0076
138	0.0126	0.0049	0.0076
139	0.0128	0.0050	0.0078
140	0.0129	0.0050	0.0078
141	0.0131	0.0051	0.0080
142	0.0132	0.0052	0.0080
143	0.0134	0.0053	0.0082
144	0.0135	0.0053	0.0082
145	0.0182	0.0071	0.0111
146	0.0184	0.0072	0.0112
147	0.0186	0.0073	0.0113
148	0.0188	0.0074	0.0114
149	0.0191	0.0075	0.0116
150	0.0192	0.0075	0.0117
151	0.0196	0.0077	0.0119
152	0.0197	0.0077	0.0120
153	0.0201	0.0079	0.0122
154	0.0202	0.0079	0.0123
155	0.0206	0.0081	0.0125
156	0.0208	0.0081	0.0126
157	0.0212	0.0083	0.0129
158	0.0214	0.0084	0.0130
159	0.0218	0.0086	0.0133
160	0.0221	0.0086	0.0134
161	0.0225	0.0088	0.0137
162	0.0228	0.0089	0.0138
163	0.0233	0.0091	0.0142
164	0.0236	0.0092	0.0143
165	0.0242	0.0095	0.0147
166	0.0245	0.0096	0.0149
167	0.0251	0.0098	0.0153
168	0.0255	0.0100	0.0155
169	0.0262	0.0103	0.0160
170	0.0266	0.0104	0.0162

171	0.0275	0.0108	0.0167
172	0.0279	0.0109	0.0170
173	0.0289	0.0113	0.0176
174	0.0294	0.0115	0.0179
175	0.0305	0.0120	0.0185
176	0.0311	0.0122	0.0189
177	0.0325	0.0127	0.0197
178	0.0332	0.0130	0.0202
179	0.0348	0.0137	0.0212
180	0.0357	0.0140	0.0217
181	0.0378	0.0148	0.0230
182	0.0390	0.0153	0.0237
183	0.0417	0.0163	0.0253
184	0.0432	0.0169	0.0263
185	0.0392	0.0154	0.0238
186	0.0414	0.0162	0.0252
187	0.0470	0.0184	0.0285
188	0.0506	0.0191	0.0315
189	0.0655	0.0191	0.0464
190	0.0734	0.0191	0.0543
191	0.1028	0.0191	0.0837
192	0.1389	0.0191	0.1198
193	0.3960	0.0191	0.3769
194	0.0847	0.0191	0.0656
195	0.0551	0.0191	0.0361
196	0.0439	0.0172	0.0267
197	0.0450	0.0176	0.0273
198	0.0402	0.0158	0.0245
199	0.0367	0.0144	0.0223
200	0.0340	0.0133	0.0207
201	0.0318	0.0125	0.0193
202	0.0299	0.0117	0.0182
203	0.0284	0.0111	0.0173
204	0.0270	0.0106	0.0164
205	0.0258	0.0101	0.0157
206	0.0248	0.0097	0.0151
207	0.0239	0.0094	0.0145
208	0.0230	0.0090	0.0140
209	0.0223	0.0087	0.0136
210	0.0216	0.0085	0.0131
211	0.0210	0.0082	0.0128
212	0.0204	0.0080	0.0124
213	0.0199	0.0078	0.0121
214	0.0194	0.0076	0.0118
215	0.0189	0.0074	0.0115
216	0.0185	0.0073	0.0113
217	0.0137	0.0054	0.0083
218	0.0133	0.0052	0.0081
219	0.0130	0.0051	0.0079
220	0.0127	0.0050	0.0077
221	0.0124	0.0049	0.0075
222	0.0121	0.0047	0.0074
223	0.0119	0.0046	0.0072
224	0.0116	0.0046	0.0071
225	0.0114	0.0045	0.0069
226	0.0112	0.0044	0.0068
227	0.0110	0.0043	0.0067
228	0.0108	0.0042	0.0065

229	0.0106	0.0041	0.0064
230	0.0104	0.0041	0.0063
231	0.0102	0.0040	0.0062
232	0.0100	0.0039	0.0061
233	0.0099	0.0039	0.0060
234	0.0097	0.0038	0.0059
235	0.0096	0.0038	0.0058
236	0.0094	0.0037	0.0057
237	0.0093	0.0036	0.0057
238	0.0092	0.0036	0.0056
239	0.0090	0.0035	0.0055
240	0.0089	0.0035	0.0054
241	0.0088	0.0035	0.0054
242	0.0087	0.0034	0.0053
243	0.0086	0.0034	0.0052
244	0.0085	0.0033	0.0052
245	0.0084	0.0033	0.0051
246	0.0083	0.0032	0.0050
247	0.0082	0.0032	0.0050
248	0.0081	0.0032	0.0049
249	0.0080	0.0031	0.0049
250	0.0079	0.0031	0.0048
251	0.0078	0.0031	0.0047
252	0.0077	0.0030	0.0047
253	0.0076	0.0030	0.0046
254	0.0076	0.0030	0.0046
255	0.0075	0.0029	0.0046
256	0.0074	0.0029	0.0045
257	0.0073	0.0029	0.0045
258	0.0073	0.0028	0.0044
259	0.0072	0.0028	0.0044
260	0.0071	0.0028	0.0043
261	0.0071	0.0028	0.0043
262	0.0070	0.0027	0.0043
263	0.0069	0.0027	0.0042
264	0.0069	0.0027	0.0042
265	0.0068	0.0027	0.0041
266	0.0068	0.0026	0.0041
267	0.0067	0.0026	0.0041
268	0.0066	0.0026	0.0040
269	0.0066	0.0026	0.0040
270	0.0065	0.0026	0.0040
271	0.0065	0.0025	0.0039
272	0.0064	0.0025	0.0039
273	0.0064	0.0025	0.0039
274	0.0063	0.0025	0.0038
275	0.0063	0.0025	0.0038
276	0.0062	0.0024	0.0038
277	0.0062	0.0024	0.0038
278	0.0061	0.0024	0.0037
279	0.0061	0.0024	0.0037
280	0.0060	0.0024	0.0037
281	0.0060	0.0024	0.0036
282	0.0060	0.0023	0.0036
283	0.0059	0.0023	0.0036
284	0.0059	0.0023	0.0036
285	0.0058	0.0023	0.0035
286	0.0058	0.0023	0.0035

287	0.0058	0.0023	0.0035
288	0.0057	0.0022	0.0035

Total soil rain loss = 1.53(In)
Total effective rainfall = 2.96(In)
Peak flow rate in flood hydrograph = 354.65(CFS)

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24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	100.0	200.0	300.0	400.0
0+ 5	0.0011	0.16	Q				
0+10	0.0058	0.67	Q				
0+15	0.0166	1.58	Q				
0+20	0.0413	3.59	Q				
0+25	0.0790	5.47	Q				
0+30	0.1226	6.33	Q				
0+35	0.1703	6.93	Q				
0+40	0.2212	7.39	Q				
0+45	0.2747	7.76	Q				
0+50	0.3303	8.07	Q				
0+55	0.3875	8.32	Q				
1+ 0	0.4462	8.53	Q				
1+ 5	0.5061	8.69	Q				
1+10	0.5670	8.83	Q				
1+15	0.6285	8.94	Q				
1+20	0.6907	9.02	Q				
1+25	0.7532	9.08	Q				
1+30	0.8162	9.14	Q				
1+35	0.8795	9.20	Q				
1+40	0.9432	9.25	Q				
1+45	1.0072	9.29	Q				
1+50	1.0715	9.34	Q				
1+55	1.1362	9.40	Q				
2+ 0	1.2013	9.44	Q				
2+ 5	1.2666	9.48	Q				
2+10	1.3322	9.52	QV				
2+15	1.3980	9.56	QV				
2+20	1.4642	9.60	QV				
2+25	1.5305	9.63	QV				
2+30	1.5971	9.67	QV				
2+35	1.6640	9.71	QV				
2+40	1.7311	9.75	QV				
2+45	1.7985	9.78	QV				
2+50	1.8661	9.82	QV				
2+55	1.9340	9.86	QV				
3+ 0	2.0022	9.90	QV				
3+ 5	2.0706	9.94	QV				
3+10	2.1393	9.98	QV				
3+15	2.2083	10.02	|Q				
3+20	2.2776	10.06	|Q				
3+25	2.3471	10.10	|Q				

3+30	2.4169	10.14	|Q	|	|	|	|
3+35	2.4871	10.18	|Q	|	|	|	|
3+40	2.5575	10.22	|Q	|	|	|	|
3+45	2.6282	10.26	|QV	|	|	|	|
3+50	2.6991	10.31	|QV	|	|	|	|
3+55	2.7704	10.35	|QV	|	|	|	|
4+ 0	2.8420	10.40	|QV	|	|	|	|
4+ 5	2.9139	10.44	|QV	|	|	|	|
4+10	2.9861	10.48	|QV	|	|	|	|
4+15	3.0587	10.53	|QV	|	|	|	|
4+20	3.1315	10.58	|QV	|	|	|	|
4+25	3.2046	10.62	|QV	|	|	|	|
4+30	3.2781	10.67	|QV	|	|	|	|
4+35	3.3519	10.72	|QV	|	|	|	|
4+40	3.4261	10.76	|QV	|	|	|	|
4+45	3.5005	10.81	|QV	|	|	|	|
4+50	3.5753	10.86	|QV	|	|	|	|
4+55	3.6505	10.91	|QV	|	|	|	|
5+ 0	3.7260	10.96	|QV	|	|	|	|
5+ 5	3.8018	11.01	|QV	|	|	|	|
5+10	3.8780	11.06	|QV	|	|	|	|
5+15	3.9546	11.12	|Q V	|	|	|	|
5+20	4.0315	11.17	|Q V	|	|	|	|
5+25	4.1088	11.22	|Q V	|	|	|	|
5+30	4.1865	11.28	|Q V	|	|	|	|
5+35	4.2645	11.33	|Q V	|	|	|	|
5+40	4.3429	11.39	|Q V	|	|	|	|
5+45	4.4218	11.44	|Q V	|	|	|	|
5+50	4.5010	11.50	|Q V	|	|	|	|
5+55	4.5806	11.56	|Q V	|	|	|	|
6+ 0	4.6606	11.62	|Q V	|	|	|	|
6+ 5	4.7410	11.68	|Q V	|	|	|	|
6+10	4.8218	11.74	|Q V	|	|	|	|
6+15	4.9030	11.80	|Q V	|	|	|	|
6+20	4.9847	11.86	|Q V	|	|	|	|
6+25	5.0668	11.92	|Q V	|	|	|	|
6+30	5.1493	11.98	|Q V	|	|	|	|
6+35	5.2323	12.05	|Q V	|	|	|	|
6+40	5.3157	12.11	|Q V	|	|	|	|
6+45	5.3996	12.18	|Q V	|	|	|	|
6+50	5.4839	12.25	|Q V	|	|	|	|
6+55	5.5687	12.31	|Q V	|	|	|	|
7+ 0	5.6540	12.38	|Q V	|	|	|	|
7+ 5	5.7397	12.45	|Q V	|	|	|	|
7+10	5.8260	12.52	|Q V	|	|	|	|
7+15	5.9127	12.59	|Q V	|	|	|	|
7+20	5.9999	12.67	|Q V	|	|	|	|
7+25	6.0877	12.74	|Q V	|	|	|	|
7+30	6.1759	12.82	|Q V	|	|	|	|
7+35	6.2647	12.89	|Q V	|	|	|	|
7+40	6.3541	12.97	|Q V	|	|	|	|
7+45	6.4439	13.05	|Q V	|	|	|	|
7+50	6.5343	13.13	|Q V	|	|	|	|
7+55	6.6253	13.21	|Q V	|	|	|	|
8+ 0	6.7168	13.29	|Q V	|	|	|	|
8+ 5	6.8089	13.38	|Q V	|	|	|	|
8+10	6.9017	13.46	|Q V	|	|	|	|
8+15	6.9950	13.55	|Q V	|	|	|	|

8+20	7.0889	13.64	|Q V |				
8+25	7.1834	13.72	|Q V |				
8+30	7.2785	13.82	|Q V |				
8+35	7.3743	13.91	|Q V |				
8+40	7.4707	14.00	|Q V |				
8+45	7.5678	14.10	|Q V |				
8+50	7.6656	14.20	|Q V |				
8+55	7.7641	14.30	|Q V |				
9+ 0	7.8632	14.40	|Q V |				
9+ 5	7.9631	14.50	|Q V |				
9+10	8.0637	14.60	|Q V |				
9+15	8.1650	14.71	|Q V |				
9+20	8.2670	14.82	|Q V |				
9+25	8.3699	14.93	|Q V |				
9+30	8.4735	15.04	|Q V |				
9+35	8.5779	15.16	|Q V |				
9+40	8.6831	15.28	|Q V |				
9+45	8.7892	15.40	|Q V |				
9+50	8.8961	15.52	|Q V |				
9+55	9.0038	15.65	|Q V |				
10+ 0	9.1125	15.77	|Q V |				
10+ 5	9.2220	15.90	|Q V |				
10+10	9.3324	16.04	|Q V |				
10+15	9.4438	16.17	|Q V |				
10+20	9.5562	16.31	|Q V |				
10+25	9.6695	16.46	|Q V |				
10+30	9.7839	16.60	|Q V |				
10+35	9.8992	16.75	|Q V |				
10+40	10.0157	16.90	|Q V |				
10+45	10.1331	17.06	|Q V |				
10+50	10.2517	17.22	|Q V |				
10+55	10.3715	17.38	|Q V |				
11+ 0	10.4924	17.55	|Q V |				
11+ 5	10.6144	17.72	|Q V |				
11+10	10.7377	17.90	|Q V |				
11+15	10.8623	18.08	|Q V |				
11+20	10.9881	18.27	|Q V |				
11+25	11.1152	18.46	|Q V |				
11+30	11.2437	18.66	|Q V |				
11+35	11.3736	18.86	|Q V |				
11+40	11.5049	19.07	|Q V |				
11+45	11.6377	19.28	|Q V |				
11+50	11.7720	19.50	|Q V|				
11+55	11.9079	19.73	|Q V|				
12+ 0	12.0453	19.96	|Q V|				
12+ 5	12.1854	20.33	| Q V|				
12+10	12.3298	20.98	| Q V|				
12+15	12.4810	21.94	| Q V|				
12+20	12.6448	23.79	| Q V|				
12+25	12.8207	25.54	| Q V|				
12+30	13.0032	26.50	| Q V|				
12+35	13.1910	27.26	| Q V				
12+40	13.3833	27.93	| Q V				
12+45	13.5798	28.53	| Q V				
12+50	13.7802	29.10	| Q V				
12+55	13.9843	29.63	| Q V				
13+ 0	14.1919	30.14	| Q V				
13+ 5	14.4029	30.64	| Q |V				

13+10	14.6173	31.13	
13+15	14.8350	31.61	
13+20	15.0559	32.08	
13+25	15.2802	32.56	
13+30	15.5078	33.05	
13+35	15.7390	33.57	
13+40	15.9738	34.10	
13+45	16.2125	34.65	
13+50	16.4551	35.23	
13+55	16.7020	35.84	
14+ 0	16.9532	36.48	
14+ 5	17.2090	37.15	
14+10	17.4697	37.86	
14+15	17.7356	38.60	
14+20	18.0070	39.40	
14+25	18.2842	40.25	
14+30	18.5675	41.15	
14+35	18.8574	42.09	
14+40	19.1544	43.12	
14+45	19.4589	44.21	
14+50	19.7715	45.40	
14+55	20.0929	46.67	
15+ 0	20.4241	48.08	
15+ 5	20.7656	49.60	
15+10	21.1189	51.29	
15+15	21.4850	53.15	
15+20	21.8655	55.26	
15+25	22.2608	57.39	
15+30	22.6701	59.43	
15+35	23.0923	61.31	
15+40	23.5217	62.34	
15+45	23.9676	64.75	
15+50	24.4558	70.88	
15+55	25.0161	81.35	
16+ 0	25.7107	100.85	
16+ 5	26.6768	140.29	
16+10	28.0447	198.62	
16+15	29.8409	260.80	
16+20	32.2834	354.65	
16+25	34.4961	321.29	
16+30	35.9246	207.41	
16+35	37.0415	162.19	
16+40	37.9902	137.75	
16+45	38.8169	120.04	
16+50	39.5462	105.89	
16+55	40.1914	93.69	
17+ 0	40.7668	83.55	
17+ 5	41.2786	74.31	
17+10	41.7357	66.37	
17+15	42.1466	59.67	
17+20	42.5111	52.92	
17+25	42.8446	48.42	
17+30	43.1600	45.80	
17+35	43.4604	43.62	
17+40	43.7450	41.32	
17+45	44.0181	39.65	
17+50	44.2834	38.53	
17+55	44.5390	37.10	

18+ 0	44.7813	35.19	Q			V
18+ 5	45.0131	33.65	Q			V
18+10	45.2326	31.88	Q			V
18+15	45.4395	30.04	Q			V
18+20	45.6277	27.33	Q			V
18+25	45.8006	25.11	Q			V
18+30	45.9645	23.79	Q			V
18+35	46.1211	22.74	Q			V
18+40	46.2714	21.83	Q			V
18+45	46.4163	21.04	Q			V
18+50	46.5564	20.34	Q			V
18+55	46.6921	19.71	Q			V
19+ 0	46.8240	19.15	Q			V
19+ 5	46.9523	18.64	Q			V
19+10	47.0775	18.17	Q			V
19+15	47.1998	17.75	Q			V
19+20	47.3194	17.38	Q			V
19+25	47.4367	17.03	Q			V
19+30	47.5518	16.71	Q			V
19+35	47.6647	16.39	Q			V
19+40	47.7756	16.10	Q			V
19+45	47.8846	15.82	Q			V
19+50	47.9917	15.55	Q			V
19+55	48.0970	15.30	Q			V
20+ 0	48.2007	15.05	Q			V
20+ 5	48.3027	14.82	Q			V
20+10	48.4033	14.60	Q			V
20+15	48.5024	14.39	Q			V
20+20	48.6001	14.19	Q			V
20+25	48.6964	13.99	Q			V
20+30	48.7915	13.80	Q			V
20+35	48.8853	13.62	Q			V
20+40	48.9779	13.45	Q			V
20+45	49.0694	13.28	Q			V
20+50	49.1597	13.11	Q			V
20+55	49.2489	12.96	Q			V
21+ 0	49.3371	12.80	Q			V
21+ 5	49.4242	12.65	Q			V
21+10	49.5103	12.51	Q			V
21+15	49.5955	12.37	Q			V
21+20	49.6797	12.23	Q			V
21+25	49.7631	12.10	Q			V
21+30	49.8455	11.97	Q			V
21+35	49.9270	11.84	Q			V
21+40	50.0078	11.72	Q			V
21+45	50.0877	11.60	Q			V
21+50	50.1668	11.49	Q			V
21+55	50.2451	11.37	Q			V
22+ 0	50.3227	11.26	Q			V
22+ 5	50.3995	11.16	Q			V
22+10	50.4756	11.05	Q			V
22+15	50.5510	10.95	Q			V
22+20	50.6257	10.85	Q			V
22+25	50.6997	10.75	Q			V
22+30	50.7731	10.66	Q			V
22+35	50.8459	10.56	Q			V
22+40	50.9180	10.47	Q			V
22+45	50.9895	10.38	Q			V

22+50	51.0604	10.29	|Q	|	|	|	V|
22+55	51.1307	10.21	|Q	|	|	|	V|
23+ 0	51.2004	10.13	|Q	|	|	|	V|
23+ 5	51.2696	10.04	|Q	|	|	|	V|
23+10	51.3382	9.96	Q	|	|	|	V|
23+15	51.4063	9.89	Q	|	|	|	V|
23+20	51.4739	9.81	Q	|	|	|	V|
23+25	51.5409	9.73	Q	|	|	|	V|
23+30	51.6074	9.66	Q	|	|	|	V|
23+35	51.6735	9.59	Q	|	|	|	V|
23+40	51.7390	9.52	Q	|	|	|	V|
23+45	51.8040	9.45	Q	|	|	|	V|
23+50	51.8686	9.38	Q	|	|	|	V|
23+55	51.9328	9.31	Q	|	|	|	V|
24+ 0	51.9964	9.24	Q	|	|	|	V|
24+ 5	52.0585	9.02	Q	|	|	|	V|
24+10	52.1167	8.45	Q	|	|	|	V|
24+15	52.1683	7.49	Q	|	|	|	V|
24+20	52.2057	5.44	Q	|	|	|	V|
24+25	52.2300	3.53	Q	|	|	|	V|
24+30	52.2484	2.66	Q	|	|	|	V|
24+35	52.2626	2.07	Q	|	|	|	V|
24+40	52.2738	1.62	Q	|	|	|	V|
24+45	52.2824	1.26	Q	|	|	|	V|
24+50	52.2892	0.97	Q	|	|	|	V|
24+55	52.2943	0.75	Q	|	|	|	V|
25+ 0	52.2982	0.56	Q	|	|	|	V|
25+ 5	52.3010	0.42	Q	|	|	|	V|
25+10	52.3032	0.31	Q	|	|	|	V|
25+15	52.3047	0.22	Q	|	|	|	V|
25+20	52.3059	0.18	Q	|	|	|	V|
25+25	52.3069	0.15	Q	|	|	|	V|
25+30	52.3078	0.12	Q	|	|	|	V|
25+35	52.3084	0.10	Q	|	|	|	V|
25+40	52.3090	0.08	Q	|	|	|	V|
25+45	52.3094	0.06	Q	|	|	|	V|
25+50	52.3097	0.05	Q	|	|	|	V|
25+55	52.3099	0.03	Q	|	|	|	V|
26+ 0	52.3100	0.02	Q	|	|	|	V|
26+ 5	52.3101	0.01	Q	|	|	|	V|
26+10	52.3101	0.00	Q	|	|	|	V

U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/26/12 File Name UNIT100Y24HEX1B.out

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Orange County Unit Hydrograph Hydrology Method
Manual Date(s) - October 1986, November 1996

Program License Serial Number 6062

ESPERANZA HILLS OPTION 1
DETENTION BASIN ANALYSIS
EXISTING CONDITION AREA B
100-YEAR 24-HOUR

Storm Event Year = 100

Antecedent Moisture Condition = 3

English (in-lb) Input Units Used

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	Area (Ac.)	Area Fraction	Soil Group	Fp (In/Hr)	Ap (dec.)	Fm (In/Hr)
81.0	123.5	0.58	C	0.250	1.000	0.250
86.0	89.0	0.42	D	0.200	1.000	0.200

Area-averaged adjusted loss rate Fm (In/Hr) = 0.229

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC3)	S	Pervious Yield Fr
123.50	0.581	81.0	94.6	0.57	0.888
89.00	0.419	86.0	97.2	0.29	0.941

Area-averaged catchment yield fraction, Y = 0.910
Area-averaged low loss fraction, Yb = 0.090

++

User entry of time of concentration = 0.370 (hours)
Watershed area = 212.50(Ac.)
Catchment Lag time = 0.296 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 28.1532
Hydrograph baseflow = 0.00(CFS)

Average maximum watershed loss rate(Fm) = 0.229(In/Hr)
Average low loss rate fraction (Yb) = 0.090 (decimal)
FOOTHILL S-Graph Selected
Computed peak 5-minute rainfall = 0.520(In)
Computed peak 30-minute rainfall = 1.090(In)
Specified peak 1-hour rainfall = 1.450(In)
Computed peak 3-hour rainfall = 2.430(In)
Specified peak 6-hour rainfall = 3.360(In)
Specified peak 24-hour rainfall = 5.630(In)

Rainfall depth area reduction factors:
Using a total area of 212.50(Ac.) (Ref: fig. E-4)

5-minute factor = 0.990 Adjusted rainfall = 0.515(In)
30-minute factor = 0.990 Adjusted rainfall = 1.079(In)
1-hour factor = 0.990 Adjusted rainfall = 1.436(In)
3-hour factor = 0.999 Adjusted rainfall = 2.427(In)
6-hour factor = 0.999 Adjusted rainfall = 3.358(In)
24-hour factor = 1.000 Adjusted rainfall = 5.629(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
(K = 2569.92 (CFS))		
1	1.983	50.960
2	8.187	159.437
3	19.709	296.108
4	45.654	666.761
5	64.076	473.441
6	72.961	228.334
7	79.237	161.288
8	83.999	122.387
9	87.711	95.397
10	90.664	75.869
11	93.022	60.610
12	94.874	47.592
13	96.256	35.508
14	97.325	27.473
15	97.989	17.072
16	98.336	8.932
17	98.645	7.936
18	98.924	7.152
19	99.125	5.177
20	99.300	4.497
21	99.517	5.580
22	99.716	5.103
23	99.834	3.035
24	99.923	2.292
25	100.000	1.979

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.5148	0.5148

2	0.6855	0.1707
3	0.8105	0.1250
4	0.9127	0.1023
5	1.0009	0.0881
6	1.0791	0.0783
7	1.1499	0.0707
8	1.2148	0.0650
9	1.2752	0.0604
10	1.3317	0.0565
11	1.3850	0.0533
12	1.4356	0.0505
13	1.4915	0.0560
14	1.5453	0.0538
15	1.5971	0.0518
16	1.6472	0.0500
17	1.6956	0.0484
18	1.7425	0.0470
19	1.7882	0.0456
20	1.8325	0.0444
21	1.8758	0.0432
22	1.9179	0.0422
23	1.9591	0.0412
24	1.9994	0.0403
25	2.0388	0.0394
26	2.0774	0.0386
27	2.1152	0.0378
28	2.1523	0.0371
29	2.1887	0.0364
30	2.2244	0.0358
31	2.2595	0.0351
32	2.2941	0.0345
33	2.3281	0.0340
34	2.3615	0.0335
35	2.3945	0.0329
36	2.4269	0.0325
37	2.4583	0.0313
38	2.4892	0.0309
39	2.5196	0.0305
40	2.5497	0.0301
41	2.5794	0.0297
42	2.6086	0.0293
43	2.6375	0.0289
44	2.6661	0.0286
45	2.6943	0.0282
46	2.7222	0.0279
47	2.7497	0.0276
48	2.7770	0.0272
49	2.8039	0.0269
50	2.8306	0.0267
51	2.8570	0.0264
52	2.8831	0.0261
53	2.9089	0.0258
54	2.9345	0.0256
55	2.9598	0.0253
56	2.9849	0.0251
57	3.0098	0.0248
58	3.0344	0.0246
59	3.0588	0.0244

60	3.0829	0.0242
61	3.1069	0.0240
62	3.1307	0.0238
63	3.1542	0.0235
64	3.1776	0.0234
65	3.2007	0.0232
66	3.2237	0.0230
67	3.2465	0.0228
68	3.2691	0.0226
69	3.2915	0.0224
70	3.3138	0.0223
71	3.3358	0.0221
72	3.3578	0.0219
73	3.3751	0.0173
74	3.3922	0.0172
75	3.4092	0.0170
76	3.4261	0.0169
77	3.4428	0.0167
78	3.4594	0.0166
79	3.4759	0.0165
80	3.4922	0.0163
81	3.5084	0.0162
82	3.5245	0.0161
83	3.5405	0.0160
84	3.5563	0.0158
85	3.5720	0.0157
86	3.5876	0.0156
87	3.6031	0.0155
88	3.6185	0.0154
89	3.6337	0.0153
90	3.6489	0.0152
91	3.6640	0.0151
92	3.6789	0.0150
93	3.6938	0.0149
94	3.7085	0.0148
95	3.7232	0.0147
96	3.7377	0.0146
97	3.7522	0.0145
98	3.7665	0.0144
99	3.7808	0.0143
100	3.7950	0.0142
101	3.8091	0.0141
102	3.8231	0.0140
103	3.8370	0.0139
104	3.8509	0.0138
105	3.8646	0.0138
106	3.8783	0.0137
107	3.8919	0.0136
108	3.9054	0.0135
109	3.9188	0.0134
110	3.9322	0.0134
111	3.9455	0.0133
112	3.9587	0.0132
113	3.9718	0.0131
114	3.9849	0.0131
115	3.9979	0.0130
116	4.0108	0.0129
117	4.0236	0.0128

118	4.0364	0.0128
119	4.0491	0.0127
120	4.0618	0.0126
121	4.0744	0.0126
122	4.0869	0.0125
123	4.0993	0.0125
124	4.1117	0.0124
125	4.1240	0.0123
126	4.1363	0.0123
127	4.1485	0.0122
128	4.1607	0.0121
129	4.1727	0.0121
130	4.1848	0.0120
131	4.1967	0.0120
132	4.2086	0.0119
133	4.2205	0.0119
134	4.2323	0.0118
135	4.2440	0.0117
136	4.2557	0.0117
137	4.2673	0.0116
138	4.2789	0.0116
139	4.2905	0.0115
140	4.3019	0.0115
141	4.3134	0.0114
142	4.3247	0.0114
143	4.3360	0.0113
144	4.3473	0.0113
145	4.3585	0.0112
146	4.3697	0.0112
147	4.3809	0.0111
148	4.3919	0.0111
149	4.4030	0.0110
150	4.4140	0.0110
151	4.4249	0.0109
152	4.4358	0.0109
153	4.4466	0.0109
154	4.4575	0.0108
155	4.4682	0.0108
156	4.4789	0.0107
157	4.4896	0.0107
158	4.5003	0.0106
159	4.5108	0.0106
160	4.5214	0.0106
161	4.5319	0.0105
162	4.5424	0.0105
163	4.5528	0.0104
164	4.5632	0.0104
165	4.5735	0.0103
166	4.5838	0.0103
167	4.5941	0.0103
168	4.6043	0.0102
169	4.6145	0.0102
170	4.6247	0.0102
171	4.6348	0.0101
172	4.6449	0.0101
173	4.6549	0.0100
174	4.6649	0.0100
175	4.6749	0.0100

176	4.6849	0.0099
177	4.6948	0.0099
178	4.7046	0.0099
179	4.7145	0.0098
180	4.7243	0.0098
181	4.7340	0.0098
182	4.7437	0.0097
183	4.7534	0.0097
184	4.7631	0.0097
185	4.7727	0.0096
186	4.7823	0.0096
187	4.7919	0.0096
188	4.8014	0.0095
189	4.8109	0.0095
190	4.8204	0.0095
191	4.8298	0.0094
192	4.8392	0.0094
193	4.8486	0.0094
194	4.8580	0.0093
195	4.8673	0.0093
196	4.8766	0.0093
197	4.8858	0.0093
198	4.8950	0.0092
199	4.9042	0.0092
200	4.9134	0.0092
201	4.9226	0.0091
202	4.9317	0.0091
203	4.9407	0.0091
204	4.9498	0.0091
205	4.9588	0.0090
206	4.9678	0.0090
207	4.9768	0.0090
208	4.9857	0.0089
209	4.9947	0.0089
210	5.0036	0.0089
211	5.0124	0.0089
212	5.0213	0.0088
213	5.0301	0.0088
214	5.0389	0.0088
215	5.0476	0.0088
216	5.0564	0.0087
217	5.0651	0.0087
218	5.0738	0.0087
219	5.0824	0.0087
220	5.0910	0.0086
221	5.0997	0.0086
222	5.1082	0.0086
223	5.1168	0.0086
224	5.1253	0.0085
225	5.1339	0.0085
226	5.1423	0.0085
227	5.1508	0.0085
228	5.1593	0.0084
229	5.1677	0.0084
230	5.1761	0.0084
231	5.1845	0.0084
232	5.1928	0.0084
233	5.2011	0.0083

234	5.2094	0.0083	
235	5.2177	0.0083	
236	5.2260	0.0083	
237	5.2342	0.0082	
238	5.2424	0.0082	
239	5.2506	0.0082	
240	5.2588	0.0082	
241	5.2670	0.0082	
242	5.2751	0.0081	
243	5.2832	0.0081	
244	5.2913	0.0081	
245	5.2994	0.0081	
246	5.3074	0.0080	
247	5.3155	0.0080	
248	5.3235	0.0080	
249	5.3315	0.0080	
250	5.3394	0.0080	
251	5.3474	0.0079	
252	5.3553	0.0079	
253	5.3632	0.0079	
254	5.3711	0.0079	
255	5.3790	0.0079	
256	5.3868	0.0079	
257	5.3946	0.0078	
258	5.4025	0.0078	
259	5.4103	0.0078	
260	5.4180	0.0078	
261	5.4258	0.0078	
262	5.4335	0.0077	
263	5.4412	0.0077	
264	5.4489	0.0077	
265	5.4566	0.0077	
266	5.4643	0.0077	
267	5.4719	0.0076	
268	5.4796	0.0076	
269	5.4872	0.0076	
270	5.4948	0.0076	
271	5.5023	0.0076	
272	5.5099	0.0076	
273	5.5174	0.0075	
274	5.5250	0.0075	
275	5.5325	0.0075	
276	5.5399	0.0075	
277	5.5474	0.0075	
278	5.5549	0.0075	
279	5.5623	0.0074	
280	5.5697	0.0074	
281	5.5771	0.0074	
282	5.5845	0.0074	
283	5.5919	0.0074	
284	5.5992	0.0074	
285	5.6066	0.0073	
286	5.6139	0.0073	
287	5.6212	0.0073	
288	5.6285	0.0073	

Unit Period	Unit Rainfall	Unit Soil-Loss	Effective Rainfall

(number)	(In)	(In)	(In)
1	0.0073	0.0007	0.0066
2	0.0073	0.0007	0.0066
3	0.0073	0.0007	0.0067
4	0.0074	0.0007	0.0067
5	0.0074	0.0007	0.0067
6	0.0074	0.0007	0.0067
7	0.0074	0.0007	0.0068
8	0.0075	0.0007	0.0068
9	0.0075	0.0007	0.0068
10	0.0075	0.0007	0.0068
11	0.0075	0.0007	0.0069
12	0.0076	0.0007	0.0069
13	0.0076	0.0007	0.0069
14	0.0076	0.0007	0.0069
15	0.0076	0.0007	0.0070
16	0.0077	0.0007	0.0070
17	0.0077	0.0007	0.0070
18	0.0077	0.0007	0.0070
19	0.0078	0.0007	0.0071
20	0.0078	0.0007	0.0071
21	0.0078	0.0007	0.0071
22	0.0078	0.0007	0.0071
23	0.0079	0.0007	0.0072
24	0.0079	0.0007	0.0072
25	0.0079	0.0007	0.0072
26	0.0079	0.0007	0.0072
27	0.0080	0.0007	0.0073
28	0.0080	0.0007	0.0073
29	0.0080	0.0007	0.0073
30	0.0081	0.0007	0.0073
31	0.0081	0.0007	0.0074
32	0.0081	0.0007	0.0074
33	0.0082	0.0007	0.0074
34	0.0082	0.0007	0.0075
35	0.0082	0.0007	0.0075
36	0.0083	0.0007	0.0075
37	0.0083	0.0007	0.0076
38	0.0083	0.0007	0.0076
39	0.0084	0.0008	0.0076
40	0.0084	0.0008	0.0076
41	0.0084	0.0008	0.0077
42	0.0085	0.0008	0.0077
43	0.0085	0.0008	0.0077
44	0.0085	0.0008	0.0078
45	0.0086	0.0008	0.0078
46	0.0086	0.0008	0.0078
47	0.0087	0.0008	0.0079
48	0.0087	0.0008	0.0079
49	0.0087	0.0008	0.0080
50	0.0088	0.0008	0.0080
51	0.0088	0.0008	0.0080
52	0.0088	0.0008	0.0080
53	0.0089	0.0008	0.0081
54	0.0089	0.0008	0.0081
55	0.0090	0.0008	0.0082
56	0.0090	0.0008	0.0082

57	0.0091	0.0008	0.0082
58	0.0091	0.0008	0.0083
59	0.0091	0.0008	0.0083
60	0.0092	0.0008	0.0083
61	0.0092	0.0008	0.0084
62	0.0093	0.0008	0.0084
63	0.0093	0.0008	0.0085
64	0.0093	0.0008	0.0085
65	0.0094	0.0008	0.0086
66	0.0094	0.0008	0.0086
67	0.0095	0.0009	0.0086
68	0.0095	0.0009	0.0087
69	0.0096	0.0009	0.0087
70	0.0096	0.0009	0.0088
71	0.0097	0.0009	0.0088
72	0.0097	0.0009	0.0089
73	0.0098	0.0009	0.0089
74	0.0098	0.0009	0.0089
75	0.0099	0.0009	0.0090
76	0.0099	0.0009	0.0090
77	0.0100	0.0009	0.0091
78	0.0100	0.0009	0.0091
79	0.0101	0.0009	0.0092
80	0.0102	0.0009	0.0092
81	0.0102	0.0009	0.0093
82	0.0103	0.0009	0.0093
83	0.0103	0.0009	0.0094
84	0.0104	0.0009	0.0095
85	0.0105	0.0009	0.0095
86	0.0105	0.0009	0.0096
87	0.0106	0.0010	0.0096
88	0.0106	0.0010	0.0097
89	0.0107	0.0010	0.0098
90	0.0108	0.0010	0.0098
91	0.0109	0.0010	0.0099
92	0.0109	0.0010	0.0099
93	0.0110	0.0010	0.0100
94	0.0110	0.0010	0.0100
95	0.0111	0.0010	0.0101
96	0.0112	0.0010	0.0102
97	0.0113	0.0010	0.0103
98	0.0113	0.0010	0.0103
99	0.0114	0.0010	0.0104
100	0.0115	0.0010	0.0104
101	0.0116	0.0010	0.0105
102	0.0116	0.0010	0.0106
103	0.0117	0.0011	0.0107
104	0.0118	0.0011	0.0107
105	0.0119	0.0011	0.0108
106	0.0120	0.0011	0.0109
107	0.0121	0.0011	0.0110
108	0.0121	0.0011	0.0111
109	0.0123	0.0011	0.0112
110	0.0123	0.0011	0.0112
111	0.0125	0.0011	0.0113
112	0.0125	0.0011	0.0114
113	0.0126	0.0011	0.0115
114	0.0127	0.0011	0.0116

115	0.0128	0.0012	0.0117
116	0.0129	0.0012	0.0118
117	0.0131	0.0012	0.0119
118	0.0131	0.0012	0.0120
119	0.0133	0.0012	0.0121
120	0.0134	0.0012	0.0122
121	0.0135	0.0012	0.0123
122	0.0136	0.0012	0.0124
123	0.0138	0.0012	0.0125
124	0.0138	0.0012	0.0126
125	0.0140	0.0013	0.0128
126	0.0141	0.0013	0.0128
127	0.0143	0.0013	0.0130
128	0.0144	0.0013	0.0131
129	0.0146	0.0013	0.0132
130	0.0147	0.0013	0.0133
131	0.0149	0.0013	0.0135
132	0.0150	0.0013	0.0136
133	0.0152	0.0014	0.0138
134	0.0153	0.0014	0.0139
135	0.0155	0.0014	0.0141
136	0.0156	0.0014	0.0142
137	0.0158	0.0014	0.0144
138	0.0160	0.0014	0.0145
139	0.0162	0.0015	0.0147
140	0.0163	0.0015	0.0149
141	0.0166	0.0015	0.0151
142	0.0167	0.0015	0.0152
143	0.0170	0.0015	0.0155
144	0.0172	0.0015	0.0156
145	0.0219	0.0020	0.0200
146	0.0221	0.0020	0.0201
147	0.0224	0.0020	0.0204
148	0.0226	0.0020	0.0206
149	0.0230	0.0021	0.0209
150	0.0232	0.0021	0.0211
151	0.0235	0.0021	0.0214
152	0.0238	0.0021	0.0216
153	0.0242	0.0022	0.0220
154	0.0244	0.0022	0.0222
155	0.0248	0.0022	0.0226
156	0.0251	0.0023	0.0228
157	0.0256	0.0023	0.0233
158	0.0258	0.0023	0.0235
159	0.0264	0.0024	0.0240
160	0.0267	0.0024	0.0243
161	0.0272	0.0024	0.0248
162	0.0276	0.0025	0.0251
163	0.0282	0.0025	0.0257
164	0.0286	0.0026	0.0260
165	0.0293	0.0026	0.0266
166	0.0297	0.0027	0.0270
167	0.0305	0.0027	0.0277
168	0.0309	0.0028	0.0281
169	0.0325	0.0029	0.0295
170	0.0329	0.0030	0.0300
171	0.0340	0.0031	0.0309
172	0.0345	0.0031	0.0314

173	0.0358	0.0032	0.0325
174	0.0364	0.0033	0.0331
175	0.0378	0.0034	0.0344
176	0.0386	0.0035	0.0351
177	0.0403	0.0036	0.0366
178	0.0412	0.0037	0.0375
179	0.0432	0.0039	0.0394
180	0.0444	0.0040	0.0404
181	0.0470	0.0042	0.0427
182	0.0484	0.0044	0.0441
183	0.0518	0.0047	0.0472
184	0.0538	0.0048	0.0489
185	0.0505	0.0045	0.0460
186	0.0533	0.0048	0.0485
187	0.0604	0.0054	0.0549
188	0.0650	0.0058	0.0591
189	0.0783	0.0070	0.0713
190	0.0881	0.0079	0.0802
191	0.1250	0.0112	0.1138
192	0.1707	0.0153	0.1553
193	0.5148	0.0191	0.4957
194	0.1023	0.0092	0.0931
195	0.0707	0.0064	0.0644
196	0.0565	0.0051	0.0515
197	0.0560	0.0050	0.0510
198	0.0500	0.0045	0.0455
199	0.0456	0.0041	0.0415
200	0.0422	0.0038	0.0384
201	0.0394	0.0035	0.0359
202	0.0371	0.0033	0.0338
203	0.0351	0.0032	0.0320
204	0.0335	0.0030	0.0304
205	0.0313	0.0028	0.0285
206	0.0301	0.0027	0.0274
207	0.0289	0.0026	0.0263
208	0.0279	0.0025	0.0254
209	0.0269	0.0024	0.0245
210	0.0261	0.0023	0.0238
211	0.0253	0.0023	0.0231
212	0.0246	0.0022	0.0224
213	0.0240	0.0022	0.0218
214	0.0234	0.0021	0.0213
215	0.0228	0.0020	0.0207
216	0.0223	0.0020	0.0203
217	0.0173	0.0016	0.0157
218	0.0169	0.0015	0.0154
219	0.0165	0.0015	0.0150
220	0.0161	0.0014	0.0146
221	0.0157	0.0014	0.0143
222	0.0154	0.0014	0.0140
223	0.0151	0.0014	0.0137
224	0.0148	0.0013	0.0134
225	0.0145	0.0013	0.0132
226	0.0142	0.0013	0.0129
227	0.0139	0.0013	0.0127
228	0.0137	0.0012	0.0124
229	0.0134	0.0012	0.0122
230	0.0132	0.0012	0.0120

231	0.0130	0.0012	0.0118
232	0.0128	0.0011	0.0116
233	0.0126	0.0011	0.0114
234	0.0124	0.0011	0.0113
235	0.0122	0.0011	0.0111
236	0.0120	0.0011	0.0109
237	0.0119	0.0011	0.0108
238	0.0117	0.0011	0.0106
239	0.0115	0.0010	0.0105
240	0.0114	0.0010	0.0104
241	0.0112	0.0010	0.0102
242	0.0111	0.0010	0.0101
243	0.0109	0.0010	0.0100
244	0.0108	0.0010	0.0098
245	0.0107	0.0010	0.0097
246	0.0106	0.0009	0.0096
247	0.0104	0.0009	0.0095
248	0.0103	0.0009	0.0094
249	0.0102	0.0009	0.0093
250	0.0101	0.0009	0.0092
251	0.0100	0.0009	0.0091
252	0.0099	0.0009	0.0090
253	0.0098	0.0009	0.0089
254	0.0097	0.0009	0.0088
255	0.0096	0.0009	0.0087
256	0.0095	0.0009	0.0086
257	0.0094	0.0008	0.0085
258	0.0093	0.0008	0.0085
259	0.0092	0.0008	0.0084
260	0.0091	0.0008	0.0083
261	0.0090	0.0008	0.0082
262	0.0089	0.0008	0.0081
263	0.0089	0.0008	0.0081
264	0.0088	0.0008	0.0080
265	0.0087	0.0008	0.0079
266	0.0086	0.0008	0.0079
267	0.0086	0.0008	0.0078
268	0.0085	0.0008	0.0077
269	0.0084	0.0008	0.0077
270	0.0084	0.0008	0.0076
271	0.0083	0.0007	0.0075
272	0.0082	0.0007	0.0075
273	0.0082	0.0007	0.0074
274	0.0081	0.0007	0.0074
275	0.0080	0.0007	0.0073
276	0.0080	0.0007	0.0073
277	0.0079	0.0007	0.0072
278	0.0079	0.0007	0.0071
279	0.0078	0.0007	0.0071
280	0.0077	0.0007	0.0070
281	0.0077	0.0007	0.0070
282	0.0076	0.0007	0.0069
283	0.0076	0.0007	0.0069
284	0.0075	0.0007	0.0068
285	0.0075	0.0007	0.0068
286	0.0074	0.0007	0.0068
287	0.0074	0.0007	0.0067
288	0.0073	0.0007	0.0067

Total soil rain loss = 0.48(In)
Total effective rainfall = 5.15(In)
Peak flow rate in flood hydrograph = 512.83(CFS)

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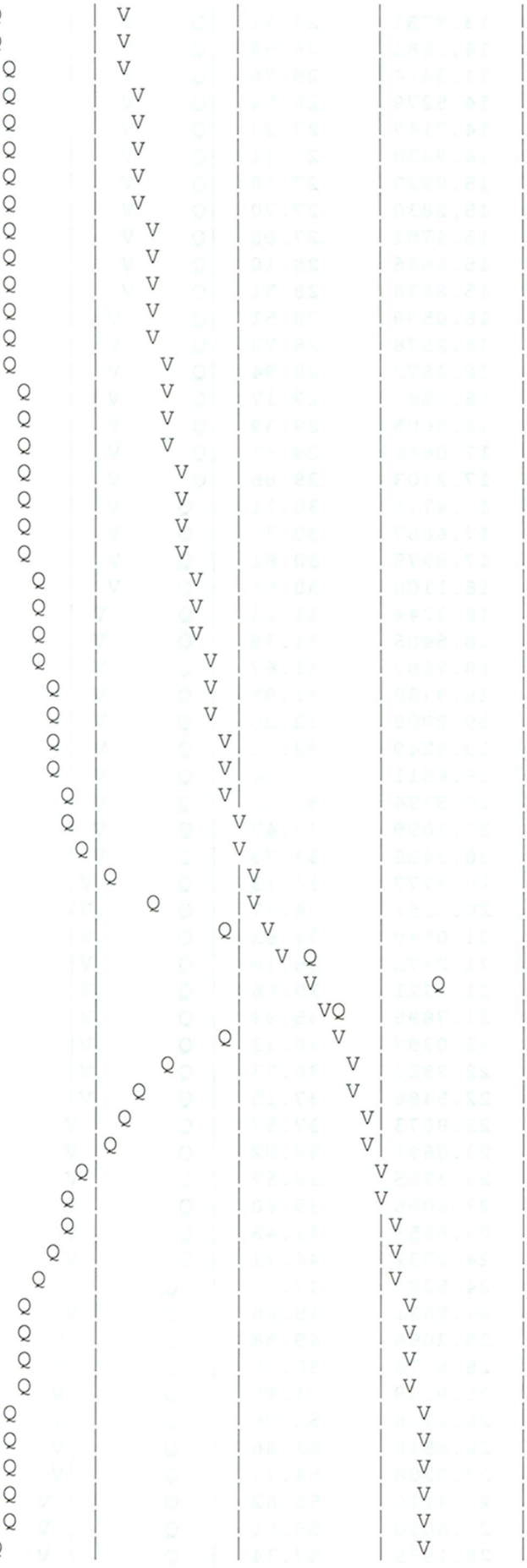
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	150.0	300.0	450.0	600.0
0+ 5	0.0023	0.34	Q				
0+10	0.0119	1.40	Q				
0+15	0.0351	3.37	Q				
0+20	0.0888	7.80	Q				
0+25	0.1643	10.96	Q				
0+30	0.2505	12.51	Q				
0+35	0.3444	13.62	Q				
0+40	0.4441	14.48	Q				
0+45	0.5485	15.16	VQ				
0+50	0.6568	15.72	VQ				
0+55	0.7681	16.17	VQ				
1+ 0	0.8821	16.54	VQ				
1+ 5	0.9980	16.83	VQ				
1+10	1.1156	17.07	VQ				
1+15	1.2344	17.25	VQ				
1+20	1.3540	17.37	VQ				
1+25	1.4743	17.48	VQ				
1+30	1.5954	17.59	VQ				
1+35	1.7172	17.68	VQ				
1+40	1.8396	17.78	VQ				
1+45	1.9627	17.87	VQ				
1+50	2.0865	17.97	VQ				
1+55	2.2109	18.06	VQ				
2+ 0	2.3358	18.14	|Q				
2+ 5	2.4613	18.22	|Q				
2+10	2.5872	18.28	|Q				
2+15	2.7136	18.35	|Q				
2+20	2.8404	18.42	|Q				
2+25	2.9677	18.49	|Q				
2+30	3.0955	18.56	|Q				
2+35	3.2238	18.63	|Q				
2+40	3.3526	18.70	|Q				
2+45	3.4818	18.77	|Q				
2+50	3.6116	18.84	|Q				
2+55	3.7418	18.91	|Q				
3+ 0	3.8726	18.99	|Q				
3+ 5	4.0038	19.06	|Q				
3+10	4.1356	19.14	|Q				
3+15	4.2679	19.21	|Q				
3+20	4.4008	19.29	|Q				
3+25	4.5341	19.36	|Q				
3+30	4.6680	19.44	|QV				
3+35	4.8025	19.52	|QV				

3+40	4.9375	19.60	|QV	|	|	|	|
3+45	5.0730	19.68	|QV	|	|	|	|
3+50	5.2091	19.76	|QV	|	|	|	|
3+55	5.3458	19.84	|QV	|	|	|	|
4+ 0	5.4830	19.93	|QV	|	|	|	|
4+ 5	5.6209	20.01	|QV	|	|	|	|
4+10	5.7593	20.10	|QV	|	|	|	|
4+15	5.8983	20.18	|QV	|	|	|	|
4+20	6.0379	20.27	|QV	|	|	|	|
4+25	6.1781	20.36	|QV	|	|	|	|
4+30	6.3189	20.45	|QV	|	|	|	|
4+35	6.4604	20.54	|QV	|	|	|	|
4+40	6.6024	20.63	|QV	|	|	|	|
4+45	6.7451	20.72	|QV	|	|	|	|
4+50	6.8885	20.81	|Q V	|	|	|	|
4+55	7.0325	20.91	|Q V	|	|	|	|
5+ 0	7.1771	21.00	|Q V	|	|	|	|
5+ 5	7.3224	21.10	|Q V	|	|	|	|
5+10	7.4684	21.20	|Q V	|	|	|	|
5+15	7.6151	21.29	|Q V	|	|	|	|
5+20	7.7624	21.40	|Q V	|	|	|	|
5+25	7.9105	21.50	|Q V	|	|	|	|
5+30	8.0592	21.60	|Q V	|	|	|	|
5+35	8.2087	21.70	|Q V	|	|	|	|
5+40	8.3589	21.81	|Q V	|	|	|	|
5+45	8.5098	21.91	|Q V	|	|	|	|
5+50	8.6615	22.02	|Q V	|	|	|	|
5+55	8.8139	22.13	|Q V	|	|	|	|
6+ 0	8.9671	22.24	|Q V	|	|	|	|
6+ 5	9.1211	22.35	|Q V	|	|	|	|
6+10	9.2758	22.47	|Q V	|	|	|	|
6+15	9.4313	22.58	|Q V	|	|	|	|
6+20	9.5877	22.70	|Q V	|	|	|	|
6+25	9.7448	22.82	|Q V	|	|	|	|
6+30	9.9028	22.94	|Q V	|	|	|	|
6+35	10.0616	23.06	|Q V	|	|	|	|
6+40	10.2212	23.18	|Q V	|	|	|	|
6+45	10.3817	23.30	|Q V	|	|	|	|
6+50	10.5431	23.43	|Q V	|	|	|	|
6+55	10.7054	23.56	|Q V	|	|	|	|
7+ 0	10.8685	23.69	|Q V	|	|	|	|
7+ 5	11.0326	23.82	|Q V	|	|	|	|
7+10	11.1976	23.96	|Q V	|	|	|	|
7+15	11.3635	24.09	|Q V	|	|	|	|
7+20	11.5304	24.23	|Q V	|	|	|	|
7+25	11.6982	24.37	|Q V	|	|	|	|
7+30	11.8670	24.51	|Q V	|	|	|	|
7+35	12.0369	24.66	|Q V	|	|	|	|
7+40	12.2077	24.80	|Q V	|	|	|	|
7+45	12.3795	24.95	|Q V	|	|	|	|
7+50	12.5524	25.10	|Q V	|	|	|	|
7+55	12.7264	25.26	|Q V	|	|	|	|
8+ 0	12.9014	25.41	|Q V	|	|	|	|
8+ 5	13.0775	25.57	|Q V	|	|	|	|
8+10	13.2547	25.73	|Q V	|	|	|	|
8+15	13.4331	25.89	|Q V	|	|	|	|
8+20	13.6126	26.06	|Q V	|	|	|	|
8+25	13.7932	26.23	|Q V	|	|	|	|

8+30	13.9751	26.41	Q V				
8+35	14.1581	26.58	Q V				
8+40	14.3424	26.76	Q V				
8+45	14.5279	26.94	Q V				
8+50	14.7147	27.13	Q V				
8+55	14.9028	27.31	Q V				
9+ 0	15.0922	27.50	Q V				
9+ 5	15.2830	27.70	Q V				
9+10	15.4751	27.90	Q V				
9+15	15.6686	28.10	Q V				
9+20	15.8636	28.31	Q V				
9+25	16.0599	28.51	Q V				
9+30	16.2578	28.73	Q V				
9+35	16.4572	28.94	Q V				
9+40	16.6581	29.17	Q V				
9+45	16.8605	29.39	Q V				
9+50	17.0646	29.63	Q V				
9+55	17.2703	29.86	Q V				
10+ 0	17.4776	30.11	Q V				
10+ 5	17.6867	30.35	Q V				
10+10	17.8975	30.61	Q V				
10+15	18.1100	30.86	Q V				
10+20	18.3244	31.13	Q V				
10+25	18.5406	31.39	Q V				
10+30	18.7587	31.67	Q V				
10+35	18.9788	31.95	Q V				
10+40	19.2009	32.25	Q V				
10+45	19.4249	32.53	Q V				
10+50	19.6511	32.84	Q V				
10+55	19.8794	33.15	Q V				
11+ 0	20.1099	33.47	Q V				
11+ 5	20.3426	33.79	Q V				
11+10	20.5777	34.13	Q V				
11+15	20.8151	34.47	Q V				
11+20	21.0549	34.82	Q V				
11+25	21.2972	35.18	Q V				
11+30	21.5421	35.56	Q V				
11+35	21.7895	35.93	Q V				
11+40	22.0397	36.33	Q V				
11+45	22.2927	36.73	Q V				
11+50	22.5486	37.15	Q V				
11+55	22.8073	37.57	Q V				
12+ 0	23.0691	38.02	Q V				
12+ 5	23.3355	38.67	Q V				
12+10	23.6096	39.80	Q V				
12+15	23.8953	41.48	Q V				
12+20	24.2032	44.71	Q V				
12+25	24.5280	47.16	Q V				
12+30	24.8631	48.66	Q V				
12+35	25.2066	49.88	Q V				
12+40	25.5578	50.99	Q V				
12+45	25.9159	51.99	Q V				
12+50	26.2806	52.96	Q V				
12+55	26.6516	53.86	Q V				
13+ 0	27.0288	54.77	Q V				
13+ 5	27.4119	55.62	Q V				
13+10	27.8010	56.51	Q V				
13+15	28.1959	57.34	Q V				

13+20	28.5969	58.21	
13+25	29.0038	59.08	
13+30	29.4171	60.02	
13+35	29.8369	60.95	
13+40	30.2636	61.96	
13+45	30.6974	62.98	
13+50	31.1388	64.09	
13+55	31.5878	65.21	
14+ 0	32.0453	66.42	
14+ 5	32.5114	67.68	
14+10	32.9875	69.12	
14+15	33.4742	70.66	
14+20	33.9739	72.57	
14+25	34.4863	74.39	
14+30	35.0114	76.24	
14+35	35.5493	78.10	
14+40	36.1013	80.15	
14+45	36.6677	82.24	
14+50	37.2502	84.58	
14+55	37.8494	87.01	
15+ 0	38.4676	89.76	
15+ 5	39.1056	92.64	
15+10	39.7664	95.95	
15+15	40.4515	99.47	
15+20	41.1650	103.60	
15+25	41.9066	107.69	
15+30	42.6772	111.89	
15+35	43.4740	115.69	
15+40	44.2882	118.23	
15+45	45.1378	123.36	
15+50	46.0542	133.05	
15+55	47.0645	146.69	
16+ 0	48.2293	169.13	
16+ 5	49.7262	217.35	
16+10	51.7559	294.71	
16+15	54.3655	378.91	
16+20	57.8973	512.83	
16+25	60.7415	412.98	
16+30	62.7388	290.01	
16+35	64.3904	239.80	
16+40	65.8309	209.16	
16+45	67.1080	185.44	
16+50	68.2472	165.41	
16+55	69.2695	148.45	
17+ 0	70.1897	133.60	
17+ 5	71.0178	120.24	
17+10	71.7702	109.25	
17+15	72.4481	98.44	
17+20	73.0646	89.51	
17+25	73.6452	84.31	
17+30	74.1961	79.99	
17+35	74.7181	75.79	
17+40	75.2174	72.50	
17+45	75.7003	70.12	
17+50	76.1638	67.30	
17+55	76.6052	64.09	
18+ 0	77.0293	61.57	
18+ 5	77.4369	59.18	

18+10	77.8224	55.99	Q			V
18+15	78.1886	53.17	Q			V
18+20	78.5263	49.03	Q			V
18+25	78.8419	45.82	Q			V
18+30	79.1429	43.70	Q			V
18+35	79.4318	41.95	Q			V
18+40	79.7103	40.44	Q			V
18+45	79.9797	39.11	Q			V
18+50	80.2408	37.91	Q			V
18+55	80.4945	36.84	Q			V
19+ 0	80.7415	35.87	Q			V
19+ 5	80.9825	34.99	Q			V
19+10	81.2179	34.18	Q			V
19+15	81.4483	33.45	Q			V
19+20	81.6741	32.79	Q			V
19+25	81.8956	32.16	Q			V
19+30	82.1130	31.57	Q			V
19+35	82.3266	31.01	Q			V
19+40	82.5364	30.47	Q			V
19+45	82.7427	29.95	Q			V
19+50	82.9456	29.46	Q			V
19+55	83.1453	28.99	Q			V
20+ 0	83.3419	28.55	Q			V
20+ 5	83.5356	28.12	Q			V
20+10	83.7264	27.72	Q			V
20+15	83.9146	27.33	Q			V
20+20	84.1003	26.95	Q			V
20+25	84.2834	26.59	Q			V
20+30	84.4641	26.24	Q			V
20+35	84.6425	25.90	Q			V
20+40	84.8186	25.58	Q			V
20+45	84.9926	25.26	Q			V
20+50	85.1645	24.95	Q			V
20+55	85.3343	24.66	Q			V
21+ 0	85.5021	24.37	Q			V
21+ 5	85.6681	24.09	Q			V
21+10	85.8321	23.82	Q			V
21+15	85.9944	23.56	Q			V
21+20	86.1549	23.30	Q			V
21+25	86.3136	23.05	Q			V
21+30	86.4708	22.81	Q			V
21+35	86.6262	22.58	Q			V
21+40	86.7802	22.35	Q			V
21+45	86.9326	22.13	Q			V
21+50	87.0834	21.91	Q			V
21+55	87.2329	21.70	Q			V
22+ 0	87.3809	21.49	Q			V
22+ 5	87.5275	21.29	Q			V
22+10	87.6728	21.09	Q			V
22+15	87.8167	20.90	Q			V
22+20	87.9594	20.71	Q			V
22+25	88.1007	20.53	Q			V
22+30	88.2409	20.35	Q			V
22+35	88.3799	20.18	Q			V
22+40	88.5176	20.00	Q			V
22+45	88.6542	19.84	Q			V
22+50	88.7897	19.67	Q			V
22+55	88.9241	19.51	Q			V

23+ 0	89.0574	19.36	|Q	|	|	|	V|
23+ 5	89.1897	19.20	|Q	|	|	|	V|
23+10	89.3209	19.05	|Q	|	|	|	V|
23+15	89.4511	18.90	|Q	|	|	|	V|
23+20	89.5803	18.76	|Q	|	|	|	V|
23+25	89.7085	18.62	|Q	|	|	|	V|
23+30	89.8358	18.48	|Q	|	|	|	V|
23+35	89.9621	18.34	|Q	|	|	|	V|
23+40	90.0875	18.21	|Q	|	|	|	V|
23+45	90.2120	18.08	|Q	|	|	|	V|
23+50	90.3356	17.95	|Q	|	|	|	V|
23+55	90.4583	17.82	|Q	|	|	|	V|
24+ 0	90.5802	17.70	|Q	|	|	|	V|
24+ 5	90.6989	17.24	|Q	|	|	|	V|
24+10	90.8096	16.06	|Q	|	|	|	V|
24+15	90.9060	14.00	Q	|	|	|	V|
24+20	90.9713	9.49	Q	|	|	|	V|
24+25	91.0146	6.29	Q	|	|	|	V|
24+30	91.0472	4.73	Q	|	|	|	V|
24+35	91.0722	3.63	Q	|	|	|	V|
24+40	91.0915	2.80	Q	|	|	|	V|
24+45	91.1063	2.15	Q	|	|	|	V|
24+50	91.1175	1.63	Q	|	|	|	V|
24+55	91.1259	1.22	Q	|	|	|	V|
25+ 0	91.1321	0.90	Q	|	|	|	V|
25+ 5	91.1366	0.65	Q	|	|	|	V|
25+10	91.1399	0.47	Q	|	|	|	V|
25+15	91.1423	0.35	Q	|	|	|	V|
25+20	91.1443	0.29	Q	|	|	|	V|
25+25	91.1459	0.24	Q	|	|	|	V|
25+30	91.1472	0.19	Q	|	|	|	V|
25+35	91.1482	0.15	Q	|	|	|	V|
25+40	91.1491	0.12	Q	|	|	|	V|
25+45	91.1497	0.08	Q	|	|	|	V|
25+50	91.1500	0.05	Q	|	|	|	V|
25+55	91.1502	0.03	Q	|	|	|	V|
26+ 0	91.1503	0.01	Q	|	|	|	V|

Appendix

J

PROPOSED CONDITION HYDROLOGY UNIT HYDROGRAPH METHOD

3

PROPOSED CONDITION HYDROLOGY
UNIT HYDROGRAPH METHOD

U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/26/12 File Name UNIT10Y24HPR1A.out

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Orange County Unit Hydrograph Hydrology Method
Manual Date(s) - October 1986, November 1996

Program License Serial Number 6062

ESPERANZA HILLS OPTION 1
DETENTION BASIN ANALYSIS
PROPOSED CONDITION AREA A
10-YEAR 24-HOUR

Storm Event Year = 10

Antecedent Moisture Condition = 2

English (in-lb) Input Units Used

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	Area (Ac.)	Area Fraction	Soil Group	Fp (In/Hr)	Ap (dec.)	Fm (In/Hr)
56.0	17.0	0.03	B	0.300	0.920	0.276
69.0	404.8	0.60	C	0.250	0.920	0.230
75.0	255.4	0.38	D	0.200	0.920	0.184

Area-averaged adjusted loss rate Fm (In/Hr) = 0.214

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC2)	S	Pervious Yield Fr
15.64	0.023	56.0	56.0	7.86	0.121
1.36	0.002	98.0	98.0	0.20	0.936
372.37	0.550	69.0	69.0	4.49	0.289
32.38	0.048	98.0	98.0	0.20	0.936
235.01	0.347	75.0	75.0	3.33	0.389
20.44	0.030	98.0	98.0	0.20	0.936

Area-averaged catchment yield fraction, Y = 0.372
Area-averaged low loss fraction, Yb = 0.628

++

User entry of time of concentration = 0.330 (hours)
Watershed area = 677.20(Ac.)
Catchment Lag time = 0.264 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 31.5657
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.214(In/Hr)
Average low loss rate fraction (Yb) = 0.628 (decimal)
FOOTHILL S-Graph Selected
Computed peak 5-minute rainfall = 0.340(In)
Computed peak 30-minute rainfall = 0.720(In)
Specified peak 1-hour rainfall = 0.950(In)
Computed peak 3-hour rainfall = 1.590(In)
Specified peak 6-hour rainfall = 2.200(In)
Specified peak 24-hour rainfall = 3.680(In)

Rainfall depth area reduction factors:
Using a total area of 677.20(Ac.) (Ref: fig. E-4)

5-minute factor = 0.968 Adjusted rainfall = 0.329(In)
30-minute factor = 0.968 Adjusted rainfall = 0.697(In)
1-hour factor = 0.968 Adjusted rainfall = 0.920(In)
3-hour factor = 0.996 Adjusted rainfall = 1.584(In)
6-hour factor = 0.998 Adjusted rainfall = 2.195(In)
24-hour factor = 0.999 Adjusted rainfall = 3.677(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
(K = 8189.89 (CFS))		
1	2.295	187.953
2	9.802	614.838
3	25.775	1308.159
4	55.974	2473.293
5	69.371	1097.195
6	77.302	649.474
7	83.074	472.771
8	87.400	354.317
9	90.737	273.229
10	93.328	212.212
11	95.287	160.456
12	96.716	117.077
13	97.721	82.252
14	98.214	40.362
15	98.575	29.591
16	98.891	25.889
17	99.125	19.159
18	99.325	16.369
19	99.572	20.217
20	99.762	15.594
21	99.883	9.911
22	99.957	6.076
23	100.000	3.495

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.3292	0.3292
2	0.4401	0.1109
3	0.5215	0.0814
4	0.5883	0.0668
5	0.6459	0.0576
6	0.6971	0.0512
7	0.7415	0.0443
8	0.7821	0.0407
9	0.8199	0.0377
10	0.8552	0.0353
11	0.8884	0.0332
12	0.9198	0.0315
13	0.9570	0.0371
14	0.9927	0.0357
15	1.0272	0.0345
16	1.0605	0.0333
17	1.0927	0.0323
18	1.1241	0.0313
19	1.1545	0.0305
20	1.1842	0.0297
21	1.2131	0.0289
22	1.2413	0.0282
23	1.2689	0.0276
24	1.2959	0.0270
25	1.3223	0.0264
26	1.3482	0.0259
27	1.3736	0.0254
28	1.3985	0.0249
29	1.4230	0.0245
30	1.4471	0.0241
31	1.4707	0.0237
32	1.4940	0.0233
33	1.5169	0.0229
34	1.5395	0.0226
35	1.5617	0.0222
36	1.5836	0.0219
37	1.6042	0.0206
38	1.6245	0.0203
39	1.6445	0.0200
40	1.6642	0.0197
41	1.6837	0.0195
42	1.7029	0.0192
43	1.7219	0.0190
44	1.7407	0.0188
45	1.7592	0.0185
46	1.7775	0.0183
47	1.7956	0.0181
48	1.8135	0.0179
49	1.8312	0.0177
50	1.8487	0.0175
51	1.8661	0.0173
52	1.8832	0.0172
53	1.9002	0.0170
54	1.9170	0.0168
55	1.9337	0.0166

56	1.9502	0.0165
57	1.9665	0.0163
58	1.9827	0.0162
59	1.9987	0.0160
60	2.0146	0.0159
61	2.0304	0.0158
62	2.0460	0.0156
63	2.0615	0.0155
64	2.0768	0.0154
65	2.0920	0.0152
66	2.1071	0.0151
67	2.1221	0.0150
68	2.1370	0.0149
69	2.1518	0.0148
70	2.1664	0.0146
71	2.1809	0.0145
72	2.1953	0.0144
73	2.2066	0.0113
74	2.2178	0.0112
75	2.2289	0.0111
76	2.2399	0.0110
77	2.2509	0.0109
78	2.2617	0.0108
79	2.2724	0.0107
80	2.2831	0.0107
81	2.2937	0.0106
82	2.3042	0.0105
83	2.3146	0.0104
84	2.3249	0.0103
85	2.3352	0.0103
86	2.3454	0.0102
87	2.3555	0.0101
88	2.3655	0.0100
89	2.3755	0.0100
90	2.3854	0.0099
91	2.3952	0.0098
92	2.4049	0.0098
93	2.4146	0.0097
94	2.4243	0.0096
95	2.4338	0.0096
96	2.4433	0.0095
97	2.4528	0.0094
98	2.4621	0.0094
99	2.4715	0.0093
100	2.4807	0.0093
101	2.4899	0.0092
102	2.4991	0.0091
103	2.5081	0.0091
104	2.5172	0.0090
105	2.5262	0.0090
106	2.5351	0.0089
107	2.5440	0.0089
108	2.5528	0.0088
109	2.5615	0.0088
110	2.5703	0.0087
111	2.5789	0.0087
112	2.5875	0.0086
113	2.5961	0.0086

114	2.6046	0.0085
115	2.6131	0.0085
116	2.6215	0.0084
117	2.6299	0.0084
118	2.6383	0.0083
119	2.6466	0.0083
120	2.6548	0.0083
121	2.6630	0.0082
122	2.6712	0.0082
123	2.6793	0.0081
124	2.6874	0.0081
125	2.6954	0.0080
126	2.7034	0.0080
127	2.7114	0.0080
128	2.7193	0.0079
129	2.7272	0.0079
130	2.7351	0.0078
131	2.7429	0.0078
132	2.7506	0.0078
133	2.7584	0.0077
134	2.7661	0.0077
135	2.7737	0.0077
136	2.7814	0.0076
137	2.7889	0.0076
138	2.7965	0.0076
139	2.8040	0.0075
140	2.8115	0.0075
141	2.8190	0.0075
142	2.8264	0.0074
143	2.8338	0.0074
144	2.8411	0.0074
145	2.8485	0.0073
146	2.8557	0.0073
147	2.8630	0.0073
148	2.8702	0.0072
149	2.8774	0.0072
150	2.8846	0.0072
151	2.8917	0.0071
152	2.8989	0.0071
153	2.9059	0.0071
154	2.9130	0.0071
155	2.9200	0.0070
156	2.9270	0.0070
157	2.9340	0.0070
158	2.9409	0.0069
159	2.9478	0.0069
160	2.9547	0.0069
161	2.9616	0.0069
162	2.9684	0.0068
163	2.9752	0.0068
164	2.9820	0.0068
165	2.9887	0.0068
166	2.9954	0.0067
167	3.0021	0.0067
168	3.0088	0.0067
169	3.0155	0.0067
170	3.0221	0.0066
171	3.0287	0.0066

172	3.0353	0.0066
173	3.0418	0.0066
174	3.0484	0.0065
175	3.0549	0.0065
176	3.0613	0.0065
177	3.0678	0.0065
178	3.0742	0.0064
179	3.0807	0.0064
180	3.0870	0.0064
181	3.0934	0.0064
182	3.0998	0.0063
183	3.1061	0.0063
184	3.1124	0.0063
185	3.1187	0.0063
186	3.1249	0.0063
187	3.1312	0.0062
188	3.1374	0.0062
189	3.1436	0.0062
190	3.1498	0.0062
191	3.1559	0.0062
192	3.1621	0.0061
193	3.1682	0.0061
194	3.1743	0.0061
195	3.1804	0.0061
196	3.1864	0.0061
197	3.1925	0.0060
198	3.1985	0.0060
199	3.2045	0.0060
200	3.2105	0.0060
201	3.2164	0.0060
202	3.2224	0.0059
203	3.2283	0.0059
204	3.2342	0.0059
205	3.2401	0.0059
206	3.2460	0.0059
207	3.2518	0.0059
208	3.2576	0.0058
209	3.2635	0.0058
210	3.2693	0.0058
211	3.2750	0.0058
212	3.2808	0.0058
213	3.2866	0.0057
214	3.2923	0.0057
215	3.2980	0.0057
216	3.3037	0.0057
217	3.3094	0.0057
218	3.3150	0.0057
219	3.3207	0.0056
220	3.3263	0.0056
221	3.3319	0.0056
222	3.3375	0.0056
223	3.3431	0.0056
224	3.3487	0.0056
225	3.3543	0.0056
226	3.3598	0.0055
227	3.3653	0.0055
228	3.3708	0.0055
229	3.3763	0.0055

230	3.3818	0.0055
231	3.3873	0.0055
232	3.3927	0.0054
233	3.3981	0.0054
234	3.4036	0.0054
235	3.4090	0.0054
236	3.4143	0.0054
237	3.4197	0.0054
238	3.4251	0.0054
239	3.4304	0.0053
240	3.4358	0.0053
241	3.4411	0.0053
242	3.4464	0.0053
243	3.4517	0.0053
244	3.4570	0.0053
245	3.4622	0.0053
246	3.4675	0.0053
247	3.4727	0.0052
248	3.4779	0.0052
249	3.4831	0.0052
250	3.4883	0.0052
251	3.4935	0.0052
252	3.4987	0.0052
253	3.5039	0.0052
254	3.5090	0.0051
255	3.5141	0.0051
256	3.5193	0.0051
257	3.5244	0.0051
258	3.5295	0.0051
259	3.5345	0.0051
260	3.5396	0.0051
261	3.5447	0.0051
262	3.5497	0.0050
263	3.5547	0.0050
264	3.5598	0.0050
265	3.5648	0.0050
266	3.5698	0.0050
267	3.5748	0.0050
268	3.5797	0.0050
269	3.5847	0.0050
270	3.5897	0.0050
271	3.5946	0.0049
272	3.5995	0.0049
273	3.6044	0.0049
274	3.6093	0.0049
275	3.6142	0.0049
276	3.6191	0.0049
277	3.6240	0.0049
278	3.6289	0.0049
279	3.6337	0.0049
280	3.6386	0.0048
281	3.6434	0.0048
282	3.6482	0.0048
283	3.6530	0.0048
284	3.6578	0.0048
285	3.6626	0.0048
286	3.6674	0.0048
287	3.6721	0.0048

288 3.6769 0.0048

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0048	0.0030	0.0018
2	0.0048	0.0030	0.0018
3	0.0048	0.0030	0.0018
4	0.0048	0.0030	0.0018
5	0.0048	0.0030	0.0018
6	0.0048	0.0030	0.0018
7	0.0049	0.0030	0.0018
8	0.0049	0.0031	0.0018
9	0.0049	0.0031	0.0018
10	0.0049	0.0031	0.0018
11	0.0049	0.0031	0.0018
12	0.0049	0.0031	0.0018
13	0.0050	0.0031	0.0018
14	0.0050	0.0031	0.0018
15	0.0050	0.0031	0.0019
16	0.0050	0.0031	0.0019
17	0.0050	0.0032	0.0019
18	0.0050	0.0032	0.0019
19	0.0051	0.0032	0.0019
20	0.0051	0.0032	0.0019
21	0.0051	0.0032	0.0019
22	0.0051	0.0032	0.0019
23	0.0051	0.0032	0.0019
24	0.0051	0.0032	0.0019
25	0.0052	0.0033	0.0019
26	0.0052	0.0033	0.0019
27	0.0052	0.0033	0.0019
28	0.0052	0.0033	0.0019
29	0.0053	0.0033	0.0020
30	0.0053	0.0033	0.0020
31	0.0053	0.0033	0.0020
32	0.0053	0.0033	0.0020
33	0.0053	0.0034	0.0020
34	0.0053	0.0034	0.0020
35	0.0054	0.0034	0.0020
36	0.0054	0.0034	0.0020
37	0.0054	0.0034	0.0020
38	0.0054	0.0034	0.0020
39	0.0055	0.0034	0.0020
40	0.0055	0.0034	0.0020
41	0.0055	0.0035	0.0020
42	0.0055	0.0035	0.0021
43	0.0056	0.0035	0.0021
44	0.0056	0.0035	0.0021
45	0.0056	0.0035	0.0021
46	0.0056	0.0035	0.0021
47	0.0056	0.0036	0.0021
48	0.0057	0.0036	0.0021
49	0.0057	0.0036	0.0021
50	0.0057	0.0036	0.0021
51	0.0057	0.0036	0.0021
52	0.0058	0.0036	0.0021

53	0.0058	0.0036	0.0022
54	0.0058	0.0037	0.0022
55	0.0059	0.0037	0.0022
56	0.0059	0.0037	0.0022
57	0.0059	0.0037	0.0022
58	0.0059	0.0037	0.0022
59	0.0060	0.0037	0.0022
60	0.0060	0.0038	0.0022
61	0.0060	0.0038	0.0022
62	0.0060	0.0038	0.0022
63	0.0061	0.0038	0.0023
64	0.0061	0.0038	0.0023
65	0.0061	0.0039	0.0023
66	0.0062	0.0039	0.0023
67	0.0062	0.0039	0.0023
68	0.0062	0.0039	0.0023
69	0.0063	0.0039	0.0023
70	0.0063	0.0039	0.0023
71	0.0063	0.0040	0.0024
72	0.0063	0.0040	0.0024
73	0.0064	0.0040	0.0024
74	0.0064	0.0040	0.0024
75	0.0065	0.0041	0.0024
76	0.0065	0.0041	0.0024
77	0.0065	0.0041	0.0024
78	0.0066	0.0041	0.0024
79	0.0066	0.0041	0.0025
80	0.0066	0.0042	0.0025
81	0.0067	0.0042	0.0025
82	0.0067	0.0042	0.0025
83	0.0068	0.0042	0.0025
84	0.0068	0.0043	0.0025
85	0.0068	0.0043	0.0025
86	0.0069	0.0043	0.0025
87	0.0069	0.0043	0.0026
88	0.0069	0.0044	0.0026
89	0.0070	0.0044	0.0026
90	0.0070	0.0044	0.0026
91	0.0071	0.0044	0.0026
92	0.0071	0.0045	0.0026
93	0.0072	0.0045	0.0027
94	0.0072	0.0045	0.0027
95	0.0073	0.0046	0.0027
96	0.0073	0.0046	0.0027
97	0.0074	0.0046	0.0027
98	0.0074	0.0046	0.0027
99	0.0075	0.0047	0.0028
100	0.0075	0.0047	0.0028
101	0.0076	0.0047	0.0028
102	0.0076	0.0048	0.0028
103	0.0077	0.0048	0.0028
104	0.0077	0.0048	0.0029
105	0.0078	0.0049	0.0029
106	0.0078	0.0049	0.0029
107	0.0079	0.0050	0.0029
108	0.0079	0.0050	0.0029
109	0.0080	0.0050	0.0030
110	0.0080	0.0051	0.0030

111	0.0081	0.0051	0.0030
112	0.0082	0.0051	0.0030
113	0.0083	0.0052	0.0031
114	0.0083	0.0052	0.0031
115	0.0084	0.0053	0.0031
116	0.0084	0.0053	0.0031
117	0.0085	0.0054	0.0032
118	0.0086	0.0054	0.0032
119	0.0087	0.0054	0.0032
120	0.0087	0.0055	0.0032
121	0.0088	0.0055	0.0033
122	0.0089	0.0056	0.0033
123	0.0090	0.0056	0.0033
124	0.0090	0.0057	0.0034
125	0.0091	0.0057	0.0034
126	0.0092	0.0058	0.0034
127	0.0093	0.0059	0.0035
128	0.0094	0.0059	0.0035
129	0.0095	0.0060	0.0035
130	0.0096	0.0060	0.0036
131	0.0097	0.0061	0.0036
132	0.0098	0.0061	0.0036
133	0.0099	0.0062	0.0037
134	0.0100	0.0063	0.0037
135	0.0101	0.0064	0.0038
136	0.0102	0.0064	0.0038
137	0.0103	0.0065	0.0038
138	0.0104	0.0065	0.0039
139	0.0106	0.0066	0.0039
140	0.0107	0.0067	0.0040
141	0.0108	0.0068	0.0040
142	0.0109	0.0069	0.0041
143	0.0111	0.0070	0.0041
144	0.0112	0.0070	0.0042
145	0.0144	0.0091	0.0054
146	0.0145	0.0091	0.0054
147	0.0148	0.0093	0.0055
148	0.0149	0.0093	0.0055
149	0.0151	0.0095	0.0056
150	0.0152	0.0096	0.0057
151	0.0155	0.0097	0.0058
152	0.0156	0.0098	0.0058
153	0.0159	0.0100	0.0059
154	0.0160	0.0101	0.0060
155	0.0163	0.0103	0.0061
156	0.0165	0.0104	0.0061
157	0.0168	0.0106	0.0062
158	0.0170	0.0107	0.0063
159	0.0173	0.0109	0.0064
160	0.0175	0.0110	0.0065
161	0.0179	0.0113	0.0067
162	0.0181	0.0114	0.0067
163	0.0185	0.0116	0.0069
164	0.0188	0.0118	0.0070
165	0.0192	0.0121	0.0071
166	0.0195	0.0122	0.0072
167	0.0200	0.0126	0.0074
168	0.0203	0.0127	0.0075

169	0.0219	0.0138	0.0081
170	0.0222	0.0140	0.0083
171	0.0229	0.0144	0.0085
172	0.0233	0.0146	0.0086
173	0.0241	0.0151	0.0089
174	0.0245	0.0154	0.0091
175	0.0254	0.0160	0.0094
176	0.0259	0.0163	0.0096
177	0.0270	0.0170	0.0100
178	0.0276	0.0173	0.0103
179	0.0289	0.0178	0.0111
180	0.0297	0.0178	0.0118
181	0.0313	0.0178	0.0135
182	0.0323	0.0178	0.0145
183	0.0345	0.0178	0.0166
184	0.0357	0.0178	0.0179
185	0.0315	0.0178	0.0136
186	0.0332	0.0178	0.0154
187	0.0377	0.0178	0.0199
188	0.0407	0.0178	0.0229
189	0.0512	0.0178	0.0334
190	0.0576	0.0178	0.0398
191	0.0814	0.0178	0.0636
192	0.1109	0.0178	0.0931
193	0.3292	0.0178	0.3114
194	0.0668	0.0178	0.0489
195	0.0443	0.0178	0.0265
196	0.0353	0.0178	0.0175
197	0.0371	0.0178	0.0193
198	0.0333	0.0178	0.0155
199	0.0305	0.0178	0.0126
200	0.0282	0.0177	0.0105
201	0.0264	0.0166	0.0098
202	0.0249	0.0157	0.0093
203	0.0237	0.0149	0.0088
204	0.0226	0.0142	0.0084
205	0.0206	0.0129	0.0076
206	0.0197	0.0124	0.0073
207	0.0190	0.0119	0.0071
208	0.0183	0.0115	0.0068
209	0.0177	0.0111	0.0066
210	0.0172	0.0108	0.0064
211	0.0166	0.0105	0.0062
212	0.0162	0.0102	0.0060
213	0.0158	0.0099	0.0059
214	0.0154	0.0097	0.0057
215	0.0150	0.0094	0.0056
216	0.0146	0.0092	0.0054
217	0.0113	0.0071	0.0042
218	0.0110	0.0069	0.0041
219	0.0107	0.0068	0.0040
220	0.0105	0.0066	0.0039
221	0.0103	0.0064	0.0038
222	0.0100	0.0063	0.0037
223	0.0098	0.0062	0.0037
224	0.0096	0.0060	0.0036
225	0.0094	0.0059	0.0035
226	0.0093	0.0058	0.0034

227	0.0091	0.0057	0.0034
228	0.0089	0.0056	0.0033
229	0.0088	0.0055	0.0033
230	0.0086	0.0054	0.0032
231	0.0085	0.0053	0.0031
232	0.0083	0.0052	0.0031
233	0.0082	0.0052	0.0030
234	0.0081	0.0051	0.0030
235	0.0080	0.0050	0.0030
236	0.0078	0.0049	0.0029
237	0.0077	0.0049	0.0029
238	0.0076	0.0048	0.0028
239	0.0075	0.0047	0.0028
240	0.0074	0.0047	0.0028
241	0.0073	0.0046	0.0027
242	0.0072	0.0045	0.0027
243	0.0071	0.0045	0.0027
244	0.0071	0.0044	0.0026
245	0.0070	0.0044	0.0026
246	0.0069	0.0043	0.0026
247	0.0068	0.0043	0.0025
248	0.0067	0.0042	0.0025
249	0.0067	0.0042	0.0025
250	0.0066	0.0041	0.0024
251	0.0065	0.0041	0.0024
252	0.0064	0.0040	0.0024
253	0.0064	0.0040	0.0024
254	0.0063	0.0040	0.0023
255	0.0062	0.0039	0.0023
256	0.0062	0.0039	0.0023
257	0.0061	0.0038	0.0023
258	0.0061	0.0038	0.0023
259	0.0060	0.0038	0.0022
260	0.0059	0.0037	0.0022
261	0.0059	0.0037	0.0022
262	0.0058	0.0037	0.0022
263	0.0058	0.0036	0.0021
264	0.0057	0.0036	0.0021
265	0.0057	0.0036	0.0021
266	0.0056	0.0035	0.0021
267	0.0056	0.0035	0.0021
268	0.0055	0.0035	0.0021
269	0.0055	0.0035	0.0020
270	0.0054	0.0034	0.0020
271	0.0054	0.0034	0.0020
272	0.0054	0.0034	0.0020
273	0.0053	0.0033	0.0020
274	0.0053	0.0033	0.0020
275	0.0052	0.0033	0.0019
276	0.0052	0.0033	0.0019
277	0.0052	0.0032	0.0019
278	0.0051	0.0032	0.0019
279	0.0051	0.0032	0.0019
280	0.0050	0.0032	0.0019
281	0.0050	0.0031	0.0019
282	0.0050	0.0031	0.0018
283	0.0049	0.0031	0.0018
284	0.0049	0.0031	0.0018

285	0.0049	0.0031	0.0018
286	0.0048	0.0030	0.0018
287	0.0048	0.0030	0.0018
288	0.0048	0.0030	0.0018

Total soil rain loss = 1.92(In)
Total effective rainfall = 1.75(In)
Peak flow rate in flood hydrograph = 1046.27(CFS)

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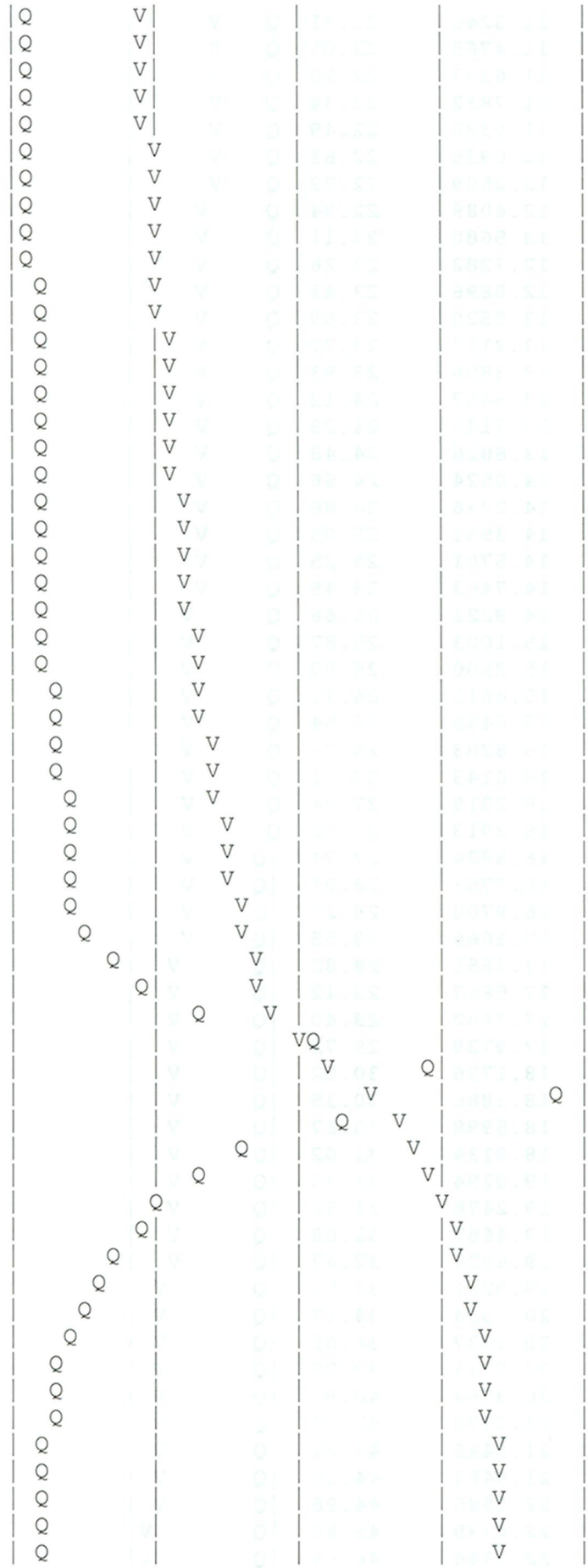
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	275.0	550.0	825.0	1100.0
0+ 5	0.0023	0.33	Q				
0+10	0.0121	1.42	Q				
0+15	0.0378	3.73	Q				
0+20	0.0937	8.11	Q				
0+25	0.1630	10.08	Q				
0+30	0.2406	11.26	Q				
0+35	0.3241	12.13	Q				
0+40	0.4122	12.80	Q				
0+45	0.5040	13.32	Q				
0+50	0.5986	13.74	Q				
0+55	0.6955	14.07	Q				
1+ 0	0.7941	14.32	Q				
1+ 5	0.8941	14.52	Q				
1+10	0.9949	14.64	Q				
1+15	1.0965	14.74	Q				
1+20	1.1987	14.84	Q				
1+25	1.3014	14.92	Q				
1+30	1.4048	15.01	Q				
1+35	1.5087	15.09	Q				
1+40	1.6133	15.18	Q				
1+45	1.7183	15.25	Q				
1+50	1.8237	15.31	Q				
1+55	1.9296	15.37	Q				
2+ 0	2.0359	15.43	Q				
2+ 5	2.1425	15.48	Q				
2+10	2.2496	15.54	Q				
2+15	2.3570	15.60	Q				
2+20	2.4648	15.66	Q				
2+25	2.5731	15.72	QV				
2+30	2.6817	15.78	QV				
2+35	2.7908	15.83	QV				
2+40	2.9002	15.90	QV				
2+45	3.0101	15.95	QV				
2+50	3.1204	16.02	QV				
2+55	3.2312	16.08	QV				
3+ 0	3.3423	16.14	QV				
3+ 5	3.4539	16.20	QV				
3+10	3.5660	16.27	QV				
3+15	3.6785	16.33	QV				

3+20	3.7914	16.40	QV				
3+25	3.9048	16.46	QV				
3+30	4.0187	16.53	QV				
3+35	4.1330	16.60	QV				
3+40	4.2478	16.67	QV				
3+45	4.3630	16.73	QV				
3+50	4.4788	16.81	QV				
3+55	4.5950	16.87	QV				
4+ 0	4.7117	16.95	QV				
4+ 5	4.8289	17.02	QV				
4+10	4.9467	17.09	QV				
4+15	5.0649	17.16	Q V				
4+20	5.1836	17.24	Q V				
4+25	5.3028	17.31	Q V				
4+30	5.4226	17.39	Q V				
4+35	5.5429	17.47	Q V				
4+40	5.6637	17.55	Q V				
4+45	5.7851	17.62	Q V				
4+50	5.9070	17.70	Q V				
4+55	6.0295	17.78	Q V				
5+ 0	6.1525	17.87	Q V				
5+ 5	6.2761	17.95	Q V				
5+10	6.4003	18.03	Q V				
5+15	6.5251	18.11	Q V				
5+20	6.6504	18.20	Q V				
5+25	6.7764	18.29	Q V				
5+30	6.9029	18.38	Q V				
5+35	7.0301	18.46	Q V				
5+40	7.1578	18.55	Q V				
5+45	7.2862	18.64	Q V				
5+50	7.4153	18.74	Q V				
5+55	7.5449	18.83	Q V				
6+ 0	7.6753	18.93	Q V				
6+ 5	7.8063	19.02	Q V				
6+10	7.9379	19.12	Q V				
6+15	8.0703	19.21	Q V				
6+20	8.2033	19.32	Q V				
6+25	8.3370	19.41	Q V				
6+30	8.4714	19.52	Q V				
6+35	8.6065	19.62	Q V				
6+40	8.7424	19.73	Q V				
6+45	8.8790	19.83	Q V				
6+50	9.0163	19.94	Q V				
6+55	9.1544	20.05	Q V				
7+ 0	9.2933	20.16	Q V				
7+ 5	9.4329	20.27	Q V				
7+10	9.5734	20.39	Q V				
7+15	9.7146	20.50	Q V				
7+20	9.8566	20.63	Q V				
7+25	9.9995	20.74	Q V				
7+30	10.1432	20.87	Q V				
7+35	10.2878	20.99	Q V				
7+40	10.4332	21.12	Q V				
7+45	10.5795	21.24	Q V				
7+50	10.7267	21.37	Q V				
7+55	10.8748	21.50	Q V				
8+ 0	11.0238	21.64	Q V				
8+ 5	11.1737	21.77	Q V				

8+10	11.3246	21.91	Q	V	|	|	|
8+15	11.4765	22.05	Q	V	|	|	|
8+20	11.6293	22.20	Q	V	|	|	|
8+25	11.7832	22.34	Q	V	|	|	|
8+30	11.9380	22.49	Q	V	|	|	|
8+35	12.0939	22.63	Q	V	|	|	|
8+40	12.2509	22.79	Q	V	|	|	|
8+45	12.4089	22.94	Q	V	|	|	|
8+50	12.5680	23.11	Q	V	|	|	|
8+55	12.7282	23.26	Q	V	|	|	|
9+ 0	12.8896	23.43	Q	V	|	|	|
9+ 5	13.0520	23.59	Q	V	|	|	|
9+10	13.2157	23.77	Q	V	|	|	|
9+15	13.3806	23.93	Q	V	|	|	|
9+20	13.5467	24.12	Q	V	|	|	|
9+25	13.7140	24.29	Q	V	|	|	|
9+30	13.8826	24.48	Q	V	|	|	|
9+35	14.0524	24.66	Q	V	|	|	|
9+40	14.2236	24.86	Q	V	|	|	|
9+45	14.3961	25.05	Q	V	|	|	|
9+50	14.5701	25.25	Q	V	|	|	|
9+55	14.7453	25.45	Q	V	|	|	|
10+ 0	14.9221	25.66	Q	V	|	|	|
10+ 5	15.1003	25.87	Q	V	|	|	|
10+10	15.2800	26.09	Q	V	|	|	|
10+15	15.4612	26.31	Q	V	|	|	|
10+20	15.6439	26.54	Q	V	|	|	|
10+25	15.8283	26.76	Q	V	|	|	|
10+30	16.0143	27.01	Q	V	|	|	|
10+35	16.2019	27.24	Q	V	|	|	|
10+40	16.3913	27.50	Q	V	|	|	|
10+45	16.5824	27.74	|Q	V	|	|	|
10+50	16.7753	28.01	|Q	V	|	|	|
10+55	16.9700	28.27	|Q	V	|	|	|
11+ 0	17.1666	28.55	|Q	V	|	|	|
11+ 5	17.3651	28.82	|Q	V	|	|	|
11+10	17.5657	29.12	|Q	V	|	|	|
11+15	17.7682	29.40	|Q	V	|	|	|
11+20	17.9729	29.72	|Q	V	|	|	|
11+25	18.1796	30.02	|Q	V	|	|	|
11+30	18.3886	30.35	|Q	V	|	|	|
11+35	18.5998	30.67	|Q	V	|	|	|
11+40	18.8134	31.02	|Q	V	|	|	|
11+45	19.0294	31.35	|Q	V	|	|	|
11+50	19.2478	31.72	|Q	V	|	|	|
11+55	19.4687	32.08	|Q	V	|	|	|
12+ 0	19.6924	32.47	|Q	V	|	|	|
12+ 5	19.9201	33.06	|Q	V	|	|	|
12+10	20.1554	34.17	|Q	V	|	|	|
12+15	20.4037	36.05	|Q	V	|	|	|
12+20	20.6743	39.29	|Q	V	|	|	|
12+25	20.9564	40.97	|Q	V	|	|	|
12+30	21.2470	42.20	|Q	V	|	|	|
12+35	21.5446	43.21	|Q	V	|	|	|
12+40	21.8487	44.15	|Q	V	|	|	|
12+45	22.1585	44.98	|Q	V	|	|	|
12+50	22.4739	45.80	|Q	V	|	|	|
12+55	22.7944	46.54	|Q	V	|	|	|

13+ 0	23.1202	47.30	
13+ 5	23.4507	48.00	
13+10	23.7863	48.72	
13+15	24.1265	49.41	
13+20	24.4721	50.17	
13+25	24.8227	50.90	
13+30	25.1789	51.72	
13+35	25.5406	52.52	
13+40	25.9085	53.41	
13+45	26.2823	54.28	
13+50	26.6628	55.25	
13+55	27.0498	56.19	
14+ 0	27.4441	57.26	
14+ 5	27.8462	58.38	
14+10	28.2580	59.80	
14+15	28.6814	61.47	
14+20	29.1204	63.75	
14+25	29.5715	65.50	
14+30	30.0348	67.27	
14+35	30.5097	68.96	
14+40	30.9977	70.85	
14+45	31.4984	72.71	
14+50	32.0138	74.83	
14+55	32.5442	77.02	
15+ 0	33.0937	79.79	
15+ 5	33.6670	83.24	
15+10	34.2761	88.44	
15+15	34.9306	95.03	
15+20	35.6456	103.82	
15+25	36.4174	112.07	
15+30	37.2430	119.87	
15+35	38.0960	123.86	
15+40	38.9454	123.33	
15+45	39.8803	135.75	
15+50	40.9814	159.87	
15+55	42.3256	195.18	
16+ 0	44.0929	256.61	
16+ 5	46.7012	378.73	
16+10	50.6830	578.15	
16+15	56.2525	808.69	
16+20	63.4582	1046.27	
16+25	67.8598	639.12	
16+30	70.9835	453.55	
16+35	73.4605	359.67	
16+40	75.5384	301.71	
16+45	77.2691	251.29	
16+50	78.7086	209.02	
16+55	79.9054	173.79	
17+ 0	80.9100	145.86	
17+ 5	81.7588	123.26	
17+10	82.4639	102.37	
17+15	83.0940	91.49	
17+20	83.6708	83.75	
17+25	84.2017	77.09	
17+30	84.6996	72.30	
17+35	85.1784	69.51	
17+40	85.6257	64.95	
17+45	86.0418	60.42	

17+50	86.4323	56.70	Q		V	
17+55	86.8020	53.69	Q		V	
18+ 0	87.1524	50.87	Q		V	
18+ 5	87.4897	48.98	Q		V	
18+10	87.8124	46.85	Q		V	
18+15	88.1161	44.10	Q		V	
18+20	88.3927	40.16	Q		V	
18+25	88.6536	37.88	Q		V	
18+30	88.9029	36.20	Q		V	
18+35	89.1425	34.79	Q		V	
18+40	89.3737	33.57	Q		V	
18+45	89.5975	32.49	Q		V	
18+50	89.8147	31.54	Q		V	
18+55	90.0260	30.68	Q		V	
19+ 0	90.2320	29.92	Q		V	
19+ 5	90.4333	29.22	Q		V	
19+10	90.6303	28.61	Q		V	
19+15	90.8234	28.04	Q		V	
19+20	91.0128	27.49	Q		V	
19+25	91.1986	26.98	Q		V	
19+30	91.3811	26.50	Q		V	
19+35	91.5603	26.03	Q		V	
19+40	91.7365	25.58	Q		V	
19+45	91.9098	25.16	Q		V	
19+50	92.0804	24.76	Q		V	
19+55	92.2483	24.38	Q		V	
20+ 0	92.4138	24.02	Q		V	
20+ 5	92.5768	23.67	Q		V	
20+10	92.7376	23.34	Q		V	
20+15	92.8961	23.02	Q		V	
20+20	93.0524	22.70	Q		V	
20+25	93.2067	22.40	Q		V	
20+30	93.3590	22.11	Q		V	
20+35	93.5094	21.83	Q		V	
20+40	93.6578	21.56	Q		V	
20+45	93.8045	21.30	Q		V	
20+50	93.9494	21.04	Q		V	
20+55	94.0926	20.79	Q		V	
21+ 0	94.2342	20.55	Q		V	
21+ 5	94.3741	20.32	Q		V	
21+10	94.5125	20.09	Q		V	
21+15	94.6494	19.87	Q		V	
21+20	94.7848	19.66	Q		V	
21+25	94.9188	19.45	Q		V	
21+30	95.0514	19.25	Q		V	
21+35	95.1826	19.05	Q		V	
21+40	95.3125	18.86	Q		V	
21+45	95.4411	18.68	Q		V	
21+50	95.5685	18.49	Q		V	
21+55	95.6947	18.32	Q		V	
22+ 0	95.8196	18.14	Q		V	
22+ 5	95.9434	17.98	Q		V	
22+10	96.0661	17.81	Q		V	
22+15	96.1876	17.65	Q		V	
22+20	96.3081	17.49	Q		V	
22+25	96.4275	17.34	Q		V	
22+30	96.5459	17.19	Q		V	
22+35	96.6633	17.04	Q		V	

22+40	96.7797	16.90	Q	|	|	|	V|
22+45	96.8951	16.76	Q	|	|	|	V|
22+50	97.0096	16.62	Q	|	|	|	V|
22+55	97.1231	16.49	Q	|	|	|	V|
23+ 0	97.2357	16.35	Q	|	|	|	V|
23+ 5	97.3475	16.23	Q	|	|	|	V|
23+10	97.4584	16.10	Q	|	|	|	V|
23+15	97.5684	15.97	Q	|	|	|	V|
23+20	97.6776	15.85	Q	|	|	|	V|
23+25	97.7859	15.73	Q	|	|	|	V|
23+30	97.8935	15.62	Q	|	|	|	V|
23+35	98.0002	15.50	Q	|	|	|	V|
23+40	98.1062	15.39	Q	|	|	|	V|
23+45	98.2115	15.28	Q	|	|	|	V|
23+50	98.3160	15.17	Q	|	|	|	V|
23+55	98.4197	15.07	Q	|	|	|	V|
24+ 0	98.5227	14.96	Q	|	|	|	V|
24+ 5	98.6228	14.53	Q	|	|	|	V|
24+10	98.7147	13.34	Q	|	|	|	V|
24+15	98.7901	10.95	Q	|	|	|	V|
24+20	98.8350	6.52	Q	|	|	|	V|
24+25	98.8662	4.54	Q	|	|	|	V|
24+30	98.8894	3.36	Q	|	|	|	V|
24+35	98.9066	2.51	Q	|	|	|	V|
24+40	98.9195	1.86	Q	|	|	|	V|
24+45	98.9289	1.37	Q	|	|	|	V|
24+50	98.9357	0.99	Q	|	|	|	V|
24+55	98.9405	0.70	Q	|	|	|	V|
25+ 0	98.9439	0.49	Q	|	|	|	V|
25+ 5	98.9462	0.34	Q	|	|	|	V|
25+10	98.9480	0.26	Q	|	|	|	V|
25+15	98.9495	0.21	Q	|	|	|	V|
25+20	98.9506	0.16	Q	|	|	|	V|
25+25	98.9515	0.13	Q	|	|	|	V|
25+30	98.9521	0.10	Q	|	|	|	V|
25+35	98.9526	0.06	Q	|	|	|	V|
25+40	98.9528	0.03	Q	|	|	|	V|
25+45	98.9529	0.02	Q	|	|	|	V|
25+50	98.9530	0.01	Q	|	|	|	V

U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/26/12 File Name UNIT25Y24HPR1A.out

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Orange County Unit Hydrograph Hydrology Method
Manual Date(s) - October 1986, November 1996

Program License Serial Number 6062

ESPERANZA HILLS OPTION 1
DETENTION BASIN ANALYSIS
PROPOSED CONDITION AREA A
25-YEAR 24-HOUR

Storm Event Year = 25

Antecedent Moisture Condition = 2

English (in-lb) Input Units Used

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	Area (Ac.)	Area Fraction	Soil Group	Fp (In/Hr)	Ap (dec.)	Fm (In/Hr)
56.0	17.0	0.03	B	0.300	0.920	0.276
69.0	404.8	0.60	C	0.250	0.920	0.230
75.0	255.4	0.38	D	0.200	0.920	0.184

Area-averaged adjusted loss rate Fm (In/Hr) = 0.214

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC2)	S	Pervious Yield Fr
15.64	0.023	56.0	56.0	7.86	0.176
1.36	0.002	98.0	98.0	0.20	0.947
372.37	0.550	69.0	69.0	4.49	0.355
32.38	0.048	98.0	98.0	0.20	0.947
235.01	0.347	75.0	75.0	3.33	0.455
20.44	0.030	98.0	98.0	0.20	0.947

Area-averaged catchment yield fraction, Y = 0.433
Area-averaged low loss fraction, Yb = 0.567

++

User entry of time of concentration = 0.350 (hours)
Watershed area = 677.20(Ac.)
Catchment Lag time = 0.280 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 29.7619
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.214(In/Hr)
Average low loss rate fraction (Yb) = 0.567 (decimal)
FOOTHILL S-Graph Selected
Computed peak 5-minute rainfall = 0.400(In)
Computed peak 30-minute rainfall = 0.870(In)
Specified peak 1-hour rainfall = 1.150(In)
Computed peak 3-hour rainfall = 1.940(In)
Specified peak 6-hour rainfall = 2.710(In)
Specified peak 24-hour rainfall = 4.490(In)

Rainfall depth area reduction factors:
Using a total area of 677.20(Ac.) (Ref: fig. E-4)

5-minute factor = 0.968 Adjusted rainfall = 0.387(In)
30-minute factor = 0.968 Adjusted rainfall = 0.842(In)
1-hour factor = 0.968 Adjusted rainfall = 1.113(In)
3-hour factor = 0.996 Adjusted rainfall = 1.932(In)
6-hour factor = 0.998 Adjusted rainfall = 2.704(In)
24-hour factor = 0.999 Adjusted rainfall = 4.486(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
(K = 8189.89 (CFS))		
1	2.128	174.298
2	8.922	556.404
3	22.234	1090.197
4	51.048	2359.915
5	66.754	1286.255
6	75.119	685.054
7	81.149	493.854
8	85.674	370.604
9	89.229	291.139
10	92.005	227.414
11	94.197	179.491
12	95.822	133.066
13	97.052	100.790
14	97.875	67.399
15	98.279	33.025
16	98.613	27.362
17	98.908	24.215
18	99.125	17.745
19	99.312	15.284
20	99.543	18.938
21	99.739	16.060
22	99.859	9.812
23	99.939	6.595

24	100.000	4.972

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.3873	0.3873
2	0.5231	0.1358
3	0.6237	0.1006
4	0.7066	0.0829
5	0.7783	0.0718
6	0.8424	0.0640
7	0.8963	0.0539
8	0.9458	0.0495
9	0.9917	0.0459
10	1.0347	0.0430
11	1.0752	0.0405
12	1.1135	0.0383
13	1.1591	0.0456
14	1.2030	0.0439
15	1.2454	0.0424
16	1.2864	0.0410
17	1.3261	0.0397
18	1.3647	0.0386
19	1.4022	0.0375
20	1.4388	0.0366
21	1.4744	0.0357
22	1.5092	0.0348
23	1.5433	0.0340
24	1.5766	0.0333
25	1.6092	0.0326
26	1.6412	0.0320
27	1.6725	0.0314
28	1.7033	0.0308
29	1.7336	0.0303
30	1.7633	0.0297
31	1.7926	0.0292
32	1.8213	0.0288
33	1.8497	0.0283
34	1.8776	0.0279
35	1.9051	0.0275
36	1.9322	0.0271
37	1.9580	0.0258
38	1.9835	0.0255
39	2.0087	0.0251
40	2.0335	0.0248
41	2.0580	0.0245
42	2.0822	0.0242
43	2.1061	0.0239
44	2.1297	0.0236
45	2.1530	0.0233
46	2.1761	0.0231
47	2.1989	0.0228
48	2.2215	0.0226
49	2.2438	0.0223
50	2.2659	0.0221
51	2.2878	0.0219
52	2.3094	0.0216
53	2.3309	0.0214
54	2.3521	0.0212

55	2.3731	0.0210
56	2.3939	0.0208
57	2.4146	0.0206
58	2.4350	0.0205
59	2.4553	0.0203
60	2.4754	0.0201
61	2.4953	0.0199
62	2.5151	0.0198
63	2.5347	0.0196
64	2.5541	0.0194
65	2.5734	0.0193
66	2.5925	0.0191
67	2.6115	0.0190
68	2.6303	0.0188
69	2.6490	0.0187
70	2.6676	0.0186
71	2.6860	0.0184
72	2.7043	0.0183
73	2.7179	0.0137
74	2.7315	0.0135
75	2.7449	0.0134
76	2.7582	0.0133
77	2.7714	0.0132
78	2.7845	0.0131
79	2.7974	0.0130
80	2.8103	0.0129
81	2.8231	0.0128
82	2.8358	0.0127
83	2.8484	0.0126
84	2.8608	0.0125
85	2.8732	0.0124
86	2.8855	0.0123
87	2.8977	0.0122
88	2.9098	0.0121
89	2.9219	0.0120
90	2.9338	0.0119
91	2.9457	0.0119
92	2.9575	0.0118
93	2.9692	0.0117
94	2.9808	0.0116
95	2.9923	0.0115
96	3.0038	0.0115
97	3.0152	0.0114
98	3.0265	0.0113
99	3.0377	0.0112
100	3.0489	0.0112
101	3.0600	0.0111
102	3.0710	0.0110
103	3.0820	0.0110
104	3.0929	0.0109
105	3.1037	0.0108
106	3.1144	0.0108
107	3.1251	0.0107
108	3.1358	0.0106
109	3.1463	0.0106
110	3.1569	0.0105
111	3.1673	0.0104
112	3.1777	0.0104

113	3.1880	0.0103
114	3.1983	0.0103
115	3.2085	0.0102
116	3.2187	0.0102
117	3.2288	0.0101
118	3.2388	0.0100
119	3.2488	0.0100
120	3.2588	0.0099
121	3.2687	0.0099
122	3.2785	0.0098
123	3.2883	0.0098
124	3.2980	0.0097
125	3.3077	0.0097
126	3.3173	0.0096
127	3.3269	0.0096
128	3.3365	0.0095
129	3.3460	0.0095
130	3.3554	0.0094
131	3.3648	0.0094
132	3.3742	0.0094
133	3.3835	0.0093
134	3.3927	0.0093
135	3.4020	0.0092
136	3.4111	0.0092
137	3.4203	0.0091
138	3.4294	0.0091
139	3.4384	0.0091
140	3.4474	0.0090
141	3.4564	0.0090
142	3.4653	0.0089
143	3.4742	0.0089
144	3.4831	0.0089
145	3.4919	0.0088
146	3.5007	0.0088
147	3.5094	0.0087
148	3.5181	0.0087
149	3.5268	0.0087
150	3.5354	0.0086
151	3.5440	0.0086
152	3.5525	0.0086
153	3.5610	0.0085
154	3.5695	0.0085
155	3.5780	0.0084
156	3.5864	0.0084
157	3.5948	0.0084
158	3.6031	0.0083
159	3.6114	0.0083
160	3.6197	0.0083
161	3.6279	0.0082
162	3.6361	0.0082
163	3.6443	0.0082
164	3.6525	0.0081
165	3.6606	0.0081
166	3.6687	0.0081
167	3.6767	0.0081
168	3.6848	0.0080
169	3.6927	0.0080
170	3.7007	0.0080

171	3.7086	0.0079
172	3.7165	0.0079
173	3.7244	0.0079
174	3.7323	0.0078
175	3.7401	0.0078
176	3.7479	0.0078
177	3.7556	0.0078
178	3.7634	0.0077
179	3.7711	0.0077
180	3.7788	0.0077
181	3.7864	0.0077
182	3.7940	0.0076
183	3.8016	0.0076
184	3.8092	0.0076
185	3.8167	0.0075
186	3.8243	0.0075
187	3.8318	0.0075
188	3.8392	0.0075
189	3.8467	0.0074
190	3.8541	0.0074
191	3.8615	0.0074
192	3.8689	0.0074
193	3.8762	0.0073
194	3.8835	0.0073
195	3.8908	0.0073
196	3.8981	0.0073
197	3.9053	0.0073
198	3.9126	0.0072
199	3.9198	0.0072
200	3.9270	0.0072
201	3.9341	0.0072
202	3.9412	0.0071
203	3.9484	0.0071
204	3.9555	0.0071
205	3.9625	0.0071
206	3.9696	0.0070
207	3.9766	0.0070
208	3.9836	0.0070
209	3.9906	0.0070
210	3.9975	0.0070
211	4.0045	0.0069
212	4.0114	0.0069
213	4.0183	0.0069
214	4.0252	0.0069
215	4.0320	0.0069
216	4.0389	0.0068
217	4.0457	0.0068
218	4.0525	0.0068
219	4.0593	0.0068
220	4.0660	0.0068
221	4.0728	0.0067
222	4.0795	0.0067
223	4.0862	0.0067
224	4.0929	0.0067
225	4.0995	0.0067
226	4.1062	0.0066
227	4.1128	0.0066
228	4.1194	0.0066

229	4.1260	0.0066
230	4.1326	0.0066
231	4.1391	0.0066
232	4.1456	0.0065
233	4.1522	0.0065
234	4.1587	0.0065
235	4.1651	0.0065
236	4.1716	0.0065
237	4.1780	0.0064
238	4.1845	0.0064
239	4.1909	0.0064
240	4.1973	0.0064
241	4.2037	0.0064
242	4.2100	0.0064
243	4.2164	0.0063
244	4.2227	0.0063
245	4.2290	0.0063
246	4.2353	0.0063
247	4.2416	0.0063
248	4.2478	0.0063
249	4.2541	0.0062
250	4.2603	0.0062
251	4.2665	0.0062
252	4.2727	0.0062
253	4.2789	0.0062
254	4.2851	0.0062
255	4.2912	0.0062
256	4.2974	0.0061
257	4.3035	0.0061
258	4.3096	0.0061
259	4.3157	0.0061
260	4.3218	0.0061
261	4.3278	0.0061
262	4.3339	0.0060
263	4.3399	0.0060
264	4.3459	0.0060
265	4.3519	0.0060
266	4.3579	0.0060
267	4.3639	0.0060
268	4.3698	0.0060
269	4.3758	0.0059
270	4.3817	0.0059
271	4.3876	0.0059
272	4.3935	0.0059
273	4.3994	0.0059
274	4.4053	0.0059
275	4.4112	0.0059
276	4.4170	0.0059
277	4.4229	0.0058
278	4.4287	0.0058
279	4.4345	0.0058
280	4.4403	0.0058
281	4.4461	0.0058
282	4.4518	0.0058
283	4.4576	0.0058
284	4.4633	0.0057
285	4.4691	0.0057
286	4.4748	0.0057

287	4.4805	0.0057
288	4.4862	0.0057

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0057	0.0032	0.0025
2	0.0057	0.0032	0.0025
3	0.0057	0.0032	0.0025
4	0.0057	0.0033	0.0025
5	0.0058	0.0033	0.0025
6	0.0058	0.0033	0.0025
7	0.0058	0.0033	0.0025
8	0.0058	0.0033	0.0025
9	0.0059	0.0033	0.0025
10	0.0059	0.0033	0.0025
11	0.0059	0.0033	0.0026
12	0.0059	0.0033	0.0026
13	0.0059	0.0034	0.0026
14	0.0059	0.0034	0.0026
15	0.0060	0.0034	0.0026
16	0.0060	0.0034	0.0026
17	0.0060	0.0034	0.0026
18	0.0060	0.0034	0.0026
19	0.0061	0.0034	0.0026
20	0.0061	0.0034	0.0026
21	0.0061	0.0035	0.0026
22	0.0061	0.0035	0.0027
23	0.0062	0.0035	0.0027
24	0.0062	0.0035	0.0027
25	0.0062	0.0035	0.0027
26	0.0062	0.0035	0.0027
27	0.0062	0.0035	0.0027
28	0.0063	0.0035	0.0027
29	0.0063	0.0036	0.0027
30	0.0063	0.0036	0.0027
31	0.0063	0.0036	0.0027
32	0.0064	0.0036	0.0028
33	0.0064	0.0036	0.0028
34	0.0064	0.0036	0.0028
35	0.0064	0.0037	0.0028
36	0.0065	0.0037	0.0028
37	0.0065	0.0037	0.0028
38	0.0065	0.0037	0.0028
39	0.0066	0.0037	0.0028
40	0.0066	0.0037	0.0028
41	0.0066	0.0037	0.0029
42	0.0066	0.0038	0.0029
43	0.0067	0.0038	0.0029
44	0.0067	0.0038	0.0029
45	0.0067	0.0038	0.0029
46	0.0067	0.0038	0.0029
47	0.0068	0.0038	0.0029
48	0.0068	0.0039	0.0029
49	0.0068	0.0039	0.0030
50	0.0069	0.0039	0.0030
51	0.0069	0.0039	0.0030

52	0.0069	0.0039	0.0030
53	0.0070	0.0039	0.0030
54	0.0070	0.0040	0.0030
55	0.0070	0.0040	0.0030
56	0.0070	0.0040	0.0031
57	0.0071	0.0040	0.0031
58	0.0071	0.0040	0.0031
59	0.0072	0.0041	0.0031
60	0.0072	0.0041	0.0031
61	0.0072	0.0041	0.0031
62	0.0073	0.0041	0.0031
63	0.0073	0.0041	0.0032
64	0.0073	0.0042	0.0032
65	0.0074	0.0042	0.0032
66	0.0074	0.0042	0.0032
67	0.0074	0.0042	0.0032
68	0.0075	0.0042	0.0032
69	0.0075	0.0043	0.0033
70	0.0075	0.0043	0.0033
71	0.0076	0.0043	0.0033
72	0.0076	0.0043	0.0033
73	0.0077	0.0044	0.0033
74	0.0077	0.0044	0.0033
75	0.0078	0.0044	0.0034
76	0.0078	0.0044	0.0034
77	0.0078	0.0044	0.0034
78	0.0079	0.0045	0.0034
79	0.0079	0.0045	0.0034
80	0.0080	0.0045	0.0034
81	0.0080	0.0045	0.0035
82	0.0081	0.0046	0.0035
83	0.0081	0.0046	0.0035
84	0.0081	0.0046	0.0035
85	0.0082	0.0047	0.0036
86	0.0082	0.0047	0.0036
87	0.0083	0.0047	0.0036
88	0.0083	0.0047	0.0036
89	0.0084	0.0048	0.0036
90	0.0084	0.0048	0.0037
91	0.0085	0.0048	0.0037
92	0.0086	0.0048	0.0037
93	0.0086	0.0049	0.0037
94	0.0087	0.0049	0.0038
95	0.0087	0.0050	0.0038
96	0.0088	0.0050	0.0038
97	0.0089	0.0050	0.0038
98	0.0089	0.0050	0.0039
99	0.0090	0.0051	0.0039
100	0.0090	0.0051	0.0039
101	0.0091	0.0052	0.0039
102	0.0091	0.0052	0.0040
103	0.0092	0.0052	0.0040
104	0.0093	0.0053	0.0040
105	0.0094	0.0053	0.0041
106	0.0094	0.0053	0.0041
107	0.0095	0.0054	0.0041
108	0.0095	0.0054	0.0041
109	0.0096	0.0055	0.0042

110	0.0097	0.0055	0.0042
111	0.0098	0.0055	0.0042
112	0.0098	0.0056	0.0043
113	0.0099	0.0056	0.0043
114	0.0100	0.0057	0.0043
115	0.0101	0.0057	0.0044
116	0.0102	0.0058	0.0044
117	0.0103	0.0058	0.0044
118	0.0103	0.0059	0.0045
119	0.0104	0.0059	0.0045
120	0.0105	0.0060	0.0046
121	0.0106	0.0060	0.0046
122	0.0107	0.0061	0.0046
123	0.0108	0.0061	0.0047
124	0.0109	0.0062	0.0047
125	0.0110	0.0063	0.0048
126	0.0111	0.0063	0.0048
127	0.0112	0.0064	0.0049
128	0.0113	0.0064	0.0049
129	0.0115	0.0065	0.0050
130	0.0115	0.0065	0.0050
131	0.0117	0.0066	0.0051
132	0.0118	0.0067	0.0051
133	0.0119	0.0068	0.0052
134	0.0120	0.0068	0.0052
135	0.0122	0.0069	0.0053
136	0.0123	0.0070	0.0053
137	0.0125	0.0071	0.0054
138	0.0126	0.0071	0.0054
139	0.0128	0.0072	0.0055
140	0.0129	0.0073	0.0056
141	0.0131	0.0074	0.0057
142	0.0132	0.0075	0.0057
143	0.0134	0.0076	0.0058
144	0.0135	0.0077	0.0059
145	0.0183	0.0104	0.0079
146	0.0184	0.0104	0.0080
147	0.0187	0.0106	0.0081
148	0.0188	0.0107	0.0082
149	0.0191	0.0108	0.0083
150	0.0193	0.0109	0.0083
151	0.0196	0.0111	0.0085
152	0.0198	0.0112	0.0086
153	0.0201	0.0114	0.0087
154	0.0203	0.0115	0.0088
155	0.0206	0.0117	0.0089
156	0.0208	0.0118	0.0090
157	0.0212	0.0120	0.0092
158	0.0214	0.0122	0.0093
159	0.0219	0.0124	0.0095
160	0.0221	0.0125	0.0096
161	0.0226	0.0128	0.0098
162	0.0228	0.0129	0.0099
163	0.0233	0.0132	0.0101
164	0.0236	0.0134	0.0102
165	0.0242	0.0137	0.0105
166	0.0245	0.0139	0.0106
167	0.0251	0.0143	0.0109

168	0.0255	0.0144	0.0110
169	0.0271	0.0154	0.0117
170	0.0275	0.0156	0.0119
171	0.0283	0.0161	0.0123
172	0.0288	0.0163	0.0125
173	0.0297	0.0169	0.0129
174	0.0303	0.0171	0.0131
175	0.0314	0.0178	0.0136
176	0.0320	0.0178	0.0142
177	0.0333	0.0178	0.0155
178	0.0340	0.0178	0.0162
179	0.0357	0.0178	0.0178
180	0.0366	0.0178	0.0187
181	0.0386	0.0178	0.0208
182	0.0397	0.0178	0.0219
183	0.0424	0.0178	0.0246
184	0.0439	0.0178	0.0261
185	0.0383	0.0178	0.0205
186	0.0405	0.0178	0.0227
187	0.0459	0.0178	0.0281
188	0.0495	0.0178	0.0317
189	0.0640	0.0178	0.0462
190	0.0718	0.0178	0.0540
191	0.1006	0.0178	0.0827
192	0.1358	0.0178	0.1180
193	0.3873	0.0178	0.3695
194	0.0829	0.0178	0.0651
195	0.0539	0.0178	0.0361
196	0.0430	0.0178	0.0251
197	0.0456	0.0178	0.0278
198	0.0410	0.0178	0.0232
199	0.0375	0.0178	0.0197
200	0.0348	0.0178	0.0170
201	0.0326	0.0178	0.0148
202	0.0308	0.0175	0.0133
203	0.0292	0.0166	0.0127
204	0.0279	0.0158	0.0121
205	0.0258	0.0147	0.0112
206	0.0248	0.0141	0.0107
207	0.0239	0.0135	0.0104
208	0.0231	0.0131	0.0100
209	0.0223	0.0127	0.0097
210	0.0216	0.0123	0.0094
211	0.0210	0.0119	0.0091
212	0.0205	0.0116	0.0089
213	0.0199	0.0113	0.0086
214	0.0194	0.0110	0.0084
215	0.0190	0.0108	0.0082
216	0.0186	0.0105	0.0080
217	0.0137	0.0077	0.0059
218	0.0133	0.0075	0.0058
219	0.0130	0.0074	0.0056
220	0.0127	0.0072	0.0055
221	0.0124	0.0070	0.0054
222	0.0121	0.0069	0.0052
223	0.0119	0.0067	0.0051
224	0.0116	0.0066	0.0050
225	0.0114	0.0065	0.0049

226	0.0112	0.0063	0.0048
227	0.0110	0.0062	0.0047
228	0.0108	0.0061	0.0047
229	0.0106	0.0060	0.0046
230	0.0104	0.0059	0.0045
231	0.0102	0.0058	0.0044
232	0.0100	0.0057	0.0044
233	0.0099	0.0056	0.0043
234	0.0097	0.0055	0.0042
235	0.0096	0.0054	0.0042
236	0.0094	0.0054	0.0041
237	0.0093	0.0053	0.0040
238	0.0092	0.0052	0.0040
239	0.0091	0.0051	0.0039
240	0.0089	0.0051	0.0039
241	0.0088	0.0050	0.0038
242	0.0087	0.0049	0.0038
243	0.0086	0.0049	0.0037
244	0.0085	0.0048	0.0037
245	0.0084	0.0047	0.0036
246	0.0083	0.0047	0.0036
247	0.0082	0.0046	0.0035
248	0.0081	0.0046	0.0035
249	0.0080	0.0045	0.0035
250	0.0079	0.0045	0.0034
251	0.0078	0.0044	0.0034
252	0.0077	0.0044	0.0033
253	0.0077	0.0043	0.0033
254	0.0076	0.0043	0.0033
255	0.0075	0.0042	0.0032
256	0.0074	0.0042	0.0032
257	0.0073	0.0042	0.0032
258	0.0073	0.0041	0.0032
259	0.0072	0.0041	0.0031
260	0.0071	0.0040	0.0031
261	0.0071	0.0040	0.0031
262	0.0070	0.0040	0.0030
263	0.0069	0.0039	0.0030
264	0.0069	0.0039	0.0030
265	0.0068	0.0039	0.0030
266	0.0068	0.0038	0.0029
267	0.0067	0.0038	0.0029
268	0.0066	0.0038	0.0029
269	0.0066	0.0037	0.0029
270	0.0065	0.0037	0.0028
271	0.0065	0.0037	0.0028
272	0.0064	0.0036	0.0028
273	0.0064	0.0036	0.0028
274	0.0063	0.0036	0.0027
275	0.0063	0.0036	0.0027
276	0.0062	0.0035	0.0027
277	0.0062	0.0035	0.0027
278	0.0061	0.0035	0.0027
279	0.0061	0.0035	0.0026
280	0.0060	0.0034	0.0026
281	0.0060	0.0034	0.0026
282	0.0060	0.0034	0.0026
283	0.0059	0.0034	0.0026

284	0.0059	0.0033	0.0025
285	0.0058	0.0033	0.0025
286	0.0058	0.0033	0.0025
287	0.0058	0.0033	0.0025
288	0.0057	0.0032	0.0025

Total soil rain loss = 2.08(In)
Total effective rainfall = 2.41(In)
Peak flow rate in flood hydrograph = 1249.41(CFS)

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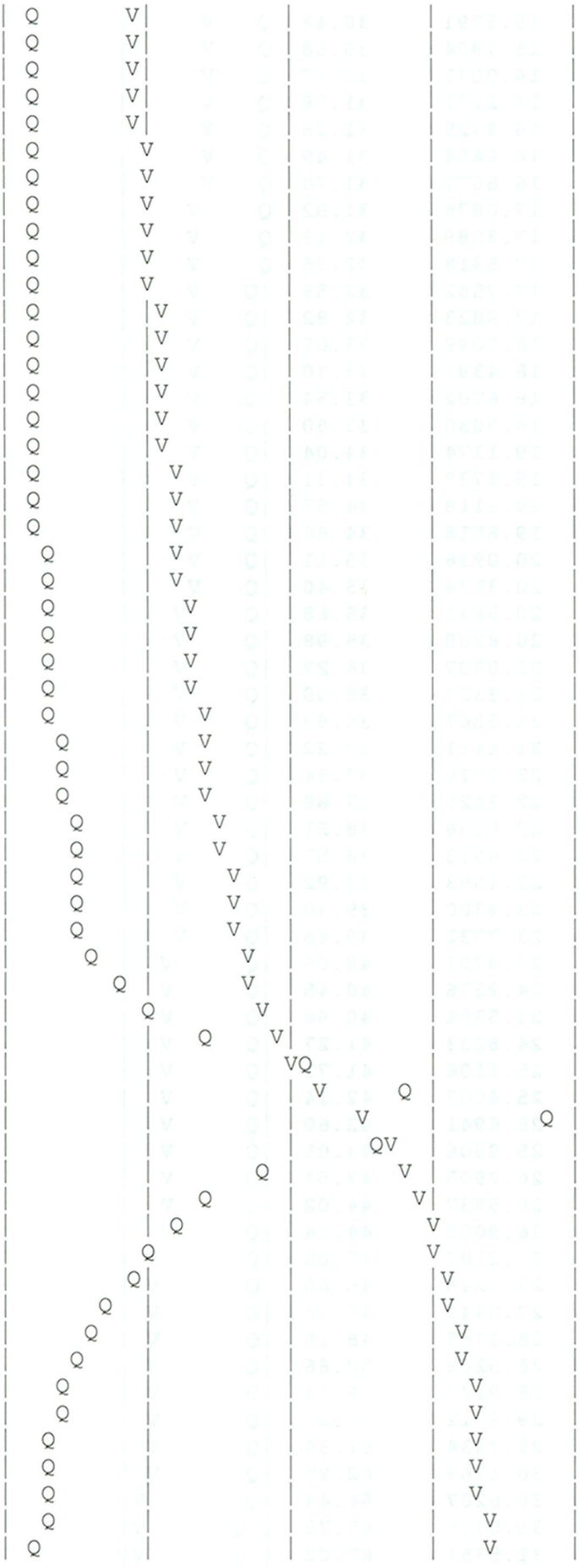
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	325.0	650.0	975.0	1300.0
0+ 5	0.0030	0.43	Q				
0+10	0.0154	1.80	Q				
0+15	0.0463	4.50	Q				
0+20	0.1175	10.33	Q				
0+25	0.2107	13.53	Q				
0+30	0.3158	15.27	Q				
0+35	0.4297	16.53	Q				
0+40	0.5503	17.51	Q				
0+45	0.6762	18.28	Q				
0+50	0.8064	18.90	Q				
0+55	0.9400	19.41	Q				
1+ 0	1.0764	19.81	Q				
1+ 5	1.2150	20.12	Q				
1+10	1.3552	20.36	Q				
1+15	1.4965	20.51	Q				
1+20	1.6387	20.65	Q				
1+25	1.7818	20.78	Q				
1+30	1.9258	20.90	Q				
1+35	2.0705	21.01	Q				
1+40	2.2160	21.13	Q				
1+45	2.3623	21.25	Q				
1+50	2.5094	21.35	Q				
1+55	2.6571	21.44	Q				
2+ 0	2.8054	21.54	Q				
2+ 5	2.9542	21.61	Q				
2+10	3.1037	21.70	Q				
2+15	3.2536	21.77	Q				
2+20	3.4042	21.86	QV				
2+25	3.5552	21.94	QV				
2+30	3.7069	22.02	QV				
2+35	3.8592	22.11	QV				
2+40	4.0120	22.19	QV				
2+45	4.1654	22.28	QV				
2+50	4.3194	22.36	QV				
2+55	4.4741	22.45	QV				
3+ 0	4.6293	22.54	QV				
3+ 5	4.7851	22.63	QV				
3+10	4.9416	22.72	QV				

3+15	5.0987	22.81	QV				
3+20	5.2564	22.90	QV				
3+25	5.4148	22.99	QV				
3+30	5.5738	23.09	QV				
3+35	5.7335	23.18	QV				
3+40	5.8938	23.28	QV				
3+45	6.0548	23.37	QV				
3+50	6.2165	23.48	QV				
3+55	6.3788	23.57	QV				
4+ 0	6.5419	23.68	QV				
4+ 5	6.7056	23.77	QV				
4+10	6.8700	23.88	Q V				
4+15	7.0352	23.98	Q V				
4+20	7.2011	24.09	Q V				
4+25	7.3677	24.19	Q V				
4+30	7.5350	24.30	Q V				
4+35	7.7031	24.41	Q V				
4+40	7.8720	24.52	Q V				
4+45	8.0416	24.63	Q V				
4+50	8.2120	24.74	Q V				
4+55	8.3831	24.85	Q V				
5+ 0	8.5551	24.97	Q V				
5+ 5	8.7278	25.08	Q V				
5+10	8.9014	25.20	Q V				
5+15	9.0758	25.32	Q V				
5+20	9.2510	25.44	Q V				
5+25	9.4271	25.56	Q V				
5+30	9.6040	25.69	Q V				
5+35	9.7818	25.81	Q V				
5+40	9.9604	25.94	Q V				
5+45	10.1399	26.07	Q V				
5+50	10.3204	26.20	Q V				
5+55	10.5017	26.33	Q V				
6+ 0	10.6839	26.46	Q V				
6+ 5	10.8671	26.60	Q V				
6+10	11.0512	26.74	Q V				
6+15	11.2363	26.87	Q V				
6+20	11.4224	27.02	Q V				
6+25	11.6094	27.15	Q V				
6+30	11.7974	27.30	Q V				
6+35	11.9864	27.44	Q V				
6+40	12.1765	27.60	Q V				
6+45	12.3676	27.74	Q V				
6+50	12.5597	27.90	Q V				
6+55	12.7529	28.05	Q V				
7+ 0	12.9472	28.21	Q V				
7+ 5	13.1426	28.37	Q V				
7+10	13.3391	28.53	Q V				
7+15	13.5367	28.69	Q V				
7+20	13.7355	28.87	Q V				
7+25	13.9354	29.03	Q V				
7+30	14.1366	29.21	Q V				
7+35	14.3389	29.38	Q V				
7+40	14.5424	29.56	Q V				
7+45	14.7472	29.73	Q V				
7+50	14.9533	29.92	Q V				
7+55	15.1606	30.10	Q V				
8+ 0	15.3692	30.29	Q V				

8+ 5	15.5791	30.48	Q V
8+10	15.7904	30.68	Q V
8+15	16.0031	30.87	Q V
8+20	16.2171	31.08	Q V
8+25	16.4325	31.28	Q V
8+30	16.6494	31.49	Q V
8+35	16.8677	31.70	Q V
8+40	17.0876	31.92	Q V
8+45	17.3089	32.13	Q V
8+50	17.5318	32.36	Q V
8+55	17.7562	32.59	|Q V
9+ 0	17.9823	32.82	|Q V
9+ 5	18.2099	33.05	|Q V
9+10	18.4393	33.30	|Q V
9+15	18.6702	33.54	|Q V
9+20	18.9030	33.80	|Q V
9+25	19.1374	34.04	|Q V
9+30	19.3737	34.31	|Q V
9+35	19.6118	34.57	|Q V
9+40	19.8518	34.84	|Q V
9+45	20.0936	35.11	|Q V
9+50	20.3374	35.40	|Q V
9+55	20.5831	35.68	|Q V
10+ 0	20.8309	35.98	|Q V
10+ 5	21.0807	36.27	|Q V
10+10	21.3327	36.59	|Q V
10+15	21.5867	36.89	|Q V
10+20	21.8431	37.22	|Q V
10+25	22.1016	37.54	|Q V
10+30	22.3625	37.88	|Q V
10+35	22.6256	38.21	|Q V
10+40	22.8913	38.57	|Q V
10+45	23.1593	38.92	|Q V
10+50	23.4300	39.30	|Q V
10+55	23.7032	39.66	|Q V
11+ 0	23.9791	40.06	|Q V
11+ 5	24.2576	40.45	|Q V
11+10	24.5391	40.86	|Q V
11+15	24.8233	41.27	|Q V
11+20	25.1106	41.71	|Q V
11+25	25.4007	42.14	|Q V
11+30	25.6941	42.60	|Q V
11+35	25.9906	43.05	|Q V
11+40	26.2905	43.54	|Q V
11+45	26.5937	44.02	|Q V
11+50	26.9005	44.54	|Q V
11+55	27.2107	45.05	|Q V
12+ 0	27.5248	45.60	|Q V
12+ 5	27.8449	46.48	|Q V
12+10	28.1765	48.16	|Q V
12+15	28.5268	50.86	|Q V
12+20	28.9132	56.11	|Q V
12+25	29.3212	59.25	|Q V
12+30	29.7434	61.30	|Q V
12+35	30.1769	62.95	|Q V
12+40	30.6207	64.44	|Q V|
12+45	31.0735	65.75	| Q V|
12+50	31.5351	67.02	| Q V|

12+55	32.0046	68.17	
13+ 0	32.4820	69.32	
13+ 5	32.9667	70.38	
13+10	33.4589	71.47	
13+15	33.9580	72.47	
13+20	34.4646	73.56	
13+25	34.9785	74.62	
13+30	35.5005	75.79	
13+35	36.0303	76.93	
13+40	36.5688	78.20	
13+45	37.1160	79.44	
13+50	37.6726	80.82	
13+55	38.2384	82.17	
14+ 0	38.8148	83.68	
14+ 5	39.4017	85.23	
14+10	40.0017	87.12	
14+15	40.6161	89.20	
14+20	41.2496	92.00	
14+25	41.8995	94.37	
14+30	42.5659	96.76	
14+35	43.2484	99.09	
14+40	43.9490	101.73	
14+45	44.6694	104.61	
14+50	45.4158	108.37	
14+55	46.1958	113.26	
15+ 0	47.0216	119.91	
15+ 5	47.8965	127.03	
15+10	48.8318	135.80	
15+15	49.8309	145.07	
15+20	50.9082	156.42	
15+25	52.0578	166.93	
15+30	53.2754	176.80	
15+35	54.5363	183.07	
15+40	55.7903	182.09	
15+45	57.1308	194.63	
15+50	58.6660	222.92	
15+55	60.4887	264.66	
16+ 0	62.8216	338.73	
16+ 5	66.1015	476.24	
16+10	70.8779	693.54	
16+15	77.2766	929.10	
16+20	85.8814	1249.41	
16+25	91.8359	864.60	
16+30	95.9739	600.83	
16+35	99.2804	480.11	
16+40	102.0959	408.81	
16+45	104.5090	350.38	
16+50	106.5635	298.32	
16+55	108.3168	254.58	
17+ 0	109.8013	215.54	
17+ 5	111.0735	184.72	
17+10	112.1629	158.18	
17+15	113.0965	135.56	
17+20	113.9472	123.52	
17+25	114.7373	114.72	
17+30	115.4716	106.62	
17+35	116.1647	100.64	
17+40	116.8322	96.92	

17+45	117.4635	91.66	Q			V	
17+50	118.0546	85.83	Q			V	
17+55	118.6144	81.28	Q			V	
18+ 0	119.1490	77.63	Q			V	
18+ 5	119.6533	73.22	Q			V	
18+10	120.1343	69.83	Q			V	
18+15	120.5870	65.74	Q			V	
18+20	120.9960	59.39	Q			V	
18+25	121.3768	55.29	Q			V	
18+30	121.7385	52.51	Q			V	
18+35	122.0845	50.24	Q			V	
18+40	122.4171	48.30	Q			V	
18+45	122.7381	46.61	Q			V	
18+50	123.0489	45.12	Q			V	
18+55	123.3505	43.79	Q			V	
19+ 0	123.6439	42.61	Q			V	
19+ 5	123.9300	41.54	Q			V	
19+10	124.2095	40.58	Q			V	
19+15	124.4832	39.74	Q			V	
19+20	124.7514	38.94	Q			V	
19+25	125.0144	38.19	Q			V	
19+30	125.2725	37.48	Q			V	
19+35	125.5260	36.81	Q			V	
19+40	125.7750	36.15	Q			V	
19+45	126.0197	35.53	Q			V	
19+50	126.2604	34.95	Q			V	
19+55	126.4973	34.40	Q			V	
20+ 0	126.7305	33.87	Q			V	
20+ 5	126.9603	33.37	Q			V	
20+10	127.1868	32.89	Q			V	
20+15	127.4101	32.42	Q			V	
20+20	127.6303	31.97	Q			V	
20+25	127.8475	31.54	Q			V	
20+30	128.0619	31.13	Q			V	
20+35	128.2735	30.72	Q			V	
20+40	128.4824	30.33	Q			V	
20+45	128.6887	29.96	Q			V	
20+50	128.8925	29.59	Q			V	
20+55	129.0939	29.24	Q			V	
21+ 0	129.2929	28.90	Q			V	
21+ 5	129.4896	28.56	Q			V	
21+10	129.6841	28.24	Q			V	
21+15	129.8765	27.93	Q			V	
21+20	130.0667	27.62	Q			V	
21+25	130.2549	27.33	Q			V	
21+30	130.4411	27.04	Q			V	
21+35	130.6254	26.76	Q			V	
21+40	130.8078	26.48	Q			V	
21+45	130.9883	26.22	Q			V	
21+50	131.1671	25.96	Q			V	
21+55	131.3441	25.71	Q			V	
22+ 0	131.5195	25.46	Q			V	
22+ 5	131.6932	25.22	Q			V	
22+10	131.8652	24.98	Q			V	
22+15	132.0357	24.75	Q			V	
22+20	132.2047	24.53	Q			V	
22+25	132.3721	24.31	Q			V	
22+30	132.5381	24.10	Q			V	

22+35	132.7026	23.89	Q				V
22+40	132.8657	23.69	Q				V
22+45	133.0275	23.49	Q				V
22+50	133.1879	23.29	Q				V
22+55	133.3470	23.10	Q				V
23+ 0	133.5048	22.91	Q				V
23+ 5	133.6613	22.73	Q				V
23+10	133.8166	22.55	Q				V
23+15	133.9706	22.37	Q				V
23+20	134.1235	22.20	Q				V
23+25	134.2753	22.03	Q				V
23+30	134.4258	21.86	Q				V
23+35	134.5753	21.70	Q				V
23+40	134.7237	21.54	Q				V
23+45	134.8709	21.39	Q				V
23+50	135.0172	21.23	Q				V
23+55	135.1623	21.08	Q				V
24+ 0	135.3065	20.93	Q				V
24+ 5	135.4467	20.36	Q				V
24+10	135.5765	18.85	Q				V
24+15	135.6870	16.04	Q				V
24+20	135.7567	10.12	Q				V
24+25	135.8041	6.89	Q				V
24+30	135.8396	5.15	Q				V
24+35	135.8665	3.90	Q				V
24+40	135.8869	2.96	Q				V
24+45	135.9022	2.23	Q				V
24+50	135.9136	1.65	Q				V
24+55	135.9219	1.20	Q				V
25+ 0	135.9278	0.86	Q				V
25+ 5	135.9320	0.61	Q				V
25+10	135.9351	0.44	Q				V
25+15	135.9375	0.36	Q				V
25+20	135.9395	0.29	Q				V
25+25	135.9410	0.22	Q				V
25+30	135.9423	0.18	Q				V
25+35	135.9433	0.14	Q				V
25+40	135.9439	0.09	Q				V
25+45	135.9443	0.05	Q				V
25+50	135.9445	0.03	Q				V
25+55	135.9446	0.01	Q				V

U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/26/12 File Name UNIT100Y24HPR1A.out

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Orange County Unit Hydrograph Hydrology Method
Manual Date(s) - October 1986, November 1996

Program License Serial Number 6062

ESPERANZA HILLS OPTION 1
DETENTION BASIN ANALYSIS
PROPOSED CONDITION AREA A
100-YEAR 24-HOUR

Storm Event Year = 100

Antecedent Moisture Condition = 3

English (in-lb) Input Units Used

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	Area (Ac.)	Area Fraction	Soil Group	Fp (In/Hr)	Ap (dec.)	Fm (In/Hr)
56.0	17.0	0.03	B	0.300	0.920	0.276
69.0	404.8	0.60	C	0.250	0.920	0.230
75.0	255.4	0.38	D	0.200	0.920	0.184

Area-averaged adjusted loss rate Fm (In/Hr) = 0.214

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC3)	S	Pervious Yield Fr
15.64	0.023	56.0	75.8	3.19	0.541
1.36	0.002	98.0	98.0	0.20	0.958
372.37	0.550	69.0	86.2	1.60	0.725
32.38	0.048	98.0	98.0	0.20	0.958
235.01	0.347	75.0	91.0	0.99	0.816
20.44	0.030	98.0	98.0	0.20	0.958

Area-averaged catchment yield fraction, Y = 0.771
Area-averaged low loss fraction, Yb = 0.229

++

User entry of time of concentration = 0.340 (hours)
Watershed area = 677.20(Ac.)
Catchment Lag time = 0.272 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 30.6373
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.214(In/Hr)
Average low loss rate fraction (Yb) = 0.229 (decimal)
FOOTHILL S-Graph Selected
Computed peak 5-minute rainfall = 0.520(In)
Computed peak 30-minute rainfall = 1.090(In)
Specified peak 1-hour rainfall = 1.450(In)
Computed peak 3-hour rainfall = 2.430(In)
Specified peak 6-hour rainfall = 3.360(In)
Specified peak 24-hour rainfall = 5.630(In)

Rainfall depth area reduction factors:
Using a total area of 677.20(Ac.) (Ref: fig. E-4)

5-minute factor = 0.968 Adjusted rainfall = 0.503(In)
30-minute factor = 0.968 Adjusted rainfall = 1.055(In)
1-hour factor = 0.968 Adjusted rainfall = 1.404(In)
3-hour factor = 0.996 Adjusted rainfall = 2.420(In)
6-hour factor = 0.998 Adjusted rainfall = 3.353(In)
24-hour factor = 0.999 Adjusted rainfall = 5.625(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
(K = 8189.89 (CFS))		
1	2.209	180.887
2	9.338	583.891
3	23.817	1185.837
4	53.629	2441.555
5	68.080	1183.500
6	76.201	665.114
7	82.106	483.577
8	86.530	362.351
9	89.990	283.405
10	92.674	219.756
11	94.751	170.093
12	96.271	124.530
13	97.412	93.475
14	98.062	53.236
15	98.428	29.929
16	98.749	26.279
17	99.027	22.771
18	99.217	15.575
19	99.434	17.799
20	99.669	19.205
21	99.812	11.748
22	99.916	8.494
23	100.000	6.882

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.5035	0.5035
2	0.6704	0.1669
3	0.7926	0.1222
4	0.8926	0.1000
5	0.9788	0.0862
6	1.0554	0.0766
7	1.1246	0.0692
8	1.1881	0.0636
9	1.2471	0.0590
10	1.3024	0.0553
11	1.3546	0.0521
12	1.4040	0.0494
13	1.4608	0.0568
14	1.5155	0.0547
15	1.5682	0.0527
16	1.6192	0.0510
17	1.6685	0.0494
18	1.7165	0.0479
19	1.7631	0.0466
20	1.8085	0.0454
21	1.8528	0.0443
22	1.8960	0.0432
23	1.9383	0.0422
24	1.9796	0.0413
25	2.0200	0.0405
26	2.0597	0.0397
27	2.0986	0.0389
28	2.1368	0.0382
29	2.1743	0.0375
30	2.2111	0.0368
31	2.2473	0.0362
32	2.2830	0.0356
33	2.3181	0.0351
34	2.3526	0.0346
35	2.3867	0.0340
36	2.4202	0.0336
37	2.4516	0.0314
38	2.4826	0.0309
39	2.5131	0.0305
40	2.5432	0.0301
41	2.5729	0.0297
42	2.6022	0.0293
43	2.6311	0.0290
44	2.6597	0.0286
45	2.6880	0.0283
46	2.7159	0.0279
47	2.7435	0.0276
48	2.7708	0.0273
49	2.7978	0.0270
50	2.8245	0.0267
51	2.8510	0.0264
52	2.8771	0.0262
53	2.9030	0.0259
54	2.9286	0.0256
55	2.9540	0.0254

56	2.9792	0.0251
57	3.0041	0.0249
58	3.0287	0.0247
59	3.0532	0.0244
60	3.0774	0.0242
61	3.1014	0.0240
62	3.1252	0.0238
63	3.1488	0.0236
64	3.1722	0.0234
65	3.1954	0.0232
66	3.2185	0.0230
67	3.2413	0.0228
68	3.2640	0.0227
69	3.2865	0.0225
70	3.3088	0.0223
71	3.3309	0.0221
72	3.3529	0.0220
73	3.3702	0.0173
74	3.3874	0.0172
75	3.4044	0.0170
76	3.4212	0.0169
77	3.4380	0.0167
78	3.4546	0.0166
79	3.4710	0.0165
80	3.4874	0.0163
81	3.5036	0.0162
82	3.5197	0.0161
83	3.5356	0.0160
84	3.5515	0.0158
85	3.5672	0.0157
86	3.5828	0.0156
87	3.5983	0.0155
88	3.6137	0.0154
89	3.6289	0.0153
90	3.6441	0.0152
91	3.6592	0.0151
92	3.6741	0.0150
93	3.6890	0.0149
94	3.7037	0.0148
95	3.7184	0.0147
96	3.7330	0.0146
97	3.7474	0.0145
98	3.7618	0.0144
99	3.7761	0.0143
100	3.7903	0.0142
101	3.8044	0.0141
102	3.8184	0.0140
103	3.8323	0.0139
104	3.8462	0.0138
105	3.8599	0.0138
106	3.8736	0.0137
107	3.8872	0.0136
108	3.9007	0.0135
109	3.9142	0.0134
110	3.9275	0.0134
111	3.9408	0.0133
112	3.9540	0.0132
113	3.9672	0.0131

114	3.9803	0.0131
115	3.9932	0.0130
116	4.0062	0.0129
117	4.0190	0.0129
118	4.0318	0.0128
119	4.0445	0.0127
120	4.0572	0.0127
121	4.0698	0.0126
122	4.0823	0.0125
123	4.0948	0.0125
124	4.1071	0.0124
125	4.1195	0.0123
126	4.1318	0.0123
127	4.1440	0.0122
128	4.1561	0.0121
129	4.1682	0.0121
130	4.1802	0.0120
131	4.1922	0.0120
132	4.2041	0.0119
133	4.2160	0.0119
134	4.2278	0.0118
135	4.2395	0.0117
136	4.2512	0.0117
137	4.2629	0.0116
138	4.2745	0.0116
139	4.2860	0.0115
140	4.2975	0.0115
141	4.3089	0.0114
142	4.3203	0.0114
143	4.3316	0.0113
144	4.3429	0.0113
145	4.3541	0.0112
146	4.3653	0.0112
147	4.3765	0.0111
148	4.3875	0.0111
149	4.3986	0.0110
150	4.4096	0.0110
151	4.4205	0.0109
152	4.4314	0.0109
153	4.4423	0.0109
154	4.4531	0.0108
155	4.4639	0.0108
156	4.4746	0.0107
157	4.4853	0.0107
158	4.4959	0.0106
159	4.5065	0.0106
160	4.5171	0.0106
161	4.5276	0.0105
162	4.5381	0.0105
163	4.5485	0.0104
164	4.5589	0.0104
165	4.5693	0.0104
166	4.5796	0.0103
167	4.5899	0.0103
168	4.6001	0.0102
169	4.6103	0.0102
170	4.6205	0.0102
171	4.6306	0.0101

172	4.6407	0.0101
173	4.6507	0.0101
174	4.6608	0.0100
175	4.6707	0.0100
176	4.6807	0.0099
177	4.6906	0.0099
178	4.7005	0.0099
179	4.7103	0.0098
180	4.7201	0.0098
181	4.7299	0.0098
182	4.7396	0.0097
183	4.7493	0.0097
184	4.7590	0.0097
185	4.7686	0.0096
186	4.7782	0.0096
187	4.7878	0.0096
188	4.7973	0.0095
189	4.8069	0.0095
190	4.8163	0.0095
191	4.8258	0.0094
192	4.8352	0.0094
193	4.8446	0.0094
194	4.8539	0.0094
195	4.8633	0.0093
196	4.8725	0.0093
197	4.8818	0.0093
198	4.8910	0.0092
199	4.9003	0.0092
200	4.9094	0.0092
201	4.9186	0.0091
202	4.9277	0.0091
203	4.9368	0.0091
204	4.9459	0.0091
205	4.9549	0.0090
206	4.9639	0.0090
207	4.9729	0.0090
208	4.9818	0.0090
209	4.9908	0.0089
210	4.9997	0.0089
211	5.0085	0.0089
212	5.0174	0.0088
213	5.0262	0.0088
214	5.0350	0.0088
215	5.0438	0.0088
216	5.0525	0.0087
217	5.0612	0.0087
218	5.0699	0.0087
219	5.0786	0.0087
220	5.0872	0.0086
221	5.0958	0.0086
222	5.1044	0.0086
223	5.1130	0.0086
224	5.1216	0.0085
225	5.1301	0.0085
226	5.1386	0.0085
227	5.1471	0.0085
228	5.1555	0.0085
229	5.1639	0.0084

230	5.1723	0.0084
231	5.1807	0.0084
232	5.1891	0.0084
233	5.1974	0.0083
234	5.2057	0.0083
235	5.2140	0.0083
236	5.2223	0.0083
237	5.2305	0.0082
238	5.2388	0.0082
239	5.2470	0.0082
240	5.2552	0.0082
241	5.2633	0.0082
242	5.2715	0.0081
243	5.2796	0.0081
244	5.2877	0.0081
245	5.2958	0.0081
246	5.3038	0.0081
247	5.3119	0.0080
248	5.3199	0.0080
249	5.3279	0.0080
250	5.3358	0.0080
251	5.3438	0.0080
252	5.3517	0.0079
253	5.3597	0.0079
254	5.3676	0.0079
255	5.3754	0.0079
256	5.3833	0.0079
257	5.3911	0.0078
258	5.3989	0.0078
259	5.4068	0.0078
260	5.4145	0.0078
261	5.4223	0.0078
262	5.4300	0.0077
263	5.4378	0.0077
264	5.4455	0.0077
265	5.4532	0.0077
266	5.4608	0.0077
267	5.4685	0.0077
268	5.4761	0.0076
269	5.4837	0.0076
270	5.4913	0.0076
271	5.4989	0.0076
272	5.5065	0.0076
273	5.5140	0.0075
274	5.5216	0.0075
275	5.5291	0.0075
276	5.5366	0.0075
277	5.5441	0.0075
278	5.5515	0.0075
279	5.5590	0.0074
280	5.5664	0.0074
281	5.5738	0.0074
282	5.5812	0.0074
283	5.5886	0.0074
284	5.5959	0.0074
285	5.6033	0.0073
286	5.6106	0.0073
287	5.6179	0.0073

288 5.6252 0.0073

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0073	0.0017	0.0056
2	0.0073	0.0017	0.0056
3	0.0073	0.0017	0.0057
4	0.0074	0.0017	0.0057
5	0.0074	0.0017	0.0057
6	0.0074	0.0017	0.0057
7	0.0074	0.0017	0.0057
8	0.0075	0.0017	0.0058
9	0.0075	0.0017	0.0058
10	0.0075	0.0017	0.0058
11	0.0075	0.0017	0.0058
12	0.0076	0.0017	0.0058
13	0.0076	0.0017	0.0059
14	0.0076	0.0017	0.0059
15	0.0077	0.0018	0.0059
16	0.0077	0.0018	0.0059
17	0.0077	0.0018	0.0059
18	0.0077	0.0018	0.0060
19	0.0078	0.0018	0.0060
20	0.0078	0.0018	0.0060
21	0.0078	0.0018	0.0060
22	0.0078	0.0018	0.0060
23	0.0079	0.0018	0.0061
24	0.0079	0.0018	0.0061
25	0.0079	0.0018	0.0061
26	0.0080	0.0018	0.0061
27	0.0080	0.0018	0.0062
28	0.0080	0.0018	0.0062
29	0.0081	0.0018	0.0062
30	0.0081	0.0019	0.0062
31	0.0081	0.0019	0.0063
32	0.0081	0.0019	0.0063
33	0.0082	0.0019	0.0063
34	0.0082	0.0019	0.0063
35	0.0082	0.0019	0.0064
36	0.0083	0.0019	0.0064
37	0.0083	0.0019	0.0064
38	0.0083	0.0019	0.0064
39	0.0084	0.0019	0.0065
40	0.0084	0.0019	0.0065
41	0.0085	0.0019	0.0065
42	0.0085	0.0019	0.0065
43	0.0085	0.0020	0.0066
44	0.0085	0.0020	0.0066
45	0.0086	0.0020	0.0066
46	0.0086	0.0020	0.0066
47	0.0087	0.0020	0.0067
48	0.0087	0.0020	0.0067
49	0.0087	0.0020	0.0067
50	0.0088	0.0020	0.0068
51	0.0088	0.0020	0.0068
52	0.0088	0.0020	0.0068

53	0.0089	0.0020	0.0069
54	0.0089	0.0020	0.0069
55	0.0090	0.0021	0.0069
56	0.0090	0.0021	0.0069
57	0.0091	0.0021	0.0070
58	0.0091	0.0021	0.0070
59	0.0091	0.0021	0.0071
60	0.0092	0.0021	0.0071
61	0.0092	0.0021	0.0071
62	0.0093	0.0021	0.0071
63	0.0093	0.0021	0.0072
64	0.0094	0.0021	0.0072
65	0.0094	0.0022	0.0073
66	0.0094	0.0022	0.0073
67	0.0095	0.0022	0.0073
68	0.0095	0.0022	0.0074
69	0.0096	0.0022	0.0074
70	0.0096	0.0022	0.0074
71	0.0097	0.0022	0.0075
72	0.0097	0.0022	0.0075
73	0.0098	0.0022	0.0076
74	0.0098	0.0023	0.0076
75	0.0099	0.0023	0.0076
76	0.0099	0.0023	0.0077
77	0.0100	0.0023	0.0077
78	0.0101	0.0023	0.0077
79	0.0101	0.0023	0.0078
80	0.0102	0.0023	0.0078
81	0.0102	0.0023	0.0079
82	0.0103	0.0024	0.0079
83	0.0104	0.0024	0.0080
84	0.0104	0.0024	0.0080
85	0.0105	0.0024	0.0081
86	0.0105	0.0024	0.0081
87	0.0106	0.0024	0.0082
88	0.0106	0.0024	0.0082
89	0.0107	0.0025	0.0083
90	0.0108	0.0025	0.0083
91	0.0109	0.0025	0.0084
92	0.0109	0.0025	0.0084
93	0.0110	0.0025	0.0085
94	0.0110	0.0025	0.0085
95	0.0111	0.0026	0.0086
96	0.0112	0.0026	0.0086
97	0.0113	0.0026	0.0087
98	0.0113	0.0026	0.0087
99	0.0114	0.0026	0.0088
100	0.0115	0.0026	0.0089
101	0.0116	0.0027	0.0089
102	0.0116	0.0027	0.0090
103	0.0117	0.0027	0.0091
104	0.0118	0.0027	0.0091
105	0.0119	0.0027	0.0092
106	0.0120	0.0027	0.0092
107	0.0121	0.0028	0.0093
108	0.0121	0.0028	0.0094
109	0.0123	0.0028	0.0095
110	0.0123	0.0028	0.0095

111	0.0125	0.0029	0.0096
112	0.0125	0.0029	0.0097
113	0.0127	0.0029	0.0098
114	0.0127	0.0029	0.0098
115	0.0129	0.0029	0.0099
116	0.0129	0.0030	0.0100
117	0.0131	0.0030	0.0101
118	0.0131	0.0030	0.0101
119	0.0133	0.0030	0.0102
120	0.0134	0.0031	0.0103
121	0.0135	0.0031	0.0104
122	0.0136	0.0031	0.0105
123	0.0138	0.0032	0.0106
124	0.0138	0.0032	0.0107
125	0.0140	0.0032	0.0108
126	0.0141	0.0032	0.0109
127	0.0143	0.0033	0.0110
128	0.0144	0.0033	0.0111
129	0.0146	0.0033	0.0112
130	0.0147	0.0034	0.0113
131	0.0149	0.0034	0.0115
132	0.0150	0.0034	0.0115
133	0.0152	0.0035	0.0117
134	0.0153	0.0035	0.0118
135	0.0155	0.0036	0.0119
136	0.0156	0.0036	0.0120
137	0.0158	0.0036	0.0122
138	0.0160	0.0037	0.0123
139	0.0162	0.0037	0.0125
140	0.0163	0.0037	0.0126
141	0.0166	0.0038	0.0128
142	0.0167	0.0038	0.0129
143	0.0170	0.0039	0.0131
144	0.0172	0.0039	0.0132
145	0.0220	0.0050	0.0169
146	0.0221	0.0051	0.0171
147	0.0225	0.0052	0.0173
148	0.0227	0.0052	0.0175
149	0.0230	0.0053	0.0177
150	0.0232	0.0053	0.0179
151	0.0236	0.0054	0.0182
152	0.0238	0.0055	0.0184
153	0.0242	0.0056	0.0187
154	0.0244	0.0056	0.0188
155	0.0249	0.0057	0.0192
156	0.0251	0.0058	0.0194
157	0.0256	0.0059	0.0198
158	0.0259	0.0059	0.0200
159	0.0264	0.0061	0.0204
160	0.0267	0.0061	0.0206
161	0.0273	0.0063	0.0210
162	0.0276	0.0063	0.0213
163	0.0283	0.0065	0.0218
164	0.0286	0.0066	0.0220
165	0.0293	0.0067	0.0226
166	0.0297	0.0068	0.0229
167	0.0305	0.0070	0.0235
168	0.0309	0.0071	0.0238

169	0.0336	0.0077	0.0259
170	0.0340	0.0078	0.0262
171	0.0351	0.0080	0.0270
172	0.0356	0.0082	0.0275
173	0.0368	0.0084	0.0284
174	0.0375	0.0086	0.0289
175	0.0389	0.0089	0.0300
176	0.0397	0.0091	0.0306
177	0.0413	0.0095	0.0319
178	0.0422	0.0097	0.0326
179	0.0443	0.0101	0.0341
180	0.0454	0.0104	0.0350
181	0.0479	0.0110	0.0370
182	0.0494	0.0113	0.0381
183	0.0527	0.0121	0.0406
184	0.0547	0.0125	0.0421
185	0.0494	0.0113	0.0381
186	0.0521	0.0119	0.0402
187	0.0590	0.0135	0.0455
188	0.0636	0.0146	0.0490
189	0.0766	0.0175	0.0590
190	0.0862	0.0178	0.0684
191	0.1222	0.0178	0.1044
192	0.1669	0.0178	0.1491
193	0.5035	0.0178	0.4857
194	0.1000	0.0178	0.0822
195	0.0692	0.0158	0.0533
196	0.0553	0.0127	0.0426
197	0.0568	0.0130	0.0438
198	0.0510	0.0117	0.0393
199	0.0466	0.0107	0.0359
200	0.0432	0.0099	0.0333
201	0.0405	0.0093	0.0312
202	0.0382	0.0087	0.0294
203	0.0362	0.0083	0.0279
204	0.0346	0.0079	0.0266
205	0.0314	0.0072	0.0242
206	0.0301	0.0069	0.0232
207	0.0290	0.0066	0.0223
208	0.0279	0.0064	0.0215
209	0.0270	0.0062	0.0208
210	0.0262	0.0060	0.0202
211	0.0254	0.0058	0.0196
212	0.0247	0.0057	0.0190
213	0.0240	0.0055	0.0185
214	0.0234	0.0054	0.0180
215	0.0228	0.0052	0.0176
216	0.0223	0.0051	0.0172
217	0.0173	0.0040	0.0133
218	0.0169	0.0039	0.0130
219	0.0165	0.0038	0.0127
220	0.0161	0.0037	0.0124
221	0.0157	0.0036	0.0121
222	0.0154	0.0035	0.0119
223	0.0151	0.0035	0.0116
224	0.0148	0.0034	0.0114
225	0.0145	0.0033	0.0112
226	0.0142	0.0033	0.0109

227	0.0139	0.0032	0.0107
228	0.0137	0.0031	0.0105
229	0.0134	0.0031	0.0104
230	0.0132	0.0030	0.0102
231	0.0130	0.0030	0.0100
232	0.0128	0.0029	0.0099
233	0.0126	0.0029	0.0097
234	0.0124	0.0028	0.0096
235	0.0122	0.0028	0.0094
236	0.0120	0.0028	0.0093
237	0.0119	0.0027	0.0091
238	0.0117	0.0027	0.0090
239	0.0115	0.0026	0.0089
240	0.0114	0.0026	0.0088
241	0.0112	0.0026	0.0087
242	0.0111	0.0025	0.0085
243	0.0109	0.0025	0.0084
244	0.0108	0.0025	0.0083
245	0.0107	0.0024	0.0082
246	0.0106	0.0024	0.0081
247	0.0104	0.0024	0.0080
248	0.0103	0.0024	0.0080
249	0.0102	0.0023	0.0079
250	0.0101	0.0023	0.0078
251	0.0100	0.0023	0.0077
252	0.0099	0.0023	0.0076
253	0.0098	0.0022	0.0075
254	0.0097	0.0022	0.0075
255	0.0096	0.0022	0.0074
256	0.0095	0.0022	0.0073
257	0.0094	0.0022	0.0072
258	0.0093	0.0021	0.0072
259	0.0092	0.0021	0.0071
260	0.0091	0.0021	0.0070
261	0.0090	0.0021	0.0070
262	0.0090	0.0021	0.0069
263	0.0089	0.0020	0.0068
264	0.0088	0.0020	0.0068
265	0.0087	0.0020	0.0067
266	0.0086	0.0020	0.0067
267	0.0086	0.0020	0.0066
268	0.0085	0.0019	0.0066
269	0.0084	0.0019	0.0065
270	0.0084	0.0019	0.0064
271	0.0083	0.0019	0.0064
272	0.0082	0.0019	0.0063
273	0.0082	0.0019	0.0063
274	0.0081	0.0019	0.0062
275	0.0080	0.0018	0.0062
276	0.0080	0.0018	0.0061
277	0.0079	0.0018	0.0061
278	0.0079	0.0018	0.0061
279	0.0078	0.0018	0.0060
280	0.0077	0.0018	0.0060
281	0.0077	0.0018	0.0059
282	0.0076	0.0017	0.0059
283	0.0076	0.0017	0.0058
284	0.0075	0.0017	0.0058

285	0.0075	0.0017	0.0058
286	0.0074	0.0017	0.0057
287	0.0074	0.0017	0.0057
288	0.0073	0.0017	0.0057

Total soil rain loss = 1.15(In)
Total effective rainfall = 4.47(In)
Peak flow rate in flood hydrograph = 1669.47(CFS)

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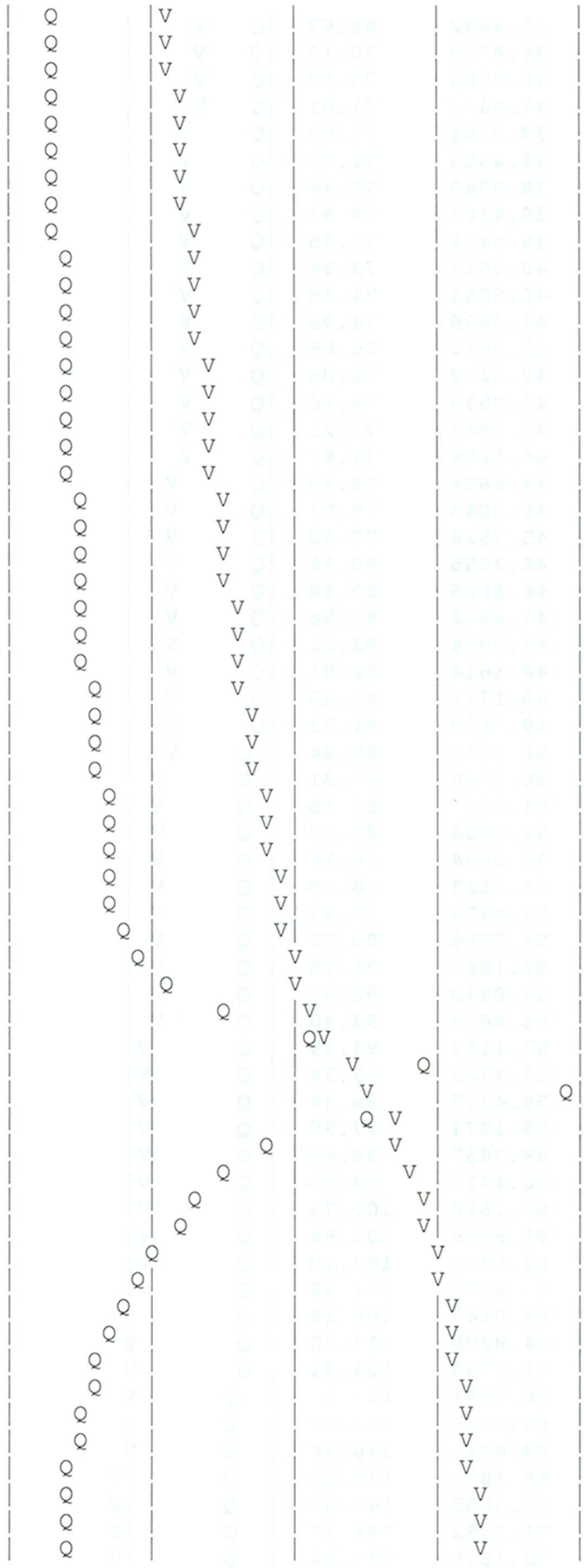
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	425.0	850.0	1275.0	1700.0
0+ 5	0.0070	1.02	Q				
0+10	0.0367	4.30	Q				
0+15	0.1123	10.99	Q				
0+20	0.2828	24.76	Q				
0+25	0.4997	31.48	Q				
0+30	0.7430	35.33	Q				
0+35	1.0058	38.16	Q				
0+40	1.2836	40.33	Q				
0+45	1.5733	42.06	Q				
0+50	1.8724	43.44	VQ				
0+55	2.1792	44.54	VQ				
1+ 0	2.4918	45.39	VQ				
1+ 5	2.8091	46.07	VQ				
1+10	3.1295	46.53	VQ				
1+15	3.4522	46.85	VQ				
1+20	3.7771	47.17	VQ				
1+25	4.1039	47.46	VQ				
1+30	4.4325	47.71	VQ				
1+35	4.7629	47.98	VQ				
1+40	5.0953	48.26	VQ				
1+45	5.4293	48.49	VQ				
1+50	5.7648	48.72	VQ				
1+55	6.1018	48.93	VQ				
2+ 0	6.4400	49.11	|Q				
2+ 5	6.7794	49.28	|Q				
2+10	7.1201	49.47	|Q				
2+15	7.4620	49.65	|Q				
2+20	7.8052	49.84	|Q				
2+25	8.1497	50.01	|Q				
2+30	8.4955	50.21	|Q				
2+35	8.8425	50.39	|Q				
2+40	9.1909	50.59	|Q				
2+45	9.5406	50.78	|Q				
2+50	9.8917	50.98	|Q				
2+55	10.2441	51.17	|Q				
3+ 0	10.5979	51.37	|Q				
3+ 5	10.9530	51.57	|Q				
3+10	11.3096	51.78	|Q				
3+15	11.6676	51.97	|Q				

3+20	12.0270	52.19	|Q	|	|	|	|
3+25	12.3878	52.39	|Q	|	|	|	|
3+30	12.7501	52.61	|QV	|	|	|	|
3+35	13.1139	52.82	|QV	|	|	|	|
3+40	13.4792	53.04	|QV	|	|	|	|
3+45	13.8459	53.25	|QV	|	|	|	|
3+50	14.2142	53.48	|QV	|	|	|	|
3+55	14.5840	53.69	|QV	|	|	|	|
4+ 0	14.9554	53.93	|QV	|	|	|	|
4+ 5	15.3283	54.15	|QV	|	|	|	|
4+10	15.7029	54.39	|QV	|	|	|	|
4+15	16.0790	54.61	|QV	|	|	|	|
4+20	16.4568	54.85	|QV	|	|	|	|
4+25	16.8361	55.08	|QV	|	|	|	|
4+30	17.2172	55.33	|QV	|	|	|	|
4+35	17.5999	55.57	|QV	|	|	|	|
4+40	17.9844	55.82	|QV	|	|	|	|
4+45	18.3705	56.06	|QV	|	|	|	|
4+50	18.7584	56.33	|QV	|	|	|	|
4+55	19.1481	56.57	|Q V	|	|	|	|
5+ 0	19.5395	56.84	|Q V	|	|	|	|
5+ 5	19.9327	57.09	|Q V	|	|	|	|
5+10	20.3278	57.37	|Q V	|	|	|	|
5+15	20.7247	57.62	|Q V	|	|	|	|
5+20	21.1235	57.90	|Q V	|	|	|	|
5+25	21.5241	58.17	|Q V	|	|	|	|
5+30	21.9267	58.46	|Q V	|	|	|	|
5+35	22.3311	58.73	|Q V	|	|	|	|
5+40	22.7376	59.02	|Q V	|	|	|	|
5+45	23.1461	59.30	|Q V	|	|	|	|
5+50	23.5566	59.60	|Q V	|	|	|	|
5+55	23.9690	59.89	|Q V	|	|	|	|
6+ 0	24.3836	60.20	|Q V	|	|	|	|
6+ 5	24.8002	60.49	|Q V	|	|	|	|
6+10	25.2190	60.81	|Q V	|	|	|	|
6+15	25.6399	61.11	|Q V	|	|	|	|
6+20	26.0631	61.44	|Q V	|	|	|	|
6+25	26.4883	61.75	|Q V	|	|	|	|
6+30	26.9159	62.08	|Q V	|	|	|	|
6+35	27.3457	62.40	|Q V	|	|	|	|
6+40	27.7778	62.75	|Q V	|	|	|	|
6+45	28.2122	63.07	|Q V	|	|	|	|
6+50	28.6490	63.43	|Q V	|	|	|	|
6+55	29.0882	63.76	|Q V	|	|	|	|
7+ 0	29.5298	64.13	|Q V	|	|	|	|
7+ 5	29.9739	64.48	|Q V	|	|	|	|
7+10	30.4205	64.85	|Q V	|	|	|	|
7+15	30.8696	65.21	|Q V	|	|	|	|
7+20	31.3214	65.59	|Q V	|	|	|	|
7+25	31.7756	65.96	|Q V	|	|	|	|
7+30	32.2327	66.36	|Q V	|	|	|	|
7+35	32.6923	66.74	|Q V	|	|	|	|
7+40	33.1547	67.15	|Q V	|	|	|	|
7+45	33.6199	67.54	|Q V	|	|	|	|
7+50	34.0880	67.96	|Q V	|	|	|	|
7+55	34.5588	68.37	|Q V	|	|	|	|
8+ 0	35.0326	68.80	|Q V	|	|	|	|
8+ 5	35.5094	69.22	|Q V	|	|	|	|

8+10	35.9892	69.67	Q V				
8+15	36.4720	70.10	Q V				
8+20	36.9580	70.57	Q V				
8+25	37.4470	71.01	Q V				
8+30	37.9394	71.50	Q V				
8+35	38.4350	71.95	Q V				
8+40	38.9340	72.46	Q V				
8+45	39.4363	72.93	Q V				
8+50	39.9421	73.45	Q V				
8+55	40.4513	73.94	Q V				
9+ 0	40.9643	74.48	Q V				
9+ 5	41.4808	74.99	Q V				
9+10	42.0011	75.55	Q V				
9+15	42.5250	76.08	Q V				
9+20	43.0530	76.66	Q V				
9+25	43.5847	77.21	Q V				
9+30	44.1206	77.81	Q V				
9+35	44.6604	78.38	Q V				
9+40	45.2045	79.01	Q V				
9+45	45.7528	79.60	Q V				
9+50	46.3055	80.26	Q V				
9+55	46.8625	80.88	Q V				
10+ 0	47.4242	81.56	Q V				
10+ 5	47.9904	82.21	Q V				
10+10	48.5614	82.91	Q V				
10+15	49.1371	83.59	Q V				
10+20	49.7179	84.33	Q V				
10+25	50.3036	85.04	Q V				
10+30	50.8946	85.81	Q V				
10+35	51.4907	86.55	Q V				
10+40	52.0924	87.37	Q V				
10+45	52.6994	88.14	Q V				
10+50	53.3123	88.99	Q V				
10+55	53.9308	89.81	Q V				
11+ 0	54.5554	90.70	Q V				
11+ 5	55.1860	91.55	Q V				
11+10	55.8230	92.50	Q V				
11+15	56.4662	93.40	Q V				
11+20	57.1163	94.39	Q V				
11+25	57.7729	95.34	Q V				
11+30	58.4367	96.38	Q V				
11+35	59.1074	97.39	Q V				
11+40	59.7857	98.49	Q V				
11+45	60.4713	99.55	Q V				
11+50	61.1650	100.73	Q V				
11+55	61.8665	101.85	Q V				
12+ 0	62.5765	103.10	Q V				
12+ 5	63.2991	104.92	Q V				
12+10	64.0449	108.28	Q V				
12+15	64.8279	113.70	Q V				
12+20	65.6795	123.64	Q V				
12+25	66.5691	129.17	Q V				
12+30	67.4855	133.07	Q V				
12+35	68.4241	136.28	Q V				
12+40	69.3831	139.25	Q V				
12+45	70.3602	141.88	Q V				
12+50	71.3552	144.47	Q V				
12+55	72.3665	146.84	Q V				

13+ 0	73.3943	149.25	
13+ 5	74.4376	151.48	
13+10	75.4969	153.80	
13+15	76.5711	155.97	
13+20	77.6619	158.38	
13+25	78.7686	160.71	
13+30	79.8932	163.28	
13+35	81.0350	165.79	
13+40	82.1963	168.62	
13+45	83.3763	171.35	
13+50	84.5775	174.41	
13+55	85.7993	177.40	
14+ 0	87.0442	180.76	
14+ 5	88.3135	184.30	
14+10	89.6138	188.81	
14+15	90.9504	194.07	
14+20	92.3382	201.51	
14+25	93.7655	207.24	
14+30	95.2318	212.92	
14+35	96.7355	218.32	
14+40	98.2803	224.31	
14+45	99.8657	230.20	
14+50	101.4973	236.91	
14+55	103.1750	243.60	
15+ 0	104.9063	251.38	
15+ 5	106.6918	259.25	
15+10	108.5413	268.55	
15+15	110.4567	278.11	
15+20	112.4516	289.67	
15+25	114.5208	300.45	
15+30	116.6629	311.03	
15+35	118.8546	318.24	
15+40	121.0612	320.40	
15+45	123.3678	334.91	
15+50	125.8635	362.38	
15+55	128.6374	402.77	
16+ 0	131.9183	476.39	
16+ 5	136.3715	646.60	
16+10	142.7979	933.12	
16+15	151.4582	1257.47	
16+20	162.9559	1669.47	
16+25	170.5155	1097.66	
16+30	176.0366	801.66	
16+35	180.6181	665.23	
16+40	184.6090	579.47	
16+45	188.1253	510.57	
16+50	191.2312	450.98	
16+55	193.9920	400.86	
17+ 0	196.4445	356.10	
17+ 5	198.6463	319.70	
17+10	200.5988	283.51	
17+15	202.3691	257.05	
17+20	204.0170	239.28	
17+25	205.5682	225.23	
17+30	207.0291	212.13	
17+35	208.4319	203.68	
17+40	209.7784	195.52	
17+45	211.0513	184.82	

17+50	212.2656	176.32	Q			V
17+55	213.4300	169.07	Q			V
18+ 0	214.5375	160.81	Q			V
18+ 5	215.6062	155.18	Q			V
18+10	216.6307	148.76	Q			V
18+15	217.5995	140.67	Q			V
18+20	218.4846	128.52	Q			V
18+25	219.3185	121.07	Q			V
18+30	220.1153	115.70	Q			V
18+35	220.8811	111.19	Q			V
18+40	221.6199	107.28	Q			V
18+45	222.3350	103.83	Q			V
18+50	223.0289	100.76	Q			V
18+55	223.7039	98.00	Q			V
19+ 0	224.3618	95.53	Q			V
19+ 5	225.0043	93.28	Q			V
19+10	225.6329	91.28	Q			V
19+15	226.2489	89.45	Q			V
19+20	226.8530	87.71	Q			V
19+25	227.4457	86.07	Q			V
19+30	228.0278	84.52	Q			V
19+35	228.5996	83.03	Q			V
19+40	229.1616	81.60	Q			V
19+45	229.7142	80.25	Q			V
19+50	230.2581	78.97	Q			V
19+55	230.7935	77.74	Q			V
20+ 0	231.3209	76.58	Q			V
20+ 5	231.8407	75.47	Q			V
20+10	232.3531	74.40	Q			V
20+15	232.8584	73.37	Q			V
20+20	233.3568	72.37	Q			V
20+25	233.8487	71.41	Q			V
20+30	234.3341	70.48	Q			V
20+35	234.8133	69.59	Q			V
20+40	235.2866	68.72	Q			V
20+45	235.7541	67.88	Q			V
20+50	236.2160	67.07	Q			V
20+55	236.6724	66.28	Q			V
21+ 0	237.1236	65.51	Q			V
21+ 5	237.5697	64.77	Q			V
21+10	238.0108	64.05	Q			V
21+15	238.4470	63.35	Q			V
21+20	238.8786	62.67	Q			V
21+25	239.3057	62.00	Q			V
21+30	239.7282	61.36	Q			V
21+35	240.1465	60.73	Q			V
21+40	240.5606	60.12	Q			V
21+45	240.9705	59.53	Q			V
21+50	241.3765	58.95	Q			V
21+55	241.7786	58.38	Q			V
22+ 0	242.1769	57.83	Q			V
22+ 5	242.5715	57.29	Q			V
22+10	242.9624	56.77	Q			V
22+15	243.3498	56.25	Q			V
22+20	243.7338	55.75	Q			V
22+25	244.1144	55.26	Q			V
22+30	244.4917	54.79	Q			V
22+35	244.8658	54.32	Q			V

22+40	245.2367	53.86	|Q	|	|	|	V |
22+45	245.6046	53.41	|Q	|	|	|	V |
22+50	245.9694	52.97	|Q	|	|	|	V|
22+55	246.3313	52.54	|Q	|	|	|	V|
23+ 0	246.6903	52.12	|Q	|	|	|	V|
23+ 5	247.0464	51.71	|Q	|	|	|	V|
23+10	247.3998	51.31	|Q	|	|	|	V|
23+15	247.7505	50.92	|Q	|	|	|	V|
23+20	248.0985	50.53	|Q	|	|	|	V|
23+25	248.4438	50.15	|Q	|	|	|	V|
23+30	248.7867	49.78	|Q	|	|	|	V|
23+35	249.1270	49.41	|Q	|	|	|	V|
23+40	249.4648	49.05	|Q	|	|	|	V|
23+45	249.8002	48.70	|Q	|	|	|	V|
23+50	250.1332	48.36	|Q	|	|	|	V|
23+55	250.4639	48.02	|Q	|	|	|	V|
24+ 0	250.7923	47.68	|Q	|	|	|	V|
24+ 5	251.1115	46.34	|Q	|	|	|	V|
24+10	251.4059	42.75	|Q	|	|	|	V|
24+15	251.6525	35.80	Q	|	|	|	V|
24+20	251.8030	21.86	Q	|	|	|	V|
24+25	251.9068	15.07	Q	|	|	|	V|
24+30	251.9842	11.23	Q	|	|	|	V|
24+35	252.0423	8.44	Q	|	|	|	V|
24+40	252.0861	6.35	Q	|	|	|	V|
24+45	252.1185	4.72	Q	|	|	|	V|
24+50	252.1423	3.45	Q	|	|	|	V|
24+55	252.1594	2.47	Q	|	|	|	V|
25+ 0	252.1715	1.76	Q	|	|	|	V|
25+ 5	252.1799	1.22	Q	|	|	|	V|
25+10	252.1862	0.91	Q	|	|	|	V|
25+15	252.1913	0.74	Q	|	|	|	V|
25+20	252.1953	0.59	Q	|	|	|	V|
25+25	252.1985	0.46	Q	|	|	|	V|
25+30	252.2010	0.37	Q	|	|	|	V|
25+35	252.2028	0.26	Q	|	|	|	V|
25+40	252.2039	0.15	Q	|	|	|	V|
25+45	252.2045	0.09	Q	|	|	|	V|
25+50	252.2048	0.04	Q	|	|	|	V

U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/26/12 File Name UNIT10Y24HPR1B.out

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Orange County Unit Hydrograph Hydrology Method
Manual Date(s) - October 1986, November 1996

Program License Serial Number 6062

ESPERANZA HILLS OPTION 1
DETENTION BASIN ANALYSIS
PROPOSED CONDITION AREA B
10-YEAR 24-HOUR

Storm Event Year = 10

Antecedent Moisture Condition = 2

English (in-lb) Input Units Used

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	Area (Ac.)	Area Fraction	Soil Group	Fp (In/Hr)	Ap (dec.)	Fm (In/Hr)
69.0	123.5	0.58	C	0.250	0.870	0.218
75.0	89.0	0.42	D	0.200	0.870	0.174

Area-averaged adjusted loss rate Fm (In/Hr) = 0.199

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC2)	S	Pervious Yield Fr
107.44	0.506	69.0	69.0	4.49	0.289
16.06	0.076	98.0	98.0	0.20	0.936
77.43	0.364	75.0	75.0	3.33	0.389
11.57	0.054	98.0	98.0	0.20	0.936

Area-averaged catchment yield fraction, Y = 0.410
Area-averaged low loss fraction, Yb = 0.590

++

User entry of time of concentration = 0.260 (hours)
Watershed area = 212.50(Ac.)
Catchment Lag time = 0.208 hours
Unit interval = 5.000 minutes

Unit interval percentage of lag time = 40.0641
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.199(In/Hr)
Average low loss rate fraction (Yb) = 0.590 (decimal)
FOOTHILL S-Graph Selected
Computed peak 5-minute rainfall = 0.340(In)
Computed peak 30-minute rainfall = 0.720(In)
Specified peak 1-hour rainfall = 0.950(In)
Computed peak 3-hour rainfall = 1.590(In)
Specified peak 6-hour rainfall = 2.200(In)
Specified peak 24-hour rainfall = 3.680(In)

Rainfall depth area reduction factors:
Using a total area of 212.50(Ac.) (Ref: fig. E-4)

5-minute factor = 0.990 Adjusted rainfall = 0.337(In)
30-minute factor = 0.990 Adjusted rainfall = 0.713(In)
1-hour factor = 0.990 Adjusted rainfall = 0.941(In)
3-hour factor = 0.999 Adjusted rainfall = 1.588(In)
6-hour factor = 0.999 Adjusted rainfall = 2.199(In)
24-hour factor = 1.000 Adjusted rainfall = 3.679(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
(K = 2569.92 (CFS))		
1	3.140	80.701
2	14.934	303.093
3	46.325	806.712
4	68.684	574.619
5	78.632	255.654
6	85.260	170.332
7	89.966	120.953
8	93.354	87.071
9	95.731	61.075
10	97.326	40.986
11	98.148	21.131
12	98.605	11.748
13	98.986	9.795
14	99.248	6.728
15	99.547	7.690
16	99.784	6.080
17	99.920	3.498
18	100.000	2.053

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.3366	0.3366
2	0.4500	0.1134
3	0.5332	0.0833
4	0.6015	0.0683
5	0.6604	0.0589
6	0.7128	0.0524

7	0.7582	0.0453
8	0.7997	0.0416
9	0.8383	0.0386
10	0.8744	0.0361
11	0.9084	0.0340
12	0.9405	0.0322
13	0.9771	0.0366
14	1.0123	0.0351
15	1.0461	0.0339
16	1.0788	0.0327
17	1.1104	0.0316
18	1.1411	0.0307
19	1.1709	0.0298
20	1.1999	0.0290
21	1.2281	0.0282
22	1.2557	0.0275
23	1.2826	0.0269
24	1.3089	0.0263
25	1.3346	0.0257
26	1.3598	0.0252
27	1.3845	0.0247
28	1.4087	0.0242
29	1.4324	0.0238
30	1.4558	0.0233
31	1.4787	0.0229
32	1.5013	0.0226
33	1.5235	0.0222
34	1.5453	0.0218
35	1.5668	0.0215
36	1.5880	0.0212
37	1.6085	0.0206
38	1.6288	0.0203
39	1.6488	0.0200
40	1.6685	0.0197
41	1.6879	0.0194
42	1.7071	0.0192
43	1.7261	0.0190
44	1.7448	0.0187
45	1.7633	0.0185
46	1.7816	0.0183
47	1.7997	0.0181
48	1.8176	0.0179
49	1.8352	0.0177
50	1.8527	0.0175
51	1.8700	0.0173
52	1.8871	0.0171
53	1.9041	0.0169
54	1.9209	0.0168
55	1.9375	0.0166
56	1.9539	0.0165
57	1.9702	0.0163
58	1.9864	0.0161
59	2.0024	0.0160
60	2.0182	0.0159
61	2.0340	0.0157
62	2.0495	0.0156
63	2.0650	0.0154
64	2.0803	0.0153

65	2.0955	0.0152
66	2.1106	0.0151
67	2.1255	0.0149
68	2.1403	0.0148
69	2.1551	0.0147
70	2.1697	0.0146
71	2.1842	0.0145
72	2.1985	0.0144
73	2.2098	0.0113
74	2.2210	0.0112
75	2.2321	0.0111
76	2.2431	0.0110
77	2.2540	0.0109
78	2.2649	0.0108
79	2.2756	0.0107
80	2.2863	0.0107
81	2.2968	0.0106
82	2.3073	0.0105
83	2.3177	0.0104
84	2.3281	0.0103
85	2.3383	0.0103
86	2.3485	0.0102
87	2.3586	0.0101
88	2.3686	0.0100
89	2.3786	0.0100
90	2.3885	0.0099
91	2.3983	0.0098
92	2.4081	0.0098
93	2.4178	0.0097
94	2.4274	0.0096
95	2.4369	0.0096
96	2.4464	0.0095
97	2.4559	0.0094
98	2.4652	0.0094
99	2.4746	0.0093
100	2.4838	0.0093
101	2.4930	0.0092
102	2.5021	0.0091
103	2.5112	0.0091
104	2.5203	0.0090
105	2.5292	0.0090
106	2.5382	0.0089
107	2.5470	0.0089
108	2.5558	0.0088
109	2.5646	0.0088
110	2.5733	0.0087
111	2.5820	0.0087
112	2.5906	0.0086
113	2.5992	0.0086
114	2.6077	0.0085
115	2.6161	0.0085
116	2.6246	0.0084
117	2.6330	0.0084
118	2.6413	0.0083
119	2.6496	0.0083
120	2.6578	0.0082
121	2.6660	0.0082
122	2.6742	0.0082

123	2.6823	0.0081
124	2.6904	0.0081
125	2.6984	0.0080
126	2.7064	0.0080
127	2.7144	0.0080
128	2.7223	0.0079
129	2.7302	0.0079
130	2.7380	0.0078
131	2.7458	0.0078
132	2.7536	0.0078
133	2.7613	0.0077
134	2.7690	0.0077
135	2.7767	0.0077
136	2.7843	0.0076
137	2.7919	0.0076
138	2.7994	0.0076
139	2.8069	0.0075
140	2.8144	0.0075
141	2.8219	0.0074
142	2.8293	0.0074
143	2.8367	0.0074
144	2.8440	0.0074
145	2.8513	0.0073
146	2.8586	0.0073
147	2.8659	0.0073
148	2.8731	0.0072
149	2.8803	0.0072
150	2.8875	0.0072
151	2.8946	0.0071
152	2.9017	0.0071
153	2.9088	0.0071
154	2.9158	0.0070
155	2.9228	0.0070
156	2.9298	0.0070
157	2.9368	0.0070
158	2.9437	0.0069
159	2.9506	0.0069
160	2.9575	0.0069
161	2.9644	0.0069
162	2.9712	0.0068
163	2.9780	0.0068
164	2.9848	0.0068
165	2.9915	0.0067
166	2.9982	0.0067
167	3.0049	0.0067
168	3.0116	0.0067
169	3.0182	0.0066
170	3.0249	0.0066
171	3.0315	0.0066
172	3.0380	0.0066
173	3.0446	0.0065
174	3.0511	0.0065
175	3.0576	0.0065
176	3.0641	0.0065
177	3.0705	0.0065
178	3.0770	0.0064
179	3.0834	0.0064
180	3.0898	0.0064

181	3.0961	0.0064
182	3.1025	0.0063
183	3.1088	0.0063
184	3.1151	0.0063
185	3.1214	0.0063
186	3.1276	0.0063
187	3.1338	0.0062
188	3.1401	0.0062
189	3.1463	0.0062
190	3.1524	0.0062
191	3.1586	0.0062
192	3.1647	0.0061
193	3.1708	0.0061
194	3.1769	0.0061
195	3.1830	0.0061
196	3.1890	0.0061
197	3.1951	0.0060
198	3.2011	0.0060
199	3.2071	0.0060
200	3.2131	0.0060
201	3.2190	0.0060
202	3.2250	0.0059
203	3.2309	0.0059
204	3.2368	0.0059
205	3.2427	0.0059
206	3.2485	0.0059
207	3.2544	0.0058
208	3.2602	0.0058
209	3.2660	0.0058
210	3.2718	0.0058
211	3.2776	0.0058
212	3.2833	0.0058
213	3.2891	0.0057
214	3.2948	0.0057
215	3.3005	0.0057
216	3.3062	0.0057
217	3.3119	0.0057
218	3.3176	0.0057
219	3.3232	0.0056
220	3.3288	0.0056
221	3.3344	0.0056
222	3.3400	0.0056
223	3.3456	0.0056
224	3.3512	0.0056
225	3.3567	0.0055
226	3.3623	0.0055
227	3.3678	0.0055
228	3.3733	0.0055
229	3.3788	0.0055
230	3.3842	0.0055
231	3.3897	0.0055
232	3.3951	0.0054
233	3.4006	0.0054
234	3.4060	0.0054
235	3.4114	0.0054
236	3.4168	0.0054
237	3.4221	0.0054
238	3.4275	0.0054

239	3.4328	0.0053
240	3.4382	0.0053
241	3.4435	0.0053
242	3.4488	0.0053
243	3.4541	0.0053
244	3.4593	0.0053
245	3.4646	0.0053
246	3.4698	0.0052
247	3.4751	0.0052
248	3.4803	0.0052
249	3.4855	0.0052
250	3.4907	0.0052
251	3.4959	0.0052
252	3.5010	0.0052
253	3.5062	0.0052
254	3.5113	0.0051
255	3.5164	0.0051
256	3.5216	0.0051
257	3.5267	0.0051
258	3.5318	0.0051
259	3.5368	0.0051
260	3.5419	0.0051
261	3.5469	0.0051
262	3.5520	0.0050
263	3.5570	0.0050
264	3.5620	0.0050
265	3.5670	0.0050
266	3.5720	0.0050
267	3.5770	0.0050
268	3.5820	0.0050
269	3.5869	0.0050
270	3.5919	0.0049
271	3.5968	0.0049
272	3.6017	0.0049
273	3.6067	0.0049
274	3.6116	0.0049
275	3.6164	0.0049
276	3.6213	0.0049
277	3.6262	0.0049
278	3.6311	0.0049
279	3.6359	0.0048
280	3.6407	0.0048
281	3.6456	0.0048
282	3.6504	0.0048
283	3.6552	0.0048
284	3.6600	0.0048
285	3.6647	0.0048
286	3.6695	0.0048
287	3.6743	0.0048
288	3.6790	0.0047

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0047	0.0028	0.0019
2	0.0048	0.0028	0.0019
3	0.0048	0.0028	0.0020

4	0.0048	0.0028	0.0020
5	0.0048	0.0028	0.0020
6	0.0048	0.0028	0.0020
7	0.0048	0.0029	0.0020
8	0.0049	0.0029	0.0020
9	0.0049	0.0029	0.0020
10	0.0049	0.0029	0.0020
11	0.0049	0.0029	0.0020
12	0.0049	0.0029	0.0020
13	0.0049	0.0029	0.0020
14	0.0050	0.0029	0.0020
15	0.0050	0.0029	0.0020
16	0.0050	0.0029	0.0020
17	0.0050	0.0030	0.0021
18	0.0050	0.0030	0.0021
19	0.0051	0.0030	0.0021
20	0.0051	0.0030	0.0021
21	0.0051	0.0030	0.0021
22	0.0051	0.0030	0.0021
23	0.0051	0.0030	0.0021
24	0.0051	0.0030	0.0021
25	0.0052	0.0031	0.0021
26	0.0052	0.0031	0.0021
27	0.0052	0.0031	0.0021
28	0.0052	0.0031	0.0021
29	0.0052	0.0031	0.0021
30	0.0053	0.0031	0.0022
31	0.0053	0.0031	0.0022
32	0.0053	0.0031	0.0022
33	0.0053	0.0031	0.0022
34	0.0053	0.0032	0.0022
35	0.0054	0.0032	0.0022
36	0.0054	0.0032	0.0022
37	0.0054	0.0032	0.0022
38	0.0054	0.0032	0.0022
39	0.0055	0.0032	0.0022
40	0.0055	0.0032	0.0022
41	0.0055	0.0032	0.0023
42	0.0055	0.0033	0.0023
43	0.0055	0.0033	0.0023
44	0.0056	0.0033	0.0023
45	0.0056	0.0033	0.0023
46	0.0056	0.0033	0.0023
47	0.0056	0.0033	0.0023
48	0.0057	0.0033	0.0023
49	0.0057	0.0034	0.0023
50	0.0057	0.0034	0.0023
51	0.0057	0.0034	0.0024
52	0.0058	0.0034	0.0024
53	0.0058	0.0034	0.0024
54	0.0058	0.0034	0.0024
55	0.0058	0.0035	0.0024
56	0.0059	0.0035	0.0024
57	0.0059	0.0035	0.0024
58	0.0059	0.0035	0.0024
59	0.0060	0.0035	0.0024
60	0.0060	0.0035	0.0024
61	0.0060	0.0036	0.0025

62	0.0060	0.0036	0.0025
63	0.0061	0.0036	0.0025
64	0.0061	0.0036	0.0025
65	0.0061	0.0036	0.0025
66	0.0062	0.0036	0.0025
67	0.0062	0.0037	0.0025
68	0.0062	0.0037	0.0025
69	0.0063	0.0037	0.0026
70	0.0063	0.0037	0.0026
71	0.0063	0.0037	0.0026
72	0.0063	0.0037	0.0026
73	0.0064	0.0038	0.0026
74	0.0064	0.0038	0.0026
75	0.0065	0.0038	0.0026
76	0.0065	0.0038	0.0027
77	0.0065	0.0039	0.0027
78	0.0065	0.0039	0.0027
79	0.0066	0.0039	0.0027
80	0.0066	0.0039	0.0027
81	0.0067	0.0039	0.0027
82	0.0067	0.0040	0.0027
83	0.0067	0.0040	0.0028
84	0.0068	0.0040	0.0028
85	0.0068	0.0040	0.0028
86	0.0069	0.0040	0.0028
87	0.0069	0.0041	0.0028
88	0.0069	0.0041	0.0028
89	0.0070	0.0041	0.0029
90	0.0070	0.0041	0.0029
91	0.0071	0.0042	0.0029
92	0.0071	0.0042	0.0029
93	0.0072	0.0042	0.0029
94	0.0072	0.0042	0.0029
95	0.0073	0.0043	0.0030
96	0.0073	0.0043	0.0030
97	0.0074	0.0043	0.0030
98	0.0074	0.0044	0.0030
99	0.0074	0.0044	0.0031
100	0.0075	0.0044	0.0031
101	0.0076	0.0045	0.0031
102	0.0076	0.0045	0.0031
103	0.0077	0.0045	0.0031
104	0.0077	0.0045	0.0032
105	0.0078	0.0046	0.0032
106	0.0078	0.0046	0.0032
107	0.0079	0.0047	0.0032
108	0.0079	0.0047	0.0032
109	0.0080	0.0047	0.0033
110	0.0080	0.0047	0.0033
111	0.0081	0.0048	0.0033
112	0.0082	0.0048	0.0033
113	0.0082	0.0049	0.0034
114	0.0083	0.0049	0.0034
115	0.0084	0.0049	0.0034
116	0.0084	0.0050	0.0035
117	0.0085	0.0050	0.0035
118	0.0086	0.0051	0.0035
119	0.0087	0.0051	0.0035

120	0.0087	0.0051	0.0036
121	0.0088	0.0052	0.0036
122	0.0089	0.0052	0.0036
123	0.0090	0.0053	0.0037
124	0.0090	0.0053	0.0037
125	0.0091	0.0054	0.0037
126	0.0092	0.0054	0.0038
127	0.0093	0.0055	0.0038
128	0.0094	0.0055	0.0038
129	0.0095	0.0056	0.0039
130	0.0096	0.0056	0.0039
131	0.0097	0.0057	0.0040
132	0.0098	0.0058	0.0040
133	0.0099	0.0058	0.0041
134	0.0100	0.0059	0.0041
135	0.0101	0.0060	0.0041
136	0.0102	0.0060	0.0042
137	0.0103	0.0061	0.0042
138	0.0104	0.0061	0.0043
139	0.0106	0.0062	0.0043
140	0.0107	0.0063	0.0044
141	0.0108	0.0064	0.0044
142	0.0109	0.0064	0.0045
143	0.0111	0.0066	0.0045
144	0.0112	0.0066	0.0046
145	0.0144	0.0085	0.0059
146	0.0145	0.0086	0.0059
147	0.0147	0.0087	0.0060
148	0.0148	0.0088	0.0061
149	0.0151	0.0089	0.0062
150	0.0152	0.0090	0.0062
151	0.0154	0.0091	0.0063
152	0.0156	0.0092	0.0064
153	0.0159	0.0094	0.0065
154	0.0160	0.0094	0.0066
155	0.0163	0.0096	0.0067
156	0.0165	0.0097	0.0067
157	0.0168	0.0099	0.0069
158	0.0169	0.0100	0.0069
159	0.0173	0.0102	0.0071
160	0.0175	0.0103	0.0072
161	0.0179	0.0106	0.0073
162	0.0181	0.0107	0.0074
163	0.0185	0.0109	0.0076
164	0.0187	0.0111	0.0077
165	0.0192	0.0113	0.0079
166	0.0194	0.0115	0.0080
167	0.0200	0.0118	0.0082
168	0.0203	0.0120	0.0083
169	0.0212	0.0125	0.0087
170	0.0215	0.0127	0.0088
171	0.0222	0.0131	0.0091
172	0.0226	0.0133	0.0092
173	0.0233	0.0138	0.0096
174	0.0238	0.0140	0.0097
175	0.0247	0.0146	0.0101
176	0.0252	0.0149	0.0103
177	0.0263	0.0155	0.0108

178	0.0269	0.0159	0.0110
179	0.0282	0.0166	0.0116
180	0.0290	0.0166	0.0124
181	0.0307	0.0166	0.0141
182	0.0316	0.0166	0.0150
183	0.0339	0.0166	0.0172
184	0.0351	0.0166	0.0185
185	0.0322	0.0166	0.0156
186	0.0340	0.0166	0.0174
187	0.0386	0.0166	0.0220
188	0.0416	0.0166	0.0250
189	0.0524	0.0166	0.0358
190	0.0589	0.0166	0.0423
191	0.0833	0.0166	0.0667
192	0.1134	0.0166	0.0968
193	0.3366	0.0166	0.3200
194	0.0683	0.0166	0.0517
195	0.0453	0.0166	0.0287
196	0.0361	0.0166	0.0195
197	0.0366	0.0166	0.0200
198	0.0327	0.0166	0.0161
199	0.0298	0.0166	0.0132
200	0.0275	0.0163	0.0113
201	0.0257	0.0152	0.0105
202	0.0242	0.0143	0.0099
203	0.0229	0.0135	0.0094
204	0.0218	0.0129	0.0089
205	0.0206	0.0121	0.0084
206	0.0197	0.0116	0.0081
207	0.0190	0.0112	0.0078
208	0.0183	0.0108	0.0075
209	0.0177	0.0104	0.0072
210	0.0171	0.0101	0.0070
211	0.0166	0.0098	0.0068
212	0.0161	0.0095	0.0066
213	0.0157	0.0093	0.0064
214	0.0153	0.0090	0.0063
215	0.0149	0.0088	0.0061
216	0.0146	0.0086	0.0060
217	0.0113	0.0067	0.0046
218	0.0110	0.0065	0.0045
219	0.0107	0.0063	0.0044
220	0.0105	0.0062	0.0043
221	0.0103	0.0061	0.0042
222	0.0100	0.0059	0.0041
223	0.0098	0.0058	0.0040
224	0.0096	0.0057	0.0039
225	0.0094	0.0056	0.0039
226	0.0093	0.0055	0.0038
227	0.0091	0.0054	0.0037
228	0.0089	0.0053	0.0037
229	0.0088	0.0052	0.0036
230	0.0086	0.0051	0.0035
231	0.0085	0.0050	0.0035
232	0.0083	0.0049	0.0034
233	0.0082	0.0048	0.0034
234	0.0081	0.0048	0.0033
235	0.0080	0.0047	0.0033

236	0.0078	0.0046	0.0032
237	0.0077	0.0046	0.0032
238	0.0076	0.0045	0.0031
239	0.0075	0.0044	0.0031
240	0.0074	0.0044	0.0030
241	0.0073	0.0043	0.0030
242	0.0072	0.0043	0.0030
243	0.0071	0.0042	0.0029
244	0.0070	0.0042	0.0029
245	0.0070	0.0041	0.0029
246	0.0069	0.0041	0.0028
247	0.0068	0.0040	0.0028
248	0.0067	0.0040	0.0028
249	0.0066	0.0039	0.0027
250	0.0066	0.0039	0.0027
251	0.0065	0.0038	0.0027
252	0.0064	0.0038	0.0026
253	0.0064	0.0038	0.0026
254	0.0063	0.0037	0.0026
255	0.0062	0.0037	0.0026
256	0.0062	0.0036	0.0025
257	0.0061	0.0036	0.0025
258	0.0061	0.0036	0.0025
259	0.0060	0.0035	0.0025
260	0.0059	0.0035	0.0024
261	0.0059	0.0035	0.0024
262	0.0058	0.0034	0.0024
263	0.0058	0.0034	0.0024
264	0.0057	0.0034	0.0023
265	0.0057	0.0034	0.0023
266	0.0056	0.0033	0.0023
267	0.0056	0.0033	0.0023
268	0.0055	0.0033	0.0023
269	0.0055	0.0032	0.0022
270	0.0054	0.0032	0.0022
271	0.0054	0.0032	0.0022
272	0.0054	0.0032	0.0022
273	0.0053	0.0031	0.0022
274	0.0053	0.0031	0.0022
275	0.0052	0.0031	0.0021
276	0.0052	0.0031	0.0021
277	0.0052	0.0030	0.0021
278	0.0051	0.0030	0.0021
279	0.0051	0.0030	0.0021
280	0.0050	0.0030	0.0021
281	0.0050	0.0030	0.0020
282	0.0050	0.0029	0.0020
283	0.0049	0.0029	0.0020
284	0.0049	0.0029	0.0020
285	0.0049	0.0029	0.0020
286	0.0048	0.0029	0.0020
287	0.0048	0.0028	0.0020
288	0.0048	0.0028	0.0020

Total soil rain loss = 1.80(In)
Total effective rainfall = 1.88(In)
Peak flow rate in flood hydrograph = 365.60(CFS)

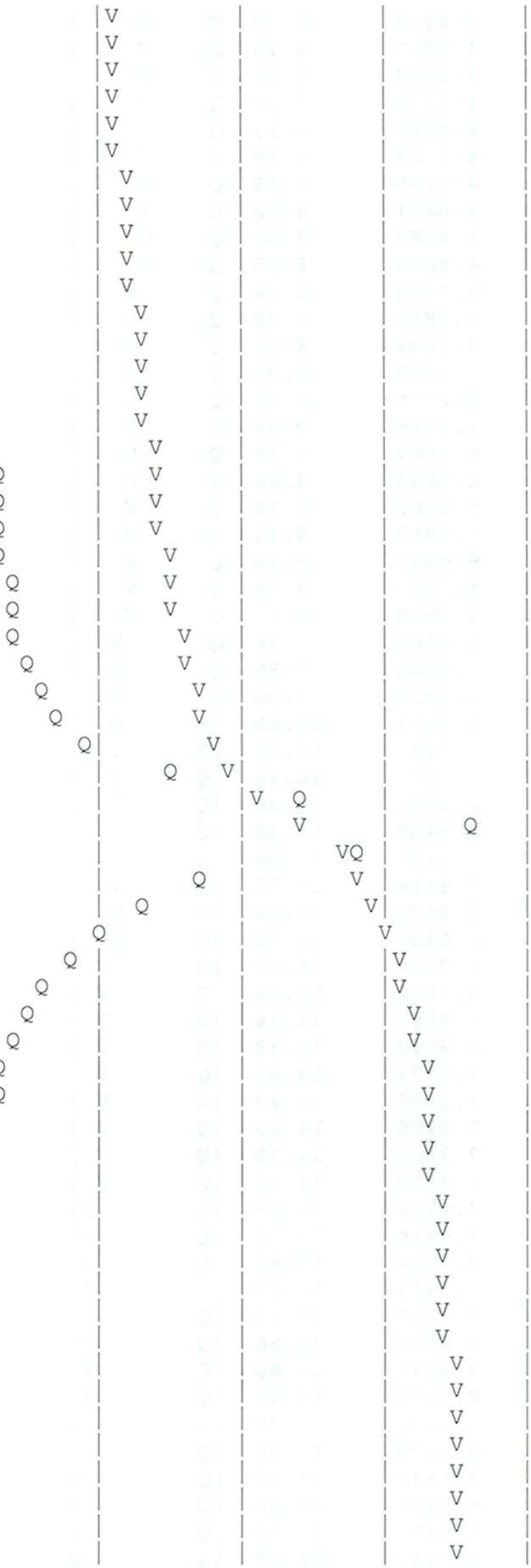
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	100.0	200.0	300.0	400.0
0+ 5	0.0011	0.16	Q				
0+10	0.0062	0.75	Q				
0+15	0.0222	2.32	Q				
0+20	0.0459	3.44	Q				
0+25	0.0731	3.95	Q				
0+30	0.1027	4.29	Q				
0+35	0.1340	4.54	Q				
0+40	0.1665	4.73	Q				
0+45	0.2000	4.86	Q				
0+50	0.2342	4.96	Q				
0+55	0.2687	5.02	Q				
1+ 0	0.3036	5.06	Q				
1+ 5	0.3386	5.09	Q				
1+10	0.3739	5.12	Q				
1+15	0.4094	5.16	Q				
1+20	0.4452	5.19	Q				
1+25	0.4811	5.21	Q				
1+30	0.5171	5.23	Q				
1+35	0.5533	5.25	Q				
1+40	0.5896	5.27	Q				
1+45	0.6260	5.29	Q				
1+50	0.6626	5.31	Q				
1+55	0.6993	5.33	Q				
2+ 0	0.7361	5.35	Q				
2+ 5	0.7731	5.37	Q				
2+10	0.8102	5.39	Q				
2+15	0.8474	5.41	QV				
2+20	0.8848	5.43	QV				
2+25	0.9223	5.45	QV				
2+30	0.9600	5.47	QV				
2+35	0.9978	5.49	QV				
2+40	1.0357	5.51	QV				
2+45	1.0738	5.53	QV				
2+50	1.1121	5.55	QV				
2+55	1.1505	5.57	QV				
3+ 0	1.1890	5.60	QV				
3+ 5	1.2277	5.62	QV				
3+10	1.2666	5.64	QV				
3+15	1.3056	5.66	QV				
3+20	1.3447	5.69	QV				
3+25	1.3841	5.71	QV				
3+30	1.4235	5.73	QV				
3+35	1.4632	5.76	QV				
3+40	1.5030	5.78	QV				
3+45	1.5430	5.80	QV				
3+50	1.5831	5.83	QV				
3+55	1.6234	5.85	QV				
4+ 0	1.6639	5.88	QV				

4+ 5	1.7045	5.90	Q	V			
4+10	1.7454	5.93	Q	V			
4+15	1.7864	5.95	Q	V			
4+20	1.8275	5.98	Q	V			
4+25	1.8689	6.01	Q	V			
4+30	1.9105	6.03	Q	V			
4+35	1.9522	6.06	Q	V			
4+40	1.9941	6.09	Q	V			
4+45	2.0362	6.11	Q	V			
4+50	2.0785	6.14	Q	V			
4+55	2.1210	6.17	Q	V			
5+ 0	2.1637	6.20	Q	V			
5+ 5	2.2066	6.23	Q	V			
5+10	2.2496	6.26	Q	V			
5+15	2.2929	6.29	Q	V			
5+20	2.3364	6.32	Q	V			
5+25	2.3801	6.35	Q	V			
5+30	2.4240	6.38	Q	V			
5+35	2.4682	6.41	Q	V			
5+40	2.5125	6.44	Q	V			
5+45	2.5571	6.47	Q	V			
5+50	2.6019	6.50	Q	V			
5+55	2.6469	6.54	Q	V			
6+ 0	2.6921	6.57	Q	V			
6+ 5	2.7376	6.60	Q	V			
6+10	2.7833	6.64	Q	V			
6+15	2.8292	6.67	Q	V			
6+20	2.8754	6.70	Q	V			
6+25	2.9218	6.74	Q	V			
6+30	2.9685	6.78	Q	V			
6+35	3.0154	6.81	Q	V			
6+40	3.0626	6.85	Q	V			
6+45	3.1100	6.89	Q	V			
6+50	3.1577	6.92	Q	V			
6+55	3.2057	6.96	Q	V			
7+ 0	3.2539	7.00	Q	V			
7+ 5	3.3024	7.04	Q	V			
7+10	3.3512	7.08	Q	V			
7+15	3.4002	7.12	Q	V			
7+20	3.4495	7.16	Q	V			
7+25	3.4992	7.21	Q	V			
7+30	3.5491	7.25	Q	V			
7+35	3.5993	7.29	Q	V			
7+40	3.6498	7.34	Q	V			
7+45	3.7007	7.38	Q	V			
7+50	3.7518	7.43	Q	V			
7+55	3.8033	7.47	Q	V			
8+ 0	3.8550	7.52	Q	V			
8+ 5	3.9072	7.57	Q	V			
8+10	3.9596	7.61	Q	V			
8+15	4.0124	7.66	Q	V			
8+20	4.0655	7.71	Q	V			
8+25	4.1190	7.77	Q	V			
8+30	4.1728	7.82	Q	V			
8+35	4.2270	7.87	Q	V			
8+40	4.2816	7.92	Q	V			
8+45	4.3365	7.98	Q	V			
8+50	4.3919	8.03	Q	V			

8+55	4.4476	8.09	Q	V	|	|	|	|
9+ 0	4.5037	8.15	Q	V	|	|	|	|
9+ 5	4.5602	8.21	Q	V	|	|	|	|
9+10	4.6171	8.27	Q	V	|	|	|	|
9+15	4.6745	8.33	Q	V	|	|	|	|
9+20	4.7323	8.39	Q	V	|	|	|	|
9+25	4.7905	8.45	Q	V	|	|	|	|
9+30	4.8491	8.52	Q	V	|	|	|	|
9+35	4.9082	8.58	Q	V	|	|	|	|
9+40	4.9678	8.65	Q	V	|	|	|	|
9+45	5.0279	8.72	Q	V	|	|	|	|
9+50	5.0884	8.79	Q	V	|	|	|	|
9+55	5.1494	8.86	Q	V	|	|	|	|
10+ 0	5.2109	8.93	Q	V	|	|	|	|
10+ 5	5.2730	9.01	Q	V	|	|	|	|
10+10	5.3355	9.08	Q	V	|	|	|	|
10+15	5.3987	9.16	Q	V	|	|	|	|
10+20	5.4623	9.24	Q	V	|	|	|	|
10+25	5.5265	9.32	Q	V	|	|	|	|
10+30	5.5913	9.41	Q	V	|	|	|	|
10+35	5.6567	9.49	Q	V	|	|	|	|
10+40	5.7227	9.58	Q	V	|	|	|	|
10+45	5.7893	9.67	Q	V	|	|	|	|
10+50	5.8565	9.76	Q	V	|	|	|	|
10+55	5.9244	9.86	Q	V	|	|	|	|
11+ 0	5.9929	9.95	Q	V	|	|	|	|
11+ 5	6.0621	10.05	|Q	V	|	|	|	|
11+10	6.1320	10.15	|Q	V	|	|	|	|
11+15	6.2027	10.26	|Q	V	|	|	|	|
11+20	6.2741	10.36	|Q	V	|	|	|	|
11+25	6.3462	10.48	|Q	V	|	|	|	|
11+30	6.4191	10.59	|Q	V	|	|	|	|
11+35	6.4928	10.71	|Q	V	|	|	|	|
11+40	6.5674	10.82	|Q	V	|	|	|	|
11+45	6.6428	10.95	|Q	V	|	|	|	|
11+50	6.7190	11.07	|Q	V	|	|	|	|
11+55	6.7962	11.21	|Q	V	|	|	|	|
12+ 0	6.8743	11.34	|Q	V	|	|	|	|
12+ 5	6.9540	11.58	|Q	V	|	|	|	|
12+10	7.0373	12.09	|Q	V	|	|	|	|
12+15	7.1285	13.23	|Q	V	|	|	|	|
12+20	7.2255	14.09	|Q	V	|	|	|	|
12+25	7.3259	14.58	|Q	V	|	|	|	|
12+30	7.4289	14.95	|Q	V	|	|	|	|
12+35	7.5342	15.29	|Q	V	|	|	|	|
12+40	7.6414	15.57	|Q	V	|	|	|	|
12+45	7.7506	15.85	|Q	V	|	|	|	|
12+50	7.8614	16.09	|Q	V	|	|	|	|
12+55	7.9739	16.33	|Q	V	|	|	|	|
13+ 0	8.0879	16.56	|Q	V	|	|	|	|
13+ 5	8.2036	16.80	|Q	V	|	|	|	|
13+10	8.3209	17.04	|Q	V	|	|	|	|
13+15	8.4400	17.29	|Q	V	|	|	|	|
13+20	8.5609	17.55	|Q	V	|	|	|	|
13+25	8.6837	17.82	|Q	V	|	|	|	|
13+30	8.8083	18.10	|Q	V	|	|	|	|
13+35	8.9350	18.39	|Q	V	|	|	|	|
13+40	9.0637	18.69	|Q	V	|	|	|	|

13+45	9.1947	19.02	
13+50	9.3279	19.34	
13+55	9.4636	19.70	
14+ 0	9.6018	20.07	
14+ 5	9.7429	20.48	
14+10	9.8870	20.93	
14+15	10.0350	21.49	
14+20	10.1866	22.02	
14+25	10.3421	22.57	
14+30	10.5013	23.12	
14+35	10.6647	23.72	
14+40	10.8323	24.34	
14+45	11.0047	25.04	
14+50	11.1821	25.75	
14+55	11.3651	26.57	
15+ 0	11.5543	27.48	
15+ 5	11.7522	28.73	
15+10	11.9624	30.52	
15+15	12.1903	33.10	
15+20	12.4385	36.03	
15+25	12.7086	39.23	
15+30	12.9945	41.51	
15+35	13.2827	41.84	
15+40	13.5877	44.29	
15+45	13.9375	50.80	
15+50	14.3517	60.14	
15+55	14.8751	76.00	
16+ 0	15.5571	99.02	
16+ 5	16.6143	153.50	
16+10	18.2818	242.13	
16+15	20.7997	365.60	
16+20	22.7536	283.70	
16+25	23.9579	174.86	
16+30	24.8548	130.23	
16+35	25.5712	104.03	
16+40	26.1499	84.02	
16+45	26.6103	66.85	
16+50	26.9768	53.21	
16+55	27.2675	42.21	
17+ 0	27.5135	35.73	
17+ 5	27.7356	32.24	
17+10	27.9369	29.24	
17+15	28.1261	27.46	
17+20	28.3004	25.31	
17+25	28.4601	23.18	
17+30	28.6084	21.54	
17+35	28.7463	20.02	
17+40	28.8785	19.19	
17+45	29.0059	18.49	
17+50	29.1290	17.88	
17+55	29.2483	17.32	
18+ 0	29.3642	16.83	
18+ 5	29.4763	16.28	
18+10	29.5830	15.49	
18+15	29.6803	14.12	
18+20	29.7703	13.07	
18+25	29.8559	12.44	
18+30	29.9381	11.93	

18+35	30.0173	11.50	|Q	|	|	|	V |
18+40	30.0940	11.14	|Q	|	|	|	V |
18+45	30.1685	10.82	|Q	|	|	|	V |
18+50	30.2410	10.53	|Q	|	|	|	V |
18+55	30.3119	10.29	|Q	|	|	|	V |
19+ 0	30.3813	10.07	|Q	|	|	|	V |
19+ 5	30.4492	9.86	Q	|	|	|	V |
19+10	30.5158	9.67	Q	|	|	|	V |
19+15	30.5811	9.48	Q	|	|	|	V |
19+20	30.6452	9.31	Q	|	|	|	V |
19+25	30.7082	9.14	Q	|	|	|	V |
19+30	30.7700	8.99	Q	|	|	|	V |
19+35	30.8309	8.84	Q	|	|	|	V |
19+40	30.8908	8.70	Q	|	|	|	V |
19+45	30.9498	8.56	Q	|	|	|	V |
19+50	31.0078	8.43	Q	|	|	|	V |
19+55	31.0650	8.31	Q	|	|	|	V |
20+ 0	31.1214	8.19	Q	|	|	|	V |
20+ 5	31.1770	8.07	Q	|	|	|	V |
20+10	31.2318	7.96	Q	|	|	|	V |
20+15	31.2859	7.85	Q	|	|	|	V |
20+20	31.3392	7.75	Q	|	|	|	V |
20+25	31.3919	7.65	Q	|	|	|	V |
20+30	31.4439	7.55	Q	|	|	|	V |
20+35	31.4952	7.45	Q	|	|	|	V |
20+40	31.5459	7.36	Q	|	|	|	V |
20+45	31.5960	7.28	Q	|	|	|	V |
20+50	31.6456	7.19	Q	|	|	|	V |
20+55	31.6945	7.11	Q	|	|	|	V |
21+ 0	31.7429	7.03	Q	|	|	|	V |
21+ 5	31.7907	6.95	Q	|	|	|	V |
21+10	31.8381	6.87	Q	|	|	|	V |
21+15	31.8849	6.80	Q	|	|	|	V |
21+20	31.9312	6.73	Q	|	|	|	V |
21+25	31.9771	6.66	Q	|	|	|	V |
21+30	32.0224	6.59	Q	|	|	|	V |
21+35	32.0674	6.52	Q	|	|	|	V |
21+40	32.1118	6.46	Q	|	|	|	V |
21+45	32.1559	6.39	Q	|	|	|	V |
21+50	32.1995	6.33	Q	|	|	|	V |
21+55	32.2427	6.27	Q	|	|	|	V |
22+ 0	32.2855	6.21	Q	|	|	|	V |
22+ 5	32.3279	6.16	Q	|	|	|	V |
22+10	32.3699	6.10	Q	|	|	|	V |
22+15	32.4116	6.05	Q	|	|	|	V |
22+20	32.4529	5.99	Q	|	|	|	V |
22+25	32.4938	5.94	Q	|	|	|	V |
22+30	32.5344	5.89	Q	|	|	|	V|
22+35	32.5746	5.84	Q	|	|	|	V|
22+40	32.6145	5.79	Q	|	|	|	V|
22+45	32.6541	5.75	Q	|	|	|	V|
22+50	32.6933	5.70	Q	|	|	|	V|
22+55	32.7323	5.65	Q	|	|	|	V|
23+ 0	32.7709	5.61	Q	|	|	|	V|
23+ 5	32.8092	5.57	Q	|	|	|	V|
23+10	32.8473	5.52	Q	|	|	|	V|
23+15	32.8850	5.48	Q	|	|	|	V|
23+20	32.9225	5.44	Q	|	|	|	V|

23+25	32.9597	5.40	Q	|	|	|	V|
23+30	32.9966	5.36	Q	|	|	|	V|
23+35	33.0332	5.32	Q	|	|	|	V|
23+40	33.0696	5.28	Q	|	|	|	V|
23+45	33.1057	5.24	Q	|	|	|	V|
23+50	33.1416	5.21	Q	|	|	|	V|
23+55	33.1772	5.17	Q	|	|	|	V|
24+ 0	33.2125	5.14	Q	|	|	|	V|
24+ 5	33.2466	4.94	Q	|	|	|	V|
24+10	33.2764	4.32	Q	|	|	|	V|
24+15	33.2952	2.73	Q	|	|	|	V|
24+20	33.3061	1.59	Q	|	|	|	V|
24+25	33.3136	1.09	Q	|	|	|	V|
24+30	33.3188	0.75	Q	|	|	|	V|
24+35	33.3223	0.51	Q	|	|	|	V|
24+40	33.3246	0.34	Q	|	|	|	V|
24+45	33.3261	0.22	Q	|	|	|	V|
24+50	33.3271	0.14	Q	|	|	|	V|
24+55	33.3277	0.09	Q	|	|	|	V|
25+ 0	33.3282	0.07	Q	|	|	|	V|
25+ 5	33.3286	0.05	Q	|	|	|	V|
25+10	33.3288	0.04	Q	|	|	|	V|
25+15	33.3290	0.02	Q	|	|	|	V|
25+20	33.3291	0.01	Q	|	|	|	V|
25+25	33.3291	0.00	Q	|	|	|	V|

U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/26/12 File Name UNIT25Y24HPR1B.out

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Orange County Unit Hydrograph Hydrology Method
Manual Date(s) - October 1986, November 1996

Program License Serial Number 6062

ESPERANZA HILLS OPTION 1
DETENTION BASIN ANALYSIS
PROPOSED CONDITION AREA B
25-YEAR 24-HOUR

Storm Event Year = 25

Antecedent Moisture Condition = 2

English (in-lb) Input Units Used

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	Area (Ac.)	Area Fraction	Soil Group	Fp (In/Hr)	Ap (dec.)	Fm (In/Hr)
69.0	123.5	0.58	C	0.250	0.870	0.218
75.0	89.0	0.42	D	0.200	0.870	0.174

Area-averaged adjusted loss rate Fm (In/Hr) = 0.199

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC2)	S	Pervious Yield Fr
107.44	0.506	69.0	69.0	4.49	0.355
16.06	0.076	98.0	98.0	0.20	0.947
77.43	0.364	75.0	75.0	3.33	0.455
11.57	0.054	98.0	98.0	0.20	0.947

Area-averaged catchment yield fraction, Y = 0.469
Area-averaged low loss fraction, Yb = 0.531

++

User entry of time of concentration = 0.290 (hours)
Watershed area = 212.50(Ac.)
Catchment Lag time = 0.232 hours
Unit interval = 5.000 minutes

Unit interval percentage of lag time = 35.9195
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.199(In/Hr)
Average low loss rate fraction (Yb) = 0.531 (decimal)
FOOTHILL S-Graph Selected
Computed peak 5-minute rainfall = 0.400(In)
Computed peak 30-minute rainfall = 0.870(In)
Specified peak 1-hour rainfall = 1.150(In)
Computed peak 3-hour rainfall = 1.940(In)
Specified peak 6-hour rainfall = 2.710(In)
Specified peak 24-hour rainfall = 4.490(In)

Rainfall depth area reduction factors:
Using a total area of 212.50(Ac.) (Ref: fig. E-4)

5-minute factor = 0.990 Adjusted rainfall = 0.396(In)
30-minute factor = 0.990 Adjusted rainfall = 0.861(In)
1-hour factor = 0.990 Adjusted rainfall = 1.139(In)
3-hour factor = 0.999 Adjusted rainfall = 1.938(In)
6-hour factor = 0.999 Adjusted rainfall = 2.708(In)
24-hour factor = 1.000 Adjusted rainfall = 4.489(In)

U n i t H y d r o g r a p h

(K = 2569.92 (CFS))

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
1	2.711	69.678
2	12.245	245.008
3	36.560	624.883
4	63.553	693.702
5	74.601	283.922
6	81.817	185.427
7	86.987	132.865
8	90.828	98.725
9	93.705	73.925
10	95.769	53.059
11	97.219	37.248
12	98.052	21.406
13	98.480	11.008
14	98.849	9.477
15	99.125	7.101
16	99.358	5.976
17	99.635	7.133
18	99.814	4.607
19	99.929	2.938
20	100.000	1.833

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.3960	0.3960
2	0.5349	0.1389
3	0.6377	0.1028
4	0.7224	0.0847

5	0.7959	0.0734
6	0.8613	0.0655
7	0.9165	0.0551
8	0.9671	0.0506
9	1.0140	0.0470
10	1.0580	0.0439
11	1.0994	0.0414
12	1.1385	0.0392
13	1.1835	0.0450
14	1.2267	0.0432
15	1.2684	0.0417
16	1.3086	0.0402
17	1.3476	0.0390
18	1.3854	0.0378
19	1.4221	0.0367
20	1.4579	0.0357
21	1.4927	0.0348
22	1.5267	0.0340
23	1.5599	0.0332
24	1.5923	0.0325
25	1.6241	0.0318
26	1.6552	0.0311
27	1.6857	0.0305
28	1.7157	0.0299
29	1.7451	0.0294
30	1.7739	0.0289
31	1.8023	0.0284
32	1.8302	0.0279
33	1.8577	0.0275
34	1.8847	0.0270
35	1.9113	0.0266
36	1.9376	0.0262
37	1.9634	0.0258
38	1.9888	0.0255
39	2.0139	0.0251
40	2.0387	0.0248
41	2.0632	0.0245
42	2.0874	0.0242
43	2.1112	0.0239
44	2.1348	0.0236
45	2.1581	0.0233
46	2.1811	0.0230
47	2.2039	0.0228
48	2.2264	0.0225
49	2.2487	0.0223
50	2.2708	0.0221
51	2.2926	0.0218
52	2.3142	0.0216
53	2.3356	0.0214
54	2.3568	0.0212
55	2.3778	0.0210
56	2.3986	0.0208
57	2.4192	0.0206
58	2.4396	0.0204
59	2.4598	0.0202
60	2.4799	0.0201
61	2.4997	0.0199
62	2.5195	0.0197

63	2.5390	0.0196
64	2.5584	0.0194
65	2.5776	0.0192
66	2.5967	0.0191
67	2.6157	0.0189
68	2.6344	0.0188
69	2.6531	0.0186
70	2.6716	0.0185
71	2.6900	0.0184
72	2.7082	0.0182
73	2.7219	0.0137
74	2.7354	0.0135
75	2.7488	0.0134
76	2.7621	0.0133
77	2.7753	0.0132
78	2.7884	0.0131
79	2.8014	0.0130
80	2.8142	0.0129
81	2.8270	0.0128
82	2.8397	0.0127
83	2.8522	0.0126
84	2.8647	0.0125
85	2.8771	0.0124
86	2.8894	0.0123
87	2.9016	0.0122
88	2.9137	0.0121
89	2.9257	0.0120
90	2.9377	0.0119
91	2.9495	0.0119
92	2.9613	0.0118
93	2.9730	0.0117
94	2.9846	0.0116
95	2.9961	0.0115
96	3.0076	0.0115
97	3.0190	0.0114
98	3.0303	0.0113
99	3.0415	0.0112
100	3.0527	0.0112
101	3.0638	0.0111
102	3.0748	0.0110
103	3.0858	0.0110
104	3.0966	0.0109
105	3.1075	0.0108
106	3.1182	0.0108
107	3.1289	0.0107
108	3.1395	0.0106
109	3.1501	0.0106
110	3.1606	0.0105
111	3.1711	0.0104
112	3.1814	0.0104
113	3.1918	0.0103
114	3.2020	0.0103
115	3.2122	0.0102
116	3.2224	0.0102
117	3.2325	0.0101
118	3.2425	0.0100
119	3.2525	0.0100
120	3.2625	0.0099

121	3.2723	0.0099
122	3.2822	0.0098
123	3.2920	0.0098
124	3.3017	0.0097
125	3.3114	0.0097
126	3.3210	0.0096
127	3.3306	0.0096
128	3.3401	0.0095
129	3.3496	0.0095
130	3.3590	0.0094
131	3.3684	0.0094
132	3.3778	0.0093
133	3.3871	0.0093
134	3.3964	0.0093
135	3.4056	0.0092
136	3.4147	0.0092
137	3.4239	0.0091
138	3.4330	0.0091
139	3.4420	0.0090
140	3.4510	0.0090
141	3.4600	0.0090
142	3.4689	0.0089
143	3.4778	0.0089
144	3.4866	0.0088
145	3.4954	0.0088
146	3.5042	0.0088
147	3.5129	0.0087
148	3.5216	0.0087
149	3.5303	0.0087
150	3.5389	0.0086
151	3.5475	0.0086
152	3.5560	0.0085
153	3.5645	0.0085
154	3.5730	0.0085
155	3.5814	0.0084
156	3.5899	0.0084
157	3.5982	0.0084
158	3.6066	0.0083
159	3.6149	0.0083
160	3.6231	0.0083
161	3.6314	0.0082
162	3.6396	0.0082
163	3.6478	0.0082
164	3.6559	0.0081
165	3.6640	0.0081
166	3.6721	0.0081
167	3.6801	0.0080
168	3.6881	0.0080
169	3.6961	0.0080
170	3.7041	0.0080
171	3.7120	0.0079
172	3.7199	0.0079
173	3.7278	0.0079
174	3.7356	0.0078
175	3.7434	0.0078
176	3.7512	0.0078
177	3.7590	0.0078
178	3.7667	0.0077

179	3.7744	0.0077
180	3.7821	0.0077
181	3.7897	0.0076
182	3.7973	0.0076
183	3.8049	0.0076
184	3.8125	0.0076
185	3.8200	0.0075
186	3.8275	0.0075
187	3.8350	0.0075
188	3.8425	0.0075
189	3.8499	0.0074
190	3.8573	0.0074
191	3.8647	0.0074
192	3.8721	0.0074
193	3.8794	0.0073
194	3.8867	0.0073
195	3.8940	0.0073
196	3.9013	0.0073
197	3.9085	0.0072
198	3.9158	0.0072
199	3.9230	0.0072
200	3.9301	0.0072
201	3.9373	0.0072
202	3.9444	0.0071
203	3.9515	0.0071
204	3.9586	0.0071
205	3.9657	0.0071
206	3.9727	0.0070
207	3.9797	0.0070
208	3.9867	0.0070
209	3.9937	0.0070
210	4.0007	0.0070
211	4.0076	0.0069
212	4.0145	0.0069
213	4.0214	0.0069
214	4.0283	0.0069
215	4.0351	0.0069
216	4.0420	0.0068
217	4.0488	0.0068
218	4.0556	0.0068
219	4.0623	0.0068
220	4.0691	0.0068
221	4.0758	0.0067
222	4.0825	0.0067
223	4.0892	0.0067
224	4.0959	0.0067
225	4.1025	0.0067
226	4.1092	0.0066
227	4.1158	0.0066
228	4.1224	0.0066
229	4.1290	0.0066
230	4.1355	0.0066
231	4.1421	0.0065
232	4.1486	0.0065
233	4.1551	0.0065
234	4.1616	0.0065
235	4.1681	0.0065
236	4.1745	0.0065

237	4.1810	0.0064
238	4.1874	0.0064
239	4.1938	0.0064
240	4.2002	0.0064
241	4.2066	0.0064
242	4.2129	0.0064
243	4.2193	0.0063
244	4.2256	0.0063
245	4.2319	0.0063
246	4.2382	0.0063
247	4.2444	0.0063
248	4.2507	0.0063
249	4.2569	0.0062
250	4.2632	0.0062
251	4.2694	0.0062
252	4.2756	0.0062
253	4.2817	0.0062
254	4.2879	0.0062
255	4.2940	0.0061
256	4.3002	0.0061
257	4.3063	0.0061
258	4.3124	0.0061
259	4.3185	0.0061
260	4.3245	0.0061
261	4.3306	0.0061
262	4.3366	0.0060
263	4.3427	0.0060
264	4.3487	0.0060
265	4.3547	0.0060
266	4.3607	0.0060
267	4.3666	0.0060
268	4.3726	0.0060
269	4.3785	0.0059
270	4.3844	0.0059
271	4.3904	0.0059
272	4.3963	0.0059
273	4.4021	0.0059
274	4.4080	0.0059
275	4.4139	0.0059
276	4.4197	0.0058
277	4.4255	0.0058
278	4.4314	0.0058
279	4.4372	0.0058
280	4.4430	0.0058
281	4.4487	0.0058
282	4.4545	0.0058
283	4.4602	0.0058
284	4.4660	0.0057
285	4.4717	0.0057
286	4.4774	0.0057
287	4.4831	0.0057
288	4.4888	0.0057

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0057	0.0030	0.0027

2	0.0057	0.0030	0.0027
3	0.0057	0.0030	0.0027
4	0.0057	0.0030	0.0027
5	0.0058	0.0031	0.0027
6	0.0058	0.0031	0.0027
7	0.0058	0.0031	0.0027
8	0.0058	0.0031	0.0027
9	0.0058	0.0031	0.0027
10	0.0059	0.0031	0.0027
11	0.0059	0.0031	0.0028
12	0.0059	0.0031	0.0028
13	0.0059	0.0031	0.0028
14	0.0059	0.0032	0.0028
15	0.0060	0.0032	0.0028
16	0.0060	0.0032	0.0028
17	0.0060	0.0032	0.0028
18	0.0060	0.0032	0.0028
19	0.0061	0.0032	0.0028
20	0.0061	0.0032	0.0028
21	0.0061	0.0032	0.0029
22	0.0061	0.0032	0.0029
23	0.0061	0.0033	0.0029
24	0.0062	0.0033	0.0029
25	0.0062	0.0033	0.0029
26	0.0062	0.0033	0.0029
27	0.0062	0.0033	0.0029
28	0.0063	0.0033	0.0029
29	0.0063	0.0033	0.0029
30	0.0063	0.0034	0.0030
31	0.0063	0.0034	0.0030
32	0.0064	0.0034	0.0030
33	0.0064	0.0034	0.0030
34	0.0064	0.0034	0.0030
35	0.0064	0.0034	0.0030
36	0.0065	0.0034	0.0030
37	0.0065	0.0034	0.0030
38	0.0065	0.0035	0.0031
39	0.0065	0.0035	0.0031
40	0.0066	0.0035	0.0031
41	0.0066	0.0035	0.0031
42	0.0066	0.0035	0.0031
43	0.0067	0.0035	0.0031
44	0.0067	0.0035	0.0031
45	0.0067	0.0036	0.0031
46	0.0067	0.0036	0.0032
47	0.0068	0.0036	0.0032
48	0.0068	0.0036	0.0032
49	0.0068	0.0036	0.0032
50	0.0069	0.0036	0.0032
51	0.0069	0.0037	0.0032
52	0.0069	0.0037	0.0032
53	0.0070	0.0037	0.0033
54	0.0070	0.0037	0.0033
55	0.0070	0.0037	0.0033
56	0.0070	0.0037	0.0033
57	0.0071	0.0038	0.0033
58	0.0071	0.0038	0.0033
59	0.0072	0.0038	0.0034

60	0.0072	0.0038	0.0034
61	0.0072	0.0038	0.0034
62	0.0072	0.0038	0.0034
63	0.0073	0.0039	0.0034
64	0.0073	0.0039	0.0034
65	0.0074	0.0039	0.0035
66	0.0074	0.0039	0.0035
67	0.0074	0.0040	0.0035
68	0.0075	0.0040	0.0035
69	0.0075	0.0040	0.0035
70	0.0075	0.0040	0.0035
71	0.0076	0.0040	0.0036
72	0.0076	0.0040	0.0036
73	0.0077	0.0041	0.0036
74	0.0077	0.0041	0.0036
75	0.0078	0.0041	0.0036
76	0.0078	0.0041	0.0036
77	0.0078	0.0042	0.0037
78	0.0079	0.0042	0.0037
79	0.0079	0.0042	0.0037
80	0.0080	0.0042	0.0037
81	0.0080	0.0043	0.0038
82	0.0080	0.0043	0.0038
83	0.0081	0.0043	0.0038
84	0.0081	0.0043	0.0038
85	0.0082	0.0044	0.0038
86	0.0082	0.0044	0.0039
87	0.0083	0.0044	0.0039
88	0.0083	0.0044	0.0039
89	0.0084	0.0045	0.0039
90	0.0084	0.0045	0.0040
91	0.0085	0.0045	0.0040
92	0.0085	0.0045	0.0040
93	0.0086	0.0046	0.0040
94	0.0087	0.0046	0.0041
95	0.0087	0.0046	0.0041
96	0.0088	0.0047	0.0041
97	0.0088	0.0047	0.0041
98	0.0089	0.0047	0.0042
99	0.0090	0.0048	0.0042
100	0.0090	0.0048	0.0042
101	0.0091	0.0048	0.0043
102	0.0091	0.0049	0.0043
103	0.0092	0.0049	0.0043
104	0.0093	0.0049	0.0043
105	0.0093	0.0050	0.0044
106	0.0094	0.0050	0.0044
107	0.0095	0.0050	0.0044
108	0.0095	0.0051	0.0045
109	0.0096	0.0051	0.0045
110	0.0097	0.0051	0.0045
111	0.0098	0.0052	0.0046
112	0.0098	0.0052	0.0046
113	0.0099	0.0053	0.0047
114	0.0100	0.0053	0.0047
115	0.0101	0.0054	0.0047
116	0.0102	0.0054	0.0048
117	0.0103	0.0055	0.0048

118	0.0103	0.0055	0.0048
119	0.0104	0.0055	0.0049
120	0.0105	0.0056	0.0049
121	0.0106	0.0056	0.0050
122	0.0107	0.0057	0.0050
123	0.0108	0.0057	0.0051
124	0.0109	0.0058	0.0051
125	0.0110	0.0059	0.0052
126	0.0111	0.0059	0.0052
127	0.0112	0.0060	0.0053
128	0.0113	0.0060	0.0053
129	0.0115	0.0061	0.0054
130	0.0115	0.0061	0.0054
131	0.0117	0.0062	0.0055
132	0.0118	0.0063	0.0055
133	0.0119	0.0063	0.0056
134	0.0120	0.0064	0.0056
135	0.0122	0.0065	0.0057
136	0.0123	0.0065	0.0058
137	0.0125	0.0066	0.0058
138	0.0126	0.0067	0.0059
139	0.0128	0.0068	0.0060
140	0.0129	0.0068	0.0060
141	0.0131	0.0070	0.0061
142	0.0132	0.0070	0.0062
143	0.0134	0.0071	0.0063
144	0.0135	0.0072	0.0063
145	0.0182	0.0097	0.0085
146	0.0184	0.0098	0.0086
147	0.0186	0.0099	0.0087
148	0.0188	0.0100	0.0088
149	0.0191	0.0101	0.0089
150	0.0192	0.0102	0.0090
151	0.0196	0.0104	0.0092
152	0.0197	0.0105	0.0092
153	0.0201	0.0107	0.0094
154	0.0202	0.0108	0.0095
155	0.0206	0.0109	0.0097
156	0.0208	0.0110	0.0097
157	0.0212	0.0113	0.0099
158	0.0214	0.0114	0.0100
159	0.0218	0.0116	0.0102
160	0.0221	0.0117	0.0103
161	0.0225	0.0120	0.0106
162	0.0228	0.0121	0.0107
163	0.0233	0.0124	0.0109
164	0.0236	0.0125	0.0110
165	0.0242	0.0128	0.0113
166	0.0245	0.0130	0.0115
167	0.0251	0.0133	0.0118
168	0.0255	0.0135	0.0119
169	0.0262	0.0139	0.0123
170	0.0266	0.0141	0.0125
171	0.0275	0.0146	0.0129
172	0.0279	0.0148	0.0131
173	0.0289	0.0153	0.0135
174	0.0294	0.0156	0.0138
175	0.0305	0.0162	0.0143

176	0.0311	0.0165	0.0146
177	0.0325	0.0166	0.0159
178	0.0332	0.0166	0.0166
179	0.0348	0.0166	0.0182
180	0.0357	0.0166	0.0191
181	0.0378	0.0166	0.0212
182	0.0390	0.0166	0.0224
183	0.0417	0.0166	0.0250
184	0.0432	0.0166	0.0266
185	0.0392	0.0166	0.0226
186	0.0414	0.0166	0.0248
187	0.0470	0.0166	0.0304
188	0.0506	0.0166	0.0340
189	0.0655	0.0166	0.0489
190	0.0734	0.0166	0.0568
191	0.1028	0.0166	0.0862
192	0.1389	0.0166	0.1223
193	0.3960	0.0166	0.3794
194	0.0847	0.0166	0.0681
195	0.0551	0.0166	0.0385
196	0.0439	0.0166	0.0273
197	0.0450	0.0166	0.0284
198	0.0402	0.0166	0.0236
199	0.0367	0.0166	0.0201
200	0.0340	0.0166	0.0174
201	0.0318	0.0166	0.0152
202	0.0299	0.0159	0.0140
203	0.0284	0.0151	0.0133
204	0.0270	0.0144	0.0127
205	0.0258	0.0137	0.0121
206	0.0248	0.0132	0.0116
207	0.0239	0.0127	0.0112
208	0.0230	0.0122	0.0108
209	0.0223	0.0118	0.0104
210	0.0216	0.0115	0.0101
211	0.0210	0.0112	0.0098
212	0.0204	0.0108	0.0096
213	0.0199	0.0106	0.0093
214	0.0194	0.0103	0.0091
215	0.0189	0.0101	0.0089
216	0.0185	0.0098	0.0087
217	0.0137	0.0073	0.0064
218	0.0133	0.0071	0.0062
219	0.0130	0.0069	0.0061
220	0.0127	0.0067	0.0059
221	0.0124	0.0066	0.0058
222	0.0121	0.0064	0.0057
223	0.0119	0.0063	0.0056
224	0.0116	0.0062	0.0054
225	0.0114	0.0060	0.0053
226	0.0112	0.0059	0.0052
227	0.0110	0.0058	0.0051
228	0.0108	0.0057	0.0050
229	0.0106	0.0056	0.0050
230	0.0104	0.0055	0.0049
231	0.0102	0.0054	0.0048
232	0.0100	0.0053	0.0047
233	0.0099	0.0053	0.0046

234	0.0097	0.0052	0.0046
235	0.0096	0.0051	0.0045
236	0.0094	0.0050	0.0044
237	0.0093	0.0049	0.0044
238	0.0092	0.0049	0.0043
239	0.0090	0.0048	0.0042
240	0.0089	0.0047	0.0042
241	0.0088	0.0047	0.0041
242	0.0087	0.0046	0.0041
243	0.0086	0.0046	0.0040
244	0.0085	0.0045	0.0040
245	0.0084	0.0044	0.0039
246	0.0083	0.0044	0.0039
247	0.0082	0.0043	0.0038
248	0.0081	0.0043	0.0038
249	0.0080	0.0042	0.0037
250	0.0079	0.0042	0.0037
251	0.0078	0.0042	0.0037
252	0.0077	0.0041	0.0036
253	0.0076	0.0041	0.0036
254	0.0076	0.0040	0.0035
255	0.0075	0.0040	0.0035
256	0.0074	0.0039	0.0035
257	0.0073	0.0039	0.0034
258	0.0073	0.0039	0.0034
259	0.0072	0.0038	0.0034
260	0.0071	0.0038	0.0033
261	0.0071	0.0038	0.0033
262	0.0070	0.0037	0.0033
263	0.0069	0.0037	0.0032
264	0.0069	0.0037	0.0032
265	0.0068	0.0036	0.0032
266	0.0068	0.0036	0.0032
267	0.0067	0.0036	0.0031
268	0.0066	0.0035	0.0031
269	0.0066	0.0035	0.0031
270	0.0065	0.0035	0.0031
271	0.0065	0.0034	0.0030
272	0.0064	0.0034	0.0030
273	0.0064	0.0034	0.0030
274	0.0063	0.0034	0.0030
275	0.0063	0.0033	0.0029
276	0.0062	0.0033	0.0029
277	0.0062	0.0033	0.0029
278	0.0061	0.0033	0.0029
279	0.0061	0.0032	0.0029
280	0.0060	0.0032	0.0028
281	0.0060	0.0032	0.0028
282	0.0060	0.0032	0.0028
283	0.0059	0.0031	0.0028
284	0.0059	0.0031	0.0028
285	0.0058	0.0031	0.0027
286	0.0058	0.0031	0.0027
287	0.0058	0.0031	0.0027
288	0.0057	0.0030	0.0027

Total soil rain loss = 1.94(In)

Total effective rainfall = 2.55(In)
Peak flow rate in flood hydrograph = 392.14(CFS)

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24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	100.0	200.0	300.0	400.0
0+ 5	0.0013	0.19	Q				
0+10	0.0071	0.84	Q				
0+15	0.0243	2.51	Q				
0+20	0.0544	4.36	Q				
0+25	0.0897	5.13	Q				
0+30	0.1286	5.64	Q				
0+35	0.1700	6.02	Q				
0+40	0.2134	6.30	Q				
0+45	0.2583	6.52	Q				
0+50	0.3043	6.68	Q				
0+55	0.3512	6.80	Q				
1+ 0	0.3986	6.89	Q				
1+ 5	0.4464	6.94	Q				
1+10	0.4945	6.99	Q				
1+15	0.5430	7.03	Q				
1+20	0.5917	7.07	Q				
1+25	0.6407	7.12	Q				
1+30	0.6899	7.15	Q				
1+35	0.7394	7.19	Q				
1+40	0.7891	7.22	Q				
1+45	0.8390	7.24	Q				
1+50	0.8891	7.27	Q				
1+55	0.9393	7.30	Q				
2+ 0	0.9898	7.32	Q				
2+ 5	1.0404	7.35	Q				
2+10	1.0912	7.38	Q				
2+15	1.1422	7.41	QV				
2+20	1.1934	7.43	QV				
2+25	1.2448	7.46	QV				
2+30	1.2964	7.49	QV				
2+35	1.3481	7.52	QV				
2+40	1.4001	7.55	QV				
2+45	1.4523	7.58	QV				
2+50	1.5047	7.61	QV				
2+55	1.5573	7.64	QV				
3+ 0	1.6101	7.67	QV				
3+ 5	1.6631	7.70	QV				
3+10	1.7163	7.73	QV				
3+15	1.7698	7.76	QV				
3+20	1.8234	7.79	QV				
3+25	1.8773	7.82	QV				
3+30	1.9314	7.85	QV				
3+35	1.9857	7.89	QV				
3+40	2.0402	7.92	QV				
3+45	2.0950	7.95	QV				
3+50	2.1500	7.99	QV				

3+55	2.2053	8.02	QV	|	|	|	|
4+ 0	2.2607	8.06	Q V	|	|	|	|
4+ 5	2.3165	8.09	Q V	|	|	|	|
4+10	2.3724	8.12	Q V	|	|	|	|
4+15	2.4286	8.16	Q V	|	|	|	|
4+20	2.4851	8.20	Q V	|	|	|	|
4+25	2.5417	8.23	Q V	|	|	|	|
4+30	2.5987	8.27	Q V	|	|	|	|
4+35	2.6559	8.31	Q V	|	|	|	|
4+40	2.7134	8.34	Q V	|	|	|	|
4+45	2.7711	8.38	Q V	|	|	|	|
4+50	2.8291	8.42	Q V	|	|	|	|
4+55	2.8873	8.46	Q V	|	|	|	|
5+ 0	2.9459	8.50	Q V	|	|	|	|
5+ 5	3.0047	8.54	Q V	|	|	|	|
5+10	3.0637	8.58	Q V	|	|	|	|
5+15	3.1231	8.62	Q V	|	|	|	|
5+20	3.1827	8.66	Q V	|	|	|	|
5+25	3.2427	8.70	Q V	|	|	|	|
5+30	3.3029	8.74	Q V	|	|	|	|
5+35	3.3634	8.79	Q V	|	|	|	|
5+40	3.4242	8.83	Q V	|	|	|	|
5+45	3.4854	8.87	Q V	|	|	|	|
5+50	3.5468	8.92	Q V	|	|	|	|
5+55	3.6085	8.96	Q V	|	|	|	|
6+ 0	3.6706	9.01	Q V	|	|	|	|
6+ 5	3.7329	9.06	Q V	|	|	|	|
6+10	3.7956	9.10	Q V	|	|	|	|
6+15	3.8587	9.15	Q V	|	|	|	|
6+20	3.9220	9.20	Q V	|	|	|	|
6+25	3.9857	9.25	Q V	|	|	|	|
6+30	4.0497	9.30	Q V	|	|	|	|
6+35	4.1141	9.35	Q V	|	|	|	|
6+40	4.1788	9.40	Q V	|	|	|	|
6+45	4.2439	9.45	Q V	|	|	|	|
6+50	4.3094	9.50	Q V	|	|	|	|
6+55	4.3752	9.56	Q V	|	|	|	|
7+ 0	4.4414	9.61	Q V	|	|	|	|
7+ 5	4.5079	9.66	Q V	|	|	|	|
7+10	4.5749	9.72	Q V	|	|	|	|
7+15	4.6422	9.78	Q V	|	|	|	|
7+20	4.7099	9.83	Q V	|	|	|	|
7+25	4.7780	9.89	Q V	|	|	|	|
7+30	4.8466	9.95	Q V	|	|	|	|
7+35	4.9155	10.01	|Q V	|	|	|	|
7+40	4.9849	10.07	|Q V	|	|	|	|
7+45	5.0547	10.13	|Q V	|	|	|	|
7+50	5.1249	10.20	|Q V	|	|	|	|
7+55	5.1955	10.26	|Q V	|	|	|	|
8+ 0	5.2666	10.32	|Q V	|	|	|	|
8+ 5	5.3382	10.39	|Q V	|	|	|	|
8+10	5.4102	10.46	|Q V	|	|	|	|
8+15	5.4827	10.52	|Q V	|	|	|	|
8+20	5.5557	10.59	|Q V	|	|	|	|
8+25	5.6291	10.66	|Q V	|	|	|	|
8+30	5.7031	10.74	|Q V	|	|	|	|
8+35	5.7775	10.81	|Q V	|	|	|	|
8+40	5.8525	10.88	|Q V	|	|	|	|

8+45	5.9279	10.96	Q V				
8+50	6.0040	11.04	Q V				
8+55	6.0805	11.11	Q V				
9+ 0	6.1576	11.19	Q V				
9+ 5	6.2352	11.27	Q V				
9+10	6.3135	11.36	Q V				
9+15	6.3923	11.44	Q V				
9+20	6.4717	11.53	Q V				
9+25	6.5517	11.62	Q V				
9+30	6.6323	11.71	Q V				
9+35	6.7135	11.80	Q V				
9+40	6.7954	11.89	Q V				
9+45	6.8779	11.98	Q V				
9+50	6.9612	12.08	Q V				
9+55	7.0450	12.18	Q V				
10+ 0	7.1296	12.28	Q V				
10+ 5	7.2149	12.38	Q V				
10+10	7.3009	12.49	Q V				
10+15	7.3877	12.60	Q V				
10+20	7.4752	12.71	Q V				
10+25	7.5635	12.82	Q V				
10+30	7.6526	12.94	Q V				
10+35	7.7425	13.05	Q V				
10+40	7.8333	13.18	Q V				
10+45	7.9249	13.30	Q V				
10+50	8.0173	13.43	Q V				
10+55	8.1107	13.56	Q V				
11+ 0	8.2050	13.69	Q V				
11+ 5	8.3002	13.83	Q V				
11+10	8.3964	13.97	Q V				
11+15	8.4936	14.11	Q V				
11+20	8.5918	14.26	Q V				
11+25	8.6911	14.41	Q V				
11+30	8.7914	14.57	Q V				
11+35	8.8929	14.73	Q V				
11+40	8.9954	14.90	Q V				
11+45	9.0992	15.07	Q V				
11+50	9.2042	15.24	Q V				
11+55	9.3104	15.42	Q V				
12+ 0	9.4179	15.61	Q V				
12+ 5	9.5277	15.95	Q V				
12+10	9.6424	16.66	Q V				
12+15	9.7676	18.17	Q V				
12+20	9.9043	19.84	Q V				
12+25	10.0466	20.67	Q V				
12+30	10.1933	21.30	Q V				
12+35	10.3435	21.82	Q V				
12+40	10.4970	22.29	Q V				
12+45	10.6535	22.71	Q V				
12+50	10.8126	23.10	Q V				
12+55	10.9742	23.47	Q V				
13+ 0	11.1382	23.81	Q V				
13+ 5	11.3045	24.15	Q V				
13+10	11.4732	24.49	Q V				
13+15	11.6443	24.85	Q V				
13+20	11.8179	25.21	Q V				
13+25	11.9942	25.59	Q V				
13+30	12.1732	25.99	Q V				

13+35	12.3549	26.39	
13+40	12.5396	26.82	
13+45	12.7274	27.26	
13+50	12.9183	27.72	
13+55	13.1125	28.20	
14+ 0	13.3103	28.72	
14+ 5	13.5118	29.26	
14+10	13.7173	29.84	
14+15	13.9271	30.46	
14+20	14.1414	31.12	
14+25	14.3605	31.81	
14+30	14.5846	32.55	
14+35	14.8142	33.33	
14+40	15.0496	34.19	
14+45	15.2916	35.14	
14+50	15.5418	36.32	
14+55	15.8031	37.95	
15+ 0	16.0791	40.07	
15+ 5	16.3721	42.55	
15+10	16.6851	45.44	
15+15	17.0206	48.72	
15+20	17.3822	52.50	
15+25	17.7699	56.29	
15+30	18.1793	59.45	
15+35	18.5961	60.52	
15+40	19.0247	62.24	
15+45	19.5006	69.10	
15+50	20.0521	80.09	
15+55	20.7265	97.91	
16+ 0	21.5891	125.26	
16+ 5	22.8406	181.71	
16+10	24.7148	272.13	
16+15	27.4155	392.14	
16+20	30.0796	386.83	
16+25	31.7027	235.68	
16+30	32.9199	176.74	
16+35	33.9057	143.13	
16+40	34.7332	120.15	
16+45	35.4207	99.83	
16+50	35.9882	82.40	
16+55	36.4576	68.15	
17+ 0	36.8440	56.11	
17+ 5	37.1738	47.89	
17+10	37.4742	43.61	
17+15	37.7499	40.04	
17+20	38.0071	37.35	
17+25	38.2518	35.53	
17+30	38.4786	32.93	
17+35	38.6905	30.77	
17+40	38.8903	29.00	
17+45	39.0783	27.30	
17+50	39.2595	26.31	
17+55	39.4349	25.47	
18+ 0	39.6051	24.71	
18+ 5	39.7695	23.87	
18+10	39.9261	22.74	
18+15	40.0698	20.86	
18+20	40.2000	18.90	

18+25	40.3228	17.84	Q			V
18+30	40.4400	17.02	Q			V
18+35	40.5525	16.34	Q			V
18+40	40.6610	15.75	Q			V
18+45	40.7660	15.25	Q			V
18+50	40.8680	14.80	Q			V
18+55	40.9673	14.41	Q			V
19+ 0	41.0642	14.07	Q			V
19+ 5	41.1590	13.77	Q			V
19+10	41.2519	13.48	Q			V
19+15	41.3429	13.22	Q			V
19+20	41.4322	12.96	Q			V
19+25	41.5198	12.72	Q			V
19+30	41.6058	12.49	Q			V
19+35	41.6903	12.28	Q			V
19+40	41.7735	12.07	Q			V
19+45	41.8553	11.88	Q			V
19+50	41.9358	11.69	Q			V
19+55	42.0151	11.52	Q			V
20+ 0	42.0933	11.35	Q			V
20+ 5	42.1703	11.18	Q			V
20+10	42.2462	11.02	Q			V
20+15	42.3211	10.87	Q			V
20+20	42.3950	10.73	Q			V
20+25	42.4679	10.58	Q			V
20+30	42.5398	10.45	Q			V
20+35	42.6108	10.31	Q			V
20+40	42.6810	10.18	Q			V
20+45	42.7502	10.06	Q			V
20+50	42.8187	9.94	Q			V
20+55	42.8863	9.82	Q			V
21+ 0	42.9532	9.71	Q			V
21+ 5	43.0193	9.60	Q			V
21+10	43.0847	9.49	Q			V
21+15	43.1494	9.39	Q			V
21+20	43.2133	9.29	Q			V
21+25	43.2766	9.19	Q			V
21+30	43.3392	9.09	Q			V
21+35	43.4012	9.00	Q			V
21+40	43.4626	8.91	Q			V
21+45	43.5233	8.82	Q			V
21+50	43.5835	8.73	Q			V
21+55	43.6430	8.65	Q			V
22+ 0	43.7021	8.57	Q			V
22+ 5	43.7605	8.49	Q			V
22+10	43.8185	8.41	Q			V
22+15	43.8759	8.33	Q			V
22+20	43.9327	8.26	Q			V
22+25	43.9891	8.19	Q			V
22+30	44.0450	8.12	Q			V
22+35	44.1004	8.05	Q			V
22+40	44.1554	7.98	Q			V
22+45	44.2099	7.91	Q			V
22+50	44.2639	7.85	Q			V
22+55	44.3175	7.78	Q			V
23+ 0	44.3707	7.72	Q			V
23+ 5	44.4234	7.66	Q			V
23+10	44.4758	7.60	Q			V

23+15	44.5277	7.54	Q	|	|	|	V|
23+20	44.5792	7.48	Q	|	|	|	V|
23+25	44.6304	7.43	Q	|	|	|	V|
23+30	44.6811	7.37	Q	|	|	|	V|
23+35	44.7315	7.32	Q	|	|	|	V|
23+40	44.7815	7.26	Q	|	|	|	V|
23+45	44.8312	7.21	Q	|	|	|	V|
23+50	44.8805	7.16	Q	|	|	|	V|
23+55	44.9294	7.11	Q	|	|	|	V|
24+ 0	44.9781	7.06	Q	|	|	|	V|
24+ 5	45.0251	6.82	Q	|	|	|	V|
24+10	45.0673	6.13	Q	|	|	|	V|
24+15	45.0977	4.42	Q	|	|	|	V|
24+20	45.1153	2.55	Q	|	|	|	V|
24+25	45.1275	1.78	Q	|	|	|	V|
24+30	45.1363	1.27	Q	|	|	|	V|
24+35	45.1425	0.91	Q	|	|	|	V|
24+40	45.1469	0.64	Q	|	|	|	V|
24+45	45.1500	0.44	Q	|	|	|	V|
24+50	45.1520	0.30	Q	|	|	|	V|
24+55	45.1533	0.19	Q	|	|	|	V|
25+ 0	45.1543	0.14	Q	|	|	|	V|
25+ 5	45.1550	0.11	Q	|	|	|	V|
25+10	45.1556	0.08	Q	|	|	|	V|
25+15	45.1560	0.06	Q	|	|	|	V|
25+20	45.1563	0.04	Q	|	|	|	V|
25+25	45.1565	0.03	Q	|	|	|	V|
25+30	45.1566	0.01	Q	|	|	|	V|
25+35	45.1566	0.00	Q	|	|	|	V|

U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/26/12 File Name UNIT100Y24HPR1B.out

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Orange County Unit Hydrograph Hydrology Method
Manual Date(s) - October 1986, November 1996

Program License Serial Number 6062

ESPERANZA HILLS OPTION 1
DETENTION BASIN ANALYSIS
PROPOSED CONDITION AREA B
100-YEAR 24-HOUR

Storm Event Year = 100

Antecedent Moisture Condition = 3

English (in-lb) Input Units Used

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	Area (Ac.)	Area Fraction	Soil Group	Fp (In/Hr)	Ap (dec.)	Fm (In/Hr)
69.0	123.5	0.58	C	0.250	0.870	0.218
75.0	89.0	0.42	D	0.200	0.870	0.174

Area-averaged adjusted loss rate Fm (In/Hr) = 0.199

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC3)	S	Pervious Yield Fr
107.44	0.506	69.0	86.2	1.60	0.725
16.06	0.076	98.0	98.0	0.20	0.958
77.43	0.364	75.0	91.0	0.99	0.816
11.57	0.054	98.0	98.0	0.20	0.958

Area-averaged catchment yield fraction, Y = 0.788
Area-averaged low loss fraction, Yb = 0.212

++

User entry of time of concentration = 0.280 (hours)
Watershed area = 212.50(Ac.)
Catchment Lag time = 0.224 hours
Unit interval = 5.000 minutes

Unit interval percentage of lag time = 37.2024
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.199(In/Hr)
Average low loss rate fraction (Yb) = 0.212 (decimal)
FOOTHILL S-Graph Selected
Computed peak 5-minute rainfall = 0.520(In)
Computed peak 30-minute rainfall = 1.090(In)
Specified peak 1-hour rainfall = 1.450(In)
Computed peak 3-hour rainfall = 2.430(In)
Specified peak 6-hour rainfall = 3.360(In)
Specified peak 24-hour rainfall = 5.630(In)

Rainfall depth area reduction factors:
Using a total area of 212.50(Ac.) (Ref: fig. E-4)

5-minute factor = 0.990 Adjusted rainfall = 0.515(In)
30-minute factor = 0.990 Adjusted rainfall = 1.079(In)
1-hour factor = 0.990 Adjusted rainfall = 1.436(In)
3-hour factor = 0.999 Adjusted rainfall = 2.427(In)
6-hour factor = 0.999 Adjusted rainfall = 3.358(In)
24-hour factor = 1.000 Adjusted rainfall = 5.629(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
(K = 2569.92 (CFS))		
1	2.840	72.989
2	13.030	261.884
3	39.725	686.030
4	65.273	656.569
5	75.923	273.695
6	82.959	180.818
7	87.982	129.080
8	91.676	94.929
9	94.416	70.427
10	96.312	48.726
11	97.618	33.554
12	98.234	15.835
13	98.650	10.692
14	98.999	8.970
15	99.238	6.151
16	99.513	7.061
17	99.754	6.195
18	99.894	3.589
19	100.000	2.729

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.5148	0.5148
2	0.6855	0.1707
3	0.8105	0.1250
4	0.9127	0.1023
5	1.0009	0.0881

6	1.0791	0.0783
7	1.1499	0.0707
8	1.2148	0.0650
9	1.2752	0.0604
10	1.3317	0.0565
11	1.3850	0.0533
12	1.4356	0.0505
13	1.4915	0.0560
14	1.5453	0.0538
15	1.5971	0.0518
16	1.6472	0.0500
17	1.6956	0.0484
18	1.7425	0.0470
19	1.7882	0.0456
20	1.8325	0.0444
21	1.8758	0.0432
22	1.9179	0.0422
23	1.9591	0.0412
24	1.9994	0.0403
25	2.0388	0.0394
26	2.0774	0.0386
27	2.1152	0.0378
28	2.1523	0.0371
29	2.1887	0.0364
30	2.2244	0.0358
31	2.2595	0.0351
32	2.2941	0.0345
33	2.3281	0.0340
34	2.3615	0.0335
35	2.3945	0.0329
36	2.4269	0.0325
37	2.4583	0.0313
38	2.4892	0.0309
39	2.5196	0.0305
40	2.5497	0.0301
41	2.5794	0.0297
42	2.6086	0.0293
43	2.6375	0.0289
44	2.6661	0.0286
45	2.6943	0.0282
46	2.7222	0.0279
47	2.7497	0.0276
48	2.7770	0.0272
49	2.8039	0.0269
50	2.8306	0.0267
51	2.8570	0.0264
52	2.8831	0.0261
53	2.9089	0.0258
54	2.9345	0.0256
55	2.9598	0.0253
56	2.9849	0.0251
57	3.0098	0.0248
58	3.0344	0.0246
59	3.0588	0.0244
60	3.0829	0.0242
61	3.1069	0.0240
62	3.1307	0.0238
63	3.1542	0.0235

64	3.1776	0.0234
65	3.2007	0.0232
66	3.2237	0.0230
67	3.2465	0.0228
68	3.2691	0.0226
69	3.2915	0.0224
70	3.3138	0.0223
71	3.3358	0.0221
72	3.3578	0.0219
73	3.3751	0.0173
74	3.3922	0.0172
75	3.4092	0.0170
76	3.4261	0.0169
77	3.4428	0.0167
78	3.4594	0.0166
79	3.4759	0.0165
80	3.4922	0.0163
81	3.5084	0.0162
82	3.5245	0.0161
83	3.5405	0.0160
84	3.5563	0.0158
85	3.5720	0.0157
86	3.5876	0.0156
87	3.6031	0.0155
88	3.6185	0.0154
89	3.6337	0.0153
90	3.6489	0.0152
91	3.6640	0.0151
92	3.6789	0.0150
93	3.6938	0.0149
94	3.7085	0.0148
95	3.7232	0.0147
96	3.7377	0.0146
97	3.7522	0.0145
98	3.7665	0.0144
99	3.7808	0.0143
100	3.7950	0.0142
101	3.8091	0.0141
102	3.8231	0.0140
103	3.8370	0.0139
104	3.8509	0.0138
105	3.8646	0.0138
106	3.8783	0.0137
107	3.8919	0.0136
108	3.9054	0.0135
109	3.9188	0.0134
110	3.9322	0.0134
111	3.9455	0.0133
112	3.9587	0.0132
113	3.9718	0.0131
114	3.9849	0.0131
115	3.9979	0.0130
116	4.0108	0.0129
117	4.0236	0.0128
118	4.0364	0.0128
119	4.0491	0.0127
120	4.0618	0.0126
121	4.0744	0.0126

122	4.0869	0.0125
123	4.0993	0.0125
124	4.1117	0.0124
125	4.1240	0.0123
126	4.1363	0.0123
127	4.1485	0.0122
128	4.1607	0.0121
129	4.1727	0.0121
130	4.1848	0.0120
131	4.1967	0.0120
132	4.2086	0.0119
133	4.2205	0.0119
134	4.2323	0.0118
135	4.2440	0.0117
136	4.2557	0.0117
137	4.2673	0.0116
138	4.2789	0.0116
139	4.2905	0.0115
140	4.3019	0.0115
141	4.3134	0.0114
142	4.3247	0.0114
143	4.3360	0.0113
144	4.3473	0.0113
145	4.3585	0.0112
146	4.3697	0.0112
147	4.3809	0.0111
148	4.3919	0.0111
149	4.4030	0.0110
150	4.4140	0.0110
151	4.4249	0.0109
152	4.4358	0.0109
153	4.4466	0.0109
154	4.4575	0.0108
155	4.4682	0.0108
156	4.4789	0.0107
157	4.4896	0.0107
158	4.5003	0.0106
159	4.5108	0.0106
160	4.5214	0.0106
161	4.5319	0.0105
162	4.5424	0.0105
163	4.5528	0.0104
164	4.5632	0.0104
165	4.5735	0.0103
166	4.5838	0.0103
167	4.5941	0.0103
168	4.6043	0.0102
169	4.6145	0.0102
170	4.6247	0.0102
171	4.6348	0.0101
172	4.6449	0.0101
173	4.6549	0.0100
174	4.6649	0.0100
175	4.6749	0.0100
176	4.6849	0.0099
177	4.6948	0.0099
178	4.7046	0.0099
179	4.7145	0.0098

180	4.7243	0.0098
181	4.7340	0.0098
182	4.7437	0.0097
183	4.7534	0.0097
184	4.7631	0.0097
185	4.7727	0.0096
186	4.7823	0.0096
187	4.7919	0.0096
188	4.8014	0.0095
189	4.8109	0.0095
190	4.8204	0.0095
191	4.8298	0.0094
192	4.8392	0.0094
193	4.8486	0.0094
194	4.8580	0.0093
195	4.8673	0.0093
196	4.8766	0.0093
197	4.8858	0.0093
198	4.8950	0.0092
199	4.9042	0.0092
200	4.9134	0.0092
201	4.9226	0.0091
202	4.9317	0.0091
203	4.9407	0.0091
204	4.9498	0.0091
205	4.9588	0.0090
206	4.9678	0.0090
207	4.9768	0.0090
208	4.9857	0.0089
209	4.9947	0.0089
210	5.0036	0.0089
211	5.0124	0.0089
212	5.0213	0.0088
213	5.0301	0.0088
214	5.0389	0.0088
215	5.0476	0.0088
216	5.0564	0.0087
217	5.0651	0.0087
218	5.0738	0.0087
219	5.0824	0.0087
220	5.0910	0.0086
221	5.0997	0.0086
222	5.1082	0.0086
223	5.1168	0.0086
224	5.1253	0.0085
225	5.1339	0.0085
226	5.1423	0.0085
227	5.1508	0.0085
228	5.1593	0.0084
229	5.1677	0.0084
230	5.1761	0.0084
231	5.1845	0.0084
232	5.1928	0.0084
233	5.2011	0.0083
234	5.2094	0.0083
235	5.2177	0.0083
236	5.2260	0.0083
237	5.2342	0.0082

238	5.2424	0.0082
239	5.2506	0.0082
240	5.2588	0.0082
241	5.2670	0.0082
242	5.2751	0.0081
243	5.2832	0.0081
244	5.2913	0.0081
245	5.2994	0.0081
246	5.3074	0.0080
247	5.3155	0.0080
248	5.3235	0.0080
249	5.3315	0.0080
250	5.3394	0.0080
251	5.3474	0.0079
252	5.3553	0.0079
253	5.3632	0.0079
254	5.3711	0.0079
255	5.3790	0.0079
256	5.3868	0.0079
257	5.3946	0.0078
258	5.4025	0.0078
259	5.4103	0.0078
260	5.4180	0.0078
261	5.4258	0.0078
262	5.4335	0.0077
263	5.4412	0.0077
264	5.4489	0.0077
265	5.4566	0.0077
266	5.4643	0.0077
267	5.4719	0.0076
268	5.4796	0.0076
269	5.4872	0.0076
270	5.4948	0.0076
271	5.5023	0.0076
272	5.5099	0.0076
273	5.5174	0.0075
274	5.5250	0.0075
275	5.5325	0.0075
276	5.5399	0.0075
277	5.5474	0.0075
278	5.5549	0.0075
279	5.5623	0.0074
280	5.5697	0.0074
281	5.5771	0.0074
282	5.5845	0.0074
283	5.5919	0.0074
284	5.5992	0.0074
285	5.6066	0.0073
286	5.6139	0.0073
287	5.6212	0.0073
288	5.6285	0.0073

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0073	0.0015	0.0057
2	0.0073	0.0015	0.0058

3	0.0073	0.0016	0.0058
4	0.0074	0.0016	0.0058
5	0.0074	0.0016	0.0058
6	0.0074	0.0016	0.0058
7	0.0074	0.0016	0.0059
8	0.0075	0.0016	0.0059
9	0.0075	0.0016	0.0059
10	0.0075	0.0016	0.0059
11	0.0075	0.0016	0.0059
12	0.0076	0.0016	0.0060
13	0.0076	0.0016	0.0060
14	0.0076	0.0016	0.0060
15	0.0076	0.0016	0.0060
16	0.0077	0.0016	0.0060
17	0.0077	0.0016	0.0061
18	0.0077	0.0016	0.0061
19	0.0078	0.0016	0.0061
20	0.0078	0.0016	0.0061
21	0.0078	0.0017	0.0062
22	0.0078	0.0017	0.0062
23	0.0079	0.0017	0.0062
24	0.0079	0.0017	0.0062
25	0.0079	0.0017	0.0063
26	0.0079	0.0017	0.0063
27	0.0080	0.0017	0.0063
28	0.0080	0.0017	0.0063
29	0.0080	0.0017	0.0063
30	0.0081	0.0017	0.0064
31	0.0081	0.0017	0.0064
32	0.0081	0.0017	0.0064
33	0.0082	0.0017	0.0064
34	0.0082	0.0017	0.0065
35	0.0082	0.0017	0.0065
36	0.0083	0.0017	0.0065
37	0.0083	0.0018	0.0065
38	0.0083	0.0018	0.0066
39	0.0084	0.0018	0.0066
40	0.0084	0.0018	0.0066
41	0.0084	0.0018	0.0067
42	0.0085	0.0018	0.0067
43	0.0085	0.0018	0.0067
44	0.0085	0.0018	0.0067
45	0.0086	0.0018	0.0068
46	0.0086	0.0018	0.0068
47	0.0087	0.0018	0.0068
48	0.0087	0.0018	0.0068
49	0.0087	0.0018	0.0069
50	0.0088	0.0019	0.0069
51	0.0088	0.0019	0.0069
52	0.0088	0.0019	0.0070
53	0.0089	0.0019	0.0070
54	0.0089	0.0019	0.0070
55	0.0090	0.0019	0.0071
56	0.0090	0.0019	0.0071
57	0.0091	0.0019	0.0071
58	0.0091	0.0019	0.0072
59	0.0091	0.0019	0.0072
60	0.0092	0.0019	0.0072

61	0.0092	0.0020	0.0073
62	0.0093	0.0020	0.0073
63	0.0093	0.0020	0.0073
64	0.0093	0.0020	0.0074
65	0.0094	0.0020	0.0074
66	0.0094	0.0020	0.0074
67	0.0095	0.0020	0.0075
68	0.0095	0.0020	0.0075
69	0.0096	0.0020	0.0076
70	0.0096	0.0020	0.0076
71	0.0097	0.0021	0.0076
72	0.0097	0.0021	0.0077
73	0.0098	0.0021	0.0077
74	0.0098	0.0021	0.0078
75	0.0099	0.0021	0.0078
76	0.0099	0.0021	0.0078
77	0.0100	0.0021	0.0079
78	0.0100	0.0021	0.0079
79	0.0101	0.0021	0.0080
80	0.0102	0.0021	0.0080
81	0.0102	0.0022	0.0081
82	0.0103	0.0022	0.0081
83	0.0103	0.0022	0.0082
84	0.0104	0.0022	0.0082
85	0.0105	0.0022	0.0083
86	0.0105	0.0022	0.0083
87	0.0106	0.0022	0.0084
88	0.0106	0.0023	0.0084
89	0.0107	0.0023	0.0085
90	0.0108	0.0023	0.0085
91	0.0109	0.0023	0.0086
92	0.0109	0.0023	0.0086
93	0.0110	0.0023	0.0087
94	0.0110	0.0023	0.0087
95	0.0111	0.0024	0.0088
96	0.0112	0.0024	0.0088
97	0.0113	0.0024	0.0089
98	0.0113	0.0024	0.0089
99	0.0114	0.0024	0.0090
100	0.0115	0.0024	0.0090
101	0.0116	0.0025	0.0091
102	0.0116	0.0025	0.0092
103	0.0117	0.0025	0.0093
104	0.0118	0.0025	0.0093
105	0.0119	0.0025	0.0094
106	0.0120	0.0025	0.0094
107	0.0121	0.0026	0.0095
108	0.0121	0.0026	0.0096
109	0.0123	0.0026	0.0097
110	0.0123	0.0026	0.0097
111	0.0125	0.0026	0.0098
112	0.0125	0.0026	0.0099
113	0.0126	0.0027	0.0100
114	0.0127	0.0027	0.0100
115	0.0128	0.0027	0.0101
116	0.0129	0.0027	0.0102
117	0.0131	0.0028	0.0103
118	0.0131	0.0028	0.0104

119	0.0133	0.0028	0.0105
120	0.0134	0.0028	0.0105
121	0.0135	0.0029	0.0107
122	0.0136	0.0029	0.0107
123	0.0138	0.0029	0.0108
124	0.0138	0.0029	0.0109
125	0.0140	0.0030	0.0110
126	0.0141	0.0030	0.0111
127	0.0143	0.0030	0.0113
128	0.0144	0.0030	0.0113
129	0.0146	0.0031	0.0115
130	0.0147	0.0031	0.0116
131	0.0149	0.0031	0.0117
132	0.0150	0.0032	0.0118
133	0.0152	0.0032	0.0120
134	0.0153	0.0032	0.0120
135	0.0155	0.0033	0.0122
136	0.0156	0.0033	0.0123
137	0.0158	0.0034	0.0125
138	0.0160	0.0034	0.0126
139	0.0162	0.0034	0.0128
140	0.0163	0.0035	0.0129
141	0.0166	0.0035	0.0131
142	0.0167	0.0035	0.0132
143	0.0170	0.0036	0.0134
144	0.0172	0.0036	0.0135
145	0.0219	0.0046	0.0173
146	0.0221	0.0047	0.0174
147	0.0224	0.0047	0.0177
148	0.0226	0.0048	0.0178
149	0.0230	0.0049	0.0181
150	0.0232	0.0049	0.0183
151	0.0235	0.0050	0.0186
152	0.0238	0.0050	0.0187
153	0.0242	0.0051	0.0191
154	0.0244	0.0052	0.0192
155	0.0248	0.0053	0.0196
156	0.0251	0.0053	0.0198
157	0.0256	0.0054	0.0202
158	0.0258	0.0055	0.0204
159	0.0264	0.0056	0.0208
160	0.0267	0.0056	0.0210
161	0.0272	0.0058	0.0215
162	0.0276	0.0058	0.0217
163	0.0282	0.0060	0.0222
164	0.0286	0.0060	0.0225
165	0.0293	0.0062	0.0231
166	0.0297	0.0063	0.0234
167	0.0305	0.0064	0.0240
168	0.0309	0.0065	0.0244
169	0.0325	0.0069	0.0256
170	0.0329	0.0070	0.0260
171	0.0340	0.0072	0.0268
172	0.0345	0.0073	0.0272
173	0.0358	0.0076	0.0282
174	0.0364	0.0077	0.0287
175	0.0378	0.0080	0.0298
176	0.0386	0.0082	0.0304

177	0.0403	0.0085	0.0317
178	0.0412	0.0087	0.0325
179	0.0432	0.0092	0.0341
180	0.0444	0.0094	0.0350
181	0.0470	0.0099	0.0370
182	0.0484	0.0102	0.0382
183	0.0518	0.0110	0.0408
184	0.0538	0.0114	0.0424
185	0.0505	0.0107	0.0398
186	0.0533	0.0113	0.0420
187	0.0604	0.0128	0.0476
188	0.0650	0.0138	0.0512
189	0.0783	0.0166	0.0617
190	0.0881	0.0166	0.0715
191	0.1250	0.0166	0.1084
192	0.1707	0.0166	0.1541
193	0.5148	0.0166	0.4982
194	0.1023	0.0166	0.0857
195	0.0707	0.0150	0.0557
196	0.0565	0.0120	0.0446
197	0.0560	0.0118	0.0441
198	0.0500	0.0106	0.0394
199	0.0456	0.0097	0.0360
200	0.0422	0.0089	0.0332
201	0.0394	0.0083	0.0311
202	0.0371	0.0079	0.0292
203	0.0351	0.0074	0.0277
204	0.0335	0.0071	0.0264
205	0.0313	0.0066	0.0247
206	0.0301	0.0064	0.0237
207	0.0289	0.0061	0.0228
208	0.0279	0.0059	0.0220
209	0.0269	0.0057	0.0212
210	0.0261	0.0055	0.0206
211	0.0253	0.0054	0.0200
212	0.0246	0.0052	0.0194
213	0.0240	0.0051	0.0189
214	0.0234	0.0049	0.0184
215	0.0228	0.0048	0.0180
216	0.0223	0.0047	0.0175
217	0.0173	0.0037	0.0136
218	0.0169	0.0036	0.0133
219	0.0165	0.0035	0.0130
220	0.0161	0.0034	0.0127
221	0.0157	0.0033	0.0124
222	0.0154	0.0033	0.0121
223	0.0151	0.0032	0.0119
224	0.0148	0.0031	0.0116
225	0.0145	0.0031	0.0114
226	0.0142	0.0030	0.0112
227	0.0139	0.0029	0.0110
228	0.0137	0.0029	0.0108
229	0.0134	0.0028	0.0106
230	0.0132	0.0028	0.0104
231	0.0130	0.0027	0.0102
232	0.0128	0.0027	0.0101
233	0.0126	0.0027	0.0099
234	0.0124	0.0026	0.0098

235	0.0122	0.0026	0.0096
236	0.0120	0.0025	0.0095
237	0.0119	0.0025	0.0093
238	0.0117	0.0025	0.0092
239	0.0115	0.0024	0.0091
240	0.0114	0.0024	0.0090
241	0.0112	0.0024	0.0088
242	0.0111	0.0023	0.0087
243	0.0109	0.0023	0.0086
244	0.0108	0.0023	0.0085
245	0.0107	0.0023	0.0084
246	0.0106	0.0022	0.0083
247	0.0104	0.0022	0.0082
248	0.0103	0.0022	0.0081
249	0.0102	0.0022	0.0080
250	0.0101	0.0021	0.0079
251	0.0100	0.0021	0.0079
252	0.0099	0.0021	0.0078
253	0.0098	0.0021	0.0077
254	0.0097	0.0020	0.0076
255	0.0096	0.0020	0.0075
256	0.0095	0.0020	0.0075
257	0.0094	0.0020	0.0074
258	0.0093	0.0020	0.0073
259	0.0092	0.0019	0.0073
260	0.0091	0.0019	0.0072
261	0.0090	0.0019	0.0071
262	0.0089	0.0019	0.0071
263	0.0089	0.0019	0.0070
264	0.0088	0.0019	0.0069
265	0.0087	0.0018	0.0069
266	0.0086	0.0018	0.0068
267	0.0086	0.0018	0.0067
268	0.0085	0.0018	0.0067
269	0.0084	0.0018	0.0066
270	0.0084	0.0018	0.0066
271	0.0083	0.0018	0.0065
272	0.0082	0.0017	0.0065
273	0.0082	0.0017	0.0064
274	0.0081	0.0017	0.0064
275	0.0080	0.0017	0.0063
276	0.0080	0.0017	0.0063
277	0.0079	0.0017	0.0062
278	0.0079	0.0017	0.0062
279	0.0078	0.0016	0.0061
280	0.0077	0.0016	0.0061
281	0.0077	0.0016	0.0061
282	0.0076	0.0016	0.0060
283	0.0076	0.0016	0.0060
284	0.0075	0.0016	0.0059
285	0.0075	0.0016	0.0059
286	0.0074	0.0016	0.0058
287	0.0074	0.0016	0.0058
288	0.0073	0.0015	0.0058

Total soil rain loss = 1.06(In)
Total effective rainfall = 4.57(In)

Peak flow rate in flood hydrograph = 533.94(CFS)

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24 - H O U R S T O R M

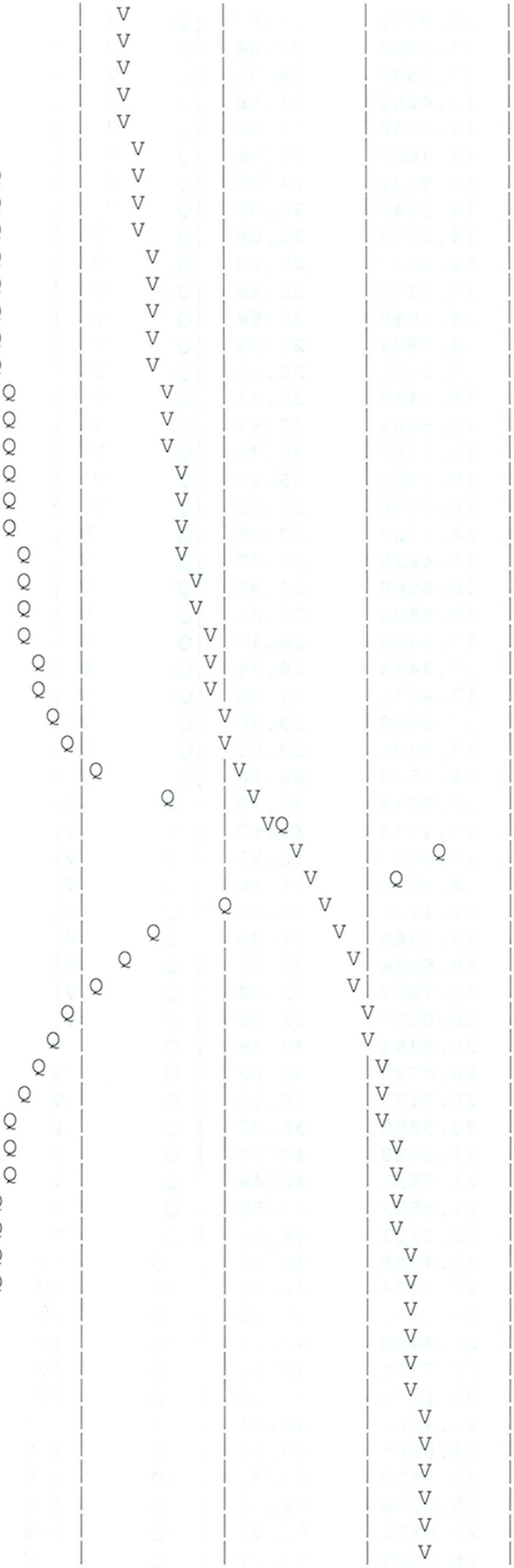
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	150.0	300.0	450.0	600.0
0+ 5	0.0029	0.42	Q				
0+10	0.0161	1.93	Q				
0+15	0.0566	5.87	Q				
0+20	0.1231	9.66	Q				
0+25	0.2007	11.27	Q				
0+30	0.2858	12.34	Q				
0+35	0.3761	13.13	Q				
0+40	0.4706	13.71	Q				
0+45	0.5681	14.16	Q				
0+50	0.6680	14.49	Q				
0+55	0.7694	14.73	Q				
1+ 0	0.8719	14.88	Q				
1+ 5	0.9751	14.99	Q				
1+10	1.0790	15.09	VQ				
1+15	1.1836	15.18	VQ				
1+20	1.2887	15.27	VQ				
1+25	1.3945	15.36	VQ				
1+30	1.5008	15.43	VQ				
1+35	1.6076	15.51	VQ				
1+40	1.7148	15.56	VQ				
1+45	1.8223	15.62	VQ				
1+50	1.9303	15.67	VQ				
1+55	2.0386	15.73	|Q				
2+ 0	2.1473	15.79	|Q				
2+ 5	2.2564	15.84	|Q				
2+10	2.3659	15.90	|Q				
2+15	2.4759	15.96	|Q				
2+20	2.5862	16.02	|Q				
2+25	2.6969	16.08	|Q				
2+30	2.8081	16.14	|Q				
2+35	2.9197	16.20	|Q				
2+40	3.0317	16.26	|Q				
2+45	3.1441	16.33	|Q				
2+50	3.2570	16.39	|Q				
2+55	3.3703	16.45	|Q				
3+ 0	3.4841	16.52	|Q				
3+ 5	3.5983	16.58	|Q				
3+10	3.7129	16.65	|Q				
3+15	3.8280	16.71	|Q				
3+20	3.9436	16.78	|Q				
3+25	4.0596	16.85	|QV				
3+30	4.1761	16.92	|QV				
3+35	4.2931	16.99	|QV				
3+40	4.4106	17.06	|QV				
3+45	4.5285	17.13	|QV				
3+50	4.6470	17.20	|QV				
3+55	4.7659	17.27	|QV				

4+ 0	4.8854	17.34	QV				
4+ 5	5.0053	17.42	QV				
4+10	5.1258	17.49	QV				
4+15	5.2468	17.57	QV				
4+20	5.3683	17.64	QV				
4+25	5.4903	17.72	QV				
4+30	5.6129	17.80	QV				
4+35	5.7360	17.88	QV				
4+40	5.8597	17.96	QV				
4+45	5.9839	18.04	QV				
4+50	6.1087	18.12	Q V				
4+55	6.2341	18.20	Q V				
5+ 0	6.3600	18.29	Q V				
5+ 5	6.4865	18.37	Q V				
5+10	6.6136	18.46	Q V				
5+15	6.7413	18.54	Q V				
5+20	6.8696	18.63	Q V				
5+25	6.9986	18.72	Q V				
5+30	7.1281	18.81	Q V				
5+35	7.2583	18.90	Q V				
5+40	7.3891	18.99	Q V				
5+45	7.5205	19.09	Q V				
5+50	7.6526	19.18	Q V				
5+55	7.7854	19.28	Q V				
6+ 0	7.9188	19.37	Q V				
6+ 5	8.0529	19.47	Q V				
6+10	8.1877	19.57	Q V				
6+15	8.3232	19.67	Q V				
6+20	8.4594	19.78	Q V				
6+25	8.5963	19.88	Q V				
6+30	8.7339	19.98	Q V				
6+35	8.8723	20.09	Q V				
6+40	9.0114	20.20	Q V				
6+45	9.1513	20.31	Q V				
6+50	9.2919	20.42	Q V				
6+55	9.4333	20.53	Q V				
7+ 0	9.5755	20.65	Q V				
7+ 5	9.7185	20.76	Q V				
7+10	9.8623	20.88	Q V				
7+15	10.0070	21.00	Q V				
7+20	10.1525	21.12	Q V				
7+25	10.2988	21.25	Q V				
7+30	10.4460	21.37	Q V				
7+35	10.5940	21.50	Q V				
7+40	10.7430	21.63	Q V				
7+45	10.8928	21.76	Q V				
7+50	11.0436	21.89	Q V				
7+55	11.1953	22.03	Q V				
8+ 0	11.3479	22.16	Q V				
8+ 5	11.5016	22.30	Q V				
8+10	11.6561	22.45	Q V				
8+15	11.8117	22.59	Q V				
8+20	11.9683	22.74	Q V				
8+25	12.1260	22.89	Q V				
8+30	12.2846	23.04	Q V				
8+35	12.4444	23.19	Q V				
8+40	12.6052	23.35	Q V				
8+45	12.7671	23.51	Q V				

8+50	12.9301	23.67	|Q V |
8+55	13.0943	23.84	|Q V |
9+ 0	13.2597	24.01	|Q V |
9+ 5	13.4262	24.18	|Q V |
9+10	13.5940	24.36	|Q V |
9+15	13.7629	24.54	|Q V |
9+20	13.9332	24.72	|Q V |
9+25	14.1047	24.90	|Q V |
9+30	14.2775	25.09	|Q V |
9+35	14.4517	25.29	|Q V |
9+40	14.6272	25.48	|Q V |
9+45	14.8040	25.68	|Q V |
9+50	14.9824	25.89	|Q V |
9+55	15.1621	26.10	|Q V |
10+ 0	15.3433	26.31	|Q V |
10+ 5	15.5261	26.53	|Q V |
10+10	15.7103	26.76	|Q V |
10+15	15.8962	26.98	|Q V |
10+20	16.0836	27.22	|Q V |
10+25	16.2727	27.46	|Q V |
10+30	16.4635	27.70	|Q V |
10+35	16.6560	27.95	|Q V |
10+40	16.8503	28.21	|Q V |
10+45	17.0464	28.47	|Q V |
10+50	17.2443	28.74	|Q V |
10+55	17.4441	29.02	|Q V |
11+ 0	17.6459	29.30	|Q V |
11+ 5	17.8496	29.59	|Q V |
11+10	18.0555	29.88	|Q V |
11+15	18.2634	30.19	| Q V|
11+20	18.4734	30.50	| Q V|
11+25	18.6857	30.83	| Q V|
11+30	18.9003	31.16	| Q V|
11+35	19.1172	31.50	| Q V|
11+40	19.3365	31.85	| Q V|
11+45	19.5584	32.21	| Q V|
11+50	19.7827	32.58	| Q V|
11+55	20.0097	32.96	| Q V|
12+ 0	20.2394	33.35	| Q V
12+ 5	20.4737	34.02	| Q V
12+10	20.7173	35.36	| Q V
12+15	20.9805	38.22	| Q V
12+20	21.2628	40.99	| Q V
12+25	21.5551	42.44	| Q V
12+30	21.8552	43.58	| Q V
12+35	22.1621	44.56	| Q V
12+40	22.4749	45.43	| Q |V
12+45	22.7934	46.24	| Q |V
12+50	23.1171	47.00	| Q |V
12+55	23.4458	47.72	| Q |V
13+ 0	23.7791	48.41	| Q |V
13+ 5	24.1173	49.10	| Q |V
13+10	24.4604	49.81	| Q | V
13+15	24.8085	50.54	| Q | V
13+20	25.1618	51.31	| Q | V
13+25	25.5206	52.10	| Q | V
13+30	25.8851	52.92	| Q | V
13+35	26.2554	53.77	| Q | V

13+40	26.6318	54.65	
13+45	27.0146	55.58	
13+50	27.4041	56.55	
13+55	27.8006	57.58	
14+ 0	28.2046	58.66	
14+ 5	28.6167	59.84	
14+10	29.0380	61.17	
14+15	29.4706	62.81	
14+20	29.9148	64.50	
14+25	30.3701	66.10	
14+30	30.8366	67.74	
14+35	31.3152	69.48	
14+40	31.8064	71.32	
14+45	32.3112	73.30	
14+50	32.8306	75.42	
14+55	33.3660	77.74	
15+ 0	33.9187	80.24	
15+ 5	34.4905	83.03	
15+10	35.0834	86.09	
15+15	35.7001	89.55	
15+20	36.3434	93.40	
15+25	37.0142	97.41	
15+30	37.7088	100.85	
15+35	38.4155	102.61	
15+40	39.1429	105.62	
15+45	39.9207	112.93	
15+50	40.7706	123.41	
15+55	41.7373	140.36	
16+ 0	42.9037	169.36	
16+ 5	44.5751	242.68	
16+10	47.0819	364.00	
16+15	50.7592	533.94	
16+20	54.1358	490.29	
16+25	56.2381	305.25	
16+30	57.8748	237.65	
16+35	59.2391	198.09	
16+40	60.4102	170.04	
16+45	61.4197	146.59	
16+50	62.2888	126.19	
16+55	63.0468	110.06	
17+ 0	63.7026	95.22	
17+ 5	64.3010	86.89	
17+10	64.8590	81.01	
17+15	65.3784	75.42	
17+20	65.8720	71.68	
17+25	66.3388	67.77	
17+30	66.7766	63.57	
17+35	67.1922	60.35	
17+40	67.5839	56.87	
17+45	67.9612	54.78	
17+50	68.3259	52.96	
17+55	68.6794	51.32	
18+ 0	69.0225	49.83	
18+ 5	69.3545	48.20	
18+10	69.6715	46.03	
18+15	69.9639	42.46	
18+20	70.2331	39.09	
18+25	70.4890	37.16	

18+30	70.7343	35.62	Q			V	
18+35	70.9707	34.33	Q			V	
18+40	71.1994	33.21	Q			V	
18+45	71.4214	32.23	Q			V	
18+50	71.6374	31.36	Q			V	
18+55	71.8480	30.59	Q			V	
19+ 0	72.0541	29.92	Q			V	
19+ 5	72.2558	29.30	Q			V	
19+10	72.4536	28.71	Q			V	
19+15	72.6475	28.16	Q			V	
19+20	72.8378	27.63	Q			V	
19+25	73.0246	27.13	Q			V	
19+30	73.2081	26.65	Q			V	
19+35	73.3886	26.21	Q			V	
19+40	73.5662	25.78	Q			V	
19+45	73.7410	25.38	Q			V	
19+50	73.9131	24.99	Q			V	
19+55	74.0827	24.62	Q			V	
20+ 0	74.2498	24.26	Q			V	
20+ 5	74.4145	23.92	Q			V	
20+10	74.5769	23.58	Q			V	
20+15	74.7371	23.26	Q			V	
20+20	74.8952	22.95	Q			V	
20+25	75.0512	22.65	Q			V	
20+30	75.2053	22.37	Q			V	
20+35	75.3574	22.09	Q			V	
20+40	75.5076	21.81	Q			V	
20+45	75.6560	21.55	Q			V	
20+50	75.8027	21.30	Q			V	
20+55	75.9477	21.05	Q			V	
21+ 0	76.0910	20.81	Q			V	
21+ 5	76.2327	20.58	Q			V	
21+10	76.3729	20.35	Q			V	
21+15	76.5116	20.13	Q			V	
21+20	76.6488	19.92	Q			V	
21+25	76.7845	19.71	Q			V	
21+30	76.9189	19.51	Q			V	
21+35	77.0519	19.31	Q			V	
21+40	77.1836	19.12	Q			V	
21+45	77.3140	18.94	Q			V	
21+50	77.4432	18.75	Q			V	
21+55	77.5711	18.58	Q			V	
22+ 0	77.6978	18.40	Q			V	
22+ 5	77.8234	18.23	Q			V	
22+10	77.9478	18.07	Q			V	
22+15	78.0712	17.91	Q			V	
22+20	78.1934	17.75	Q			V	
22+25	78.3146	17.59	Q			V	
22+30	78.4347	17.44	Q			V	
22+35	78.5538	17.30	Q			V	
22+40	78.6720	17.15	Q			V	
22+45	78.7891	17.01	Q			V	
22+50	78.9053	16.87	Q			V	
22+55	79.0206	16.74	Q			V	
23+ 0	79.1350	16.60	Q			V	
23+ 5	79.2484	16.48	Q			V	
23+10	79.3610	16.35	Q			V	
23+15	79.4727	16.22	Q			V	

23+20	79.5836	16.10	|Q	|	|	|	V|
23+25	79.6937	15.98	|Q	|	|	|	V|
23+30	79.8029	15.86	|Q	|	|	|	V|
23+35	79.9114	15.75	|Q	|	|	|	V|
23+40	80.0191	15.63	|Q	|	|	|	V|
23+45	80.1260	15.52	|Q	|	|	|	V|
23+50	80.2322	15.41	|Q	|	|	|	V|
23+55	80.3376	15.31	|Q	|	|	|	V|
24+ 0	80.4423	15.20	|Q	|	|	|	V|
24+ 5	80.5434	14.68	Q	|	|	|	V|
24+10	80.6335	13.08	Q	|	|	|	V|
24+15	80.6958	9.06	Q	|	|	|	V|
24+20	80.7319	5.23	Q	|	|	|	V|
24+25	80.7569	3.63	Q	|	|	|	V|
24+30	80.7745	2.57	Q	|	|	|	V|
24+35	80.7870	1.81	Q	|	|	|	V|
24+40	80.7956	1.25	Q	|	|	|	V|
24+45	80.8014	0.84	Q	|	|	|	V|
24+50	80.8052	0.56	Q	|	|	|	V|
24+55	80.8077	0.36	Q	|	|	|	V|
25+ 0	80.8095	0.27	Q	|	|	|	V|
25+ 5	80.8109	0.20	Q	|	|	|	V|
25+10	80.8120	0.15	Q	|	|	|	V|
25+15	80.8128	0.11	Q	|	|	|	V|
25+20	80.8133	0.07	Q	|	|	|	V|
25+25	80.8135	0.04	Q	|	|	|	V|
25+30	80.8136	0.02	Q	|	|	|	V

Appendix

K

STREET CAPACITY CALCULATIONS

TABLE 5
STREET CAPACITY CALCULATIONS

Right-of-Way Width	Street Slope	Full Street Capacity		Half Street Capacity	
		100-Year Flow (Right-of-Way)	10-Year Flow (Top-of-Curb)	100-Year Flow (Right-of-Way)	10-Year Flow (Top-of-Curb)
(ft.)	(%)	(cfs)	(cfs)	(cfs)	(cfs)
44	1	50.0	25.8	25.0	12.9
44	2	70.6	36.5	35.3	18.3
44	3	86.5	44.7	43.3	22.4
44	4	99.8	51.6	49.9	25.8
44	5	111.6	57.7	55.8	28.9
44	6	122.3	63.2	61.2	31.6
44	7	132.1	68.3	66.1	34.2
44	8	141.2	73.0	70.6	36.5
44	9	149.8	77.4	74.9	38.7
44	10	157.9	81.6	79.0	40.8
52	1	59.9	25.1	30.0	12.6
52	2	84.7	35.5	42.4	17.8
52	3	103.7	43.5	51.9	21.8
52	4	119.8	50.2	59.9	25.1
52	5	133.9	56.1	67.0	28.1
52	6	146.7	61.5	73.4	30.8
52	7	158.5	66.4	79.3	33.2
52	8	169.4	71.0	84.7	35.5
52	9	179.7	75.3	89.9	37.7
52	10	189.4	79.4	94.7	39.7
90	1	62.2	24.2	31.1	12.1
90	2	88.0	34.3	44.0	17.2
90	3	107.8	42.0	53.9	21.0
90	4	124.5	48.5	62.3	24.3
90	5	139.1	54.2	69.6	27.1
90	6	152.4	59.4	76.2	29.7
90	7	164.6	64.1	82.3	32.1
90	8	176.0	68.6	88.0	34.3
90	9	186.7	72.7	93.4	36.4
90	10	196.8	76.7	98.4	38.4

44' RW Street Flow - Top of Curb - 1%

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.01000	ft/ft
Normal Depth	0.50	ft

Section Definitions

Station (ft)	Elevation (ft)
0+00	1.00
0+07	0.86
0+07	0.36
0+09	0.53
0+09	0.56
0+22	0.78
0+35	0.56
0+35	0.53
0+37	0.36
0+37	0.86
0+44	1.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 1.00)	(0+09, 0.56)	0.016
(0+09, 0.56)	(0+35, 0.53)	0.013
(0+35, 0.53)	(0+44, 1.00)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

44' RW Street Flow - Top of Curb - 1%

Results

Discharge		25.82	ft^3/s
Elevation Range	0.36 to 1.00 ft		
Flow Area		6.57	ft^2
Wetted Perimeter		30.75	ft
Hydraulic Radius		0.21	ft
Top Width		30.00	ft
Normal Depth		0.50	ft
Critical Depth		0.58	ft
Critical Slope		0.00438	ft/ft
Velocity		3.93	ft/s
Velocity Head		0.24	ft
Specific Energy		0.74	ft
Froude Number		1.48	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	1.00	ft
Length	100.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	1.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.50	ft
Critical Depth	0.58	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.00438	ft/ft

52' RW Street Flow - Top of Curb - 1%

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.01000	ft/ft
Normal Depth	0.50	ft

Section Definitions

Station (ft)	Elevation (ft)
0+00	1.00
0+08	0.84
0+08	0.34
0+10	0.51
0+10	0.54
0+26	0.81
0+42	0.54
0+42	0.51
0+44	0.34
0+44	0.84
0+52	1.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 1.00)	(0+10, 0.54)	0.016
(0+10, 0.54)	(0+42, 0.54)	0.013
(0+42, 0.54)	(0+52, 1.00)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

52' RW Street Flow - Top of Curb - 1%

Results

Discharge		25.10	ft³/s
Elevation Range	0.34 to 1.00 ft		
Flow Area		6.92	ft²
Wetted Perimeter		36.75	ft
Hydraulic Radius		0.19	ft
Top Width		36.00	ft
Normal Depth		0.50	ft
Critical Depth		0.56	ft
Critical Slope		0.00445	ft/ft
Velocity		3.63	ft/s
Velocity Head		0.20	ft
Specific Energy		0.70	ft
Froude Number		1.46	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	1.00	ft
Length	100.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	1.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.50	ft
Critical Depth	0.56	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.00445	ft/ft

90' RW Street Flow - Top of Curb - 1%

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.01000	ft/ft
Normal Depth	0.50	ft

Section Definitions

Station (ft)	Elevation (ft)
0+00	1.00
0+08	0.84
0+08	0.34
0+10	0.51
0+10	0.54
0+38	1.02
0+38	1.52
0+45	1.66
0+52	1.52
0+52	1.02
0+52	1.00
0+80	0.54
0+80	0.51
0+82	0.34
0+82	0.84
0+90	1.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 1.00)	(0+10, 0.54)	0.016
(0+10, 0.54)	(0+80, 0.54)	0.013
(0+80, 0.54)	(0+90, 1.00)	0.016

90' RW Street Flow - Top of Curb - 1%

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Discharge		24.24	ft³/s
Elevation Range	0.34 to 1.66 ft		
Flow Area		7.04	ft²
Wetted Perimeter		40.72	ft
Hydraulic Radius		0.17	ft
Top Width		39.96	ft
Normal Depth		0.50	ft
Critical Depth		0.56	ft
Critical Slope		0.00468	ft/ft
Velocity		3.44	ft/s
Velocity Head		0.18	ft
Specific Energy		0.68	ft
Froude Number		1.45	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	1.00	ft
Length	100.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	1.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.50	ft
Critical Depth	0.56	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.00468	ft/ft

Messages

Messages	Flow is divided.

Appendix

L

CATCH BASIN SIZING CALCULATIONS

CATCH BASIN SIZING
SUMMARY TABLE

Street Slope (%)	C.B. Width (ft.)	Flow Intercepted (cfs)
2	21	31
3	21	26
4	21	23
5	21	22
6	21	21
7	21	20
8	21	19
9	21	18
10	21	17
Sump	21	30

Catch Basin Sizing - 21' Width on 2% Street

Project Description

Solve For	Curb Opening Length

Input Data

Discharge	31.00	ft³/s
Slope	0.02000	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Efficiency	50.00	%
Local Depression	4.00	in
Local Depression Width	4.00	ft

Results

Curb Opening Length	20.98	ft
Intercepted Flow	15.50	ft³/s
Bypass Flow	15.50	ft³/s
Spread	22.93	ft
Depth	0.52	ft
Flow Area	4.60	ft²
Gutter Depression	0.13	ft
Total Depression	0.47	ft
Velocity	6.73	ft/s
Equivalent Cross Slope	0.04809	ft/ft
Length Factor	0.32	
Total Interception Length	65.65	ft

Curb Inlet In Sag - 21' Width

Project Description

Solve For	Spread

Input Data

Discharge		30.00	ft³/s
Gutter Width		2.00	ft
Gutter Cross Slope		0.08	ft/ft
Road Cross Slope		0.02	ft/ft
Curb Opening Length		21.00	ft
Opening Height		0.50	ft
Curb Throat Type	Vertical		
Local Depression		2.50	in
Local Depression Width		4.00	ft
Throat Incline Angle		0.00	degrees

Results

Spread	35.18	ft
Depth	0.72	ft
Gutter Depression	0.13	ft
Total Depression	0.33	ft

Appendix

N

STORM DRAIN PIPE SIZING EXHIBIT

(24")
(24")
(24")
(48")
(24")
(48")
(45")
(18")
(54")
(48")
(66")
(54")
(36")
(42")
(84")
(84")
EX. OUTLET
(18")
(18")
SAN ANTONIO ROAD
CITY PROPERTY OPEN SPACE
(24")
(30")
(36")
CITY PROPERTY OPEN SPACE
PARK SITE
EX. INLET
EXISTING 13Wx11H CHANNEL
(18")
(36")
(36")
(36")
EXISTING 7Wx8H RCB
OUTLET STRUCTURE #1
OUTLET STRUCTURE #2
CIELO VISTA PROPERTY
DEBRIS BASIN #1
DEBRIS BASIN #2
24"
36"
42"
42"
78"
78"
78"
WQMP
WQMP
DEBRIS/DETENTION BASIN #3
DEBRIS/DETENTION BASIN #4
36"
54"
54"
54"
54"
54"
54"
WQMP
24"
INLET
(33")
STONEHAVEN DRIVE
BLUE MUD CANYON

LEGEND

- EXISTING BLUELINE STREAM PER USGS MAP
- PROPOSED PUBLIC STORM DRAIN LINE
- PROPOSED PRIVATE STORM DRAIN LINE
- EXISTING STORM DRAIN PIPE
- 12" PIPE SIZE (INCHES)

N

800' 0 800'

SCALE IN FEET

NOTES:
1. PIPE SIZES BASED ON 100 YEAR STORM EVENT
2. FILL OVER BLUELINE STREAMS IS SUBJECT TO RESOURCE AGENCY APPROVAL.

STONEHAVEN – OPTION 1

EXHIBIT "B"

ESPERANZA HILLS
PROPOSED STORM DRAIN FACILITIES

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Appendix

O

DEBRIS BASIN SIZING

LOS ANGELES DISTIRCT METHOD FOR PREDICTION OF DEBRIS YIELD

February 1992, updated February 2000

For Watershed areas from 0.1 square mile to 3.0 square miles, use equation 1 as shown on page 15

LOG Dy = 0.65(LOG P) + 0.62(LOG RR) + 0.18(LOG A) + 0.12(FF)

Where:

Dy = Unit Debris Yield (yd^3/mi^2)
P = Maximum 1-Hour Precipitation (inches, taken to two decimal places after the decimal points, times 100)
RR = Relief Ratio (ft/mi) (Highest Watershed Elev-Basin Elev)/Maximum Length
A = Drainage Area (ac)
FF = Non-Dimensional Fire factor

UNDEVELOPED TRIBUTARY AREA (BASIN #1)

P = 200 (OC Hydrology Manual Figure B-1)
RR = 1655-1180 ft/ 0.29 mi = 1618 ft/mi
A = 24.65 acres = 0.0385 mi^2
FF = 4.5 (Debris Method Figure 2)

LOG(P) = 2.301
LOG(RR) = 3.209
LOG(A) = 1.392

LOG (Dy) = 0.65(2.301) + 0.62(3.209) + 0.18(1.392) + 0.12(4.5)

LOG (Dy) = 1.4957 + 1.9896 + 0.2506 + 0.54 = 4.276

Dy = 18,871CY/mi^2

REDUCED ADJUSTED UNIT DEBRIS BY STUDY ACREAGE

THEREFORE DY = 727 CY

DEBRIS YIELD = 727 CY = 0.45 AC-FT

SAFETY FACTOR IS 1.25, THEREFORE THE TOTAL DEBRIS YIELD IS: 909 CY

USE DEBRIS YIELD = 909 CY = 0.56 AC-FT

UNDEVELOPED TRIBUTARY AREA (BASIN #2)

P = 200 (OC Hydrology Manual Figure B-1)
RR = 1780-1170 ft/ 0.506 mi = 1206 ft/mi
A = 52.4 acres = 0.0819 mi^2
FF = 4.5 (Debris Method Figure 2)

LOG(P) = 2.301
LOG(RR) = 3.085
LOG(A) = 1.723

LOG (Dy) = 0.65(2.301) + 0.62(3.081) + 0.18(1.719) + 0.12(4.5)

LOG (Dy) = 1.4957 + 1.910 + 0.309 + 0.454 = 4.258

Dy = 18,134 CY/mi^2

REDUCED ADJUSTED UNIT DEBRIS BY STUDY ACREAGE

THEREFORE DY = 1,485 CY

DEBRIS YIELD = 1,485 CY = 0.92 AC-FT

SAFETY FACTOR IS 1.25, THEREFORE THE TOTAL DEBRIS YIELD IS: 1,856 CY

USE DEBRIS YIELD = 1,856 CY = 1.15 AC-FT

UNDEVELOPED TRIBUTARY AREA (BASIN #3)

P = 200 (OC Hydrology Manual Figure B-1)
RR = 1615-1056 ft/ 0.653 mi = 860.6 ft/mi
A = 123.22 acres = 0.193 mi^2
FF = 4.5 (Debris Method Figure 2)

LOG(P) = 2.301
LOG(RR) = 2.935
LOG(A) = 2.091

LOG (Dy) = 0.65(2.301) + 0.62(2.935) + 0.18(2.091) + 0.12(4.5)

LOG (Dy) = 1.4957 + 1.820 + 0.376 + 0.54 = 4.232

Dy = 17,050 CY/mi^2

REDUCED ADJUSTED UNIT DEBRIS BY STUDY ACREAGE

THEREFORE DY = 3,291 CY

DEBRIS YIELD = 3,291 CY = 2.04 AC-FT

SAFETY FACTOR IS 1.25, THEREFORE THE TOTAL DEBRIS YIELD IS: 4,113 CY

USE DEBRIS YIELD = 4,113 CY = 2.55 AC-FT

UNDEVELOPED TRIBUTARY AREA (BASIN #4)

P = 200 (OC Hydrology Manual Figure B-1)
RR = 1515-920 ft/ 0.668 mi = 890.0 ft/mi
A = 100.3 acres = 0.157 mi^2
FF = 4.5 (Debris Method Figure 2)

LOG(P) = 2.301
LOG(RR) = 2.949
LOG(A) = 2.001

LOG (Dy) = 0.65(2.301) + 0.62(2.949) + 0.18(2.001) + 0.12(4.5)

LOG (Dy) = 1.4957 + 1.829 + 0.360 + 0.54 = 4.465

Dy = 16,758 CY/mi^2

REDUCED ADJUSTED UNIT DEBRIS BY STUDY ACREAGE

THEREFORE DY = 2,631 CY

DEBRIS YIELD = 2,631 CY = 1.63 AC-FT

SAFETY FACTOR IS 1.25, THEREFORE THE TOTAL DEBRIS YIELD IS: 3,289 CY

USE DEBRIS YIELD = 3,289 CY = 2.04 AC-FT

UNDEVELOPED TRIBUTARY AREA (BLUE MUD CANYON)

P = 200 (OC Hydrology Manual Figure B-1)
RR = 1645-570 ft/ 2.75 mi = 390.9 ft/mi
A = 647.6 acres = 1.01 mi^2
FF = 4.5 (Debris Method Figure 2 – 4 years)

LOG(P) = 2.301
LOG(RR) = 2.592
LOG(A) = 2.811

LOG (Dy) = 0.65(2.301) + 0.62(2.592) + 0.18(2.811) + 0.12(4.5)

LOG (Dy) = 1.4957 + 1.607 + 0.506 + 0.54 = 4.149

Dy = 14,082 CY/mi^2

REDUCED ADJUSTED UNIT DEBRIS BY STUDY ACREAGE

THEREFORE DY = 14,223 CY

DEBRIS YIELD = 14,223 CY = 8.73 AC-FT

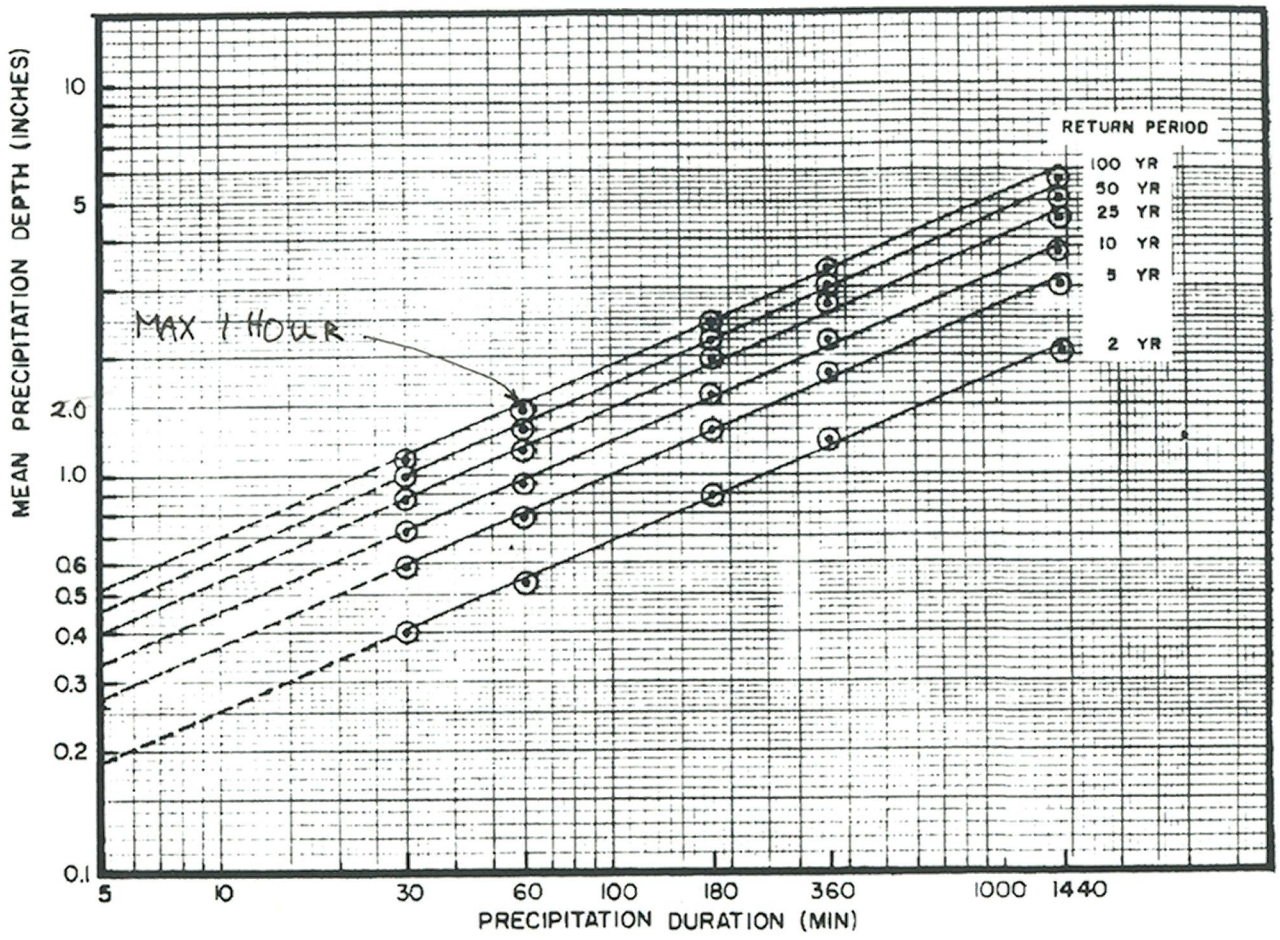
SAFETY FACTOR IS 1.25, THEREFORE THE TOTAL DEBRIS YIELD IS: 5,719 CY

USE DEBRIS YIELD = 17,778 CY = 11.02 AC-FT

Regression Equations: $D(t) = at^b$

(D= Depth in inches, t= duration in minutes)

Return Frequency (years)	a	b
2	0.095	0.426
5	0.131	0.438
10	0.170	0.427
25	0.200	0.434
50	0.225	0.434
100	0.259	0.427



ORANGE COUNTY

HYDROLOGY MANUAL

MEAN PRECIPITATION DEPTHS FOR NONMOUNTAINOUS AREAS

Figure B-1

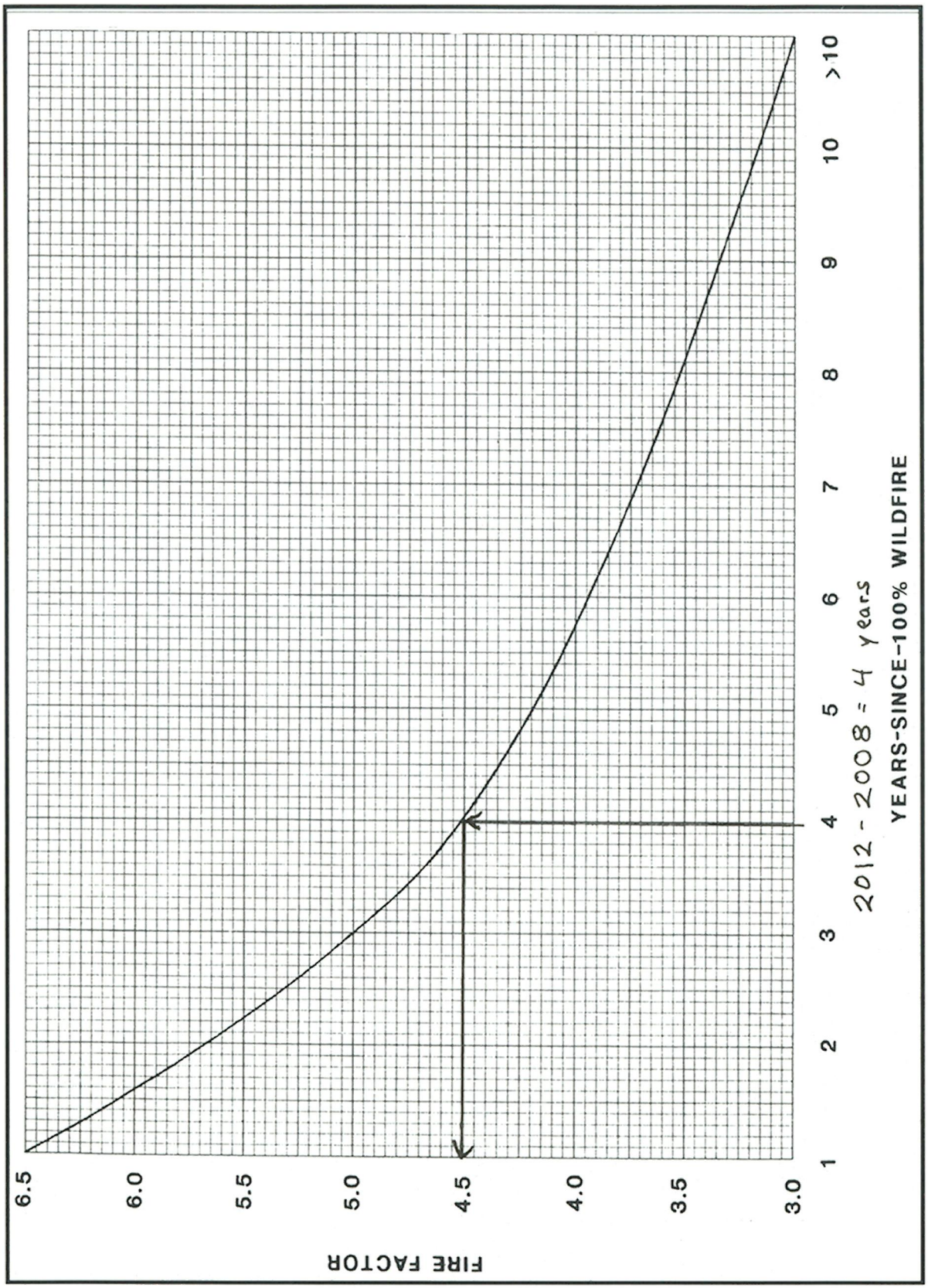
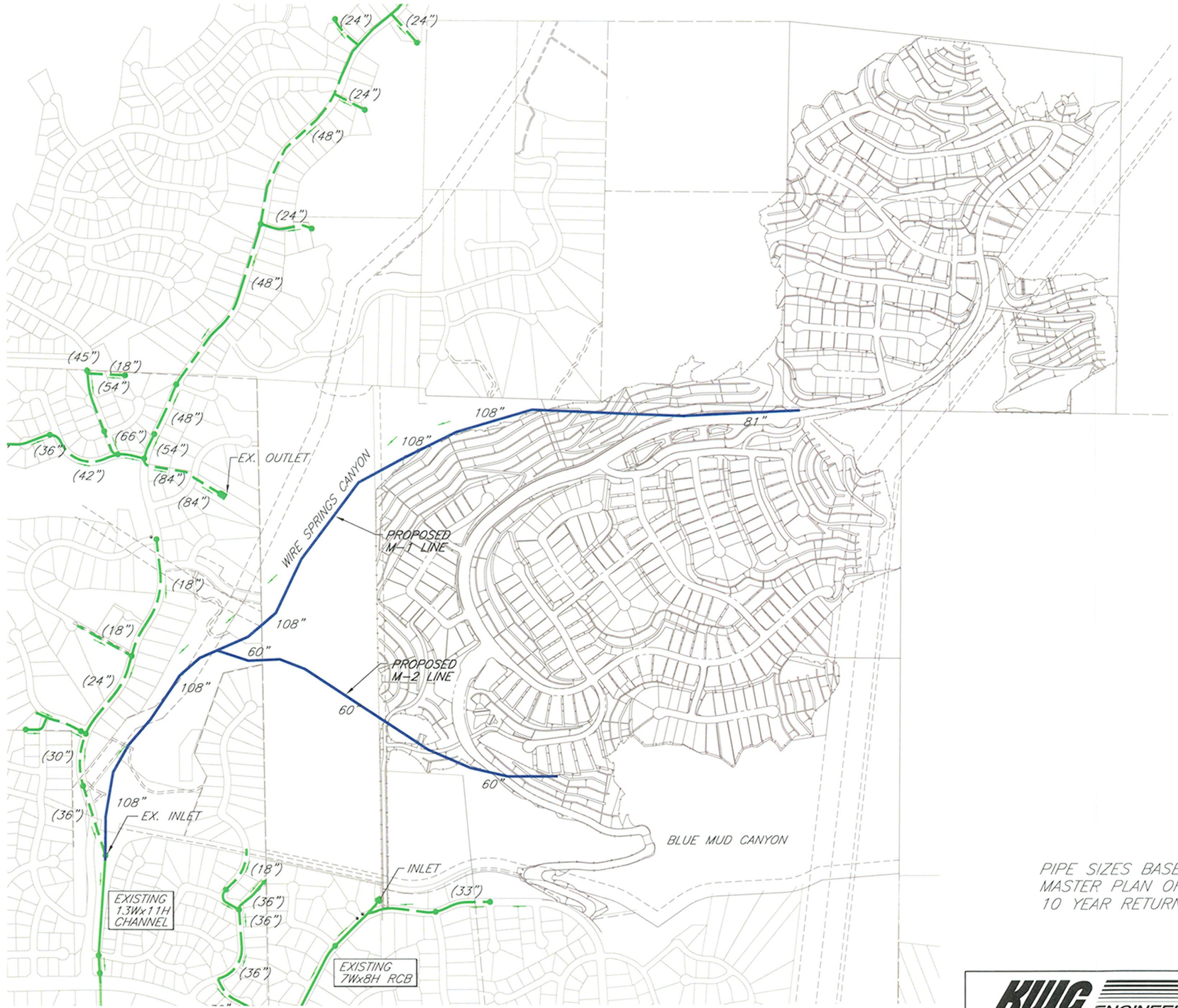


Figure 2: Fire Factor Curve for Watersheds 0.1 to 3.0 mi²

Appendix

P

MASTER PLAN EXHIBITS



SCALE: 1" = 800'

PIPE SIZES BASED ON CITY OF YORBA LINDA MASTER PLAN OF DRAINAGE, FEBRUARY 2000, 10 YEAR RETURN FREQUENCY STORM EVENT.

FIGURE 13

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MASTER PLAN PROP. FACILITIES
ESPERANZA HILLS

Designed by	Drawn by	Checked by
VAE	VAE	MCT

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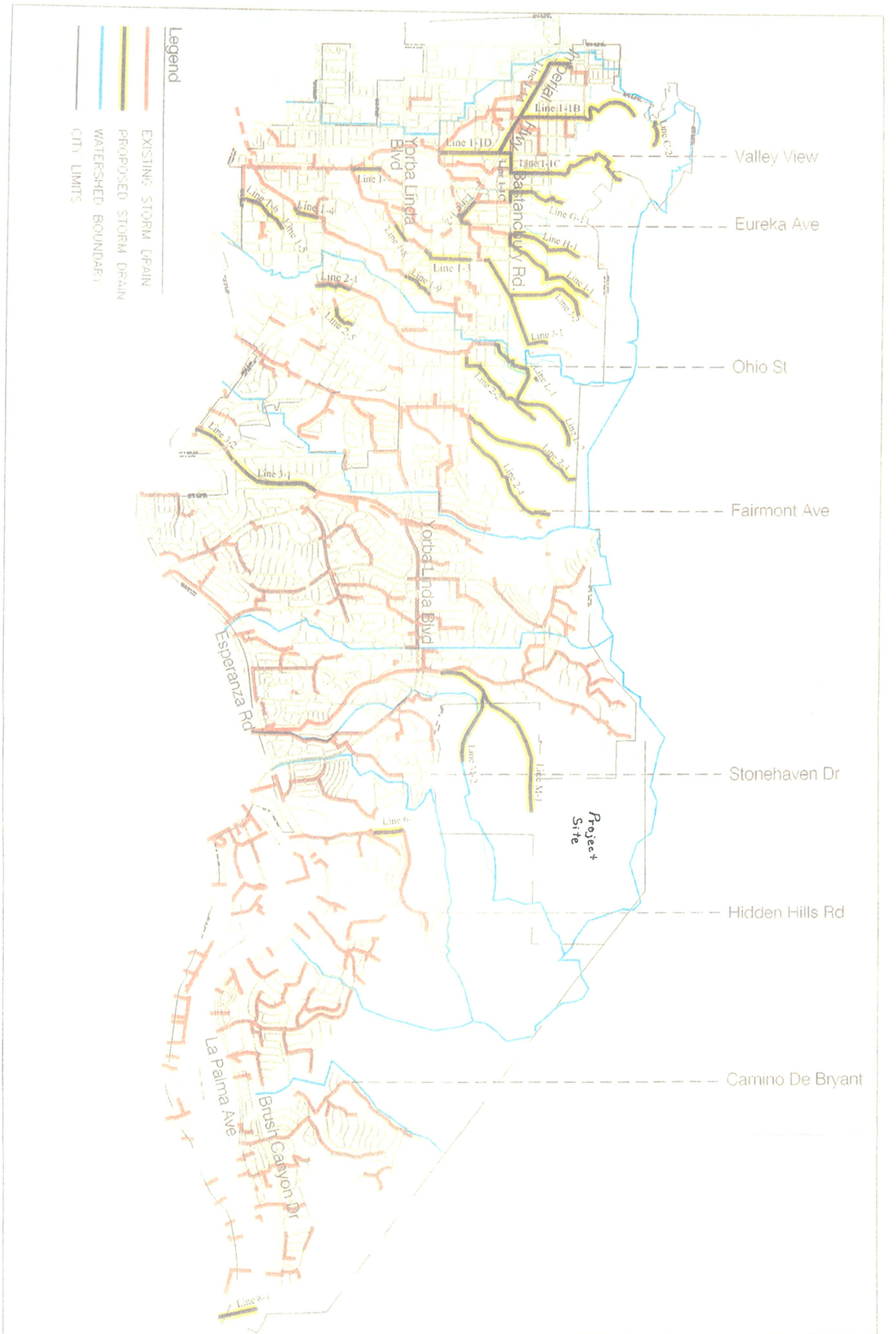
Legend
EXISTING STORM DRAIN
PROPOSED STORM DRAIN
WATERSHED BOUNDARY
CITY LIMITS
Valley View
Eureka Ave
Ohio St
Fairmont Ave
Stonehaven Dr
Hidden Hills Rd
Camino De Bryant
Yorba Linda Blvd
Esperanza Rd
La Palma Ave
Brush Canyon Dr
Project Site
Line 1-4B
Line 1-4C
Line 1-4D
Line 1-4E
Line 1-4
Line 1-5
Line 1-6
Line 1-7
Line 1-8
Line 1-9
Line 2-1
Line 2-2
Line 2-3
Line 2-4
Line 2-5
Line 3-1
Line 3-2
Line 3-3
Line 3-4
Line 3-5
Line 6-
Line 8-1
Line G-1
Line H-1
Line L-1
Line L-2
Line L-3
Line M-1
Line N-1
Line N-2
Line O-1
Line O-2
Line O-3
Line O-4
Line O-5
Line O-6
Line O-7
Line O-8
Line O-9
Line O-10
Line O-11
Line O-12
Line O-13
Line O-14
Line O-15
Line O-16
Line O-17
Line O-18
Line O-19
Line O-20
Line

21

16

27

23

CITY OF YORBA LINDA
INCORPORATED 1967

Detailed Facilities Maps

LEGEND

- SURFACE FLOW
- CONCENTRATION NODE
- 18" SIZE OF STORM DRAIN
- 12.34 AC SUBAREA ACREAGE
- EXISTING STORM DRAIN
- GOLF COURSE BOUNDARY
- CITY LIMITS
- SUBAREA BOUNDARY
- WATERSHED BOUNDARY
- PROPOSED STORM DRAIN
- SUMP LOCATION

1 inch = 400 ft.

KEY MAP

1	6			21	26			
2	7	11	16	22	27	31	36	
3	8	12	17	23	28	32	37	
4	9	13	18	24	29	33	38	41
5	10	14	19	25	30	34	39	42
		15	20			35	40	

Berryman & Henigar

DATE: 2/21/2000

SHEET 22

Figure 15a

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22

17

28

24

Detailed Facilities Maps

CITY OF YORBA LINDA
INCORPORATED 1967

LEGEND

- SURFACE FLOW
- CONCENTRATION NODE
- 18" SIZE OF STORM DRAIN
- 12.34 AC SUBAREA ACREAGE
- EXISTING STORM DRAIN
- GOLF COURSE BOUNDARY
- CITY LIMITS
- SUBAREA BOUNDARY
- WATERSHED BOUNDARY
- PROPOSED STORM DRAIN
- SUMP LOCATION

1 inch = 400 ft.

KEY MAP

1	6			21	26			
2	7	11	16	22	27	31	36	
3	8	12	17	23	28	32	37	
4	9	13	18	24	29	33	38	41
5	10	14	19	25	30	34	39	42
		15	20			35	40	

Berryman & Henigar

DATE: 2/21/2000

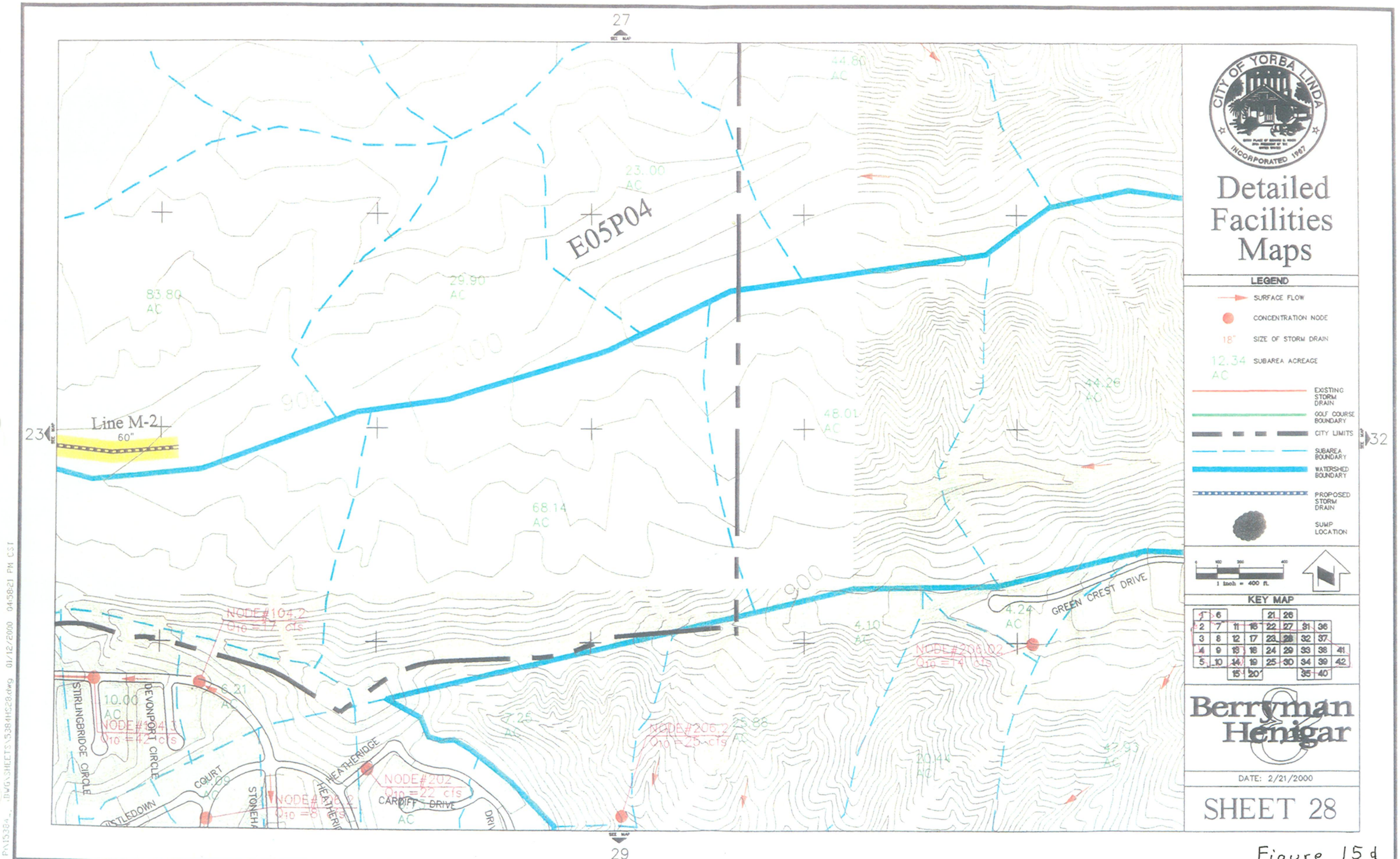
SHEET 23

Figure 15b



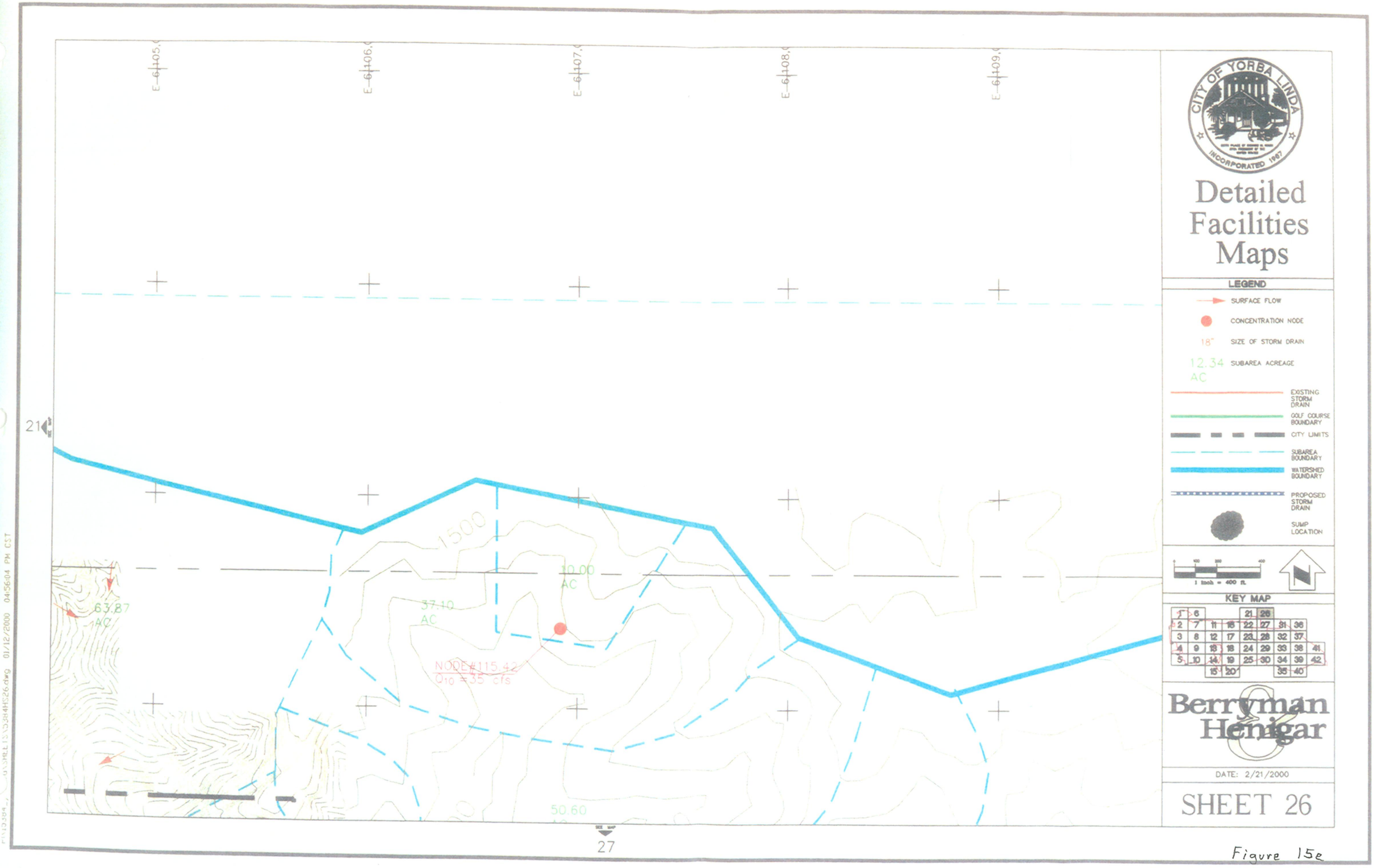
26
22
31
28
E06P07
E06P08
Line M-1
NODE#115.40
Q10 =1038 cfs
NODE#115.30
Q10 =430 cfs
NODE#115.52
Q10 =33 cfs
E-6|105,000
E-6|106,000
E-6|107,000
E-6|108,000
E-6|109,000
108"
81"
56.30 AC
43.70 AC
19.40 AC
26.10 AC
51.70 AC
24.90 AC
37.40 AC
41.70 AC
26.30 AC
46.00 AC
CITY OF YORBA LINDA
INCORPORATED 1967
Detailed Facilities Maps
LEGEND
SURFACE FLOW
CONCENTRATION NODE
18" SIZE OF STORM DRAIN
12.34 AC SUBAREA ACREAGE
EXISTING STORM DRAIN
GOLF COURSE BOUNDARY
CITY LIMITS
SUBAREA BOUNDARY
WATERSHED BOUNDARY
PROPOSED STORM DRAIN
SUMP LOCATION
1 inch = 400 ft.
KEY MAP
Berryman Henigar
DATE: 2/21/2000
SHEET 27

Figure 15c



27
29
23
32
E05P04
Line M-2
60"
23.00 AC
29.90 AC
83.80 AC
68.14 AC
44.80 AC
48.01 AC
44.26 AC
4.24 AC
4.10 AC
7.25 AC
25.88 AC
20.44 AC
47.93 AC
10.00 AC
6.21 AC
NODE#104.2
Q10 = 17 cfs
NODE#104.3
Q10 = 42 cfs
NODE#206.2
Q10 = 25 cfs
NODE#206.02
Q10 = 14 cfs
NODE#202
Q10 = 22 cfs
NODE#206.2
Q10 = 8 cfs
STIRLINGBRIDGE CIRCLE
DEVONPORT CIRCLE
COURT
HEATHERIDGE
CARDIFF DRIVE
GREEN CREST DRIVE
CITY OF YORBA LINDA
INCORPORATED 1967
Detailed Facilities Maps
LEGEND
SURFACE FLOW
CONCENTRATION NODE
18" SIZE OF STORM DRAIN
12.34 AC SUBAREA ACREAGE
EXISTING STORM DRAIN
GOLF COURSE BOUNDARY
CITY LIMITS
SUBAREA BOUNDARY
WATERSHED BOUNDARY
PROPOSED STORM DRAIN
SUMP LOCATION
1 inch = 400 ft.
KEY MAP
Berryman & Henigar
DATE: 2/21/2000
SHEET 28

Figure 15d



E-6 105.0
E-6 106.0
E-6 107.0
E-6 108.0
E-6 109.0
21
1500
10.00 AC
37.10 AC
63.87 AC
NODE #115.42
Q10 = 35 cfs
50.60
27
CITY OF YORBA LINDA
INCORPORATED 1967
Detailed Facilities Maps
LEGEND
SURFACE FLOW
CONCENTRATION NODE
18" SIZE OF STORM DRAIN
12.34 AC SUBAREA ACREAGE
EXISTING STORM DRAIN
GOLF COURSE BOUNDARY
CITY LIMITS
SUBAREA BOUNDARY
WATERSHED BOUNDARY
PROPOSED STORM DRAIN
SUMP LOCATION
1 inch = 400 ft.
KEY MAP
Berryman Henigar
DATE: 2/21/2000
SHEET 26

Figure 15e

Appendix

Q
REFERENCE STORM DRAIN PLANS

IMPROVEMENT PLANS FOR TRACT 9813 IN THE CITY OF YORBA LINDA

GENERAL NOTES

1. ALL WORK SHALL CONFORM TO STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION; THE ORANGE COUNTY ENVIRONMENTAL MANAGEMENT AGENCY STANDARD PLANS; AND THE STANDARD SPECIFICATIONS OF THE CITY OF YORBA LINDA, LATEST EDITIONS.
2. ALL EXISTING IMPROVEMENTS INCLUDING CURB AND GUTTERS, SIDEWALKS, ASPHALT CONCRETE OR P.C.C. PAVING, WHICH ARE BEING JOINED OR MATCHED IN CONNECTION WITH THIS PROJECT, SHALL BE JOINED OR MATCHED IN A MANNER SATISFACTORY TO THE CITY ENGINEER, INCLUDING NECESSARY SAWCUTTING, REMOVAL, REPLACEMENT AND CAPPING.
3. ANY EXISTING TRAVEL WAYS IN WHICH EXCAVATION IS MADE IN CONJUNCTION WITH THIS PROJECT SHALL BE COVERED BY A SEPARATE PERMIT. THIS AREA SHALL BE PROPERLY POSTED AND LIGHTED IN CONFORMANCE WITH THE STATE MANUAL OF WARNING SIGNS, LIGHTS, AND DEVICES FOR USE IN PERFORMANCE OF WORK UPON HIGHWAYS IN ORDER TO ELIMINATE ANY HAZARDS. STREETS SHALL BE SURFACED WITH A MINIMUM OF 4" OF ASPHALT AT THE END OF EACH WORKING DAY.
4. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND SHALL NOTIFY THE CITY ENGINEER (994-7170) 48 HOURS PRIOR TO STARTING EACH PHASE OF CONSTRUCTION AND PRIOR TO REQUIRING INSPECTION.
5. ALL UTILITIES SHALL BE INSTALLED PRIOR TO PAVING OF STREETS; ALL TRENCHES SHALL BE FULLY COMPACTED TO THE SATISFACTION OF THE CITY ENGINEER. MANHOLE AND VALVE BOX FRAMES SHALL BE ADJUSTED TO FINISHED GRADES AFTER COMPLETION OF CONSTRUCTION.
6. THE CONTRACTOR SHALL DETERMINE THE LINE LOCATION OF ANY UNDERGROUND UTILITY PRIOR TO LAYING ANY LINES WHICH ARE TO CONNECT TO EXISTING SEWERS OR STORM DRAINS. THESE LINES SHALL BE EXPOSED AND JOINT ELEVATIONS VERIFIED. ANY CHANGE IN GRADE OR DEVIATON FROM THE PLANS MUST BE APPROVED BY THE CITY ENGINEER.
7. A MINIMUM OF TWO WEEKS AFTER THE COMPLETION OF THE A.C. SURFACING OR AS DIRECTED BY THE CITY ENGINEER, AN ASPHALT EMULSION SEAL COAT, SS-1H, SHALL BE APPLIED AT THE APPROXIMATE RATE OF 0.1 GAL. PER SQ. YD.
8. STREET NAME SIGNS AND TRAFFIC CONTROL SIGNS, TYPE AND LOCATIONS SHALL BE DESIGNATED BY THE CITY ENGINEER.
9. STAKES FOR CURB CONSTRUCTION ARE TO BE OFFSET FROM FACE OF CURBS.
10. THE ENGINEER SHALL FURNISH GRADE SHEETS TO THE CITY INSPECTOR FOR CONSTRUCTION OF IMPROVEMENTS.
11. IF DRIVEWAY EXPRESSIONS ARE MADE IN ANY CURB, DRIVEWAY APPROACHES ARE THEN TO BE A PART OF THE IMPROVEMENT PLAN AND SHALL BE CONSTRUCTED IN ACCORDANCE WITH STANDARD PLAN NO. 209 OF THE OCEMA STANDARD PLANS.
12. ADVERTISING SIGNS WILL NOT BE PERMITTED WITHIN STREET RIGHT-OF-WAY.
13. TREES SHALL BE PLANTED WITHIN THE STREET RIGHT-OF-WAY IN ACCORDANCE WITH CITY OF YORBA LINDA REQUIREMENTS.
14. STREET LIGHTS ARE TO BE INSTALLED BY SOUTHERN CALIFORNIA EDISON COMPANY PER PLAN APPROVED BY THE CITY OF YOUBA LINDA.
15. STRUCTURAL SECTION OF PAVEMENT SHALL BE DETERMINED BY THE CITY'S SOILS ENGINEER AND APPROVED BY THE CITY ENGINEER.
16. PRIME COAT SHALL CONSIST OF M.C.-70 LIQUID ASPHALT APPLIED AT THE RATE OF 0.25 GAL. PER SQ. YD. AT LEAST 12 HOURS PRIOR TO ASPHALT PAVING OPERATIONS.
17. ALL EXISTING PAVEMENT WITHIN THIS PROJECT SHALL EITHER BE REMOVED OR STRUCTURALLY TESTED TO VERIFY THE STRUCTURAL CAPABILITIES AND THE RESULTS SHALL BE APPROVED BY THE CITY ENGINEER.
18. COMPACTION TESTING SHALL BE PERFORMED BY THE CITY'S SOILS ENGINEER AT THE DIRECTION OF THE CITY ENGINEER.
19. INTERIOR AND EXTERIOR STREET IMPROVEMENTS SHALL BE CONSTRUCTED PRIOR TO THE ISSUANCE OF BUILDING PERMITS TO THE SATISFACTION OF THE CITY ENGINEER.
20. SEWER MAIN AND LATERALS SHALL BE CONSTRUCTED, BACKFILL COMPACTED AND TESTED PRIOR TO CONSTRUCTION OF THE CURB AND GUTTER.
21. THE CURB AND GUTTER SHALL BE "ETCHED" SHOWING LATERAL LOCATIONS; "S" FOR SEWER, "G" FOR GAS, AND "E" FOR ELECTRICAL.
22. DRIVEWAYS SHALL BE LOCATED PER APPROVED PLOT PLAN BY DEVELOPER'S ENGINEER. STAKES SHALL BE SET ON CENTERLINE OF APPROACH WITH OVERALL MARKED ON WITNESS STAKE. W=BOTTOM OF "V" WIDTH.
23. STREET CENTERLINE AND INTER-VERTICAL CONTROL STAKING (GRID FLEXATIONS) SHALL BE PROVIDED ABY DEVELOPER'S ENGINEER AS REQUIRED BY CITY INSPECTOR.
24. TRAFFIC CONTROL AND SAFETY DEVICES SHALL BE PLACED AND MAINTAINED PER THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION, MANUAL OF WARNING SIGNS, LIGHTS, AND DEVICES FOR USE IN PERFORMANCE OF WORK UPON HIGHWAYS AND TO THE SATISFACTION OF THE CITY ENGINEER.
25. NOTICE TO CONTRACTORS: EXISTENCE AND LOCATIONS OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN OF THESE PLANS ARE OBTAINED BY A SEARCH OF THE AVAILABLE RECORDS. APPROVAL OF THESE PLANS BY THE CITY OF YORBA LINDA DOES NOT CONSTITUTE A REPRESENTATION AS TO THE ACCURACY OR COMPLETENESS OF THE LOCATION OR EXISTENCE OR NON-EXISTENCE OF ANY UNDERGROUND UTILITY PIPE OR STRUCTURE WITHIN THE LIMITS OF THIS PROJECT. THE CONTRACTOR IS REQUIRED TO TAKE ALL DUE PRECAUTIONARY MEANS TO PROTECT THE UTILITY LINES NOT OF RECORD OR NOT SHOWN ON THESE PLANS.
26. PRIVATE ENGINEER'S NOTICE: PRIOR TO CONSTRUCTION, SEWER AND WATER CONTRACTORS SHALL ASCERTAIN THE CORRECTNESS OF WATER SERVICES AND SEWER LATERAL LOCATIONS WITH THE DEVELOPER. ANY DEVIATION FROM LOCATIONS SHOWN ON THESE PLANS SHALL BE REPORTED TO THE ENGINEER FOR ADJUSTMENT PRIOR TO CALLING FOR ANY CONSTRUCTION STAKING REQUIRED.
27. THE FINAL OR SURFACE LAYER OF ASPHALT CONCRETE SHALL NOT BE PLACED UNTIL ALL ON-SITE IMPROVEMENTS HAVE BEEN COMPLETED, INCLUDING ALL GRADING AND UNTIL ALL UNACCEPTABLE CONCRETE WORK HAS BEEN REMOVED AND REPLACED UNLESS APPROVED OTHERWISE BY THE ENGINEER, PER OCEMA STD. #805.
28. ALL STREET LIGHTS SHOULD BE LOCATED 18" BEHIND CURB.

WATER NOTES

1. THE WATER SYSTEM SHALL BE INSTALLED IN CONFORMANCE WITH THE YORBA LINDA COUNTY WATER DISTRICT "STANDARD SPECIFICATIONS FOR CONSTRUCTION OF WATER MAINS".
2. ALL SERVICES TO BE 1" PLASTIC WITH 1" METER, UNLESS OTHERWISE NOTED.
3. FIRE HYDRANTS TO BE MUELLER A-423-MODERN IMPROVED OR APPROVED EQUAL.
4. A-442 VALVE OPENING SIZE SHALL BE 6-1/2" AND 4"X2-1/2" HOSE OUTLETS.
5. ALL WATER MAINS TO BE CLASS 150-ASBESTOS CEMENT, UNLESS NOTED TO BE CLASS 200 SIZED AS SHOWN.
   METERS TO BE INSTALLED BY YORBA LINDA WATER DISTRICT.
6. IN ACCORDANCE WITH ASSEMBLY BILL 1366, THE CONTRACTOR SHALL OBTAIN A PERMIT FROM THE STATE OF CALIFORNIA, DIVISION OF INDUSTRIAL SAFETY PRIOR TO ANY TRENCH EXCAVATION. A COPY OF SAID PERMIT SHALL BE KEPT AT THE JOB SITE AND AVAILABLE TO DISTRICT REPRESENTATIVE UPON REQUEST.
7. ALL TRENCH BACKFILL SHALL BE COMPACTED TO A MINIMUM OF 90% REL. DENSITY.
8. CONTRACTOR SHALL NOTIFY WATER DISTRICT INSPECTOR 48 HOURS PRIOR TO STARTING ANY PHASE OF CONSTRUCTION.
9. WATER VALVES ARE TO BE PLACED OUT OF SPANDREL AREA.
10. ALL WATER MAINS SHALL MAINTAIN DEPTH OF 54" TO FLOWLINE FROM TOP OF CURB.
11. BUTTERFLY VALVES MAY BE SUBSTITUTED FOR GATE VALVES OVER 12".
12. ALL VALVE BOXES SHALL BE BROUGHT TO GRADE AFTER EACH LIFT OF ROADWAY PAVING
13. ALL LANDSCAPE METER LOCATIONS SHALL BE NOTED TO YORBA LINDA WATER DISTRICT.
14. MINIMUM DISTANCE BETWEEN STREET LIGHT STANDARD AND FIRE HYDRANT IS 6 FEET.

SEWER NOTES

1. ALL SEWER WORK SHALL COMPLY WITH THE GENERAL PROVISIONS, STANDARD SPECIFICATIONS AND STANDARD PLANS FOR SEWER CONSTRUCTION OF THE YORBA LINDA WATER DISTRICT, LATEST EDITION.
2. THE CONTRACTOR SHALL NOTIFY THE CITY ENGINEER AT LEAST 24 HOURS PRIOR TO THE NEED OF ANY INSPECTION.
3. VITRIFIED CLAY PIPE SEWERS SHALL HAVE JOINTS OF THE MECHANICAL COMPRESSION TYPE, SUCH AS "WEDGELOCK", "SPEED SEAL MAINLINE" OR "BANDSEAL" OR APPROVED EQUAL.
4. THE USE OF PORTLAND CEMENT IN ANY FORM WILL NOT BE PERMITTED FOR JOINTS.
5. MANHOLE COVERS SHALL BE LEFT AT LEAST 6" BELOW SUBGRADE AND BROUGHT TO FINAL GRADE UPON COMPLETION OF PAVING. FINAL MANHOLE SEATING SHALL BE 1/8" BELOW ASPHALT SURFACE.
6. FOUR INCH (4") A.B.S. SEWER HOUSE CONNECTIONS SHALL BE LAID TO GRADE AS ESTABLISHED BY THE ENGINEER FOR THE SUBDIVIDER SO THAT THE 4" A.B.S. WILL HAVE A MINIMUM COVER OF FIVE AND ONE-HALF (5.5 FEET) FROM TOP OF CURB TO TOP OF PIPE — PER Y.L.W.D. STDS.
7. FINAL TESTING FOR PIPELINE LEAKAGE SHALL BE MADE IN THE PRESENCE OF THE INSPECTOR FOR THE CITY, AFTER BACKFILL HAS BEEN COMPLETED BY THE CONTRACTOR AND INSPECTED, APPROVED AND ACCEPTED BY THE CITY ENGINEER.
8. ALL SEWER LINES SHALL BE BALLED IN THE PRESENCE OF THE INSPECTOR FOR THE CITY AFTER FINAL TESTING AND MANHOLE COVERS HAVE BEEN BROUGHT TO GRDE UPON COMPLETION OF PAVING. BALLING MUST BE COMPLETED TO THE SATISFACTION OF THE CITY ENGINEER PRIOR TO OCCUPANCE RELEASES BEING ISSUED.
9. WHERE THE SEWER HOUSE CONNECTION COVER IS LESS THAN 5.5 FEET AND DOES NOT COMPLY WITH NOTE NO. 6 ABOVE, THE CONTRACTOR SHALL SUBSTITUTE C.I.P. PIPE (57.6 WITH RUBBER RING JOINTS) FOR A.B.S. OR CONCRETE ENCASE THE 4" A.B.S. PER DISTRICT STANDARD. THE C.I.P. OR CONCRETE ENCASED A.B.S. SHALL BE LAID AFTER THE WATER LINE IS INSTALLED AND SHALL BE LAID A MINIMUM DISTANCE OF 9 FEET EACH SIDE OF THE WATER LINE CROSSING WITH A 6" VERTICAL CLEARANCE BETWEEN THE WATER LINE AND THE HOUSE CONNECTION.
10. THE SUBDIVIDER'S ENGINEER SHALL SET A TOP OF CURB STAKE AT ALL SEWER LATERAL CONNECTIONS.
11. A 4" X 4" REDWOOD POST PAINTED WHITE (4' - 6" WITH 3' - 0" ABOVE GROUND) SHALL BE SET AS A MANHOLE REFERENCE, WHEN SEWER IS NOT CONSTRUCTED IN THE STREET RIGHT-OF-WAY, AT THE DIRECTION OF THE ENGINEER.
12. ALL TRENCH BACKFILL SHALL BE COMPACTED TO A MINIMUM OF 90% REL. DENSITY.
13. THE SUBDIVIDER'S ENGINEER SHALL FURNISH A COMPLETE SET OF "AS-BUILT" PLANS ON ORIGINAL LINENS OR MYLAR TO THE CITY ENGINEER AT THE COMPLETION OF THE SEWER WORK AND PRIOR TO PAVING STREETS SHOWING LOCATION OF WYES AND END OF HOUSE LATERALS AT PROPERTY.
14. THE CONTRACTOR'S ATTENTION IS DIRECTED TO SECTION 4-10, "SAFETY AND ACCIDENT PREVENTION" OF THE YORBA LINDA WATER DISTRICT'S SPECIFICATIONS.
15. IF THE BOTTOM OF THE WATER MAIN DOES NOT CLEAR THE TOP OF THE SANITARY SEWER BY 3", CONCRETE ENCASEMENT OF THE SEWER WITH STEEL REINFORCING WILL BE REQUIRED, AND EXTENDING 5' EACH SIDE OF WATER MAIN MEASURED AT RIGHT ANGLES OF THE WATER MAIN.
16. SEWER LATERAL CONNECTIONS SHALL ENTER THE MAINLINE AT A POINT DOWNSTREAM OF A MANHOLE. SEWER LATERAL CONNECTIONS AT PROPERTY LINE SHALL NOT BE MADE UNTIL MAINLINE HAS BEEN AIR TESTED AND ACCEPTED FOR LEAKAGE BY THE CITY OF YORBA LINDA.
17. THE DEVELOPER SHALL FURNISH CONTRACTOR AND CITY INSPECTOR "WYE" STATIONING WITH ALL MAINLINE SEWER CUT SHEETS.
18. SEWER STATIONING SHOWN THUS: 0 + 00.00
19. ACRYLONITRILE-BUTADIENE-STYRENE (A.B.S.) PLASTIC SEWER PIPE SHALL CONFORM TO THE REQUIREMENTS OF SECTIONS 207-14 AND 207-15 OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION.
20. SOLID WALL PLASTIC PIPE SHALL HAVE AN SDR RATIO OF OUTSIDE DIAMETER TO THICKNESS OF 23.5.
21. PLASTIC PIPE SHALL BE BEDDED IN STRICT ACCORDANCE WITH THE BEDDING DETAILS HEREON. CASE 2 BEDDING SHALL BE USED FOR PIPE WITH FROM 4' TO 17' COVER. BEDDING MATERIAL SHALL BE NO. 4 AGGREGATE OR 1/2" CRUSHED ROCK. IF COVER IS LESS THAN 4', SAND MAY BE SUBSTITUTED. CASE 4 BEDDING SHALL BE USED FOR COVER GREATER THAN 17', SEE DETAIL SHEET 2.
22. HOUSE CONNECTIONS CUT THROUGH THE PIPE WILL NOT BE ACCEPTED.
23. A SEAL, WATERSTOP, OR COUPLING SHALL BE PLACED OR GROUTED INTO THE MANHOLE TO ACCEPT THE PLASTIC SEWER PIPE.
24. ALL EXPOSED ENDS OF A.B.S., COMPOSITE PIPE SHALL BE THOROUGHLY COATED WITH SOLVENT CEMENT PRIOR TO JOINING.
25. ALL MAINLINE PLASTIC (A.B.S.) PIPE SHALL BE MANDRELL TESTED PER SECTION 306-1.4.6 OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION. THE TEST SHALL COMMENCE AT LEAST 48 HOURS AFTER BACKFILL.
26. STANDARD 12.5' LENGTHS OF A.B.S. COMPOSITE PIPE SHALL NOT BE PLACED ON A CURVE WITH A RADIUS LESS THAN 540'. SMALLER RADIUS CURVES SHALL CONSTRUCTED USING 3 DEGREE DEFLECTION FITTINGS.

STORM DRAIN NOTES

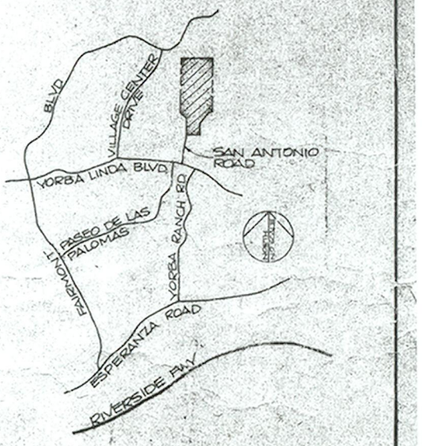
1. ALL CONCRETE IN REINFORCED CONCRETE STRUCTURES MUST BE 3250 P.S.I. IN 28 DAYS. TYPE V PORTLAND CEMENT CONCRETE, CLASS A.
2. ALL PIPE LENGTHS ARE HORIZONTAL PROJECTIONS, UNLESS OTHERWISE SHOWN.
3. FOR TRENCH EXCAVATIONS IN NATIVE SOIL, SHORING SHALL BE PROVIDED TO SATISFY STATE OF CALIFORNIA SAFETY REQUIREMENTS.
4. PIPE CONSTRUCTION IN FILL AREA MUST BE COORDINATED WITH THE GRADING TO INSURE THAT WHEN THE FILL OPERATION HAS BEEN COMPLETED AT GRADE A MINIMUM OF ONE FOOT ABOVE THE TOP OF PIPE OR TO FIVE FEET (MAXIMUM) ABOVE THE PROPOSED SUBGRADE OF THE PIPE, THE STORM DRAIN TRENCH SHALL BE EXCAVATED AND THE PIPE INSTALLED.
5. ALL WORK MUST BE IN CONFORMANCE WITH THE ORANGE COUNTY E.M.A. STANDARD SPECIFICATIONS WHICH MAY BE PURCHASED FROM THE COUNTY AND KEPT ON THE JOB SITE AT ALL TIMES.
6. THE CONTRACTOR MUST NOTIFY THE CITY OF YORBA LINDA INSPECTOR AT LEAST (2) WORKING DAYS PRIOR TO COMMENCEMENT OF ANY CONSTRUCTION.
7. ALL FILLS MUST BE COMPACTED TO 90% RELATIVE COMPACTION AS DETERMINED BY THE CALIFORNIA TEST METHOD NO. 216-F, 1963 "FIVE LAYER METHOD". ALL BACKFILL MATERIAL MUST BE FREE OF VEGETABLE MATTER.
8. ALL SURVEYING REQUIRED FOR VERTICAL AND HORIZONTAL ALIGNMENT MUST BE PROVIDED BY THE CONTRACTOR OR DEVELOPER AND SUFFICIENT REFERENCE STAKING MUST BE IN ACCORDANCE WITH THE REQUEST OF THE CITY OF YORBA LINDA INSPECTOR.
9. ALL REINFORCED CONCRETE PIPE MUST BE BEDDED IN ACCORDANCE PIPE BEDDING DETAIL PER O.C.E.M.A. STD. PLAN 319.
10. PRIOR TO THE PLACEMENT OF STORM DRAIN IMPROVEMENTS, THE DEVELOPER'S SOILS ENGINEER SHALL CERTIFY IN WRITING TO THE CITY ENGINEER THAT THE STORM DRAINS' SUBGRADE IS OF ADEQUATE STRENGTH TO SUPPORT THE STRUCTURES AND ANY ANTICIPATED LOADS.
11. PRIOR TO THE COMMENCEMENT OF CONSTRUCTION, THE DEVELOPER'S CONTRACTOR SHALL OBTAIN A PERMIT FROM THE STATE DIVISION OF INDUSTRIAL SAFETY. A COPY OF THE PERMIT SHALL BE KEPT ON THE JOB SITE AT ALL TIMES.
12. WHENEVER APPLICABLE, THE DEVELOPER SHALL OBTAIN A PERMIT FROM THE STATE DEPT. OF FISH AND GAME IN ACCORDANCE WITH SECTION 1602 OF THE CALIFORNIA FISH AND GAME CODE PRIOR TO COMMENCEMENT OF CONSTRUCTION.
13. ALL STEEL THAT IS TO BE CONTINUOUS SHALL BE LAPPED A MINIMUM OF 45 BAR DIAMETERS.
14. ALL MATERIALS TESTING FOR THE DRAINAGE FACILITIES SHALL BE PROVIDED BY THE CONTRACTOR OR DEVELOPER IN ACCORDANCE WITH THE NUMBER, LOCATION AND FREQUENCY REQUESTED BY THE CITY ENGINEER.
15. CHAMFER ALL EXPOSED EDGES OF CONCRETE 3/4" MIN.
16. A PERMIT FOR WORK WITHIN EXISTING STREET RIGHT OF WAY IS REQUIRED FROM THE CITY OF YORBA LINDA FOR ANY ENCROACHMENT NECESSARY FOR CONSTRUCTION IN THE STREET RIGHT OF WAY.
17. LENGTH OF MANHOLE STRUCTURES MAY BE INCREASED TO MEET PIPE ENDS AT OPTION OF CONTRACTOR AS LONG AS REINFORCING STEEL IS CONTINUED AS REQUIRED. ANY CHANGE IN SPUR LOCATION MUST BE APPROVED BY THE ENGINEER.
18. FLOWLINE OF MANHOLE STRUCTURE SHALL BE STEEL TROWELED TO SPRING LINE.
19. BODY OF MANHOLE STRUCTURE, INCLUDING SPUR, MUST BE POURED IN ONE CONTINUOUS OPERATION, EXCEPT THAT CONSTRUCTION JOINT AT THE SPRING LINE WITH A LONGITUDINAL KEY, IS PERMITTED.
20. ALL REINFORCING BARS MUST BE SECURELY HELD IN PLACE IN THE FORMS. TWO WAY MATS OF STEEL MUST BE WIRED TOGETHER BOTH WAYS AT ALTERNATE INTERSECTIONS.
21. STORM DRAIN BACKFILL FOR ALL FACILITIES WITHIN STREET RIGHT OF WAY IS TO BE PLACED AND COMPACTED UNDER CITY OF YORBA LINDA INSPECTION AND MEET OR EXCEED O.C.E.M.A. MINIMUM STANDARDS.
22. ALL PIPE TO BE BANDED AND GROUTED.
23. AREA DRAIN PIPE SHALL BE:
    A. ACRYLONITRILE BUTADIENE STYRENE (A.B.S.) SOLID WALL PIPE CONFORMING TO A.S.T.M. D 2751, DR35.
    OR B. POLYVINYL CHLORIDE PLASTIC (P.V.C.) PIPE CONFORMING TO A.S.T.M. D 3034, SDR 35.
    OR C. ASBESTOS CEMENT PIPE (A.C.P.) CONFORMING TO A.S.T.M. C-563.
    OR D. APPROVED EQUAL.
24. R.C.P. SHALL COMPLY WITH ALL A.S.T.M. APPLICABLE STANDARDS.

ED. RCP ON HORIZONTAL AND VERTICAL CURVES SHALL BE BEVELLED PER MANUFACTURERS RECOMMENDATIONS

LEGEND:

- FIRE HYDRANT
- P.C.P. WATER MAIN & BLOW OFF VALVE
- P.C.P. WATER MAIN & GATE VALVE
- A.B.S. TRUNK SEWER & MANHOLE
- STREET LIGHT
- STREET NAME SIGN
- STOP SIGN
- BARRICADE

VICINITY MAP



INDEX OF STREETS & TITLES

SHT #	DESCRIPTION
1	GENERAL NOTES, WATER, SEWER & STORM DRAIN NOTES
2	INDEX MAP, STREET SECTIONS & DETAILS
3,5,6,9	STREET PLAN & PROFILE - SAN ANTONIO ROAD
7	STREET PLAN & PROFILE
8	STREET PLAN & PROFILE
0	STREET PLAN & PROFILE
10	STREET PLAN & PROFILE
11	STREET PLAN & PROFILE
15,16	STREET PLAN & PROFILE
18	STREET PLAN & PROFILE
19	STREET PLAN & SEWER PROFILE (PRIVATE DRIVE)
13	SEWER IMP. "LINE A" & "LINE B"
17,18	STORM DRAIN IMPR. "LINE A"
19	STORM DRAIN IMPR. "LINE B"
22	STORM DRAIN IMPR. "LINE C"
21,22	STORM DRAIN IMPR. "LINE D"
23	STORM DRAIN IMPR. "LINE E"
24	STREET PLAN & PROFILE, GRADING

NOTICE TO CONTRACTOR:

THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS ARE OBTAINED BY A SEARCH OF THE AVAILABLE RECORDS. APPROVAL OF THIS PLAN BY THE CITY OF YORBA LINDA DOES NOT CONSTITUTE A REPRESENTATION AS TO THE ACCURACY OR COMPLETENESS OF THE LOCATION OR EXISTENCE OR NON-EXISTENCE OF ANY UNDERGROUND UTILITY PIPE OR STRUCTURE WITHIN THE LIMITS OF THIS PROJECT. THE CONTRACTOR IS REQUIRED TO TAKE ALL DUE PRECAUTIONARY MEANS TO PROTECT THE UTILITY LINES NOT OF RECORD OR NOT SHOWN ON THIS PLAN.

NOTE:

CONTRACTOR AGREES THAT HE SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT INCLUDING SAFETY OF ALL PERSONS AND PROPERTY THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS ABD THAT THE CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD THE OWNER AND THE ENGINEER HARMLESS FROM ANY AND ALL LIABILITY REAL OR ALLEGED IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS EXCEPTING FOR LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNER OR THE ENGINEER.

APPROVED FOR STORM DRAIN ONLY:
ROY STEPHENSON 8/21/86 DATE
BSM 7/21/86

REGISTERED PROFESSIONAL ENGINEER DOUGLAS SNYDER NO. 24068 CIVIL STATE OF CALIFORNIA

YORBA LINDA WATER DISTRICT	ORANGE COUNTY FIRE DEPT.
APPROVED BY:	APPROVED BY: JAN 15 1987
GENERAL MANAGER — DATE 9-16-86	DATE 3-14-86
J-84-01	

REVISIONS

NO	DESCRIPTION:	APPRD.	DATE:
1	ADDED SHEET 24 FA, GRADING & STREET IMP. FOR EXTENSION OF SAN ANTONIO RD.		
2	CHANGED SIZE OF STREET LIGHTS ON SAN ANTONIO RD. TO 22,000 LUMEN'S SHTS. 2 - 124		11/14/86
3	DELETE RUN OFF, EXTEND WATER LINE AND R.P.H. SHT II RPH QUAKE SHT. 2.		
4	DELETED WATER LOOP SHT 15		11/21/86

BASIS OF BEARINGS

THE BEARING OF N 1°22'00" E 18 SHOWN FOR THE EASTERLY LINE OF TRACT NO. 10011, AS FILED IN BOOK 460, PAGES 4-15 OF MISCELLANEOUS MAPS, WAS USED.

BENCH MARK

IN THE SOUTHWEST PART OF THE INTERSECTION OF YORBA LINDA BLVD. AND OHIO STREET TO THE SOUTH 38.5' WEST OF THE CENTER OF THE STREET, 50' NORTH ALONG THE EXTENSION OF THE WEST CURB OF OHIO STREET FROM THE SOUTHWEST CURB RETURN, SET IN THE TOP, 1.5' SOUTHEAST OF THE NORTHWEST END OF A CONCRETE HEADWALL OF A CULVERT UNDER THE STREET, MARKED BY MILE POST 10.00 AND ABOUT 3' LOWER THAN SIDEWALK.
ELEVATION 429.132 1970 ADJ.

SOILS/GEOLOGISTS

EARTH RESEARCH ASSOCIATES, INC.
3001 REDHILL AVENUE
THE ESPLANADE, IV SUITE 120
COSTA MESA, CALIFORNIA
92626
(714) 549-8921

REPORT DATE: 4-28-86

CITY ENGINEER

ROY STEPHENSON 9/16/86 DATE

OWNER

WARMINGTON HOMES
3090 PULLMAN STREET
COSTA MESA CALIFORNIA
92626
(714) 557-5511

ENGINEER

HUNSAKER & ASSOCIATES IRVINE, INC.
THREE HUGHES, IRVINE CA 92718
(714) 855-3600

DOUGLAS SNYDER 3-4-87 DATE

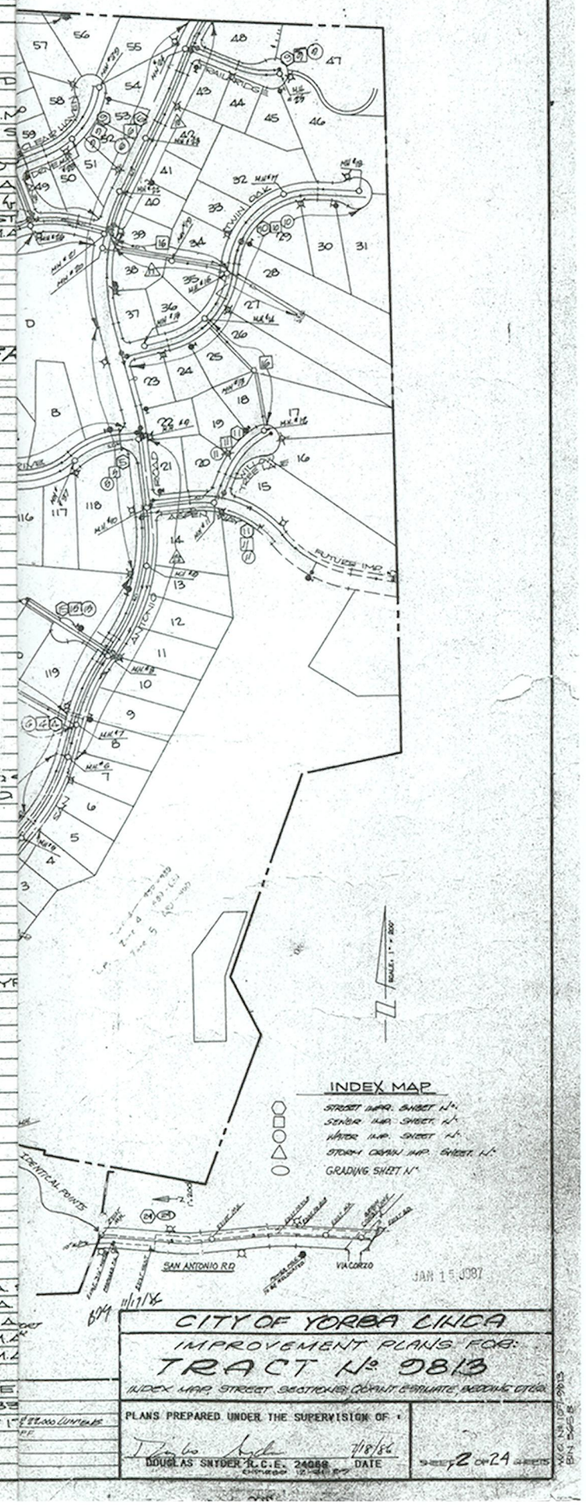
CITY OF YORBA LINDA

IMPROVEMENT PLANS FOR TRACT 9813
GENERAL NOTES, SEWER, WATER & STORM DRAIN NOTES
SHEET 1 OF 24

8401

ESTIMATE OF QUANTITIES

NO.	DESCRIPTION
	STREETS
1	CONST. "A.C.W/SEALCOAT OVER "A.B.W/PRIMECOAT
2.	CONST. & CONC. CURB & GUTTER TYPE 'D' PER O.C.E.M.A. STD
3.	CONST. SIDEWALK PER O.C.E.M.A. STD. 105
4.	CONST. SIDEWALK RETURN & ACCESS RAMP PER O.C.E.M
5.	INSTALL STREET LIGHT (5800 LUMENS) PER O.C.E.M.A. S
6.	FEATHER OVER EXIST. A.C. FOR SMOOTH JOIN
7.	INSTALL STREET NAME SIGN PER O.C.E.M.A. STD. 40
8.	INSTALL "NOT A THROUGH STREET" SIGN PER O.C.E.M.A
9.	INSTALL LOCAL DEPRESSION PER O.C.E.M.A. STD 308 &
10.	INSTALL TIMBER BARRICADE TYPE III PER O.C.E.M.A. ST
11.	CONST. DEPRESSED CURB DRIVEWAY APPROACH PER O.C.E.M.A
12	INSTALL PARKWAY CULVERT TYPE 'B' PER O.C.E.M.A. STD. 302
13.	CONST. ALLEY APRON PER O.C.E.M.A. STD. 206
14.	VARIABLE A.C. CAP
15.	SAWCUT EXIST. A.C. & REMOVE
16.	RELOCATE FIRE HYDRANT
17	ADJUST TO GRADE
18.	INSTALL STREET LIGHT (22,000 LUMENS) PER O.C.E.M.A. STD 411
	-SEWER
24	INSTALL 10" V.C.P. SEWER PER Y.L.W.D. STDS & SPECS
26	INSTALL 8" V.C.P. SEWER PER Y.L.W.D. STDS & SPECS
27	INSTALL 48" DIA MANHOLE TYPE I PER Y.L.W.D. STD. SP.3
28	INSTALL 4" V.C.P. LATERAL PER Y.L.W.D. STD. SP.2A
30	INSTALL SEWER CLEANOUT PER Y.L.W.D. STD SP. 7
30	INSTALL CONC. ANCHOR BLOCK PER Y.L.W.D. STD SP. 10
31	REMOVE PLUG & JOIN
32	CONST CONC. ENCASEMENT PER Y.L.W.D. STDS.
	WATER
60	INSTALL CONC ANCHOR BLOCK PER Y.L.W.D STD SP-10
62	INSTALL 90° ELBOW RT x FLG.
61	INSTALL 1" IRRIGATION METER
33	INSTALL 6" GV. FLG. x RT.
34	INSTALL 12"x10" REDUCER FLG. x RT.
35	INSTALL 10" ADAPTER FLG x RT
36	REMOVE BLIND FLANGE
37	INSTALL 10" GATE VALVE FLG x RT
38	INSTALL 10" ACP CLASS 100 WATER MAIN
39	INSTALL 10" ACP CLASS 200 WATER MAIN
60	INSTALL 6" ACP WATER MAIN
50	INSTALL 10"x8" TEE ALL FLG.
40	INSTALL 8" A.C.P. WATER MAIN
41	INSTALL 8" TEE ALL FLG.
	INSTALL 8" GATE VALVE FLG. x RT.
	INSTALL 8" ADAPTER FLG. x RT.
44.	INSTALL FIRE HYDRANT ASSEMBLY PER Y.L. W.D
45.	INSTALL DEADEND BLOWOFF PER Y.L. W.D STD
46.	INSTALL TYP AIR VACUUM
65.	INSTALL 1" IRRIGATION METER
47.	INSTALL 10" x 8" REDUCER FLG x R.T.
48	INSTALL 10"x6" TEE ALL FLG
49.	INSTALL 2" IRRIGATION METER
50.	INSTALL 4" MAIN - IRRIGATION SLEEVE
51.	INSTALL 22 1/2° ELBOW RT. x RT.
52.	REMOVE EXIST. TEMP BLOWOFF & JOIN.
53.	INSTALL 3" WIRE SLEEVE
54.	INSTALL 45° ELBOW RT. x RT.
55.	INSTALL 1" WATER SERVICE TYPE 4 METER TYP
57	INSTALL 10" ADAPTER FG x RT
76	INSTALL 8"x6" TEE ALL FLG
	STORM DRAIN
79	CONSTR INLET TYPE III PER OCEMA STD. No 326
80	INSTALL 18" R.C.P. (SEE PROFILE FOR D-LOAD)
81.	INSTALL 21" R.C.P. (SEE PROFILE FOR D-LOAD)
82.	INSTALL 24" R.C.P. (SEE PROFILE FOR D-LOAD)
83.	INSTALL 30" R.C.P. (SEE PROFILE FOR D-LOAD)
84.	INSTALL 36" R.C.P. (SEE PROFILE FOR D-LOAD)
85.	CONSTRUCT PIPE ENTRANCE TO EARTH CHANNEL PER OCEMA STD. 326
86.	INSTALL 42" R.C.P. (SEE PROFILE FOR D-LOAD)
87.	INSTALL 45" R.C.P. (SEE PROFILE FOR D-LOAD)
88.	INSTALL 48" R.C.P. (SEE PROFILE FOR D-LOAD)
89.	INSTALL 54" R.C.P. (SEE PROFILE FOR D-LOAD)
90.	INSTALL 84" R.C.P. (SEE PROFILE FOR D-LOAD)
91.	CONST. INLET TYPE I PER O.C.E.M.A. STD 301
92.	CONST. INLET TYPE II PER O.C.E.M.A. STD 302
93.	CONST. JUNCTION STRUCTURE TYPE I PER O.C.E.M.A.
94.	CONST. JUNCTION STRUCTURE TYPE II PER O.C.E.M.A.
95.	CONST. JUNCTION STRUCTURE TYPE III PER O.C.E.M.A.
96.	CONST. JUNCTION STRUCTURE TYPE IV PER O.C.E.M.A.
97.	CONST. JUNCTION STRUCTURE TYPE VI PER O.C.E.M.A.
98.	CONST. CONC. COLLAR PER O.C.E.M.A. STD 317
99.	CONST. DOWNDRAIN TO PIPE TRANSITION PER O.C.E.
100	CONST. PIPE SLOPE ANCHOR PER O.C.E.M.A. STD. 32
101.	CONST. ENERGY DISSIPATOR PER DETAIL SHEET 1
102.	CONST. PIPE INLET PER DETAIL SHEET 19
103.	CONST. RIP RAP PER O.C.E.M.A. STD 800
104	INSTALL 66" R.C.P. (SEE PROFILE FOR D-LOAD)



CITY OF YORBA LINDA

IMPROVEMENT PLANS FOR:

TRACT N° 9813

INDEX MAP, STREET, SEWER, WATER, STORM DRAIN, GRADING SHEET

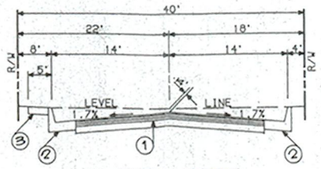
PLANS PREPARED UNDER THE SUPERVISION OF:

DOUGLAS SNYDER R.C.E. 24088 DATE 7/8/86

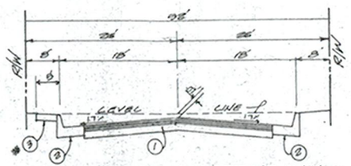
SHEET 2 OF 24 SHEETS

ESTIMATE OF QUANTITIES

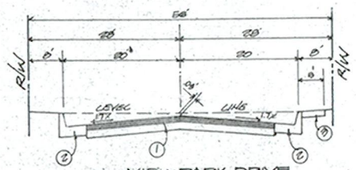
NO.	DESCRIPTION	QUANITY	UNIT	
	STREETS			
1	CONST. "A.C.W/SEALCOAT OVER "A.B.W/PRIMECOAT	401,476	SF	
2	CONST. 6" CONC. CURB & GUTTER TYPE 'D' PER O.C.E.M.A. STD 201	122,526	LF	
3	CONST. SIDEWALK PER O.C.E.M.A. STD. 206	52,858	SF	
4	CONST. SIDEWALK RETURN & ACCESS RAMP PER O.C.E.M.A. STD. 111	22	EA	
5	INSTALL STREET LIGHT (5800 LUMENS) PER O.C.E.M.A. STD. 411	38	EA	⚠
6	FEATHER OVER EXIST. A.C. FOR SMOOTH JOIN	145	EA	
7	INSTALL STREET NAME SIGN PER O.C.E.M.A. STD. 407	11	EA	
8	INSTALL "NOT A THROUGH STREET" SIGN PER O.C.E.M.A. STD W-53	10	EA	
9	INSTALL LOCAL DEPRESSION PER O.C.E.M.A. STD 308 & DETAIL	2	EA	
10	INSTALL TIMBER BARRICADE TYPE III PER O.C.E.M.A. STD. 404	80	LF	
11	CONST. DEPRESSED CURB DRIVEWAY APPROACH PER O.C.E.M.A. STD. 209	724	SF	
12	INSTALL PARKWAY CULVERT TYPE 'B' PER O.C.E.M.A. STD. 309	5	EA	
13	CONST. ALLEY APRON PER O.C.E.M.A. STD 206	300	SF	
14	VARIABLE A.C. CAP	18,900	SF	
15	SAWCUT EXIST A.C. & REMOVE	1,650	LF	
16	RELOCATE FIRE HYDRANT	1	EA	
17	ADJUST TO GRADE	14	EA	
18	INSTALL STREET LIGHT (22,000 LUMENS) PER O.C.E.M.A. STD 411	21	EA	⚠
	-SEWER-			
25	INSTALL 10" V.C.P. SEWER PER Y.L.W.D. STDS & SPECS	4,078	LF	
26	INSTALL 8" V.C.P. SEWER PER Y.L.W.D. STDS & SPECS	6,801	LF	
27	INSTALL 48" DIA MANHOLE TYPE I PER Y.L.W.D. STD. SP.3	51	EA	* SEE STREET IMPROVEMENT PLANS FOR CONTROL OF SIDEWALKS
28	INSTALL 4" V.C.P. LATERAL PER Y.L.W.D. STD. SP.24	4,129	LF	
30	INSTALL SEWER CHIMNEY PER Y.L.W.D. STD SP 7	—		
30	INSTALL CONC. ANCHOR BLOCK PER Y.L.W.D. STD. SP. 10	7	EA.	
31	REMOVE PLUG & JOIN	1	EA.	
32	CONST. CONC. ENCASEMENT PER Y.L.W.D. STDS.	1	EA.	
	WATER			
60	INSTALL CONC. ANCHOR BLOCK PER Y.L.W.D. STD SP-10	5	EA	
62	INSTALL 90° ELBOW RT x FLG.	1	EA	
61	INSTALL 1" IRRIGATION METER	1	EA	
33	INSTALL 6" GV. FLG. x RT.	3	EA	
34	INSTALL 12"x10" REDUCER FLG. x RT.	1	EA	
35	INSTALL 10" ADAPTER FLG x RT	1	EA	
36	REMOVE BLIND FLANGE	1	EA	
37	INSTALL 10" GATE VALVE FLG x RT	11	EA.	
38	INSTALL 10" ACP CLASS 150 WATER MAIN	2,015	LF	
39	INSTALL 10" ACP CLASS 200 WATER MAIN	1,000	LF	
60	INSTALL 6" ACP WATER MAIN	895	LF	
50	INSTALL 10"x8" TEE - ALL FLG.	5	EA	
40	INSTALL 8" A.C.P. WATER MAIN	8,536	LF	⚠
41	INSTALL 8" TEE ALL FLG.	6	EA	
9	INSTALL 8" GATE VALVE FLG. x RT.	22	EA	
	INSTALL 8" ADAPTER FLG. x RT.	6	EA	
44	INSTALL FIRE HYDRANT ASSEMBLY PER Y.L.W.D. STD 5	30	EA.	⚠
45	INSTALL DEADEND BLOW-OFF PER Y.L.W.D. STD 6	11	EA	⚠
46	INSTALL TYP AIR VACUUM	1	EA	
66	INSTALL 1½" IRRIGATION METER	3	EA.	
47	INSTALL 10" x 8" REDUCER FLG x RT.	3	EA.	
48	INSTALL 10"x8" TEE ALL FLG	1	EA	
49	INSTALL 6" IRRIGATION METER	5	EA	
50	INSTALL 4" MAIN - IRRIGATION SLEEVE	3	EA	
51	INSTALL 22½° ELBOW RT. x RT.	1	EA.	
52	REMOVE EXIST. TEMP BLOW-OFF & JOIN	3	EA.	
53	INSTALL 3" WIRE SLEEVE	5	EA	
54	INSTALL 45° ELBOW RT. x RT.	1	EA.	
55	INSTALL 1" WATER SERVICE TYPE 1 METER TYPE	134	EA.	
57	INSTALL 10" ADAPTER FLG x RT	3	EA	
58	INSTALL 8"x6" TEE ALL FLG	4	EA.	
	STORM DRAIN			
70	CONVTR INLET TYPE III PER O.C.E.M.A. STD. No 326	3	EA	
80	INSTALL 18" R.C.P. (SEE PROFILE FOR D-LOAD)	3080	L.F.	
81	INSTALL 21" R.C.P. (SEE PROFILE FOR D-LOAD)	—	L.F.	
82	INSTALL 24" R.C.P. (SEE PROFILE FOR D-LOAD)	880	L.F.	
83	INSTALL 30" R.C.P. (SEE PROFILE FOR D-LOAD)	3778	L.F.	
84	INSTALL 36" R.C.P. (SEE PROFILE FOR D-LOAD)	674	L.F.	
85	CONSTRUCT PIPE ENTRANCE TO EARTH CHANNEL PER O.C.E.M.A. STD. 326	1	EA	
86	INSTALL 42" R.C.P. (SEE PROFILE FOR D-LOAD)	582	L.F.	
87	INSTALL 45" R.C.P. (SEE PROFILE FOR D-LOAD)	32	L.F.	
88	INSTALL 48" R.C.P. (SEE PROFILE FOR D-LOAD)	558	L.F.	
89	INSTALL 54" R.C.P. (SEE PROFILE FOR D-LOAD)	750	L.F.	
90	INSTALL 84" R.C.P. (SEE PROFILE FOR D-LOAD)	618	L.F.	
91	CONST. INLET TYPE I PER O.C.E.M.A. STD 301	5	EA	
92	CONST. INLET TYPE II PER O.C.E.M.A. STD 302	15	EA	
93	CONST. JUNCTION STRUCTURE TYPE I PER O.C.E.M.A. STD. 310	13	EA	
94	CONST. JUNCTION STRUCTURE TYPE II PER O.C.E.M.A. STD. 310	6	EA	
95	CONST. JUNCTION STRUCTURE TYPE III PER O.C.E.M.A. STD. 310	5	EA	
96	CONST. JUNCTION STRUCTURE TYPE IV PER O.C.E.M.A. STD 310	3	EA	
97	CONST. JUNCTION STRUCTURE TYPE VI PER O.C.E.M.A. STD. 310	5	EA	
98	CONST CONC. COLLAR PER O.C.E.M.A. STD 317	9	EA	
99	CONST. DOWNDRAIN TO PIPE TRANSITION PER O.C.E.M.A. STD 331	1	EA	
100	CONST. PIPE SLOPE ANCHOR PER O.C.E.M.A. STD. 835	19	EA	
101	CONST. ENERGY DISSIPATOR PER DETAIL SHEET 17	1	EA	
102	CONST. PIPE INLET PER DETAIL SHEET 19	1	EA	
103	CONST. RIP RAP PER O.C.E.M.A. STD 803	1,100	SF	
104	INSTALL 66" R.C.P. (SEE PROFILE FOR D-LOAD)	207	LF	



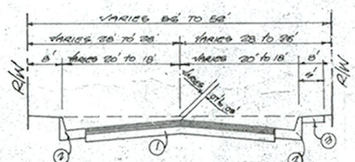
TRAIL RIDGE



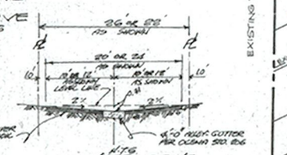
VIEW PARK DRIVE, SPRING OAK
VIA CORZO ALDER AVENUE
WILLOW TREE LANE, TWIN OAK
CLEAR HAVEN DR.
HICKORY TREE LANE
RIDGE PARK DRIVE from STA 7+68.16 to STA 15+17.30



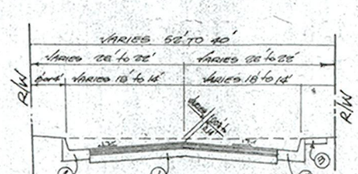
VIEW PARK DRIVE
DESERT WAY
RIDGE PARK DRIVE
From STA 14+97.00 to STA 15+17.30



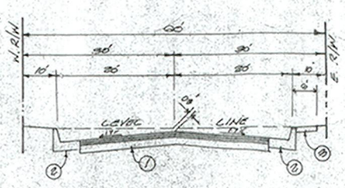
RIDGE PARK DRIVE
TRANSITION FROM 56' TO 52' WIDTH
FROM STA: 5+68.16 TO STA: 7+68.16



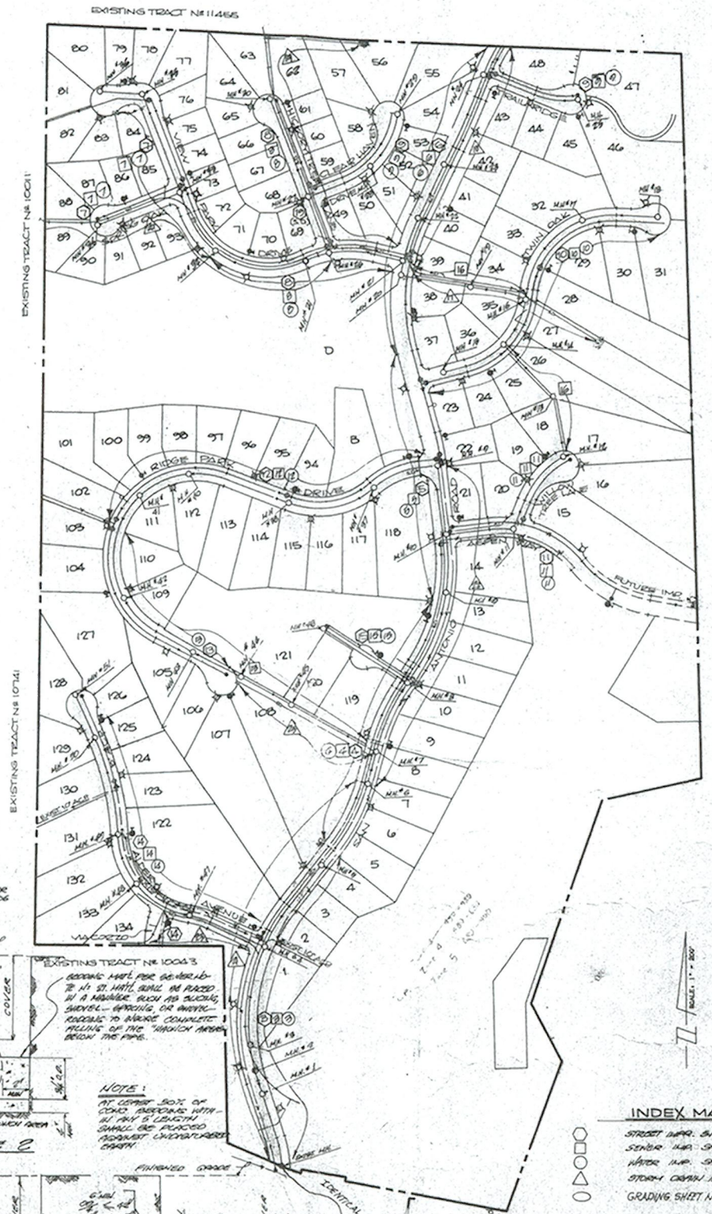
PRIVATE DRIVE
PER ROUGH GRADING PLAN

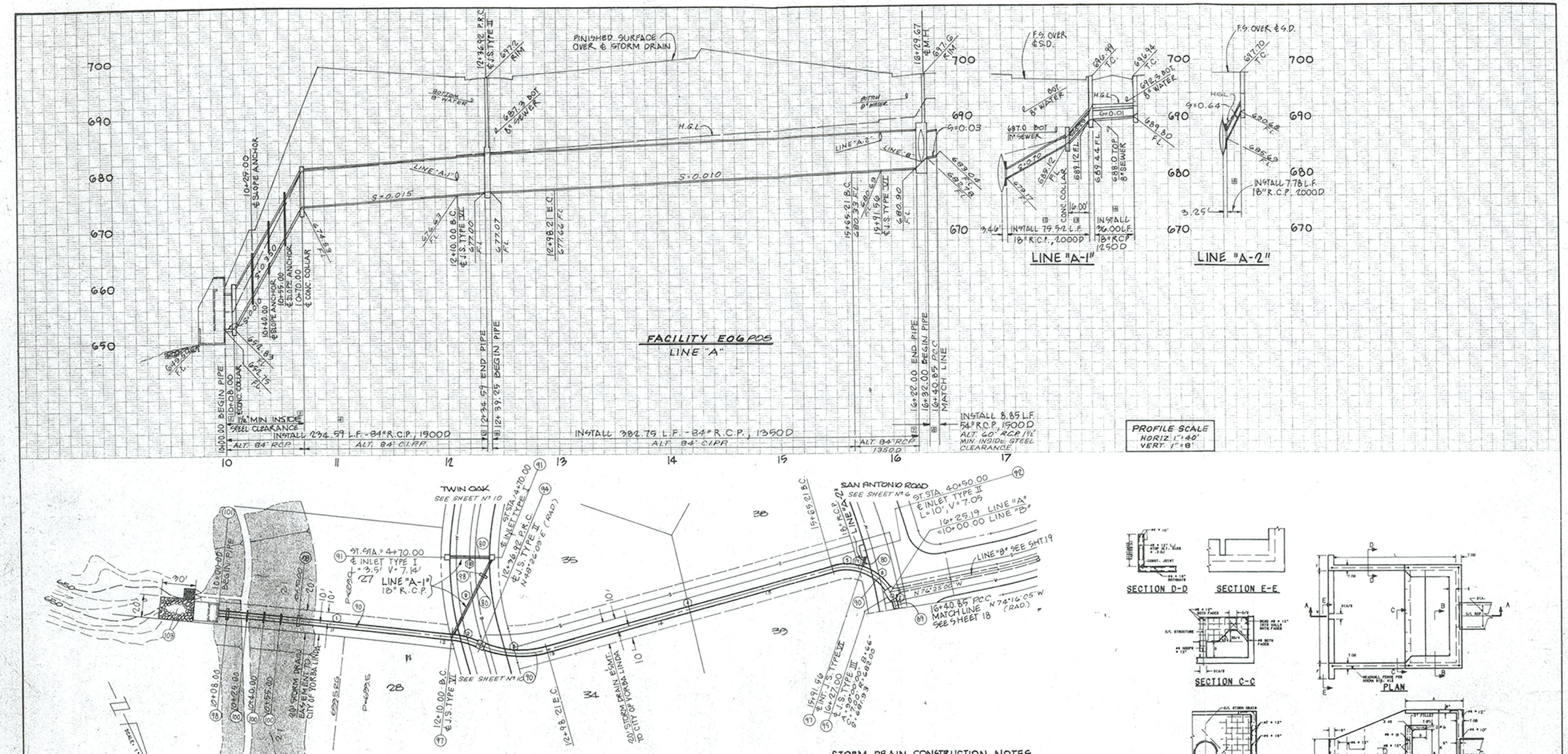


RIDGE PARK DRIVE
TRANSITION FROM 52' TO 40' WIDTH
FROM STA: 15+17.93 TO STA: 16+67.99



SAN ANTONIO ROAD





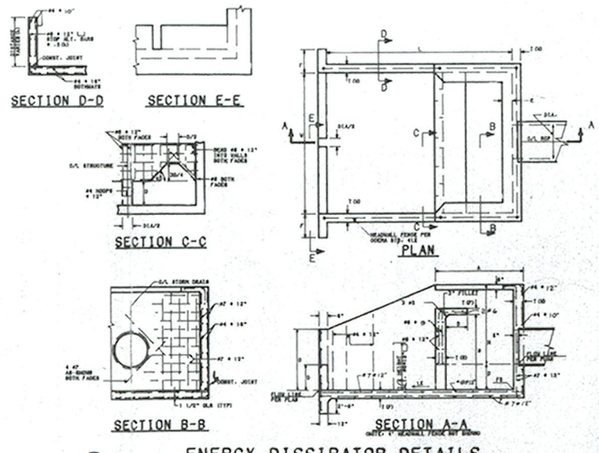
FACILITY E06 P05
LINE "A"

STORM DRAIN CONSTRUCTION NOTES

(80)-INSTALL 18" R.C.P. (SEE PROFILE FOR D-LOAD)
(89)-INSTALL 54" R.C.P. (SEE PROFILE FOR D-LOAD)
(90)-INSTALL 84" R.C.P. (SEE PROFILE FOR D-LOAD)
(91)-CONSTRUCT INLET TYPE I PER OCEMA STD. 301
(92)-CONSTRUCT INLET TYPE II PER OCEMA STD. 302
(94)-CONSTRUCT JUNCTION STRUCTURE TYPE II PER OCEMA STD. 311
(95)-CONSTRUCT JUNCTION STRUCTURE TYPE III PER OCEMA STD. 312
(97)-CONSTRUCT JUNCTION STRUCTURE TYPE VI PER OCEMA STD. 315
(98)-CONSTRUCT CONCRETE COLLAR PER OCEMA STD. 317
(100)-CONSTRUCT PIPE SLOPE ANCHOR PER OCEMA STD. 333
(101)-CONSTRUCT ENERGY DISSIPATOR PER DETAIL ON SHEET 17
(103)-CONSTRUCT UNGROUTED RIP-RAP ON GEOTEXTILE FABRIC PER OCEMA STD. 809 & 808

DATA

	DELTA/BEARING	RADIUS	LEN./DIST.	TANGENT
1	N 58°42'00"W		210.00	
2	17°08'09"	90.00	26.92	13.56
3	39°01'09"	90.00	61.29	31.89
4	N 80°35'00"W		267.00	
5	33°33'14"	45.00	26.35	13.57
6	42°49'35"	45.00	33.64	17.65
7	19°56'06"	45.00	15.66	7.91
9	N 52°34'04"E		78.98	
10	N 64°06'26"W		36.00	
11	N 42°58'14"E		11.03	



ENERGY DISSIPATOR DETAILS

(101)

LINE "A"	0	14½	15	14½	10'-9"	3'-6"	1'-6"	3'-3"	8'-6"	11'-7"	26'-8"	15	20	8'-4"
SYMBOL	T.O.S.	T.O.B.	T.O.S.	T.O.B.	B	F	E	D	C	A	L	N	W	DIA

ENERGY DISSIPATOR DIMENSIONS

JAN 15 1987

B24 11/17/88

REVISIONS

	APPR.	DATE	

Hunsaker & Associates Inc.
PLANNING-ENGINEERING-SURVEYING
Three Hughes • Irvine, CA 92718
Offices: Carlsbad • Irvine • Ontario
(714) 855-3600

CITY OF YORBA LINDA
STORM DRAIN IMPROVEMENT PLANS FOR
TRACT 9813
FACILITY E06 P05
FROM STA: 10+00.00 TO STA: 16+40.85

PLANS PREPARED UNDER THE SUPERVISION OF:
Douglas Snyder 3-4-86
DOUGLAS SNYDER, R.C.E. 24068 DATE
EXPIRES 12-31-80

SHEET 17 OF 21 SHEETS

S.D. LINE A SHEET 1 - 366[20.5]PF: 9813 627 25-Feb-86 13:16 / 107-9813-650

WO No 107-9813
BN 9565-B

THOMPSON BLUEPRINT 96347

PRELIMINARY DRAINAGE REPORT PA12-0037

for the ESPERANZA HILLS PROJECT ASPEN WAY OPTION 2 in the Yorba Linda Area

in the Unincorporated Area of County of Orange, California



PREPARED FOR :

Yorba Linda Estates, LLC
7114 East Stetson Drive, Suite 350
Scottsdale, AZ 85251

APN Numbers:
351-031-006
351-031-004
326-031-006

June 20, 2013

PREPARED BY:

KWC ENGINEERS
CIVIL ENGINEERS • PLANNERS • SURVEYORS

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www.kwcengineers.com

REGISTERED PROFESSIONAL ENGINEER
VICTOR A. ELIA
64803
Exp. 06/30/15
CIVIL
STATE OF CALIFORNIA

Victor Elia
Victor Elia, RCE 64803

ESPERANZA HILLS – OPTION 2
PRELIMINARY DRAINAGE REPORT
EXECUTIVE SUMMARY

The Esperanza Hills project consists of approximately 469 acres of undeveloped land north of Stonehaven Drive, east of San Antonio Road and Casino Ridge and west of Chino Hills State Park. The project proposes to construct single family residential on approximately 340 acres of graded land. Existing topography consists of steep hillsides and canyons with offsite areas draining through the site from east to southwest. Refer to the attached Exhibit "A" for a vicinity map, project location, existing topography and existing blueline streams of the site.

The Esperanza Hills project has been designed with two (2) entry street options:

- Option 1 – Stonehaven Drive: Entry to the site will be from the south, a connection to Stonehaven Drive, down, across and up Blue Mud Canyon. Proposes 334 residential lots.
- Option 2 – Aspen Way: Entry to the site will be from the west, an extension of the existing Aspen Way over the un-named canyon. Proposes 340 residential lots.

These entry street options will be evaluated in the Specific Plan and EIR process and chosen by the discretionary approval process.

METHODOLOGY / CONCEPTUAL DRAINAGE DESIGN

The Esperanza Hills project has been conceptually designed per Orange County Public Works standards for local storm drain systems. Peak flows were calculated per the 1986 Orange County Hydrology Manual, Modified Rational Method and runoff volumes were calculated using the Unit Hydrograph Method. The CivilD 2005 computer software was used to generate the models and aerial topography was used to create the hydrology maps. Debris basins were sized using the Army Corps. of Engineers Los Angeles District Method. Refer to the attached Exhibit "B" for the conceptual drainage design and proposed drainage facilities.

Conceptual drainage design facilities include:

- **Debris Basins**: Offsite flows from the east will be accepted in four (4) debris basins which will be maintained by the H.O.A. Local private storm drain laterals will connect into the public mainline.

- **WQMP Basins**: For water quality treatment the 2-year flow from the local storm drain systems will be directed into private WQMP basins (Dry Extended Detention Basins with Sediment Forebays). After the 2-year volume has been treated flow shall be conveyed to the public storm drain mainline via an inlet riser/headwall system.

- **Detention Basin**: One of the four proposed debris basins will also serve as the detention basin for the site, sized large enough to detain the increase in peak flow generated by

development. This Detention Basin will utilize a restricted outlet riser designed per Orange County Public Works standards.

- **Storm Drain Mainline Pipes**: Storm drain mainline pipes within private streets designed per Orange County Public Works guidelines will convey the 100-year offsite flow southwesterly through the project. The storm drain mainline pipes are proposed to be maintained by Orange County Public Works.

- **Private Storm Drain Lateral Pipes**: Local private storm drain laterals will connect curb opening catch basins to the public mainline. The private storm drain laterals (including pipes to and from the WQMP basins) and catch basins will be maintained by the H.O.A.

- **Outlet Structure:** At the outlet of the public storm drain system, an **energy dissipater** and erosion protection rip-rap pad designed per Orange County Public Works and other agency standard guidelines will reduce the discharge velocity to slower than the existing condition to reduce the potential for erosion of the downstream properties, the Cielo Vista project and the City of Yorba Linda Open Space property. **With the construction of the Outlet Structure the Esperanza Hills project will not erode the downstream canyon.**

Stormwater discharge from the storm drain will flow through the existing downstream natural canyon prior to flowing into the existing OCFC facility E06, a 13' wide by 11' high reinforced concrete box located southwest of the project site adjacent to San Antonio Road.

RESOURCE AGENCIES

The Esperanza Hills project will process an application through the following resource agencies and **obtain approval prior to the final approval of this project**. The following agencies have given preliminary indications that the project is feasible as currently planned:

- U.S. Army Corps of Engineers (ACOE) approval of permits under Section 404 of the Clean Water Act
- California Department of Fish and Game (CDFG) approval of future potential streambed alteration agreements, pursuant to Section 1600 of the Fish and Game Code
- U.S. Fish and Wildlife Services consultation related to biological impact assessments, if requested by ACOE
- Regional Water Quality Control Board (RWQCB), National Pollutant Discharge Elimination System (NPDES) permits under Section 402 of the Clean Water Act as well as approval of Section 401 Water Quality Certification

DIFFERENCES BETWEEN OPTION 1 AND OPTION 2

Option 1: Esperanza Hills Option 1 proposes to outlet the public storm drain mainline onsite prior to the project westerly boundary. Stormwater discharge will flow through the existing natural canyons on the adjacent Cielo Vista property prior to flowing into the City of Yorba Linda Open Space property and facility E06.

Option 2: Esperanza Hills Option 2 proposes a storm drain mainline westerly through the Cielo Vista property via the proposed extension of Aspen Way discharging into the existing natural canyon just prior to the City of Yorba Linda Open Space property which flows into facility E06.

SUMMARY OF DRAINAGE FACILITIES

The following table provides a listing of the proposed drainage facilities and the maintenance responsibility entity for Esperanza Hills Option 2:

TABLE E-1 – SUMMARY OF DRAINAGE FACILITIES

Type of Storm Drain Facility	Street Name	Approximate Length of Facility	Approximate Size of Facility	Maintenance Responsibility
Debris Basins (3)	-	-	3± acres total	H.O.A.
Detention \ Debris Basin #3	-	-	10.33 acre park	H.O.A.
Water Quality Basins (4)	-	-	3± acres total	H.O.A.
Box Culvert	Aspen Way	300’	20’x10’	O.C.P.W.*
SD Pipes	Aspen Way	355’	18” + 2 CBs	O.C.P.W.*
SD Pipe	Aspen Way	1,600’	78”	O.C.P.W.*
SD Pipe	“G” & “K” Streets	3,130’	54”	O.C.P.W.*
SD Pipe	“G” Street	1,590’	30”	O.C.P.W.*
SD Pipe	“B” & “C” Streets	540’	18”-24”	O.C.P.W.*
SD Pipe	Esperanza Hills Parkway	450’	18”-30”	O.C.P.W.*
SD Pipe	Esperanza Hills Parkway to Debris Basin #3	5,690’	78”	O.C.P.W.*
SD Pipe	“S” Street	710’	18”-36”	O.C.P.W.*
SD Pipe	“X” Street	840’	24”-36”	O.C.P.W.*
SD Pipe	“W” Street	1,520’	42”	O.C.P.W.*
SD Pipe	“W” Street to Debris Basin #2	240’	36”	O.C.P.W.*
SD Pipe	“W” Street to Debris Basin #1	170’	24”	O.C.P.W.*
SD Pipe	All other laterals and catch basins	-	18”	H.O.A.
SD Pipe	All pipes to & from WQ basins	-	18”	H.O.A.

* pending approval from O.C.P.W.

SUMMARY

The following table provides a summary of the calculations for Esperanza Hills Option 2:

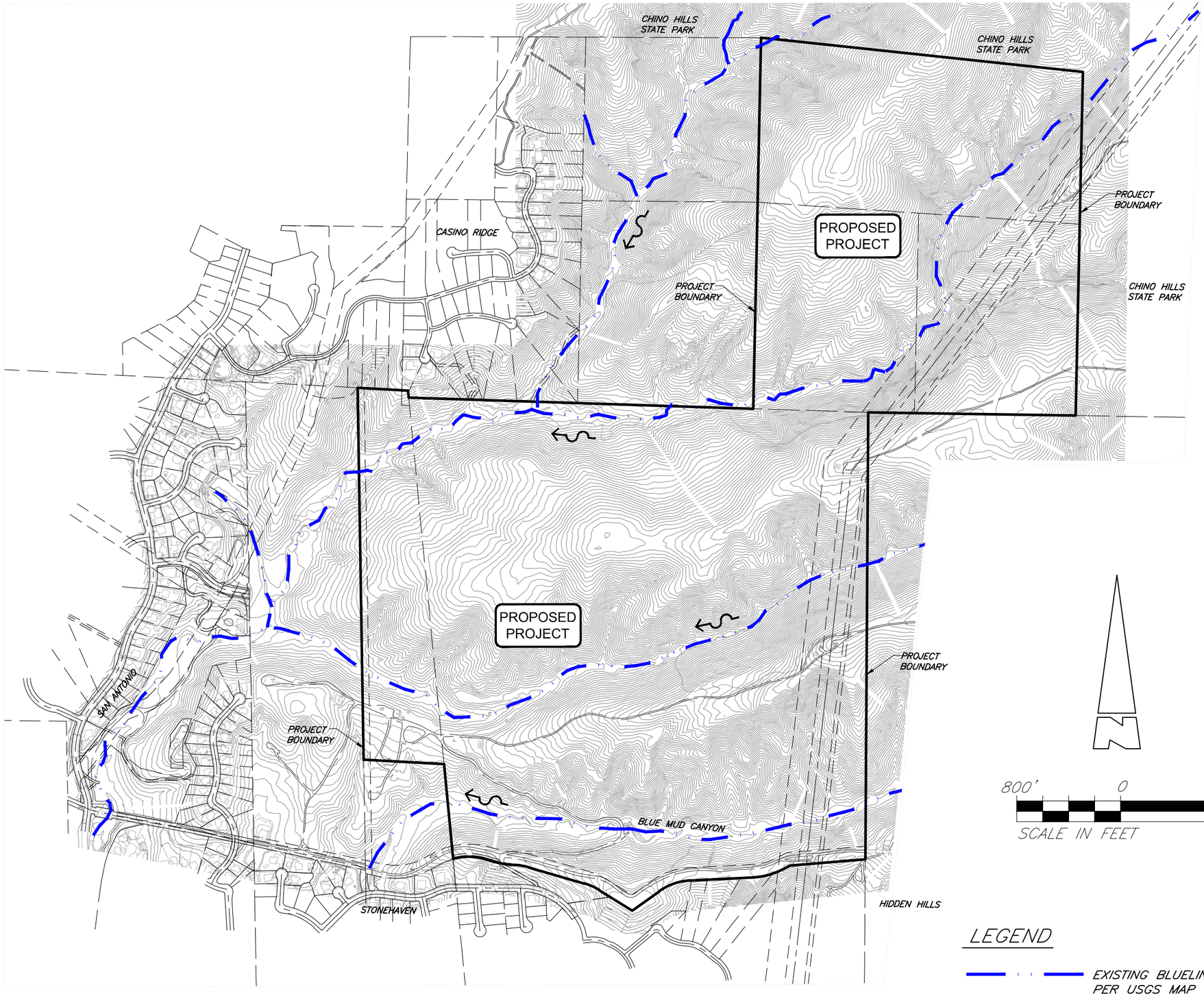
TABLE E-2 – SUMMARY

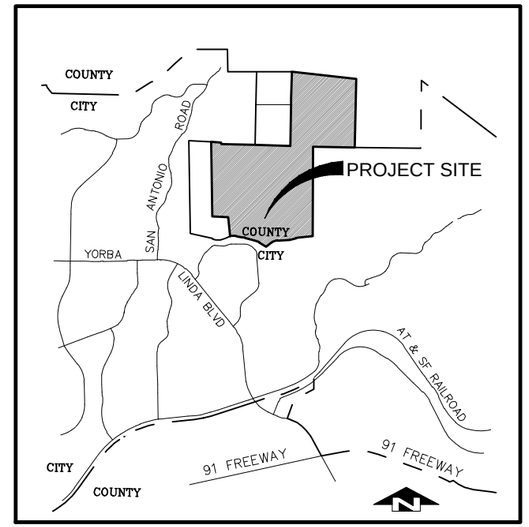
	Existing Condition	Proposed Condition **without** Mitigation	Difference (Prop.-Exist)	Proposed Condition **with** Mitigation
Area (ac.)	610.1	610.1	0	610.1
Q_{25} (cfs)	1141.3	1090.2	-51.1	1090.2
Q_{100} (cfs)	1518.8	1445.3	-73.5	1445.3
$Vol._{25}$ (ac.-ft.)	113.7	122.3	8.6	113.7
$Vol._{100}$ (ac.-ft.)	221.9	226.3	4.4	221.9
$Vel._{25}$ (fps)	11.7	54.5	42.8	5 *
$Vel._{100}$ (fps)	12.6	59.3	46.7	5 *

* Energy Dissipator and erosion protection rip rap pad shall be designed in Final Engineering to mitigate the velocity in the proposed condition with mitigation.

CONCLUSION

The Esperanza Hills project conceptual drainage design conforms to Orange County guidelines. A final Hydrology and Hydraulics Report and storm drain improvement plans designed per Orange County Public Works guidelines will be prepared in the final engineering stage of the Esperanza Hills project.





VICINITY MAP

N

800' 0 800'

SCALE IN FEET

LEGEND

EXISTING BLUELINE STREAM PER USGS MAP

ESPERANZA HILLS

EXHIBIT A

EXISTING TOPOGRAPHY AND BLUELINE STREAMS

KWC ENGINEERS

CIVIL ENGINEERS • PLANNERS • SURVEYORS
1880 COMPTON AVENUE, SUITE 100 • CORONA, CA. 92881-3370 • 951-734-2130

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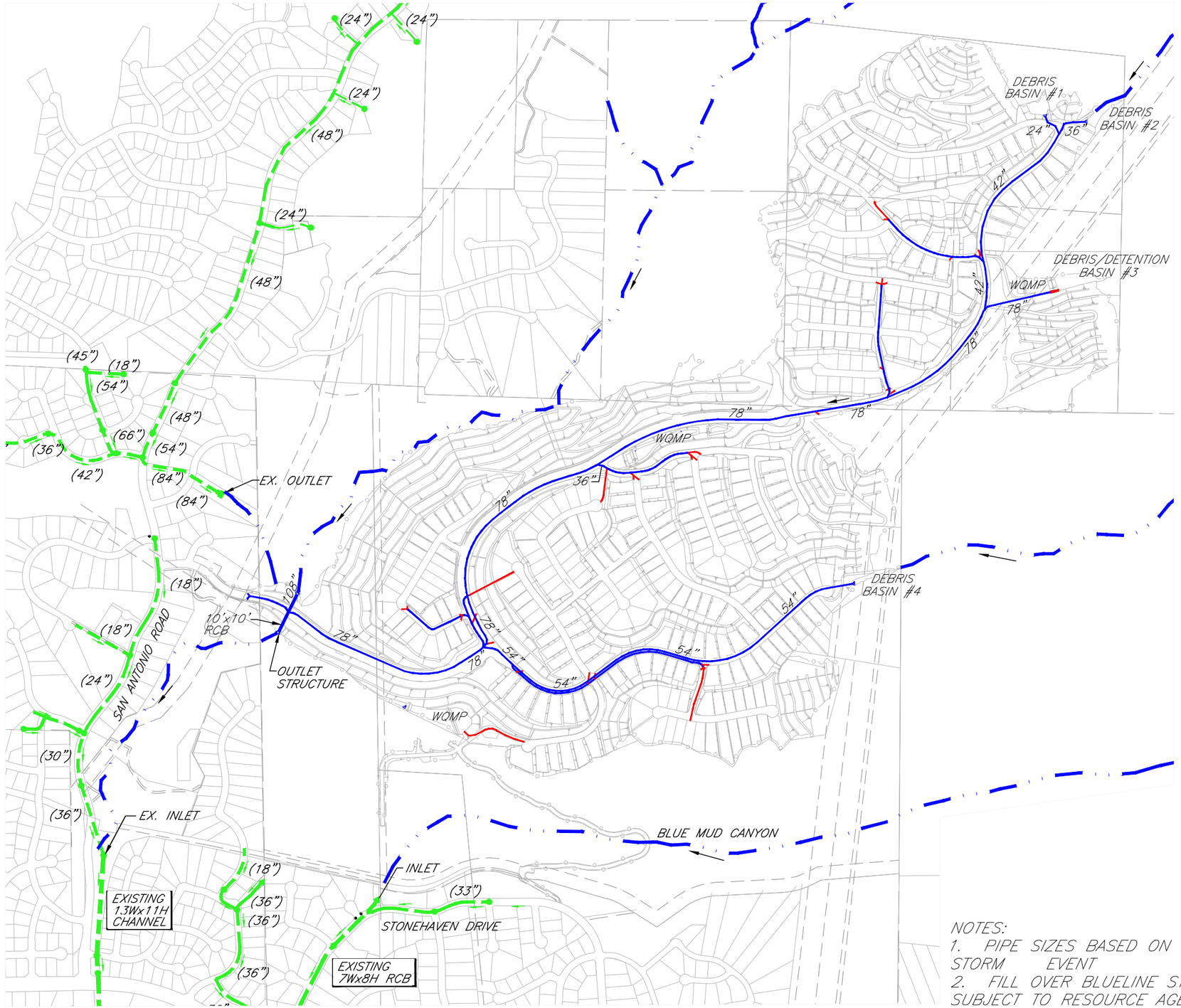

LEGEND

- EXISTING BLUELINE STREAM PER USGS MAP
- PROPOSED PUBLIC STORM DRAIN LINE
- PROPOSED PRIVATE STORM DRAIN LINE
- EXISTING STORM DRAIN PIPE
- 12" PIPE SIZE (INCHES)

800' 0 800'

SCALE IN FEET

NOTES:
1. PIPE SIZES BASED ON 100 YEAR STORM EVENT
2. FILL OVER BLUELINE STREAMS IS SUBJECT TO RESOURCE AGENCY APPROVAL.

ASPEN WAY – OPTION 2

EXHIBIT B

ESPERANZA HILLS
PROPOSED STORM DRAIN FACILITIES

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Section

1
INTRODUCTION

1.1 PURPOSE OF STUDY

The Esperanza Hills project, previously known as the Murdock Property, is located within the unincorporated area of Orange County, California, south and west of the Chino Hills State Park and surrounded on all other sides by the City of Yorba Linda. The site is within the sphere of influence for the City of Yorba Linda with potential annexation as the site is developed. The purpose of this study is to hydrologically model the project site's onsite and offsite tributary watersheds and to determine the existing and proposed peak runoffs and volumes in order to analyze stormwater mitigation. The hydrologic analysis was prepared using the Modified Rational Method as specified in the Orange County Hydrology Manual. This report also approximates the peak storage required to mitigate any increased runoff due to development for the most critical storm and duration event using the Unit Hydrograph Method. The flows were used to estimate the above and below ground drainage facilities to support the Esperanza Hills project. The storm drain mainlines are proposed as being owned and maintained by Orange County Public Works. Laterals and inlets will be maintained by the H.O.A.

Development of permanent improved drainage facilities relies in part, on early identification of any adverse drainage conditions that are caused or worsened by new development projects. To avoid sub-standard drainage facilities (difficult and costly to replace) sufficient information is needed early, when the project is being considered for approval. The Orange County and City of Yorba Linda subdivision, zoning and other related ordinances provides for incorporation of drainage facility protection in design of private projects from the early start. The County's application process provides for a preliminary hydrology report / drainage study on all development projects at the time of application. This study provides the needed information to ensure proposed drainage facilities are located appropriately. This preliminary hydrology/ drainage study is also part of the full CEQA and public hearing reviews on all discretionary projects. This eliminates the need for CEQA reviews later on when proposed drainage facilities conform to what was previously reviewed and when circumstances have not changed. Orange County Planning shall review this preliminary hydrology / drainage study as part of the overall project application. Information from the study shall be used in formulating department CEQA responses and conditions of approval for the project.

1.2 PROJECT DESCRIPTION

The Esperanza Hills site is comprised of approximately 469 acres of undeveloped land that is currently vacant. **Figure 1** in **Appendix A** shows a vicinity map of the area. Upstream adjacent land uses to this project are also undeveloped, designated as open space and downstream adjacent land uses are developed residential tracts. Refer to **Figures 2 & 2a** for land uses of the surrounding area. The Esperanza Hills project by Yorba Linda Estates, L.L.C. (A.P.N. 351-031-006) is partnered with Yorba

Trails, L.L.C. (351-031-004) and Yorba Linda Estates North (326-031-006) owners of the remaining lots. The site is planned for a multifaceted community consisting of open space with a trail system and low density residential lots, totaling about 334 acres of graded land. The project proposes to construct 340 residential lots: 185 – 9,800 minimum s.f. pad size on the Esperanza Hills property, 122 – 9,900 minimum s.f. pad size on the Yorba Linda Estates North property and 33 – 9,100 minimum s.f. pad size on the Yorba Trails, L.L.C. property, with lot sizes being larger. San Antonio Road is the main north-south thoroughfare into the community connecting to Yorba Linda Boulevard and the Interstate 91 Freeway. An extension of Aspen Way through the adjacent property, the Cielo Vista project, is proposed as the main access to the site. Offsite grading onto another property, Bridal Hills L.L.C., will also be required to grade the collector road to the YLE North site. The development of the Esperanza Hills project will enhance the north area of the City of Yorba Linda.

1.3 STUDY AREA

The project site is located within the Santa Ana River Watershed, the largest watershed in Orange County, covering 153.2 square miles. The river begins almost 75 miles away in the San Bernardino Mountains, crossing central Orange County before emptying into the Pacific Ocean. The Orange County portion of the watershed includes portions of the cities of Anaheim, Brea, Huntington Beach, Orange, Placentia, Santa Ana, Villa Park, and Yorba Linda. The river serves as the main tributary to the watershed. Refer to **Figure 3** for a map of the Santa Ana River Watershed.

There are several USGS designated blueline streams onsite (refer to Executive Summary Exhibit A). Two un-named streams confluence at the Aspen Way extension prior to flowing into the Orange County Esperanza Channel (Facility number E06 Orange County Flood Control District) located along San Antonio Road between Via Corzo and Alder Ave. The entry is a rip-rap protected pad entrance to a 13' wide x 11' high trapezoidal channel about one (1) mile downstream from the property line, refer to **Figure 6**. On the southern edge of the site, a stream flows at the base of Blue Mud Canyon, however development is not proposed in this tributary area and therefore will not be analyzed in this report.

The site is currently undeveloped consisting of rolling hills with fairly steep slopes covered with native grasses and deep canyons having chaparral in the canyon bottoms. The site generally drains from northeast to southwest, in a natural canyon flow condition, with the flowline of the streams having an average slope of about 15%-25%. Being undeveloped, there are no major drainage improvements on-site. Stormwater runoff ultimately discharges into the Santa Ana River – Reach 2, located approximately 1.25 miles south of the project site.

1.4 PROPOSED MASTER DRAINAGE FACILITIES

The Orange County Esperanza Master Plan of Drainage (Adopted by the Board of Supervisors April 4, 1973) identifies drainage facilities for the Esperanza Hills project site area. The Esperanza Channel is the regional drainage facility planned to improve flood control and conveyance from the southern slopes of the Puente Hills to the Santa Ana River. The following proposed county facilities identified in the report: E06- P07, P08, P04 and S01 are within the proposed project site. The County of Orange prepared in 1977, a Hydrology Report for the Esperanza Channel, providing preliminary pipe sizing for

these facilities, also shown in **Figure 7.** This report provides 25-year storm event hydrology used to size the E06 facility now constructed.

The City of Yorba Linda has also prepared a Master Plan of Drainage, dated February 2000, prepared by Berryman & Henigar. This study includes a hydrologic analysis for the 10 year storm return frequency event for the project area. The master plan of drainage is based on the General Plan ultimate land use of Open Space with a small portion of the site as 0.5-18 du/ac. The calculated 10 year proposed flow at Aspen Way was determined to be 1813 cfs, with an area of 956 acres, refer to **Figure 15b,** node #115.5. This results in a ratio of 1.9:1 between the peak flow rate and the drainage area for the 10-year event. This study also includes Capital Improvement Project master plan drainage facilities, M-1 (P07 of county study) and M-2 (P08 of county study) through the project site. The alignment of these facilities with pipe sizes, sized for the 10 year event, are shown in **Figure 13** overlaid onto the current site plan for this project. In order to account for minor losses and to provide adequate inlet capacity to the facilities, hydraulic grade lines were calculated at 85% of pipe diameter, using a RCP roughness coefficient of 0.013. **Figure 14** shows the summary of master plans facilities in the City of Yorba Linda.

The City of Yorba Linda's criteria for a storm drain to be considered as master planned facility, is that the storm drain facility should provide protection to prevent flood damage to properties, and require a minimum of a 39-inch diameter reinforced concrete pipe. The master plan provided an estimated cost analysis and concluded that the development fee for these proposed facilities is $14,000 per acre. Storm Drainage mitigation fees and reimbursements will be determined in Final Engineering.

1.5 FLOODPLAIN MAPPING

The National Flood Insurance Act (1968) established the National Flood Insurance Program, which is based on the minimal requirements for floodplain management and is designed to minimize flood damage within Special Flood Hazard Areas. The Federal Emergency Management Agency (FEMA) is the agency which administrates the National Flood Insurance Program. Special Flood Hazard Areas (SFHA) are defined as areas that have a 1% chance of flooding within a given year. This is also referred to as the 100-year flood. Flood Insurance Rate Maps (FIRMs) were developed to identify areas of flood hazards within a community.

According to the Flood Insurance Rate Map (FIRM) catalog, there are FIRMs produced by FEMA for the project site:

MAP Number: 06059C0069J and 06059C0090J

MAP Revised: both maps were revised on December 3, 2009

Figure 5 shows the flood zones designated for the Esperanza Hills project site. The complete site is located within Zone X (white), which is an area outside the 0.2% annual chance of flood (500-year). However, these areas may be subject to flooding from severe storm activity or local drainage problems.

As shown in Figure 5, there are no floodways recognized by FEMA within the vicinity of the project site.

1.6 DESIGN CRITERIA

Public Storm Drain Lines
Facilities that are to be owned and maintained by the Orange County Public Works department shall be designed to convey the 100-year storm event.

Private Storm Drain Lines
The following are design criteria for this project, based on the Orange County Local Drainage Manual since the site is within the unincorporated area of Orange County.

Protection Levels

1. Storm Drain with tributary area less than 640 acres are to be designed for a minimum of 10-year storm frequency below top of curb using a combination of street and storm drain flow.

2. In sump conditions, catch basins and the connecting storm drains should be designed to a 25-year frequency.

3. Habitable structures shall have 100-year flood protection.

4. Minimum acceptable freeboard for catch basins from gutter flowline and detention basins from top of slope is 2.0 feet.

Section

2

HYDROLOGIC DATA AND MODEL DEVELOPMENT

2.1 EXISTING CONDITION MODEL

KWC Engineers has performed a hydrologic analysis for the Esperanza Hills project and its tributary watershed to the Orange County Esperanza Channel System located along San Antonio Road north of the 91 Freeway.

The Esperanza Hills project site can be divided into 2 sub-drainage areas to further describe the existing drainage conditions. Refer to the Existing Condition Hydrology Key Map **Figure 9** in **Appendix F** for locations of the drainage sub-areas, and peak flows at each sub-area. Hydrologic calculations to evaluate surface water runoff associated with the 100-year, 25-year, and 10-year high confidence storm frequency were performed for the drainage areas both on- and off-site. The Orange County Modified Rational Method Hydrologic calculations (as described in the Orange County Hydrology Manual) were performed using the CivilDesign Hydrology / Hydraulics computer program package 2005 by Bonadiman and Associates, Inc. The existing condition watershed boundaries were delineated using aerial topography and US Geological Survey (USGS) topographic maps, see **Figure 4**. Soil types were determined by overlaying the Hydrologic Classification of Soils from the hydrology manual onto the existing topography and calculating the areas of each soil type within each sub-area, refer to **Figure 8.** Currently a site soil investigation has not been performed to verify the soil types. Results of the existing condition hydrologic analysis are summarized in **Table 4** in **Appendix E** along with detailed calculations.

Under existing conditions, there are two drainage streams into the site for off-site waters. The total site drainage area comprises of 1366.5 acres and generates 3401.8 cfs in the 100-year event, 2543.0 cfs in the 25-year event, and 2044.1 cfs in the 10-year event which must be accepted and conveyed through the site. This corresponds generally to a 1.5:1 ratio for the 10-year between the peak flow rate and the drainage area. As previously mentioned, there are no existing drainage facilities upstream or within the project boundaries, and storm water runoff is conveyed via natural channel flow through the project site.

2.2 PROPOSED CONDITION MODEL

The Esperanza Hills project proposes a pipe (or RCB) culvert under the extension of Aspen Way at the flowline of the existing stream, just downstream of the confluence from Tract 9813 and the un-named streams. The onsite storm drain system will connect to this culvert as well as street catch basins for Aspen Way. The existing canyons upstream from the site drain into four (4) proposed debris basins, one will serve as a Debris/Detention basin (Basin #3) located at the upstream end of the proposed public onsite storm drain mainline. Privately maintained street catch basins onsite will connect to the publicly maintained onsite storm drain system. In order to treat the urban runoff for water quality requirements

lowflows are bypassed via private storm drain pipes into HOA maintained WQMP Basins prior to connecting to the remaining onsite storm drain system. The proposed hydrology model uses the combination of the Offsite Condition (**Figure 10**) and the Proposed Condition (**Figure 11**) Hydrology Key Maps in **Appendix H.** The land use types of *2 dwelling units per acre* was used for the developed areas and *undeveloped (dense cover)* was used for the open space/landscaped areas in the model to represent the proposed project. The same soils map from the hydrology manual was overlaid on the proposed condition hydrology maps and soil type areas were calculated for each sub-area.

Results of the proposed condition hydrologic analysis are summarized in **Table 5** in **Appendix G** along with detailed calculations. The proposed drainage area at the local point of discharge from the project site comprises of 610.1 acres and generates 1445.3 cfs in the 100-year event, 1090.2 cfs in the 25-year event and 857.6 cfs in the 10-year event which is conveyed through the site and outlets from the culvert under Aspen Way. This corresponds generally to a 1.4:1 ratio between the peak flow rate and the drainage area for the 10-year event which is below the master planned ratio. Therefore, the proposed discharge from the project site is in conformance with the master plan. It may be concluded that the master plan predicted more development in this tributary area than is currently being proposed.

The below **Table 1** is a comparison between the Existing Condition and Proposed Condition Hydrology results for onsite only (Areas C, D and G).

TABLE 1 – PEAK FLOW COMPARISON

	Existing Condition	Proposed Condition **without** Mitigation	Difference (Prop.-Exist)
Area (ac.)	610.1	610.1	0
Q 10 (cfs)	912.6	857.6	-55.0
Q 25 (cfs)	1141.3	1090.2	-51.1
Q 100 (cfs)	1518.8	1445.3	-73.5

2.3 ONSITE STORM DRAIN SYSTEM

The onsite storm drain system shall be owned and maintained by the Orange County Public Works. Preliminary onsite drainage facilities for the proposed Esperanza Hills project were calculated by the rational method hydrology program and are presented in **Figure 12, Appendix N,** titled Proposed Storm Drain Facilities. The estimated sizes of these facilities and their approximate locations are intended for conceptual purposes only and will be refined in the design review and final engineering process. Pipe sizes from the Debris Basins are based on the 100-year storm event and pipes not downstream of the Debris Basins are based on the 25-year event. Pipes were designed as reinforced concrete pipe in an open channel flow condition, with a roughness coefficient of 0.013 per the master plan. Hydraulic calculations will be performed in the Final Engineering phase.

Catch basins and storm drain laterals were placed at locations to keep the 25 year flow below the top of curb and the 100 year flow below the right of way. Catch basins were also placed in locations so that a single 21 foot long (the largest size) catch basin can collect a majority of the current street flow without

bypassing to the next downstream catch basin. Preliminary sizing calculations are included in **Table 7** in **Appendix L.** Catch basins will also be sized in Final Engineering.

2.4 STREET CAPACITY ANALYSIS

Preliminary onsite street capacities for the proposed Esperanza Hills project were calculated using the computer program FlowMaster by Bentley. The street sections as shown on the TTM were analyzed with variable street grades. Flow to the top of curb was determined for the 25-year storm event street capacity and flow to the right of way was determined for the 100-year storm event, for both the full street and half street. Results are summarized in **Table 6, Appendix K.** By using this street capacity analysis with the rational method flows, it's concluded that the street sections are sufficient to provide the level of protection required by Orange County as previously discussed. (The street capacity is also capable of conveying the flow if the proposed water tanks were to rupture.) **Since, the storm drain mainline pipes were sized for the 100-year storm event, the street will only contain local flows until catch basins intercept the 100-year flow.**

2.5 OUTLET ANALYSIS

The storm drain is proposed to outlet into an existing natural canyon at the downstream end of the proposed culvert at the extension of Aspen Way. At the outlet of the public storm drain system, an **energy dissipater** and erosion protection rip-rap pad designed per Orange County Public Works and other agencies standard guidelines will reduce the discharge velocity to slower than the existing condition to reduce the potential for erosion of the downstream properties, the Cielo Vista project and the City of Yorba Linda Open Space property. **With the construction of the Outlet Structure the Esperanza Hills project will not erode the downstream canyon.**

Section

3

DETENTION ANALYSIS

3.1 DETENTION ANALYSIS

The developed tributary area at the most downstream point of the proposed storm drain system was analyzed for both the existing and proposed condition. The 10-year, 25-year and 100-year 24-hour storms were analyzed using the Orange County Unit Hydrograph Method. The difference in peak flow and volume were compared to determine if and how much mitigation would be necessary. Refer to the following page for the results of the Detention Analysis.

The following table provides a summary of the **Detention Basin Analysis** for Esperanza Hills Option 2:

TABLE 2 – SUMMARY

	Existing Condition	Proposed Condition **without** Mitigation	Difference (Prop.-Exist)	Proposed Condition **with** Mitigation
Area (ac.)	610.1	610.1	0	610.1
Q 25 (cfs)	1141.3	1090.2	-51.1	1090.2
Q 100 (cfs)	1518.8	1445.3	-73.5	1445.3
Vol. 25 (ac.-ft.)	113.7	122.3	8.6	113.7
Vol. 100 (ac.-ft.)	221.9	226.3	4.4	221.9
Vel. 25 (fps)	11.7	54.5	42.8	5 *
Vel. 100 (fps)	12.6	59.3	46.7	5 *

* Energy Dissipator and erosion protection rip rap pad shall be designed in Final Engineering to mitigate the velocity in the proposed condition with mitigation.

The differences in volume in acre-feet between the 10-year and 25-year 24-hour storms are minor with the proposed condition a little less than the existing condition. The 100-year proposed volume is less than the existing condition as well. Therefore, no mitigation for volume is required. Note that the existing tributary area is 610 acres and the proposed development is adding 75.6 acres of impervious surface, or about 12% of the tributary area. The existing condition is steep hillsides with clayey soils which does not allow for much infiltration and yields a high runoff coefficient. Therefore, it seems reasonable for the volume to be similar or less in the proposed condition as the existing condition.

However, the difference in peak flow in the 25-year 24-hour event is 157.2 cfs between the proposed and existing condition. Comparing the proposed and existing condition hydrograph results in a detention volume of 5.1 acre-feet to mitigate the peak flow. See the following page for a summary table.

ESPERANZA HILLS - ASPEN WAY OPTION 2
DETENTION BASIN ANALYSIS
DATE OF LATEST REVISION: 6/20/2013

	Area (ac)	Soil B Area (ac)	Soil C Area (ac)	Soil D Area (ac)
Total Site	610.1	17	404.75	188.39
Perviousness	Existing:	0.99	Proposed:	0.91

TABLE 2

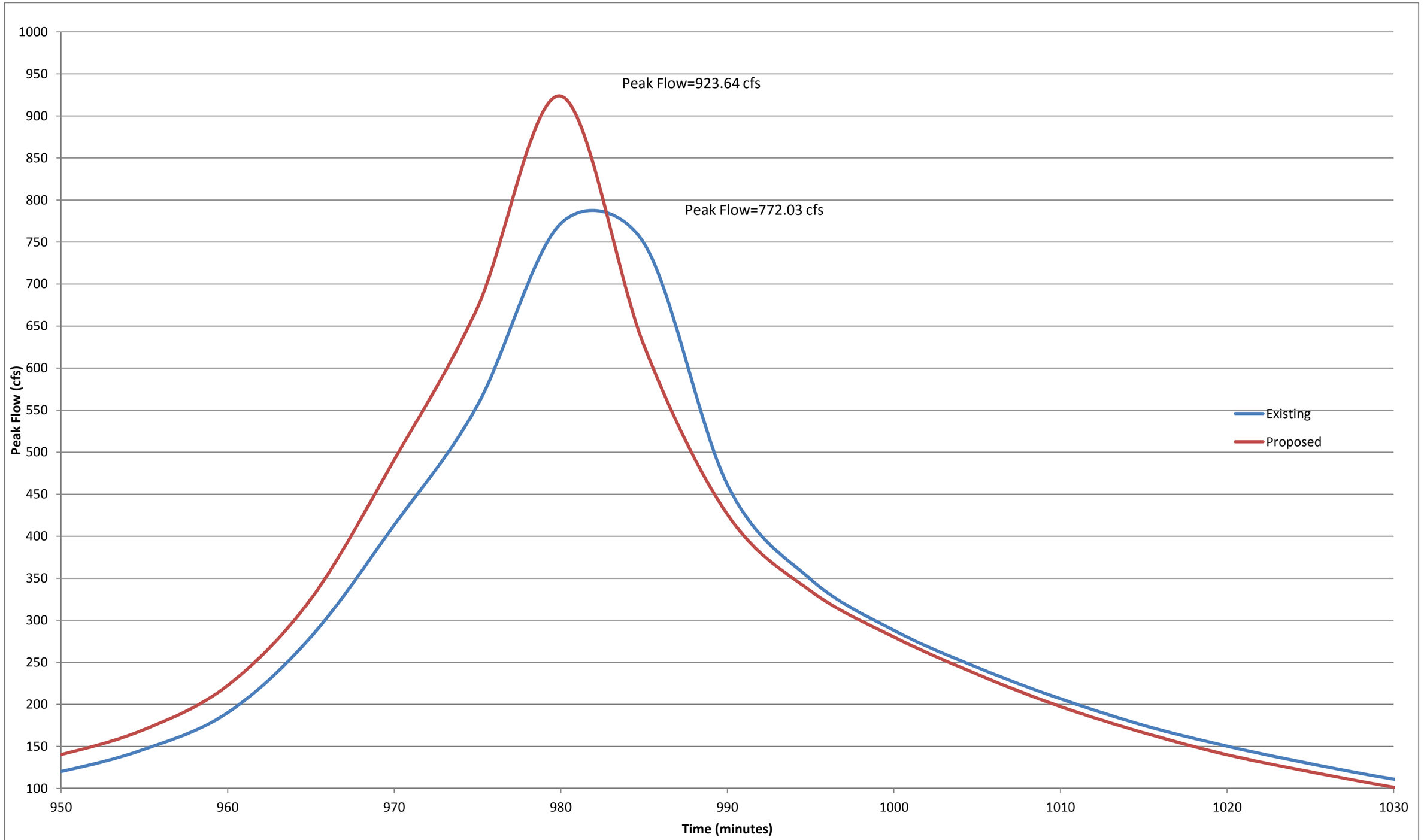
10-Year 24-H	Rational Method		Unit Hydrograph	
	Tc	**Tc**	**Volume**	**Peak Flow**
Condition	**(min.)**	**(hr)**	**(ac.ft.)**	**(cfs)**
Proposed	21.12	0.35	89.1	923.6
Existing	24.00	0.40	81.2	772
Difference			7.9	151.6

25-Year 24-H	Rational Method		Unit Hydrograph		Basin #3
	Tc	**Tc**	**Volume**	**Peak Flow**	**Volume**
Condition	**(min.)**	**(hr)**	**(ac.ft.)**	**(cfs)**	**(ac.ft.)**
Proposed	20.55	0.34	122.3	1148.3	
Existing	23.66	0.39	113.7	991.1	
Difference			8.6	157.2	5.1

100-Year 24-H	Rational Method		Unit Hydrograph	
	Tc	**Tc**	**Volume**	**Peak Flow**
Condition	**(min.)**	**(hr)**	**(ac.ft.)**	**(cfs)**
Proposed	24.12	0.40	226.3	1269.3
Existing	22.65	0.38	221.9	1352.3
Difference			4.4	-83

Basin #3	Depth = 8'	A = 28,000 sf	Volume = 5.1 ac-ft.

ESPERANZA HILLS
HYDROGRAPH COMPARISON(OPTION 2, 10-YR)



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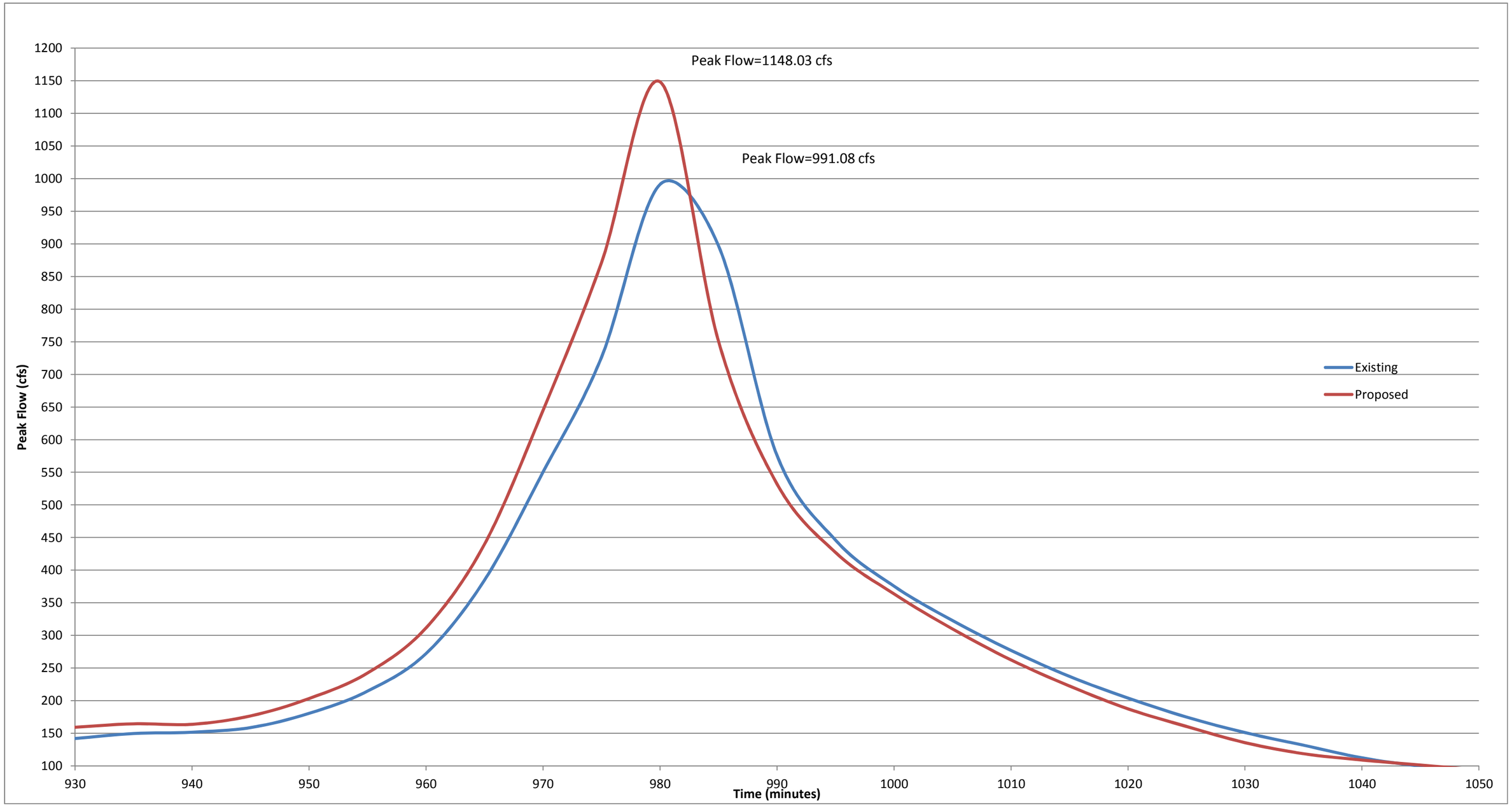
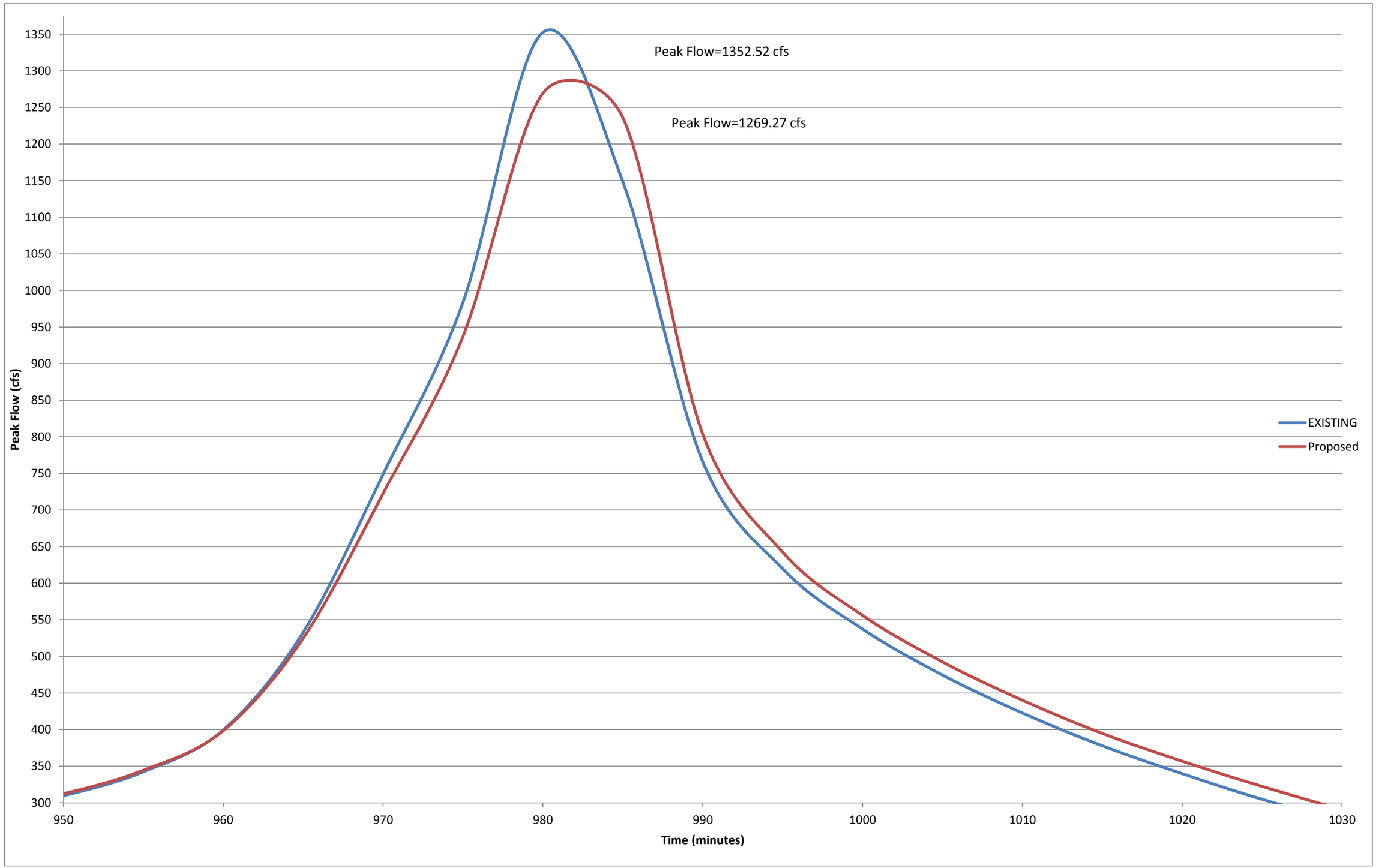


ESPERANZA HILLS
HYDROGRAPH COMPARISON (OPTION 2, 100-YR)



Section

4

DEBRIS BASIN ANALYSIS

4.1 DESIGN CRITERIA

This section determines the debris yield for the undeveloped tributary watershed areas upstream of the development. The corresponding calculated debris yield is then used to determine the size of the debris basin required upstream of the drainage watersheds. To predict debris yield the US Army Corps of Engineers Los Angeles District Method for Prediction of Debris Yield was used as shown below.

4.2 DEBRIS YIELD

LOS ANGELES DISTIRCT METHOD FOR PREDICTION OF DEBRIS YIELD
February 1992, updated February 2000

For Watershed areas from 0.1 square mile to 3.0 square miles, use equation 1 as shown on page 15

LOG Dy = 0.65(LOG P) + 0.62(LOG RR) + 0.18(LOG A) + 0.12(FF)

Where:

Dy = Unit Debris Yield (yd^3/mi^2)
P = Maximum 1-Hour Precipitation (inches, taken to two decimal places after the decimal points, times 100)
RR = Relief Ratio (ft/mi) (Highest Watershed Elev-Basin Elev)/Maximum Length
A = Drainage Area (ac)
FF = Non-Dimensional Fire factor

Refer to Appendix O for detailed calculations

Section

5
CONCLUSIONS

This preliminary drainage report has evaluated the potential effects of runoff for the proposed project. In addition, this report has addressed the methodology used to analyze the existing and proposed conditions, which was based on the Orange County Hydrology and Local Drainage Manuals. This section provides a summary discussion that evaluates the potential effects of the proposed project.

- The proposed project will not significantly alter drainage patterns on the site. The project will add approximately 75.6-acres of impervious area, which is about 16% of the site, or about 5% of the total tributary area, in the form of rooftops, driveways, sidewalks and streets.
- The Rational Method results illustrates that there is an increase in peak flowrate. Thus, with the existing drainage pattern flowing into a downstream property, a detention basin was sized for the project site to mitigate the increase in flowrate. The pre- and post-developed conditions will be met at the outlet of the project.
- The onsite storm drain mainlines shall be owned and maintained by Orange County Public Works. (If the area is annexed into the City of Yorba Linda than ownership and maintenance would need to be accepted by the City of Yorba Linda Public Works Department.)
- Preliminary alignment and pipe sizes of storm drain lines were presented. Storm drain lines larger than 39" diameter follow the criteria of Master Planned Facilities.
- A Final Hydrology & Hydraulics Report must be conducted to determine the proposed hydraulic grade lines throughout the storm drain system and final detention basin sizing.

All stormwater run-off will be carried via typical street sections and an onsite storm drain system. The computed 25 year storm event is contained below the top of curb and the computed 100 year storm event is contained with-in the street right-of-way.

The proposed peak flow rate, volume, time of concentration and flow velocity will be match the existing condition at the downstream end of the drainage flowline at the property line prior to discharging into the downstream properties. Therefore, Esperanza Hills and Cielo Vista will not share any drainage improvements. Furthermore, downstream OCFC facilities shall not be affected from the development of this project and shall not need to be upsized.

Potential Hydrologic Impacts

Without properly designed and constructed stormwater mitigation measures the following items could be impacted due to the development of this project:

1. Runoff – increase in runoff peak flow and volume will be mitigated by the detention basin
2. Erosion – of existing natural downstream canyons and hillsides will be mitigated by properly designed grading, energy dissipater, and erosion protection rip-rap pad at the outlet of storm drain system
3. Flooding – of structures due to the 100-year storm event will be mitigated with properly designed grading and sized storm drain system
4. Debris – from existing upstream canyons into the development will be mitigated by debris basins and debris from site into downstream properties will be mitigated by WQMP basins, trash racks and properly maintained storm drain facilities.
5. Landslides – the project site is located in a potential landslide area that will be mitigated with properly designed grading and mitigation measures recommended by geotechnical engineer
6. Groundwater – is deep based on regional maps. The WQMP basins will mitigate any potential pollutants due to development prior to discharging onsite. WQMP and detention basins will allow for groundwater replenishment to the extent feasible to mitigate the increase in permeable area.

Section

6
REFERENCES

City of Yorba Linda, City of Yorba Linda Master Drainage Plan, dated February 2000.

County of Orange, Esperanza Area Master Plan of Drainage, Approved by the Board of Supervisors April 4, 1973.

County of Orange, Hydrology Report, Esperanza Channel, Facility No. E06, entire drainage system. June 1977.

County of Orange. Local Drainage Manual. January 1996 plus subsequent errata.

Orange County Flood Control District. *Hydrology Manual*. 1986

US Army Corps of Engineers, Los Angeles District Method for Prediction of Debris Yield, February 1992, Updated February 2000.

Appendix

A
VICINITY MAPS

- Thomas Brothers Map
- Surrounding Planning Areas Exhibit
- City of Yorba Linda Land Use Map
- Santa Ana River Watershed
- USGS Topography Yorba Linda Quadrangle

Appendix

B

FEMA FIRM PANELS

VICINITY MAP

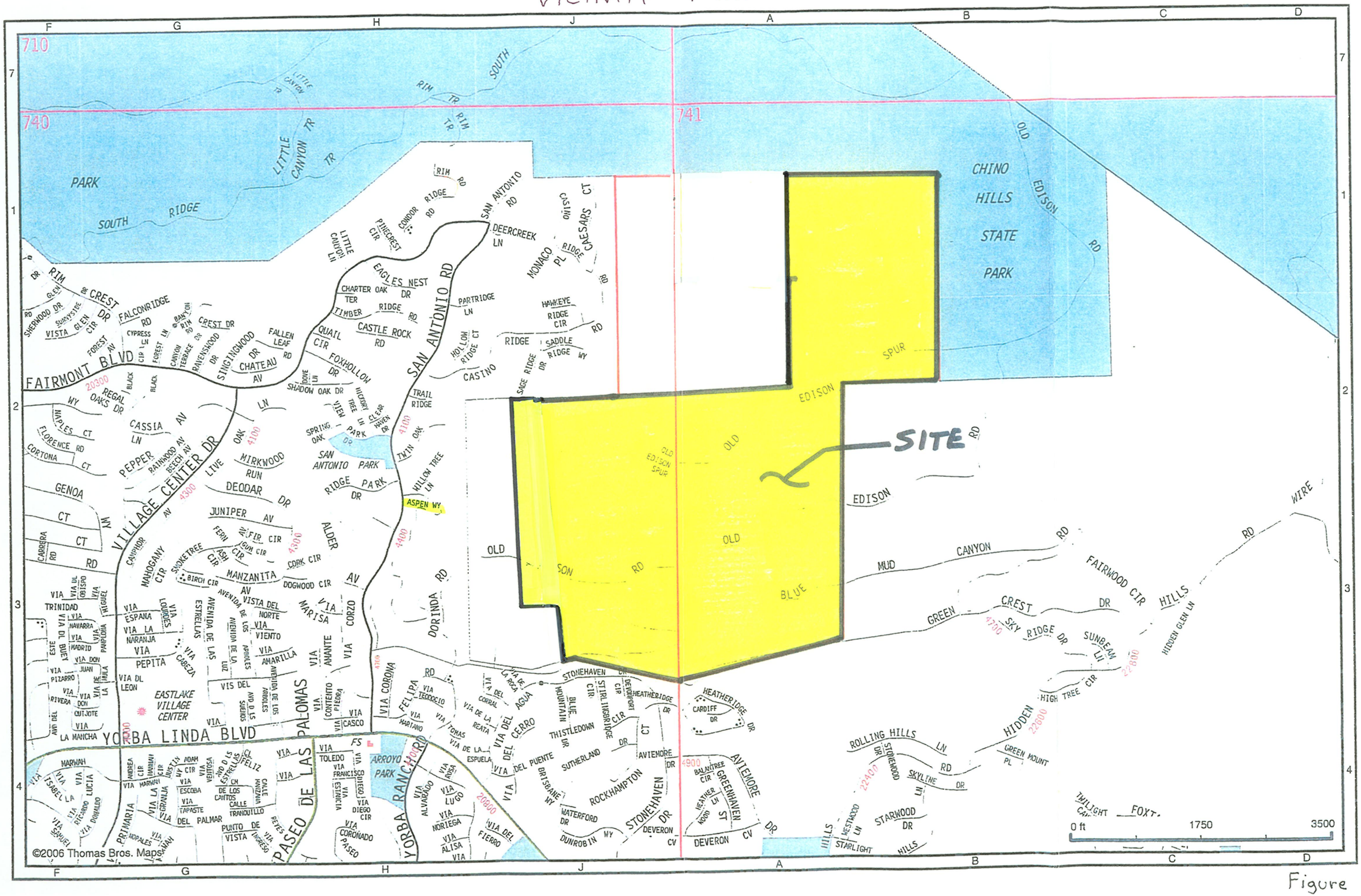
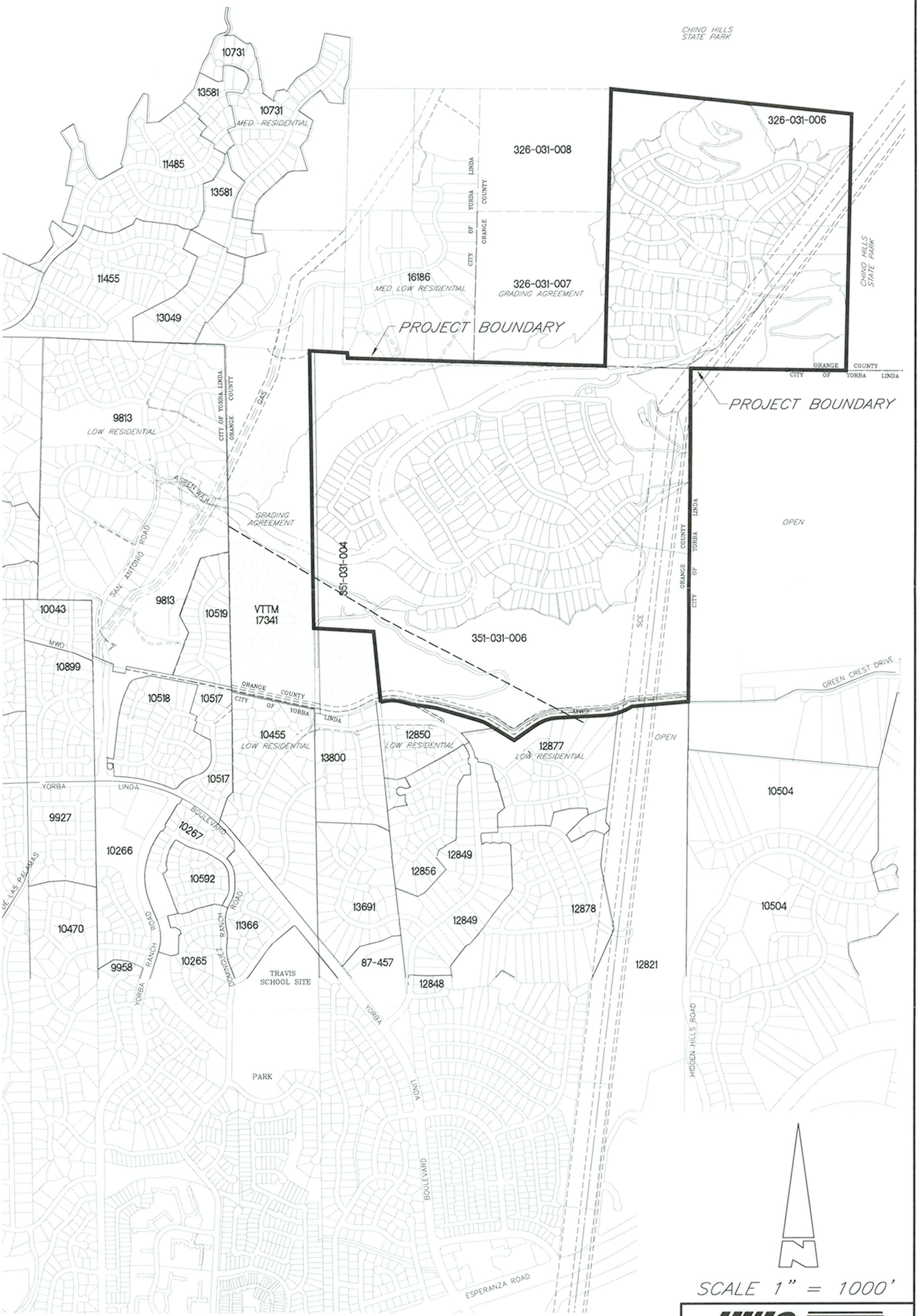


Figure 1

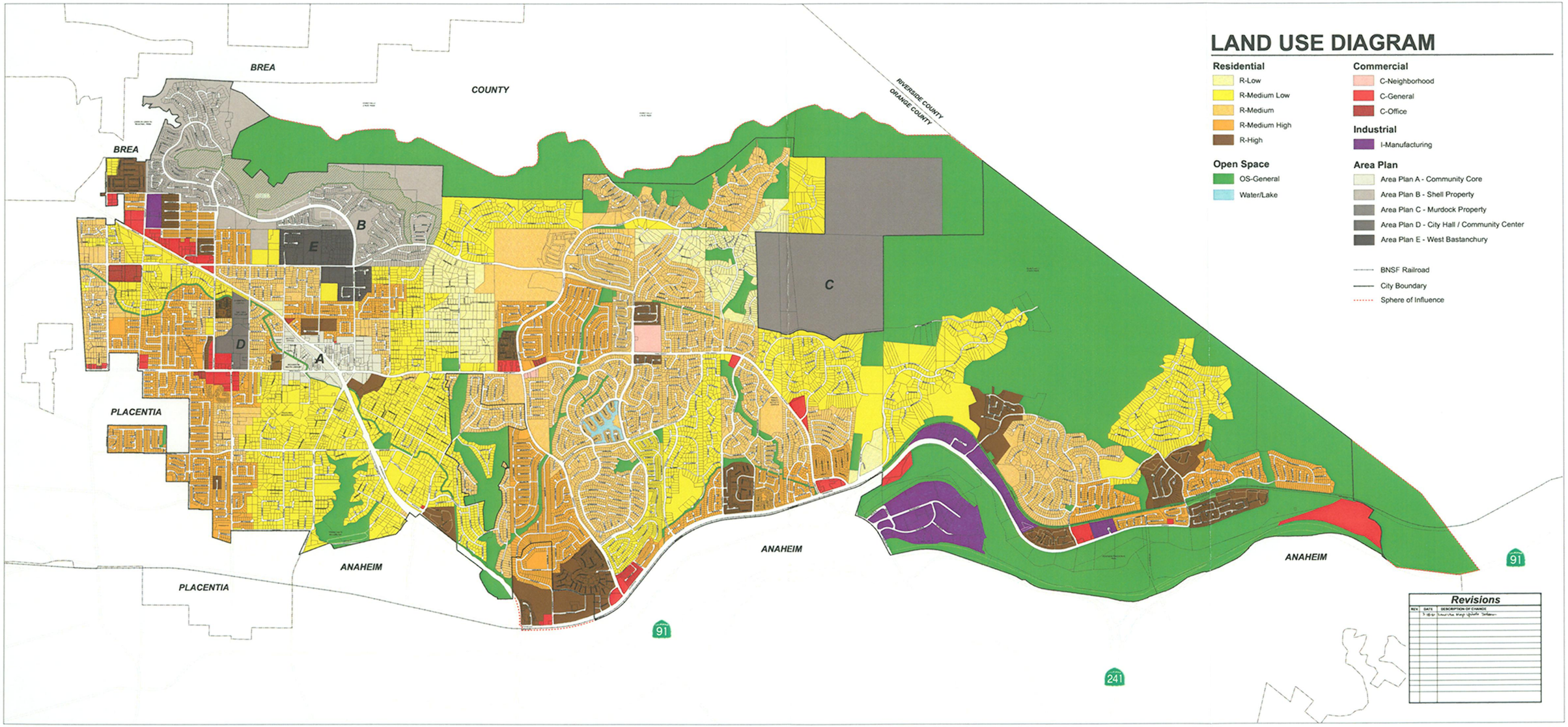
R:\09\1200\PRELIM\REPORTS\PRELIM WQMP\WQMP Surrounding Planning Areas.dwg (10/5/2012 5:52 PM) Plotted by: Victor Elia

ESPERANZA HILLS – OPTION 2
SURROUNDING PLANNING AREAS



KWC ENGINEERS
CIVIL ENGINEERS • PLANNERS • SURVEYORS
1880 COMPTON AVENUE, SUITE 100 • CORONA, CA. 92881-3370 • 951-734-2130

Figure 2



CITY OF YORBA LINDA LAND USE MAP

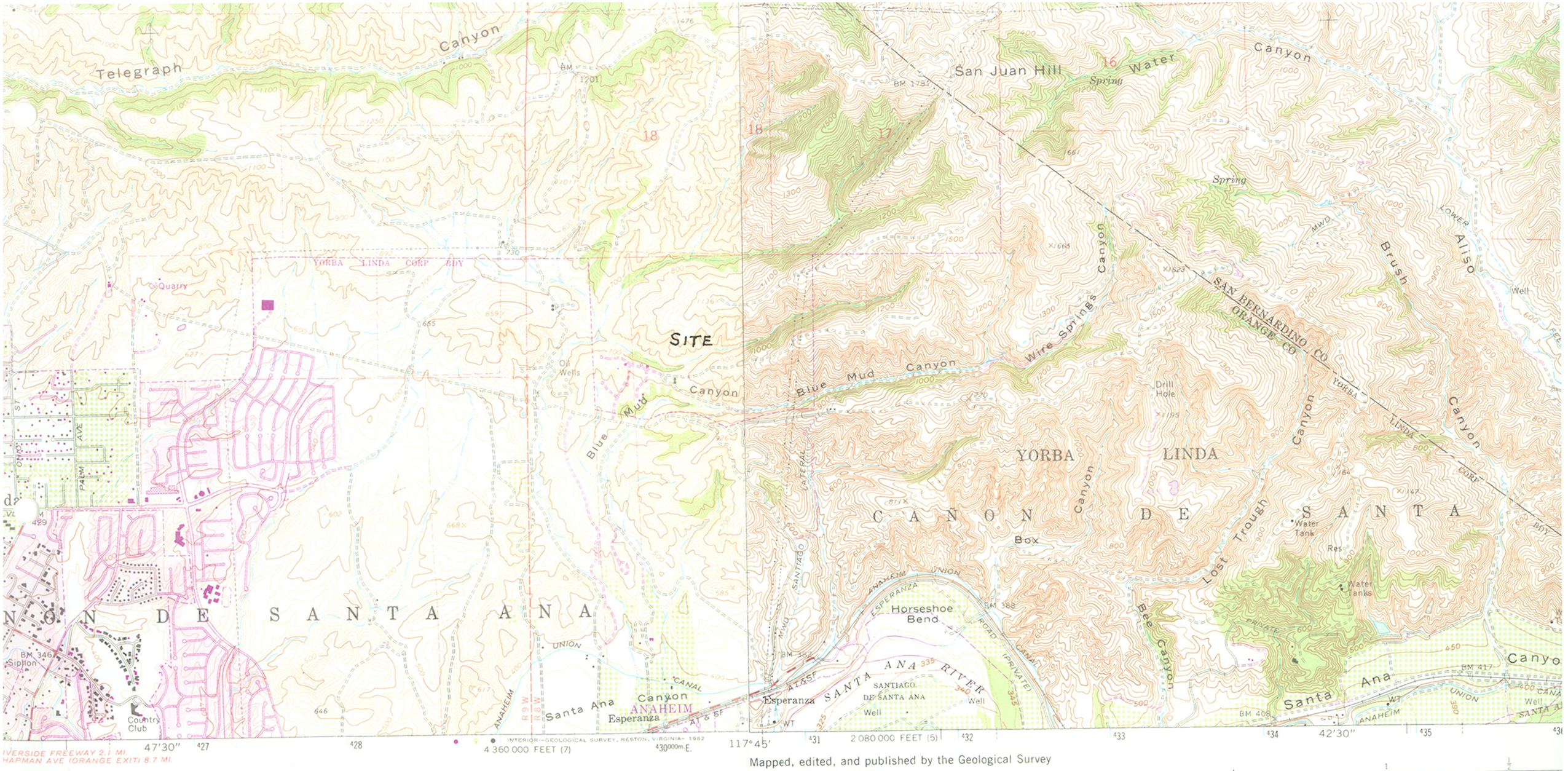
Figure 2a



http://www.ocwatersheds.com/watersheds/aerials/aerial_santaana.gif

Figure 3

2/4/2008



IVERSIDE FREEWAY 2.1 MI.
HAPMAN AVE (ORANGE EXIT) 8.7 MI.

1 MILE
7000 FEET
1 KILOMETER

ROAD CLASSIFICATION

Heavy-duty — Light-duty
Medium-duty — Unimproved dirt
State Route

CALIF
QUADRANGLE LOCATION

DARDS
ESTON, VIRGINIA 22092
E ON REQUEST

Revisions shown in purple and woodland compiled from aerial photographs taken 1978 and other sources
This information not field checked. Map edited 1981

Purple tint indicates extension of urban areas

YORBA LINDA, CALIF

N3352.5—W11745/7.5

1964
PHOTOREVISED 1981
DMA 2451 IV NE—SERIES V895

Mapped, edited, and published by the Geological Survey

Control by USGS and NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1946 and planetable surveys 1933 and 1949. Revised from aerial photographs taken 1966. Field checked 1967

Polyconic projection. 10,000-foot grid ticks based on California coordinate system, zones 5 and 6. 1000-meter Universal Transverse Mercator grid ticks, zone 11, shown in blue
1927 North American Datum. To place on the predicted North American Datum 1983 move the projection lines 1 meter north and 84 meters east as shown by dashed corner ticks

Fine red dashed lines indicate selected fence lines

Areas covered by dashed light-blue pattern are subject to controlled inundation

There may be private inholdings within the boundaries of the National or State reservations shown on this map

Revisions shown in purple and woodland compiled from aerial photographs taken 1978 and other sources. This information not field checked. Map edited 1981

Purple tint indicates extension of urban areas

GN MN
0°23' 7 MILS
14° 249 MILS

UTM GRID AND 1981 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

1000 0 1000

CO
DOTTED L
NATIONAL

THIS MAP COMPLIE
FOR SALE BY U. S. GEOLOGICAL SU
A FOLDER DESCRIBING TOPO

Figure 4

Appendix

B

FEMA FIRM PANELS



tional Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

50 0 500 1000

FEET

METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0069J

FIRM

FLOOD INSURANCE RATE MAP

ORANGE COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 69 OF 539

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ANAHEIM, CITY OF	060213	0069	J
ORANGE COUNTY	060212	0069	J
YORBA LINDA, CITY OF	060238	0069	J

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

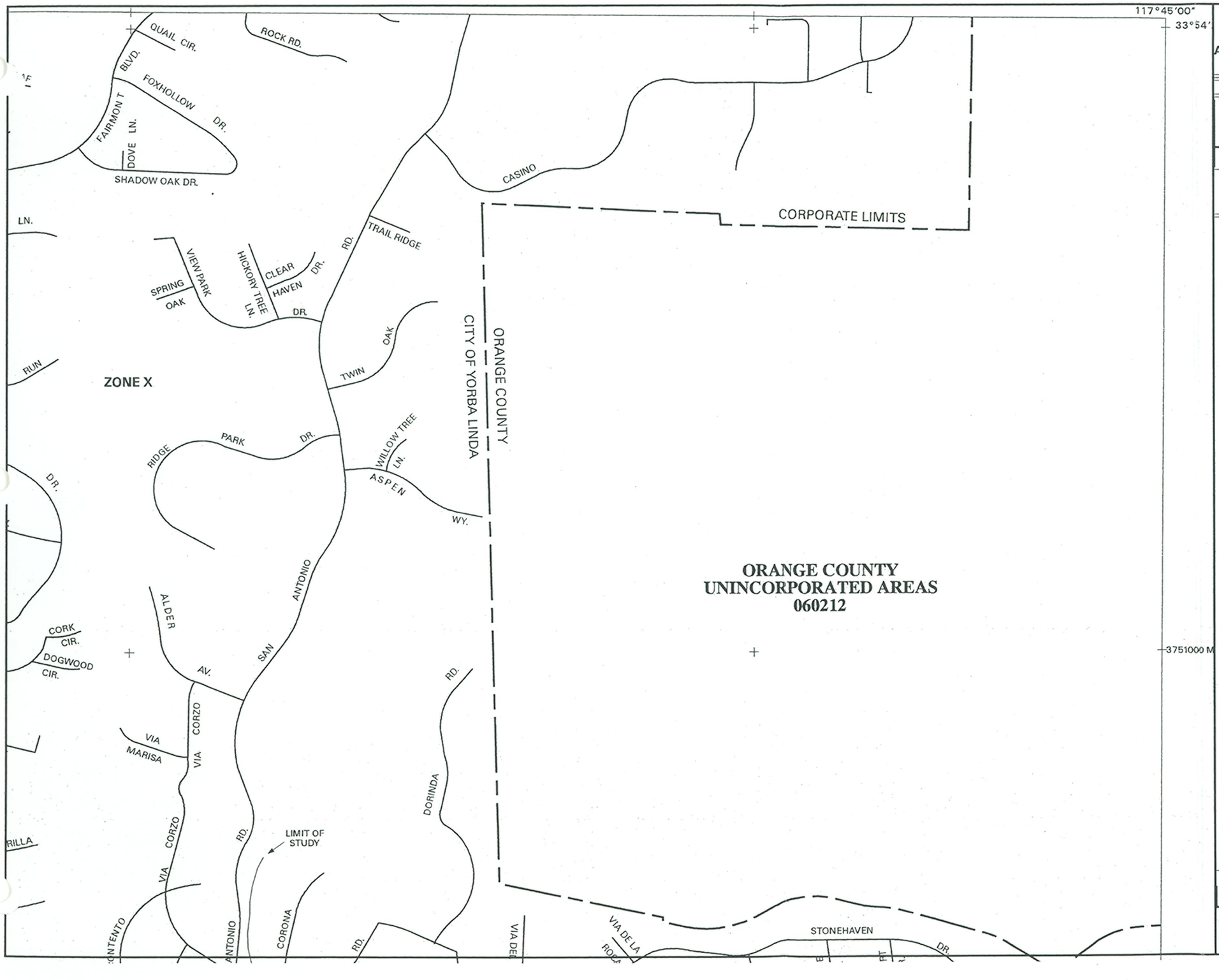
MAP NUMBER
06059C0069J

MAP REVISED
DECEMBER 3, 2009

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Figure 5a



AP SCALE 1" = 500'

500 1000 FEET

METERS

PANEL 0069H

FIRM

FLOOD INSURANCE RATE MAP

ORANGE COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 69 OF 550

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ORANGE COUNTY, UNINCORPORATED AREAS	060212	0069	H
YORBA LINDA, CITY OF	060238	0069	H
ANAHEIM, CITY OF	060213	0069	H

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

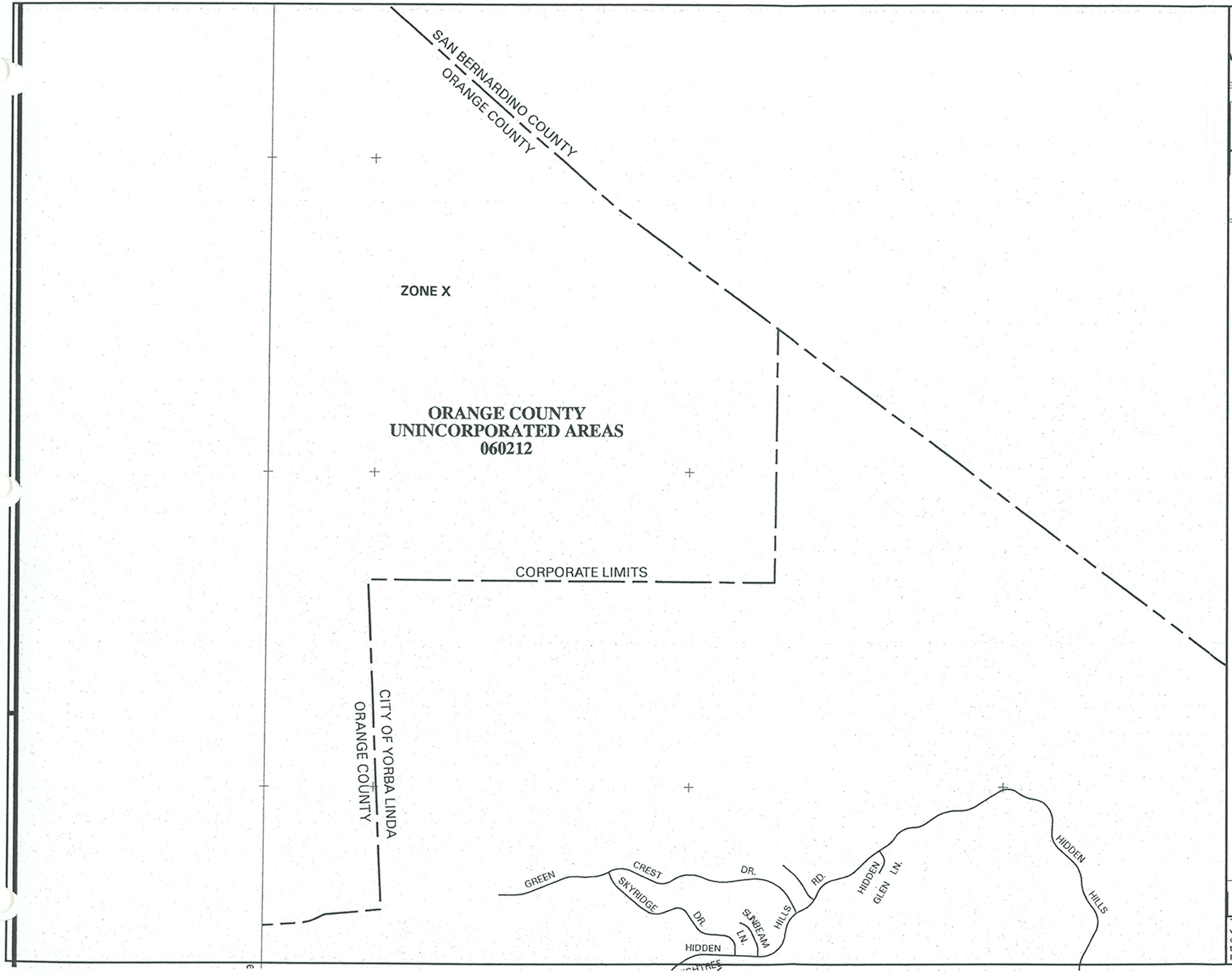
MAP NUMBER
06059C0069H

MAP REVISED:
FEBRUARY 18, 2004

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Figure 5b



AP SCALE 1" = 1000'

1000 2000 FEET

PANEL 0090H

FIRM

FLOOD INSURANCE RATE MAP

ORANGE COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 90 OF 550

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ORANGE COUNTY, UNINCORPORATED AREAS	060212	0090	H
YORBA LINDA, CITY OF	060238	0090	H
ANAHEIM, CITY OF	060213	0090	H

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

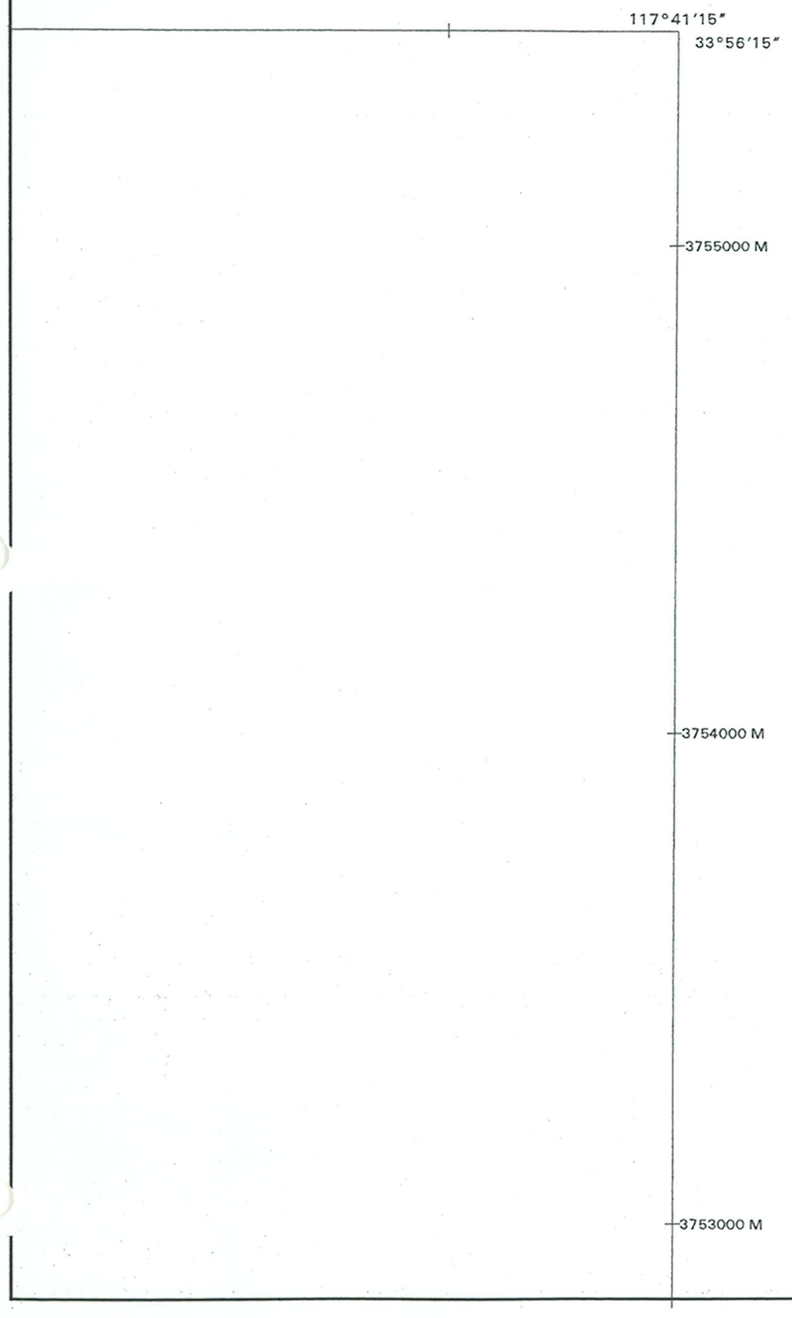
MAP NUMBER 06059C0090H

MAP REVISED: FEBRUARY 18, 2004

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Figure 5c



LEGEND

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

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 Area of special flood hazard formerly protected from the 1% annual chance flood event 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 event.

ZONE A99 Area to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no base flood elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no base flood elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

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

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

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 velocities.

513 Base Flood Elevation line and value; elevation in feet*

AP SCALE 1" = 1000'

1000 2000 FEET

PANEL 0090H

FIRM

FLOOD INSURANCE RATE MAP

ORANGE COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 90 OF 550

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ORANGE COUNTY, UNINCORPORATED AREAS	060212	0090	H
YORBA LINDA, CITY OF	060238	0090	H
ANAHEIM, CITY OF	060213	0090	H

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

MAP NUMBER 06059C0090H

MAP REVISED: FEBRUARY 18, 2004

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Figure 5d

Appendix

C

ORANGE COUNTY FLOOD CONTROL EXISTING FACILITIES

E 6100907.322

N 2276545.278

E 6122407.468

N 2276545.165

N 2260745.163

E 6100907.413

E 6122407.550

N 2260745.045

SAN BERNARDINO COUNTY


transition from 20x13.79
transition from 20x12.01 to 20x13.79
transition from I-13x11 to 20x12.01
trans from I-13x13.79 to I-13x11
trans from I-13x12 to I-13x10
trans to I-12x10.5
trans to I-12x12.71
trans to I-13x15.66
trans to I-13x9
trans to I-13x5.91
trans to I-13x11.5
trans to I-13x12
trans to I-13x14.74
trans to I-13x10
trans to I-13x12
trans to I-13x12
trans to I-13x12

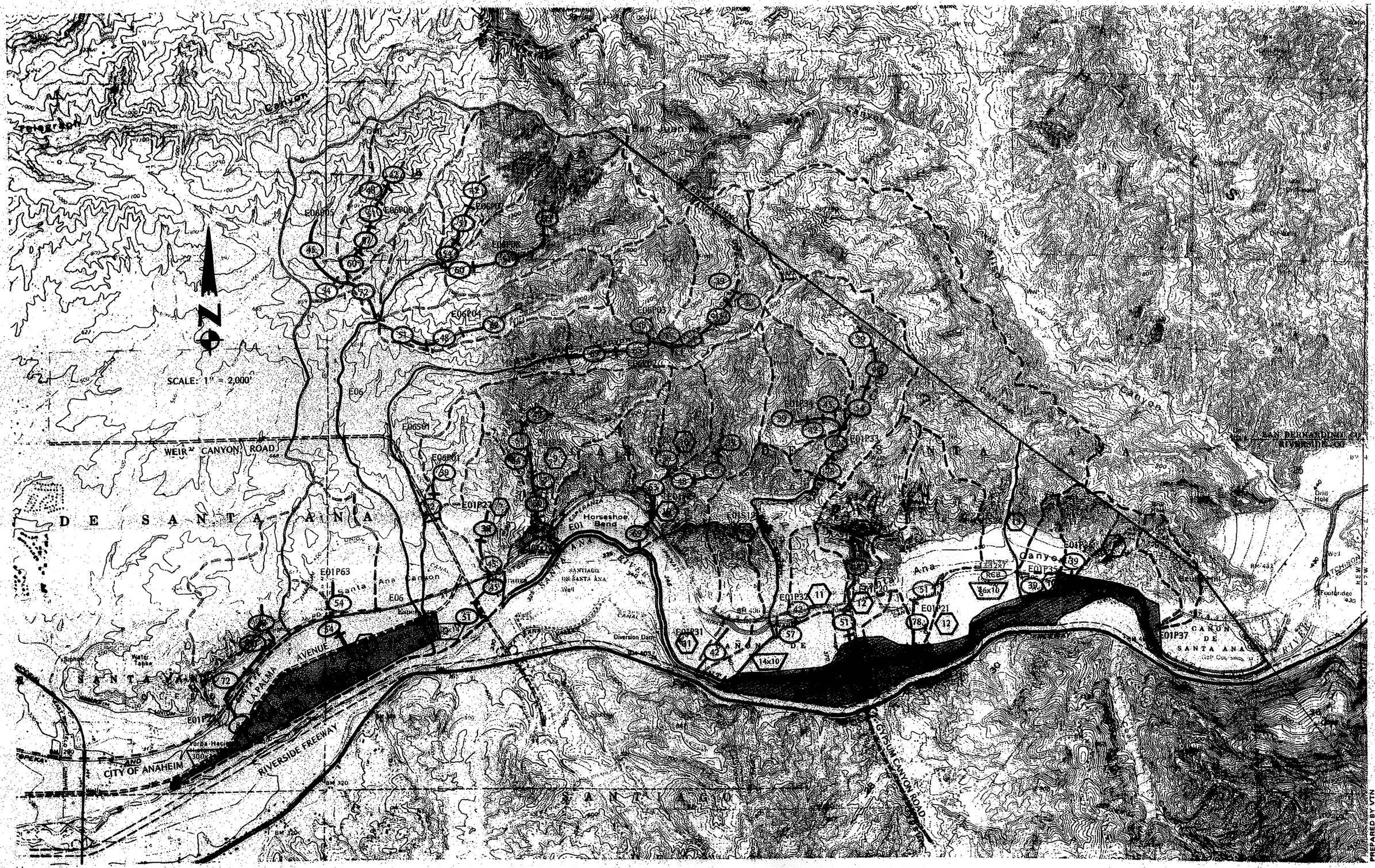


PLATE 2

FACILITY SIZE LEGEND

- PROPOSED REGIONAL FACILITY (INTERIM IMPROVEMENT REQUIRED) TRAPEZOIDAL CHANNEL, BASE WIDTH AND HEIGHT IN FEET
- PROPOSED REINFORCED CONCRETE BOX, (RCB), NUMBER OF BARRELS AND SPAN BY HEIGHT IN FEET
- PROPOSED LOCAL DRAINAGE FACILITY RCP, SIZE IN INCHES
- PROPOSED CITY DRAINAGE FACILITY RCP, SIZE IN INCHES
- EXISTING O.C.F.C.D. FACILITY, TRAPEZOIDAL CHANNEL, BASE WIDTH AND HEIGHT IN FEET
- EXISTING R.C. ARCH, BASE WIDTH BY HEIGHT IN INCHES

PROPOSED MASTER PLAN DRAINAGE FACILITIES

LEGEND

- STUDY AREA BOUNDARY
- DRAINAGE SUB–AREA BOUNDARIES
- REGIONAL WATERCOURSES
- EXISTING O.C.F.C.D. FACILITIES
- PROPOSED LOCAL DRAINAGE FACILITIES
- EXISTING GREENBELT LOCAL DRAINAGE FACILITIES
- PROPOSED CITY DRAINAGE FACILITY
- PLATE NUMBER OF PRELIMINARY PLAN AND PROFILE

Figure 7

Appendix

D

HYDROLOGIC CLASSIFICATION OF SOILS

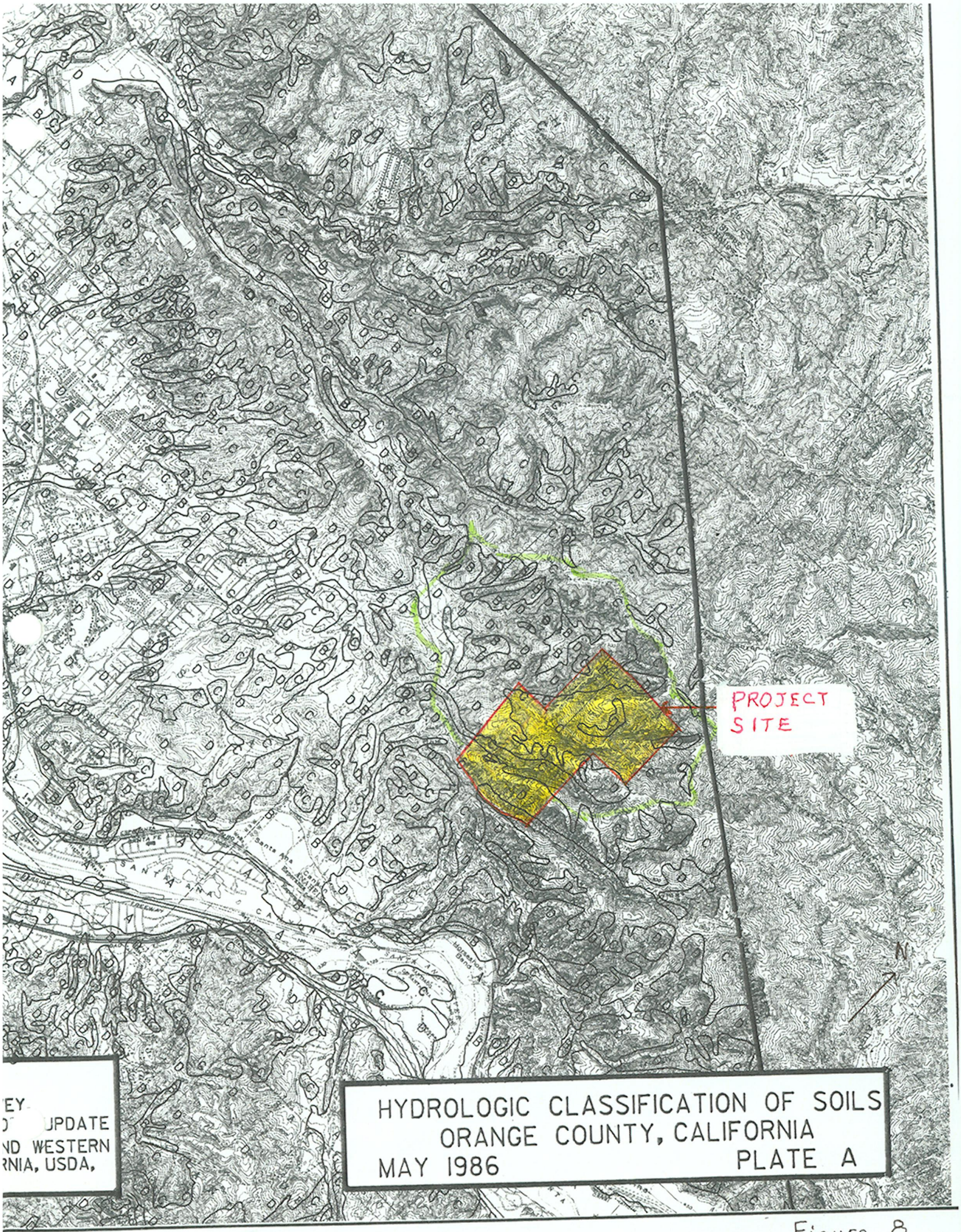

PROJECT SITE
N
HYDROLOGIC CLASSIFICATION OF SOILS
ORANGE COUNTY, CALIFORNIA
MAY 1986
PLATE A

Figure 8

Appendix

E

EXISTING CONDITION HYDROLOGY RATIONAL METHOD

TABLE 4
ESPERANZA HILLS
EXISTING CONDITION HYDROLOGY SUMMARY TABLE

Area A	Area (ac)	Total Area (ac)	Q100 (cfs)	100-Y Tc (min)	Q25 (cfs)	25-Y Tc (min)
1	0.93	0.93	3.06	11.19	2.35	11.19
2	3.52	4.45	13.92	12.12	10.65	12.21
3	5.63	10.08	29.90	13.27	22.79	13.47
4	12.43	22.51	64.13	14.23	48.75	14.52
5	13.55	36.06	102.52	14.23	77.87	14.52
6	10.74	46.80	128.12	15.15	97.08	15.52
7	13.21	60.01	157.40	16.21	118.90	16.66
8	2.19	2.19	6.99	11.74	5.37	11.74
9	6.53	8.72	26.66	12.58	20.41	12.66
10	11.71	20.43	59.33	13.67	45.22	13.85
11	9.15	29.58	83.17	14.41	63.23	14.65
Confluence		***89.59***	***234.70***	***16.21***	***177.22***	***16.66***
12	28.38	117.97	286.75	18.31	215.60	18.92
13	2.72	2.72	8.11	13.10	6.23	13.10
14	10.31	13.03	36.93	14.30	28.26	14.41
15	13.31	26.34	69.98	15.86	53.26	16.11
16	1.26	1.26	4.18	11.00	3.22	11.00
17	3.35	4.61	14.44	12.09	11.05	12.20
18	6.83	11.44	35.84	12.09	27.41	12.20
19	10.78	22.22	66.95	12.88	51.03	13.06
20	16.19	38.41	111.11	13.76	84.43	14.01
Confluence		***64.75***	***177.39***	***13.76***	***134.96***	***14.01***
21	64.95	129.70	327.54	16.43	247.32	16.89
Confluence		***244.18***	***602.81***	***16.43***	***454.05***	***16.89***
22	46.58	290.76	666.15	18.78	499.57	19.42
23	84.91	375.67	796.78	21.57	594.88	22.42
24	1.35	1.35	4.84	9.70	3.73	9.70
25	7.02	8.37	23.98	10.37	22.09	10.43
26	12.25	20.62	66.40	11.61	50.65	11.79
27	13.04	33.66	108.29	11.61	82.57	11.79
28	27.41	61.07	179.96	13.48	136.53	13.80
29	34.65	95.72	282.32	13.48	214.26	13.80
30	56.03	151.75	411.42	15.50	310.90	15.98
31	61.84	213.59	518.22	18.57	389.42	19.28
Confluence		***526.67***	***1271.83***	***18.57***	***952.68***	***19.28***
32	5.72	532.38	1271.83	19.29	952.68	20.05
33	1.20	1.20	3.52	13.10	2.70	13.10
34	34.27	35.47	93.02	16.69	70.80	17.10
Confluence		***567.85***	***1356.98***	***19.29***	***1016.87***	***20.05***
35	31.92	599.77	1359.29	20.61	1016.87	21.48
36	1.70	1.70	5.56	11.52	4.30	11.52
37	19.96	21.66	61.56	14.79	47.11	15.08
38	25.75	25.84	0.00	22.65	0.00	23.66
Confluence		***647.19***	***1409.64***	***22.65***	***1054.86***	***21.48***
39	435.56	435.56	1580.77	24.00	1160.74	24.00
Area A Total	**1148.83**	***1081.56**	**2327.94**	**22.65**	**1739.46**	**23.66**
B1	0.91	0.91	3.09	10.59	2.38	10.59
B2	4.36	5.27	17.31	11.28	13.28	11.35

TABLE 4
ESPERANZA HILLS
EXISTING CONDITION HYDROLOGY SUMMARY TABLE

B3	7.36	12.63	38.96	12.49	29.73	12.67
B4	31.28	43.91	131.37	13.19	100.10	13.43
B5	66.47	110.38	285.23	16.70	215.29	17.21
B6	70.76	181.14	402.16	21.30	301.00	22.17
B7	36.54	217.68	453.76	23.56	338.53	24.61
Area B Total	**217.68**	***217.68***	***453.76***	***23.56***	***338.53***	***24.61***
TOTAL	***1366.51***	****1300.42***	***3401.84***	***22.65***	***2543.03***	***23.66***

* Effective Area after confluence

100-YEAR EXISTING CONDITION

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2004 Version 8.0
Rational Hydrology Study, Date: 09/18/12 File Name: 1200A100.roc

---

ESPERANZA HILLS
EXISTING CONDITION
100 YEAR
R/09/1200/PRELIM/REPORTS/HYDRO/RATIONAL/1200A100

Program License Serial Number 6062

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 100.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

++
Process from Point/Station 10.000 to Point/Station 15.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 74.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.250(In/Hr)
Max Catchment Loss (Fm) = 0.250(In/Hr)
Initial subarea data:
Initial area flow distance = 300.000(Ft.)
Top (of initial area) elevation = 1780.000(Ft.)
Bottom (of initial area) elevation = 1670.000(Ft.)
Difference in elevation = 110.000(Ft.)
Slope = 0.36667 s(%)= 36.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.189 min.
Rainfall intensity = 3.900(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.842
Subarea runoff = 3.055(CFS)
Total initial stream area = 0.930(Ac.)

++
Process from Point/Station 15.000 to Point/Station 20.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 8.532(CFS)
Depth of flow = 0.269(Ft.), Average velocity = 5.736(Ft/s)

```
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =      8.532(CFS)
   '      '    flow top width =      6.074(Ft.)
   '      '     velocity=    5.736(Ft/s)
   '      '    area =      1.487(Sq.Ft)
   '      '    Froude number =     2.043

Upstream point elevation =  1670.000(Ft.)
Downstream point elevation =  1590.000(Ft.)
Flow length =   320.000(Ft.)
Travel time  =    0.93 min.
Time of concentration =   12.12 min.
Depth of flow =   0.269(Ft.)
Average velocity =   5.736(Ft/s)
Total irregular channel flow =     8.532(CFS)
Irregular channel normal depth above invert elev. =   0.269(Ft.)
Average velocity of channel(s) =   5.736(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      3.725(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.840
Subarea runoff =     10.864(CFS) for    3.520(Ac.)
Total runoff =     13.919(CFS)    Total area =        4.45(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.358(Ft.), Average velocity =   6.805(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       25.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     21.937(CFS)
Depth of flow =   0.464(Ft.), Average velocity =   7.983(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
```

```
Sub-Channel flow  =     21.937(CFS)
  '     '    flow top width =      6.854(Ft.)
  '     '     velocity=    7.983(Ft/s)
  '     '    area =      2.748(Sq.Ft)
  '     '    Froude number =     2.222

Upstream point elevation =  1590.000(Ft.)
Downstream point elevation =  1450.000(Ft.)
Flow length =   550.000(Ft.)
Travel time  =    1.15 min.
Time of concentration =   13.27 min.
Depth of flow =   0.464(Ft.)
Average velocity =   7.983(Ft/s)
Total irregular channel flow =    21.937(CFS)
Irregular channel normal depth above invert elev. =   0.464(Ft.)
Average velocity of channel(s) =   7.983(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.680
Decimal fraction soil group D = 0.320
SCS curve number for soil(AMC 2)  = 75.92
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.234(In/Hr)
Max Catchment Loss (Fm) =     0.234(In/Hr)
Rainfall intensity =      3.537(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.839
Subarea runoff =     15.983(CFS) for    5.630(Ac.)
Total runoff =     29.902(CFS)    Total area =       10.08(Ac.)
Area averaged Fm value =    0.241(In/Hr)
Depth of flow =   0.554(Ft.), Average velocity =   8.838(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       25.000 to Point/Station       30.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     47.060(CFS)
Depth of flow =   0.707(Ft.), Average velocity =  10.374(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     47.060(CFS)
  '     '    flow top width =      7.829(Ft.)
  '     '     velocity=   10.374(Ft/s)
  '     '    area =      4.536(Sq.Ft)
  '     '    Froude number =     2.402

Upstream point elevation =  1450.000(Ft.)
Downstream point elevation =  1290.000(Ft.)
Flow length =   600.000(Ft.)
Travel time  =    0.96 min.
```

```
Time of concentration =   14.23 min.
Depth of flow =   0.707(Ft.)
Average velocity =  10.374(Ft/s)
Total irregular channel flow =    47.060(CFS)
Irregular channel normal depth above invert elev. =   0.707(Ft.)
Average velocity of channel(s) =  10.374(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.500
SCS curve number for soil(AMC 2)  = 77.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.225(In/Hr)
Max Catchment Loss (Fm) =     0.225(In/Hr)
Rainfall intensity =      3.398(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.838
Subarea runoff =     34.230(CFS) for   12.430(Ac.)
Total runoff =     64.132(CFS)    Total area =       22.51(Ac.)
Area averaged Fm value =    0.232(In/Hr)
Depth of flow =   0.841(Ft.), Average velocity =  11.414(Ft/s)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Process from Point/Station       27.000 to Point/Station       30.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 79.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Time of concentration =    14.23 min.
Rainfall intensity =      3.398(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.837
Subarea runoff =     38.388(CFS) for   13.550(Ac.)
Total runoff =    102.520(CFS)    Total area =       36.06(Ac.)
Area averaged Fm value =    0.239(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.000 to Point/Station       40.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    115.360(CFS)
Depth of flow =   1.294(Ft.), Average velocity =  11.743(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
```

```
------------------------------------------------------------------
Sub-Channel flow  =    115.360(CFS)
  '     '    flow top width =     10.178(Ft.)
  '     '     velocity=   11.743(Ft/s)
  '     '    area =      9.823(Sq.Ft)
  '     '    Froude number =     2.107

Upstream point elevation =  1290.000(Ft.)
Downstream point elevation =  1175.000(Ft.)
Flow length =   650.000(Ft.)
Travel time  =    0.92 min.
Time of concentration =   15.15 min.
Depth of flow =   1.294(Ft.)
Average velocity =  11.743(Ft/s)
Total irregular channel flow =   115.360(CFS)
Irregular channel normal depth above invert elev. =   1.294(Ft.)
Average velocity of channel(s) =  11.743(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.520
Decimal fraction soil group D = 0.480
SCS curve number for soil(AMC 2)  = 76.88
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.226(In/Hr)
Max Catchment Loss (Fm) =     0.226(In/Hr)
Rainfall intensity =      3.278(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.835
Subarea runoff =     25.600(CFS) for   10.740(Ac.)
Total runoff =    128.120(CFS)    Total area =       46.80(Ac.)
Area averaged Fm value =    0.236(In/Hr)
Depth of flow =   1.369(Ft.), Average velocity =  12.099(Ft/s)


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Process from Point/Station       40.000 to Point/Station       50.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    142.789(CFS)
Depth of flow =   1.493(Ft.), Average velocity =  11.975(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    142.789(CFS)
  '     '    flow top width =     10.972(Ft.)
  '     '     velocity=   11.975(Ft/s)
  '     '    area =     11.924(Sq.Ft)
  '     '    Froude number =     2.024

Upstream point elevation =  1175.000(Ft.)
Downstream point elevation =  1055.000(Ft.)
Flow length =   760.000(Ft.)
```

```
Travel time  =    1.06 min.
Time of concentration =   16.21 min.
Depth of flow =   1.493(Ft.)
Average velocity =  11.975(Ft/s)
Total irregular channel flow =   142.789(CFS)
Irregular channel normal depth above invert elev. =   1.493(Ft.)
Average velocity of channel(s) =  11.975(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      3.153(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.832
Subarea runoff =     29.283(CFS) for   13.210(Ac.)
Total runoff =    157.403(CFS)    Total area =       60.01(Ac.)
Area averaged Fm value =    0.239(In/Hr)
Depth of flow =   1.571(Ft.), Average velocity =  12.305(Ft/s)


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Process from Point/Station       10.000 to Point/Station       50.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     60.010(Ac.)
Runoff from this stream =    157.403(CFS)
Time of concentration =   16.21 min.
Rainfall intensity =     3.153(In/Hr)
Area averaged loss rate (Fm) =    0.2390(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     60.01   157.403     16.21    0.239      3.153
Qmax(1) =
         1.000 *    1.000 *   157.403) + =     157.403

Total of 1 streams to confluence:
Flow rates before confluence point:
     157.403
Maximum flow rates at confluence using above data:
      157.403
Area of streams before confluence:
       60.010
Effective area values after confluence:
       60.010
Results of confluence:
Total flow rate =    157.403(CFS)
Time of concentration =    16.212 min.
Effective stream area after confluence =     60.010(Ac.)
Study area average Pervious fraction(Ap) =  1.000
```

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Study area average soil loss rate(Fm) =     0.239(In/Hr)
Study area total (this main stream) =      60.01(Ac.)


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Process from Point/Station       60.000 to Point/Station       70.000
**** INITIAL AREA EVALUATION ****

------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   320.000(Ft.)
Top (of initial area) elevation =  1655.000(Ft.)
Bottom (of initial area) elevation =  1550.000(Ft.)
Difference in elevation =   105.000(Ft.)
Slope =    0.32813  s(%)=      32.81
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.740 min.
Rainfall intensity =      3.794(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.841
Subarea runoff =      6.985(CFS)
Total initial stream area =        2.190(Ac.)


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Process from Point/Station       70.000 to Point/Station       75.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     16.858(CFS)
Depth of flow =   0.334(Ft.), Average velocity =   8.919(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     16.858(CFS)
   '      '    flow top width =      6.334(Ft.)
   '      '     velocity=    8.919(Ft/s)
   '      '    area =      1.890(Sq.Ft)
   '      '    Froude number =     2.877

Upstream point elevation =  1550.000(Ft.)
Downstream point elevation =  1340.000(Ft.)
Flow length =   450.000(Ft.)
Travel time  =    0.84 min.
Time of concentration =   12.58 min.
Depth of flow =   0.334(Ft.)
Average velocity =   8.919(Ft/s)
Total irregular channel flow =    16.858(CFS)
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Irregular channel normal depth above invert elev. =    0.334(Ft.)
Average velocity of channel(s) =    8.919(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      3.647(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.838
Subarea runoff =     19.671(CFS) for    6.530(Ac.)
Total runoff =     26.656(CFS)    Total area =        8.72(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.435(Ft.), Average velocity =  10.426(Ft/s)


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Process from Point/Station       75.000 to Point/Station       80.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     43.017(CFS)
Depth of flow =   0.682(Ft.), Average velocity =   9.917(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     43.017(CFS)
  '     '    flow top width =      7.727(Ft.)
  '     '     velocity=    9.917(Ft/s)
  '     '    area =      4.338(Sq.Ft)
  '     '    Froude number =     2.332

Upstream point elevation =  1340.000(Ft.)
Downstream point elevation =  1175.000(Ft.)
Flow length =   650.000(Ft.)
Travel time  =    1.09 min.
Time of concentration =   13.67 min.
Depth of flow =   0.682(Ft.)
Average velocity =   9.917(Ft/s)
Total irregular channel flow =    43.017(CFS)
Irregular channel normal depth above invert elev. =   0.682(Ft.)
Average velocity of channel(s) =   9.917(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
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Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      3.477(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.835
Subarea runoff =     32.672(CFS) for   11.710(Ac.)
Total runoff =     59.328(CFS)    Total area =       20.43(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.816(Ft.), Average velocity =  10.957(Ft/s)


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Process from Point/Station       80.000 to Point/Station       50.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     71.292(CFS)
Depth of flow =   0.918(Ft.), Average velocity =  11.360(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     71.292(CFS)
  '     '    flow top width =      8.672(Ft.)
  '     '     velocity=   11.360(Ft/s)
  '     '    area =      6.276(Sq.Ft)
  '     '    Froude number =     2.353

Upstream point elevation =  1175.000(Ft.)
Downstream point elevation =  1055.000(Ft.)
Flow length =   500.000(Ft.)
Travel time  =    0.73 min.
Time of concentration =   14.41 min.
Depth of flow =   0.918(Ft.)
Average velocity =  11.360(Ft/s)
Total irregular channel flow =    71.292(CFS)
Irregular channel normal depth above invert elev. =   0.918(Ft.)
Average velocity of channel(s) =  11.360(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      3.374(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.833
Subarea runoff =     23.841(CFS) for    9.150(Ac.)
Total runoff =     83.168(CFS)    Total area =       29.58(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.999(Ft.), Average velocity =  11.895(Ft/s)
```

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Process from Point/Station       60.000 to Point/Station       50.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     29.580(Ac.)
Runoff from this stream =     83.168(CFS)
Time of concentration =   14.41 min.
Rainfall intensity =     3.374(In/Hr)
Area averaged loss rate (Fm) =    0.2500(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     60.01   157.403     16.21    0.239      3.153
2     29.58    83.168     14.41    0.250      3.374
Qmax(1) =
         1.000 *    1.000 *   157.403) +
         0.929 *    1.000 *    83.168) + =     234.698
Qmax(2) =
         1.076 *    0.889 *   157.403) +
         1.000 *    1.000 *    83.168) + =     233.638

Total of 2 streams to confluence:
Flow rates before confluence point:
     157.403      83.168
Maximum flow rates at confluence using above data:
      234.698      233.638
Area of streams before confluence:
       60.010       29.580
Effective area values after confluence:
       89.590       82.909
Results of confluence:
Total flow rate =    234.698(CFS)
Time of concentration =    16.212 min.
Effective stream area after confluence =     89.590(Ac.)
Study area average Pervious fraction(Ap) =  1.000
Study area average soil loss rate(Fm) =    0.243(In/Hr)
Study area total (this main stream) =      89.59(Ac.)


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Process from Point/Station       50.000 to Point/Station       90.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    260.770(CFS)
Depth of flow =   2.652(Ft.), Average velocity =   9.544(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
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```
Sub-Channel flow  =    260.770(CFS)
  '      '    flow top width =     15.607(Ft.)
  '      '     velocity=    9.544(Ft/s)
  '      '    area =     27.324(Sq.Ft)
  '      '    Froude number =     1.271

Upstream point elevation =  1055.000(Ft.)
Downstream point elevation =   990.000(Ft.)
Flow length =  1200.000(Ft.)
Travel time  =    2.10 min.
Time of concentration =   18.31 min.
Depth of flow =   2.652(Ft.)
Average velocity =   9.544(Ft/s)
Total irregular channel flow =   260.770(CFS)
Irregular channel normal depth above invert elev. =   2.652(Ft.)
Average velocity of channel(s) =   9.544(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.670
Decimal fraction soil group D = 0.330
SCS curve number for soil(AMC 2)  = 75.98
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.234(In/Hr)
Max Catchment Loss (Fm) =     0.234(In/Hr)
Rainfall intensity =      2.941(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.826
Subarea runoff =     52.052(CFS) for   28.380(Ac.)
Total runoff =    286.749(CFS)    Total area =      117.97(Ac.)
Area averaged Fm value =    0.240(In/Hr)
Depth of flow =   2.777(Ft.), Average velocity =   9.785(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       90.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    117.970(Ac.)
Runoff from this stream =    286.749(CFS)
Time of concentration =   18.31 min.
Rainfall intensity =     2.941(In/Hr)
Area averaged loss rate (Fm) =    0.2404(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      110.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
```

```
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1610.000(Ft.)
Bottom (of initial area) elevation =  1560.000(Ft.)
Difference in elevation =    50.000(Ft.)
Slope =    0.16667  s(%)=      16.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.101 min.
Rainfall intensity =      3.563(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.837
Subarea runoff =      8.110(CFS)
Total initial stream area =        2.720(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      115.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     22.551(CFS)
Depth of flow =   0.457(Ft.), Average velocity =   8.350(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     22.551(CFS)
  '      '    flow top width =      6.827(Ft.)
  '      '     velocity=    8.350(Ft/s)
  '      '    area =      2.701(Sq.Ft)
  '      '    Froude number =     2.340

Upstream point elevation =  1560.000(Ft.)
Downstream point elevation =  1390.000(Ft.)
Flow length =   600.000(Ft.)
Travel time  =    1.20 min.
Time of concentration =   14.30 min.
Depth of flow =   0.457(Ft.)
Average velocity =   8.350(Ft/s)
Total irregular channel flow =    22.551(CFS)
Irregular channel normal depth above invert elev. =   0.457(Ft.)
Average velocity of channel(s) =   8.350(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.740
Decimal fraction soil group D = 0.260
SCS curve number for soil(AMC 2)  = 75.56
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.237(In/Hr)
Max Catchment Loss (Fm) =     0.237(In/Hr)
Rainfall intensity =      3.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.836
Subarea runoff =     28.818(CFS) for   10.310(Ac.)
```

```
Total runoff =     36.928(CFS)     Total area =       13.03(Ac.)
Area averaged Fm value =    0.240(In/Hr)
Depth of flow =   0.606(Ft.), Average velocity =   9.809(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      115.000 to Point/Station      120.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     53.493(CFS)
Depth of flow =   0.801(Ft.), Average velocity =  10.117(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     53.493(CFS)
   '      '    flow top width =      8.204(Ft.)
   '      '     velocity=   10.117(Ft/s)
   '      '    area =      5.287(Sq.Ft)
   '      '    Froude number =     2.221

Upstream point elevation =  1390.000(Ft.)
Downstream point elevation =  1180.000(Ft.)
Flow length =   950.000(Ft.)
Travel time  =    1.56 min.
Time of concentration =   15.86 min.
Depth of flow =   0.801(Ft.)
Average velocity =  10.117(Ft/s)
Total irregular channel flow =    53.493(CFS)
Irregular channel normal depth above invert elev. =   0.801(Ft.)
Average velocity of channel(s) =  10.117(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.840
Decimal fraction soil group D = 0.160
SCS curve number for soil(AMC 2)  = 74.96
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.242(In/Hr)
Max Catchment Loss (Fm) =     0.242(In/Hr)
Rainfall intensity =      3.193(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.832
Subarea runoff =     33.053(CFS) for   13.310(Ac.)
Total runoff =     69.981(CFS)     Total area =       26.34(Ac.)
Area averaged Fm value =    0.241(In/Hr)
Depth of flow =   0.929(Ft.), Average velocity =  10.977(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      120.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
```

```
Stream flow area =     26.340(Ac.)
Runoff from this stream =     69.981(CFS)
Time of concentration =   15.86 min.
Rainfall intensity =     3.193(In/Hr)
Area averaged loss rate (Fm) =    0.2409(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      122.000 to Point/Station      124.000
**** INITIAL AREA EVALUATION ****

------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1615.000(Ft.)
Bottom (of initial area) elevation =  1495.000(Ft.)
Difference in elevation =   120.000(Ft.)
Slope =    0.40000  s(%)=      40.00
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.996 min.
Rainfall intensity =      3.939(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.843
Subarea runoff =      4.183(CFS)
Total initial stream area =        1.260(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      124.000 to Point/Station      126.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      9.341(CFS)
Depth of flow =   0.275(Ft.), Average velocity =   6.109(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =      9.341(CFS)
  '     '    flow top width =      6.102(Ft.)
  '     '     velocity=    6.109(Ft/s)
  '     '    area =      1.529(Sq.Ft)
  '     '    Froude number =     2.150

Upstream point elevation =  1495.000(Ft.)
Downstream point elevation =  1385.000(Ft.)
Flow length =   400.000(Ft.)
Travel time  =    1.09 min.
```

```
Time of concentration =   12.09 min.
Depth of flow =   0.275(Ft.)
Average velocity =   6.109(Ft/s)
Total irregular channel flow =     9.341(CFS)
Irregular channel normal depth above invert elev. =   0.275(Ft.)
Average velocity of channel(s) =   6.109(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      3.731(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.840
Subarea runoff =     10.260(CFS) for    3.350(Ac.)
Total runoff =     14.443(CFS)    Total area =        4.61(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.356(Ft.), Average velocity =   7.111(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      126.000 to Point/Station      126.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Time of concentration =    12.09 min.
Rainfall intensity =      3.731(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.840
Subarea runoff =     21.398(CFS) for    6.830(Ac.)
Total runoff =     35.840(CFS)    Total area =       11.44(Ac.)
Area averaged Fm value =    0.250(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      126.000 to Point/Station      128.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     51.437(CFS)
Depth of flow =   0.819(Ft.), Average velocity =   9.466(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
```

```
------------------------------------------------------------------
Sub-Channel flow  =     51.437(CFS)
  '     '    flow top width =      8.275(Ft.)
  '     '     velocity=    9.466(Ft/s)
  '     '    area =      5.434(Sq.Ft)
  '     '    Froude number =     2.059

Upstream point elevation =  1385.000(Ft.)
Downstream point elevation =  1300.000(Ft.)
Flow length =   450.000(Ft.)
Travel time  =    0.79 min.
Time of concentration =   12.88 min.
Depth of flow =   0.819(Ft.)
Average velocity =   9.466(Ft/s)
Total irregular channel flow =    51.437(CFS)
Irregular channel normal depth above invert elev. =   0.819(Ft.)
Average velocity of channel(s) =   9.466(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      3.598(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.837
Subarea runoff =     31.107(CFS) for   10.780(Ac.)
Total runoff =     66.948(CFS)    Total area =       22.22(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.947(Ft.), Average velocity =  10.252(Ft/s)


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Process from Point/Station      128.000 to Point/Station      120.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =     89.068(CFS)
Depth of flow =   1.090(Ft.), Average velocity =  11.382(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     89.068(CFS)
  '     '    flow top width =      9.360(Ft.)
  '     '     velocity=   11.382(Ft/s)
  '     '    area =      7.825(Sq.Ft)
  '     '    Froude number =     2.194

Upstream point elevation =  1300.000(Ft.)
Downstream point elevation =  1180.000(Ft.)
Flow length =   600.000(Ft.)
```

```
Travel time  =    0.88 min.
Time of concentration =   13.76 min.
Depth of flow =   1.090(Ft.)
Average velocity =  11.382(Ft/s)
Total irregular channel flow =    89.068(CFS)
Irregular channel normal depth above invert elev. =   1.090(Ft.)
Average velocity of channel(s) =  11.382(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      3.464(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.835
Subarea runoff =     44.165(CFS) for   16.190(Ac.)
Total runoff =    111.113(CFS)    Total area =       38.41(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   1.228(Ft.), Average velocity =  12.137(Ft/s)


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Process from Point/Station      122.000 to Point/Station      120.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     38.410(Ac.)
Runoff from this stream =    111.113(CFS)
Time of concentration =   13.76 min.
Rainfall intensity =     3.464(In/Hr)
Area averaged loss rate (Fm) =    0.2500(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     26.34    69.981     15.86    0.241      3.193
2     38.41   111.113     13.76    0.250      3.464
Qmax(1) =
         1.000 *    1.000 *    69.981) +
         0.916 *    1.000 *   111.113) + =     171.715
Qmax(2) =
         1.092 *    0.867 *    69.981) +
         1.000 *    1.000 *   111.113) + =     177.388

Total of 2 streams to confluence:
Flow rates before confluence point:
      69.981     111.113
Maximum flow rates at confluence using above data:
      171.715      177.388
Area of streams before confluence:
       26.340       38.410
Effective area values after confluence:
       64.750       61.256
```

```
Results of confluence:
Total flow rate =    177.388(CFS)
Time of concentration =    13.759 min.
Effective stream area after confluence =     61.256(Ac.)
Study area average Pervious fraction(Ap) =  1.000
Study area average soil loss rate(Fm) =    0.246(In/Hr)
Study area total (this main stream) =      64.75(Ac.)


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Process from Point/Station      120.000 to Point/Station       90.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    252.508(CFS)
Depth of flow =   2.245(Ft.), Average velocity =  11.854(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =    252.508(CFS)
  '     '   flow top width =     13.979(Ft.)
  '     '    velocity=   11.854(Ft/s)
  '     '   area =     21.302(Sq.Ft)
  '     '   Froude number =     1.692

Upstream point elevation =  1180.000(Ft.)
Downstream point elevation =   990.000(Ft.)
Flow length =  1900.000(Ft.)
Travel time  =    2.67 min.
Time of concentration =   16.43 min.
Depth of flow =   2.245(Ft.)
Average velocity =  11.854(Ft/s)
Total irregular channel flow =   252.508(CFS)
Irregular channel normal depth above invert elev. =   2.245(Ft.)
Average velocity of channel(s) =  11.854(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.100
SCS curve number for soil(AMC 2)  = 74.60
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.245(In/Hr)
Max Catchment Loss (Fm) =     0.245(In/Hr)
Rainfall intensity =      3.129(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.829
Subarea runoff =    150.155(CFS) for   64.950(Ac.)
Total runoff =    327.543(CFS)    Total area =      126.21(Ac.)
Area averaged Fm value =    0.246(In/Hr)
Depth of flow =   2.552(Ft.), Average velocity =  12.702(Ft/s)


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Process from Point/Station      100.000 to Point/Station       90.000
**** CONFLUENCE OF MAIN STREAMS ****
--------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =    126.206(Ac.)
Runoff from this stream =    327.543(CFS)
Time of concentration =   16.43 min.
Rainfall intensity =     3.129(In/Hr)
Area averaged loss rate (Fm) =    0.2456(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    117.97   286.749     18.31    0.240      2.941
2    126.21   327.543     16.43    0.246      3.129
Qmax(1) =
         1.000 *    1.000 *   286.749) +
         0.935 *    1.000 *   327.543) + =     592.929
Qmax(2) =
         1.070 *    0.897 *   286.749) +
         1.000 *    1.000 *   327.543) + =     602.813

Total of 2 main streams to confluence:
Flow rates before confluence point:
     287.749     328.543
Maximum flow rates at confluence using above data:
      592.929      602.813
Area of streams before confluence:
      117.970      126.206
Effective area values after confluence:
      244.176      232.080


Results of confluence:
Total flow rate =    602.813(CFS)
Time of concentration =    16.430 min.
Effective stream area after confluence  =    232.080(Ac.)
Study area average Pervious fraction(Ap) =  1.000
Study area average soil loss rate(Fm) =    0.243(In/Hr)
Study area total =     244.18(Ac.)


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Process from Point/Station       90.000 to Point/Station      130.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
--------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    634.514(CFS)
Depth of flow =   3.761(Ft.), Average velocity =  13.474(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
```

```
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =    634.514(CFS)
  '      '    flow top width =     20.044(Ft.)
  '      '     velocity=   13.474(Ft/s)
  '      '    area =     47.093(Sq.Ft)
  '      '    Froude number =     1.549

Upstream point elevation =   990.000(Ft.)
Downstream point elevation =   850.000(Ft.)
Flow length =  1900.000(Ft.)
Travel time  =    2.35 min.
Time of concentration =   18.78 min.
Depth of flow =   3.761(Ft.)
Average velocity =  13.474(Ft/s)
Total irregular channel flow =   634.514(CFS)
Irregular channel normal depth above invert elev. =   3.761(Ft.)
Average velocity of channel(s) =  13.474(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.770
Decimal fraction soil group D = 0.230
SCS curve number for soil(AMC 2)  = 75.38
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.239(In/Hr)
Max Catchment Loss (Fm) =     0.239(In/Hr)
Rainfall intensity =      2.899(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.825
Subarea runoff =     63.339(CFS) for   46.580(Ac.)
Total runoff =    666.152(CFS)    Total area =      278.66(Ac.)
Area averaged Fm value =    0.242(In/Hr)
Depth of flow =   3.847(Ft.), Average velocity =  13.643(Ft/s)


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Process from Point/Station      130.000 to Point/Station      140.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_________________________________________________________________
Estimated mean flow rate at midpoint of channel =    731.504(CFS)
Depth of flow =   4.267(Ft.), Average velocity =  12.668(Ft/s)
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =    731.503(CFS)
  '      '    flow top width =     22.067(Ft.)
  '      '     velocity=   12.668(Ft/s)
  '      '    area =     57.746(Sq.Ft)
  '      '    Froude number =     1.380

Upstream point elevation =   850.000(Ft.)
Downstream point elevation =   730.000(Ft.)
```

```
Flow length =  2120.000(Ft.)
Travel time  =    2.79 min.
Time of concentration =   21.57 min.
Depth of flow =   4.267(Ft.)
Average velocity =  12.668(Ft/s)
Total irregular channel flow =   731.504(CFS)
Irregular channel normal depth above invert elev. =   4.267(Ft.)
Average velocity of channel(s) =  12.668(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.850
Decimal fraction soil group D = 0.150
SCS curve number for soil(AMC 2)  = 74.90
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.242(In/Hr)
Max Catchment Loss (Fm) =     0.242(In/Hr)
Rainfall intensity =      2.677(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.819
Subarea runoff =    130.624(CFS) for   84.910(Ac.)
Total runoff =    796.777(CFS)    Total area =      363.57(Ac.)
Area averaged Fm value =    0.242(In/Hr)
Depth of flow =   4.436(Ft.), Average velocity =  12.947(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station      140.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    363.570(Ac.)
Runoff from this stream =    796.777(CFS)
Time of concentration =   21.57 min.
Rainfall intensity =     2.677(In/Hr)
Area averaged loss rate (Fm) =    0.2424(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      150.000 to Point/Station      160.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1575.000(Ft.)
Bottom (of initial area) elevation =  1350.000(Ft.)
Difference in elevation =   225.000(Ft.)
Slope =    0.75000  s(%)=      75.00
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.697 min.
Rainfall intensity =      4.233(In/Hr) for a   100.0 year storm
```

```
Effective runoff coefficient used for area (Q=KCIA) is C = 0.847
Subarea runoff =      4.839(CFS)
Total initial stream area =        1.350(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      160.000 to Point/Station      162.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     16.866(CFS)
Depth of flow =   0.342(Ft.), Average velocity =   8.675(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =     16.866(CFS)
   '      '    flow top width =      6.368(Ft.)
   '      '     velocity=    8.675(Ft/s)
   '      '    area =      1.944(Sq.Ft)
   '      '    Froude number =     2.767

Upstream point elevation =  1350.000(Ft.)
Downstream point elevation =  1200.000(Ft.)
Flow length =   350.000(Ft.)
Travel time  =    0.67 min.
Time of concentration =   10.37 min.
Depth of flow =   0.342(Ft.)
Average velocity =   8.675(Ft/s)
Total irregular channel flow =    16.866(CFS)
Irregular channel normal depth above invert elev. =   0.342(Ft.)
Average velocity of channel(s) =   8.675(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.960
Decimal fraction soil group D = 0.040
SCS curve number for soil(AMC 2)  = 74.24
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.248(In/Hr)
Max Catchment Loss (Fm) =     0.248(In/Hr)
Rainfall intensity =      4.074(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.845
Subarea runoff =     23.976(CFS) for    7.020(Ac.)
Total runoff =     28.816(CFS)    Total area =        8.37(Ac.)
Area averaged Fm value =    0.248(In/Hr)
Depth of flow =   0.467(Ft.), Average velocity =  10.401(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      162.000 to Point/Station      164.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     47.648(CFS)
```

```
Depth of flow =   0.734(Ft.), Average velocity =  10.043(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     47.649(CFS)
  '     '    flow top width =      7.934(Ft.)
  '     '     velocity=   10.044(Ft/s)
  '     '    area =      4.744(Sq.Ft)
  '     '    Froude number =     2.289

Upstream point elevation =  1200.000(Ft.)
Downstream point elevation =  1020.000(Ft.)
Flow length =   750.000(Ft.)
Travel time  =    1.24 min.
Time of concentration =   11.61 min.
Depth of flow =   0.734(Ft.)
Average velocity =  10.043(Ft/s)
Total irregular channel flow =    47.648(CFS)
Irregular channel normal depth above invert elev. =   0.734(Ft.)
Average velocity of channel(s) =  10.043(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.660
Decimal fraction soil group D = 0.340
SCS curve number for soil(AMC 2)  = 76.04
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.233(In/Hr)
Max Catchment Loss (Fm) =     0.233(In/Hr)
Rainfall intensity =      3.817(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.844
Subarea runoff =     37.589(CFS) for   12.250(Ac.)
Total runoff =     66.404(CFS)    Total area =       20.62(Ac.)
Area averaged Fm value =    0.239(In/Hr)
Depth of flow =   0.883(Ft.), Average velocity =  11.120(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      163.000 to Point/Station      164.000
**** SUBAREA FLOW ADDITION ****

------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.970
Decimal fraction soil group D = 0.030
SCS curve number for soil(AMC 2)  = 74.18
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.249(In/Hr)
Max Catchment Loss (Fm) =     0.249(In/Hr)
Time of concentration =    11.61 min.
Rainfall intensity =      3.817(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
```

```
rational method)(Q=KCIA) is C = 0.843
Subarea runoff =     41.885(CFS) for   13.040(Ac.)
Total runoff =    108.289(CFS)    Total area =       33.66(Ac.)
Area averaged Fm value =    0.243(In/Hr)


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Process from Point/Station      164.000 to Point/Station      170.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    144.158(CFS)
Depth of flow =   1.732(Ft.), Average velocity =   9.836(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    144.158(CFS)
   '      '    flow top width =     11.927(Ft.)
   '      '     velocity=    9.836(Ft/s)
   '      '    area =     14.656(Sq.Ft)
   '      '    Froude number =     1.564

Upstream point elevation =  1020.000(Ft.)
Downstream point elevation =   920.000(Ft.)
Flow length =  1100.000(Ft.)
Travel time  =    1.86 min.
Time of concentration =   13.48 min.
Depth of flow =   1.732(Ft.)
Average velocity =   9.836(Ft/s)
Total irregular channel flow =   144.158(CFS)
Irregular channel normal depth above invert elev. =   1.732(Ft.)
Average velocity of channel(s) =   9.836(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.340
Decimal fraction soil group D = 0.660
SCS curve number for soil(AMC 2)  = 77.96
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.217(In/Hr)
Max Catchment Loss (Fm) =     0.217(In/Hr)
Rainfall intensity =      3.505(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.841
Subarea runoff =     71.667(CFS) for   27.410(Ac.)
Total runoff =    179.956(CFS)    Total area =       61.07(Ac.)
Area averaged Fm value =    0.231(In/Hr)
Depth of flow =   1.939(Ft.), Average velocity =  10.450(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      168.000 to Point/Station      170.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
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```
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.460
Decimal fraction soil group D = 0.540
SCS curve number for soil(AMC 2)  = 81.70
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.223(In/Hr)
Max Catchment Loss (Fm) =     0.223(In/Hr)
Time of concentration =    13.48 min.
Rainfall intensity =      3.505(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.841
Subarea runoff =    102.360(CFS) for   34.650(Ac.)
Total runoff =    282.316(CFS)    Total area =       95.72(Ac.)
Area averaged Fm value =    0.228(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      170.000 to Point/Station      175.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    346.909(CFS)
Depth of flow =   3.025(Ft.), Average velocity =  10.380(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =    346.909(CFS)
  '      '    flow top width =     17.098(Ft.)
  '      '     velocity=   10.380(Ft/s)
  '      '    area =     33.419(Sq.Ft)
  '      '    Froude number =     1.308

Upstream point elevation =   920.000(Ft.)
Downstream point elevation =   850.000(Ft.)
Flow length =  1260.000(Ft.)
Travel time  =    2.02 min.
Time of concentration =   15.50 min.
Depth of flow =   3.025(Ft.)
Average velocity =  10.380(Ft/s)
Total irregular channel flow =   346.909(CFS)
Irregular channel normal depth above invert elev. =   3.025(Ft.)
Average velocity of channel(s) =  10.380(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.280
Decimal fraction soil group D = 0.720
SCS curve number for soil(AMC 2)  = 78.32
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.214(In/Hr)
Max Catchment Loss (Fm) =     0.214(In/Hr)
Rainfall intensity =      3.235(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
```

```
rational method)(Q=KCIA) is C = 0.838
Subarea runoff =    129.107(CFS) for   56.030(Ac.)
Total runoff =    411.423(CFS)    Total area =      151.75(Ac.)
Area averaged Fm value =    0.223(In/Hr)
Depth of flow =   3.280(Ft.), Average velocity =  10.851(Ft/s)


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Process from Point/Station      175.000 to Point/Station      140.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    464.857(CFS)
Depth of flow =   3.447(Ft.), Average velocity =  11.336(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    464.857(CFS)
  '     '   flow top width =     18.790(Ft.)
  '     '    velocity=   11.336(Ft/s)
  '     '   area =     41.006(Sq.Ft)
  '     '   Froude number =     1.352

Upstream point elevation =   850.000(Ft.)
Downstream point elevation =   730.000(Ft.)
Flow length =  2090.000(Ft.)
Travel time  =    3.07 min.
Time of concentration =   18.57 min.
Depth of flow =   3.447(Ft.)
Average velocity =  11.336(Ft/s)
Total irregular channel flow =   464.857(CFS)
Irregular channel normal depth above invert elev. =   3.447(Ft.)
Average velocity of channel(s) =  11.336(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.100
Decimal fraction soil group C = 0.130
Decimal fraction soil group D = 0.770
SCS curve number for soil(AMC 2)  = 77.32
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.217(In/Hr)
Max Catchment Loss (Fm) =     0.217(In/Hr)
Rainfall intensity =      2.917(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.832
Subarea runoff =    106.800(CFS) for   61.840(Ac.)
Total runoff =    518.223(CFS)    Total area =      213.59(Ac.)
Area averaged Fm value =    0.221(In/Hr)
Depth of flow =   3.627(Ft.), Average velocity =  11.658(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      150.000 to Point/Station      140.000
**** CONFLUENCE OF MINOR STREAMS ****
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```
Along Main Stream number: 1 in normal stream number 2
Stream flow area =    213.590(Ac.)
Runoff from this stream =    518.223(CFS)
Time of concentration =   18.57 min.
Rainfall intensity =     2.917(In/Hr)
Area averaged loss rate (Fm) =    0.2211(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    363.57   796.777     21.57    0.242      2.677
2    213.59   518.223     18.57    0.221      2.917
Qmax(1) =
         1.000 *    1.000 *   796.777) +
         0.911 *    1.000 *   518.223) + =    1268.958
Qmax(2) =
         1.098 *    0.861 *   796.777) +
         1.000 *    1.000 *   518.223) + =    1271.826

Total of 2 streams to confluence:
Flow rates before confluence point:
     796.777     518.223
Maximum flow rates at confluence using above data:
     1268.958     1271.826
Area of streams before confluence:
      363.570      213.590
Effective area values after confluence:
      577.160      526.665
Results of confluence:
Total flow rate =   1271.826(CFS)
Time of concentration =    18.574 min.
Effective stream area after confluence =    526.665(Ac.)
Study area average Pervious fraction(Ap) =  1.000
Study area average soil loss rate(Fm) =    0.235(In/Hr)
Study area total (this main stream) =     577.16(Ac.)


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Process from Point/Station      140.000 to Point/Station      178.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =   1271.853(CFS)
Depth of flow =   5.785(Ft.), Average velocity =  13.270(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =   1271.853(CFS)
  '     '   flow top width =     28.138(Ft.)
  '     '    velocity=   13.270(Ft/s)
```

```
  '      '    area =      95.844(Sq.Ft)
  '      '    Froude number =      1.267

Upstream point elevation =    730.000(Ft.)
Downstream point elevation =    705.000(Ft.)
Flow length =    568.000(Ft.)
Travel time  =     0.71 min.
Time of concentration =    19.29 min.
Depth of flow =    5.785(Ft.)
Average velocity =   13.270(Ft/s)
Total irregular channel flow =   1271.853(CFS)
Irregular channel normal depth above invert elev. =    5.785(Ft.)
Average velocity of channel(s) =   13.270(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.650
Decimal fraction soil group D = 0.350
SCS curve number for soil(AMC 2)  = 76.10
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=      0.232(In/Hr)
Max Catchment Loss (Fm) =      0.232(In/Hr)
The area added to the existing stream with this TC
does not add flow per Para 6b, Page D-15 of the OCHM,
therefore the upstream flow rate of Q =    1271.826(CFS) is being used
Rainfall intensity =      2.855(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.826
Subarea runoff =      0.000(CFS) for     5.720(Ac.)
Total runoff =   1271.826(CFS)    Total area =      532.38(Ac.)
Area averaged Fm value =     0.234(In/Hr)
Depth of flow =    5.784(Ft.), Average velocity =   13.270(Ft/s)


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Process from Point/Station       10.000 to Point/Station      178.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     532.385(Ac.)
Runoff from this stream =    1271.826(CFS)
Time of concentration =    19.29 min.
Rainfall intensity =      2.855(In/Hr)
Area averaged loss rate (Fm) =     0.2345(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


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Process from Point/Station      176.000 to Point/Station      177.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 61.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=      0.300(In/Hr)
Max Catchment Loss (Fm) =      0.300(In/Hr)
Initial subarea data:
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```
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1225.000(Ft.)
Bottom (of initial area) elevation =  1175.000(Ft.)
Difference in elevation =    50.000(Ft.)
Slope =    0.16667  s(%)=      16.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.101 min.
Rainfall intensity =      3.563(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.824
Subarea runoff =      3.524(CFS)
Total initial stream area =        1.200(Ac.)


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Process from Point/Station      177.000 to Point/Station      178.000
**** STREET INLET + AREA  + PIPE  TRAVEL TIME ****
------------------------------------------------------------------------------
Top of street segment elevation =  1175.000(Ft.)
End of street segment elevation =   915.000(Ft.)
Length of street segment  =  2250.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  13.000(Ft.)
Distance from crown to crossfall grade break  =   5.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.017
Slope from grade break to crown (v/hz)  =   0.017
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   2.000(Ft.)
Slope from curb to property line (v/hz) =   0.017
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
No street inlet installed at this point
Estimated mean flow rate at midpoint of street =     48.328(CFS)
Depth of flow =   0.411(Ft.), Average velocity =  10.437(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  13.000(Ft.)
Flow velocity =  10.44(Ft/s)
Travel time =    3.59 min.     TC =   16.69  min.
 Adding area flow to street
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.290
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.710
SCS curve number for soil(AMC 2)  = 69.49
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=     0.229(In/Hr)
Max Catchment Loss (Fm) =     0.183(In/Hr)
Rainfall intensity =      3.101(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.846
Subarea runoff =     89.492(CFS) for   34.270(Ac.)
Total runoff =     93.016(CFS)    Total area =       35.47(Ac.)
Area averaged Fm value =    0.187(In/Hr)
Street flow at end of street =     93.016(CFS)
Half street flow at end of street =     46.508(CFS)
Depth of flow =   0.497(Ft.), Average velocity =  13.527(Ft/s)
Note:  depth of flow exceeds top of street crown.
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```
Flow width (from curb towards crown)=  13.000(Ft.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      176.000 to Point/Station      178.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     35.470(Ac.)
Runoff from this stream =     93.016(CFS)
Time of concentration =   16.69 min.
Rainfall intensity =     3.101(In/Hr)
Area averaged loss rate (Fm) =    0.1872(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8068
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    532.38  1271.826     19.29    0.234      2.855
2     35.47    93.016     16.69    0.187      3.101
Qmax(1) =
         1.000 *    1.000 *  1271.826) +
         0.915 *    1.000 *    93.016) + =    1356.980
Qmax(2) =
         1.094 *    0.866 *  1271.826) +
         1.000 *    1.000 *    93.016) + =    1297.282

Total of 2 streams to confluence:
Flow rates before confluence point:
    1271.826      93.016
Maximum flow rates at confluence using above data:
     1356.980     1297.282
Area of streams before confluence:
      532.385       35.470
Effective area values after confluence:
      567.855      496.264
Results of confluence:
Total flow rate =   1356.980(CFS)
Time of concentration =    19.287 min.
Effective stream area after confluence =    567.855(Ac.)
Study area average Pervious fraction(Ap) =  0.988
Study area average soil loss rate(Fm) =    0.232(In/Hr)
Study area total (this main stream) =     567.85(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      178.000 to Point/Station      182.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =   1358.173(CFS)
Depth of flow =   6.113(Ft.), Average velocity =  12.898(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
```

```
     4           205.00            50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =   1358.173(CFS)
  '     '    flow top width =     29.452(Ft.)
  '     '     velocity=   12.898(Ft/s)
  '     '    area =    105.300(Sq.Ft)
  '     '    Froude number =     1.202

Upstream point elevation =   705.000(Ft.)
Downstream point elevation =   665.000(Ft.)
Flow length =  1025.000(Ft.)
Travel time  =    1.32 min.
Time of concentration =   20.61 min.
Depth of flow =   6.113(Ft.)
Average velocity =  12.898(Ft/s)
Total irregular channel flow =  1358.173(CFS)
Irregular channel normal depth above invert elev. =   6.113(Ft.)
Average velocity of channel(s) =  12.898(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.010
Decimal fraction soil group D = 0.990
SCS curve number for soil(AMC 2)  = 79.94
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.201(In/Hr)
Max Catchment Loss (Fm) =     0.201(In/Hr)
Rainfall intensity =      2.748(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.825
Subarea runoff =      2.310(CFS) for   31.920(Ac.)
Total runoff =   1359.290(CFS)    Total area =      599.77(Ac.)
Area averaged Fm value =    0.230(In/Hr)
Depth of flow =   6.115(Ft.), Average velocity =  12.901(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station      182.000
**** CONFLUENCE OF MINOR STREAMS ****
_________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    599.775(Ac.)
Runoff from this stream =   1359.290(CFS)
Time of concentration =   20.61 min.
Rainfall intensity =     2.748(In/Hr)
Area averaged loss rate (Fm) =    0.2299(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9886


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Process from Point/Station      179.000 to Point/Station      180.000
**** INITIAL AREA EVALUATION ****
_________________________________________________________________________
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 80.00
```

```
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.200(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1085.000(Ft.)
Bottom (of initial area) elevation =   990.000(Ft.)
Difference in elevation =    95.000(Ft.)
Slope =    0.31667  s(%)=      31.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.522 min.
Rainfall intensity =      3.835(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.853
Subarea runoff =      5.561(CFS)
Total initial stream area =        1.700(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      180.000 to Point/Station      182.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     33.607(CFS)
Depth of flow =   0.637(Ft.), Average velocity =   8.410(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =     33.607(CFS)
  '     '   flow top width =      7.548(Ft.)
  '     '    velocity=    8.410(Ft/s)
  '     '   area =      3.996(Sq.Ft)
  '     '   Froude number =     2.037

Upstream point elevation =   990.000(Ft.)
Downstream point elevation =   665.000(Ft.)
Flow length =  1650.000(Ft.)
Travel time  =    3.27 min.
Time of concentration =   14.79 min.
Depth of flow =   0.637(Ft.)
Average velocity =   8.410(Ft/s)
Total irregular channel flow =    33.607(CFS)
Irregular channel normal depth above invert elev. =   0.637(Ft.)
Average velocity of channel(s) =   8.410(Ft/s)
 Adding area flow to channel
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.030
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.970
SCS curve number for soil(AMC 2)  = 74.43
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=     0.203(In/Hr)
Max Catchment Loss (Fm) =     0.162(In/Hr)
Rainfall intensity =      3.323(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.855
```

```
Subarea runoff =     56.002(CFS) for   19.960(Ac.)
Total runoff =     61.563(CFS)     Total area =       21.66(Ac.)
Area averaged Fm value =    0.165(In/Hr)
Depth of flow =   0.894(Ft.), Average velocity =  10.144(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      179.000 to Point/Station      182.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     21.660(Ac.)
Runoff from this stream =     61.563(CFS)
Time of concentration =   14.79 min.
Rainfall intensity =     3.323(In/Hr)
Area averaged loss rate (Fm) =    0.1654(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8157
Summary of stream data:

Stream  Area  Flow rate      TC     Fm      Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    599.77  1359.290     20.61    0.230      2.748
2     21.66    61.563     14.79    0.165      3.323
Qmax(1) =
         1.000 *    1.000 *  1359.290) +
         0.818 *    1.000 *    61.563) + =    1409.637
Qmax(2) =
         1.228 *    0.718 *  1359.290) +
         1.000 *    1.000 *    61.563) + =    1259.953

Total of 2 streams to confluence:
Flow rates before confluence point:
    1359.290      61.563
Maximum flow rates at confluence using above data:
     1409.637     1259.953
Area of streams before confluence:
      599.775      21.660
Effective area values after confluence:
      621.435     452.091
Results of confluence:
Total flow rate =   1409.637(CFS)
Time of concentration =    20.612 min.
Effective stream area after confluence =    621.435(Ac.)
Study area average Pervious fraction(Ap) =  0.983
Study area average soil loss rate(Fm) =    0.228(In/Hr)
Study area total (this main stream) =     621.43(Ac.)


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Process from Point/Station      182.000 to Point/Station      190.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =   1409.666(CFS)
Depth of flow =   6.333(Ft.), Average velocity =  12.601(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
```

```
      1              0.00            50.00
      2            100.00             0.00
      3            105.00             0.00
      4            205.00            50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =   1409.665(CFS)
   '      '   flow top width =     30.330(Ft.)
   '      '    velocity=   12.601(Ft/s)
   '      '   area =    111.867(Sq.Ft)
   '      '   Froude number =    1.156

Upstream point elevation =   665.000(Ft.)
Downstream point elevation =   610.000(Ft.)
Flow length =  1538.000(Ft.)
Travel time  =    2.03 min.
Time of concentration =   22.65 min.
Depth of flow =   6.333(Ft.)
Average velocity =  12.601(Ft/s)
Total irregular channel flow =  1409.666(CFS)
Irregular channel normal depth above invert elev. =   6.333(Ft.)
Average velocity of channel(s) =  12.601(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.280
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.720
SCS curve number for soil(AMC 2)  = 74.68
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.228(In/Hr)
Max Catchment Loss (Fm) =     0.228(In/Hr)
The area added to the existing stream with this TC
does not add flow per Para 6b, Page D-15 of the OCHM,
therefore the upstream flow rate of Q =   1409.637(CFS) is being used
Rainfall intensity =      2.604(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.821
Subarea runoff =      0.000(CFS) for   25.750(Ac.)
Total runoff =   1409.637(CFS)    Total area =      647.18(Ac.)
Area averaged Fm value =    0.228(In/Hr)
Depth of flow =   6.333(Ft.), Average velocity =  12.601(Ft/s)


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Process from Point/Station       10.000 to Point/Station      190.000
**** CONFLUENCE OF MAIN STREAMS ****
_________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    647.185(Ac.)
Runoff from this stream =   1409.637(CFS)
Time of concentration =   22.65 min.
Rainfall intensity =     2.604(In/Hr)
Area averaged loss rate (Fm) =    0.2276(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9832
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      193.000 to Point/Station      190.000
```

```
**** USER DEFINED FLOW INFORMATION AT A POINT ****
------------------------------------------------------------------------
RESIDENTIAL(3 - 4 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.200
Decimal fraction soil group C = 0.300
Decimal fraction soil group D = 0.500
SCS curve number for soil(AMC 2)  = 69.40
Pervious ratio(Ap) = 0.6000  Max loss rate(Fp)=     0.235(In/Hr)
Max Catchment Loss (Fm) =     0.141(In/Hr)
Rainfall intensity =      2.519(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  24.00 min.  Rain intensity =       2.52(In/Hr)
Total area =       435.56(Ac.)  Total runoff =   1580.77(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      194.000 to Point/Station      190.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =    435.560(Ac.)
Runoff from this stream =   1580.770(CFS)
Time of concentration =   24.00 min.
Rainfall intensity =     2.519(In/Hr)
Area averaged loss rate (Fm) =    0.1410(In/Hr)
Area averaged Pervious ratio (Ap) = 0.6000
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      210.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1515.000(Ft.)
Bottom (of initial area) elevation =  1370.000(Ft.)
Difference in elevation =   145.000(Ft.)
Slope =    0.48333  s(%)=      48.33
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.588 min.
Rainfall intensity =      4.025(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.844
Subarea runoff =      3.092(CFS)
Total initial stream area =        0.910(Ac.)


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Process from Point/Station      210.000 to Point/Station      214.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

```
Estimated mean flow rate at midpoint of channel =     10.238(CFS)
Depth of flow =   0.257(Ft.), Average velocity =   7.216(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00             50.00
     2            100.00              0.00
     3            105.00              0.00
     4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     10.238(CFS)
  '     '   flow top width =      6.029(Ft.)
  '     '    velocity=    7.216(Ft/s)
  '     '   area =      1.419(Sq.Ft)
  '     '   Froude number =     2.621

Upstream point elevation =  1370.000(Ft.)
Downstream point elevation =  1245.000(Ft.)
Flow length =   300.000(Ft.)
Travel time  =    0.69 min.
Time of concentration =   11.28 min.
Depth of flow =   0.257(Ft.)
Average velocity =   7.216(Ft/s)
Total irregular channel flow =    10.238(CFS)
Irregular channel normal depth above invert elev. =   0.257(Ft.)
Average velocity of channel(s) =   7.216(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.580
Decimal fraction soil group D = 0.420
SCS curve number for soil(AMC 2)  = 76.52
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.229(In/Hr)
Max Catchment Loss (Fm) =     0.229(In/Hr)
Rainfall intensity =      3.882(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.846
Subarea runoff =     14.215(CFS) for    4.360(Ac.)
Total runoff =     17.307(CFS)    Total area =        5.27(Ac.)
Area averaged Fm value =    0.233(In/Hr)
Depth of flow =   0.350(Ft.), Average velocity =   8.673(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      214.000 to Point/Station      216.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     28.175(CFS)
Depth of flow =   0.598(Ft.), Average velocity =   7.602(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00             50.00
     2            100.00              0.00
     3            105.00              0.00
```

```
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =     28.175(CFS)
   '      '    flow top width =      7.392(Ft.)
   '      '     velocity=    7.602(Ft/s)
   '      '    area =      3.706(Sq.Ft)
   '      '    Froude number =     1.892

Upstream point elevation =  1245.000(Ft.)
Downstream point elevation =  1150.000(Ft.)
Flow length =   550.000(Ft.)
Travel time  =    1.21 min.
Time of concentration =   12.49 min.
Depth of flow =   0.598(Ft.)
Average velocity =   7.602(Ft/s)
Total irregular channel flow =    28.175(CFS)
Irregular channel normal depth above invert elev. =   0.598(Ft.)
Average velocity of channel(s) =   7.602(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.730
Decimal fraction soil group D = 0.270
SCS curve number for soil(AMC 2)  = 75.62
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.236(In/Hr)
Max Catchment Loss (Fm) =     0.236(In/Hr)
Rainfall intensity =      3.662(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.842
Subarea runoff =     21.651(CFS) for    7.360(Ac.)
Total runoff =     38.959(CFS)    Total area =       12.63(Ac.)
Area averaged Fm value =    0.235(In/Hr)
Depth of flow =   0.719(Ft.), Average velocity =   8.423(Ft/s)


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Process from Point/Station      216.000 to Point/Station      220.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
-----------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     85.198(CFS)
Depth of flow =   1.052(Ft.), Average velocity =  11.398(Ft/s)
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =     85.198(CFS)
   '      '    flow top width =      9.209(Ft.)
   '      '     velocity=   11.398(Ft/s)
   '      '    area =      7.475(Sq.Ft)
   '      '    Froude number =     2.229

Upstream point elevation =  1150.000(Ft.)
```

```
Downstream point elevation =  1050.000(Ft.)
Flow length =   480.000(Ft.)
Travel time  =    0.70 min.
Time of concentration =   13.19 min.
Depth of flow =   1.052(Ft.)
Average velocity =  11.398(Ft/s)
Total irregular channel flow =    85.198(CFS)
Irregular channel normal depth above invert elev. =   1.052(Ft.)
Average velocity of channel(s) =  11.398(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.420
Decimal fraction soil group D = 0.580
SCS curve number for soil(AMC 2)  = 77.48
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.221(In/Hr)
Max Catchment Loss (Fm) =     0.221(In/Hr)
Rainfall intensity =      3.549(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.843
Subarea runoff =     92.413(CFS) for   31.280(Ac.)
Total runoff =    131.372(CFS)    Total area =       43.91(Ac.)
Area averaged Fm value =    0.225(In/Hr)
Depth of flow =   1.328(Ft.), Average velocity =  12.920(Ft/s)


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Process from Point/Station      220.000 to Point/Station      230.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =    208.330(CFS)
Depth of flow =   2.179(Ft.), Average velocity =  10.219(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    208.330(CFS)
  '      '    flow top width =     13.715(Ft.)
  '      '     velocity=   10.219(Ft/s)
  '      '    area =     20.387(Sq.Ft)
  '      '    Froude number =     1.477

Upstream point elevation =  1050.000(Ft.)
Downstream point elevation =   885.000(Ft.)
Flow length =  2150.000(Ft.)
Travel time  =    3.51 min.
Time of concentration =   16.70 min.
Depth of flow =   2.179(Ft.)
Average velocity =  10.219(Ft/s)
Total irregular channel flow =   208.330(CFS)
Irregular channel normal depth above invert elev. =   2.179(Ft.)
Average velocity of channel(s) =  10.219(Ft/s)
 Adding area flow to channel
```

```
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.650
Decimal fraction soil group D = 0.350
SCS curve number for soil(AMC 2)  = 76.10
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.232(In/Hr)
Max Catchment Loss (Fm) =     0.232(In/Hr)
Rainfall intensity =      3.101(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.833
Subarea runoff =    153.863(CFS) for   66.470(Ac.)
Total runoff =    285.234(CFS)    Total area =      110.38(Ac.)
Area averaged Fm value =    0.230(In/Hr)
Depth of flow =   2.545(Ft.), Average velocity =  11.110(Ft/s)


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Process from Point/Station      230.000 to Point/Station      240.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    343.737(CFS)
Depth of flow =   2.918(Ft.), Average velocity =  10.870(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =    343.737(CFS)
   '      '    flow top width =     16.673(Ft.)
   '      '     velocity=   10.870(Ft/s)
   '      '    area =     31.624(Sq.Ft)
   '      '    Froude number =     1.391

Upstream point elevation =   885.000(Ft.)
Downstream point elevation =   695.000(Ft.)
Flow length =  3000.000(Ft.)
Travel time  =    4.60 min.
Time of concentration =   21.30 min.
Depth of flow =   2.918(Ft.)
Average velocity =  10.870(Ft/s)
Total irregular channel flow =   343.737(CFS)
Irregular channel normal depth above invert elev. =   2.918(Ft.)
Average velocity of channel(s) =  10.870(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.630
Decimal fraction soil group D = 0.370
SCS curve number for soil(AMC 2)  = 76.22
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.231(In/Hr)
Max Catchment Loss (Fm) =     0.231(In/Hr)
Rainfall intensity =      2.697(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
```

```
rational method)(Q=KCIA) is C = 0.823
Subarea runoff =    116.928(CFS) for   70.760(Ac.)
Total runoff =    402.163(CFS)    Total area =      181.14(Ac.)
Area averaged Fm value =    0.230(In/Hr)
Depth of flow =   3.146(Ft.), Average velocity =  11.323(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      240.000 to Point/Station      190.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    427.991(CFS)
Depth of flow =   3.326(Ft.), Average velocity =  11.043(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    427.991(CFS)
   '      '    flow top width =     18.305(Ft.)
   '      '     velocity=   11.043(Ft/s)
   '      '    area =     38.758(Sq.Ft)
   '      '    Froude number =     1.337

Upstream point elevation =   695.000(Ft.)
Downstream point elevation =   610.000(Ft.)
Flow length =  1500.000(Ft.)
Travel time  =    2.26 min.
Time of concentration =   23.56 min.
Depth of flow =   3.326(Ft.)
Average velocity =  11.043(Ft/s)
Total irregular channel flow =   427.991(CFS)
Irregular channel normal depth above invert elev. =   3.326(Ft.)
Average velocity of channel(s) =  11.043(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.490
Decimal fraction soil group D = 0.510
SCS curve number for soil(AMC 2)  = 77.06
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.225(In/Hr)
Max Catchment Loss (Fm) =     0.225(In/Hr)
Rainfall intensity =      2.545(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.819
Subarea runoff =     51.594(CFS) for   36.540(Ac.)
Total runoff =    453.757(CFS)    Total area =      217.68(Ac.)
Area averaged Fm value =    0.229(In/Hr)
Depth of flow =   3.419(Ft.), Average velocity =  11.211(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      240.000 to Point/Station      190.000
**** CONFLUENCE OF MAIN STREAMS ****
```

```
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =    217.680(Ac.)
Runoff from this stream =    453.757(CFS)
Time of concentration =   23.56 min.
Rainfall intensity =     2.545(In/Hr)
Area averaged loss rate (Fm) =    0.2293(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    647.18  1409.637     22.65    0.228      2.604
2    435.56  1580.770     24.00    0.141      2.519
3    217.68   453.757     23.56    0.229      2.545
Qmax(1) =
         1.000 *    1.000 *  1409.637) +
         1.036 *    0.944 *  1580.770) +
         1.025 *    0.961 *   453.757) + =    3401.836
Qmax(2) =
         0.964 *    1.000 *  1409.637) +
         1.000 *    1.000 *  1580.770) +
         0.988 *    1.000 *   453.757) + =    3388.338
Qmax(3) =
         0.975 *    1.000 *  1409.637) +
         1.011 *    0.982 *  1580.770) +
         1.000 *    1.000 *   453.757) + =    3398.086

Total of 3 main streams to confluence:
Flow rates before confluence point:
    1410.637    1581.770     454.757
Maximum flow rates at confluence using above data:
     3401.836     3388.338     3398.086
Area of streams before confluence:
      647.185      435.560      217.680
Effective area values after confluence:
     1267.415     1300.425     1292.422


Results of confluence:
Total flow rate =   3401.836(CFS)
Time of concentration =    22.646 min.
Effective stream area after confluence  =   1267.415(Ac.)
Study area average Pervious fraction(Ap) =  0.858
Study area average soil loss rate(Fm) =    0.199(In/Hr)
Study area total =    1300.42(Ac.)
End of computations, total study area =         1366.51 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.865
Area averaged SCS curve number (AMC 2) =  73.9
```

25-YEAR EXISTING CONDITION

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2004 Version 8.0
Rational Hydrology Study, Date: 09/18/12 File Name: 1200A25.roc

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ESPERANZA HILLS
EXISTING CONDITION
25 YEAR
R/09/1200/PRELIM/REPORTS/HYDRO/RATIONAL/1200A25

Program License Serial Number 6062

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 25.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

++
Process from Point/Station 10.000 to Point/Station 15.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 74.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.250(In/Hr)
Max Catchment Loss (Fm) = 0.250(In/Hr)
Initial subarea data:
Initial area flow distance = 300.000(Ft.)
Top (of initial area) elevation = 1780.000(Ft.)
Bottom (of initial area) elevation = 1670.000(Ft.)
Difference in elevation = 110.000(Ft.)
Slope = 0.36667 s(%)= 36.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.189 min.
Rainfall intensity = 3.058(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.826
Subarea runoff = 2.350(CFS)
Total initial stream area = 0.930(Ac.)

++
Process from Point/Station 15.000 to Point/Station 20.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 6.540(CFS)
Depth of flow = 0.230(Ft.), Average velocity = 5.217(Ft/s)

```
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =      6.540(CFS)
   '      '    flow top width =      5.919(Ft.)
   '      '     velocity=    5.217(Ft/s)
   '      '    area =      1.254(Sq.Ft)
   '      '    Froude number =     1.998

Upstream point elevation =  1670.000(Ft.)
Downstream point elevation =  1590.000(Ft.)
Flow length =   320.000(Ft.)
Travel time  =    1.02 min.
Time of concentration =   12.21 min.
Depth of flow =   0.230(Ft.)
Average velocity =   5.217(Ft/s)
Total irregular channel flow =     6.540(CFS)
Irregular channel normal depth above invert elev. =   0.230(Ft.)
Average velocity of channel(s) =   5.217(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.910(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.823
Subarea runoff =      8.303(CFS) for    3.520(Ac.)
Total runoff =     10.653(CFS)    Total area =        4.45(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.306(Ft.), Average velocity =   6.203(Ft/s)


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Process from Point/Station       20.000 to Point/Station       25.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_________________________________________________________________
Estimated mean flow rate at midpoint of channel =     16.764(CFS)
Depth of flow =   0.397(Ft.), Average velocity =   7.294(Ft/s)
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
```

```
Sub-Channel flow  =     16.764(CFS)
  '     '    flow top width =      6.587(Ft.)
  '     '     velocity=    7.294(Ft/s)
  '     '    area =      2.298(Sq.Ft)
  '     '    Froude number =     2.176

Upstream point elevation =  1590.000(Ft.)
Downstream point elevation =  1450.000(Ft.)
Flow length =   550.000(Ft.)
Travel time  =    1.26 min.
Time of concentration =   13.47 min.
Depth of flow =   0.397(Ft.)
Average velocity =   7.294(Ft/s)
Total irregular channel flow =    16.764(CFS)
Irregular channel normal depth above invert elev. =   0.397(Ft.)
Average velocity of channel(s) =   7.294(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.680
Decimal fraction soil group D = 0.320
SCS curve number for soil(AMC 2)  = 75.92
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.234(In/Hr)
Max Catchment Loss (Fm) =     0.234(In/Hr)
Rainfall intensity =      2.753(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.821
Subarea runoff =     12.135(CFS) for    5.630(Ac.)
Total runoff =     22.788(CFS)    Total area =       10.08(Ac.)
Area averaged Fm value =    0.241(In/Hr)
Depth of flow =   0.474(Ft.), Average velocity =   8.085(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       25.000 to Point/Station       30.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     35.802(CFS)
Depth of flow =   0.606(Ft.), Average velocity =   9.514(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     35.802(CFS)
  '     '    flow top width =      7.423(Ft.)
  '     '     velocity=    9.514(Ft/s)
  '     '    area =      3.763(Sq.Ft)
  '     '    Froude number =     2.355

Upstream point elevation =  1450.000(Ft.)
Downstream point elevation =  1290.000(Ft.)
Flow length =   600.000(Ft.)
Travel time  =    1.05 min.
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```
Time of concentration =   14.52 min.
Depth of flow =   0.606(Ft.)
Average velocity =   9.514(Ft/s)
Total irregular channel flow =    35.802(CFS)
Irregular channel normal depth above invert elev. =   0.606(Ft.)
Average velocity of channel(s) =   9.514(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.500
SCS curve number for soil(AMC 2)  = 77.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.225(In/Hr)
Max Catchment Loss (Fm) =     0.225(In/Hr)
Rainfall intensity =      2.638(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.821
Subarea runoff =     25.958(CFS) for   12.430(Ac.)
Total runoff =     48.747(CFS)    Total area =       22.51(Ac.)
Area averaged Fm value =    0.232(In/Hr)
Depth of flow =   0.721(Ft.), Average velocity =  10.489(Ft/s)


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Process from Point/Station       27.000 to Point/Station       30.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 79.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Time of concentration =    14.52 min.
Rainfall intensity =      2.638(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.819
Subarea runoff =     29.126(CFS) for   13.550(Ac.)
Total runoff =     77.873(CFS)    Total area =       36.06(Ac.)
Area averaged Fm value =    0.239(In/Hr)


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Process from Point/Station       30.000 to Point/Station       40.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     87.510(CFS)
Depth of flow =   1.116(Ft.), Average velocity =  10.843(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
```

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------------------------------------------------------------------
Sub-Channel flow  =     87.510(CFS)
  '     '    flow top width =      9.464(Ft.)
  '     '     velocity=   10.843(Ft/s)
  '     '    area =      8.071(Sq.Ft)
  '     '    Froude number =     2.069

Upstream point elevation =  1290.000(Ft.)
Downstream point elevation =  1175.000(Ft.)
Flow length =   650.000(Ft.)
Travel time  =    1.00 min.
Time of concentration =   15.52 min.
Depth of flow =   1.116(Ft.)
Average velocity =  10.843(Ft/s)
Total irregular channel flow =    87.510(CFS)
Irregular channel normal depth above invert elev. =   1.116(Ft.)
Average velocity of channel(s) =  10.843(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.520
Decimal fraction soil group D = 0.480
SCS curve number for soil(AMC 2)  = 76.88
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.226(In/Hr)
Max Catchment Loss (Fm) =     0.226(In/Hr)
Rainfall intensity =      2.541(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.816
Subarea runoff =     19.210(CFS) for   10.740(Ac.)
Total runoff =     97.083(CFS)    Total area =       46.80(Ac.)
Area averaged Fm value =    0.236(In/Hr)
Depth of flow =   1.180(Ft.), Average velocity =  11.175(Ft/s)


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Process from Point/Station       40.000 to Point/Station       50.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    108.037(CFS)
Depth of flow =   1.288(Ft.), Average velocity =  11.066(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    108.037(CFS)
  '     '    flow top width =     10.154(Ft.)
  '     '     velocity=   11.066(Ft/s)
  '     '    area =      9.763(Sq.Ft)
  '     '    Froude number =     1.989

Upstream point elevation =  1175.000(Ft.)
Downstream point elevation =  1055.000(Ft.)
Flow length =   760.000(Ft.)
```

```
Travel time  =    1.14 min.
Time of concentration =   16.66 min.
Depth of flow =   1.288(Ft.)
Average velocity =  11.066(Ft/s)
Total irregular channel flow =   108.037(CFS)
Irregular channel normal depth above invert elev. =   1.288(Ft.)
Average velocity of channel(s) =  11.066(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.441(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.812
Subarea runoff =     21.818(CFS) for   13.210(Ac.)
Total runoff =    118.901(CFS)    Total area =       60.01(Ac.)
Area averaged Fm value =    0.239(In/Hr)
Depth of flow =   1.356(Ft.), Average velocity =  11.373(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       50.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     60.010(Ac.)
Runoff from this stream =    118.901(CFS)
Time of concentration =   16.66 min.
Rainfall intensity =     2.441(In/Hr)
Area averaged loss rate (Fm) =    0.2390(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     60.01   118.901     16.66    0.239      2.441
Qmax(1) =
         1.000 *    1.000 *   118.901) + =     118.901

Total of 1 streams to confluence:
Flow rates before confluence point:
     118.901
Maximum flow rates at confluence using above data:
      118.901
Area of streams before confluence:
       60.010
Effective area values after confluence:
       60.010
Results of confluence:
Total flow rate =    118.901(CFS)
Time of concentration =    16.663 min.
Effective stream area after confluence =     60.010(Ac.)
Study area average Pervious fraction(Ap) =  1.000
```

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Study area average soil loss rate(Fm) =    0.239(In/Hr)
Study area total (this main stream) =      60.01(Ac.)


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Process from Point/Station       60.000 to Point/Station       70.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   320.000(Ft.)
Top (of initial area) elevation =  1655.000(Ft.)
Bottom (of initial area) elevation =  1550.000(Ft.)
Difference in elevation =   105.000(Ft.)
Slope =    0.32813  s(%)=      32.81
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.740 min.
Rainfall intensity =      2.976(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.824
Subarea runoff =      5.372(CFS)
Total initial stream area =        2.190(Ac.)


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Process from Point/Station       70.000 to Point/Station       75.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     12.924(CFS)
Depth of flow =   0.285(Ft.), Average velocity =   8.128(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     12.924(CFS)
  '     '   flow top width =      6.142(Ft.)
  '     '    velocity=    8.128(Ft/s)
  '     '   area =      1.590(Sq.Ft)
  '     '   Froude number =     2.815

Upstream point elevation =  1550.000(Ft.)
Downstream point elevation =  1340.000(Ft.)
Flow length =   450.000(Ft.)
Travel time  =    0.92 min.
Time of concentration =   12.66 min.
Depth of flow =   0.285(Ft.)
Average velocity =   8.128(Ft/s)
Total irregular channel flow =    12.924(CFS)
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Irregular channel normal depth above invert elev. =    0.285(Ft.)
Average velocity of channel(s) =    8.128(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.851(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.821
Subarea runoff =     15.039(CFS) for    6.530(Ac.)
Total runoff =     20.411(CFS)    Total area =        8.72(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.373(Ft.), Average velocity =   9.525(Ft/s)


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Process from Point/Station       75.000 to Point/Station       80.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     32.860(CFS)
Depth of flow =   0.585(Ft.), Average velocity =   9.103(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     32.860(CFS)
  '     '    flow top width =      7.340(Ft.)
  '     '     velocity=    9.103(Ft/s)
  '     '    area =      3.610(Sq.Ft)
  '     '    Froude number =     2.287

Upstream point elevation =  1340.000(Ft.)
Downstream point elevation =  1175.000(Ft.)
Flow length =   650.000(Ft.)
Travel time  =    1.19 min.
Time of concentration =   13.85 min.
Depth of flow =   0.585(Ft.)
Average velocity =   9.103(Ft/s)
Total irregular channel flow =    32.860(CFS)
Irregular channel normal depth above invert elev. =   0.585(Ft.)
Average velocity of channel(s) =   9.103(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
```

```
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.710(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.817
Subarea runoff =     24.812(CFS) for   11.710(Ac.)
Total runoff =     45.223(CFS)    Total area =       20.43(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.701(Ft.), Average velocity =  10.074(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       80.000 to Point/Station       50.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     54.262(CFS)
Depth of flow =   0.789(Ft.), Average velocity =  10.455(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00             50.00
     2            100.00              0.00
     3            105.00              0.00
     4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     54.262(CFS)
  '     '    flow top width =      8.156(Ft.)
  '     '     velocity=   10.455(Ft/s)
  '     '    area =      5.190(Sq.Ft)
  '     '    Froude number =     2.310

Upstream point elevation =  1175.000(Ft.)
Downstream point elevation =  1055.000(Ft.)
Flow length =   500.000(Ft.)
Travel time  =    0.80 min.
Time of concentration =   14.65 min.
Depth of flow =   0.789(Ft.)
Average velocity =  10.455(Ft/s)
Total irregular channel flow =    54.262(CFS)
Irregular channel normal depth above invert elev. =   0.789(Ft.)
Average velocity of channel(s) =  10.455(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.625(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.814
Subarea runoff =     18.006(CFS) for    9.150(Ac.)
Total runoff =     63.229(CFS)    Total area =       29.58(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.859(Ft.), Average velocity =  10.956(Ft/s)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       60.000 to Point/Station       50.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     29.580(Ac.)
Runoff from this stream =     63.229(CFS)
Time of concentration =   14.65 min.
Rainfall intensity =     2.625(In/Hr)
Area averaged loss rate (Fm) =    0.2500(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     60.01   118.901     16.66    0.239      2.441
2     29.58    63.229     14.65    0.250      2.625
Qmax(1) =
         1.000 *    1.000 *   118.901) +
         0.922 *    1.000 *    63.229) + =     177.218
Qmax(2) =
         1.084 *    0.879 *   118.901) +
         1.000 *    1.000 *    63.229) + =     176.525

Total of 2 streams to confluence:
Flow rates before confluence point:
     118.901      63.229
Maximum flow rates at confluence using above data:
      177.218      176.525
Area of streams before confluence:
       60.010       29.580
Effective area values after confluence:
       89.590       82.339
Results of confluence:
Total flow rate =    177.218(CFS)
Time of concentration =    16.663 min.
Effective stream area after confluence =     89.590(Ac.)
Study area average Pervious fraction(Ap) =  1.000
Study area average soil loss rate(Fm) =    0.243(In/Hr)
Study area total (this main stream) =     89.59(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       50.000 to Point/Station       90.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    196.446(CFS)
Depth of flow =   2.308(Ft.), Average velocity =   8.854(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
```

```
Sub-Channel flow  =    196.447(CFS)
  '      '    flow top width =     14.230(Ft.)
  '      '     velocity=    8.854(Ft/s)
  '      '    area =     22.187(Sq.Ft)
  '      '    Froude number =     1.250

Upstream point elevation =  1055.000(Ft.)
Downstream point elevation =   990.000(Ft.)
Flow length =  1200.000(Ft.)
Travel time  =    2.26 min.
Time of concentration =   18.92 min.
Depth of flow =   2.308(Ft.)
Average velocity =   8.854(Ft/s)
Total irregular channel flow =   196.446(CFS)
Irregular channel normal depth above invert elev. =   2.308(Ft.)
Average velocity of channel(s) =   8.854(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.670
Decimal fraction soil group D = 0.330
SCS curve number for soil(AMC 2)  = 75.98
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.234(In/Hr)
Max Catchment Loss (Fm) =     0.234(In/Hr)
Rainfall intensity =      2.271(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.805
Subarea runoff =     38.383(CFS) for   28.380(Ac.)
Total runoff =    215.600(CFS)    Total area =      117.97(Ac.)
Area averaged Fm value =    0.240(In/Hr)
Depth of flow =   2.416(Ft.), Average velocity =   9.076(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       90.000
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    117.970(Ac.)
Runoff from this stream =    215.600(CFS)
Time of concentration =   18.92 min.
Rainfall intensity =     2.271(In/Hr)
Area averaged loss rate (Fm) =    0.2404(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      110.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
```

```
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1610.000(Ft.)
Bottom (of initial area) elevation =  1560.000(Ft.)
Difference in elevation =    50.000(Ft.)
Slope =    0.16667  s(%)=      16.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.101 min.
Rainfall intensity =      2.796(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.820
Subarea runoff =      6.234(CFS)
Total initial stream area =        2.720(Ac.)


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Process from Point/Station      110.000 to Point/Station      115.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     17.274(CFS)
Depth of flow =   0.391(Ft.), Average velocity =   7.634(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     17.274(CFS)
  '     '   flow top width =      6.565(Ft.)
  '     '    velocity=    7.634(Ft/s)
  '     '   area =      2.263(Sq.Ft)
  '     '   Froude number =     2.292

Upstream point elevation =  1560.000(Ft.)
Downstream point elevation =  1390.000(Ft.)
Flow length =   600.000(Ft.)
Travel time  =    1.31 min.
Time of concentration =   14.41 min.
Depth of flow =   0.391(Ft.)
Average velocity =   7.634(Ft/s)
Total irregular channel flow =    17.274(CFS)
Irregular channel normal depth above invert elev. =   0.391(Ft.)
Average velocity of channel(s) =   7.634(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.740
Decimal fraction soil group D = 0.260
SCS curve number for soil(AMC 2)  = 75.56
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.237(In/Hr)
Max Catchment Loss (Fm) =     0.237(In/Hr)
Rainfall intensity =      2.650(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.819
Subarea runoff =     22.027(CFS) for   10.310(Ac.)
```

```
Total runoff =     28.261(CFS)     Total area =       13.03(Ac.)
Area averaged Fm value =    0.240(In/Hr)
Depth of flow =   0.520(Ft.), Average velocity =   8.996(Ft/s)


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Process from Point/Station      115.000 to Point/Station      120.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     40.791(CFS)
Depth of flow =   0.688(Ft.), Average velocity =   9.301(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     40.791(CFS)
   '      '    flow top width =      7.752(Ft.)
   '      '     velocity=    9.301(Ft/s)
   '      '    area =      4.386(Sq.Ft)
   '      '    Froude number =     2.179

Upstream point elevation =  1390.000(Ft.)
Downstream point elevation =  1180.000(Ft.)
Flow length =   950.000(Ft.)
Travel time  =    1.70 min.
Time of concentration =   16.11 min.
Depth of flow =   0.688(Ft.)
Average velocity =   9.301(Ft/s)
Total irregular channel flow =    40.791(CFS)
Irregular channel normal depth above invert elev. =   0.688(Ft.)
Average velocity of channel(s) =   9.301(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.840
Decimal fraction soil group D = 0.160
SCS curve number for soil(AMC 2)  = 74.96
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.242(In/Hr)
Max Catchment Loss (Fm) =     0.242(In/Hr)
Rainfall intensity =      2.487(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.813
Subarea runoff =     24.994(CFS) for   13.310(Ac.)
Total runoff =     53.256(CFS)     Total area =       26.34(Ac.)
Area averaged Fm value =    0.241(In/Hr)
Depth of flow =   0.799(Ft.), Average velocity =  10.104(Ft/s)


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Process from Point/Station      100.000 to Point/Station      120.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
```

```
Stream flow area =     26.340(Ac.)
Runoff from this stream =     53.256(CFS)
Time of concentration =   16.11 min.
Rainfall intensity =     2.487(In/Hr)
Area averaged loss rate (Fm) =    0.2409(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


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Process from Point/Station      122.000 to Point/Station      124.000
**** INITIAL AREA EVALUATION ****

------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1615.000(Ft.)
Bottom (of initial area) elevation =  1495.000(Ft.)
Difference in elevation =   120.000(Ft.)
Slope =    0.40000  s(%)=      40.00
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.996 min.
Rainfall intensity =      3.088(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.827
Subarea runoff =      3.218(CFS)
Total initial stream area =        1.260(Ac.)


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Process from Point/Station      124.000 to Point/Station      126.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      7.179(CFS)
Depth of flow =   0.236(Ft.), Average velocity =   5.562(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =      7.179(CFS)
  '     '    flow top width =      5.944(Ft.)
  '     '     velocity=    5.562(Ft/s)
  '     '    area =      1.291(Sq.Ft)
  '     '    Froude number =     2.103

Upstream point elevation =  1495.000(Ft.)
Downstream point elevation =  1385.000(Ft.)
Flow length =   400.000(Ft.)
Travel time  =    1.20 min.
```

```
Time of concentration =   12.20 min.
Depth of flow =   0.236(Ft.)
Average velocity =   5.562(Ft/s)
Total irregular channel flow =     7.179(CFS)
Irregular channel normal depth above invert elev. =   0.236(Ft.)
Average velocity of channel(s) =   5.562(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.912(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.823
Subarea runoff =      7.827(CFS) for    3.350(Ac.)
Total runoff =     11.045(CFS)    Total area =        4.61(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.304(Ft.), Average velocity =   6.479(Ft/s)


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Process from Point/Station      126.000 to Point/Station      126.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Time of concentration =   12.20 min.
Rainfall intensity =      2.912(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.823
Subarea runoff =     16.365(CFS) for    6.830(Ac.)
Total runoff =     27.410(CFS)    Total area =       11.44(Ac.)
Area averaged Fm value =    0.250(In/Hr)


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Process from Point/Station      126.000 to Point/Station      128.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     39.257(CFS)
Depth of flow =   0.704(Ft.), Average velocity =   8.707(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
```

```
------------------------------------------------------------------
Sub-Channel flow  =     39.257(CFS)
  '      '    flow top width =      7.815(Ft.)
  '      '     velocity=    8.707(Ft/s)
  '      '    area =      4.509(Sq.Ft)
  '      '    Froude number =     2.020

Upstream point elevation =  1385.000(Ft.)
Downstream point elevation =  1300.000(Ft.)
Flow length =   450.000(Ft.)
Travel time  =    0.86 min.
Time of concentration =   13.06 min.
Depth of flow =   0.704(Ft.)
Average velocity =   8.707(Ft/s)
Total irregular channel flow =    39.257(CFS)
Irregular channel normal depth above invert elev. =   0.704(Ft.)
Average velocity of channel(s) =   8.707(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.802(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.820
Subarea runoff =     23.622(CFS) for   10.780(Ac.)
Total runoff =     51.032(CFS)    Total area =       22.22(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.815(Ft.), Average velocity =   9.443(Ft/s)


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Process from Point/Station      128.000 to Point/Station      120.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     67.762(CFS)
Depth of flow =   0.939(Ft.), Average velocity =  10.497(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     67.762(CFS)
  '      '    flow top width =      8.755(Ft.)
  '      '     velocity=   10.497(Ft/s)
  '      '    area =      6.455(Sq.Ft)
  '      '    Froude number =     2.154

Upstream point elevation =  1300.000(Ft.)
Downstream point elevation =  1180.000(Ft.)
Flow length =   600.000(Ft.)
```

```
Travel time  =    0.95 min.
Time of concentration =   14.01 min.
Depth of flow =   0.939(Ft.)
Average velocity =  10.497(Ft/s)
Total irregular channel flow =    67.762(CFS)
Irregular channel normal depth above invert elev. =   0.939(Ft.)
Average velocity of channel(s) =  10.497(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.692(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.816
Subarea runoff =     33.398(CFS) for   16.190(Ac.)
Total runoff =     84.430(CFS)    Total area =       38.41(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   1.059(Ft.), Average velocity =  11.205(Ft/s)


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Process from Point/Station      122.000 to Point/Station      120.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     38.410(Ac.)
Runoff from this stream =     84.430(CFS)
Time of concentration =   14.01 min.
Rainfall intensity =     2.692(In/Hr)
Area averaged loss rate (Fm) =    0.2500(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     26.34    53.256     16.11    0.241      2.487
2     38.41    84.430     14.01    0.250      2.692
Qmax(1) =
         1.000 *    1.000 *    53.256) +
         0.916 *    1.000 *    84.430) + =     130.599
Qmax(2) =
         1.091 *    0.869 *    53.256) +
         1.000 *    1.000 *    84.430) + =     134.957

Total of 2 streams to confluence:
Flow rates before confluence point:
      53.256      84.430
Maximum flow rates at confluence using above data:
      130.599      134.957
Area of streams before confluence:
       26.340       38.410
Effective area values after confluence:
       64.750       61.311
```

```
Results of confluence:
Total flow rate =    134.957(CFS)
Time of concentration =    14.009 min.
Effective stream area after confluence =     61.311(Ac.)
Study area average Pervious fraction(Ap) =  1.000
Study area average soil loss rate(Fm) =    0.246(In/Hr)
Study area total (this main stream) =      64.75(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      120.000 to Point/Station       90.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    191.173(CFS)
Depth of flow =   1.952(Ft.), Average velocity =  10.998(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    191.173(CFS)
  '     '   flow top width =     12.808(Ft.)
  '     '    velocity=   10.998(Ft/s)
  '     '   area =     17.382(Sq.Ft)
  '     '   Froude number =     1.664

Upstream point elevation =  1180.000(Ft.)
Downstream point elevation =   990.000(Ft.)
Flow length =  1900.000(Ft.)
Travel time  =    2.88 min.
Time of concentration =   16.89 min.
Depth of flow =   1.952(Ft.)
Average velocity =  10.998(Ft/s)
Total irregular channel flow =   191.173(CFS)
Irregular channel normal depth above invert elev. =   1.952(Ft.)
Average velocity of channel(s) =  10.998(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.100
SCS curve number for soil(AMC 2)  = 74.60
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.245(In/Hr)
Max Catchment Loss (Fm) =     0.245(In/Hr)
Rainfall intensity =      2.422(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.809
Subarea runoff =    112.363(CFS) for   64.950(Ac.)
Total runoff =    247.320(CFS)    Total area =      126.26(Ac.)
Area averaged Fm value =    0.246(In/Hr)
Depth of flow =   2.222(Ft.), Average velocity =  11.788(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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```
Process from Point/Station      100.000 to Point/Station       90.000
**** CONFLUENCE OF MAIN STREAMS ****
--------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =    126.261(Ac.)
Runoff from this stream =    247.320(CFS)
Time of concentration =   16.89 min.
Rainfall intensity =     2.422(In/Hr)
Area averaged loss rate (Fm) =    0.2456(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    117.97   215.600     18.92    0.240      2.271
2    126.26   247.320     16.89    0.246      2.422
Qmax(1) =
         1.000 *    1.000 *   215.600) +
         0.931 *    1.000 *   247.320) + =     445.765
Qmax(2) =
         1.074 *    0.893 *   215.600) +
         1.000 *    1.000 *   247.320) + =     454.054

Total of 2 main streams to confluence:
Flow rates before confluence point:
     216.600     248.320
Maximum flow rates at confluence using above data:
      445.765      454.054
Area of streams before confluence:
      117.970      126.261
Effective area values after confluence:
      244.231      231.551


Results of confluence:
Total flow rate =    454.054(CFS)
Time of concentration =    16.888 min.
Effective stream area after confluence  =    231.551(Ac.)
Study area average Pervious fraction(Ap) =  1.000
Study area average soil loss rate(Fm) =    0.243(In/Hr)
Study area total =     244.23(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       90.000 to Point/Station      130.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
--------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    476.859(CFS)
Depth of flow =   3.290(Ft.), Average velocity =  12.517(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
```

```
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =    476.859(CFS)
  '     '   flow top width =     18.160(Ft.)
  '     '    velocity=   12.517(Ft/s)
  '     '   area =     38.097(Sq.Ft)
  '     '   Froude number =     1.523

Upstream point elevation =   990.000(Ft.)
Downstream point elevation =   850.000(Ft.)
Flow length =  1900.000(Ft.)
Travel time  =    2.53 min.
Time of concentration =   19.42 min.
Depth of flow =   3.290(Ft.)
Average velocity =  12.517(Ft/s)
Total irregular channel flow =   476.859(CFS)
Irregular channel normal depth above invert elev. =   3.290(Ft.)
Average velocity of channel(s) =  12.517(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.770
Decimal fraction soil group D = 0.230
SCS curve number for soil(AMC 2)  = 75.38
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.239(In/Hr)
Max Catchment Loss (Fm) =     0.239(In/Hr)
Rainfall intensity =      2.238(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.803
Subarea runoff =     45.512(CFS) for   46.580(Ac.)
Total runoff =    499.566(CFS)    Total area =      278.13(Ac.)
Area averaged Fm value =    0.242(In/Hr)
Depth of flow =   3.363(Ft.), Average velocity =  12.668(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      130.000 to Point/Station      140.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_________________________________________________________________________
Estimated mean flow rate at midpoint of channel =    547.255(CFS)
Depth of flow =   3.733(Ft.), Average velocity =  11.760(Ft/s)
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =    547.255(CFS)
  '     '   flow top width =     19.932(Ft.)
  '     '    velocity=   11.760(Ft/s)
  '     '   area =     46.534(Sq.Ft)
  '     '   Froude number =     1.356

Upstream point elevation =   850.000(Ft.)
Downstream point elevation =   730.000(Ft.)
```

```
Flow length =  2120.000(Ft.)
Travel time  =    3.00 min.
Time of concentration =   22.42 min.
Depth of flow =   3.733(Ft.)
Average velocity =  11.760(Ft/s)
Total irregular channel flow =   547.255(CFS)
Irregular channel normal depth above invert elev. =   3.733(Ft.)
Average velocity of channel(s) =  11.760(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.850
Decimal fraction soil group D = 0.150
SCS curve number for soil(AMC 2)  = 74.90
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.242(In/Hr)
Max Catchment Loss (Fm) =     0.242(In/Hr)
Rainfall intensity =      2.063(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.794
Subarea runoff =     95.317(CFS) for   84.910(Ac.)
Total runoff =    594.882(CFS)    Total area =      363.04(Ac.)
Area averaged Fm value =    0.242(In/Hr)
Depth of flow =   3.880(Ft.), Average velocity =  12.015(Ft/s)


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Process from Point/Station       10.000 to Point/Station      140.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    363.041(Ac.)
Runoff from this stream =    594.882(CFS)
Time of concentration =   22.42 min.
Rainfall intensity =     2.063(In/Hr)
Area averaged loss rate (Fm) =    0.2424(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


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Process from Point/Station      150.000 to Point/Station      160.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1575.000(Ft.)
Bottom (of initial area) elevation =  1350.000(Ft.)
Difference in elevation =   225.000(Ft.)
Slope =    0.75000  s(%)=     75.00
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.697 min.
Rainfall intensity =      3.316(In/Hr) for a    25.0 year storm
```

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Effective runoff coefficient used for area (Q=KCIA) is C = 0.832
Subarea runoff =      3.725(CFS)
Total initial stream area =        1.350(Ac.)


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Process from Point/Station      160.000 to Point/Station      162.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     12.940(CFS)
Depth of flow =   0.293(Ft.), Average velocity =   7.911(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------------
Sub-Channel flow  =     12.940(CFS)
   '      '    flow top width =      6.171(Ft.)
   '      '     velocity=    7.911(Ft/s)
   '      '    area =      1.636(Sq.Ft)
   '      '    Froude number =     2.708

Upstream point elevation =  1350.000(Ft.)
Downstream point elevation =  1200.000(Ft.)
Flow length =   350.000(Ft.)
Travel time  =    0.74 min.
Time of concentration =   10.43 min.
Depth of flow =   0.293(Ft.)
Average velocity =   7.911(Ft/s)
Total irregular channel flow =    12.940(CFS)
Irregular channel normal depth above invert elev. =   0.293(Ft.)
Average velocity of channel(s) =   7.911(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.960
Decimal fraction soil group D = 0.040
SCS curve number for soil(AMC 2)  = 74.24
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.248(In/Hr)
Max Catchment Loss (Fm) =     0.248(In/Hr)
Rainfall intensity =      3.181(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.830
Subarea runoff =     18.366(CFS) for    7.020(Ac.)
Total runoff =     22.091(CFS)    Total area =        8.37(Ac.)
Area averaged Fm value =    0.248(In/Hr)
Depth of flow =   0.400(Ft.), Average velocity =   9.514(Ft/s)


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Process from Point/Station      162.000 to Point/Station      164.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     36.402(CFS)
```

```
Depth of flow =   0.630(Ft.), Average velocity =   9.228(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     36.402(CFS)
  '     '    flow top width =      7.521(Ft.)
  '     '     velocity=    9.228(Ft/s)
  '     '    area =      3.945(Sq.Ft)
  '     '    Froude number =     2.245

Upstream point elevation =  1200.000(Ft.)
Downstream point elevation =  1020.000(Ft.)
Flow length =   750.000(Ft.)
Travel time  =    1.35 min.
Time of concentration =   11.79 min.
Depth of flow =   0.630(Ft.)
Average velocity =   9.228(Ft/s)
Total irregular channel flow =    36.402(CFS)
Irregular channel normal depth above invert elev. =   0.630(Ft.)
Average velocity of channel(s) =   9.228(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.660
Decimal fraction soil group D = 0.340
SCS curve number for soil(AMC 2)  = 76.04
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.233(In/Hr)
Max Catchment Loss (Fm) =     0.233(In/Hr)
Rainfall intensity =      2.969(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.827
Subarea runoff =     28.560(CFS) for   12.250(Ac.)
Total runoff =     50.650(CFS)    Total area =      20.62(Ac.)
Area averaged Fm value =    0.239(In/Hr)
Depth of flow =   0.759(Ft.), Average velocity =  10.236(Ft/s)


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Process from Point/Station      163.000 to Point/Station      164.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.970
Decimal fraction soil group D = 0.030
SCS curve number for soil(AMC 2)  = 74.18
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.249(In/Hr)
Max Catchment Loss (Fm) =     0.249(In/Hr)
Time of concentration =    11.79 min.
Rainfall intensity =      2.969(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
```

```
rational method)(Q=KCIA) is C = 0.826
Subarea runoff =     31.922(CFS) for   13.040(Ac.)
Total runoff =     82.572(CFS)    Total area =       33.66(Ac.)
Area averaged Fm value =    0.243(In/Hr)


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Process from Point/Station      164.000 to Point/Station      170.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    109.582(CFS)
Depth of flow =   1.502(Ft.), Average velocity =   9.116(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    109.582(CFS)
  '      '    flow top width =     11.008(Ft.)
  '      '     velocity=    9.116(Ft/s)
  '      '    area =     12.021(Sq.Ft)
  '      '    Froude number =     1.537

Upstream point elevation =  1020.000(Ft.)
Downstream point elevation =   920.000(Ft.)
Flow length =  1100.000(Ft.)
Travel time  =    2.01 min.
Time of concentration =   13.80 min.
Depth of flow =   1.502(Ft.)
Average velocity =   9.116(Ft/s)
Total irregular channel flow =   109.582(CFS)
Irregular channel normal depth above invert elev. =   1.502(Ft.)
Average velocity of channel(s) =   9.116(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.340
Decimal fraction soil group D = 0.660
SCS curve number for soil(AMC 2)  = 77.96
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.217(In/Hr)
Max Catchment Loss (Fm) =     0.217(In/Hr)
Rainfall intensity =      2.715(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.823
Subarea runoff =     53.961(CFS) for   27.410(Ac.)
Total runoff =    136.533(CFS)    Total area =       61.07(Ac.)
Area averaged Fm value =    0.231(In/Hr)
Depth of flow =   1.684(Ft.), Average velocity =   9.690(Ft/s)


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Process from Point/Station      168.000 to Point/Station      170.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
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UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.460
Decimal fraction soil group D = 0.540
SCS curve number for soil(AMC 2)  = 81.70
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.223(In/Hr)
Max Catchment Loss (Fm) =     0.223(In/Hr)
Time of concentration =   13.80 min.
Rainfall intensity =      2.715(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.824
Subarea runoff =     77.723(CFS) for   34.650(Ac.)
Total runoff =    214.256(CFS)    Total area =       95.72(Ac.)
Area averaged Fm value =    0.228(In/Hr)


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Process from Point/Station      170.000 to Point/Station      175.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    262.608(CFS)
Depth of flow =   2.645(Ft.), Average velocity =   9.651(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    262.608(CFS)
  '     '    flow top width =     15.578(Ft.)
  '     '     velocity=    9.651(Ft/s)
  '     '    area =     27.211(Sq.Ft)
  '     '    Froude number =     1.287

Upstream point elevation =   920.000(Ft.)
Downstream point elevation =   850.000(Ft.)
Flow length =  1260.000(Ft.)
Travel time  =    2.18 min.
Time of concentration =   15.98 min.
Depth of flow =   2.645(Ft.)
Average velocity =   9.651(Ft/s)
Total irregular channel flow =   262.608(CFS)
Irregular channel normal depth above invert elev. =   2.645(Ft.)
Average velocity of channel(s) =   9.651(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.280
Decimal fraction soil group D = 0.720
SCS curve number for soil(AMC 2)  = 78.32
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.214(In/Hr)
Max Catchment Loss (Fm) =     0.214(In/Hr)
Rainfall intensity =      2.499(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
```

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rational method)(Q=KCIA) is C = 0.820
Subarea runoff =     96.641(CFS) for   56.030(Ac.)
Total runoff =    310.897(CFS)    Total area =      151.75(Ac.)
Area averaged Fm value =    0.223(In/Hr)
Depth of flow =   2.870(Ft.), Average velocity =  10.088(Ft/s)


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Process from Point/Station      175.000 to Point/Station      140.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    350.187(CFS)
Depth of flow =   3.014(Ft.), Average velocity =  10.533(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    350.187(CFS)
  '      '    flow top width =     17.058(Ft.)
  '      '     velocity=   10.533(Ft/s)
  '      '    area =     33.245(Sq.Ft)
  '      '    Froude number =     1.330

Upstream point elevation =   850.000(Ft.)
Downstream point elevation =   730.000(Ft.)
Flow length =  2090.000(Ft.)
Travel time  =    3.31 min.
Time of concentration =   19.28 min.
Depth of flow =   3.014(Ft.)
Average velocity =  10.533(Ft/s)
Total irregular channel flow =   350.187(CFS)
Irregular channel normal depth above invert elev. =   3.014(Ft.)
Average velocity of channel(s) =  10.533(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.100
Decimal fraction soil group C = 0.130
Decimal fraction soil group D = 0.770
SCS curve number for soil(AMC 2)  = 77.32
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.217(In/Hr)
Max Catchment Loss (Fm) =     0.217(In/Hr)
Rainfall intensity =      2.247(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.811
Subarea runoff =     78.526(CFS) for   61.840(Ac.)
Total runoff =    389.423(CFS)    Total area =      213.59(Ac.)
Area averaged Fm value =    0.221(In/Hr)
Depth of flow =   3.171(Ft.), Average velocity =  10.828(Ft/s)


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Process from Point/Station      150.000 to Point/Station      140.000
**** CONFLUENCE OF MINOR STREAMS ****
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```
Along Main Stream number: 1 in normal stream number 2
Stream flow area =    213.590(Ac.)
Runoff from this stream =    389.423(CFS)
Time of concentration =   19.28 min.
Rainfall intensity =     2.247(In/Hr)
Area averaged loss rate (Fm) =    0.2211(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    363.04   594.882     22.42    0.242      2.063
2    213.59   389.423     19.28    0.221      2.247
Qmax(1) =
         1.000 *    1.000 *   594.882) +
         0.909 *    1.000 *   389.423) + =     948.962
Qmax(2) =
         1.101 *    0.860 *   594.882) +
         1.000 *    1.000 *   389.423) + =     952.681

Total of 2 streams to confluence:
Flow rates before confluence point:
     594.882     389.423
Maximum flow rates at confluence using above data:
      948.962      952.681
Area of streams before confluence:
      363.041      213.590
Effective area values after confluence:
      576.631      525.803
Results of confluence:
Total flow rate =    952.681(CFS)
Time of concentration =    19.283 min.
Effective stream area after confluence =    525.803(Ac.)
Study area average Pervious fraction(Ap) =  1.000
Study area average soil loss rate(Fm) =    0.235(In/Hr)
Study area total (this main stream) =     576.63(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      140.000 to Point/Station      178.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    952.722(CFS)
Depth of flow =   5.089(Ft.), Average velocity =  12.335(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    952.722(CFS)
  '      '    flow top width =     25.355(Ft.)
  '      '     velocity=   12.335(Ft/s)
```

```
  '      '    area =      77.238(Sq.Ft)
  '      '    Froude number =      1.245

Upstream point elevation =    730.000(Ft.)
Downstream point elevation =    705.000(Ft.)
Flow length =    568.000(Ft.)
Travel time  =     0.77 min.
Time of concentration =    20.05 min.
Depth of flow =    5.089(Ft.)
Average velocity =   12.335(Ft/s)
Total irregular channel flow =    952.722(CFS)
Irregular channel normal depth above invert elev. =    5.089(Ft.)
Average velocity of channel(s) =   12.335(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.650
Decimal fraction soil group D = 0.350
SCS curve number for soil(AMC 2)  = 76.10
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=      0.232(In/Hr)
Max Catchment Loss (Fm) =      0.232(In/Hr)
The area added to the existing stream with this TC
does not add flow per Para 6b, Page D-15 of the OCHM,
therefore the upstream flow rate of Q =     952.681(CFS) is being used
Rainfall intensity =       2.198(In/Hr) for a     25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.804
Subarea runoff =       0.000(CFS) for     5.720(Ac.)
Total runoff =     952.681(CFS)     Total area =       531.52(Ac.)
Area averaged Fm value =     0.234(In/Hr)
Depth of flow =    5.089(Ft.), Average velocity =   12.335(Ft/s)


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Process from Point/Station       10.000 to Point/Station      178.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     531.523(Ac.)
Runoff from this stream =     952.681(CFS)
Time of concentration =    20.05 min.
Rainfall intensity =      2.198(In/Hr)
Area averaged loss rate (Fm) =     0.2345(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      176.000 to Point/Station      177.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 61.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=      0.300(In/Hr)
Max Catchment Loss (Fm) =      0.300(In/Hr)
Initial subarea data:
```

```
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1225.000(Ft.)
Bottom (of initial area) elevation =  1175.000(Ft.)
Difference in elevation =    50.000(Ft.)
Slope =    0.16667  s(%)=      16.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.101 min.
Rainfall intensity =      2.796(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.803
Subarea runoff =      2.696(CFS)
Total initial stream area =        1.200(Ac.)


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Process from Point/Station      177.000 to Point/Station      178.000
**** STREET INLET + AREA  + PIPE  TRAVEL TIME ****
------------------------------------------------------------------------
Top of street segment elevation =  1175.000(Ft.)
End of street segment elevation =   915.000(Ft.)
Length of street segment  =  2250.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  13.000(Ft.)
Distance from crown to crossfall grade break  =   5.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.017
Slope from grade break to crown (v/hz)  =   0.017
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   2.000(Ft.)
Slope from curb to property line (v/hz) =   0.017
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
No street inlet installed at this point
Estimated mean flow rate at midpoint of street =     36.836(CFS)
Depth of flow =   0.384(Ft.), Average velocity =   9.370(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  13.000(Ft.)
Flow velocity =   9.37(Ft/s)
Travel time =    4.00 min.     TC =   17.10  min.
 Adding area flow to street
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.290
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.710
SCS curve number for soil(AMC 2)  = 69.49
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=     0.229(In/Hr)
Max Catchment Loss (Fm) =     0.183(In/Hr)
Rainfall intensity =      2.405(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.830
Subarea runoff =     68.099(CFS) for   34.270(Ac.)
Total runoff =     70.795(CFS)    Total area =       35.47(Ac.)
Area averaged Fm value =    0.187(In/Hr)
Street flow at end of street =     70.795(CFS)
Half street flow at end of street =     35.398(CFS)
Depth of flow =   0.457(Ft.), Average velocity =  12.142(Ft/s)
Note:  depth of flow exceeds top of street crown.
```

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Flow width (from curb towards crown)=  13.000(Ft.)

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Process from Point/Station      176.000 to Point/Station      178.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     35.470(Ac.)
Runoff from this stream =     70.795(CFS)
Time of concentration =   17.10 min.
Rainfall intensity =     2.405(In/Hr)
Area averaged loss rate (Fm) =    0.1872(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8068
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    531.52   952.681     20.05    0.234      2.198
2     35.47    70.795     17.10    0.187      2.405
Qmax(1) =
         1.000 *    1.000 *   952.681) +
         0.907 *    1.000 *    70.795) + =    1016.868
Qmax(2) =
         1.105 *    0.853 *   952.681) +
         1.000 *    1.000 *    70.795) + =     969.081

Total of 2 streams to confluence:
Flow rates before confluence point:
     952.681      70.795
Maximum flow rates at confluence using above data:
     1016.868      969.081
Area of streams before confluence:
      531.523       35.470
Effective area values after confluence:
      566.993      488.842
Results of confluence:
Total flow rate =   1016.868(CFS)
Time of concentration =    20.051 min.
Effective stream area after confluence =    566.993(Ac.)
Study area average Pervious fraction(Ap) =  0.988
Study area average soil loss rate(Fm) =    0.232(In/Hr)
Study area total (this main stream) =     566.99(Ac.)


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Process from Point/Station      178.000 to Point/Station      182.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =   1016.896(CFS)
Depth of flow =   5.381(Ft.), Average velocity =  11.989(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
```

```
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =   1016.896(CFS)
   '      '    flow top width =     26.524(Ft.)
   '      '     velocity=   11.989(Ft/s)
   '      '    area =     84.817(Sq.Ft)
   '      '    Froude number =     1.182

Upstream point elevation =   705.000(Ft.)
Downstream point elevation =   665.000(Ft.)
Flow length =  1025.000(Ft.)
Travel time  =    1.42 min.
Time of concentration =   21.48 min.
Depth of flow =   5.381(Ft.)
Average velocity =  11.989(Ft/s)
Total irregular channel flow =  1016.896(CFS)
Irregular channel normal depth above invert elev. =   5.381(Ft.)
Average velocity of channel(s) =  11.989(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.010
Decimal fraction soil group D = 0.990
SCS curve number for soil(AMC 2)  = 79.94
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.201(In/Hr)
Max Catchment Loss (Fm) =     0.201(In/Hr)
The area added to the existing stream with this TC
does not add flow per Para 6b, Page D-15 of the OCHM,
therefore the upstream flow rate of Q =   1016.868(CFS) is being used
Rainfall intensity =      2.114(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.802
Subarea runoff =      0.000(CFS) for   31.920(Ac.)
Total runoff =   1016.868(CFS)    Total area =      598.91(Ac.)
Area averaged Fm value =    0.230(In/Hr)
Depth of flow =   5.381(Ft.), Average velocity =  11.989(Ft/s)


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Process from Point/Station       10.000 to Point/Station      182.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    598.913(Ac.)
Runoff from this stream =   1016.868(CFS)
Time of concentration =   21.48 min.
Rainfall intensity =     2.114(In/Hr)
Area averaged loss rate (Fm) =    0.2299(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9886


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Process from Point/Station      179.000 to Point/Station      180.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
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Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 80.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.200(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1085.000(Ft.)
Bottom (of initial area) elevation =   990.000(Ft.)
Difference in elevation =    95.000(Ft.)
Slope =    0.31667  s(%)=      31.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.522 min.
Rainfall intensity =      3.007(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.840
Subarea runoff =      4.295(CFS)
Total initial stream area =        1.700(Ac.)


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Process from Point/Station      180.000 to Point/Station      182.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     25.740(CFS)
Depth of flow =   0.547(Ft.), Average velocity =   7.720(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     25.740(CFS)
  '     '    flow top width =      7.188(Ft.)
  '     '     velocity=    7.720(Ft/s)
  '     '    area =      3.334(Sq.Ft)
  '     '    Froude number =     1.998

Upstream point elevation =   990.000(Ft.)
Downstream point elevation =   665.000(Ft.)
Flow length =  1650.000(Ft.)
Travel time  =    3.56 min.
Time of concentration =   15.08 min.
Depth of flow =   0.547(Ft.)
Average velocity =   7.720(Ft/s)
Total irregular channel flow =    25.740(CFS)
Irregular channel normal depth above invert elev. =   0.547(Ft.)
Average velocity of channel(s) =   7.720(Ft/s)
 Adding area flow to channel
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.030
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.970
SCS curve number for soil(AMC 2)  = 74.43
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=     0.203(In/Hr)
Max Catchment Loss (Fm) =     0.162(In/Hr)
```

```
Rainfall intensity =      2.582(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.842
Subarea runoff =     42.814(CFS) for   19.960(Ac.)
Total runoff =     47.109(CFS)    Total area =       21.66(Ac.)
Area averaged Fm value =    0.165(In/Hr)
Depth of flow =   0.770(Ft.), Average velocity =   9.349(Ft/s)


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Process from Point/Station      179.000 to Point/Station      182.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     21.660(Ac.)
Runoff from this stream =     47.109(CFS)
Time of concentration =   15.08 min.
Rainfall intensity =     2.582(In/Hr)
Area averaged loss rate (Fm) =    0.1654(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8157
Summary of stream data:

Stream  Area  Flow rate      TC     Fm      Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    598.91  1016.868     21.48    0.230      2.114
2     21.66    47.109     15.08    0.165      2.582
Qmax(1) =
         1.000 *    1.000 *  1016.868) +
         0.806 *    1.000 *    47.109) + =    1054.856
Qmax(2) =
         1.248 *    0.702 *  1016.868) +
         1.000 *    1.000 *    47.109) + =     938.730

Total of 2 streams to confluence:
Flow rates before confluence point:
    1016.868      47.109
Maximum flow rates at confluence using above data:
     1054.856      938.730
Area of streams before confluence:
      598.913       21.660
Effective area values after confluence:
      620.573      442.339
Results of confluence:
Total flow rate =   1054.856(CFS)
Time of concentration =    21.476 min.
Effective stream area after confluence =    620.573(Ac.)
Study area average Pervious fraction(Ap) =  0.983
Study area average soil loss rate(Fm) =    0.228(In/Hr)
Study area total (this main stream) =     620.57(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      182.000 to Point/Station      190.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =   1054.899(CFS)
Depth of flow =   5.576(Ft.), Average velocity =  11.713(Ft/s)
     ******* Irregular Channel Data ***********
```

```
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =   1054.898(CFS)
   '     '   flow top width =     27.304(Ft.)
   '     '    velocity=   11.713(Ft/s)
   '     '   area =     90.065(Sq.Ft)
   '     '   Froude number =     1.136

Upstream point elevation =   665.000(Ft.)
Downstream point elevation =   610.000(Ft.)
Flow length =  1538.000(Ft.)
Travel time  =    2.19 min.
Time of concentration =   23.66 min.
Depth of flow =   5.576(Ft.)
Average velocity =  11.713(Ft/s)
Total irregular channel flow =  1054.899(CFS)
Irregular channel normal depth above invert elev. =   5.576(Ft.)
Average velocity of channel(s) =  11.713(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.280
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.720
SCS curve number for soil(AMC 2)  = 74.68
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.228(In/Hr)
Max Catchment Loss (Fm) =     0.228(In/Hr)
The area added to the existing stream with this TC
does not add flow per Para 6b, Page D-15 of the OCHM,
therefore the upstream flow rate of Q =   1054.856(CFS) is being used
Rainfall intensity =      2.001(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.798
Subarea runoff =      0.000(CFS) for   25.750(Ac.)
Total runoff =   1054.856(CFS)    Total area =     646.32(Ac.)
Area averaged Fm value =    0.228(In/Hr)
Depth of flow =   5.576(Ft.), Average velocity =  11.712(Ft/s)


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Process from Point/Station       10.000 to Point/Station      190.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    646.323(Ac.)
Runoff from this stream =   1054.856(CFS)
Time of concentration =   23.66 min.
Rainfall intensity =     2.001(In/Hr)
Area averaged loss rate (Fm) =    0.2276(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9832
Program is now starting with Main Stream No. 2
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      193.000 to Point/Station      190.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
------------------------------------------------------------------------
RESIDENTIAL(3 - 4 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.200
Decimal fraction soil group C = 0.300
Decimal fraction soil group D = 0.500
SCS curve number for soil(AMC 2)  = 69.40
Pervious ratio(Ap) = 0.6000  Max loss rate(Fp)=     0.235(In/Hr)
Max Catchment Loss (Fm) =     0.141(In/Hr)
Rainfall intensity =      1.985(In/Hr) for a    25.0 year storm
User specified values are as follows:
TC =  24.00 min.  Rain intensity =       1.99(In/Hr)
Total area =       435.56(Ac.)  Total runoff =   1160.74(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      194.000 to Point/Station      190.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =    435.560(Ac.)
Runoff from this stream =   1160.740(CFS)
Time of concentration =   24.00 min.
Rainfall intensity =     1.985(In/Hr)
Area averaged loss rate (Fm) =    0.1410(In/Hr)
Area averaged Pervious ratio (Ap) = 0.6000
Program is now starting with Main Stream No. 3


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Process from Point/Station      200.000 to Point/Station      210.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1515.000(Ft.)
Bottom (of initial area) elevation =  1370.000(Ft.)
Difference in elevation =   145.000(Ft.)
Slope =    0.48333  s(%)=      48.33
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.588 min.
Rainfall intensity =      3.155(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.829
Subarea runoff =      2.379(CFS)
Total initial stream area =        0.910(Ac.)
```

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Process from Point/Station      210.000 to Point/Station      214.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      7.862(CFS)
Depth of flow =   0.220(Ft.), Average velocity =   6.564(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =      7.863(CFS)
   '      '    flow top width =      5.881(Ft.)
   '      '     velocity=    6.564(Ft/s)
   '      '    area =      1.198(Sq.Ft)
   '      '    Froude number =     2.563

Upstream point elevation =  1370.000(Ft.)
Downstream point elevation =  1245.000(Ft.)
Flow length =   300.000(Ft.)
Travel time  =    0.76 min.
Time of concentration =   11.35 min.
Depth of flow =   0.220(Ft.)
Average velocity =   6.564(Ft/s)
Total irregular channel flow =     7.862(CFS)
Irregular channel normal depth above invert elev. =   0.220(Ft.)
Average velocity of channel(s) =   6.564(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.580
Decimal fraction soil group D = 0.420
SCS curve number for soil(AMC 2)  = 76.52
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.229(In/Hr)
Max Catchment Loss (Fm) =     0.229(In/Hr)
Rainfall intensity =      3.033(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.831
Subarea runoff =     10.903(CFS) for    4.360(Ac.)
Total runoff =     13.282(CFS)    Total area =        5.27(Ac.)
Area averaged Fm value =    0.233(In/Hr)
Depth of flow =   0.300(Ft.), Average velocity =   7.911(Ft/s)


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Process from Point/Station      214.000 to Point/Station      216.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     21.542(CFS)
Depth of flow =   0.513(Ft.), Average velocity =   6.969(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
```

```
      1             0.00            50.00
      2           100.00             0.00
      3           105.00             0.00
      4           205.00            50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =     21.542(CFS)
   '      '    flow top width =      7.052(Ft.)
   '      '     velocity=    6.969(Ft/s)
   '      '    area =      3.091(Sq.Ft)
   '      '    Froude number =    1.855

Upstream point elevation =  1245.000(Ft.)
Downstream point elevation =  1150.000(Ft.)
Flow length =   550.000(Ft.)
Travel time  =    1.32 min.
Time of concentration =   12.67 min.
Depth of flow =   0.513(Ft.)
Average velocity =   6.969(Ft/s)
Total irregular channel flow =    21.542(CFS)
Irregular channel normal depth above invert elev. =   0.513(Ft.)
Average velocity of channel(s) =   6.969(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.730
Decimal fraction soil group D = 0.270
SCS curve number for soil(AMC 2)  = 75.62
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.236(In/Hr)
Max Catchment Loss (Fm) =     0.236(In/Hr)
Rainfall intensity =      2.851(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.826
Subarea runoff =     16.450(CFS) for    7.360(Ac.)
Total runoff =     29.732(CFS)    Total area =       12.63(Ac.)
Area averaged Fm value =    0.235(In/Hr)
Depth of flow =   0.617(Ft.), Average velocity =   7.734(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      216.000 to Point/Station      220.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_________________________________________________________________
Estimated mean flow rate at midpoint of channel =     64.942(CFS)
Depth of flow =   0.907(Ft.), Average velocity =  10.513(Ft/s)
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1             0.00            50.00
      2           100.00             0.00
      3           105.00             0.00
      4           205.00            50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =     64.942(CFS)
   '      '    flow top width =      8.627(Ft.)
   '      '     velocity=   10.513(Ft/s)
   '      '    area =      6.177(Sq.Ft)
```

```
  '     '    Froude number =     2.189

Upstream point elevation =  1150.000(Ft.)
Downstream point elevation =  1050.000(Ft.)
Flow length =   480.000(Ft.)
Travel time  =    0.76 min.
Time of concentration =   13.43 min.
Depth of flow =   0.907(Ft.)
Average velocity =  10.513(Ft/s)
Total irregular channel flow =    64.942(CFS)
Irregular channel normal depth above invert elev. =   0.907(Ft.)
Average velocity of channel(s) =  10.513(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.420
Decimal fraction soil group D = 0.580
SCS curve number for soil(AMC 2)  = 77.48
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.221(In/Hr)
Max Catchment Loss (Fm) =     0.221(In/Hr)
Rainfall intensity =      2.758(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.827
Subarea runoff =     70.367(CFS) for   31.280(Ac.)
Total runoff =    100.099(CFS)    Total area =       43.91(Ac.)
Area averaged Fm value =    0.225(In/Hr)
Depth of flow =   1.148(Ft.), Average velocity =  11.948(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      220.000 to Point/Station      230.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    157.736(CFS)
Depth of flow =   1.894(Ft.), Average velocity =   9.480(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    157.736(CFS)
  '     '    flow top width =     12.574(Ft.)
  '     '     velocity=    9.480(Ft/s)
  '     '    area =     16.640(Sq.Ft)
  '     '    Froude number =     1.452

Upstream point elevation =  1050.000(Ft.)
Downstream point elevation =   885.000(Ft.)
Flow length =  2150.000(Ft.)
Travel time  =    3.78 min.
Time of concentration =   17.21 min.
Depth of flow =   1.894(Ft.)
Average velocity =   9.480(Ft/s)
Total irregular channel flow =   157.736(CFS)
```

```
Irregular channel normal depth above invert elev. =   1.894(Ft.)
Average velocity of channel(s) =   9.480(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.650
Decimal fraction soil group D = 0.350
SCS curve number for soil(AMC 2)  = 76.10
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.232(In/Hr)
Max Catchment Loss (Fm) =     0.232(In/Hr)
Rainfall intensity =     2.397(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.814
Subarea runoff =    115.189(CFS) for   66.470(Ac.)
Total runoff =    215.288(CFS)    Total area =      110.38(Ac.)
Area averaged Fm value =    0.230(In/Hr)
Depth of flow =   2.215(Ft.), Average velocity =  10.309(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      230.000 to Point/Station      240.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    258.172(CFS)
Depth of flow =   2.540(Ft.), Average velocity =  10.083(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    258.172(CFS)
  '     '   flow top width =     15.161(Ft.)
  '     '    velocity=   10.083(Ft/s)
  '     '   area =     25.606(Sq.Ft)
  '     '   Froude number =     1.367

Upstream point elevation =   885.000(Ft.)
Downstream point elevation =   695.000(Ft.)
Flow length =  3000.000(Ft.)
Travel time  =    4.96 min.
Time of concentration =   22.17 min.
Depth of flow =   2.540(Ft.)
Average velocity =  10.083(Ft/s)
Total irregular channel flow =   258.172(CFS)
Irregular channel normal depth above invert elev. =   2.540(Ft.)
Average velocity of channel(s) =  10.083(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.630
Decimal fraction soil group D = 0.370
SCS curve number for soil(AMC 2)  = 76.22
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.231(In/Hr)
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```
Max Catchment Loss (Fm) =     0.231(In/Hr)
Rainfall intensity =      2.077(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.800
Subarea runoff =     85.707(CFS) for   70.760(Ac.)
Total runoff =    300.995(CFS)    Total area =      181.14(Ac.)
Area averaged Fm value =    0.230(In/Hr)
Depth of flow =   2.737(Ft.), Average velocity =  10.498(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      240.000 to Point/Station      190.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =    319.812(CFS)
Depth of flow =   2.895(Ft.), Average velocity =  10.237(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    319.812(CFS)
  '     '    flow top width =     16.581(Ft.)
  '     '     velocity=   10.237(Ft/s)
  '     '    area =     31.240(Sq.Ft)
  '     '    Froude number =     1.314

Upstream point elevation =   695.000(Ft.)
Downstream point elevation =   610.000(Ft.)
Flow length =  1500.000(Ft.)
Travel time  =    2.44 min.
Time of concentration =   24.61 min.
Depth of flow =   2.895(Ft.)
Average velocity =  10.237(Ft/s)
Total irregular channel flow =   319.812(CFS)
Irregular channel normal depth above invert elev. =   2.895(Ft.)
Average velocity of channel(s) =  10.237(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.490
Decimal fraction soil group D = 0.510
SCS curve number for soil(AMC 2)  = 77.06
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.225(In/Hr)
Max Catchment Loss (Fm) =     0.225(In/Hr)
Rainfall intensity =      1.957(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.795
Subarea runoff =     37.539(CFS) for   36.540(Ac.)
Total runoff =    338.534(CFS)    Total area =      217.68(Ac.)
Area averaged Fm value =    0.229(In/Hr)
Depth of flow =   2.975(Ft.), Average velocity =  10.390(Ft/s)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      240.000 to Point/Station      190.000
**** CONFLUENCE OF MAIN STREAMS ****
```

```
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =    217.680(Ac.)
Runoff from this stream =    338.534(CFS)
Time of concentration =   24.61 min.
Rainfall intensity =     1.957(In/Hr)
Area averaged loss rate (Fm) =    0.2293(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    646.32  1054.856     23.66    0.228      2.001
2    435.56  1160.740     24.00    0.141      1.985
3    217.68   338.534     24.61    0.229      1.957
Qmax(1) =
         1.000 *    1.000 *  1054.856) +
         1.009 *    0.986 *  1160.740) +
         1.025 *    0.962 *   338.534) + =    2543.028
Qmax(2) =
         0.991 *    1.000 *  1054.856) +
         1.000 *    1.000 *  1160.740) +
         1.016 *    0.975 *   338.534) + =    2541.648
Qmax(3) =
         0.975 *    1.000 *  1054.856) +
         0.985 *    1.000 *  1160.740) +
         1.000 *    1.000 *   338.534) + =    2510.549

Total of 3 main streams to confluence:
Flow rates before confluence point:
    1055.856    1161.740     339.534
Maximum flow rates at confluence using above data:
     2543.028     2541.648     2510.549
Area of streams before confluence:
      646.323      435.560      217.680
Effective area values after confluence:
     1285.127     1294.192     1299.563


Results of confluence:
Total flow rate =   2543.028(CFS)
Time of concentration =    23.664 min.
Effective stream area after confluence  =   1285.127(Ac.)
Study area average Pervious fraction(Ap) =  0.858
Study area average soil loss rate(Fm) =    0.199(In/Hr)
Study area total =    1299.56(Ac.)
End of computations, total study area =         1366.51 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.865
Area averaged SCS curve number (AMC 2) =  73.9
```

10-YEAR EXISTING CONDITION

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2004 Version 8.0
Rational Hydrology Study, Date: 09/18/12 File Name: 1200A10.roc

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ESPERANZA HILLS
EXISTING CONDITION
10 YEAR
R/09/1200/PRELIM/REPORTS/HYDRO/RATIONAL/1200A10

Program License Serial Number 6062

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 10.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

++
Process from Point/Station 10.000 to Point/Station 15.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 74.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.250(In/Hr)
Max Catchment Loss (Fm) = 0.250(In/Hr)
Initial subarea data:
Initial area flow distance = 300.000(Ft.)
Top (of initial area) elevation = 1780.000(Ft.)
Bottom (of initial area) elevation = 1670.000(Ft.)
Difference in elevation = 110.000(Ft.)
Slope = 0.36667 s(%)= 36.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.189 min.
Rainfall intensity = 2.559(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.812
Subarea runoff = 1.932(CFS)
Total initial stream area = 0.930(Ac.)

++
Process from Point/Station 15.000 to Point/Station 20.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 5.356(CFS)
Depth of flow = 0.204(Ft.), Average velocity = 4.853(Ft/s)

```
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =      5.356(CFS)
   '      '    flow top width =      5.816(Ft.)
   '      '     velocity=    4.853(Ft/s)
   '      '    area =      1.104(Sq.Ft)
   '      '    Froude number =     1.963

Upstream point elevation =  1670.000(Ft.)
Downstream point elevation =  1590.000(Ft.)
Flow length =   320.000(Ft.)
Travel time  =    1.10 min.
Time of concentration =   12.29 min.
Depth of flow =   0.204(Ft.)
Average velocity =   4.853(Ft/s)
Total irregular channel flow =     5.356(CFS)
Irregular channel normal depth above invert elev. =   0.204(Ft.)
Average velocity of channel(s) =   4.853(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.425(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.807
Subarea runoff =      6.778(CFS) for    3.520(Ac.)
Total runoff =      8.711(CFS)    Total area =       4.45(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.272(Ft.), Average velocity =   5.779(Ft/s)


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Process from Point/Station       20.000 to Point/Station       25.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     13.664(CFS)
Depth of flow =   0.352(Ft.), Average velocity =   6.802(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
```

```
Sub-Channel flow  =     13.664(CFS)
  '     '    flow top width =      6.409(Ft.)
  '     '     velocity=    6.802(Ft/s)
  '     '    area =      2.009(Sq.Ft)
  '     '    Froude number =     2.141

Upstream point elevation =  1590.000(Ft.)
Downstream point elevation =  1450.000(Ft.)
Flow length =   550.000(Ft.)
Travel time  =    1.35 min.
Time of concentration =   13.64 min.
Depth of flow =   0.352(Ft.)
Average velocity =   6.802(Ft/s)
Total irregular channel flow =    13.664(CFS)
Irregular channel normal depth above invert elev. =   0.352(Ft.)
Average velocity of channel(s) =   6.802(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.680
Decimal fraction soil group D = 0.320
SCS curve number for soil(AMC 2)  = 75.92
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.234(In/Hr)
Max Catchment Loss (Fm) =     0.234(In/Hr)
Rainfall intensity =      2.285(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.805
Subarea runoff =      9.828(CFS) for    5.630(Ac.)
Total runoff =     18.539(CFS)    Total area =      10.08(Ac.)
Area averaged Fm value =    0.241(In/Hr)
Depth of flow =   0.421(Ft.), Average velocity =   7.546(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       25.000 to Point/Station       30.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     29.063(CFS)
Depth of flow =   0.538(Ft.), Average velocity =   8.895(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00             50.00
     2            100.00              0.00
     3            105.00              0.00
     4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     29.063(CFS)
  '     '    flow top width =      7.151(Ft.)
  '     '     velocity=    8.895(Ft/s)
  '     '    area =      3.267(Sq.Ft)
  '     '    Froude number =     2.319

Upstream point elevation =  1450.000(Ft.)
Downstream point elevation =  1290.000(Ft.)
Flow length =   600.000(Ft.)
Travel time  =    1.12 min.
```

```
Time of concentration =   14.76 min.
Depth of flow =   0.538(Ft.)
Average velocity =   8.895(Ft/s)
Total irregular channel flow =    29.063(CFS)
Irregular channel normal depth above invert elev. =   0.538(Ft.)
Average velocity of channel(s) =   8.895(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.500
SCS curve number for soil(AMC 2)  = 77.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.225(In/Hr)
Max Catchment Loss (Fm) =     0.225(In/Hr)
Rainfall intensity =      2.183(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.804
Subarea runoff =     20.987(CFS) for   12.430(Ac.)
Total runoff =     39.525(CFS)    Total area =      22.51(Ac.)
Area averaged Fm value =    0.232(In/Hr)
Depth of flow =   0.641(Ft.), Average velocity =   9.819(Ft/s)


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Process from Point/Station       27.000 to Point/Station       30.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 79.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Time of concentration =    14.76 min.
Rainfall intensity =      2.183(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.802
Subarea runoff =     23.575(CFS) for   13.550(Ac.)
Total runoff =     63.101(CFS)    Total area =      36.06(Ac.)
Area averaged Fm value =    0.239(In/Hr)


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Process from Point/Station       30.000 to Point/Station       40.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     70.791(CFS)
Depth of flow =   0.994(Ft.), Average velocity =  10.187(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
```

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------------------------------------------------------------------
Sub-Channel flow  =     70.791(CFS)
  '     '   flow top width =      8.977(Ft.)
  '     '    velocity=   10.187(Ft/s)
  '     '   area =      6.949(Sq.Ft)
  '     '   Froude number =     2.040

Upstream point elevation =  1290.000(Ft.)
Downstream point elevation =  1175.000(Ft.)
Flow length =   650.000(Ft.)
Travel time  =    1.06 min.
Time of concentration =   15.82 min.
Depth of flow =   0.994(Ft.)
Average velocity =  10.187(Ft/s)
Total irregular channel flow =    70.791(CFS)
Irregular channel normal depth above invert elev. =   0.994(Ft.)
Average velocity of channel(s) =  10.187(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.520
Decimal fraction soil group D = 0.480
SCS curve number for soil(AMC 2)  = 76.88
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.226(In/Hr)
Max Catchment Loss (Fm) =     0.226(In/Hr)
Rainfall intensity =      2.098(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.799
Subarea runoff =     15.325(CFS) for   10.740(Ac.)
Total runoff =     78.425(CFS)    Total area =       46.80(Ac.)
Area averaged Fm value =    0.236(In/Hr)
Depth of flow =   1.052(Ft.), Average velocity =  10.500(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       40.000 to Point/Station       50.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     87.093(CFS)
Depth of flow =   1.148(Ft.), Average velocity =  10.400(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     87.093(CFS)
  '     '   flow top width =      9.591(Ft.)
  '     '    velocity=   10.400(Ft/s)
  '     '   area =      8.374(Sq.Ft)
  '     '   Froude number =     1.961

Upstream point elevation =  1175.000(Ft.)
Downstream point elevation =  1055.000(Ft.)
Flow length =   760.000(Ft.)
```

```
Travel time  =    1.22 min.
Time of concentration =   17.04 min.
Depth of flow =   1.148(Ft.)
Average velocity =  10.400(Ft/s)
Total irregular channel flow =    87.093(CFS)
Irregular channel normal depth above invert elev. =   1.148(Ft.)
Average velocity of channel(s) =  10.400(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.011(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.793
Subarea runoff =     17.256(CFS) for   13.210(Ac.)
Total runoff =     95.682(CFS)    Total area =      60.01(Ac.)
Area averaged Fm value =    0.239(In/Hr)
Depth of flow =   1.207(Ft.), Average velocity =  10.687(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       50.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     60.010(Ac.)
Runoff from this stream =     95.682(CFS)
Time of concentration =   17.04 min.
Rainfall intensity =     2.011(In/Hr)
Area averaged loss rate (Fm) =    0.2390(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     60.01    95.682     17.04    0.239      2.011
Qmax(1) =
        1.000 *    1.000 *    95.682) + =      95.682

Total of 1 streams to confluence:
Flow rates before confluence point:
      95.682
Maximum flow rates at confluence using above data:
       95.682
Area of streams before confluence:
       60.010
Effective area values after confluence:
       60.010
Results of confluence:
Total flow rate =     95.682(CFS)
Time of concentration =    17.042 min.
Effective stream area after confluence =     60.010(Ac.)
Study area average Pervious fraction(Ap) =  1.000
```

```
Study area average soil loss rate(Fm) =    0.239(In/Hr)
Study area total (this main stream) =      60.01(Ac.)


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Process from Point/Station       60.000 to Point/Station       70.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   320.000(Ft.)
Top (of initial area) elevation =  1655.000(Ft.)
Bottom (of initial area) elevation =  1550.000(Ft.)
Difference in elevation =   105.000(Ft.)
Slope =    0.32813  s(%)=     32.81
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.740 min.
Rainfall intensity =      2.489(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.810
Subarea runoff =      4.414(CFS)
Total initial stream area =        2.190(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       70.000 to Point/Station       75.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     10.579(CFS)
Depth of flow =   0.254(Ft.), Average velocity =   7.572(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     10.579(CFS)
  '     '    flow top width =      6.015(Ft.)
  '     '     velocity=    7.572(Ft/s)
  '     '    area =      1.397(Sq.Ft)
  '     '    Froude number =     2.769

Upstream point elevation =  1550.000(Ft.)
Downstream point elevation =  1340.000(Ft.)
Flow length =   450.000(Ft.)
Travel time  =    0.99 min.
Time of concentration =   12.73 min.
Depth of flow =   0.254(Ft.)
Average velocity =   7.572(Ft/s)
Total irregular channel flow =    10.579(CFS)
```

```
Irregular channel normal depth above invert elev. =    0.254(Ft.)
Average velocity of channel(s) =    7.572(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.376(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.805
Subarea runoff =     12.274(CFS) for    6.530(Ac.)
Total runoff =     16.688(CFS)    Total area =        8.72(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.332(Ft.), Average velocity =   8.888(Ft/s)


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Process from Point/Station       75.000 to Point/Station       80.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     26.770(CFS)
Depth of flow =   0.520(Ft.), Average velocity =   8.517(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     26.770(CFS)
  '     '    flow top width =      7.081(Ft.)
  '     '     velocity=    8.517(Ft/s)
  '     '    area =      3.143(Sq.Ft)
  '     '    Froude number =     2.253

Upstream point elevation =  1340.000(Ft.)
Downstream point elevation =  1175.000(Ft.)
Flow length =   650.000(Ft.)
Travel time  =    1.27 min.
Time of concentration =   14.00 min.
Depth of flow =   0.520(Ft.)
Average velocity =   8.517(Ft/s)
Total irregular channel flow =    26.770(CFS)
Irregular channel normal depth above invert elev. =   0.520(Ft.)
Average velocity of channel(s) =   8.517(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
```

```
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.250(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.800
Subarea runoff =     20.089(CFS) for   11.710(Ac.)
Total runoff =     36.777(CFS)    Total area =       20.43(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.624(Ft.), Average velocity =   9.437(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       80.000 to Point/Station       50.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     44.049(CFS)
Depth of flow =   0.702(Ft.), Average velocity =   9.800(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     44.049(CFS)
   '      '    flow top width =      7.808(Ft.)
   '      '     velocity=    9.800(Ft/s)
   '      '    area =      4.495(Sq.Ft)
   '      '    Froude number =     2.276

Upstream point elevation =  1175.000(Ft.)
Downstream point elevation =  1055.000(Ft.)
Flow length =   500.000(Ft.)
Travel time  =    0.85 min.
Time of concentration =   14.85 min.
Depth of flow =   0.702(Ft.)
Average velocity =   9.800(Ft/s)
Total irregular channel flow =    44.049(CFS)
Irregular channel normal depth above invert elev. =   0.702(Ft.)
Average velocity of channel(s) =   9.800(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.175(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.797
Subarea runoff =     14.481(CFS) for    9.150(Ac.)
Total runoff =     51.258(CFS)    Total area =       29.58(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.764(Ft.), Average velocity =  10.273(Ft/s)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       60.000 to Point/Station       50.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     29.580(Ac.)
Runoff from this stream =     51.258(CFS)
Time of concentration =   14.85 min.
Rainfall intensity =     2.175(In/Hr)
Area averaged loss rate (Fm) =    0.2500(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     60.01    95.682     17.04    0.239      2.011
2     29.58    51.258     14.85    0.250      2.175
Qmax(1) =
         1.000 *    1.000 *    95.682) +
         0.914 *    1.000 *    51.258) + =     142.553
Qmax(2) =
         1.093 *    0.872 *    95.682) +
         1.000 *    1.000 *    51.258) + =     142.407

Total of 2 streams to confluence:
Flow rates before confluence point:
      95.682      51.258
Maximum flow rates at confluence using above data:
      142.553      142.407
Area of streams before confluence:
       60.010       29.580
Effective area values after confluence:
       89.590       81.882
Results of confluence:
Total flow rate =    142.553(CFS)
Time of concentration =    17.042 min.
Effective stream area after confluence =     89.590(Ac.)
Study area average Pervious fraction(Ap) =  1.000
Study area average soil loss rate(Fm) =    0.243(In/Hr)
Study area total (this main stream) =     89.59(Ac.)


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Process from Point/Station       50.000 to Point/Station       90.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    157.529(CFS)
Depth of flow =   2.067(Ft.), Average velocity =   8.346(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
```

```
Sub-Channel flow  =    157.529(CFS)
  '      '    flow top width =     13.267(Ft.)
  '      '     velocity=    8.346(Ft/s)
  '      '    area =     18.876(Sq.Ft)
  '      '    Froude number =     1.233

Upstream point elevation =  1055.000(Ft.)
Downstream point elevation =   990.000(Ft.)
Flow length =  1200.000(Ft.)
Travel time  =    2.40 min.
Time of concentration =   19.44 min.
Depth of flow =   2.067(Ft.)
Average velocity =   8.346(Ft/s)
Total irregular channel flow =   157.529(CFS)
Irregular channel normal depth above invert elev. =   2.067(Ft.)
Average velocity of channel(s) =   8.346(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.670
Decimal fraction soil group D = 0.330
SCS curve number for soil(AMC 2)  = 75.98
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.234(In/Hr)
Max Catchment Loss (Fm) =     0.234(In/Hr)
Rainfall intensity =      1.865(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.784
Subarea runoff =     29.888(CFS) for   28.380(Ac.)
Total runoff =    172.441(CFS)    Total area =      117.97(Ac.)
Area averaged Fm value =    0.240(In/Hr)
Depth of flow =   2.163(Ft.), Average velocity =   8.551(Ft/s)


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Process from Point/Station       10.000 to Point/Station       90.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    117.970(Ac.)
Runoff from this stream =    172.441(CFS)
Time of concentration =   19.44 min.
Rainfall intensity =     1.865(In/Hr)
Area averaged loss rate (Fm) =    0.2404(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Program is now starting with Main Stream No. 2


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Process from Point/Station      100.000 to Point/Station      110.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
```

```
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1610.000(Ft.)
Bottom (of initial area) elevation =  1560.000(Ft.)
Difference in elevation =    50.000(Ft.)
Slope =    0.16667  s(%)=      16.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.101 min.
Rainfall intensity =      2.338(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.804
Subarea runoff =      5.111(CFS)
Total initial stream area =        2.720(Ac.)


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Process from Point/Station      110.000 to Point/Station      115.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     14.127(CFS)
Depth of flow =   0.348(Ft.), Average velocity =   7.126(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     14.127(CFS)
   '      '    flow top width =      6.392(Ft.)
   '      '     velocity=    7.126(Ft/s)
   '      '    area =      1.982(Sq.Ft)
   '      '    Froude number =     2.255

Upstream point elevation =  1560.000(Ft.)
Downstream point elevation =  1390.000(Ft.)
Flow length =   600.000(Ft.)
Travel time  =    1.40 min.
Time of concentration =   14.50 min.
Depth of flow =   0.348(Ft.)
Average velocity =   7.126(Ft/s)
Total irregular channel flow =    14.127(CFS)
Irregular channel normal depth above invert elev. =   0.348(Ft.)
Average velocity of channel(s) =   7.126(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.740
Decimal fraction soil group D = 0.260
SCS curve number for soil(AMC 2)  = 75.56
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.237(In/Hr)
Max Catchment Loss (Fm) =     0.237(In/Hr)
Rainfall intensity =      2.205(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.802
Subarea runoff =     17.939(CFS) for   10.310(Ac.)
```

```
Total runoff =     23.050(CFS)     Total area =       13.03(Ac.)
Area averaged Fm value =    0.240(In/Hr)
Depth of flow =   0.463(Ft.), Average velocity =   8.411(Ft/s)


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Process from Point/Station      115.000 to Point/Station      120.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     33.127(CFS)
Depth of flow =   0.611(Ft.), Average velocity =   8.707(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------------
Sub-Channel flow  =     33.127(CFS)
   '      '    flow top width =     7.446(Ft.)
   '      '     velocity=    8.707(Ft/s)
   '      '    area =      3.804(Sq.Ft)
   '      '    Froude number =     2.147

Upstream point elevation =  1390.000(Ft.)
Downstream point elevation =  1180.000(Ft.)
Flow length =   950.000(Ft.)
Travel time  =    1.82 min.
Time of concentration =   16.32 min.
Depth of flow =   0.611(Ft.)
Average velocity =   8.707(Ft/s)
Total irregular channel flow =    33.127(CFS)
Irregular channel normal depth above invert elev. =   0.611(Ft.)
Average velocity of channel(s) =   8.707(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.840
Decimal fraction soil group D = 0.160
SCS curve number for soil(AMC 2)  = 74.96
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.242(In/Hr)
Max Catchment Loss (Fm) =     0.242(In/Hr)
Rainfall intensity =      2.061(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.795
Subarea runoff =     20.096(CFS) for   13.310(Ac.)
Total runoff =     43.146(CFS)     Total area =       26.34(Ac.)
Area averaged Fm value =    0.241(In/Hr)
Depth of flow =   0.710(Ft.), Average velocity =   9.466(Ft/s)


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Process from Point/Station      100.000 to Point/Station      120.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
```

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Stream flow area =     26.340(Ac.)
Runoff from this stream =     43.146(CFS)
Time of concentration =   16.32 min.
Rainfall intensity =     2.061(In/Hr)
Area averaged loss rate (Fm) =    0.2409(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


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Process from Point/Station      122.000 to Point/Station      124.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1615.000(Ft.)
Bottom (of initial area) elevation =  1495.000(Ft.)
Difference in elevation =   120.000(Ft.)
Slope =    0.40000  s(%)=      40.00
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.996 min.
Rainfall intensity =      2.584(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.813
Subarea runoff =      2.647(CFS)
Total initial stream area =        1.260(Ac.)


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Process from Point/Station      124.000 to Point/Station      126.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      5.879(CFS)
Depth of flow =   0.210(Ft.), Average velocity =   5.175(Ft/s)
      ******* Irregular Channel Data ***********
---------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
---------------------------------------------------------------
Sub-Channel flow  =      5.879(CFS)
   '      '    flow top width =      5.839(Ft.)
   '      '     velocity=    5.175(Ft/s)
   '      '    area =      1.136(Sq.Ft)
   '      '    Froude number =     2.067

Upstream point elevation =  1495.000(Ft.)
Downstream point elevation =  1385.000(Ft.)
Flow length =   400.000(Ft.)
Travel time  =    1.29 min.
```

```
Time of concentration =   12.28 min.
Depth of flow =   0.210(Ft.)
Average velocity =   5.175(Ft/s)
Total irregular channel flow =     5.879(CFS)
Irregular channel normal depth above invert elev. =   0.210(Ft.)
Average velocity of channel(s) =   5.175(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.425(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.807
Subarea runoff =      6.379(CFS) for    3.350(Ac.)
Total runoff =      9.026(CFS)    Total area =        4.61(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.270(Ft.), Average velocity =   6.035(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      126.000 to Point/Station      126.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Time of concentration =   12.28 min.
Rainfall intensity =      2.425(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.807
Subarea runoff =     13.372(CFS) for    6.830(Ac.)
Total runoff =     22.398(CFS)    Total area =       11.44(Ac.)
Area averaged Fm value =    0.250(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      126.000 to Point/Station      128.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     32.000(CFS)
Depth of flow =   0.627(Ft.), Average velocity =   8.163(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
```

```
------------------------------------------------------------------
Sub-Channel flow  =     32.000(CFS)
  '     '    flow top width =      7.507(Ft.)
  '     '     velocity=    8.163(Ft/s)
  '     '    area =      3.920(Sq.Ft)
  '     '    Froude number =     1.991

Upstream point elevation =  1385.000(Ft.)
Downstream point elevation =  1300.000(Ft.)
Flow length =   450.000(Ft.)
Travel time  =    0.92 min.
Time of concentration =   13.20 min.
Depth of flow =   0.627(Ft.)
Average velocity =   8.163(Ft/s)
Total irregular channel flow =    32.000(CFS)
Irregular channel normal depth above invert elev. =   0.627(Ft.)
Average velocity of channel(s) =   8.163(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.327(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.803
Subarea runoff =     19.142(CFS) for   10.780(Ac.)
Total runoff =     41.540(CFS)    Total area =       22.22(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.726(Ft.), Average velocity =   8.862(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      128.000 to Point/Station      120.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     55.030(CFS)
Depth of flow =   0.837(Ft.), Average velocity =   9.857(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     55.030(CFS)
  '     '    flow top width =      8.346(Ft.)
  '     '     velocity=    9.857(Ft/s)
  '     '    area =      5.583(Sq.Ft)
  '     '    Froude number =     2.124

Upstream point elevation =  1300.000(Ft.)
Downstream point elevation =  1180.000(Ft.)
Flow length =   600.000(Ft.)
```

```
Travel time  =    1.01 min.
Time of concentration =   14.22 min.
Depth of flow =   0.837(Ft.)
Average velocity =   9.857(Ft/s)
Total irregular channel flow =    55.030(CFS)
Irregular channel normal depth above invert elev. =   0.837(Ft.)
Average velocity of channel(s) =   9.857(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =     2.231(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.799
Subarea runoff =     26.926(CFS) for   16.190(Ac.)
Total runoff =     68.465(CFS)    Total area =       38.41(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.944(Ft.), Average velocity =  10.529(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      122.000 to Point/Station      120.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     38.410(Ac.)
Runoff from this stream =     68.465(CFS)
Time of concentration =   14.22 min.
Rainfall intensity =     2.231(In/Hr)
Area averaged loss rate (Fm) =    0.2500(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     26.34    43.146     16.32    0.241      2.061
2     38.41    68.465     14.22    0.250      2.231
Qmax(1) =
         1.000 *    1.000 *    43.146) +
         0.914 *    1.000 *    68.465) + =     105.748
Qmax(2) =
         1.093 *    0.871 *    43.146) +
         1.000 *    1.000 *    68.465) + =     109.551

Total of 2 streams to confluence:
Flow rates before confluence point:
      43.146      68.465
Maximum flow rates at confluence using above data:
      105.748      109.551
Area of streams before confluence:
       26.340       38.410
Effective area values after confluence:
       64.750       61.354
```

```
Results of confluence:
Total flow rate =    109.551(CFS)
Time of concentration =    14.218 min.
Effective stream area after confluence =     61.354(Ac.)
Study area average Pervious fraction(Ap) =  1.000
Study area average soil loss rate(Fm) =    0.246(In/Hr)
Study area total (this main stream) =      64.75(Ac.)


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Process from Point/Station      120.000 to Point/Station       90.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    154.251(CFS)
Depth of flow =   1.750(Ft.), Average velocity =  10.373(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =    154.251(CFS)
  '     '   flow top width =     11.998(Ft.)
  '     '    velocity=   10.373(Ft/s)
  '     '   area =     14.870(Sq.Ft)
  '     '   Froude number =     1.642

Upstream point elevation =  1180.000(Ft.)
Downstream point elevation =   990.000(Ft.)
Flow length =  1900.000(Ft.)
Travel time  =    3.05 min.
Time of concentration =   17.27 min.
Depth of flow =   1.750(Ft.)
Average velocity =  10.373(Ft/s)
Total irregular channel flow =   154.251(CFS)
Irregular channel normal depth above invert elev. =   1.750(Ft.)
Average velocity of channel(s) =  10.373(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.100
SCS curve number for soil(AMC 2)  = 74.60
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.245(In/Hr)
Max Catchment Loss (Fm) =     0.245(In/Hr)
Rainfall intensity =      1.995(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.789
Subarea runoff =     89.339(CFS) for   64.950(Ac.)
Total runoff =    198.890(CFS)    Total area =      126.30(Ac.)
Area averaged Fm value =    0.246(In/Hr)
Depth of flow =   1.992(Ft.), Average velocity =  11.117(Ft/s)


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Process from Point/Station      100.000 to Point/Station       90.000
**** CONFLUENCE OF MAIN STREAMS ****
--------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =    126.304(Ac.)
Runoff from this stream =    198.890(CFS)
Time of concentration =   17.27 min.
Rainfall intensity =     1.995(In/Hr)
Area averaged loss rate (Fm) =    0.2456(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    117.97   172.441     19.44    0.240      1.865
2    126.30   198.890     17.27    0.246      1.995
Qmax(1) =
         1.000 *    1.000 *   172.441) +
         0.925 *    1.000 *   198.890) + =     356.476
Qmax(2) =
         1.080 *    0.888 *   172.441) +
         1.000 *    1.000 *   198.890) + =     364.432

Total of 2 main streams to confluence:
Flow rates before confluence point:
     173.441     199.890
Maximum flow rates at confluence using above data:
      356.476      364.432
Area of streams before confluence:
      117.970      126.304
Effective area values after confluence:
      244.274      231.120


Results of confluence:
Total flow rate =    364.432(CFS)
Time of concentration =    17.271 min.
Effective stream area after confluence  =    231.120(Ac.)
Study area average Pervious fraction(Ap) =  1.000
Study area average soil loss rate(Fm) =    0.243(In/Hr)
Study area total =     244.27(Ac.)


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Process from Point/Station       90.000 to Point/Station      130.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
--------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    381.527(CFS)
Depth of flow =   2.959(Ft.), Average velocity =  11.812(Ft/s)
      ******* Irregular Channel Data ***********
---------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
```

```
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =    381.527(CFS)
  '     '   flow top width =     16.834(Ft.)
  '     '    velocity=   11.812(Ft/s)
  '     '   area =     32.300(Sq.Ft)
  '     '   Froude number =     1.503

Upstream point elevation =   990.000(Ft.)
Downstream point elevation =   850.000(Ft.)
Flow length =  1900.000(Ft.)
Travel time  =    2.68 min.
Time of concentration =   19.95 min.
Depth of flow =   2.959(Ft.)
Average velocity =  11.812(Ft/s)
Total irregular channel flow =   381.527(CFS)
Irregular channel normal depth above invert elev. =   2.959(Ft.)
Average velocity of channel(s) =  11.812(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.770
Decimal fraction soil group D = 0.230
SCS curve number for soil(AMC 2)  = 75.38
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.239(In/Hr)
Max Catchment Loss (Fm) =     0.239(In/Hr)
Rainfall intensity =      1.837(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.781
Subarea runoff =     34.106(CFS) for   46.580(Ac.)
Total runoff =    398.538(CFS)    Total area =      277.70(Ac.)
Area averaged Fm value =    0.242(In/Hr)
Depth of flow =   3.021(Ft.), Average velocity =  11.947(Ft/s)


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Process from Point/Station      130.000 to Point/Station      140.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_________________________________________________________________
Estimated mean flow rate at midpoint of channel =    435.083(CFS)
Depth of flow =   3.353(Ft.), Average velocity =  11.085(Ft/s)
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =    435.083(CFS)
  '     '   flow top width =     18.412(Ft.)
  '     '    velocity=   11.085(Ft/s)
  '     '   area =     39.249(Sq.Ft)
  '     '   Froude number =     1.338

Upstream point elevation =   850.000(Ft.)
Downstream point elevation =   730.000(Ft.)
```

```
Flow length =  2120.000(Ft.)
Travel time  =    3.19 min.
Time of concentration =   23.14 min.
Depth of flow =   3.353(Ft.)
Average velocity =  11.085(Ft/s)
Total irregular channel flow =   435.083(CFS)
Irregular channel normal depth above invert elev. =   3.353(Ft.)
Average velocity of channel(s) =  11.085(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.850
Decimal fraction soil group D = 0.150
SCS curve number for soil(AMC 2)  = 74.90
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.242(In/Hr)
Max Catchment Loss (Fm) =     0.242(In/Hr)
Rainfall intensity =      1.687(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.771
Subarea runoff =     73.037(CFS) for   84.910(Ac.)
Total runoff =    471.575(CFS)    Total area =     362.61(Ac.)
Area averaged Fm value =    0.242(In/Hr)
Depth of flow =   3.482(Ft.), Average velocity =  11.318(Ft/s)


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Process from Point/Station       10.000 to Point/Station      140.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    362.610(Ac.)
Runoff from this stream =    471.575(CFS)
Time of concentration =   23.14 min.
Rainfall intensity =     1.687(In/Hr)
Area averaged loss rate (Fm) =    0.2424(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


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Process from Point/Station      150.000 to Point/Station      160.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1575.000(Ft.)
Bottom (of initial area) elevation =  1350.000(Ft.)
Difference in elevation =   225.000(Ft.)
Slope =    0.75000  s(%)=     75.00
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.697 min.
Rainfall intensity =      2.777(In/Hr) for a    10.0 year storm
```

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Effective runoff coefficient used for area (Q=KCIA) is C = 0.819
Subarea runoff =      3.071(CFS)
Total initial stream area =        1.350(Ac.)


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Process from Point/Station      160.000 to Point/Station      162.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     10.631(CFS)
Depth of flow =   0.261(Ft.), Average velocity =   7.380(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------------
Sub-Channel flow  =     10.631(CFS)
   '      '    flow top width =      6.044(Ft.)
   '      '     velocity=    7.380(Ft/s)
   '      '    area =      1.441(Sq.Ft)
   '      '    Froude number =     2.664

Upstream point elevation =  1350.000(Ft.)
Downstream point elevation =  1200.000(Ft.)
Flow length =   350.000(Ft.)
Travel time  =    0.79 min.
Time of concentration =   10.49 min.
Depth of flow =   0.261(Ft.)
Average velocity =   7.380(Ft/s)
Total irregular channel flow =    10.631(CFS)
Irregular channel normal depth above invert elev. =   0.261(Ft.)
Average velocity of channel(s) =   7.380(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.960
Decimal fraction soil group D = 0.040
SCS curve number for soil(AMC 2)  = 74.24
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.248(In/Hr)
Max Catchment Loss (Fm) =     0.248(In/Hr)
Rainfall intensity =      2.655(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.816
Subarea runoff =     15.062(CFS) for    7.020(Ac.)
Total runoff =     18.133(CFS)    Total area =        8.37(Ac.)
Area averaged Fm value =    0.248(In/Hr)
Depth of flow =   0.357(Ft.), Average velocity =   8.894(Ft/s)


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Process from Point/Station      162.000 to Point/Station      164.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     29.758(CFS)
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```
Depth of flow =   0.562(Ft.), Average velocity =   8.650(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    29.758(CFS)
  '     '    flow top width =      7.247(Ft.)
  '     '     velocity=    8.650(Ft/s)
  '     '    area =      3.440(Sq.Ft)
  '     '    Froude number =     2.213

Upstream point elevation =  1200.000(Ft.)
Downstream point elevation =  1020.000(Ft.)
Flow length =   750.000(Ft.)
Travel time  =    1.45 min.
Time of concentration =   11.93 min.
Depth of flow =   0.562(Ft.)
Average velocity =   8.650(Ft/s)
Total irregular channel flow =    29.758(CFS)
Irregular channel normal depth above invert elev. =   0.562(Ft.)
Average velocity of channel(s) =   8.650(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.660
Decimal fraction soil group D = 0.340
SCS curve number for soil(AMC 2)  = 76.04
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.233(In/Hr)
Max Catchment Loss (Fm) =     0.233(In/Hr)
Rainfall intensity =      2.466(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.813
Subarea runoff =     23.194(CFS) for   12.250(Ac.)
Total runoff =     41.326(CFS)    Total area =      20.62(Ac.)
Area averaged Fm value =    0.239(In/Hr)
Depth of flow =   0.677(Ft.), Average velocity =   9.606(Ft/s)


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Process from Point/Station      163.000 to Point/Station      164.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.970
Decimal fraction soil group D = 0.030
SCS curve number for soil(AMC 2)  = 74.18
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.249(In/Hr)
Max Catchment Loss (Fm) =     0.249(In/Hr)
Time of concentration =    11.93 min.
Rainfall intensity =      2.466(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
```

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rational method)(Q=KCIA) is C = 0.811
Subarea runoff =     26.026(CFS) for   13.040(Ac.)
Total runoff =     67.352(CFS)     Total area =       33.66(Ac.)
Area averaged Fm value =    0.243(In/Hr)


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Process from Point/Station      164.000 to Point/Station      170.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     89.050(CFS)
Depth of flow =   1.346(Ft.), Average velocity =   8.597(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     89.050(CFS)
   '      '    flow top width =     10.386(Ft.)
   '      '     velocity=    8.598(Ft/s)
   '      '    area =     10.358(Sq.Ft)
   '      '    Froude number =     1.517

Upstream point elevation =  1020.000(Ft.)
Downstream point elevation =   920.000(Ft.)
Flow length =  1100.000(Ft.)
Travel time  =    2.13 min.
Time of concentration =   14.07 min.
Depth of flow =   1.346(Ft.)
Average velocity =   8.597(Ft/s)
Total irregular channel flow =    89.050(CFS)
Irregular channel normal depth above invert elev. =   1.346(Ft.)
Average velocity of channel(s) =   8.597(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.340
Decimal fraction soil group D = 0.660
SCS curve number for soil(AMC 2)  = 77.96
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.217(In/Hr)
Max Catchment Loss (Fm) =     0.217(In/Hr)
Rainfall intensity =      2.244(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.807
Subarea runoff =     43.297(CFS) for   27.410(Ac.)
Total runoff =    110.649(CFS)     Total area =       61.07(Ac.)
Area averaged Fm value =    0.231(In/Hr)
Depth of flow =   1.510(Ft.), Average velocity =   9.140(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      168.000 to Point/Station      170.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
```

```
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.460
Decimal fraction soil group D = 0.540
SCS curve number for soil(AMC 2)  = 81.70
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.223(In/Hr)
Max Catchment Loss (Fm) =     0.223(In/Hr)
Time of concentration =    14.07 min.
Rainfall intensity =      2.244(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.808
Subarea runoff =     63.037(CFS) for   34.650(Ac.)
Total runoff =    173.686(CFS)    Total area =       95.72(Ac.)
Area averaged Fm value =    0.228(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      170.000 to Point/Station      175.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    212.155(CFS)
Depth of flow =   2.382(Ft.), Average velocity =   9.122(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =    212.155(CFS)
   '      '    flow top width =     14.528(Ft.)
   '      '     velocity=    9.122(Ft/s)
   '      '    area =     23.258(Sq.Ft)
   '      '    Froude number =     1.270

Upstream point elevation =   920.000(Ft.)
Downstream point elevation =   850.000(Ft.)
Flow length =  1260.000(Ft.)
Travel time  =    2.30 min.
Time of concentration =   16.37 min.
Depth of flow =   2.382(Ft.)
Average velocity =   9.122(Ft/s)
Total irregular channel flow =   212.155(CFS)
Irregular channel normal depth above invert elev. =   2.382(Ft.)
Average velocity of channel(s) =   9.122(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.280
Decimal fraction soil group D = 0.720
SCS curve number for soil(AMC 2)  = 78.32
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.214(In/Hr)
Max Catchment Loss (Fm) =     0.214(In/Hr)
Rainfall intensity =      2.058(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
```

```
rational method)(Q=KCIA) is C = 0.802
Subarea runoff =     76.884(CFS) for   56.030(Ac.)
Total runoff =    250.570(CFS)    Total area =      151.75(Ac.)
Area averaged Fm value =    0.223(In/Hr)
Depth of flow =   2.585(Ft.), Average velocity =   9.532(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      175.000 to Point/Station      140.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    281.052(CFS)
Depth of flow =   2.711(Ft.), Average velocity =   9.945(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    281.053(CFS)
   '      '    flow top width =     15.846(Ft.)
   '      '     velocity=    9.945(Ft/s)
   '      '    area =     28.262(Sq.Ft)
   '      '    Froude number =     1.312

Upstream point elevation =   850.000(Ft.)
Downstream point elevation =   730.000(Ft.)
Flow length =  2090.000(Ft.)
Travel time  =    3.50 min.
Time of concentration =   19.87 min.
Depth of flow =   2.711(Ft.)
Average velocity =   9.945(Ft/s)
Total irregular channel flow =   281.052(CFS)
Irregular channel normal depth above invert elev. =   2.711(Ft.)
Average velocity of channel(s) =   9.945(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.100
Decimal fraction soil group C = 0.130
Decimal fraction soil group D = 0.770
SCS curve number for soil(AMC 2)  = 77.32
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.217(In/Hr)
Max Catchment Loss (Fm) =     0.217(In/Hr)
Rainfall intensity =      1.841(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.792
Subarea runoff =     60.873(CFS) for   61.840(Ac.)
Total runoff =    311.443(CFS)    Total area =      213.59(Ac.)
Area averaged Fm value =    0.221(In/Hr)
Depth of flow =   2.849(Ft.), Average velocity =  10.216(Ft/s)


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Process from Point/Station      150.000 to Point/Station      140.000
**** CONFLUENCE OF MINOR STREAMS ****
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```
Along Main Stream number: 1 in normal stream number 2
Stream flow area =    213.590(Ac.)
Runoff from this stream =    311.443(CFS)
Time of concentration =   19.87 min.
Rainfall intensity =     1.841(In/Hr)
Area averaged loss rate (Fm) =    0.2211(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    362.61   471.575     23.14    0.242      1.687
2    213.59   311.443     19.87    0.221      1.841
Qmax(1) =
         1.000 *    1.000 *   471.575) +
         0.905 *    1.000 *   311.443) + =     753.438
Qmax(2) =
         1.106 *    0.859 *   471.575) +
         1.000 *    1.000 *   311.443) + =     759.520

Total of 2 streams to confluence:
Flow rates before confluence point:
     471.575     311.443
Maximum flow rates at confluence using above data:
      753.438      759.520
Area of streams before confluence:
      362.610      213.590
Effective area values after confluence:
      576.200      524.973
Results of confluence:
Total flow rate =    759.520(CFS)
Time of concentration =    19.870 min.
Effective stream area after confluence =    524.973(Ac.)
Study area average Pervious fraction(Ap) =  1.000
Study area average soil loss rate(Fm) =    0.234(In/Hr)
Study area total (this main stream) =     576.20(Ac.)


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Process from Point/Station      140.000 to Point/Station      178.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    759.552(CFS)
Depth of flow =   4.596(Ft.), Average velocity =  11.645(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    759.552(CFS)
  '     '    flow top width =     23.384(Ft.)
  '     '     velocity=   11.645(Ft/s)
```

```
  '      '    area =      65.224(Sq.Ft)
  '      '    Froude number =      1.229

Upstream point elevation =    730.000(Ft.)
Downstream point elevation =    705.000(Ft.)
Flow length =    568.000(Ft.)
Travel time  =     0.81 min.
Time of concentration =    20.68 min.
Depth of flow =    4.596(Ft.)
Average velocity =  11.645(Ft/s)
Total irregular channel flow =    759.552(CFS)
Irregular channel normal depth above invert elev. =    4.596(Ft.)
Average velocity of channel(s) =  11.645(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.650
Decimal fraction soil group D = 0.350
SCS curve number for soil(AMC 2)  = 76.10
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.232(In/Hr)
Max Catchment Loss (Fm) =     0.232(In/Hr)
The area added to the existing stream with this TC
does not add flow per Para 6b, Page D-15 of the OCHM,
therefore the upstream flow rate of Q =    759.520(CFS) is being used
Rainfall intensity =      1.799(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.783
Subarea runoff =      0.000(CFS) for    5.720(Ac.)
Total runoff =    759.520(CFS)    Total area =      530.69(Ac.)
Area averaged Fm value =    0.234(In/Hr)
Depth of flow =    4.596(Ft.), Average velocity =  11.645(Ft/s)


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Process from Point/Station       10.000 to Point/Station      178.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    530.693(Ac.)
Runoff from this stream =    759.520(CFS)
Time of concentration =    20.68 min.
Rainfall intensity =    1.799(In/Hr)
Area averaged loss rate (Fm) =    0.2345(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


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Process from Point/Station      176.000 to Point/Station      177.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 61.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.300(In/Hr)
Max Catchment Loss (Fm) =     0.300(In/Hr)
Initial subarea data:
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Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1225.000(Ft.)
Bottom (of initial area) elevation =  1175.000(Ft.)
Difference in elevation =    50.000(Ft.)
Slope =    0.16667  s(%)=      16.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.101 min.
Rainfall intensity =      2.338(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.784
Subarea runoff =      2.201(CFS)
Total initial stream area =        1.200(Ac.)


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Process from Point/Station      177.000 to Point/Station      178.000
**** STREET INLET + AREA  + PIPE  TRAVEL TIME ****
------------------------------------------------------------------------
Top of street segment elevation =  1175.000(Ft.)
End of street segment elevation =   915.000(Ft.)
Length of street segment  =  2250.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  13.000(Ft.)
Distance from crown to crossfall grade break  =   5.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.017
Slope from grade break to crown (v/hz)  =   0.017
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   2.000(Ft.)
Slope from curb to property line (v/hz) =   0.017
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
No street inlet installed at this point
Estimated mean flow rate at midpoint of street =     29.851(CFS)
Depth of flow =   0.366(Ft.), Average velocity =   8.619(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  13.000(Ft.)
Flow velocity =   8.62(Ft/s)
Travel time =    4.35 min.     TC =   17.45  min.
 Adding area flow to street
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.290
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.710
SCS curve number for soil(AMC 2)  = 69.49
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=     0.229(In/Hr)
Max Catchment Loss (Fm) =     0.183(In/Hr)
Rainfall intensity =      1.983(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.815
Subarea runoff =     55.141(CFS) for   34.270(Ac.)
Total runoff =     57.342(CFS)    Total area =       35.47(Ac.)
Area averaged Fm value =    0.187(In/Hr)
Street flow at end of street =     57.342(CFS)
Half street flow at end of street =     28.671(CFS)
Depth of flow =   0.430(Ft.), Average velocity =  11.169(Ft/s)
Note:  depth of flow exceeds top of street crown.
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Flow width (from curb towards crown)=  13.000(Ft.)

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Process from Point/Station      176.000 to Point/Station      178.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      35.470(Ac.)
Runoff from this stream =      57.342(CFS)
Time of concentration =   17.45 min.
Rainfall intensity =     1.983(In/Hr)
Area averaged loss rate (Fm) =    0.1872(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8068
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    530.69   759.520     20.68    0.234      1.799
2     35.47    57.342     17.45    0.187      1.983
Qmax(1) =
         1.000 *    1.000 *   759.520) +
         0.898 *    1.000 *    57.342) + =     810.989
Qmax(2) =
         1.118 *    0.844 *   759.520) +
         1.000 *    1.000 *    57.342) + =     773.533

Total of 2 streams to confluence:
Flow rates before confluence point:
     759.520      57.342
Maximum flow rates at confluence using above data:
      810.989      773.533
Area of streams before confluence:
      530.693      35.470
Effective area values after confluence:
      566.163      483.248
Results of confluence:
Total flow rate =    810.989(CFS)
Time of concentration =    20.683 min.
Effective stream area after confluence =    566.163(Ac.)
Study area average Pervious fraction(Ap) =  0.988
Study area average soil loss rate(Fm) =    0.232(In/Hr)
Study area total (this main stream) =     566.16(Ac.)


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Process from Point/Station      178.000 to Point/Station      182.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    811.033(CFS)
Depth of flow =   4.864(Ft.), Average velocity =  11.321(Ft/s)
     ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
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     4            205.00              50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =    811.033(CFS)
  '      '    flow top width =     24.456(Ft.)
  '      '     velocity=   11.321(Ft/s)
  '      '    area =     71.637(Sq.Ft)
  '      '    Froude number =    1.166

Upstream point elevation =   705.000(Ft.)
Downstream point elevation =   665.000(Ft.)
Flow length =  1025.000(Ft.)
Travel time  =    1.51 min.
Time of concentration =   22.19 min.
Depth of flow =   4.864(Ft.)
Average velocity =  11.321(Ft/s)
Total irregular channel flow =   811.033(CFS)
Irregular channel normal depth above invert elev. =   4.864(Ft.)
Average velocity of channel(s) =  11.321(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.010
Decimal fraction soil group D = 0.990
SCS curve number for soil(AMC 2)  = 79.94
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.201(In/Hr)
Max Catchment Loss (Fm) =     0.201(In/Hr)
The area added to the existing stream with this TC
does not add flow per Para 6b, Page D-15 of the OCHM,
therefore the upstream flow rate of Q =    810.989(CFS) is being used
Rainfall intensity =      1.728(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.780
Subarea runoff =      0.000(CFS) for   31.920(Ac.)
Total runoff =    810.989(CFS)    Total area =    598.08(Ac.)
Area averaged Fm value =    0.230(In/Hr)
Depth of flow =   4.864(Ft.), Average velocity =  11.321(Ft/s)


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Process from Point/Station       10.000 to Point/Station      182.000
**** CONFLUENCE OF MINOR STREAMS ****
_________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    598.083(Ac.)
Runoff from this stream =    810.989(CFS)
Time of concentration =   22.19 min.
Rainfall intensity =     1.728(In/Hr)
Area averaged loss rate (Fm) =    0.2299(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9885


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Process from Point/Station      179.000 to Point/Station      180.000
**** INITIAL AREA EVALUATION ****
_________________________________________________________________________
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
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Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 80.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.200(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1085.000(Ft.)
Bottom (of initial area) elevation =   990.000(Ft.)
Difference in elevation =    95.000(Ft.)
Slope =    0.31667  s(%)=      31.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.522 min.
Rainfall intensity =      2.516(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.828
Subarea runoff =      3.544(CFS)
Total initial stream area =      1.700(Ac.)


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Process from Point/Station      180.000 to Point/Station      182.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     21.018(CFS)
Depth of flow =   0.487(Ft.), Average velocity =   7.224(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     21.018(CFS)
  '     '    flow top width =      6.948(Ft.)
  '     '     velocity=    7.224(Ft/s)
  '     '    area =      2.909(Sq.Ft)
  '     '    Froude number =     1.967

Upstream point elevation =   990.000(Ft.)
Downstream point elevation =   665.000(Ft.)
Flow length =  1650.000(Ft.)
Travel time  =    3.81 min.
Time of concentration =   15.33 min.
Depth of flow =   0.487(Ft.)
Average velocity =   7.224(Ft/s)
Total irregular channel flow =    21.018(CFS)
Irregular channel normal depth above invert elev. =   0.487(Ft.)
Average velocity of channel(s) =   7.224(Ft/s)
 Adding area flow to channel
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.030
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.970
SCS curve number for soil(AMC 2)  = 74.43
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=     0.203(In/Hr)
Max Catchment Loss (Fm) =     0.162(In/Hr)
```

```
Rainfall intensity =      2.136(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.830
Subarea runoff =     34.880(CFS) for   19.960(Ac.)
Total runoff =     38.424(CFS)    Total area =       21.66(Ac.)
Area averaged Fm value =    0.165(In/Hr)
Depth of flow =   0.687(Ft.), Average velocity =   8.774(Ft/s)


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Process from Point/Station      179.000 to Point/Station      182.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     21.660(Ac.)
Runoff from this stream =     38.424(CFS)
Time of concentration =   15.33 min.
Rainfall intensity =     2.136(In/Hr)
Area averaged loss rate (Fm) =    0.1654(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8157
Summary of stream data:

Stream  Area  Flow rate      TC     Fm      Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    598.08   810.989     22.19    0.230      1.728
2     21.66    38.424     15.33    0.165      2.136
Qmax(1) =
         1.000 *    1.000 *   810.989) +
         0.793 *    1.000 *    38.424) + =     841.456
Qmax(2) =
         1.272 *    0.691 *   810.989) +
         1.000 *    1.000 *    38.424) + =     751.191

Total of 2 streams to confluence:
Flow rates before confluence point:
     810.989      38.424
Maximum flow rates at confluence using above data:
      841.456      751.191
Area of streams before confluence:
      598.083      21.660
Effective area values after confluence:
      619.743      434.785
Results of confluence:
Total flow rate =    841.456(CFS)
Time of concentration =    22.192 min.
Effective stream area after confluence =    619.743(Ac.)
Study area average Pervious fraction(Ap) =  0.982
Study area average soil loss rate(Fm) =    0.228(In/Hr)
Study area total (this main stream) =     619.74(Ac.)


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Process from Point/Station      182.000 to Point/Station      190.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    841.490(CFS)
Depth of flow =   5.043(Ft.), Average velocity =  11.061(Ft/s)
     ******* Irregular Channel Data ***********
```

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------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    841.491(CFS)
   '      '    flow top width =     25.171(Ft.)
   '      '     velocity=   11.061(Ft/s)
   '      '    area =     76.075(Sq.Ft)
   '      '    Froude number =     1.121

Upstream point elevation =   665.000(Ft.)
Downstream point elevation =   610.000(Ft.)
Flow length =  1538.000(Ft.)
Travel time  =    2.32 min.
Time of concentration =   24.51 min.
Depth of flow =   5.043(Ft.)
Average velocity =  11.061(Ft/s)
Total irregular channel flow =   841.490(CFS)
Irregular channel normal depth above invert elev. =   5.043(Ft.)
Average velocity of channel(s) =  11.061(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.280
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.720
SCS curve number for soil(AMC 2)  = 74.68
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.228(In/Hr)
Max Catchment Loss (Fm) =     0.228(In/Hr)
The area added to the existing stream with this TC
does not add flow per Para 6b, Page D-15 of the OCHM,
therefore the upstream flow rate of Q =    841.456(CFS) is being used
Rainfall intensity =      1.633(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.775
Subarea runoff =      0.000(CFS) for   25.750(Ac.)
Total runoff =    841.456(CFS)    Total area =      645.49(Ac.)
Area averaged Fm value =    0.228(In/Hr)
Depth of flow =   5.043(Ft.), Average velocity =  11.061(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station      190.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    645.493(Ac.)
Runoff from this stream =    841.456(CFS)
Time of concentration =   24.51 min.
Rainfall intensity =     1.633(In/Hr)
Area averaged loss rate (Fm) =    0.2276(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9832
Program is now starting with Main Stream No. 2
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      193.000 to Point/Station      190.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
------------------------------------------------------------------------
RESIDENTIAL(3 - 4 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.200
Decimal fraction soil group C = 0.300
Decimal fraction soil group D = 0.500
SCS curve number for soil(AMC 2)  = 69.40
Pervious ratio(Ap) = 0.6000  Max loss rate(Fp)=     0.235(In/Hr)
Max Catchment Loss (Fm) =     0.141(In/Hr)
Rainfall intensity =      1.652(In/Hr) for a    10.0 year storm
User specified values are as follows:
TC =  24.00 min.  Rain intensity =       1.65(In/Hr)
Total area =       435.56(Ac.)  Total runoff =    946.00(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      194.000 to Point/Station      190.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =    435.560(Ac.)
Runoff from this stream =    946.000(CFS)
Time of concentration =   24.00 min.
Rainfall intensity =     1.652(In/Hr)
Area averaged loss rate (Fm) =    0.1410(In/Hr)
Area averaged Pervious ratio (Ap) = 0.6000
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      210.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1515.000(Ft.)
Bottom (of initial area) elevation =  1370.000(Ft.)
Difference in elevation =   145.000(Ft.)
Slope =    0.48333  s(%)=      48.33
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.588 min.
Rainfall intensity =      2.641(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.815
Subarea runoff =      1.958(CFS)
Total initial stream area =        0.910(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      210.000 to Point/Station      214.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      6.457(CFS)
Depth of flow =   0.196(Ft.), Average velocity =   6.111(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00             50.00
     2            100.00              0.00
     3            105.00              0.00
     4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =      6.457(CFS)
  '     '   flow top width =      5.784(Ft.)
  '     '    velocity=    6.111(Ft/s)
  '     '   area =      1.057(Sq.Ft)
  '     '   Froude number =     2.520

Upstream point elevation =  1370.000(Ft.)
Downstream point elevation =  1245.000(Ft.)
Flow length =   300.000(Ft.)
Travel time  =    0.82 min.
Time of concentration =   11.41 min.
Depth of flow =   0.196(Ft.)
Average velocity =   6.111(Ft/s)
Total irregular channel flow =     6.457(CFS)
Irregular channel normal depth above invert elev. =   0.196(Ft.)
Average velocity of channel(s) =   6.111(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.580
Decimal fraction soil group D = 0.420
SCS curve number for soil(AMC 2)  = 76.52
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.229(In/Hr)
Max Catchment Loss (Fm) =     0.229(In/Hr)
Rainfall intensity =      2.531(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.817
Subarea runoff =      8.942(CFS) for    4.360(Ac.)
Total runoff =     10.900(CFS)    Total area =        5.27(Ac.)
Area averaged Fm value =    0.233(In/Hr)
Depth of flow =   0.267(Ft.), Average velocity =   7.378(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      214.000 to Point/Station      216.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     17.603(CFS)
Depth of flow =   0.457(Ft.), Average velocity =   6.519(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
```

```
      1             0.00            50.00
      2           100.00             0.00
      3           105.00             0.00
      4           205.00            50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =     17.603(CFS)
   '      '   flow top width =      6.827(Ft.)
   '      '    velocity=    6.519(Ft/s)
   '      '   area =      2.700(Sq.Ft)
   '      '   Froude number =    1.827

Upstream point elevation =  1245.000(Ft.)
Downstream point elevation =  1150.000(Ft.)
Flow length =   550.000(Ft.)
Travel time  =    1.41 min.
Time of concentration =   12.81 min.
Depth of flow =   0.457(Ft.)
Average velocity =   6.519(Ft/s)
Total irregular channel flow =    17.603(CFS)
Irregular channel normal depth above invert elev. =   0.457(Ft.)
Average velocity of channel(s) =   6.519(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.730
Decimal fraction soil group D = 0.270
SCS curve number for soil(AMC 2)  = 75.62
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.236(In/Hr)
Max Catchment Loss (Fm) =     0.236(In/Hr)
Rainfall intensity =      2.368(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.811
Subarea runoff =     13.343(CFS) for    7.360(Ac.)
Total runoff =     24.243(CFS)    Total area =       12.63(Ac.)
Area averaged Fm value =    0.235(In/Hr)
Depth of flow =   0.549(Ft.), Average velocity =   7.243(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      216.000 to Point/Station      220.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     52.890(CFS)
Depth of flow =   0.809(Ft.), Average velocity =   9.877(Ft/s)
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1             0.00            50.00
      2           100.00             0.00
      3           105.00             0.00
      4           205.00            50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =     52.890(CFS)
   '      '   flow top width =      8.236(Ft.)
   '      '    velocity=    9.877(Ft/s)
   '      '   area =      5.355(Sq.Ft)
```

```
  '     '    Froude number =     2.159

Upstream point elevation =  1150.000(Ft.)
Downstream point elevation =  1050.000(Ft.)
Flow length =   480.000(Ft.)
Travel time  =    0.81 min.
Time of concentration =   13.62 min.
Depth of flow =   0.809(Ft.)
Average velocity =   9.877(Ft/s)
Total irregular channel flow =    52.890(CFS)
Irregular channel normal depth above invert elev. =   0.809(Ft.)
Average velocity of channel(s) =   9.877(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.420
Decimal fraction soil group D = 0.580
SCS curve number for soil(AMC 2)  = 77.48
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.221(In/Hr)
Max Catchment Loss (Fm) =     0.221(In/Hr)
Rainfall intensity =      2.286(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.811
Subarea runoff =     57.203(CFS) for   31.280(Ac.)
Total runoff =     81.446(CFS)    Total area =       43.91(Ac.)
Area averaged Fm value =    0.225(In/Hr)
Depth of flow =   1.027(Ft.), Average velocity =  11.247(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      220.000 to Point/Station      230.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    127.304(CFS)
Depth of flow =   1.697(Ft.), Average velocity =   8.939(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    127.304(CFS)
  '     '    flow top width =     11.787(Ft.)
  '     '     velocity=    8.939(Ft/s)
  '     '    area =     14.241(Sq.Ft)
  '     '    Froude number =     1.433

Upstream point elevation =  1050.000(Ft.)
Downstream point elevation =   885.000(Ft.)
Flow length =  2150.000(Ft.)
Travel time  =    4.01 min.
Time of concentration =   17.63 min.
Depth of flow =   1.697(Ft.)
Average velocity =   8.939(Ft/s)
Total irregular channel flow =   127.304(CFS)
```

```
Irregular channel normal depth above invert elev. =   1.697(Ft.)
Average velocity of channel(s) =   8.939(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.650
Decimal fraction soil group D = 0.350
SCS curve number for soil(AMC 2)  = 76.10
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.232(In/Hr)
Max Catchment Loss (Fm) =     0.232(In/Hr)
Rainfall intensity =    1.972(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.795
Subarea runoff =     91.640(CFS) for   66.470(Ac.)
Total runoff =    173.086(CFS)    Total area =      110.38(Ac.)
Area averaged Fm value =    0.230(In/Hr)
Depth of flow =   1.985(Ft.), Average velocity =   9.721(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      230.000 to Point/Station      240.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    206.181(CFS)
Depth of flow =   2.274(Ft.), Average velocity =   9.498(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    206.181(CFS)
  '     '   flow top width =     14.095(Ft.)
  '     '    velocity=    9.498(Ft/s)
  '     '   area =     21.707(Sq.Ft)
  '     '   Froude number =    1.349

Upstream point elevation =   885.000(Ft.)
Downstream point elevation =   695.000(Ft.)
Flow length =  3000.000(Ft.)
Travel time  =    5.26 min.
Time of concentration =   22.89 min.
Depth of flow =   2.274(Ft.)
Average velocity =   9.498(Ft/s)
Total irregular channel flow =   206.181(CFS)
Irregular channel normal depth above invert elev. =   2.274(Ft.)
Average velocity of channel(s) =   9.498(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.630
Decimal fraction soil group D = 0.370
SCS curve number for soil(AMC 2)  = 76.22
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.231(In/Hr)
```

```
Max Catchment Loss (Fm) =     0.231(In/Hr)
Rainfall intensity =      1.698(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.778
Subarea runoff =     66.136(CFS) for   70.760(Ac.)
Total runoff =    239.222(CFS)    Total area =      181.14(Ac.)
Area averaged Fm value =    0.230(In/Hr)
Depth of flow =   2.447(Ft.), Average velocity =   9.881(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      240.000 to Point/Station      190.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =    253.562(CFS)
Depth of flow =   2.587(Ft.), Average velocity =   9.632(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    253.562(CFS)
   '      '    flow top width =     15.349(Ft.)
   '      '     velocity=    9.632(Ft/s)
   '      '    area =     26.324(Sq.Ft)
   '      '    Froude number =     1.296

Upstream point elevation =   695.000(Ft.)
Downstream point elevation =   610.000(Ft.)
Flow length =  1500.000(Ft.)
Travel time  =    2.60 min.
Time of concentration =   25.49 min.
Depth of flow =   2.587(Ft.)
Average velocity =   9.632(Ft/s)
Total irregular channel flow =   253.562(CFS)
Irregular channel normal depth above invert elev. =   2.587(Ft.)
Average velocity of channel(s) =   9.632(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.490
Decimal fraction soil group D = 0.510
SCS curve number for soil(AMC 2)  = 77.06
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.225(In/Hr)
Max Catchment Loss (Fm) =     0.225(In/Hr)
Rainfall intensity =      1.596(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.771
Subarea runoff =     28.598(CFS) for   36.540(Ac.)
Total runoff =    267.820(CFS)    Total area =      217.68(Ac.)
Area averaged Fm value =    0.229(In/Hr)
Depth of flow =   2.657(Ft.), Average velocity =   9.772(Ft/s)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      240.000 to Point/Station      190.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =    217.680(Ac.)
Runoff from this stream =    267.820(CFS)
Time of concentration =   25.49 min.
Rainfall intensity =     1.596(In/Hr)
Area averaged loss rate (Fm) =    0.2293(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    645.49   841.456     24.51    0.228      1.633
2    435.56   946.000     24.00    0.141      1.652
3    217.68   267.820     25.49    0.229      1.596
Qmax(1) =
         1.000 *    1.000 *   841.456) +
         0.987 *    1.000 *   946.000) +
         1.027 *    0.962 *   267.820) + =    2039.438
Qmax(2) =
         1.014 *    0.979 *   841.456) +
         1.000 *    1.000 *   946.000) +
         1.041 *    0.942 *   267.820) + =    2044.065
Qmax(3) =
         0.974 *    1.000 *   841.456) +
         0.963 *    1.000 *   946.000) +
         1.000 *    1.000 *   267.820) + =    1998.444

Total of 3 main streams to confluence:
Flow rates before confluence point:
     842.456     947.000     268.820
Maximum flow rates at confluence using above data:
     2039.438     2044.065     1998.444
Area of streams before confluence:
      645.493      435.560      217.680
Effective area values after confluence:
     1290.356     1272.593     1298.733

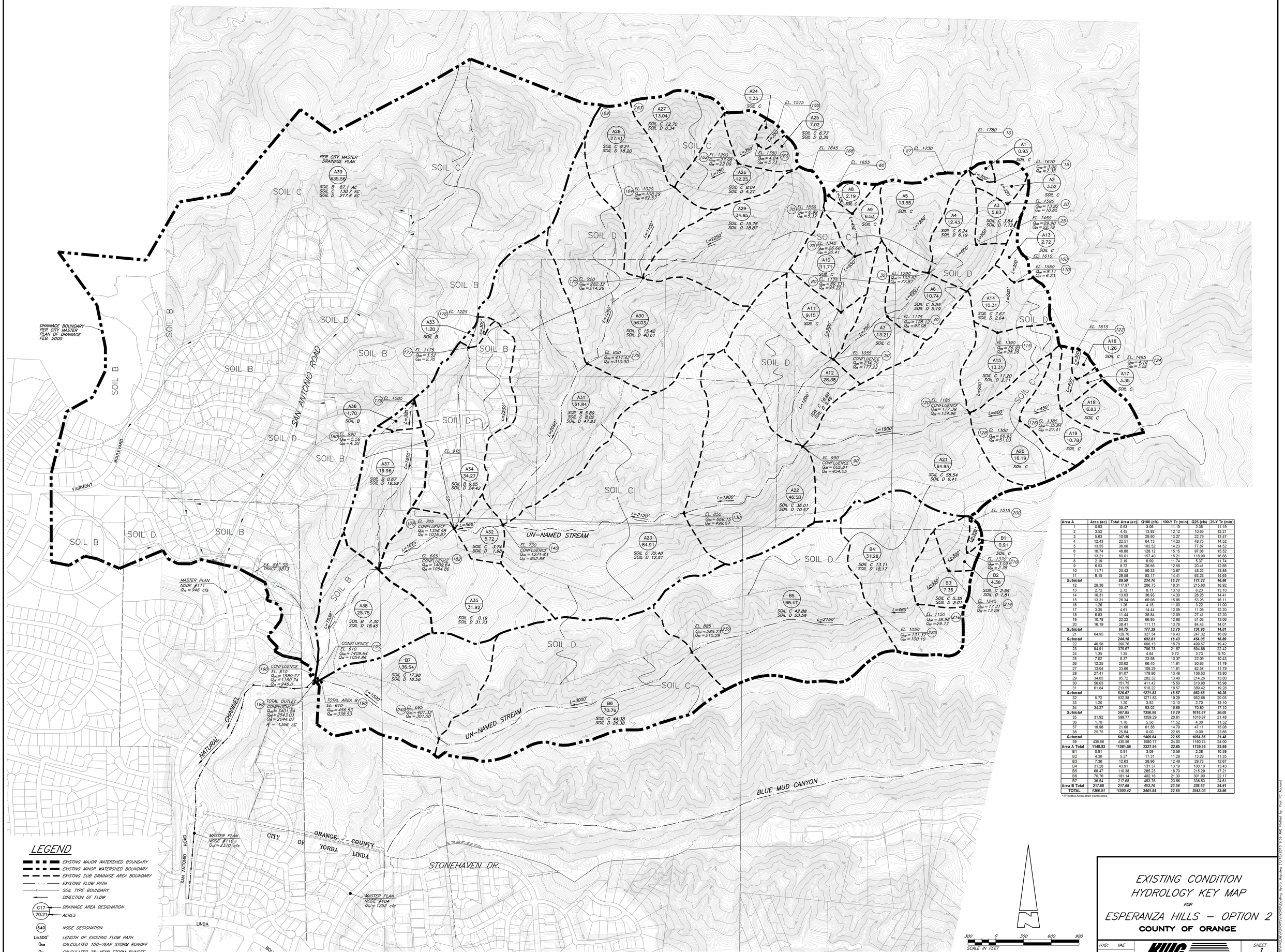

Results of confluence:
Total flow rate =   2044.065(CFS)
Time of concentration =    24.000 min.
Effective stream area after confluence  =   1272.593(Ac.)
Study area average Pervious fraction(Ap) =  0.857
Study area average soil loss rate(Fm) =    0.199(In/Hr)
Study area total =    1298.73(Ac.)
End of computations, total study area =         1366.51 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.865
Area averaged SCS curve number (AMC 2) =  73.9
```

Appendix

F

EXISTING CONDITION HYDROLOGIC KEY MAP



Area A	Area (ac)	Total Area (ac)	Q100 (cfs)	100-Y Tc (min)	Q25 (cfs)	25-Y Tc (min)
1	0.93	0.93	3.06	11.19	2.35	11.19
2	3.52	4.45	13.92	12.12	10.65	12.21
3	5.63	10.08	29.90	13.27	22.79	13.47
4	12.43	22.51	64.13	14.23	48.75	14.52
5	13.55	36.06	102.52	14.23	77.87	14.52
6	10.74	46.80	128.12	15.15	97.08	15.52
7	13.21	60.01	157.40	16.21	118.90	16.66
8	2.19	2.19	8.99	11.74	5.37	11.74
9	6.53	8.72	26.66	12.58	20.41	12.66
10	11.71	20.43	59.33	13.67	45.22	13.85
11	9.15	29.58	83.17	14.41	63.23	14.65
Subtotal		***89.59***	***234.70***	***16.21***	***177.22***	***16.66***
12	28.38	117.97	286.17	18.31	215.60	18.92
13	2.72	2.72	8.11	13.10	6.23	13.10
14	10.31	13.03	36.93	14.30	28.26	14.41
15	13.31	26.34	69.98	15.86	53.26	16.11
16	1.26	1.26	4.18	11.00	3.22	11.00
17	3.35	4.61	14.44	12.09	11.05	12.20
18	6.83	11.44	35.84	12.09	27.41	12.20
19	10.78	22.22	66.95	12.88	51.03	13.06
20	16.19	38.41	111.11	13.76	84.43	14.01
Subtotal		***64.75***	***177.39***	***13.76***	***134.96***	***14.01***
21	64.95	129.70	327.54	16.43	247.32	16.89
Subtotal		***244.18***	***602.81***	***16.43***	***454.05***	***16.89***
22	46.58	290.76	666.15	18.78	499.57	19.42
23	84.91	375.67	796.78	21.57	594.88	22.42
24	1.35	1.35	4.84	9.70	3.73	9.70
25	7.02	8.37	23.98	10.37	22.09	10.43
26	12.25	20.62	66.40	11.61	50.65	11.79
27	13.04	33.66	108.29	11.61	82.57	11.79
28	27.41	61.07	179.96	13.48	136.53	13.80
29	34.65	95.72	282.32	13.48	214.26	13.80
30	56.03	151.75	411.42	15.50	310.90	15.98
31	61.84	213.59	518.22	18.57	389.42	19.28
Subtotal		***526.67***	***1271.83***	***18.57***	***952.68***	***19.28***
32	5.72	532.38	1271.83	19.29	952.68	20.05
33	1.20	1.20	3.52	13.10	2.70	13.10
34	34.27	35.47	93.02	16.69	70.80	17.10
Subtotal		***567.85***	***1356.98***	***19.29***	***1016.87***	***20.05***
35	31.92	599.77	1359.29	20.61	1016.87	21.48
36	1.70	1.70	5.56	11.52	4.30	11.52
37	19.96	21.66	61.56	14.79	47.11	15.08
38	25.75	25.84	0.00	22.65	0.00	23.66
Subtotal		***647.19***	***1409.64***	***22.65***	***1054.86***	***21.48***
39	435.56	435.56	1580.77	24.00	1160.74	24.00
Area A Total	**1148.83**	****1081.56***	***2327.94***	***22.65***	***1739.46***	***23.66***
B1	0.91	0.91	3.09	10.59	2.38	10.59
B2	4.36	5.27	17.31	11.28	13.28	11.35
B3	7.36	12.63	38.96	12.49	29.73	12.67
B4	31.28	43.91	131.37	13.19	100.10	13.43
B5	66.47	110.38	285.23	16.70	215.29	17.21
B6	70.76	181.14	402.16	21.30	301.00	22.17
B7	36.54	217.68	453.76	23.56	338.53	24.61
Area B Total	***217.68***	***217.68***	***453.76***	***23.56***	***338.53***	***24.61***
TOTAL	***1366.51***	****1300.42***	***3401.84***	***22.65***	***2543.03***	***23.66***

* Effective Area after confluence

LEGEND

- EXISTING MAJOR WATERSHED BOUNDARY
- EXISTING MINOR WATERSHED BOUNDARY
- EXISTING SUB DRAINAGE AREA BOUNDARY
- EXISTING FLOW PATH
- SOIL TYPE BOUNDARY
- DIRECTION OF FLOW
- C17 / 70.21 — DRAINAGE AREA DESIGNATION / ACRES
- 340 — NODE DESIGNATION
- L=300' — LENGTH OF EXISTING FLOW PATH
- Q_{100} — CALCULATED 100-YEAR STORM RUNOFF
- Q_{25} — CALCULATED 25-YEAR STORM RUNOFF

SCALE IN FEET: 300 0 300 600 900

FIGURE 9

EXISTING CONDITION HYDROLOGY KEY MAP
FOR
ESPERANZA HILLS – OPTION 2
COUNTY OF ORANGE

HYD: VAE
DRAFT: VAE
CHECK: MCT

KWC ENGINEERS
CIVIL ENGINEERING, PLANNING AND CONSTRUCTION MANAGEMENT
1880 COMPTON AVENUE, SUITE 100 • CORONA, CA. 92881-3370 • 909-734-2130

SHEET 1 OF 1

K:\09\12003.P6\DWG\HYDRO\Exhibits\Existing Hydro Map.dwg 7/17/2013 3:59 AM Plotted By: Tom Fc Kimball

Appendix

G

PROPOSED CONDITION HYDROLOGY RATIONAL METHOD

TABLE 5
ESPERANZA HILLS
PROPOSED CONDITION HYDROLOGY SUMMARY TABLE

Sub Area	Area (ac)	Total Area (ac)	Q100 (cfs)	100-Y Tc (min)	Q25 (cfs)	25-Y Tc (min)
C1	0.93	0.93	3.06	11.19	2.35	11.19
C2	3.52	4.45	13.92	12.12	10.65	12.21
C3	5.63	10.08	29.90	13.27	22.79	13.47
C4	12.43	22.51	64.13	14.23	48.75	14.52
C5	13.55	36.06	102.52	14.23	77.87	14.52
C6	16.32	52.38	140.65	15.62	106.43	16.32
Confluence		***52.38***	***140.65***	***15.62***	***106.43***	***16.32***
C7	2.19	2.19	7.15	11.29	5.50	11.29
C8	6.53	8.72	27.19	12.18	20.82	12.26
C9	15.93	24.65	72.06	13.53	54.86	13.73
Confluence		***77.03***	***206.48***	***15.77***	***156.17***	***16.18***
G1	0.77	0.77	2.70	10.45	2.09	10.45
G2	29.41	30.18	76.62	17.78	58.28	18.28
G3	1.09	1.09	3.73	11.00	2.89	11.00
G4	27.78	28.87	77.74	16.20	59.44	16.54
Confluence		***136.08***	***357.90***	***16.49***	***271.33***	***16.95***
C10	2.74	2.72	8.17	13.10	6.23	13.10
C11	10.27	13.01	36.87	14.30	28.26	14.41
C12	13.29	26.30	69.87	15.86	53.26	16.11
C13	1.26	1.26	4.18	11.00	3.22	11.00
C14	3.35	4.61	14.44	12.09	11.05	12.20
C15	6.83	11.44	35.84	12.09	27.41	12.20
C16	10.76	22.20	66.95	12.88	51.03	13.06
C17	16.19	38.41	111.11	13.76	84.43	14.01
Confluence		***64.71***	***177.28***	***16.62***	***134.88***	***14.01***
C18	62.00	123.27	314.85	16.84	237.51	17.32
Confluence		***257.12***	***666.08***	***16.62***	***503.85***	***17.08***
G5	18.34	268.79	12.67	17.36	8.13	17.89
G6	1.08	1.08	3.88	9.96	3.09	9.96
G7	26.20	27.28	84.45	13.25	64.71	13.46
Confluence		***296.07***	***749.18***	***17.36***	***585.30***	***17.89***
G8	10.46	306.53	775.58	17.67	585.30	17.89
G9	3.35	309.88	775.58	17.67	585.30	17.89
G10	7.09	316.97	793.35	17.67	598.44	17.89
G11	8.01	324.98	793.35	17.67	598.44	19.12
Confluence		***324.98***	793.35	***16.62***	***598.44***	***19.12***
G12	1.28	1.28	4.74	10.77	3.67	10.77
G13	31.13	32.41	95.77	14.03	73.15	14.24
G14	9.13	41.54	128.91	14.03	98.99	14.24
Confluence		***366.52***	***897.24***	***18.51***	***677.40***	***19.13***
G15	32.92	208.36	951.55	19.31	716.66	19.13
G16	0.72	0.72	2.72	9.32	2.11	9.32
G17	62.03	62.75	181.98	14.30	138.98	14.63
D1	0.91	0.91	3.67	8.00	2.82	8.00
D2	4.34	5.27	20.33	8.65	15.61	8.71
D3	7.36	12.63	45.16	9.80	34.44	9.96
D4	30.06	42.69	146.95	10.48	111.84	10.70
D5	57.57	100.26	292.97	13.66	220.84	14.13
Confluence		***562.45***	***1364.47***	***19.31***	***1028.94***	***20.00***
G18	10.88	10.88	0.00	19.77	***0.00***	***20.50***
E1	1.42	1.42	5.09	9.70	3.98	8.69

TABLE 5
ESPERANZA HILLS
PROPOSED CONDITION HYDROLOGY SUMMARY TABLE

E2	7.05	8.47	29.17	10.37	23.53	9.41
E3	12.28	20.75	66.85	11.61	53.63	10.74
E4	13.12	33.87	109.01	11.61	87.43	10.74
E5	27.41	61.28	180.65	13.47	143.55	12.72
E6	31.97	93.26	275.21	13.47	222.71	12.72
E7	46.19	139.44	378.04	15.52	299.01	14.90
E8	61.66	201.10	486.96	18.65	380.02	18.24
E9	32.08	233.18	563.76	18.65	438.22	18.24
E10	7.88	241.06	567.20	18.65	438.85	19.17
E11	1.30	1.30	3.82	13.10	2.70	13.10
E12	34.16	35.46	92.99	16.69	72.29	17.07
Confluence		***276.52***	***651.79***	***19.48***	***506.96***	***19.17***
E13	14.48	291.00	653.41	21.08	511.62	20.87
E14	1.83	1.83	5.82	11.52	4.14	11.52
E15	19.82	21.65	61.37	14.79	47.71	15.07
Confluence		***312.65***	***702.88***	***21.08***	***550.86***	***20.87***
E16	21.88	334.53	715.58	22.85	550.86	23.93
E17	434.50	434.50	1580.77	24.00	439.80	23.93
Total Offsite		**769.03**	***2274.79***	***24.00***	***1694.18***	***24.00***
Confluence		1342.36	*3482.39*	*24.06*	*2624.40*	*20.55*
G19	0.62	0.62	2.82	6.73	2.18	6.73
G20	5.84	6.46	26.03	8.23	20.02	8.31
G21	8.15	14.61	55.20	9.09	42.30	9.21
G22	9.90	24.51	80.80	11.29	61.30	11.60
Total Onsite		**610.10**	**1445.30**		**1090.20**	
Total	**1379.20**	**1366.87***	**3533.00**	**24.12**	**2667.37**	**20.55**

* Effective Area after confluence

100-YEAR PROPOSED CONDITION

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2004 Version 8.0
Rational Hydrology Study, Date: 12/07/12 File Name: 1200prop100.roc

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ESPERANZA HILLS
PROPOSED CONDITION (ONSITE AND OFFSITE)
100-YEAR
R:\09\1200\PRELIM\REPORTS\HYDRO\RATIONAL\PROPOSED\1200A100

Program License Serial Number 6062

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 100.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

++
Process from Point/Station 10.000 to Point/Station 15.000
**** INITIAL AREA EVALUATION ****

C1

UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 74.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.250(In/Hr)
Max Catchment Loss (Fm) = 0.250(In/Hr)
Initial subarea data:
Initial area flow distance = 300.000(Ft.)
Top (of initial area) elevation = 1780.000(Ft.)
Bottom (of initial area) elevation = 1670.000(Ft.)
Difference in elevation = 110.000(Ft.)
Slope = 0.36667 s(%)= 36.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.189 min.
Rainfall intensity = 3.900(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.842
Subarea runoff = 3.055(CFS)
Total initial stream area = 0.930(Ac.)

++
Process from Point/Station 15.000 to Point/Station 20.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

C2

```
Estimated mean flow rate at midpoint of channel =      8.532(CFS)
Depth of flow =   0.269(Ft.), Average velocity =   5.736(Ft/s)
     ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------
Sub-Channel flow  =      8.532(CFS)
  '      '    flow top width =      6.074(Ft.)
  '      '     velocity=    5.736(Ft/s)
  '      '    area =      1.487(Sq.Ft)
  '      '    Froude number =     2.043

Upstream point elevation =  1670.000(Ft.)
Downstream point elevation =  1590.000(Ft.)
Flow length =   320.000(Ft.)
Travel time  =    0.93 min.
Time of concentration =   12.12 min.
Depth of flow =   0.269(Ft.)
Average velocity =   5.736(Ft/s)
Total irregular channel flow =     8.532(CFS)
Irregular channel normal depth above invert elev. =   0.269(Ft.)
Average velocity of channel(s) =   5.736(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      3.725(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.840
Subarea runoff =     10.864(CFS) for    3.520(Ac.)
Total runoff =     13.919(CFS)    Total area =       4.45(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.358(Ft.), Average velocity =   6.805(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       25.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                              C3
----------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     21.937(CFS)
Depth of flow =   0.464(Ft.), Average velocity =   7.983(Ft/s)
     ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
```

```
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =     21.937(CFS)
  '      '    flow top width =      6.854(Ft.)
  '      '     velocity=    7.983(Ft/s)
  '      '    area =      2.748(Sq.Ft)
  '      '    Froude number =     2.222

Upstream point elevation =  1590.000(Ft.)
Downstream point elevation =  1450.000(Ft.)
Flow length =   550.000(Ft.)
Travel time  =    1.15 min.
Time of concentration =   13.27 min.
Depth of flow =   0.464(Ft.)
Average velocity =   7.983(Ft/s)
Total irregular channel flow =    21.937(CFS)
Irregular channel normal depth above invert elev. =   0.464(Ft.)
Average velocity of channel(s) =   7.983(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.680
Decimal fraction soil group D = 0.320
SCS curve number for soil(AMC 2)  = 75.92
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.234(In/Hr)
Max Catchment Loss (Fm) =     0.234(In/Hr)
Rainfall intensity =      3.537(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.839
Subarea runoff =     15.983(CFS) for    5.630(Ac.)
Total runoff =     29.902(CFS)    Total area =       10.08(Ac.)
Area averaged Fm value =    0.241(In/Hr)
Depth of flow =   0.554(Ft.), Average velocity =   8.838(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       25.000 to Point/Station       30.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                              C4
-----------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     47.060(CFS)
Depth of flow =   0.707(Ft.), Average velocity =  10.374(Ft/s)
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =     47.060(CFS)
  '      '    flow top width =      7.829(Ft.)
  '      '     velocity=   10.374(Ft/s)
  '      '    area =      4.536(Sq.Ft)
```

```
'      '    Froude number =     2.402

Upstream point elevation =  1450.000(Ft.)
Downstream point elevation =  1290.000(Ft.)
Flow length =   600.000(Ft.)
Travel time  =    0.96 min.
Time of concentration =   14.23 min.
Depth of flow =   0.707(Ft.)
Average velocity =  10.374(Ft/s)
Total irregular channel flow =    47.060(CFS)
Irregular channel normal depth above invert elev. =   0.707(Ft.)
Average velocity of channel(s) =  10.374(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.500
SCS curve number for soil(AMC 2)  = 77.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.225(In/Hr)
Max Catchment Loss (Fm) =     0.225(In/Hr)
Rainfall intensity =      3.398(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.838
Subarea runoff =     34.230(CFS) for   12.430(Ac.)
Total runoff =     64.132(CFS)    Total area =       22.51(Ac.)
Area averaged Fm value =    0.232(In/Hr)
Depth of flow =   0.841(Ft.), Average velocity =  11.414(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       28.000 to Point/Station       30.000
**** SUBAREA FLOW ADDITION ****
                                                                  C5
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Time of concentration =    14.23 min.
Rainfall intensity =     3.398(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.837
Subarea runoff =     38.388(CFS) for   13.550(Ac.)
Total runoff =    102.520(CFS)    Total area =       36.06(Ac.)
Area averaged Fm value =    0.239(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.000 to Point/Station       40.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                  C6
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    121.618(CFS)
Depth of flow =   1.435(Ft.), Average velocity =  10.772(Ft/s)
      ******* Irregular Channel Data ***********
```

```
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    121.618(CFS)
   '      '    flow top width =     10.739(Ft.)
   '      '    velocity=   10.772(Ft/s)
   '      '    area =     11.290(Sq.Ft)
   '      '    Froude number =     1.851

Upstream point elevation =  1290.000(Ft.)
Downstream point elevation =  1170.000(Ft.)
Flow length =   900.000(Ft.)
Travel time  =    1.39 min.
Time of concentration =   15.62 min.
Depth of flow =   1.435(Ft.)
Average velocity =  10.772(Ft/s)
Total irregular channel flow =   121.618(CFS)
Irregular channel normal depth above invert elev. =   1.435(Ft.)
Average velocity of channel(s) =  10.772(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.680
Decimal fraction soil group D = 0.320
SCS curve number for soil(AMC 2)  = 75.92
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.234(In/Hr)
Max Catchment Loss (Fm) =     0.234(In/Hr)
Rainfall intensity =      3.221(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.834
Subarea runoff =     38.127(CFS) for   16.320(Ac.)
Total runoff =    140.648(CFS)    Total area =      52.38(Ac.)
Area averaged Fm value =    0.237(In/Hr)
Depth of flow =   1.548(Ft.), Average velocity =  11.220(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       40.000 to Point/Station       85.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1170.000(Ft.)
Downstream point/station elevation =  1162.000(Ft.)
Pipe length  =   198.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   140.648(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =   140.648(CFS)
Normal flow depth in pipe =   27.56(In.)
Flow top width inside pipe =   35.52(In.)
Critical depth could not be calculated.
Pipe flow velocity =     22.45(Ft/s)
Travel time through pipe =    0.15 min.
```

```
Time of concentration (TC) =    15.77 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       85.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     52.380(Ac.)
Runoff from this stream =    140.648(CFS)
Time of concentration =   15.77 min.
Rainfall intensity =     3.204(In/Hr)
Area averaged loss rate (Fm) =    0.2374(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       60.000 to Point/Station       70.000
**** INITIAL AREA EVALUATION ****
                                                                  C7
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1655.000(Ft.)
Bottom (of initial area) elevation =  1550.000(Ft.)
Difference in elevation =   105.000(Ft.)
Slope =    0.35000  s(%)=      35.00
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.294 min.
Rainfall intensity =      3.879(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.842
Subarea runoff =      7.153(CFS)
Total initial stream area =        2.190(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       70.000 to Point/Station       75.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                  C8
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     17.215(CFS)
Depth of flow =   0.342(Ft.), Average velocity =   8.857(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
```

```
Sub-Channel flow  =     17.215(CFS)
  '      '    flow top width =      6.368(Ft.)
  '      '     velocity=    8.857(Ft/s)
  '      '    area =      1.944(Sq.Ft)
  '      '    Froude number =     2.825

Upstream point elevation =  1550.000(Ft.)
Downstream point elevation =  1340.000(Ft.)
Flow length =   470.000(Ft.)
Travel time  =    0.88 min.
Time of concentration =   12.18 min.
Depth of flow =   0.342(Ft.)
Average velocity =   8.857(Ft/s)
Total irregular channel flow =    17.215(CFS)
Irregular channel normal depth above invert elev. =   0.342(Ft.)
Average velocity of channel(s) =   8.857(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=    0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      3.715(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.839
Subarea runoff =     20.041(CFS) for    6.530(Ac.)
Total runoff =     27.194(CFS)    Total area =        8.72(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.446(Ft.), Average velocity =  10.345(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       75.000 to Point/Station       80.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                  C9
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     49.666(CFS)
Depth of flow =   0.785(Ft.), Average velocity =   9.636(Ft/s)
     ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------------
Sub-Channel flow  =     49.666(CFS)
  '      '    flow top width =      8.138(Ft.)
  '      '     velocity=    9.636(Ft/s)
  '      '    area =      5.154(Sq.Ft)
  '      '    Froude number =     2.134

Upstream point elevation =  1340.000(Ft.)
Downstream point elevation =  1180.000(Ft.)
```

```
Flow length =   780.000(Ft.)
Travel time  =    1.35 min.
Time of concentration =   13.53 min.
Depth of flow =   0.785(Ft.)
Average velocity =   9.636(Ft/s)
Total irregular channel flow =    49.666(CFS)
Irregular channel normal depth above invert elev. =   0.785(Ft.)
Average velocity of channel(s) =   9.636(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      3.498(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.836
Subarea runoff =     44.864(CFS) for   15.930(Ac.)
Total runoff =     72.057(CFS)    Total area =       24.65(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.964(Ft.), Average velocity =  10.787(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       80.000 to Point/Station       85.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1180.000(Ft.)
Downstream point/station elevation =  1162.000(Ft.)
Pipe length  =   165.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    72.057(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    72.057(CFS)
Normal flow depth in pipe =   18.94(In.)
Flow top width inside pipe =   19.57(In.)
Critical depth could not be calculated.
Pipe flow velocity =     27.09(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =    13.63 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       60.000 to Point/Station       85.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     24.650(Ac.)
Runoff from this stream =     72.057(CFS)
Time of concentration =   13.63 min.
Rainfall intensity =     3.483(In/Hr)
Area averaged loss rate (Fm) =    0.2500(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
```

```
 No.     (Ac.)    (CFS)        (min) (In/Hr)      (In/Hr)

1      52.38   140.648      15.77     0.237       3.204
2      24.65    72.057      13.63     0.250       3.483
Qmax(1) =
         1.000 *     1.000 *   140.648) +
         0.914 *     1.000 *    72.057) + =     206.476
Qmax(2) =
         1.094 *     0.864 *   140.648) +
         1.000 *     1.000 *    72.057) + =     205.055

Total of 2 streams to confluence:
Flow rates before confluence point:
     140.648      72.057
Maximum flow rates at confluence using above data:
      206.476      205.055
Area of streams before confluence:
       52.380       24.650
Effective area values after confluence:
       77.030       69.916
Results of confluence:
Total flow rate =    206.476(CFS)
Time of concentration =    15.771 min.
Effective stream area after confluence =     77.030(Ac.)
Study area average Pervious fraction(Ap) =  1.000
Study area average soil loss rate(Fm) =    0.241(In/Hr)
Study area total (this main stream) =      77.03(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       85.000 to Point/Station      302.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1162.000(Ft.)
Downstream point/station elevation =  1100.000(Ft.)
Pipe length  =  1177.00(Ft.)  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =  206.476(CFS)
Nearest computed pipe diameter  =     42.00(In.)
Calculated individual pipe flow  =   206.476(CFS)
Normal flow depth in pipe =   30.98(In.)
Flow top width inside pipe =   36.95(In.)
Critical depth could not be calculated.
Pipe flow velocity =     27.14(Ft/s)
Travel time through pipe =    0.72 min.
Time of concentration (TC) =    16.49 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       85.000 to Point/Station      302.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     77.030(Ac.)
Runoff from this stream =    206.476(CFS)
Time of concentration =   16.49 min.
Rainfall intensity =     3.122(In/Hr)
```

```
Area averaged loss rate (Fm) =    0.2414(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      300.000 to Point/Station      301.000
**** INITIAL AREA EVALUATION ****
```

G1

```
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.500
SCS curve number for soil(AMC 2)  = 72.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.225(In/Hr)
Max Catchment Loss (Fm) =     0.158(In/Hr)
Initial subarea data:
Initial area flow distance =   285.000(Ft.)
Top (of initial area) elevation =  1275.000(Ft.)
Bottom (of initial area) elevation =  1272.000(Ft.)
Difference in elevation =     3.000(Ft.)
Slope =    0.01053  s(%)=       1.05
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.446 min.
Rainfall intensity =      4.056(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.865
Subarea runoff =      2.702(CFS)
Total initial stream area =        0.770(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
```

G2

```
Top of street segment elevation =  1272.500(Ft.)
End of street segment elevation =  1115.300(Ft.)
Length of street segment  =  3270.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   8.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0130
 Manning's N from gutter to grade break =  0.0130
 Manning's N from grade break to crown =  0.0130
Estimated mean flow rate at midpoint of street =     39.783(CFS)
Depth of flow =   0.445(Ft.), Average velocity =   7.466(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  15.929(Ft.)
Flow velocity =   7.47(Ft/s)
Travel time =    7.30 min.     TC =   17.75  min.
 Adding area flow to street
```

```
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.880
Decimal fraction soil group D = 0.120
SCS curve number for soil(AMC 2)  = 69.72
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.244(In/Hr)
Max Catchment Loss (Fm) =     0.171(In/Hr)
Rainfall intensity =    2.994(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.849
Subarea runoff =      73.997(CFS) for   29.410(Ac.)
Total runoff =     76.699(CFS)   Total area =      30.18(Ac.)
Area averaged Fm value =    0.170(In/Hr)
Street flow at end of street =      76.699(CFS)
Half street flow at end of street =      38.349(CFS)
Depth of flow =   0.537(Ft.), Average velocity =   8.899(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    1.86(Ft.)
Flow width (from curb towards crown)=  18.000(Ft.)


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Process from Point/Station      300.000 to Point/Station      302.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      30.180(Ac.)
Runoff from this stream =      76.699(CFS)
Time of concentration =   17.75 min.
Rainfall intensity =     2.994(In/Hr)
Area averaged loss rate (Fm) =     0.1705(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)      (min) (In/Hr)      (In/Hr)


1     77.03   206.476     16.49    0.241      3.122
2     30.18    76.699     17.75    0.170      2.994
Qmax(1) =
         1.000 *    1.000 *   206.476) +
         1.045 *    0.929 *    76.699) + =     281.000
Qmax(2) =
         0.956 *    1.000 *   206.476) +
         1.000 *    1.000 *    76.699) + =     273.988

Total of 2 main streams to confluence:
Flow rates before confluence point:
     207.476      77.699
Maximum flow rates at confluence using above data:
      281.000      273.988
Area of streams before confluence:
       77.030       30.180
Effective area values after confluence:
```

```
      105.081      107.210

Results of confluence:
Total flow rate =    281.000(CFS)
Time of concentration =    16.494 min.
Effective stream area after confluence =    105.081(Ac.)
Study area average Pervious fraction(Ap) =  0.916
Study area average soil loss rate(Fm) =    0.221(In/Hr)
Study area total =    107.21(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      303.000 to Point/Station      304.000
**** INITIAL AREA EVALUATION ****                                  G3
------------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.140(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1275.200(Ft.)
Bottom (of initial area) elevation =  1272.500(Ft.)
Difference in elevation =     2.700(Ft.)
Slope =    0.00900  s(%)=       0.90
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.002 min.
Rainfall intensity =      3.938(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.868
Subarea runoff =      3.726(CFS)
Total initial stream area =        1.090(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      304.000 to Point/Station      302.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****           G4
------------------------------------------------------------------------
Top of street segment elevation =  1272.500(Ft.)
End of street segment elevation =  1115.300(Ft.)
Length of street segment  =  2562.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =    0.020
Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =    8.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
Gutter width =    2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0130
 Manning's N from gutter to grade break =  0.0130
 Manning's N from grade break to crown =  0.0130
```

```
Estimated mean flow rate at midpoint of street =    40.809(CFS)
Depth of flow =   0.433(Ft.), Average velocity =   8.241(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  15.328(Ft.)
Flow velocity =   8.24(Ft/s)
Travel time =    5.18 min.     TC =   16.18  min.
 Adding area flow to street
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.680
Decimal fraction soil group D = 0.320
SCS curve number for soil(AMC 2)  = 70.92
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=    0.234(In/Hr)
Max Catchment Loss (Fm) =     0.164(In/Hr)
Rainfall intensity =      3.157(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.854
Subarea runoff =     74.057(CFS) for   27.780(Ac.)
Total runoff =     77.783(CFS)    Total area =       28.87(Ac.)
Area averaged Fm value =    0.163(In/Hr)
Street flow at end of street =     77.783(CFS)
Half street flow at end of street =     38.891(CFS)
Depth of flow =   0.520(Ft.), Average velocity =   9.800(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    0.98(Ft.)
Flow width (from curb towards crown)=  18.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      303.000 to Point/Station      302.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =     28.870(Ac.)
Runoff from this stream =     77.783(CFS)
Time of concentration =   16.18 min.
Rainfall intensity =     3.157(In/Hr)
Area averaged loss rate (Fm) =    0.1629(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     77.03   206.476     16.49    0.241      3.122
2     30.18    76.699     17.75    0.170      2.994
3     28.87    77.783     16.18    0.163      3.157
Qmax(1) =
         1.000 *    1.000 *   206.476) +
         1.045 *    0.929 *    76.699) +
         0.989 *    1.000 *    77.783) + =     357.897
Qmax(2) =
         0.956 *    1.000 *   206.476) +
         1.000 *    1.000 *    76.699) +
```

```
        0.946 *    1.000 *    77.783) + =     347.554
Qmax(3) =
        1.012 *    0.981 *   206.476) +
        1.057 *    0.912 *    76.699) +
        1.000 *    1.000 *    77.783) + =     356.748

Total of 3 main streams to confluence:
Flow rates before confluence point:
     207.476      77.699      78.783
Maximum flow rates at confluence using above data:
      357.897      347.554      356.748
Area of streams before confluence:
       77.030       30.180       28.870
Effective area values after confluence:
      133.951      136.080      131.977


Results of confluence:
Total flow rate =    357.897(CFS)
Time of concentration =    16.494 min.
Effective stream area after confluence  =    133.951(Ac.)
Study area average Pervious fraction(Ap) =  0.870
Study area average soil loss rate(Fm) =    0.209(In/Hr)
Study area total =    136.08(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      132.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1105.000(Ft.)
Downstream point/station elevation =  1048.000(Ft.)
Pipe length  =   344.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   357.897(CFS)
Nearest computed pipe diameter  =   42.00(In.)
Calculated individual pipe flow  =   357.897(CFS)
Normal flow depth in pipe =   30.41(In.)
Flow top width inside pipe =   37.55(In.)
Critical depth could not be calculated.
Pipe flow velocity =     47.98(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =    16.61 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station      132.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    133.951(Ac.)
Runoff from this stream =    357.897(CFS)
Time of concentration =   16.61 min.
Rainfall intensity =     3.110(In/Hr)
Area averaged loss rate (Fm) =    0.2090(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8698
Program is now starting with Main Stream No. 2
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      110.000
**** INITIAL AREA EVALUATION ****
```

C10

```
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1610.000(Ft.)
Bottom (of initial area) elevation =  1560.000(Ft.)
Difference in elevation =    50.000(Ft.)
Slope =    0.16667  s(%)=      16.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.101 min.
Rainfall intensity =      3.563(In/Hr) for a  100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.837
Subarea runoff =      8.170(CFS)
Total initial stream area =      2.740(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      115.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

C11

```
Estimated mean flow rate at midpoint of channel =    22.552(CFS)
Depth of flow =   0.457(Ft.), Average velocity =   8.350(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------
Sub-Channel flow  =     22.552(CFS)
  '     '    flow top width =      6.827(Ft.)
  '     '     velocity=    8.350(Ft/s)
  '     '    area =      2.701(Sq.Ft)
  '     '    Froude number =     2.340

Upstream point elevation =  1560.000(Ft.)
Downstream point elevation =  1390.000(Ft.)
Flow length =   600.000(Ft.)
Travel time  =    1.20 min.
Time of concentration =   14.30 min.
Depth of flow =   0.457(Ft.)
Average velocity =   8.350(Ft/s)
Total irregular channel flow =    22.552(CFS)
Irregular channel normal depth above invert elev. =   0.457(Ft.)
```

```
Average velocity of channel(s) =   8.350(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.740
Decimal fraction soil group D = 0.260
SCS curve number for soil(AMC 2)  = 75.56
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.237(In/Hr)
Max Catchment Loss (Fm) =     0.237(In/Hr)
Rainfall intensity =      3.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.836
Subarea runoff =     28.702(CFS) for   10.270(Ac.)
Total runoff =     36.871(CFS)     Total area =       13.01(Ac.)
Area averaged Fm value =    0.240(In/Hr)
Depth of flow =   0.605(Ft.), Average velocity =   9.804(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      115.000 to Point/Station      129.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

C12

```
Estimated mean flow rate at midpoint of channel =     53.411(CFS)
Depth of flow =   0.800(Ft.), Average velocity =  10.113(Ft/s)
      ******* Irregular Channel Data ***********
-------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number       'X' coordinate      'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
-------------------------------------------------------------------
Sub-Channel flow  =     53.411(CFS)
  '     '    flow top width =      8.201(Ft.)
  '     '     velocity=   10.113(Ft/s)
  '     '    area =      5.282(Sq.Ft)
  '     '    Froude number =     2.221

Upstream point elevation =  1390.000(Ft.)
Downstream point elevation =  1180.000(Ft.)
Flow length =   950.000(Ft.)
Travel time  =    1.57 min.
Time of concentration =   15.86 min.
Depth of flow =   0.800(Ft.)
Average velocity =  10.113(Ft/s)
Total irregular channel flow =    53.411(CFS)
Irregular channel normal depth above invert elev. =   0.800(Ft.)
Average velocity of channel(s) =  10.113(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.840
Decimal fraction soil group D = 0.160
SCS curve number for soil(AMC 2)  = 74.96
```

```
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.242(In/Hr)
Max Catchment Loss (Fm) =     0.242(In/Hr)
Rainfall intensity =      3.193(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.832
Subarea runoff =     33.001(CFS) for   13.290(Ac.)
Total runoff =     69.873(CFS)     Total area =     26.30(Ac.)
Area averaged Fm value =     0.241(In/Hr)
Depth of flow =   0.929(Ft.), Average velocity =  10.972(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      129.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     26.300(Ac.)
Runoff from this stream =     69.873(CFS)
Time of concentration =   15.86 min.
Rainfall intensity =     3.193(In/Hr)
Area averaged loss rate (Fm) =     0.2409(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      122.000 to Point/Station      124.000
**** INITIAL AREA EVALUATION ****
                                                              C13
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1615.000(Ft.)
Bottom (of initial area) elevation =  1495.000(Ft.)
Difference in elevation =   120.000(Ft.)
Slope =    0.40000  s(%)=      40.00
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.996 min.
Rainfall intensity =      3.939(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.843
Subarea runoff =      4.183(CFS)
Total initial stream area =        1.260(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      124.000 to Point/Station      126.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                              C14
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      9.341(CFS)
Depth of flow =   0.275(Ft.), Average velocity =   6.109(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------------
```

```
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =     9.341(CFS)
   '     '    flow top width =      6.102(Ft.)
   '     '     velocity=    6.109(Ft/s)
   '     '    area =      1.529(Sq.Ft)
   '     '    Froude number =     2.150

Upstream point elevation =  1495.000(Ft.)
Downstream point elevation =  1385.000(Ft.)
Flow length =   400.000(Ft.)
Travel time  =    1.09 min.
Time of concentration =   12.09 min.
Depth of flow =   0.275(Ft.)
Average velocity =   6.109(Ft/s)
Total irregular channel flow =     9.341(CFS)
Irregular channel normal depth above invert elev. =   0.275(Ft.)
Average velocity of channel(s) =   6.109(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      3.731(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.840
Subarea runoff =     10.260(CFS) for    3.350(Ac.)
Total runoff =     14.443(CFS)    Total area =      4.61(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.356(Ft.), Average velocity =   7.111(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      125.000 to Point/Station      126.000
**** SUBAREA FLOW ADDITION ****
```

C15

```
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Time of concentration =    12.09 min.
Rainfall intensity =      3.731(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.840
```

```
Subarea runoff =      21.398(CFS) for     6.830(Ac.)
Total runoff =      35.840(CFS)     Total area =       11.44(Ac.)
Area averaged Fm value =     0.250(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      126.000 to Point/Station      128.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

C16

```
Estimated mean flow rate at midpoint of channel =      51.437(CFS)
Depth of flow =    0.819(Ft.), Average velocity =    9.466(Ft/s)
      ******* Irregular Channel Data ***********
-------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number       'X' coordinate      'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =    0.050
-------------------------------------------------------------------
Sub-Channel flow  =      51.437(CFS)
  '     '    flow top width =       8.275(Ft.)
  '     '     velocity=     9.466(Ft/s)
  '     '    area =       5.434(Sq.Ft)
  '     '    Froude number =      2.059

Upstream point elevation =  1385.000(Ft.)
Downstream point elevation =  1300.000(Ft.)
Flow length =    450.000(Ft.)
Travel time  =     0.79 min.
Time of concentration =    12.88 min.
Depth of flow =    0.819(Ft.)
Average velocity =    9.466(Ft/s)
Total irregular channel flow =     51.437(CFS)
Irregular channel normal depth above invert elev. =    0.819(Ft.)
Average velocity of channel(s) =    9.466(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=      0.250(In/Hr)
Max Catchment Loss (Fm) =      0.250(In/Hr)
Rainfall intensity =       3.598(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.837
Subarea runoff =      31.107(CFS) for    10.780(Ac.)
Total runoff =      66.948(CFS)     Total area =       22.22(Ac.)
Area averaged Fm value =     0.250(In/Hr)
Depth of flow =    0.947(Ft.), Average velocity =  10.252(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      128.000 to Point/Station      129.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

C17

```
Estimated mean flow rate at midpoint of channel =    89.068(CFS)
Depth of flow =   1.090(Ft.), Average velocity =  11.382(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     89.068(CFS)
  '     '    flow top width =      9.360(Ft.)
  '     '     velocity=   11.382(Ft/s)
  '     '    area =      7.825(Sq.Ft)
  '     '    Froude number =     2.194

Upstream point elevation =  1300.000(Ft.)
Downstream point elevation =  1180.000(Ft.)
Flow length =   600.000(Ft.)
Travel time  =    0.88 min.
Time of concentration =   13.76 min.
Depth of flow =   1.090(Ft.)
Average velocity =  11.382(Ft/s)
Total irregular channel flow =    89.068(CFS)
Irregular channel normal depth above invert elev. =   1.090(Ft.)
Average velocity of channel(s) =  11.382(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      3.464(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.835
Subarea runoff =     44.165(CFS) for   16.190(Ac.)
Total runoff =    111.113(CFS)    Total area =      38.41(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   1.228(Ft.), Average velocity =  12.137(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      122.000 to Point/Station      129.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     38.410(Ac.)
Runoff from this stream =    111.113(CFS)
Time of concentration =   13.76 min.
Rainfall intensity =     3.464(In/Hr)
Area averaged loss rate (Fm) =    0.2500(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
```

```
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     26.30    69.873     15.86    0.241      3.193
2     38.41   111.113     13.76    0.250      3.464
Qmax(1) =
         1.000 *    1.000 *    69.873) +
         0.916 *    1.000 *   111.113) + =     171.603
Qmax(2) =
         1.092 *    0.867 *    69.873) +
         1.000 *    1.000 *   111.113) + =     177.284

Total of 2 streams to confluence:
Flow rates before confluence point:
      69.873     111.113
Maximum flow rates at confluence using above data:
      171.603      177.284
Area of streams before confluence:
       26.300       38.410
Effective area values after confluence:
       64.710       61.220
Results of confluence:
Total flow rate =    177.284(CFS)
Time of concentration =    13.759 min.
Effective stream area after confluence =     61.220(Ac.)
Study area average Pervious fraction(Ap) =  1.000
Study area average soil loss rate(Fm) =    0.246(In/Hr)
Study area total (this main stream) =      64.71(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      129.000 to Point/Station      130.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                  C18
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    246.117(CFS)
Depth of flow =   2.454(Ft.), Average velocity =  10.125(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------------
Sub-Channel flow  =    246.116(CFS)
  '     '    flow top width =     14.814(Ft.)
  '     '     velocity=   10.125(Ft/s)
  '     '    area =     24.307(Sq.Ft)
  '     '    Froude number =     1.393

Upstream point elevation =  1180.000(Ft.)
Downstream point elevation =  1056.000(Ft.)
Flow length =  1870.000(Ft.)
```

```
Travel time  =    3.08 min.
Time of concentration =   16.84 min.
Depth of flow =   2.454(Ft.)
Average velocity =  10.125(Ft/s)
Total irregular channel flow =   246.117(CFS)
Irregular channel normal depth above invert elev. =   2.454(Ft.)
Average velocity of channel(s) =  10.125(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.940
Decimal fraction soil group D = 0.060
SCS curve number for soil(AMC 2)  = 74.36
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.247(In/Hr)
Max Catchment Loss (Fm) =     0.247(In/Hr)
Rainfall intensity =      3.086(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.828
Subarea runoff =    137.569(CFS) for   62.000(Ac.)
Total runoff =    314.853(CFS)    Total area =      123.22(Ac.)
Area averaged Fm value =    0.247(In/Hr)
Depth of flow =   2.767(Ft.), Average velocity =  10.804(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      130.000 to Point/Station      132.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1050.000(Ft.)
Downstream point/station elevation =  1048.000(Ft.)
Pipe length  =   500.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   314.853(CFS)
Nearest computed pipe diameter  =     78.00(In.)
Calculated individual pipe flow  =   314.853(CFS)
Normal flow depth in pipe =   60.66(In.)
Flow top width inside pipe =   64.86(In.)
Critical Depth =   57.16(In.)
Pipe flow velocity =     11.37(Ft/s)
Travel time through pipe =     0.73 min.
Time of concentration (TC) =     17.57 min.


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Process from Point/Station      130.000 to Point/Station      132.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =    123.220(Ac.)
Runoff from this stream =    314.853(CFS)
Time of concentration =   17.57 min.
Rainfall intensity =     3.011(In/Hr)
Area averaged loss rate (Fm) =    0.2466(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
```

```
 No.     (Ac.)    (CFS)        (min)  (In/Hr)      (In/Hr)

1     133.95    357.897      16.61     0.209       3.110
2     123.22    314.853      17.57     0.247       3.011
Qmax(1) =
         1.000 *    1.000 *   357.897) +
         1.036 *    0.946 *   314.853) + =     666.180
Qmax(2) =
         0.966 *    1.000 *   357.897) +
         1.000 *    1.000 *   314.853) + =     660.639

Total of 2 main streams to confluence:
Flow rates before confluence point:
     358.897     315.853
Maximum flow rates at confluence using above data:
      666.180      660.639
Area of streams before confluence:
      133.951      123.220
Effective area values after confluence:
      250.463      257.171


Results of confluence:
Total flow rate =    666.180(CFS)
Time of concentration =    16.613 min.
Effective stream area after confluence  =    250.463(Ac.)
Study area average Pervious fraction(Ap) =  0.932
Study area average soil loss rate(Fm) =    0.227(In/Hr)
Study area total =     257.17(Ac.)


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Process from Point/Station      132.000 to Point/Station      305.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1048.000(Ft.)
Downstream point/station elevation =  1032.000(Ft.)
Pipe length  =  1025.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   666.180(CFS)
Nearest computed pipe diameter  =   81.00(In.)
Calculated individual pipe flow  =   666.180(CFS)
Normal flow depth in pipe =   61.20(In.)
Flow top width inside pipe =   69.62(In.)
Critical Depth =   76.44(In.)
Pipe flow velocity =     22.97(Ft/s)
Travel time through pipe =    0.74 min.
Time of concentration (TC) =    17.36 min.


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Process from Point/Station      132.000 to Point/Station      305.000
**** SUBAREA FLOW ADDITION ****
                                                              G5
------------------------------------------------------------------------
RESIDENTIAL(2.5 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.750
```

```
Decimal fraction soil group D = 0.250
SCS curve number for soil(AMC 2)  = 70.50
Pervious ratio(Ap) = 0.9000  Max loss rate(Fp)=     0.237(In/Hr)
Max Catchment Loss (Fm) =    0.214(In/Hr)
Time of concentration =  17.36 min.
Rainfall intensity =      3.032(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.833
Subarea runoff =     12.726(CFS) for   18.340(Ac.)
Total runoff =    678.906(CFS)    Total area =    268.80(Ac.)
Area averaged Fm value =   0.226(In/Hr)


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Process from Point/Station       10.000 to Point/Station      305.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    268.803(Ac.)
Runoff from this stream =    678.906(CFS)
Time of concentration =   17.36 min.
Rainfall intensity =     3.032(In/Hr)
Area averaged loss rate (Fm) =    0.2261(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9300


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Process from Point/Station      306.000 to Point/Station      307.000
**** INITIAL AREA EVALUATION ****                                  G6
------------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =    0.175(In/Hr)
Initial subarea data:
Initial area flow distance =   330.000(Ft.)
Top (of initial area) elevation =  1127.400(Ft.)
Bottom (of initial area) elevation =  1120.000(Ft.)
Difference in elevation =     7.400(Ft.)
Slope =    0.02242  s(%)=       2.24
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.522 min.
NOTE: Distance EXCEEDS recommended maximum value of   328.084(Ft.)
for this Development Type
Rainfall intensity =      4.278(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.863
Subarea runoff =     3.988(CFS)
Total initial stream area =      1.080(Ac.)


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Process from Point/Station      307.000 to Point/Station      305.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****           G7
------------------------------------------------------------------------
```

```
Top of street segment elevation =  1120.000(Ft.)
End of street segment elevation =  1042.000(Ft.)
Length of street segment  =  1423.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  8.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =    44.298(CFS)
Depth of flow =   0.469(Ft.), Average velocity =   7.227(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  17.141(Ft.)
Flow velocity =   7.23(Ft/s)
Travel time =    3.28 min.     TC =   12.80  min.
 Adding area flow to street
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.860
Decimal fraction soil group D = 0.140
SCS curve number for soil(AMC 2)  = 69.84
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=    0.243(In/Hr)
Max Catchment Loss (Fm) =     0.170(In/Hr)
Rainfall intensity =      3.610(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.858
Subarea runoff =     80.463(CFS) for   26.200(Ac.)
Total runoff =     84.451(CFS)    Total area =       27.28(Ac.)
Area averaged Fm value =    0.170(In/Hr)
Street flow at end of street =     84.451(CFS)
Half street flow at end of street =     42.225(CFS)
Depth of flow =   0.567(Ft.), Average velocity =   8.584(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    3.34(Ft.)
Flow width (from curb towards crown)=  18.000(Ft.)


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Process from Point/Station      306.000 to Point/Station      305.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     27.280(Ac.)
Runoff from this stream =     84.451(CFS)
Time of concentration =   12.80 min.
Rainfall intensity =    3.610(In/Hr)
Area averaged loss rate (Fm) =   0.1703(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7000
Summary of stream data:
```

```
Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    268.80   678.906     17.36    0.226      3.032
2     27.28    84.451     12.80    0.170      3.610
Qmax(1) =
        1.000 *    1.000 *   678.906) +
        0.832 *    1.000 *    84.451) + =     749.177
Qmax(2) =
        1.206 *    0.738 *   678.906) +
        1.000 *    1.000 *    84.451) + =     688.333

Total of 2 streams to confluence:
Flow rates before confluence point:
     678.906      84.451
Maximum flow rates at confluence using above data:
      749.177      688.333
Area of streams before confluence:
      268.803       27.280
Effective area values after confluence:
      296.083      225.570
Results of confluence:
Total flow rate =    749.177(CFS)
Time of concentration =    17.357 min.
Effective stream area after confluence =    296.083(Ac.)
Study area average Pervious fraction(Ap) =  0.909
Study area average soil loss rate(Fm) =    0.221(In/Hr)
Study area total (this main stream) =     296.08(Ac.)


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Process from Point/Station      305.000 to Point/Station      305.000
**** SUBAREA FLOW ADDITION ****
                                                                  G8
______________________________________________________________________
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.550
Decimal fraction soil group D = 0.450
SCS curve number for soil(AMC 2)  = 76.70
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.228(In/Hr)
Max Catchment Loss (Fm) =     0.228(In/Hr)
Time of concentration =    17.36 min.
Rainfall intensity =      3.032(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.834
Subarea runoff =     26.406(CFS) for   10.460(Ac.)
Total runoff =    775.583(CFS)    Total area =      306.54(Ac.)
Area averaged Fm value =    0.221(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      305.000 to Point/Station      308.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1032.000(Ft.)
```

```
Downstream point/station elevation =   989.000(Ft.)
Pipe length  =   673.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =   775.583(CFS)
Nearest computed pipe diameter  =     69.00(In.)
Calculated individual pipe flow  =  775.583(CFS)
Normal flow depth in pipe =  52.98(In.)
Flow top width inside pipe =   58.27(In.)
Critical depth could not be calculated.
Pipe flow velocity =     36.25(Ft/s)
Travel time through pipe =   0.31 min.
Time of concentration (TC) =    17.67 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      308.000 to Point/Station      308.000
**** SUBAREA FLOW ADDITION ****
```

G9

```
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.640
Decimal fraction soil group D = 0.360
SCS curve number for soil(AMC 2)  = 76.16
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.232(In/Hr)
Max Catchment Loss (Fm) =     0.232(In/Hr)
The area added to the existing stream with this TC
does not add flow per Para 6b, Page D-15 of the OCHM,
therefore the upstream flow rate of Q =    775.583(CFS) is being used
Time of concentration =    17.67 min.
Rainfall intensity =      3.002(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.834
Subarea runoff =      0.000(CFS) for    3.350(Ac.)
Total runoff =    775.583(CFS)    Total area =      309.89(Ac.)
Area averaged Fm value =    0.221(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      308.000 to Point/Station      308.000
**** SUBAREA FLOW ADDITION ****
```

G10

```
PARK subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.850
Decimal fraction soil group D = 0.150
SCS curve number for soil(AMC 2)  = 69.90
Pervious ratio(Ap) = 0.8500  Max loss rate(Fp)=     0.242(In/Hr)
Max Catchment Loss (Fm) =     0.206(In/Hr)
Time of concentration =    17.67 min.
Rainfall intensity =      3.002(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.834
Subarea runoff =     17.764(CFS) for    7.090(Ac.)
Total runoff =    793.347(CFS)    Total area =      316.98(Ac.)
Area averaged Fm value =    0.221(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      308.000 to Point/Station      312.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =    989.000(Ft.)
Downstream point/station elevation =    920.000(Ft.)
Pipe length  =  1587.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =   793.347(CFS)
Nearest computed pipe diameter  =     75.00(In.)
Calculated individual pipe flow  =   793.347(CFS)
Normal flow depth in pipe =   57.21(In.)
Flow top width inside pipe =   63.80(In.)
Critical depth could not be calculated.
Pipe flow velocity =    31.59(Ft/s)
Travel time through pipe =    0.84 min.
Time of concentration (TC) =    18.50 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      308.000 to Point/Station      312.000
**** SUBAREA FLOW ADDITION ****
                                                                    G11
------------------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.175(In/Hr)
The area added to the existing stream with this TC
does not add flow per Para 6b, Page D-15 of the OCHM,
therefore the upstream flow rate of Q =    793.347(CFS) is being used
Time of concentration =    18.50 min.
Rainfall intensity =      2.923(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.832
Subarea runoff =      0.000(CFS) for    8.010(Ac.)
Total runoff =    793.347(CFS)    Total area =     324.99(Ac.)
Area averaged Fm value =    0.220(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      308.000 to Point/Station      312.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    324.993(Ac.)
Runoff from this stream =    793.347(CFS)
Time of concentration =   18.50 min.
Rainfall intensity =    2.923(In/Hr)
Area averaged loss rate (Fm) =    0.2199(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9063


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Process from Point/Station      309.000 to Point/Station      310.000
**** INITIAL AREA EVALUATION ****
                                                                    G12
```

```
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.140(In/Hr)
Initial subarea data:
Initial area flow distance =   330.000(Ft.)
Top (of initial area) elevation =  1077.000(Ft.)
Bottom (of initial area) elevation =  1070.000(Ft.)
Difference in elevation =    7.000(Ft.)
Slope =    0.02121  s(%)=    2.12
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.629 min.
NOTE: Distance EXCEEDS recommended maximum value of   328.084(Ft.)
for this Development Type
Rainfall intensity =      4.250(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
Subarea runoff =      4.735(CFS)
Total initial stream area =        1.280(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      310.000 to Point/Station      311.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
                                                              G13
Top of street segment elevation =  1070.000(Ft.)
End of street segment elevation =   932.000(Ft.)
Length of street segment  =  1705.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   8.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =    52.711(CFS)
Depth of flow =   0.467(Ft.), Average velocity =   8.737(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  16.999(Ft.)
Flow velocity =   8.74(Ft/s)
Travel time =    3.25 min.     TC =   12.88  min.
 Adding area flow to street
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.360
Decimal fraction soil group D = 0.640
SCS curve number for soil(AMC 2)  = 72.84
```

```
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.218(In/Hr)
Max Catchment Loss (Fm) =     0.153(In/Hr)
Rainfall intensity =      3.598(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.862
Subarea runoff =     95.766(CFS) for   31.130(Ac.)
Total runoff =    100.501(CFS)    Total area =     32.41(Ac.)
Area averaged Fm value =    0.152(In/Hr)
Street flow at end of street =    100.501(CFS)
Half street flow at end of street =     50.250(CFS)
Depth of flow =   0.563(Ft.), Average velocity =  10.379(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    3.15(Ft.)
Flow width (from curb towards crown)=  18.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      311.000 to Point/Station      311.000
**** SUBAREA FLOW ADDITION ****
                                                              G14
----------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.140(In/Hr)
Time of concentration =    12.88 min.
Rainfall intensity =      3.598(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.863
Subarea runoff =     28.411(CFS) for    9.130(Ac.)
Total runoff =    128.912(CFS)    Total area =     41.54(Ac.)
Area averaged Fm value =    0.149(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      311.000 to Point/Station      312.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =   922.000(Ft.)
Downstream point/station elevation =   920.000(Ft.)
Pipe length  =    50.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   128.912(CFS)
Nearest computed pipe diameter  =    36.00(In.)
Calculated individual pipe flow  =   128.912(CFS)
Normal flow depth in pipe =   28.47(In.)
Flow top width inside pipe =   29.28(In.)
Critical depth could not be calculated.
Pipe flow velocity =     21.50(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    12.92 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      309.000 to Point/Station      312.000
```

**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 41.540(Ac.)
Runoff from this stream = 128.912(CFS)
Time of concentration = 12.92 min.
Rainfall intensity = 3.591(In/Hr)
Area averaged loss rate (Fm) = 0.1494(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7000
Summary of stream data:

Stream No.	Area (Ac.)	Flow rate (CFS)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
1	324.99	793.347	18.50	0.220	2.923
2	41.54	128.912	12.92	0.149	3.591

```
Qmax(1) =
        1.000 *    1.000 *   793.347) +
        0.806 *    1.000 *   128.912) + =     897.236
Qmax(2) =
        1.247 *    0.698 *   793.347) +
        1.000 *    1.000 *   128.912) + =     819.741
```

Total of 2 streams to confluence:
Flow rates before confluence point:
793.347 128.912
Maximum flow rates at confluence using above data:
897.236 819.741
Area of streams before confluence:
324.993 41.540
Effective area values after confluence:
366.533 268.459
Results of confluence:
Total flow rate = 897.236(CFS)
Time of concentration = 18.504 min.
Effective stream area after confluence = 366.533(Ac.)
Study area average Pervious fraction(Ap) = 0.883
Study area average soil loss rate(Fm) = 0.212(In/Hr)
Study area total (this main stream) = 366.53(Ac.)

++
Process from Point/Station 312.000 to Point/Station 314.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 920.000(Ft.)
Downstream point/station elevation = 812.000(Ft.)
Pipe length = 1935.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 897.236(CFS)
Nearest computed pipe diameter = 72.00(In.)
Calculated individual pipe flow = 897.236(CFS)
Normal flow depth in pipe = 53.24(In.)
Flow top width inside pipe = 63.21(In.)
Critical depth could not be calculated.
Pipe flow velocity = 40.03(Ft/s)
Travel time through pipe = 0.81 min.
Time of concentration (TC) = 19.31 min.

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      312.000 to Point/Station      314.000
**** SUBAREA FLOW ADDITION ****
```

G15

```
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.140(In/Hr)
Time of concentration =    19.31 min.
Rainfall intensity =     2.853(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.835
Subarea runoff =     54.312(CFS) for   32.920(Ac.)
Total runoff =    951.549(CFS)    Total area =     399.45(Ac.)
Area averaged Fm value =    0.206(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      312.000 to Point/Station      314.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    399.453(Ac.)
Runoff from this stream =    951.549(CFS)
Time of concentration =   19.31 min.
Rainfall intensity =     2.853(In/Hr)
Area averaged loss rate (Fm) =    0.2060(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8678
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      315.000 to Point/Station      316.000
**** INITIAL AREA EVALUATION ****
```

G16

```
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.140(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =   996.200(Ft.)
Bottom (of initial area) elevation =   990.000(Ft.)
Difference in elevation =     6.200(Ft.)
Slope =    0.02067  s(%)=       2.07
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.317 min.
```

```
Rainfall intensity =      4.331(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.871
Subarea runoff =      2.716(CFS)
Total initial stream area =        0.720(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      316.000 to Point/Station     317.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
```

G-17

```
Top of street segment elevation =   990.000(Ft.)
End of street segment elevation =   834.000(Ft.)
Length of street segment  =  2683.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   8.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     92.425(CFS)
Depth of flow =   0.577(Ft.), Average velocity =   8.971(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    3.87(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  18.000(Ft.)
Flow velocity =   8.97(Ft/s)
Travel time =   4.98 min.     TC =   14.30  min.
 Adding area flow to street
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.750
Decimal fraction soil group D = 0.250
SCS curve number for soil(AMC 2)  = 70.50
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.237(In/Hr)
Max Catchment Loss (Fm) =     0.166(In/Hr)
Rainfall intensity =      3.388(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.856
Subarea runoff =    179.263(CFS) for   62.030(Ac.)
Total runoff =    181.979(CFS)    Total area =       62.75(Ac.)
Area averaged Fm value =    0.166(In/Hr)
Street flow at end of street =    181.979(CFS)
Half street flow at end of street =     90.990(CFS)
Depth of flow =   0.704(Ft.), Average velocity =  10.993(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =   10.21(Ft.)
Flow width (from curb towards crown)=  18.000(Ft.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      315.000 to Point/Station      317.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      62.750(Ac.)
Runoff from this stream =     181.979(CFS)
Time of concentration =  14.30 min.
Rainfall intensity =     3.388(In/Hr)
Area averaged loss rate (Fm) =    0.1659(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      210.000
**** INITIAL AREA EVALUATION ****                                  D1
------------------------------------------------------------------------
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 79.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =    0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1515.000(Ft.)
Bottom (of initial area) elevation =  1370.000(Ft.)
Difference in elevation =   145.000(Ft.)
Slope =    0.48333  s(%)=     48.33
TC = k(0.706)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.995 min.
Rainfall intensity =      4.728(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.852
Subarea runoff =      3.668(CFS)
Total initial stream area =        0.910(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      210.000 to Point/Station      214.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****                        D2
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     12.030(CFS)
Depth of flow =   0.283(Ft.), Average velocity =   7.640(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     12.031(CFS)
  '     '   flow top width =      6.132(Ft.)
```

```
   '      '    velocity=     7.640(Ft/s)
   '      '    area =       1.575(Sq.Ft)
   '      '    Froude number =      2.657

Upstream point elevation =  1370.000(Ft.)
Downstream point elevation =  1245.000(Ft.)
Flow length =   300.000(Ft.)
Travel time  =    0.65 min.
Time of concentration =    8.65 min.
Depth of flow =   0.283(Ft.)
Average velocity =   7.640(Ft/s)
Total irregular channel flow =    12.030(CFS)
Irregular channel normal depth above invert elev. =   0.283(Ft.)
Average velocity of channel(s) =   7.640(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.580
Decimal fraction soil group D = 0.420
SCS curve number for soil(AMC 2)  = 81.10
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=    0.229(In/Hr)
Max Catchment Loss (Fm) =     0.229(In/Hr)
Rainfall intensity =      4.520(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.854
Subarea runoff =     16.667(CFS) for    4.360(Ac.)
Total runoff =     20.334(CFS)    Total area =        5.27(Ac.)
Area averaged Fm value =    0.233(In/Hr)
Depth of flow =   0.385(Ft.), Average velocity =   9.165(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      214.000 to Point/Station      216.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                              D3
Estimated mean flow rate at midpoint of channel =    32.779(CFS)
Depth of flow =   0.652(Ft.), Average velocity =   7.978(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     32.779(CFS)
   '      '    flow top width =      7.607(Ft.)
   '      '    velocity=     7.978(Ft/s)
   '      '    area =       4.109(Sq.Ft)
   '      '    Froude number =      1.913

Upstream point elevation =  1245.000(Ft.)
Downstream point elevation =  1150.000(Ft.)
Flow length =   550.000(Ft.)
Travel time  =    1.15 min.
```

```
Time of concentration =    9.80 min.
Depth of flow =   0.652(Ft.)
Average velocity =   7.978(Ft/s)
Total irregular channel flow =    32.779(CFS)
Irregular channel normal depth above invert elev. =   0.652(Ft.)
Average velocity of channel(s) =  7.978(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.730
Decimal fraction soil group D = 0.270
SCS curve number for soil(AMC 2)  = 80.35
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=    0.236(In/Hr)
Max Catchment Loss (Fm) =     0.236(In/Hr)
Rainfall intensity =      4.208(In/Hr) for a  100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.850
Subarea runoff =     24.829(CFS) for   7.360(Ac.)
Total runoff =     45.163(CFS)    Total area =    12.63(Ac.)
Area averaged Fm value =    0.235(In/Hr)
Depth of flow =  0.781(Ft.), Average velocity =   8.818(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      216.000 to Point/Station      220.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                  D4
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    96.104(CFS)
Depth of flow =   1.123(Ft.), Average velocity =  11.807(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------------
Sub-Channel flow  =     96.104(CFS)
  '      '    flow top width =    9.493(Ft.)
  '      '     velocity=   11.807(Ft/s)
  '      '    area =      8.139(Sq.Ft)
  '      '    Froude number =     2.247

Upstream point elevation =  1150.000(Ft.)
Downstream point elevation =  1050.000(Ft.)
Flow length =   480.000(Ft.)
Travel time  =    0.68 min.
Time of concentration =   10.48 min.
Depth of flow =   1.123(Ft.)
Average velocity =  11.807(Ft/s)
Total irregular channel flow =    96.104(CFS)
Irregular channel normal depth above invert elev. =   1.123(Ft.)
Average velocity of channel(s) =  11.807(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
```

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.420
Decimal fraction soil group D = 0.580
SCS curve number for soil(AMC 2)  = 81.90
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.221(In/Hr)
Max Catchment Loss (Fm) =     0.221(In/Hr)
Rainfall intensity =      4.050(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.850
Subarea runoff =    101.789(CFS) for   30.060(Ac.)
Total runoff =    146.953(CFS)     Total area =       42.69(Ac.)
Area averaged Fm value =    0.225(In/Hr)
Depth of flow =   1.409(Ft.), Average velocity =  13.337(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     220.000 to Point/Station     230.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

D5

```
Estimated mean flow rate at midpoint of channel =    219.992(CFS)
Depth of flow =   2.303(Ft.), Average velocity =   9.942(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    219.992(CFS)
  '      '    flow top width =     14.214(Ft.)
  '      '     velocity=    9.942(Ft/s)
  '      '    area =     22.128(Sq.Ft)
  '      '    Froude number =     1.404

Upstream point elevation =  1050.000(Ft.)
Downstream point elevation =   920.000(Ft.)
Flow length =  1900.000(Ft.)
Travel time  =    3.19 min.
Time of concentration =   13.66 min.
Depth of flow =   2.303(Ft.)
Average velocity =   9.942(Ft/s)
Total irregular channel flow =   219.992(CFS)
Irregular channel normal depth above invert elev. =   2.303(Ft.)
Average velocity of channel(s) =   9.942(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.730
Decimal fraction soil group D = 0.270
SCS curve number for soil(AMC 2)  = 80.35
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.236(In/Hr)
Max Catchment Loss (Fm) =     0.236(In/Hr)
Rainfall intensity =      3.478(In/Hr) for a   100.0 year storm
```

```
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.840
Subarea runoff =    146.015(CFS) for   57.570(Ac.)
Total runoff =    292.967(CFS)    Total area =     100.26(Ac.)
Area averaged Fm value =    0.232(In/Hr)
Depth of flow =   2.651(Ft.), Average velocity =  10.725(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      230.000 to Point/Station      317.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   920.000(Ft.)
Downstream point/station elevation =   827.000(Ft.)
Pipe length  =  2810.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =   292.967(CFS)
Nearest computed pipe diameter  =    54.00(In.)
Calculated individual pipe flow  =  292.967(CFS)
Normal flow depth in pipe =   41.80(In.)
Flow top width inside pipe =   45.16(In.)
Critical depth could not be calculated.
Pipe flow velocity =   22.17(Ft/s)
Travel time through pipe =   2.11 min.
Time of concentration (TC) =    15.77 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      317.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =    100.260(Ac.)
Runoff from this stream =    292.967(CFS)
Time of concentration =   15.77 min.
Rainfall intensity =    3.203(In/Hr)
Area averaged loss rate (Fm) =    0.2316(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm      Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     62.75   181.979     14.30    0.166      3.388
2    100.26   292.967     15.77    0.232      3.203
Qmax(1) =
         1.000 *    1.000 *   181.979) +
         1.062 *    0.907 *   292.967) + =     464.144
Qmax(2) =
         0.943 *    1.000 *   181.979) +
         1.000 *    1.000 *   292.967) + =     464.505

Total of 2 streams to confluence:
Flow rates before confluence point:
     181.979     292.967
Maximum flow rates at confluence using above data:
      464.144      464.505
Area of streams before confluence:
```

```
       62.750      100.260
Effective area values after confluence:
      153.657      163.010
Results of confluence:
Total flow rate =    464.505(CFS)
Time of concentration =    15.773 min.
Effective stream area after confluence =    163.010(Ac.)
Study area average Pervious fraction(Ap) =  0.885
Study area average soil loss rate(Fm) =    0.206(In/Hr)
Study area total (this main stream) =     163.01(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      317.000 to Point/Station      314.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   827.000(Ft.)
Downstream point/station elevation =   812.000(Ft.)
Pipe length  =   326.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   464.505(CFS)
Nearest computed pipe diameter  =    57.00(In.)
Calculated individual pipe flow  =  464.505(CFS)
Normal flow depth in pipe =   44.50(In.)
Flow top width inside pipe =  47.18(In.)
Critical depth could not be calculated.
Pipe flow velocity =     31.30(Ft/s)
Travel time through pipe =    0.17 min.
Time of concentration (TC) =    15.95 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      315.000 to Point/Station      314.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =    163.010(Ac.)
Runoff from this stream =    464.505(CFS)
Time of concentration =  15.95 min.
Rainfall intensity =     3.183(In/Hr)
Area averaged loss rate (Fm) =    0.2064(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8845
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    399.45   951.549     19.31    0.206      2.853
2    163.01   464.505     15.95    0.206      3.183
Qmax(1) =
        1.000 *    1.000 *   951.549) +
        0.889 *    1.000 *   464.505) + =    1364.474
Qmax(2) =
        1.125 *    0.826 *   951.549) +
        1.000 *    1.000 *   464.505) + =    1348.486

Total of 2 main streams to confluence:
```

```
Flow rates before confluence point:
     952.549     465.505
Maximum flow rates at confluence using above data:
     1364.474     1348.486
Area of streams before confluence:
      399.453      163.010
Effective area values after confluence:
      562.463      492.898


Results of confluence:
Total flow rate =   1364.474(CFS)
Time of concentration =    19.309 min.
Effective stream area after confluence  =    562.463(Ac.)
Study area average Pervious fraction(Ap) =  0.873
Study area average soil loss rate(Fm) =    0.206(In/Hr)
Study area total =     562.46(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     314.000 to Point/Station     830.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  812.000(Ft.)
Downstream point/station elevation =  615.000(Ft.)
Pipe length  =  1621.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =  1364.474(CFS)
Nearest computed pipe diameter  =    72.00(In.)
Calculated individual pipe flow  =  1364.474(CFS)
Normal flow depth in pipe =   54.64(In.)
Flow top width inside pipe =   61.60(In.)
Critical depth could not be calculated.
Pipe flow velocity =     59.27(Ft/s)
Travel time through pipe =    0.46 min.
Time of concentration (TC) =    19.77 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      314.000 to Point/Station      830.000
**** SUBAREA FLOW ADDITION ****
                                                              G18
------------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.090
Decimal fraction soil group C = 0.490
Decimal fraction soil group D = 0.420
SCS curve number for soil(AMC 2)  = 70.35
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.233(In/Hr)
Max Catchment Loss (Fm) =     0.163(In/Hr)
The area added to the existing stream with this TC
does not add flow per Para 6b, Page D-15 of the OCHM,
therefore the upstream flow rate of Q =   1364.474(CFS) is being used
Time of concentration =    19.77 min.
Rainfall intensity =      2.815(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.834
Subarea runoff =      0.000(CFS) for   10.880(Ac.)
Total runoff =   1364.474(CFS)    Total area =    573.34(Ac.)
```

```
Area averaged Fm value =     0.205(In/Hr)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station      803.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     573.343(Ac.)
Runoff from this stream =    1364.474(CFS)
Time of concentration =    19.77 min.
Rainfall intensity =      2.815(In/Hr)
Area averaged loss rate (Fm) =     0.2053(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8694
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      150.000 to Point/Station      160.000
**** INITIAL AREA EVALUATION ****
                                                                  E1
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =      0.250(In/Hr)
Initial subarea data:
Initial area flow distance =    300.000(Ft.)
Top (of initial area) elevation =   1575.000(Ft.)
Bottom (of initial area) elevation =   1350.000(Ft.)
Difference in elevation =    225.000(Ft.)
Slope =    0.75000  s(%)=       75.00
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.697 min.
Rainfall intensity =      4.233(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.847
Subarea runoff =     5.090(CFS)
Total initial stream area =       1.420(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      160.000 to Point/Station      162.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                  E2
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     17.167(CFS)
Depth of flow =   0.346(Ft.), Average velocity =   8.729(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
```

```
Manning's 'N' friction factor =    0.050
-----------------------------------------------------------------
Sub-Channel flow  =     17.167(CFS)
   '     '   flow top width =      6.382(Ft.)
   '     '    velocity=   8.729(Ft/s)
   '     '   area =      1.967(Sq.Ft)
   '     '   Froude number =     2.771

Upstream point elevation =  1350.000(Ft.)
Downstream point elevation =  1200.000(Ft.)
Flow length =   350.000(Ft.)
Travel time  =    0.67 min.
Time of concentration =   10.37 min.
Depth of flow =   0.346(Ft.)
Average velocity =   8.729(Ft/s)
Total irregular channel flow =    17.167(CFS)
Irregular channel normal depth above invert elev. =    0.346(Ft.)
Average velocity of channel(s) =    8.729(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.960
Decimal fraction soil group D = 0.040
SCS curve number for soil(AMC 2)  = 74.24
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.248(In/Hr)
Max Catchment Loss (Fm) =     0.248(In/Hr)
Rainfall intensity =      4.075(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.845
Subarea runoff =     24.077(CFS) for    7.050(Ac.)
Total runoff =     29.167(CFS)    Total area =     8.47(Ac.)
Area averaged Fm value =    0.248(In/Hr)
Depth of flow =   0.470(Ft.), Average velocity =  10.443(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     162.000 to Point/Station     164.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                              E3
-----------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     48.046(CFS)
Depth of flow =   0.737(Ft.), Average velocity =  10.069(Ft/s)
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =    0.050
-----------------------------------------------------------------
Sub-Channel flow  =     48.046(CFS)
   '     '   flow top width =      7.948(Ft.)
   '     '    velocity=   10.069(Ft/s)
   '     '   area =      4.771(Sq.Ft)
   '     '   Froude number =     2.290
```

```
Upstream point elevation =  1200.000(Ft.)
Downstream point elevation =  1020.000(Ft.)
Flow length =  750.000(Ft.)
Travel time =  1.24 min.
Time of concentration =  11.61 min.
Depth of flow =  0.737(Ft.)
Average velocity =  10.069(Ft/s)
Total irregular channel flow =  48.046(CFS)
Irregular channel normal depth above invert elev. =  0.737(Ft.)
Average velocity of channel(s) =  10.069(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.660
Decimal fraction soil group D = 0.340
SCS curve number for soil(AMC 2)  = 76.04
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=  0.233(In/Hr)
Max Catchment Loss (Fm) =  0.233(In/Hr)
Rainfall intensity =  3.819(In/Hr) for a  100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.844
Subarea runoff =  37.681(CFS) for  12.280(Ac.)
Total runoff =  66.848(CFS)  Total area =  20.75(Ac.)
Area averaged Fm value =  0.239(In/Hr)
Depth of flow =  0.886(Ft.), Average velocity =  11.142(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station  163.000 to Point/Station  164.000
**** SUBAREA FLOW ADDITION ****
                                                              E4
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.970
Decimal fraction soil group D = 0.030
SCS curve number for soil(AMC 2)  = 74.18
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=  0.249(In/Hr)
Max Catchment Loss (Fm) =  0.249(In/Hr)
Time of concentration =  11.61 min.
Rainfall intensity =  3.819(In/Hr) for a  100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.843
Subarea runoff =  42.158(CFS) for  13.120(Ac.)
Total runoff =  109.006(CFS)  Total area =  33.87(Ac.)
Area averaged Fm value =  0.243(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station  164.000 to Point/Station  170.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                              E5
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =  144.865(CFS)
Depth of flow =  1.736(Ft.), Average velocity =  9.849(Ft/s)
     ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
```

```
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =    144.865(CFS)
  '     '    flow top width =    11.944(Ft.)
  '     '     velocity=    9.849(Ft/s)
  '     '    area =     14.708(Sq.Ft)
  '     '    Froude number =     1.564

Upstream point elevation =  1020.000(Ft.)
Downstream point elevation =   920.000(Ft.)
Flow length =  1100.000(Ft.)
Travel time  =    1.86 min.
Time of concentration =   13.47 min.
Depth of flow =   1.736(Ft.)
Average velocity =   9.849(Ft/s)
Total irregular channel flow =   144.865(CFS)
Irregular channel normal depth above invert elev. =   1.736(Ft.)
Average velocity of channel(s) =   9.849(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.340
Decimal fraction soil group D = 0.660
SCS curve number for soil(AMC 2)  = 77.96
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=    0.217(In/Hr)
Max Catchment Loss (Fm) =     0.217(In/Hr)
Rainfall intensity =      3.507(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.841
Subarea runoff =     71.646(CFS) for   27.410(Ac.)
Total runoff =    180.652(CFS)    Total area =    61.28(Ac.)
Area averaged Fm value =    0.231(In/Hr)
Depth of flow =   1.943(Ft.), Average velocity =  10.461(Ft/s)


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Process from Point/Station     168.000 to Point/Station     170.000
**** SUBAREA FLOW ADDITION ****
                                                          E6
-----------------------------------------------------------------
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.410
Decimal fraction soil group D = 0.590
SCS curve number for soil(AMC 2)  = 81.95
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=    0.220(In/Hr)
Max Catchment Loss (Fm) =     0.220(In/Hr)
Time of concentration =    13.47 min.
Rainfall intensity =      3.507(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.842
Subarea runoff =     94.557(CFS) for   31.970(Ac.)
```

```
Total runoff =    275.210(CFS)    Total area =      93.25(Ac.)
Area averaged Fm value =    0.228(In/Hr)


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Process from Point/Station      170.000 to Point/Station      175.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

E7

```
Estimated mean flow rate at midpoint of channel =    326.659(CFS)
Depth of flow =   2.939(Ft.), Average velocity =  10.219(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------
Sub-Channel flow  =    326.659(CFS)
  '      '    flow top width =     16.755(Ft.)
  '      '     velocity=   10.219(Ft/s)
  '      '    area =     31.966(Sq.Ft)
  '      '    Froude number =     1.304

Upstream point elevation =   920.000(Ft.)
Downstream point elevation =   850.000(Ft.)
Flow length =  1260.000(Ft.)
Travel time  =    2.05 min.
Time of concentration =   15.52 min.
Depth of flow =   2.939(Ft.)
Average velocity =  10.219(Ft/s)
Total irregular channel flow =   326.659(CFS)
Irregular channel normal depth above invert elev. =   2.939(Ft.)
Average velocity of channel(s) =  10.219(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.120
Decimal fraction soil group D = 0.880
SCS curve number for soil(AMC 2)  = 79.28
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.206(In/Hr)
Max Catchment Loss (Fm) =     0.206(In/Hr)
Rainfall intensity =      3.233(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.839
Subarea runoff =    102.827(CFS) for   46.190(Ac.)
Total runoff =    378.037(CFS)    Total area =      139.44(Ac.)
Area averaged Fm value =    0.220(In/Hr)
Depth of flow =   3.151(Ft.), Average velocity =  10.615(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      175.000 to Point/Station      180.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

E8

```
Estimated mean flow rate at midpoint of channel =    432.532(CFS)
Depth of flow =   3.332(Ft.), Average velocity =  11.127(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    432.532(CFS)
  '     '    flow top width =     18.330(Ft.)
  '     '     velocity=   11.127(Ft/s)
  '     '    area =     38.872(Sq.Ft)
  '     '    Froude number =     1.347

Upstream point elevation =   850.000(Ft.)
Downstream point elevation =   730.000(Ft.)
Flow length =  2090.000(Ft.)
Travel time  =    3.13 min.
Time of concentration =   18.65 min.
Depth of flow =   3.332(Ft.)
Average velocity =  11.127(Ft/s)
Total irregular channel flow =   432.532(CFS)
Irregular channel normal depth above invert elev. =   3.332(Ft.)
Average velocity of channel(s) =  11.127(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.100
Decimal fraction soil group C = 0.130
Decimal fraction soil group D = 0.770
SCS curve number for soil(AMC 2)  = 77.32
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.217(In/Hr)
Max Catchment Loss (Fm) =     0.217(In/Hr)
Rainfall intensity =      2.910(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.832
Subarea runoff =    108.926(CFS) for   61.660(Ac.)
Total runoff =    486.962(CFS)    Total area =      201.10(Ac.)
Area averaged Fm value =    0.219(In/Hr)
Depth of flow =   3.523(Ft.), Average velocity =  11.473(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      178.000 to Point/Station      180.000
**** SUBAREA FLOW ADDITION ****
```

E9

```
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
```

```
Time of concentration =    18.65 min.
Rainfall intensity =     2.910(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.831
Subarea runoff =     76.793(CFS) for   32.080(Ac.)
Total runoff =    563.755(CFS)    Total area =     233.18(Ac.)
Area averaged Fm value =    0.223(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     180.000 to Point/Station     184.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                  E10
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    565.511(CFS)
Depth of flow =   3.981(Ft.), Average velocity =  10.961(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------------
Sub-Channel flow  =    565.510(CFS)
  '      '    flow top width =     20.923(Ft.)
  '      '     velocity=   10.961(Ft/s)
  '      '    area =     51.594(Sq.Ft)
  '      '    Froude number =    1.230

Upstream point elevation =   730.000(Ft.)
Downstream point elevation =   705.000(Ft.)
Flow length =   546.000(Ft.)
Travel time  =    0.83 min.
Time of concentration =  19.48 min.
Depth of flow =   3.981(Ft.)
Average velocity =  10.961(Ft/s)
Total irregular channel flow =   565.511(CFS)
Irregular channel normal depth above invert elev. =   3.981(Ft.)
Average velocity of channel(s) =  10.961(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.600
Decimal fraction soil group D = 0.400
SCS curve number for soil(AMC 2)  = 76.40
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.230(In/Hr)
Max Catchment Loss (Fm) =     0.230(In/Hr)
Rainfall intensity =      2.838(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.829
Subarea runoff =      3.448(CFS) for    7.880(Ac.)
Total runoff =    567.204(CFS)    Total area =     241.06(Ac.)
Area averaged Fm value =    0.224(In/Hr)
Depth of flow =   3.986(Ft.), Average velocity =  10.969(Ft/s)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      180.000 to Point/Station      184.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     241.060(Ac.)
Runoff from this stream =     567.204(CFS)
Time of concentration =   19.48 min.
Rainfall intensity =    2.838(In/Hr)
Area averaged loss rate (Fm) =    0.2237(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


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Process from Point/Station      181.000 to Point/Station      182.000
**** INITIAL AREA EVALUATION ****                                  E11
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 61.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.300(In/Hr)
Max Catchment Loss (Fm) =     0.300(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1225.000(Ft.)
Bottom (of initial area) elevation =  1175.000(Ft.)
Difference in elevation =    50.000(Ft.)
Slope =    0.16667  s(%)=      16.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.101 min.
Rainfall intensity =      3.563(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.824
Subarea runoff =      3.818(CFS)
Total initial stream area =        1.300(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      182.000 to Point/Station      184.000
**** STREET INLET + AREA  + PIPE  TRAVEL TIME ****                 E12
----------------------------------------------------------------------
Top of street segment elevation =  1175.000(Ft.)
End of street segment elevation =   915.000(Ft.)
Length of street segment  =  2250.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  13.000(Ft.)
Distance from crown to crossfall grade break  =   5.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.017
Slope from grade break to crown (v/hz)  =   0.017
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   2.000(Ft.)
Slope from curb to property line (v/hz) =   0.017
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
```

```
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
No street inlet installed at this point
Estimated mean flow rate at midpoint of street =    48.463(CFS)
Depth of flow =   0.411(Ft.), Average velocity =  10.448(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  13.000(Ft.)
Flow velocity =  10.45(Ft/s)
Travel time =    3.59 min.     TC =   16.69  min.
 Adding area flow to street
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.290
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.710
SCS curve number for soil(AMC 2)  = 69.49
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=     0.229(In/Hr)
Max Catchment Loss (Fm) =     0.183(In/Hr)
Rainfall intensity =   3.101(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.846
Subarea runoff =    89.175(CFS) for   34.160(Ac.)
Total runoff =   92.992(CFS)   Total area =     35.46(Ac.)
Area averaged Fm value =   0.187(In/Hr)
Street flow at end of street =     92.992(CFS)
Half street flow at end of street =    46.496(CFS)
Depth of flow =   0.497(Ft.), Average velocity =  13.525(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  13.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      181.000 to Point/Station      184.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     35.460(Ac.)
Runoff from this stream =     92.992(CFS)
Time of concentration =   16.69 min.
Rainfall intensity =     3.101(In/Hr)
Area averaged loss rate (Fm) =    0.1875(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8073
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    241.06   567.204     19.48    0.224      2.838
2     35.46    92.992     16.69    0.187      3.101
Qmax(1) =
        1.000 *    1.000 *   567.204) +
        0.910 *    1.000 *    92.992) + =     651.794
Qmax(2) =
        1.101 *    0.857 *   567.204) +
        1.000 *    1.000 *    92.992) + =     627.770
```

```
Total of 2 streams to confluence:
Flow rates before confluence point:
     567.204      92.992
Maximum flow rates at confluence using above data:
      651.794      627.770
Area of streams before confluence:
      241.060       35.460
Effective area values after confluence:
      276.520      241.947
Results of confluence:
Total flow rate =    651.794(CFS)
Time of concentration =    19.484 min.
Effective stream area after confluence =    276.520(Ac.)
Study area average Pervious fraction(Ap) =  0.975
Study area average soil loss rate(Fm) =    0.219(In/Hr)
Study area total (this main stream) =    276.52(Ac.)


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Process from Point/Station      184.000 to Point/Station      190.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                  E13
Estimated mean flow rate at midpoint of channel =    652.637(CFS)
Depth of flow =   4.409(Ft.), Average velocity =  10.713(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number     'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    652.636(CFS)
  '      '    flow top width =     22.636(Ft.)
  '      '     velocity=  10.713(Ft/s)
  '      '    area =     60.922(Sq.Ft)
  '      '    Froude number =     1.151

Upstream point elevation =   705.000(Ft.)
Downstream point elevation =  665.000(Ft.)
Flow length =  1025.000(Ft.)
Travel time  =    1.59 min.
Time of concentration =   21.08 min.
Depth of flow =   4.409(Ft.)
Average velocity =  10.713(Ft/s)
Total irregular channel flow =   652.637(CFS)
Irregular channel normal depth above invert elev. =   4.409(Ft.)
Average velocity of channel(s) =  10.713(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 80.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.200(In/Hr)
```

```
Max Catchment Loss (Fm) =     0.200(In/Hr)
Rainfall intensity =      2.713(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.828
Subarea runoff =      1.618(CFS) for   14.480(Ac.)
Total runoff =    653.412(CFS)    Total area =    291.00(Ac.)
Area averaged Fm value =    0.218(In/Hr)
Depth of flow =   4.411(Ft.), Average velocity =  10.716(Ft/s)


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Process from Point/Station      184.000 to Point/Station      190.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =    291.000(Ac.)
Runoff from this stream =    653.412(CFS)
Time of concentration =   21.08 min.
Rainfall intensity =     2.713(In/Hr)
Area averaged loss rate (Fm) =    0.2181(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9765


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      186.000 to Point/Station      188.000
**** INITIAL AREA EVALUATION ****
                                                              E14
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 61.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.300(In/Hr)
Max Catchment Loss (Fm) =     0.300(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1085.000(Ft.)
Bottom (of initial area) elevation =   990.000(Ft.)
Difference in elevation =    95.000(Ft.)
Slope =    0.31667  s(%)=      31.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.522 min.
Rainfall intensity =      3.835(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.830
Subarea runoff =      5.822(CFS)
Total initial stream area =        1.830(Ac.)


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Process from Point/Station      188.000 to Point/Station      190.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                              E15
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     33.631(CFS)
Depth of flow =   0.637(Ft.), Average velocity =   8.412(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
```

```
Point number      'X' coordinate    'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =  0.050
-----------------------------------------------------------------
Sub-Channel flow =    33.631(CFS)
   '      '    flow top width =      7.549(Ft.)
   '      '     velocity=    8.412(Ft/s)
   '      '    area =      3.998(Sq.Ft)
   '      '    Froude number =    2.037

Upstream point elevation =   990.000(Ft.)
Downstream point elevation =   665.000(Ft.)
Flow length =  1650.000(Ft.)
Travel time  =    3.27 min.
Time of concentration =   14.79 min.
Depth of flow =   0.637(Ft.)
Average velocity =   8.412(Ft/s)
Total irregular channel flow =    33.631(CFS)
Irregular channel normal depth above invert elev. =   0.637(Ft.)
Average velocity of channel(s) =   8.412(Ft/s)
 Adding area flow to channel
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.030
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.970
SCS curve number for soil(AMC 2)  = 74.43
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=     0.203(In/Hr)
Max Catchment Loss (Fm) =     0.162(In/Hr)
Rainfall intensity =      3.323(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.853
Subarea runoff =     55.545(CFS) for   19.820(Ac.)
Total runoff =     61.367(CFS)     Total area =       21.65(Ac.)
Area averaged Fm value =    0.174(In/Hr)
Depth of flow =   0.892(Ft.), Average velocity =  10.134(Ft/s)


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Process from Point/Station      186.000 to Point/Station      190.000
**** CONFLUENCE OF MINOR STREAMS ****
_________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     21.650(Ac.)
Runoff from this stream =     61.367(CFS)
Time of concentration =   14.79 min.
Rainfall intensity =     3.323(In/Hr)
Area averaged loss rate (Fm) =    0.1740(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8169
Summary of stream data:

Stream  Area  Flow rate      TC     Fm      Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)
```

```
1    291.00   653.412     21.08    0.218      2.713
2     21.65    61.367     14.79    0.174      3.323
Qmax(1) =
         1.000 *    1.000 *   653.412) +
         0.806 *    1.000 *    61.367) + =     702.884
Qmax(2) =
         1.245 *    0.702 *   653.412) +
         1.000 *    1.000 *    61.367) + =     632.080

Total of 2 streams to confluence:
Flow rates before confluence point:
     653.412      61.367
Maximum flow rates at confluence using above data:
      702.884      632.080
Area of streams before confluence:
      291.000       21.650
Effective area values after confluence:
      312.650      225.851
Results of confluence:
Total flow rate =    702.884(CFS)
Time of concentration =    21.079 min.
Effective stream area after confluence =    312.650(Ac.)
Study area average Pervious fraction(Ap) =  0.965
Study area average soil loss rate(Fm) =    0.215(In/Hr)
Study area total (this main stream) =     312.65(Ac.)


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Process from Point/Station      190.000 to Point/Station      195.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                E16
Estimated mean flow rate at midpoint of channel =    709.270(CFS)
Depth of flow =   4.587(Ft.), Average velocity =  10.911(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    709.270(CFS)
  '     '    flow top width =     23.346(Ft.)
  '     '     velocity=   10.911(Ft/s)
  '     '    area =     65.006(Sq.Ft)
  '     '    Froude number =     1.152

Upstream point elevation =   665.000(Ft.)
Downstream point elevation =   620.000(Ft.)
Flow length =  1162.000(Ft.)
Travel time  =    1.77 min.
Time of concentration =   22.85 min.
Depth of flow =   4.587(Ft.)
Average velocity =  10.911(Ft/s)
Total irregular channel flow =   709.270(CFS)
Irregular channel normal depth above invert elev. =   4.587(Ft.)
```

```
Average velocity of channel(s) =  10.911(Ft/s)
 Adding area flow to channel
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.380
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.620
SCS curve number for soil(AMC 2)  = 67.78
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=     0.238(In/Hr)
Max Catchment Loss (Fm) =     0.190(In/Hr)
Rainfall intensity =      2.590(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.826
Subarea runoff =     12.698(CFS) for   21.880(Ac.)
Total runoff =    715.581(CFS)    Total area =      334.53(Ac.)
Area averaged Fm value =    0.213(In/Hr)
Depth of flow =   4.605(Ft.), Average velocity =  10.936(Ft/s)


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Process from Point/Station      190.000 to Point/Station      195.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =    334.530(Ac.)
Runoff from this stream =    715.581(CFS)
Time of concentration =   22.85 min.
Rainfall intensity =     2.590(In/Hr)
Area averaged loss rate (Fm) =    0.2134(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9546


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Process from Point/Station      193.000 to Point/Station      195.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
                                                              E17
------------------------------------------------------------------------
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.200
Decimal fraction soil group C = 0.300
Decimal fraction soil group D = 0.500
SCS curve number for soil(AMC 2)  = 69.40
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=     0.235(In/Hr)
Max Catchment Loss (Fm) =     0.188(In/Hr)
Rainfall intensity =      2.519(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  24.00 min.  Rain intensity =       2.52(In/Hr)
Total area =       434.50(Ac.)  Total runoff =   1580.77(CFS)


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Process from Point/Station      193.000 to Point/Station      195.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =    434.500(Ac.)
Runoff from this stream =   1580.770(CFS)
Time of concentration =   24.00 min.
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Rainfall intensity =     2.519(In/Hr)
Area averaged loss rate (Fm) =    0.1880(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    334.53   715.581     22.85    0.213      2.590
2    434.50  1580.770     24.00    0.188      2.519
Qmax(1) =
         1.000 *    1.000 *   715.581) +
         1.031 *    0.952 *  1580.770) + =    2267.114
Qmax(2) =
         0.970 *    1.000 *   715.581) +
         1.000 *    1.000 *  1580.770) + =    2274.787

Total of 2 streams to confluence:
Flow rates before confluence point:
     715.581    1580.770
Maximum flow rates at confluence using above data:
     2267.114     2274.787
Area of streams before confluence:
      334.530      434.500
Effective area values after confluence:
      748.278      769.030
Results of confluence:
Total flow rate =   2274.787(CFS)
Time of concentration =    24.000 min.
Effective stream area after confluence =    769.030(Ac.)
Study area average Pervious fraction(Ap) =  0.867
Study area average soil loss rate(Fm) =    0.199(In/Hr)
Study area total (this main stream) =     769.03(Ac.)


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Process from Point/Station      195.000 to Point/Station      830.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   620.000(Ft.)
Downstream point/station elevation =   615.000(Ft.)
Pipe length  =   150.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =  2274.787(CFS)
Nearest computed pipe diameter  =    108.00(In.)
Calculated individual pipe flow  =  2274.787(CFS)
Normal flow depth in pipe =   88.31(In.)
Flow top width inside pipe =   83.40(In.)
Critical depth could not be calculated.
Pipe flow velocity =     40.85(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    24.06 min.


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Process from Point/Station      150.000 to Point/Station      830.000
**** CONFLUENCE OF MAIN STREAMS ****
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```

```
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     769.030(Ac.)
Runoff from this stream =   2274.787(CFS)
Time of concentration =   24.06 min.
Rainfall intensity =     2.515(In/Hr)
Area averaged loss rate (Fm) =    0.1991(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8673
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    573.34  1364.474     19.77    0.205      2.815
2    769.03  2274.787     24.06    0.199      2.515
Qmax(1) =
         1.000 *    1.000 *  1364.474) +
         1.130 *    0.821 *  2274.787) + =    3475.178
Qmax(2) =
         0.885 *    1.000 *  1364.474) +
         1.000 *    1.000 *  2274.787) + =    3482.393

Total of 2 main streams to confluence:
Flow rates before confluence point:
    1365.474    2275.787
Maximum flow rates at confluence using above data:
     3475.178     3482.393
Area of streams before confluence:
      573.343      769.030
Effective area values after confluence:
     1205.062     1342.373


Results of confluence:
Total flow rate =   3482.393(CFS)
Time of concentration =    24.061 min.
Effective stream area after confluence  =   1342.373(Ac.)
Study area average Pervious fraction(Ap) =  0.868
Study area average soil loss rate(Fm) =    0.202(In/Hr)
Study area total =    1342.37(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      830.000 to Point/Station      840.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   615.000(Ft.)
Downstream point/station elevation =   610.000(Ft.)
Pipe length  =   150.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =  3482.393(CFS)
Nearest computed pipe diameter  =    129.00(In.)
Calculated individual pipe flow  =  3482.393(CFS)
Normal flow depth in pipe =  100.48(In.)
Flow top width inside pipe =  107.07(In.)
Critical depth could not be calculated.
Pipe flow velocity =     45.91(Ft/s)
Travel time through pipe =    0.05 min.
```

```
Time of concentration (TC) =    24.12 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station      840.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =   1342.373(Ac.)
Runoff from this stream =   3482.393(CFS)
Time of concentration =   24.12 min.
Rainfall intensity =     2.512(In/Hr)
Area averaged loss rate (Fm) =    0.2017(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8682
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      330.000 to Point/Station      331.000
**** INITIAL AREA EVALUATION ****
                                                                      G19
------------------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.175(In/Hr)
Initial subarea data:
Initial area flow distance =   260.000(Ft.)
Top (of initial area) elevation =   886.600(Ft.)
Bottom (of initial area) elevation =   866.000(Ft.)
Difference in elevation =   20.600(Ft.)
Slope =   0.07923  s(%)=       7.92
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.725 min.
Rainfall intensity =     5.221(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
Subarea runoff =     2.816(CFS)
Total initial stream area =       0.620(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      331.000 to Point/Station      332.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
                                                                      G20
------------------------------------------------------------------------------
Top of street segment elevation =   866.000(Ft.)
End of street segment elevation =   793.000(Ft.)
Length of street segment  =   710.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   8.000(Ft.)
```

```
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0130
 Manning's N from gutter to grade break =  0.0130
 Manning's N from grade break to crown =  0.0130
Estimated mean flow rate at midpoint of street =    14.477(CFS)
Depth of flow =   0.305(Ft.), Average velocity =   7.881(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   8.898(Ft.)
Flow velocity =   7.88(Ft/s)
Travel time =    1.50 min.     TC =    8.23  min.
 Adding area flow to street
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.175(In/Hr)
Rainfall intensity =      4.652(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.866
Subarea runoff =     23.211(CFS) for    5.840(Ac.)
Total runoff =     26.027(CFS)    Total area =        6.46(Ac.)
Area averaged Fm value =    0.175(In/Hr)
Street flow at end of street =     26.027(CFS)
Half street flow at end of street =     13.013(CFS)
Depth of flow =   0.356(Ft.), Average velocity =   9.012(Ft/s)
Flow width (from curb towards crown)=  11.477(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      332.000 to Point/Station      333.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   785.000(Ft.)
Downstream point/station elevation =   720.000(Ft.)
Pipe length  =   925.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    26.027(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    26.027(CFS)
Normal flow depth in pipe =   13.80(In.)
Flow top width inside pipe =   15.23(In.)
Critical depth could not be calculated.
Pipe flow velocity =     17.91(Ft/s)
Travel time through pipe =    0.86 min.
Time of concentration (TC) =     9.09 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      333.000 to Point/Station      333.000
**** SUBAREA FLOW ADDITION ****
                                                              G21
------------------------------------------------------------------------
PARK subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
```

```
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.8500  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.212(In/Hr)
Time of concentration =     9.09 min.
Rainfall intensity =      4.394(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.860
Subarea runoff =     29.170(CFS) for    8.150(Ac.)
Total runoff =     55.196(CFS)    Total area =       14.61(Ac.)
Area averaged Fm value =    0.196(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      333.000 to Point/Station      840.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

G22

```
Estimated mean flow rate at midpoint of channel =     68.022(CFS)
Depth of flow =   1.133(Ft.), Average velocity =   8.258(Ft/s)
      ******* Irregular Channel Data ***********
-------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
-------------------------------------------------------------------
Sub-Channel flow  =     68.022(CFS)
  '     '    flow top width =      9.534(Ft.)
  '     '     velocity=    8.258(Ft/s)
  '     '    area =      8.237(Sq.Ft)
  '     '    Froude number =     1.566

Upstream point elevation =   720.000(Ft.)
Downstream point elevation =   610.000(Ft.)
Flow length =  1090.000(Ft.)
Travel time  =    2.20 min.
Time of concentration =   11.29 min.
Depth of flow =   1.133(Ft.)
Average velocity =   8.258(Ft/s)
Total irregular channel flow =    68.022(CFS)
Irregular channel normal depth above invert elev. =   1.133(Ft.)
Average velocity of channel(s) =   8.258(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      3.880(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.849
```

```
Subarea runoff =     25.599(CFS) for    9.900(Ac.)
Total runoff =     80.795(CFS)     Total area =       24.51(Ac.)
Area averaged Fm value =    0.218(In/Hr)
Depth of flow =   1.243(Ft.), Average velocity =   8.680(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      330.000 to Point/Station      840.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     24.510(Ac.)
Runoff from this stream =     80.795(CFS)
Time of concentration =   11.29 min.
Rainfall intensity =     3.880(In/Hr)
Area averaged loss rate (Fm) =    0.2178(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8711
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1   1342.37  3482.393     24.12    0.202      2.512
2     24.51    80.795     11.29    0.218      3.880
Qmax(1) =
         1.000 *    1.000 *  3482.393) +
         0.626 *    1.000 *    80.795) + =    3532.993
Qmax(2) =
         1.593 *    0.468 *  3482.393) +
         1.000 *    1.000 *    80.795) + =    2676.555

Total of 2 main streams to confluence:
Flow rates before confluence point:
    3483.393      81.795
Maximum flow rates at confluence using above data:
     3532.993     2676.555
Area of streams before confluence:
     1342.373       24.510
Effective area values after confluence:
     1366.883      652.795


Results of confluence:
Total flow rate =   3532.993(CFS)
Time of concentration =    24.116 min.
Effective stream area after confluence  =   1366.883(Ac.)
Study area average Pervious fraction(Ap) =  0.868
Study area average soil loss rate(Fm) =    0.202(In/Hr)
Study area total =    1366.88(Ac.)
End of computations, total study area =         1379.21 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.869
```

Area averaged SCS curve number (AMC 2) = 73.1

25-YEAR PROPOSED CONDITION

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2004 Version 8.0
Rational Hydrology Study, Date: 12/07/12 File Name: 1200prop25.roc

---

ESPERANZA HILLS
PROPOSED CONDITION (ONSITE AND OFFSITE)
25-YEAR
R:\09\1200\PRELIM\REPORTS\HYDRO\RATIONAL\PROPOSED\1200A25

Program License Serial Number 6062

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 25.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

++
Process from Point/Station 10.000 to Point/Station 15.000
**** INITIAL AREA EVALUATION ****

C1

UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 74.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.250(In/Hr)
Max Catchment Loss (Fm) = 0.250(In/Hr)
Initial subarea data:
Initial area flow distance = 300.000(Ft.)
Top (of initial area) elevation = 1780.000(Ft.)
Bottom (of initial area) elevation = 1670.000(Ft.)
Difference in elevation = 110.000(Ft.)
Slope = 0.36667 s(%)= 36.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.189 min.
Rainfall intensity = 3.058(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.826
Subarea runoff = 2.350(CFS)
Total initial stream area = 0.930(Ac.)

++
Process from Point/Station 15.000 to Point/Station 20.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

C2

Estimated mean flow rate at midpoint of channel = 6.540(CFS)
Depth of flow = 0.230(Ft.), Average velocity = 5.217(Ft/s)

```
      ******* Irregular Channel Data ***********
--------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1               0.00              50.00
      2             100.00               0.00
      3             105.00               0.00
      4             205.00              50.00
Manning's 'N' friction factor =   0.050
--------------------------------------------------------------------
Sub-Channel flow  =      6.540(CFS)
   '      '    flow top width =      5.919(Ft.)
   '      '     velocity=    5.217(Ft/s)
   '      '    area =      1.254(Sq.Ft)
   '      '    Froude number =     1.998

Upstream point elevation =  1670.000(Ft.)
Downstream point elevation =  1590.000(Ft.)
Flow length =   320.000(Ft.)
Travel time  =    1.02 min.
Time of concentration =   12.21 min.
Depth of flow =   0.230(Ft.)
Average velocity =   5.217(Ft/s)
Total irregular channel flow =     6.540(CFS)
Irregular channel normal depth above invert elev. =   0.230(Ft.)
Average velocity of channel(s) =   5.217(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.910(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.823
Subarea runoff =     8.303(CFS) for    3.520(Ac.)
Total runoff =     10.653(CFS)    Total area =       4.45(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.306(Ft.), Average velocity =   6.203(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       25.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

C3

```
--------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     16.764(CFS)
Depth of flow =   0.397(Ft.), Average velocity =   7.294(Ft/s)
      ******* Irregular Channel Data ***********
--------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1               0.00              50.00
      2             100.00               0.00
      3             105.00               0.00
      4             205.00              50.00
Manning's 'N' friction factor =   0.050
--------------------------------------------------------------------
```

```
Sub-Channel flow  =     16.764(CFS)
  '     '    flow top width =      6.587(Ft.)
  '     '     velocity=    7.294(Ft/s)
  '     '    area =      2.298(Sq.Ft)
  '     '    Froude number =     2.176

Upstream point elevation =  1590.000(Ft.)
Downstream point elevation =  1450.000(Ft.)
Flow length =   550.000(Ft.)
Travel time  =    1.26 min.
Time of concentration =   13.47 min.
Depth of flow =   0.397(Ft.)
Average velocity =   7.294(Ft/s)
Total irregular channel flow =    16.764(CFS)
Irregular channel normal depth above invert elev. =   0.397(Ft.)
Average velocity of channel(s) =   7.294(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.680
Decimal fraction soil group D = 0.320
SCS curve number for soil(AMC 2)  = 75.92
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.234(In/Hr)
Max Catchment Loss (Fm) =     0.234(In/Hr)
Rainfall intensity =     2.753(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.821
Subarea runoff =     12.135(CFS) for    5.630(Ac.)
Total runoff =     22.788(CFS)    Total area =       10.08(Ac.)
Area averaged Fm value =    0.241(In/Hr)
Depth of flow =   0.474(Ft.), Average velocity =   8.085(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       25.000 to Point/Station       30.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****                    C4
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     35.802(CFS)
Depth of flow =   0.606(Ft.), Average velocity =   9.514(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------
Sub-Channel flow  =     35.802(CFS)
  '     '    flow top width =      7.423(Ft.)
  '     '     velocity=    9.514(Ft/s)
  '     '    area =      3.763(Sq.Ft)
  '     '    Froude number =     2.355

Upstream point elevation =  1450.000(Ft.)
Downstream point elevation =  1290.000(Ft.)
Flow length =   600.000(Ft.)
Travel time  =    1.05 min.
```

```
Time of concentration =   14.52 min.
Depth of flow =   0.606(Ft.)
Average velocity =   9.514(Ft/s)
Total irregular channel flow =    35.802(CFS)
Irregular channel normal depth above invert elev. =   0.606(Ft.)
Average velocity of channel(s) =   9.514(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.500
SCS curve number for soil(AMC 2)  = 77.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.225(In/Hr)
Max Catchment Loss (Fm) =     0.225(In/Hr)
Rainfall intensity =      2.638(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.821
Subarea runoff =     25.958(CFS) for   12.430(Ac.)
Total runoff =     48.747(CFS)    Total area =       22.51(Ac.)
Area averaged Fm value =    0.232(In/Hr)
Depth of flow =   0.721(Ft.), Average velocity =  10.489(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       28.000 to Point/Station       30.000
**** SUBAREA FLOW ADDITION ****
                                                                  C5
_____________________________________________________________________
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Time of concentration =    14.52 min.
Rainfall intensity =      2.638(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.819
Subarea runoff =     29.126(CFS) for   13.550(Ac.)
Total runoff =     77.873(CFS)    Total area =       36.06(Ac.)
Area averaged Fm value =    0.239(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.000 to Point/Station       40.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                  C6
_____________________________________________________________________
Estimated mean flow rate at midpoint of channel =     92.178(CFS)
Depth of flow =   1.238(Ft.), Average velocity =   9.955(Ft/s)
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
```

```
------------------------------------------------------------------
Sub-Channel flow  =     92.178(CFS)
  '      '    flow top width =      9.954(Ft.)
  '      '     velocity=    9.955(Ft/s)
  '      '    area =      9.259(Sq.Ft)
  '      '    Froude number =     1.819

Upstream point elevation =  1290.000(Ft.)
Downstream point elevation =  1170.000(Ft.)
Flow length =   900.000(Ft.)
Travel time  =    1.51 min.
Time of concentration =   16.03 min.
Depth of flow =   1.238(Ft.)
Average velocity =   9.955(Ft/s)
Total irregular channel flow =    92.178(CFS)
Irregular channel normal depth above invert elev. =   1.238(Ft.)
Average velocity of channel(s) =   9.955(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.680
Decimal fraction soil group D = 0.320
SCS curve number for soil(AMC 2)  = 75.92
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.234(In/Hr)
Max Catchment Loss (Fm) =     0.234(In/Hr)
Rainfall intensity =      2.495(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.814
Subarea runoff =     28.555(CFS) for   16.320(Ac.)
Total runoff =    106.428(CFS)    Total area =       52.38(Ac.)
Area averaged Fm value =    0.237(In/Hr)
Depth of flow =   1.337(Ft.), Average velocity =  10.373(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       40.000 to Point/Station       85.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1170.000(Ft.)
Downstream point/station elevation =  1162.000(Ft.)
Pipe length  =   198.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   106.428(CFS)
Nearest computed pipe diameter  =    36.00(In.)
Calculated individual pipe flow  =   106.428(CFS)
Normal flow depth in pipe =   24.22(In.)
Flow top width inside pipe =   33.78(In.)
Critical depth could not be calculated.
Pipe flow velocity =     21.04(Ft/s)
Travel time through pipe =    0.16 min.
Time of concentration (TC) =    16.18 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       85.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     52.380(Ac.)
Runoff from this stream =    106.428(CFS)
```

```
Time of concentration =   16.18 min.
Rainfall intensity =     2.481(In/Hr)
Area averaged loss rate (Fm) =    0.2374(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       60.000 to Point/Station       70.000
**** INITIAL AREA EVALUATION ****                                  C7
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1655.000(Ft.)
Bottom (of initial area) elevation =  1550.000(Ft.)
Difference in elevation =   105.000(Ft.)
Slope =    0.35000  s(%)=      35.00
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.294 min.
Rainfall intensity =     3.042(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.826
Subarea runoff =      5.502(CFS)
Total initial stream area =       2.190(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       70.000 to Point/Station       75.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****                        C8
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     13.196(CFS)
Depth of flow =   0.293(Ft.), Average velocity =   8.074(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     13.196(CFS)
  '     '    flow top width =      6.171(Ft.)
  '     '     velocity=    8.074(Ft/s)
  '     '    area =      1.635(Sq.Ft)
  '     '    Froude number =     2.764

Upstream point elevation =  1550.000(Ft.)
Downstream point elevation =  1340.000(Ft.)
Flow length =   470.000(Ft.)
Travel time  =    0.97 min.
Time of concentration =   12.26 min.
Depth of flow =   0.293(Ft.)
```

```
Average velocity =   8.074(Ft/s)
Total irregular channel flow =    13.196(CFS)
Irregular channel normal depth above invert elev. =   0.293(Ft.)
Average velocity of channel(s) =   8.074(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.903(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.822
Subarea runoff =     15.318(CFS) for    6.530(Ac.)
Total runoff =     20.820(CFS)    Total area =       8.72(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.382(Ft.), Average velocity =   9.454(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       75.000 to Point/Station       80.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

C9

```
Estimated mean flow rate at midpoint of channel =     37.875(CFS)
Depth of flow =   0.674(Ft.), Average velocity =   8.856(Ft/s)
      ******* Irregular Channel Data ***********
-------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
-------------------------------------------------------------------
Sub-Channel flow  =     37.875(CFS)
  '     '    flow top width =      7.695(Ft.)
  '     '     velocity=    8.856(Ft/s)
  '     '    area =      4.277(Sq.Ft)
  '     '    Froude number =     2.094

Upstream point elevation =  1340.000(Ft.)
Downstream point elevation =  1180.000(Ft.)
Flow length =   780.000(Ft.)
Travel time  =    1.47 min.
Time of concentration =   13.73 min.
Depth of flow =   0.674(Ft.)
Average velocity =   8.856(Ft/s)
Total irregular channel flow =    37.875(CFS)
Irregular channel normal depth above invert elev. =   0.674(Ft.)
Average velocity of channel(s) =   8.856(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
```

```
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=    0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.723(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.817
Subarea runoff =     34.043(CFS) for   15.930(Ac.)
Total runoff =     54.863(CFS)    Total area =      24.65(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.829(Ft.), Average velocity =   9.935(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       80.000 to Point/Station       85.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1180.000(Ft.)
Downstream point/station elevation =  1162.000(Ft.)
Pipe length  =   165.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    54.863(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    54.863(CFS)
Normal flow depth in pipe =   15.28(In.)
Flow top width inside pipe =  23.09(In.)
Critical depth could not be calculated.
Pipe flow velocity =     25.99(Ft/s)
Travel time through pipe =   0.11 min.
Time of concentration (TC) =   13.84 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       60.000 to Point/Station       85.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     24.650(Ac.)
Runoff from this stream =     54.863(CFS)
Time of concentration =   13.84 min.
Rainfall intensity =     2.711(In/Hr)
Area averaged loss rate (Fm) =    0.2500(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     52.38   106.428     16.18    0.237      2.481
2     24.65    54.863     13.84    0.250      2.711
Qmax(1) =
         1.000 *    1.000 *   106.428) +
         0.907 *    1.000 *    54.863) + =     156.166
Qmax(2) =
         1.102 *    0.855 *   106.428) +
         1.000 *    1.000 *    54.863) + =     155.192

Total of 2 streams to confluence:
Flow rates before confluence point:
     106.428      54.863
Maximum flow rates at confluence using above data:
```

```
      156.166      155.192
Area of streams before confluence:
       52.380       24.650
Effective area values after confluence:
       77.030       69.439
Results of confluence:
Total flow rate =    156.166(CFS)
Time of concentration =  16.183 min.
Effective stream area after confluence =    77.030(Ac.)
Study area average Pervious fraction(Ap) =  1.000
Study area average soil loss rate(Fm) =    0.241(In/Hr)
Study area total (this main stream) =      77.03(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      85.000 to Point/Station     302.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1162.000(Ft.)
Downstream point/station elevation =  1100.000(Ft.)
Pipe length  =  1177.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   156.166(CFS)
Nearest computed pipe diameter =    39.00(In.)
Calculated individual pipe flow  =   156.166(CFS)
Normal flow depth in pipe =   26.97(In.)
Flow top width inside pipe =   36.02(In.)
Critical depth could not be calculated.
Pipe flow velocity =     25.51(Ft/s)
Travel time through pipe =    0.77 min.
Time of concentration (TC) =    16.95 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      85.000 to Point/Station     302.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     77.030(Ac.)
Runoff from this stream =    156.166(CFS)
Time of concentration =   16.95 min.
Rainfall intensity =     2.417(In/Hr)
Area averaged loss rate (Fm) =    0.2414(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      300.000 to Point/Station     301.000
**** INITIAL AREA EVALUATION ****
                                                          G-1
------------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.500
SCS curve number for soil(AMC 2)  = 72.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.225(In/Hr)
Max Catchment Loss (Fm) =    0.158(In/Hr)
Initial subarea data:
```

```
Initial area flow distance =   285.000(Ft.)
Top (of initial area) elevation =  1275.000(Ft.)
Bottom (of initial area) elevation =  1272.000(Ft.)
Difference in elevation =     3.000(Ft.)
Slope =    0.01053  s(%)=       1.05
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.446 min.
Rainfall intensity =      3.179(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.855
Subarea runoff =      2.094(CFS)
Total initial stream area =      0.770(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
```

G1

```
Top of street segment elevation =  1272.500(Ft.)
End of street segment elevation =  1115.300(Ft.)
Length of street segment   =  3270.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =    0.020
Slope from grade break to crown (v/hz) =    0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =    8.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
Gutter width =    2.000(Ft.)
Gutter hike from flowline =   2.000(In.)
 Manning's N in gutter =  0.0130
 Manning's N from gutter to grade break =  0.0130
 Manning's N from grade break to crown =  0.0130
Estimated mean flow rate at midpoint of street =     30.290(CFS)
Depth of flow =   0.412(Ft.), Average velocity =   6.991(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  14.281(Ft.)
Flow velocity =   6.99(Ft/s)
Travel time =    7.80 min.     TC =   18.24  min.
 Adding area flow to street
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.880
Decimal fraction soil group D = 0.120
SCS curve number for soil(AMC 2)  = 69.72
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.244(In/Hr)
Max Catchment Loss (Fm) =     0.171(In/Hr)
Rainfall intensity =    2.319(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.834
Subarea runoff =     56.256(CFS) for   29.410(Ac.)
Total runoff =     58.350(CFS)    Total area =     30.18(Ac.)
Area averaged Fm value =    0.170(In/Hr)
Street flow at end of street =     58.350(CFS)
Half street flow at end of street =    29.175(CFS)
Depth of flow =   0.495(Ft.), Average velocity =   8.289(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  18.000(Ft.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      300.000 to Point/Station      302.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      30.180(Ac.)
Runoff from this stream =      58.350(CFS)
Time of concentration =  18.24 min.
Rainfall intensity =     2.319(In/Hr)
Area averaged loss rate (Fm) =    0.1705(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7000
Summary of stream data:

Stream  Area  Flow rate    TC     Fm     Rainfall Intensity
 No.    (Ac.)   (CFS)     (min) (In/Hr)     (In/Hr)


1     77.03   156.166     16.95    0.241     2.417
2     30.18    58.350     18.24    0.170     2.319
Qmax(1) =
         1.000 *    1.000 *   156.166) +
         1.046 *    0.929 *    58.350) + =    212.871
Qmax(2) =
         0.955 *    1.000 *   156.166) +
         1.000 *    1.000 *    58.350) + =    207.463

Total of 2 main streams to confluence:
Flow rates before confluence point:
     157.166      59.350
Maximum flow rates at confluence using above data:
      212.871      207.463
Area of streams before confluence:
       77.030      30.180
Effective area values after confluence:
      105.076      107.210


Results of confluence:
Total flow rate =    212.871(CFS)
Time of concentration =    16.952 min.
Effective stream area after confluence  =    105.076(Ac.)
Study area average Pervious fraction(Ap) =  0.916
Study area average soil loss rate(Fm) =    0.221(In/Hr)
Study area total =     107.21(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      303.000 to Point/Station      304.000
**** INITIAL AREA EVALUATION ****
                                                              G3
------------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.140(In/Hr)
```

```
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1275.200(Ft.)
Bottom (of initial area) elevation =  1272.500(Ft.)
Difference in elevation =     2.700(Ft.)
Slope =    0.00900  s(%)=     0.90
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.002 min.
Rainfall intensity =      3.087(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.859
Subarea runoff =      2.891(CFS)
Total initial stream area =    1.090(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     304.000 to Point/Station     302.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
```

G4

```
Top of street segment elevation =  1272.500(Ft.)
End of street segment elevation =  1115.300(Ft.)
Length of street segment   =  2562.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =    0.020
Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =    8.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
Gutter width =    2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0130
 Manning's N from gutter to grade break =  0.0130
 Manning's N from grade break to crown =  0.0130
Estimated mean flow rate at midpoint of street =    31.270(CFS)
Depth of flow =   0.402(Ft.), Average velocity =   7.730(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  13.770(Ft.)
Flow velocity =   7.73(Ft/s)
Travel time =    5.52 min.     TC =   16.53  min.
 Adding area flow to street
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.680
Decimal fraction soil group D = 0.320
SCS curve number for soil(AMC 2)  = 70.92
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.234(In/Hr)
Max Catchment Loss (Fm) =     0.164(In/Hr)
Rainfall intensity =    2.452(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.840
Subarea runoff =     56.586(CFS) for   27.780(Ac.)
Total runoff =     59.477(CFS)    Total area =       28.87(Ac.)
Area averaged Fm value =    0.163(In/Hr)
Street flow at end of street =     59.477(CFS)
Half street flow at end of street =    29.738(CFS)
Depth of flow =   0.483(Ft.), Average velocity =   9.030(Ft/s)
Flow width (from curb towards crown)=  17.795(Ft.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      303.000 to Point/Station      302.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      28.870(Ac.)
Runoff from this stream =      59.477(CFS)
Time of concentration =   16.53 min.
Rainfall intensity =     2.452(In/Hr)
Area averaged loss rate (Fm) =    0.1629(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)      (In/Hr)


1     77.03   156.166     16.95    0.241      2.417
2     30.18    58.350     18.24    0.170      2.319
3     28.87    59.477     16.53    0.163      2.452
Qmax(1) =
         1.000 *    1.000 *   156.166) +
         1.046 *    0.929 *    58.350) +
         0.985 *    1.000 *    59.477) + =     271.437
Qmax(2) =
         0.955 *    1.000 *   156.166) +
         1.000 *    1.000 *    58.350) +
         0.942 *    1.000 *    59.477) + =     263.477
Qmax(3) =
         1.016 *    0.975 *   156.166) +
         1.062 *    0.906 *    58.350) +
         1.000 *    1.000 *    59.477) + =     270.316

Total of 3 main streams to confluence:
Flow rates before confluence point:
     157.166      59.350      60.477
Maximum flow rates at confluence using above data:
      271.437      263.477      270.316
Area of streams before confluence:
       77.030       30.180       28.870
Effective area values after confluence:
      133.946      136.080      131.307


Results of confluence:
Total flow rate =    271.437(CFS)
Time of concentration =   16.952 min.
Effective stream area after confluence  =    133.946(Ac.)
Study area average Pervious fraction(Ap) =  0.870
Study area average soil loss rate(Fm) =    0.209(In/Hr)
Study area total =     136.08(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      132.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1105.000(Ft.)
```

```
Downstream point/station elevation =  1048.000(Ft.)
Pipe length  =   344.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   271.437(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =   271.437(CFS)
Normal flow depth in pipe =   29.50(In.)
Flow top width inside pipe =   27.70(In.)
Critical depth could not be calculated.
Pipe flow velocity =     43.79(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =    17.08 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station      132.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    133.946(Ac.)
Runoff from this stream =    271.437(CFS)
Time of concentration =  17.08 min.
Rainfall intensity =     2.406(In/Hr)
Area averaged loss rate (Fm) =    0.2090(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8698
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      110.000
**** INITIAL AREA EVALUATION ****
                                                              C10
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1610.000(Ft.)
Bottom (of initial area) elevation =  1560.000(Ft.)
Difference in elevation =    50.000(Ft.)
Slope =    0.16667  s(%)=      16.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.101 min.
Rainfall intensity =      2.796(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.820
Subarea runoff =      6.280(CFS)
Total initial stream area =       2.740(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      115.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                              C11
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     17.275(CFS)
Depth of flow =   0.391(Ft.), Average velocity =   7.634(Ft/s)
```

```
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =     17.275(CFS)
  '      '    flow top width =      6.565(Ft.)
  '      '    velocity=    7.634(Ft/s)
  '      '    area =      2.263(Sq.Ft)
  '      '    Froude number =     2.292

Upstream point elevation =  1560.000(Ft.)
Downstream point elevation =  1390.000(Ft.)
Flow length =   600.000(Ft.)
Travel time  =    1.31 min.
Time of concentration =   14.41 min.
Depth of flow =   0.391(Ft.)
Average velocity =   7.634(Ft/s)
Total irregular channel flow =     17.275(CFS)
Irregular channel normal depth above invert elev. =    0.391(Ft.)
Average velocity of channel(s) =    7.634(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.740
Decimal fraction soil group D = 0.260
SCS curve number for soil(AMC 2)  = 75.56
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=      0.237(In/Hr)
Max Catchment Loss (Fm) =     0.237(In/Hr)
Rainfall intensity =     2.650(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.819
Subarea runoff =     21.938(CFS) for   10.270(Ac.)
Total runoff =     28.218(CFS)    Total area =       13.01(Ac.)
Area averaged Fm value =    0.240(In/Hr)
Depth of flow =   0.520(Ft.), Average velocity =   8.991(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      115.000 to Point/Station      129.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                          C12
-----------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     40.728(CFS)
Depth of flow =   0.687(Ft.), Average velocity =   9.296(Ft/s)
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
```

```
Sub-Channel flow  =     40.728(CFS)
  '      '    flow top width =      7.749(Ft.)
  '      '     velocity=    9.296(Ft/s)
  '      '    area =      4.381(Sq.Ft)
  '      '    Froude number =     2.179

Upstream point elevation =  1390.000(Ft.)
Downstream point elevation =  1180.000(Ft.)
Flow length =   950.000(Ft.)
Travel time  =    1.70 min.
Time of concentration =   16.11 min.
Depth of flow =   0.687(Ft.)
Average velocity =   9.296(Ft/s)
Total irregular channel flow =    40.728(CFS)
Irregular channel normal depth above invert elev. =   0.687(Ft.)
Average velocity of channel(s) =   9.296(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.840
Decimal fraction soil group D = 0.160
SCS curve number for soil(AMC 2)  = 74.96
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.242(In/Hr)
Max Catchment Loss (Fm) =     0.242(In/Hr)
Rainfall intensity =      2.487(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.813
Subarea runoff =     24.955(CFS) for   13.290(Ac.)
Total runoff =     53.173(CFS)    Total area =       26.30(Ac.)
Area averaged Fm value =    0.241(In/Hr)
Depth of flow =   0.798(Ft.), Average velocity =  10.099(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      129.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     26.300(Ac.)
Runoff from this stream =     53.173(CFS)
Time of concentration =   16.11 min.
Rainfall intensity =     2.487(In/Hr)
Area averaged loss rate (Fm) =    0.2409(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      122.000 to Point/Station      124.000
**** INITIAL AREA EVALUATION ****
                                                          C13
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
```

```
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1615.000(Ft.)
Bottom (of initial area) elevation =  1495.000(Ft.)
Difference in elevation =   120.000(Ft.)
Slope =    0.40000  s(%)=    40.00
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.996 min.
Rainfall intensity =      3.088(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.827
Subarea runoff =      3.218(CFS)
Total initial stream area =        1.260(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      124.000 to Point/Station      126.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

C14

```
Estimated mean flow rate at midpoint of channel =     7.179(CFS)
Depth of flow =   0.236(Ft.), Average velocity =   5.562(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =      7.179(CFS)
   '      '    flow top width =      5.944(Ft.)
   '      '     velocity=    5.562(Ft/s)
   '      '    area =      1.291(Sq.Ft)
   '      '    Froude number =     2.103

Upstream point elevation =  1495.000(Ft.)
Downstream point elevation =  1385.000(Ft.)
Flow length =   400.000(Ft.)
Travel time  =    1.20 min.
Time of concentration =   12.20 min.
Depth of flow =   0.236(Ft.)
Average velocity =   5.562(Ft/s)
Total irregular channel flow =     7.179(CFS)
Irregular channel normal depth above invert elev. =   0.236(Ft.)
Average velocity of channel(s) =   5.562(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.912(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.823
Subarea runoff =      7.827(CFS) for    3.350(Ac.)
Total runoff =     11.045(CFS)    Total area =     4.61(Ac.)
Area averaged Fm value =    0.250(In/Hr)
```

```
Depth of flow =   0.304(Ft.), Average velocity =   6.479(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      125.000 to Point/Station      126.000
**** SUBAREA FLOW ADDITION ****                                    C15
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =    0.250(In/Hr)
Time of concentration =    12.20 min.
Rainfall intensity =      2.912(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.823
Subarea runoff =     16.365(CFS) for    6.830(Ac.)
Total runoff =     27.410(CFS)    Total area =       11.44(Ac.)
Area averaged Fm value =    0.250(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      126.000 to Point/Station      128.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****                        C16
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     39.257(CFS)
Depth of flow =   0.704(Ft.), Average velocity =   8.707(Ft/s)
     ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------------
Sub-Channel flow  =     39.257(CFS)
  '     '   flow top width =      7.815(Ft.)
  '     '    velocity=    8.707(Ft/s)
  '     '   area =     4.509(Sq.Ft)
  '     '   Froude number =     2.020

Upstream point elevation =  1385.000(Ft.)
Downstream point elevation =  1300.000(Ft.)
Flow length =   450.000(Ft.)
Travel time  =    0.86 min.
Time of concentration =   13.06 min.
Depth of flow =   0.704(Ft.)
Average velocity =   8.707(Ft/s)
Total irregular channel flow =    39.257(CFS)
Irregular channel normal depth above invert elev. =   0.704(Ft.)
Average velocity of channel(s) =   8.707(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
```

```
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.802(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.820
Subarea runoff =     23.622(CFS) for   10.780(Ac.)
Total runoff =     51.032(CFS)     Total area =       22.22(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.815(Ft.), Average velocity =   9.443(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      128.000 to Point/Station      129.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

C17

```
Estimated mean flow rate at midpoint of channel =     67.762(CFS)
Depth of flow =   0.939(Ft.), Average velocity =  10.497(Ft/s)
      ******* Irregular Channel Data ***********
-------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
-------------------------------------------------------------------
Sub-Channel flow  =     67.762(CFS)
  '     '    flow top width =      8.755(Ft.)
  '     '     velocity=   10.497(Ft/s)
  '     '    area =      6.455(Sq.Ft)
  '     '    Froude number =     2.154

Upstream point elevation =  1300.000(Ft.)
Downstream point elevation =  1180.000(Ft.)
Flow length =   600.000(Ft.)
Travel time  =    0.95 min.
Time of concentration =   14.01 min.
Depth of flow =   0.939(Ft.)
Average velocity =  10.497(Ft/s)
Total irregular channel flow =    67.762(CFS)
Irregular channel normal depth above invert elev. =   0.939(Ft.)
Average velocity of channel(s) =  10.497(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.692(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.816
Subarea runoff =     33.398(CFS) for   16.190(Ac.)
Total runoff =     84.430(CFS)     Total area =       38.41(Ac.)
```

```
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   1.059(Ft.), Average velocity =  11.205(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      122.000 to Point/Station      129.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =   38.410(Ac.)
Runoff from this stream =     84.430(CFS)
Time of concentration =   14.01 min.
Rainfall intensity =     2.692(In/Hr)
Area averaged loss rate (Fm) =    0.2500(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     26.30    53.173     16.11    0.241      2.487
2     38.41    84.430     14.01    0.250      2.692
Qmax(1) =
         1.000 *    1.000 *    53.173) +
         0.916 *    1.000 *    84.430) + =     130.514
Qmax(2) =
         1.091 *    0.869 *    53.173) +
         1.000 *    1.000 *    84.430) + =     134.877

Total of 2 streams to confluence:
Flow rates before confluence point:
      53.173      84.430
Maximum flow rates at confluence using above data:
      130.514      134.877
Area of streams before confluence:
       26.300       38.410
Effective area values after confluence:
       64.710       61.275
Results of confluence:
Total flow rate =    134.877(CFS)
Time of concentration =    14.009 min.
Effective stream area after confluence =     61.275(Ac.)
Study area average Pervious fraction(Ap) =  1.000
Study area average soil loss rate(Fm) =    0.246(In/Hr)
Study area total (this main stream) =     64.71(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      129.000 to Point/Station      130.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                              C/8
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    186.230(CFS)
Depth of flow =   2.137(Ft.), Average velocity =   9.400(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
```

```
      3            105.00                0.00
      4            205.00               50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =    186.230(CFS)
   '      '    flow top width =     13.546(Ft.)
   '      '     velocity=    9.400(Ft/s)
   '      '    area =     19.812(Sq.Ft)
   '      '    Froude number =     1.370

Upstream point elevation =  1180.000(Ft.)
Downstream point elevation =  1056.000(Ft.)
Flow length =  1870.000(Ft.)
Travel time =    3.32 min.
Time of concentration =   17.32 min.
Depth of flow =   2.137(Ft.)
Average velocity =   9.400(Ft/s)
Total irregular channel flow =   186.230(CFS)
Irregular channel normal depth above invert elev. =   2.137(Ft.)
Average velocity of channel(s) =   9.400(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.940
Decimal fraction soil group D = 0.060
SCS curve number for soil(AMC 2) = 74.36
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.247(In/Hr)
Max Catchment Loss (Fm) =     0.247(In/Hr)
Rainfall intensity =      2.387(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.807
Subarea runoff =    102.627(CFS) for   62.000(Ac.)
Total runoff =    237.505(CFS)    Total area =      123.27(Ac.)
Area averaged Fm value =    0.247(In/Hr)
Depth of flow =   2.411(Ft.), Average velocity =  10.030(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      130.000 to Point/Station      132.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
-------------------------------------------------------------------------
Upstream point/station elevation =  1050.000(Ft.)
Downstream point/station elevation =  1048.000(Ft.)
Pipe length  =   500.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   237.505(CFS)
Nearest computed pipe diameter  =     69.00(In.)
Calculated individual pipe flow  =   237.505(CFS)
Normal flow depth in pipe =   56.14(In.)
Flow top width inside pipe =   53.74(In.)
Critical Depth =   51.16(In.)
Pipe flow velocity =     10.50(Ft/s)
Travel time through pipe =   0.79 min.
Time of concentration (TC) =    18.12 min.


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Process from Point/Station      130.000 to Point/Station      132.000
**** CONFLUENCE OF MAIN STREAMS ****
-------------------------------------------------------------------------
```

```
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =    123.275(Ac.)
Runoff from this stream =    237.505(CFS)
Time of concentration =   18.12 min.
Rainfall intensity =     2.328(In/Hr)
Area averaged loss rate (Fm) =    0.2466(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm      Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)    (In/Hr)

1    133.95   271.437     17.08    0.209      2.406
2    123.27   237.505     18.12    0.247      2.328
Qmax(1) =
         1.000 *    1.000 *   271.437) +
         1.038 *    0.943 *   237.505) + =     503.850
Qmax(2) =
         0.964 *    1.000 *   271.437) +
         1.000 *    1.000 *   237.505) + =     499.202

Total of 2 main streams to confluence:
Flow rates before confluence point:
     272.437     238.505
Maximum flow rates at confluence using above data:
      503.850     499.202
Area of streams before confluence:
      133.946     123.275
Effective area values after confluence:
      250.175     257.221


Results of confluence:
Total flow rate =    503.850(CFS)
Time of concentration =    17.083 min.
Effective stream area after confluence  =    250.175(Ac.)
Study area average Pervious fraction(Ap) =  0.932
Study area average soil loss rate(Fm) =   0.227(In/Hr)
Study area total =    257.22(Ac.)


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Process from Point/Station      132.000 to Point/Station      305.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1048.000(Ft.)
Downstream point/station elevation =  1032.000(Ft.)
Pipe length  =  1025.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   503.850(CFS)
Nearest computed pipe diameter  =     72.00(In.)
Calculated individual pipe flow  =   503.850(CFS)
Normal flow depth in pipe =   56.14(In.)
Flow top width inside pipe =   59.67(In.)
Critical Depth =   68.12(In.)
Pipe flow velocity =     21.30(Ft/s)
Travel time through pipe =    0.80 min.
Time of concentration (TC) =    17.88 min.
```

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Process from Point/Station      132.000 to Point/Station      305.000
**** SUBAREA FLOW ADDITION ****
```

G5

```
RESIDENTIAL(2.5 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.750
Decimal fraction soil group D = 0.250
SCS curve number for soil(AMC 2)  = 70.50
Pervious ratio(Ap) = 0.9000  Max loss rate(Fp)=     0.237(In/Hr)
Max Catchment Loss (Fm) =     0.214(In/Hr)
Time of concentration =   17.88 min.
Rainfall intensity =      2.345(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.813
Subarea runoff =      8.134(CFS) for   18.340(Ac.)
Total runoff =    511.984(CFS)    Total area =     268.52(Ac.)
Area averaged Fm value =    0.226(In/Hr)


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Process from Point/Station      10.000 to Point/Station      305.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area =    268.515(Ac.)
Runoff from this stream =    511.984(CFS)
Time of concentration =   17.88 min.
Rainfall intensity =     2.345(In/Hr)
Area averaged loss rate (Fm) =    0.2261(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9300


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Process from Point/Station      306.000 to Point/Station      307.000
**** INITIAL AREA EVALUATION ****
```

G6

```
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.175(In/Hr)
Initial subarea data:
Initial area flow distance =   330.000(Ft.)
Top (of initial area) elevation =  1127.400(Ft.)
Bottom (of initial area) elevation =  1120.000(Ft.)
Difference in elevation =     7.400(Ft.)
Slope =    0.02242  s(%)=       2.24
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.522 min.
NOTE: Distance EXCEEDS recommended maximum value of   328.084(Ft.)
for this Development Type
Rainfall intensity =      3.350(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.853
Subarea runoff =      3.086(CFS)
```

Total initial stream area = 1.080(Ac.)

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Process from Point/Station 307.000 to Point/Station 305.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

G-7

Top of street segment elevation = 1120.000(Ft.)
End of street segment elevation = 1042.000(Ft.)
Length of street segment = 1423.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 18.000(Ft.)
Distance from crown to crossfall grade break = 10.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.020
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line = 8.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 2.000(Ft.)
Gutter hike from flowline = 2.000(In.)
Manning's N in gutter = 0.0150
Manning's N from gutter to grade break = 0.0150
Manning's N from grade break to crown = 0.0150
Estimated mean flow rate at midpoint of street = 33.963(CFS)
Depth of flow = 0.435(Ft.), Average velocity = 6.776(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 15.425(Ft.)
Flow velocity = 6.78(Ft/s)
Travel time = 3.50 min. TC = 13.02 min.
Adding area flow to street
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.860
Decimal fraction soil group D = 0.140
SCS curve number for soil(AMC 2) = 69.84
Pervious ratio(Ap) = 0.7000 Max loss rate(Fp)= 0.243(In/Hr)
Max Catchment Loss (Fm) = 0.170(In/Hr)
Rainfall intensity = 2.806(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area,(total area with modified rational method)(Q=KCIA) is C = 0.845
Subarea runoff = 61.626(CFS) for 26.200(Ac.)
Total runoff = 64.712(CFS) Total area = 27.28(Ac.)
Area averaged Fm value = 0.170(In/Hr)
Street flow at end of street = 64.712(CFS)
Half street flow at end of street = 32.356(CFS)
Depth of flow = 0.522(Ft.), Average velocity = 8.057(Ft/s)
Warning: depth of flow exceeds top of curb
Note: depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property = 1.10(Ft.)
Flow width (from curb towards crown)= 18.000(Ft.)

++
Process from Point/Station 306.000 to Point/Station 305.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 27.280(Ac.)
Runoff from this stream = 64.712(CFS)

```
Time of concentration =  13.02 min.
Rainfall intensity =    2.806(In/Hr)
Area averaged loss rate (Fm) =   0.1703(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)      (min) (In/Hr)     (In/Hr)


1    268.52   511.984     17.88    0.226      2.345
2     27.28    64.712     13.02    0.170      2.806
Qmax(1) =
        1.000 *    1.000 *   511.984) +
        0.825 *    1.000 *    64.712) + =     565.370
Qmax(2) =
        1.218 *    0.728 *   511.984) +
        1.000 *    1.000 *    64.712) + =     518.658

Total of 2 streams to confluence:
Flow rates before confluence point:
     511.984      64.712
Maximum flow rates at confluence using above data:
      565.370      518.658
Area of streams before confluence:
      268.515       27.280
Effective area values after confluence:
      295.795      222.789
Results of confluence:
Total flow rate =    565.370(CFS)
Time of concentration =   17.885 min.
Effective stream area after confluence =    295.795(Ac.)
Study area average Pervious fraction(Ap) =  0.909
Study area average soil loss rate(Fm) =    0.221(In/Hr)
Study area total (this main stream) =     295.80(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      305.000 to Point/Station      305.000
**** SUBAREA FLOW ADDITION ****
```

G-8

```
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.550
Decimal fraction soil group D = 0.450
SCS curve number for soil(AMC 2)  = 76.70
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.228(In/Hr)
Max Catchment Loss (Fm) =     0.228(In/Hr)
Time of concentration =    17.88 min.
Rainfall intensity =      2.345(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.815
Subarea runoff =     19.932(CFS) for   10.460(Ac.)
Total runoff =    585.302(CFS)    Total area =     306.26(Ac.)
Area averaged Fm value =    0.221(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      305.000 to Point/Station      308.000
```

```
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
-------------------------------------------------------------------------
Upstream point/station elevation =  1032.000(Ft.)
Downstream point/station elevation =   989.000(Ft.)
Pipe length  =   673.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =   585.302(CFS)
Nearest computed pipe diameter  =    63.00(In.)
Calculated individual pipe flow  =  585.302(CFS)
Normal flow depth in pipe =   46.76(In.)
Flow top width inside pipe =   55.12(In.)
Critical depth could not be calculated.
Pipe flow velocity =    33.97(Ft/s)
Travel time through pipe =    0.33 min.
Time of concentration (TC) =    18.22 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      308.000 to Point/Station      308.000
**** SUBAREA FLOW ADDITION ****                                    G9
-------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.640
Decimal fraction soil group D = 0.360
SCS curve number for soil(AMC 2)  = 76.16
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.232(In/Hr)
Max Catchment Loss (Fm) =     0.232(In/Hr)
The area added to the existing stream with this TC
does not add flow per Para 6b, Page D-15 of the OCHM,
therefore the upstream flow rate of Q =    585.302(CFS) is being used
Time of concentration =   18.22 min.
Rainfall intensity =     2.321(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.814
Subarea runoff =      0.000(CFS) for    3.350(Ac.)
Total runoff =    585.302(CFS)    Total area =      309.61(Ac.)
Area averaged Fm value =    0.221(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      308.000 to Point/Station      308.000
**** SUBAREA FLOW ADDITION ****                                   G10
-------------------------------------------------------------------------
PARK subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.850
Decimal fraction soil group D = 0.150
SCS curve number for soil(AMC 2)  = 69.90
Pervious ratio(Ap) = 0.8500  Max loss rate(Fp)=     0.242(In/Hr)
Max Catchment Loss (Fm) =     0.206(In/Hr)
Time of concentration =    18.22 min.
Rainfall intensity =     2.321(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.814
Subarea runoff =     13.133(CFS) for    7.090(Ac.)
Total runoff =    598.435(CFS)    Total area =      316.70(Ac.)
Area averaged Fm value =    0.221(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      308.000 to Point/Station      312.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =    989.000(Ft.)
Downstream point/station elevation =    920.000(Ft.)
Pipe length  =  1587.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =    598.435(CFS)
Nearest computed pipe diameter  =     66.00(In.)
Calculated individual pipe flow  =    598.435(CFS)
Normal flow depth in pipe =    53.29(In.)
Flow top width inside pipe =    52.06(In.)
Critical depth could not be calculated.
Pipe flow velocity =     29.12(Ft/s)
Travel time through pipe =    0.91 min.
Time of concentration (TC) =    19.12 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      308.000 to Point/Station      312.000
**** SUBAREA FLOW ADDITION ****
                                                              G11
------------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.175(In/Hr)
The area added to the existing stream with this TC
does not add flow per Para 6b, Page D-15 of the OCHM,
therefore the upstream flow rate of Q =    598.435(CFS) is being used
Time of concentration =    19.12 min.
Rainfall intensity =      2.258(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.812
Subarea runoff =      0.000(CFS) for    8.010(Ac.)
Total runoff =    598.435(CFS)    Total area =      324.71(Ac.)
Area averaged Fm value =    0.220(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      308.000 to Point/Station      312.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    324.705(Ac.)
Runoff from this stream =    598.435(CFS)
Time of concentration =   19.12 min.
Rainfall intensity =     2.258(In/Hr)
Area averaged loss rate (Fm) =    0.2199(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9062


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      309.000 to Point/Station      310.000
**** INITIAL AREA EVALUATION ****
                                                              G12
------------------------------------------------------------------------
```

```
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.140(In/Hr)
Initial subarea data:
Initial area flow distance =   330.000(Ft.)
Top (of initial area) elevation =  1077.000(Ft.)
Bottom (of initial area) elevation =  1070.000(Ft.)
Difference in elevation =     7.000(Ft.)
Slope =    0.02121  s(%)=       2.12
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.629 min.
NOTE: Distance EXCEEDS recommended maximum value of   328.084(Ft.)
for this Development Type
Rainfall intensity =      3.329(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.862
Subarea runoff =     3.674(CFS)
Total initial stream area =        1.280(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      310.000 to Point/Station      311.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
                                                              G13
----------------------------------------------------------------------
Top of street segment elevation =  1070.000(Ft.)
End of street segment elevation =   932.000(Ft.)
Length of street segment  =  1705.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =    0.020
Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =    8.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     40.489(CFS)
Depth of flow =   0.433(Ft.), Average velocity =   8.196(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  15.308(Ft.)
Flow velocity =   8.20(Ft/s)
Travel time =    3.47 min.     TC =   13.10  min.
 Adding area flow to street
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.360
Decimal fraction soil group D = 0.640
SCS curve number for soil(AMC 2)  = 72.84
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.218(In/Hr)
Max Catchment Loss (Fm) =     0.153(In/Hr)
Rainfall intensity =      2.797(In/Hr) for a    25.0 year storm
```

```
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.851
Subarea runoff =     73.478(CFS) for   31.130(Ac.)
Total runoff =     77.151(CFS)    Total area =     32.41(Ac.)
Area averaged Fm value =    0.152(In/Hr)
Street flow at end of street =     77.151(CFS)
Half street flow at end of street =    38.576(CFS)
Depth of flow =   0.519(Ft.), Average velocity =   9.747(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    0.95(Ft.)
Flow width (from curb towards crown)=  18.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      311.000 to Point/Station      311.000
**** SUBAREA FLOW ADDITION ****
                                                              G14
------------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.140(In/Hr)
Time of concentration =    13.10 min.
Rainfall intensity =      2.797(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.852
Subarea runoff =     21.833(CFS) for    9.130(Ac.)
Total runoff =     98.985(CFS)    Total area =     41.54(Ac.)
Area averaged Fm value =    0.149(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      311.000 to Point/Station      312.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   922.000(Ft.)
Downstream point/station elevation =   920.000(Ft.)
Pipe length  =    50.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   98.985(CFS)
Nearest computed pipe diameter  =    33.00(In.)
Calculated individual pipe flow  =    98.985(CFS)
Normal flow depth in pipe =   25.32(In.)
Flow top width inside pipe =   27.89(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.24(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    13.14 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      309.000 to Point/Station      312.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     41.540(Ac.)
Runoff from this stream =     98.985(CFS)
```

```
Time of concentration =   13.14 min.
Rainfall intensity =     2.792(In/Hr)
Area averaged loss rate (Fm) =    0.1494(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    324.71   598.435     19.12    0.220      2.258
2     41.54    98.985     13.14    0.149      2.792
Qmax(1) =
         1.000 *    1.000 *   598.435) +
         0.798 *    1.000 *    98.985) + =     677.396
Qmax(2) =
         1.262 *    0.687 *   598.435) +
         1.000 *    1.000 *    98.985) + =     617.931

Total of 2 streams to confluence:
Flow rates before confluence point:
     598.435      98.985
Maximum flow rates at confluence using above data:
      677.396      617.931
Area of streams before confluence:
      324.705       41.540
Effective area values after confluence:
      366.245      264.596
Results of confluence:
Total flow rate =    677.396(CFS)
Time of concentration =    19.124 min.
Effective stream area after confluence =    366.245(Ac.)
Study area average Pervious fraction(Ap) =  0.883
Study area average soil loss rate(Fm) =    0.212(In/Hr)
Study area total (this main stream) =     366.25(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      312.000 to Point/Station      314.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   920.000(Ft.)
Downstream point/station elevation =   812.000(Ft.)
Pipe length  =  1935.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   677.396(CFS)
Nearest computed pipe diameter  =     63.00(In.)
Calculated individual pipe flow  =   677.396(CFS)
Normal flow depth in pipe =   49.84(In.)
Flow top width inside pipe =   51.22(In.)
Critical depth could not be calculated.
Pipe flow velocity =     36.88(Ft/s)
Travel time through pipe =    0.87 min.
Time of concentration (TC) =    20.00 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      312.000 to Point/Station      314.000
**** SUBAREA FLOW ADDITION ****
```

G-15

```
------------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
```

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.140(In/Hr)
Time of concentration =    20.00 min.
Rainfall intensity =      2.201(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.816
Subarea runoff =     39.366(CFS) for   32.920(Ac.)
Total runoff =    716.762(CFS)    Total area =     399.17(Ac.)
Area averaged Fm value =    0.206(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      312.000 to Point/Station      314.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    399.165(Ac.)
Runoff from this stream =    716.762(CFS)
Time of concentration =   20.00 min.
Rainfall intensity =     2.201(In/Hr)
Area averaged loss rate (Fm) =    0.2059(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8678
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      315.000 to Point/Station      316.000
**** INITIAL AREA EVALUATION ****
                                                              G16
------------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.140(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =   996.200(Ft.)
Bottom (of initial area) elevation =   990.000(Ft.)
Difference in elevation =     6.200(Ft.)
Slope =    0.02067  s(%)=       2.07
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.317 min.
Rainfall intensity =     3.392(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.863
Subarea runoff =      2.107(CFS)
Total initial stream area =      0.720(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      316.000 to Point/Station      317.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
```

```
Top of street segment elevation =   990.000(Ft.)
End of street segment elevation =   834.000(Ft.)
Length of street segment  =  2683.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz) =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   8.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =    70.607(CFS)
Depth of flow =   0.531(Ft.), Average velocity =   8.412(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    1.57(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  18.000(Ft.)
Flow velocity =   8.41(Ft/s)
Travel time =    5.32 min.     TC =   14.63  min.
 Adding area flow to street
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.750
Decimal fraction soil group D = 0.250
SCS curve number for soil(AMC 2)  = 70.50
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=    0.237(In/Hr)
Max Catchment Loss (Fm) =     0.166(In/Hr)
Rainfall intensity =      2.627(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.843
Subarea runoff =    136.871(CFS) for   62.030(Ac.)
Total runoff =    138.978(CFS)    Total area =       62.75(Ac.)
Area averaged Fm value =    0.166(In/Hr)
Street flow at end of street =   138.978(CFS)
Half street flow at end of street =    69.489(CFS)
Depth of flow =   0.656(Ft.), Average velocity =   9.901(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    7.79(Ft.)
Flow width (from curb towards crown)=  18.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      315.000 to Point/Station      317.000
**** CONFLUENCE OF MINOR STREAMS ****
```

```
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     62.750(Ac.)
Runoff from this stream =    138.978(CFS)
Time of concentration =   14.63 min.
Rainfall intensity =    2.627(In/Hr)
Area averaged loss rate (Fm) =    0.1659(In/Hr)
```

```
Area averaged Pervious ratio (Ap) = 0.7000

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Process from Point/Station      200.000 to Point/Station      210.000
**** INITIAL AREA EVALUATION ****
```

D1

```
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 79.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1515.000(Ft.)
Bottom (of initial area) elevation =  1370.000(Ft.)
Difference in elevation =  145.000(Ft.)
Slope =   0.48333  s(%)=     48.33
TC = k(0.706)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.995 min.
Rainfall intensity =      3.698(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.839
Subarea runoff =      2.824(CFS)
Total initial stream area =       0.910(Ac.)

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Process from Point/Station      210.000 to Point/Station      214.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

D2

```
Estimated mean flow rate at midpoint of channel =     9.263(CFS)
Depth of flow =   0.243(Ft.), Average velocity =   6.963(Ft/s)
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =      9.263(CFS)
  '     '    flow top width =      5.970(Ft.)
  '     '     velocity=    6.963(Ft/s)
  '     '    area =      1.330(Sq.Ft)
  '     '    Froude number =    2.599

Upstream point elevation =  1370.000(Ft.)
Downstream point elevation =  1245.000(Ft.)
Flow length =   300.000(Ft.)
Travel time  =    0.72 min.
Time of concentration =    8.71 min.
Depth of flow =   0.243(Ft.)
Average velocity =   6.963(Ft/s)
Total irregular channel flow =     9.263(CFS)
Irregular channel normal depth above invert elev. =   0.243(Ft.)
```

```
Average velocity of channel(s) =   6.963(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.580
Decimal fraction soil group D = 0.420
SCS curve number for soil(AMC 2)  = 81.10
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.229(In/Hr)
Max Catchment Loss (Fm) =     0.229(In/Hr)
Rainfall intensity =      3.523(In/Hr) for a   25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.841
Subarea runoff =    12.780(CFS) for    4.360(Ac.)
Total runoff =     15.605(CFS)    Total area =       5.27(Ac.)
Area averaged Fm value =    0.233(In/Hr)
Depth of flow =   0.330(Ft.), Average velocity =   8.368(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      214.000 to Point/Station      216.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                    D3
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     25.073(CFS)
Depth of flow =   0.560(Ft.), Average velocity =   7.322(Ft/s)
     ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------------
Sub-Channel flow  =     25.073(CFS)
  '     '   flow top width =      7.238(Ft.)
  '     '    velocity=    7.322(Ft/s)
  '     '   area =      3.424(Sq.Ft)
  '     '   Froude number =     1.876

Upstream point elevation =  1245.000(Ft.)
Downstream point elevation =  1150.000(Ft.)
Flow length =   550.000(Ft.)
Travel time  =    1.25 min.
Time of concentration =    9.96 min.
Depth of flow =   0.560(Ft.)
Average velocity =   7.322(Ft/s)
Total irregular channel flow =    25.073(CFS)
Irregular channel normal depth above invert elev. =   0.560(Ft.)
Average velocity of channel(s) =   7.322(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.730
Decimal fraction soil group D = 0.270
SCS curve number for soil(AMC 2)  = 80.35
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.236(In/Hr)
Max Catchment Loss (Fm) =     0.236(In/Hr)
```

```
Rainfall intensity =      3.265(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.835
Subarea runoff =     18.837(CFS) for    7.360(Ac.)
Total runoff =    34.442(CFS)    Total area =      12.63(Ac.)
Area averaged Fm value =    0.235(In/Hr)
Depth of flow =   0.670(Ft.), Average velocity =   8.104(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      216.000 to Point/Station      220.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                    D4
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     73.180(CFS)
Depth of flow =   0.968(Ft.), Average velocity =  10.896(Ft/s)
     ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------------
Sub-Channel flow  =     73.180(CFS)
  '     '   flow top width =      8.873(Ft.)
  '     '    velocity=   10.896(Ft/s)
  '     '   area =      6.716(Sq.Ft)
  '     '   Froude number =     2.207

Upstream point elevation =  1150.000(Ft.)
Downstream point elevation =  1050.000(Ft.)
Flow length =   480.000(Ft.)
Travel time  =    0.73 min.
Time of concentration =   10.70 min.
Depth of flow =   0.968(Ft.)
Average velocity =  10.896(Ft/s)
Total irregular channel flow =    73.180(CFS)
Irregular channel normal depth above invert elev. =   0.968(Ft.)
Average velocity of channel(s) =  10.896(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.420
Decimal fraction soil group D = 0.580
SCS curve number for soil(AMC 2)  = 81.90
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.221(In/Hr)
Max Catchment Loss (Fm) =     0.221(In/Hr)
Rainfall intensity =      3.136(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.835
Subarea runoff =     77.402(CFS) for   30.060(Ac.)
Total runoff =    111.844(CFS)    Total area =      42.69(Ac.)
Area averaged Fm value =    0.225(In/Hr)
Depth of flow =   1.219(Ft.), Average velocity =  12.338(Ft/s)


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Process from Point/Station      220.000 to Point/Station      230.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                    D5
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    166.367(CFS)
Depth of flow =   2.003(Ft.), Average velocity =   9.223(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =  0.050
------------------------------------------------------------------------
Sub-Channel flow  =    166.367(CFS)
  '      '    flow top width =     13.011(Ft.)
  '      '     velocity=    9.223(Ft/s)
  '      '    area =     18.037(Sq.Ft)
  '      '    Froude number =     1.381

Upstream point elevation =  1050.000(Ft.)
Downstream point elevation =   920.000(Ft.)
Flow length =  1900.000(Ft.)
Travel time  =    3.43 min.
Time of concentration =   14.13 min.
Depth of flow =   2.003(Ft.)
Average velocity =   9.223(Ft/s)
Total irregular channel flow =   166.367(CFS)
Irregular channel normal depth above invert elev. =   2.003(Ft.)
Average velocity of channel(s) =   9.223(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.730
Decimal fraction soil group D = 0.270
SCS curve number for soil(AMC 2)  = 80.35
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=    0.236(In/Hr)
Max Catchment Loss (Fm) =    0.236(In/Hr)
Rainfall intensity =      2.679(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.822
Subarea runoff =    108.995(CFS) for   57.570(Ac.)
Total runoff =    220.838(CFS)    Total area =     100.26(Ac.)
Area averaged Fm value =    0.232(In/Hr)
Depth of flow =   2.308(Ft.), Average velocity =   9.952(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      230.000 to Point/Station      317.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   920.000(Ft.)
Downstream point/station elevation =   827.000(Ft.)
Pipe length  =  2810.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =   220.838(CFS)
Nearest computed pipe diameter  =     48.00(In.)
Calculated individual pipe flow  =   220.838(CFS)
Normal flow depth in pipe =   38.31(In.)
```

```
Flow top width inside pipe =   38.54(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.54(Ft/s)
Travel time through pipe =    2.28 min.
Time of concentration (TC) =    16.41 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      317.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =    100.260(Ac.)
Runoff from this stream =    220.838(CFS)
Time of concentration =   16.41 min.
Rainfall intensity =     2.462(In/Hr)
Area averaged loss rate (Fm) =    0.2316(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     62.75   138.978     14.63    0.166      2.627
2    100.26   220.838     16.41    0.232      2.462
Qmax(1) =
         1.000 *    1.000 *   138.978) +
         1.074 *    0.892 *   220.838) + =     350.456
Qmax(2) =
         0.933 *    1.000 *   138.978) +
         1.000 *    1.000 *   220.838) + =     350.483

Total of 2 streams to confluence:
Flow rates before confluence point:
     138.978     220.838
Maximum flow rates at confluence using above data:
      350.456      350.483
Area of streams before confluence:
       62.750      100.260
Effective area values after confluence:
      152.136      163.010
Results of confluence:
Total flow rate =    350.483(CFS)
Time of concentration =    16.412 min.
Effective stream area after confluence =    163.010(Ac.)
Study area average Pervious fraction(Ap) =  0.885
Study area average soil loss rate(Fm) =    0.206(In/Hr)
Study area total (this main stream) =     163.01(Ac.)


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Process from Point/Station      317.000 to Point/Station      314.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   827.000(Ft.)
Downstream point/station elevation =   812.000(Ft.)
Pipe length  =   326.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   350.483(CFS)
Nearest computed pipe diameter  =     51.00(In.)
```

```
Calculated individual pipe flow  =   350.483(CFS)
Normal flow depth in pipe =   40.39(In.)
Flow top width inside pipe =   41.40(In.)
Critical depth could not be calculated.
Pipe flow velocity =     29.09(Ft/s)
Travel time through pipe =    0.19 min.
Time of concentration (TC) =    16.60 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      315.000 to Point/Station      314.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =    163.010(Ac.)
Runoff from this stream =    350.483(CFS)
Time of concentration =   16.60 min.
Rainfall intensity =     2.446(In/Hr)
Area averaged loss rate (Fm) =    0.2064(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8845
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)      (min) (In/Hr)     (In/Hr)


1    399.17   716.762     20.00    0.206      2.201
2    163.01   350.483     16.60    0.206      2.446
Qmax(1) =
         1.000 *    1.000 *   716.762) +
         0.891 *    1.000 *   350.483) + =    1028.943
Qmax(2) =
         1.123 *    0.830 *   716.762) +
         1.000 *    1.000 *   350.483) + =    1018.409

Total of 2 main streams to confluence:
Flow rates before confluence point:
     717.762     351.483
Maximum flow rates at confluence using above data:
     1028.943     1018.409
Area of streams before confluence:
      399.165      163.010
Effective area values after confluence:
      562.175      494.336


Results of confluence:
Total flow rate =   1028.943(CFS)
Time of concentration =    19.998 min.
Effective stream area after confluence  =    562.175(Ac.)
Study area average Pervious fraction(Ap) =  0.873
Study area average soil loss rate(Fm) =    0.206(In/Hr)
Study area total =     562.18(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      314.000 to Point/Station      830.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
```

```
Upstream point/station elevation =    812.000(Ft.)
Downstream point/station elevation =    615.000(Ft.)
Pipe length  =  1621.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =  1028.943(CFS)
Nearest computed pipe diameter  =    63.00(In.)
Calculated individual pipe flow  =  1028.943(CFS)
Normal flow depth in pipe =   51.35(In.)
Flow top width inside pipe =   48.91(In.)
Critical depth could not be calculated.
Pipe flow velocity =     54.46(Ft/s)
Travel time through pipe =    0.50 min.
Time of concentration (TC) =    20.49 min.


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Process from Point/Station      314.000 to Point/Station      830.000
**** SUBAREA FLOW ADDITION ****
                                                              G18
------------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.090
Decimal fraction soil group C = 0.490
Decimal fraction soil group D = 0.420
SCS curve number for soil(AMC 2)  = 70.35
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.233(In/Hr)
Max Catchment Loss (Fm) =     0.163(In/Hr)
The area added to the existing stream with this TC
does not add flow per Para 6b, Page D-15 of the OCHM,
therefore the upstream flow rate of Q =   1028.943(CFS) is being used
Time of concentration =    20.49 min.
Rainfall intensity =      2.171(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.815
Subarea runoff =      0.000(CFS) for   10.880(Ac.)
Total runoff =   1028.943(CFS)    Total area =      573.06(Ac.)
Area averaged Fm value =    0.205(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station      803.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    573.055(Ac.)
Runoff from this stream =   1028.943(CFS)
Time of concentration =   20.49 min.
Rainfall intensity =     2.171(In/Hr)
Area averaged loss rate (Fm) =    0.2053(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8693
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      150.000 to Point/Station      160.000
**** INITIAL AREA EVALUATION ****
                                                               E1
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
```

```
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1575.000(Ft.)
Bottom (of initial area) elevation =  1350.000(Ft.)
Difference in elevation =   225.000(Ft.)
Slope =    0.75000  s(%)=      75.00
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.697 min.
Rainfall intensity =      3.316(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.832
Subarea runoff =      3.918(CFS)
Total initial stream area =        1.420(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      160.000 to Point/Station      162.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                  E2
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    13.172(CFS)
Depth of flow =   0.296(Ft.), Average velocity =   7.960(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------------
Sub-Channel flow  =     13.172(CFS)
  '      '    flow top width =      6.184(Ft.)
  '      '     velocity=    7.960(Ft/s)
  '      '    area =      1.655(Sq.Ft)
  '      '    Froude number =    2.712

Upstream point elevation =  1350.000(Ft.)
Downstream point elevation =  1200.000(Ft.)
Flow length =   350.000(Ft.)
Travel time  =    0.73 min.
Time of concentration =   10.43 min.
Depth of flow =   0.296(Ft.)
Average velocity =   7.960(Ft/s)
Total irregular channel flow =    13.172(CFS)
Irregular channel normal depth above invert elev. =   0.296(Ft.)
Average velocity of channel(s) =   7.960(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.960
Decimal fraction soil group D = 0.040
SCS curve number for soil(AMC 2)  = 74.24
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.248(In/Hr)
Max Catchment Loss (Fm) =     0.248(In/Hr)
```

```
Rainfall intensity =      3.182(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.830
Subarea runoff =     18.443(CFS) for    7.050(Ac.)
Total runoff =     22.361(CFS)    Total area =       8.47(Ac.)
Area averaged Fm value =    0.248(In/Hr)
Depth of flow =   0.403(Ft.), Average velocity =   9.553(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      162.000 to Point/Station      164.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                  E 3
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     36.708(CFS)
Depth of flow =   0.633(Ft.), Average velocity =   9.252(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------------
Sub-Channel flow  =     36.708(CFS)
  '      '    flow top width =      7.533(Ft.)
  '      '     velocity=    9.252(Ft/s)
  '      '    area =      3.967(Sq.Ft)
  '      '    Froude number =     2.247

Upstream point elevation =  1200.000(Ft.)
Downstream point elevation =  1020.000(Ft.)
Flow length =   750.000(Ft.)
Travel time  =    1.35 min.
Time of concentration =   11.78 min.
Depth of flow =   0.633(Ft.)
Average velocity =   9.252(Ft/s)
Total irregular channel flow =    36.708(CFS)
Irregular channel normal depth above invert elev. =   0.633(Ft.)
Average velocity of channel(s) =   9.252(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.660
Decimal fraction soil group D = 0.340
SCS curve number for soil(AMC 2)  = 76.04
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.233(In/Hr)
Max Catchment Loss (Fm) =     0.233(In/Hr)
Rainfall intensity =      2.970(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.827
Subarea runoff =     28.630(CFS) for   12.280(Ac.)
Total runoff =     50.991(CFS)    Total area =      20.75(Ac.)
Area averaged Fm value =    0.239(In/Hr)
Depth of flow =   0.762(Ft.), Average velocity =  10.257(Ft/s)


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```
Process from Point/Station      163.000 to Point/Station      164.000
**** SUBAREA FLOW ADDITION ****
```
E4

```
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.970
Decimal fraction soil group D = 0.030
SCS curve number for soil(AMC 2)  = 74.18
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.249(In/Hr)
Max Catchment Loss (Fm) =     0.249(In/Hr)
Time of concentration =    11.78 min.
Rainfall intensity =      2.970(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.826
Subarea runoff =     32.132(CFS) for   13.120(Ac.)
Total runoff =     83.122(CFS)    Total area =       33.87(Ac.)
Area averaged Fm value =    0.243(In/Hr)


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Process from Point/Station      164.000 to Point/Station      170.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```
E5

```
Estimated mean flow rate at midpoint of channel =    110.124(CFS)
Depth of flow =   1.506(Ft.), Average velocity =   9.128(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    110.124(CFS)
  '      '    flow top width =     11.023(Ft.)
  '      '     velocity=    9.128(Ft/s)
  '      '    area =     12.064(Sq.Ft)
  '      '    Froude number =    1.538

Upstream point elevation =  1020.000(Ft.)
Downstream point elevation =   920.000(Ft.)
Flow length =  1100.000(Ft.)
Travel time  =    2.01 min.
Time of concentration =   13.79 min.
Depth of flow =   1.506(Ft.)
Average velocity =   9.128(Ft/s)
Total irregular channel flow =   110.124(CFS)
Irregular channel normal depth above invert elev. =   1.506(Ft.)
Average velocity of channel(s) =   9.128(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.340
Decimal fraction soil group D = 0.660
SCS curve number for soil(AMC 2)  = 77.96
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.217(In/Hr)
```

```
Max Catchment Loss (Fm) =     0.217(In/Hr)
Rainfall intensity =      2.717(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.823
Subarea runoff =     53.944(CFS) for   27.410(Ac.)
Total runoff =    137.067(CFS)     Total area =      61.28(Ac.)
Area averaged Fm value =    0.231(In/Hr)
Depth of flow =   1.687(Ft.), Average velocity =   9.700(Ft/s)


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Process from Point/Station      168.000 to Point/Station      170.000
**** SUBAREA FLOW ADDITION ****
```

E6

```
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.410
Decimal fraction soil group D = 0.590
SCS curve number for soil(AMC 2)  = 81.95
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.220(In/Hr)
Max Catchment Loss (Fm) =     0.220(In/Hr)
Time of concentration =   13.79 min.
Rainfall intensity =      2.717(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.825
Subarea runoff =     71.818(CFS) for   31.970(Ac.)
Total runoff =    208.885(CFS)     Total area =      93.25(Ac.)
Area averaged Fm value =    0.228(In/Hr)


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Process from Point/Station      170.000 to Point/Station      175.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

E7

```
Estimated mean flow rate at midpoint of channel =    247.339(CFS)
Depth of flow =   2.568(Ft.), Average velocity =   9.500(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    247.339(CFS)
   '      '    flow top width =     15.274(Ft.)
   '      '     velocity=    9.500(Ft/s)
   '      '    area =     26.036(Sq.Ft)
   '      '    Froude number =     1.282

Upstream point elevation =   920.000(Ft.)
Downstream point elevation =   850.000(Ft.)
Flow length =  1260.000(Ft.)
Travel time  =    2.21 min.
Time of concentration =   16.00 min.
Depth of flow =   2.568(Ft.)
Average velocity =   9.500(Ft/s)
```

```
Total irregular channel flow =   247.339(CFS)
Irregular channel normal depth above invert elev. =   2.568(Ft.)
Average velocity of channel(s) =   9.500(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.120
Decimal fraction soil group D = 0.880
SCS curve number for soil(AMC 2)  = 79.28
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.206(In/Hr)
Max Catchment Loss (Fm) =     0.206(In/Hr)
Rainfall intensity =      2.497(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.821
Subarea runoff =     76.849(CFS) for   46.190(Ac.)
Total runoff =    285.735(CFS)    Total area =      139.44(Ac.)
Area averaged Fm value =    0.220(In/Hr)
Depth of flow =   2.755(Ft.), Average velocity =   9.867(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      175.000 to Point/Station      180.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                                  E8
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    325.876(CFS)
Depth of flow =   2.912(Ft.), Average velocity =  10.338(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------------
Sub-Channel flow  =    325.876(CFS)
  '     '    flow top width =     16.649(Ft.)
  '     '     velocity=   10.338(Ft/s)
  '     '    area =     31.523(Sq.Ft)
  '     '    Froude number =     1.324

Upstream point elevation =   850.000(Ft.)
Downstream point elevation =   730.000(Ft.)
Flow length =  2090.000(Ft.)
Travel time  =    3.37 min.
Time of concentration =   19.37 min.
Depth of flow =   2.912(Ft.)
Average velocity =  10.338(Ft/s)
Total irregular channel flow =   325.876(CFS)
Irregular channel normal depth above invert elev. =   2.912(Ft.)
Average velocity of channel(s) =  10.338(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.100
Decimal fraction soil group C = 0.130
Decimal fraction soil group D = 0.770
SCS curve number for soil(AMC 2)  = 77.32
```

```
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=    0.217(In/Hr)
Max Catchment Loss (Fm) =     0.217(In/Hr)
Rainfall intensity =      2.241(In/Hr) for a   25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.812
Subarea runoff =     80.230(CFS) for   61.660(Ac.)
Total runoff =    365.965(CFS)    Total area =     201.10(Ac.)
Area averaged Fm value =    0.219(In/Hr)
Depth of flow =   3.078(Ft.), Average velocity =  10.655(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      178.000 to Point/Station    180.000
**** SUBAREA FLOW ADDITION ****
```

E9

```
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Time of concentration =  19.37 min.
Rainfall intensity =      2.241(In/Hr) for a   25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.810
Subarea runoff =     57.491(CFS) for   32.080(Ac.)
Total runoff =    423.456(CFS)    Total area =     233.18(Ac.)
Area averaged Fm value =    0.223(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      180.000 to Point/Station      184.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

E10

```
Estimated mean flow rate at midpoint of channel =    424.508(CFS)
Depth of flow =   3.484(Ft.), Average velocity =  10.182(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    424.508(CFS)
  '     '    flow top width =     18.935(Ft.)
  '     '     velocity=   10.182(Ft/s)
  '     '    area =     41.692(Sq.Ft)
  '     '    Froude number =     1.209

Upstream point elevation =   730.000(Ft.)
Downstream point elevation =   705.000(Ft.)
Flow length =   546.000(Ft.)
Travel time  =    0.89 min.
Time of concentration =   20.26 min.
Depth of flow =   3.484(Ft.)
```

```
Average velocity =  10.182(Ft/s)
Total irregular channel flow =   424.508(CFS)
Irregular channel normal depth above invert elev. =   3.484(Ft.)
Average velocity of channel(s) =  10.182(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.600
Decimal fraction soil group D = 0.400
SCS curve number for soil(AMC 2)  = 76.40
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.230(In/Hr)
Max Catchment Loss (Fm) =     0.230(In/Hr)
Rainfall intensity =      2.185(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.808
Subarea runoff =      2.006(CFS) for    7.880(Ac.)
Total runoff =    425.462(CFS)    Total area =      241.06(Ac.)
Area averaged Fm value =    0.224(In/Hr)
Depth of flow =   3.487(Ft.), Average velocity =  10.188(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      180.000 to Point/Station      184.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =    241.060(Ac.)
Runoff from this stream =    425.462(CFS)
Time of concentration =   20.26 min.
Rainfall intensity =     2.185(In/Hr)
Area averaged loss rate (Fm) =    0.2237(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      181.000 to Point/Station      182.000
**** INITIAL AREA EVALUATION ****
                                                              E11
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 61.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.300(In/Hr)
Max Catchment Loss (Fm) =     0.300(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1225.000(Ft.)
Bottom (of initial area) elevation =  1175.000(Ft.)
Difference in elevation =    50.000(Ft.)
Slope =    0.16667  s(%)=      16.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.101 min.
Rainfall intensity =      2.796(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.803
Subarea runoff =      2.921(CFS)
Total initial stream area =        1.300(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      182.000 to Point/Station      184.000
**** STREET INLET + AREA  + PIPE  TRAVEL TIME ****
```

E12

```
Top of street segment elevation =  1175.000(Ft.)
End of street segment elevation =   915.000(Ft.)
Length of street segment  =  2250.000(Ft.)
Height of curb above gutter flowline =    6.0(In.)
Width of half street (curb to crown) =  13.000(Ft.)
Distance from crown to crossfall grade break  =   5.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.017
Slope from grade break to crown (v/hz) =   0.017
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   2.000(Ft.)
Slope from curb to property line (v/hz) =   0.017
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
No street inlet installed at this point
Estimated mean flow rate at midpoint of street =   36.938(CFS)
Depth of flow =   0.384(Ft.), Average velocity =  9.380(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  13.000(Ft.)
Flow velocity =   9.38(Ft/s)
Travel time =    4.00 min.     TC =   17.10  min.
 Adding area flow to street
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.290
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.710
SCS curve number for soil(AMC 2)  = 69.49
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=    0.229(In/Hr)
Max Catchment Loss (Fm) =     0.183(In/Hr)
Rainfall intensity =      2.405(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.830
Subarea runoff =     67.855(CFS) for   34.160(Ac.)
Total runoff =     70.776(CFS)    Total area =       35.46(Ac.)
Area averaged Fm value =    0.187(In/Hr)
Street flow at end of street =    70.776(CFS)
Half street flow at end of street =    35.388(CFS)
Depth of flow =   0.457(Ft.), Average velocity =  12.141(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  13.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      181.000 to Point/Station      184.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
Stream flow area =     35.460(Ac.)
Runoff from this stream =     70.776(CFS)
Time of concentration =   17.10 min.
Rainfall intensity =     2.405(In/Hr)
```

```
Area averaged loss rate (Fm) =    0.1875(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8073
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)      (min) (In/Hr)     (In/Hr)


1    241.06   425.462     20.26    0.224      2.185
2     35.46    70.776     17.10    0.187      2.405
Qmax(1) =
         1.000 *    1.000 *   425.462) +
         0.901 *    1.000 *    70.776) + =     489.203
Qmax(2) =
         1.112 *    0.844 *   425.462) +
         1.000 *    1.000 *    70.776) + =     470.137

Total of 2 streams to confluence:
Flow rates before confluence point:
     425.462      70.776
Maximum flow rates at confluence using above data:
      489.203      470.137
Area of streams before confluence:
      241.060      35.460
Effective area values after confluence:
      276.520      238.867
Results of confluence:
Total flow rate =    489.203(CFS)
Time of concentration =    20.263 min.
Effective stream area after confluence =    276.520(Ac.)
Study area average Pervious fraction(Ap) =  0.975
Study area average soil loss rate(Fm) =   0.219(In/Hr)
Study area total (this main stream) =   276.52(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     184.000 to Point/Station     190.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
                                                              E13
Estimated mean flow rate at midpoint of channel =    489.293(CFS)
Depth of flow =   3.863(Ft.), Average velocity =   9.952(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    489.294(CFS)
  '     '   flow top width =    20.453(Ft.)
  '     '    velocity=    9.952(Ft/s)
  '     '   area =     49.165(Sq.Ft)
  '     '   Froude number =    1.131

Upstream point elevation =   705.000(Ft.)
Downstream point elevation =   665.000(Ft.)
Flow length =  1025.000(Ft.)
```

```
Travel time =    1.72 min.
Time of concentration =   21.98 min.
Depth of flow =   3.863(Ft.)
Average velocity =   9.952(Ft/s)
Total irregular channel flow =   489.293(CFS)
Irregular channel normal depth above invert elev. =   3.863(Ft.)
Average velocity of channel(s) =   9.952(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 80.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.200(In/Hr)
Rainfall intensity =      2.086(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.806
Subarea runoff =      0.128(CFS) for   14.480(Ac.)
Total runoff =    489.331(CFS)    Total area =     291.00(Ac.)
Area averaged Fm value =    0.218(In/Hr)
Depth of flow =   3.863(Ft.), Average velocity =   9.952(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      184.000 to Point/Station      190.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =    291.000(Ac.)
Runoff from this stream =    489.331(CFS)
Time of concentration =   21.98 min.
Rainfall intensity =     2.086(In/Hr)
Area averaged loss rate (Fm) =    0.2181(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9765


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      186.000 to Point/Station      188.000
**** INITIAL AREA EVALUATION ****
                                                              E14
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 61.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.300(In/Hr)
Max Catchment Loss (Fm) =     0.300(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1085.000(Ft.)
Bottom (of initial area) elevation =   990.000(Ft.)
Difference in elevation =    95.000(Ft.)
Slope =    0.31667  s(%)=     31.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.522 min.
Rainfall intensity =      3.007(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.810
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```
Subarea runoff =      4.459(CFS)
Total initial stream area =        1.830(Ac.)


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Process from Point/Station      188.000 to Point/Station      190.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

E15

```
Estimated mean flow rate at midpoint of channel =     25.717(CFS)
Depth of flow =   0.547(Ft.), Average velocity =   7.717(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow =     25.717(CFS)
   '      '    flow top width =      7.187(Ft.)
   '      '     velocity=    7.718(Ft/s)
   '      '    area =      3.332(Sq.Ft)
   '      '    Froude number =     1.997

Upstream point elevation =   990.000(Ft.)
Downstream point elevation =   665.000(Ft.)
Flow length =  1650.000(Ft.)
Travel time  =    3.56 min.
Time of concentration =   15.09 min.
Depth of flow =   0.547(Ft.)
Average velocity =   7.717(Ft/s)
Total irregular channel flow =    25.717(CFS)
Irregular channel normal depth above invert elev. =   0.547(Ft.)
Average velocity of channel(s) =   7.717(Ft/s)
 Adding area flow to channel
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.030
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.970
SCS curve number for soil(AMC 2)  = 74.43
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=     0.203(In/Hr)
Max Catchment Loss (Fm) =     0.162(In/Hr)
Rainfall intensity =      2.582(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.839
Subarea runoff =     42.458(CFS) for   19.820(Ac.)
Total runoff =     46.917(CFS)    Total area =       21.65(Ac.)
Area averaged Fm value =    0.174(In/Hr)
Depth of flow =   0.769(Ft.), Average velocity =   9.337(Ft/s)


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Process from Point/Station      186.000 to Point/Station      190.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     21.650(Ac.)
```

```
Runoff from this stream =      46.917(CFS)
Time of concentration =   15.09 min.
Rainfall intensity =      2.582(In/Hr)
Area averaged loss rate (Fm) =     0.1740(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8169
Summary of stream data:

Stream  Area  Flow rate      TC      Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min)  (In/Hr)     (In/Hr)


1    291.00   489.331     21.98    0.218      2.086
2     21.65    46.917     15.09    0.174      2.582
Qmax(1) =
         1.000 *    1.000 *   489.331) +
         0.794 *    1.000 *    46.917) + =     526.595
Qmax(2) =
         1.265 *    0.686 *   489.331) +
         1.000 *    1.000 *    46.917) + =     471.809

Total of 2 streams to confluence:
Flow rates before confluence point:
     489.331      46.917
Maximum flow rates at confluence using above data:
      526.595      471.809
Area of streams before confluence:
      291.000       21.650
Effective area values after confluence:
      312.650      221.374
Results of confluence:
Total flow rate =     526.595(CFS)
Time of concentration =    21.980 min.
Effective stream area after confluence =    312.650(Ac.)
Study area average Pervious fraction(Ap) =  0.965
Study area average soil loss rate(Fm) =    0.215(In/Hr)
Study area total (this main stream) =     312.65(Ac.)


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Process from Point/Station      190.000 to Point/Station      195.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

E16

```
Estimated mean flow rate at midpoint of channel =    530.815(CFS)
Depth of flow =   4.018(Ft.), Average velocity =  10.133(Ft/s)
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =    530.814(CFS)
  '     '    flow top width =     21.073(Ft.)
  '     '     velocity=   10.133(Ft/s)
  '     '    area =     52.384(Sq.Ft)
  '     '    Froude number =     1.133
```

```
Upstream point elevation =   665.000(Ft.)
Downstream point elevation =   620.000(Ft.)
Flow length =  1162.000(Ft.)
Travel time  =    1.91 min.
Time of concentration =   23.89 min.
Depth of flow =   4.018(Ft.)
Average velocity =  10.133(Ft/s)
Total irregular channel flow =   530.815(CFS)
Irregular channel normal depth above invert elev. =   4.018(Ft.)
Average velocity of channel(s) =  10.133(Ft/s)
 Adding area flow to channel
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.380
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.620
SCS curve number for soil(AMC 2)  = 67.78
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=     0.238(In/Hr)
Max Catchment Loss (Fm) =     0.190(In/Hr)
Rainfall intensity =     1.990(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.803
Subarea runoff =      8.380(CFS) for   21.880(Ac.)
Total runoff =    534.975(CFS)    Total area =      334.53(Ac.)
Area averaged Fm value =    0.213(In/Hr)
Depth of flow =   4.033(Ft.), Average velocity =  10.153(Ft/s)


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Process from Point/Station      190.000 to Point/Station      195.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =    334.530(Ac.)
Runoff from this stream =    534.975(CFS)
Time of concentration =   23.89 min.
Rainfall intensity =     1.990(In/Hr)
Area averaged loss rate (Fm) =    0.2134(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9546


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Process from Point/Station      193.000 to Point/Station      195.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
------------------------------------------------------------------------
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.200
Decimal fraction soil group C = 0.300
Decimal fraction soil group D = 0.500
SCS curve number for soil(AMC 2)  = 69.40
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=     0.235(In/Hr)
Max Catchment Loss (Fm) =     0.188(In/Hr)
Rainfall intensity =     1.985(In/Hr) for a    25.0 year storm
User specified values are as follows:
TC =  24.00 min.  Rain intensity =       1.99(In/Hr)
Total area =       434.50(Ac.)  Total runoff =   1160.74(CFS)


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```
Process from Point/Station      193.000 to Point/Station      195.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =    434.500(Ac.)
Runoff from this stream =   1160.740(CFS)
Time of concentration =   24.00 min.
Rainfall intensity =     1.985(In/Hr)
Area averaged loss rate (Fm) =    0.1880(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    334.53   534.975     23.89    0.213      1.990
2    434.50  1160.740     24.00    0.188      1.985
Qmax(1) =
         1.000 *    1.000 *   534.975) +
         1.003 *    0.995 *  1160.740) + =    1693.739
Qmax(2) =
         0.997 *    1.000 *   534.975) +
         1.000 *    1.000 *  1160.740) + =    1694.176

Total of 2 streams to confluence:
Flow rates before confluence point:
     534.975    1160.740
Maximum flow rates at confluence using above data:
     1693.739     1694.176
Area of streams before confluence:
      334.530      434.500
Effective area values after confluence:
      767.059      769.030
Results of confluence:
Total flow rate =   1694.176(CFS)
Time of concentration =    24.000 min.
Effective stream area after confluence =    769.030(Ac.)
Study area average Pervious fraction(Ap) =  0.867
Study area average soil loss rate(Fm) =    0.199(In/Hr)
Study area total (this main stream) =     769.03(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      195.000 to Point/Station      830.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =   620.000(Ft.)
Downstream point/station elevation =   615.000(Ft.)
Pipe length  =   150.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =  1694.176(CFS)
Nearest computed pipe diameter  =     99.00(In.)
Calculated individual pipe flow  =  1694.176(CFS)
Normal flow depth in pipe =   76.07(In.)
Flow top width inside pipe =   83.53(In.)
Critical depth could not be calculated.
Pipe flow velocity =     38.44(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    24.07 min.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      150.000 to Point/Station      830.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     769.030(Ac.)
Runoff from this stream =   1694.176(CFS)
Time of concentration =   24.07 min.
Rainfall intensity =     1.982(In/Hr)
Area averaged loss rate (Fm) =    0.1991(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8673
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    573.06  1028.943     20.49    0.205       2.171
2    769.03  1694.176     24.07    0.199       1.982
Qmax(1) =
         1.000 *    1.000 *  1028.943) +
         1.106 *    0.852 *  1694.176) + =    2624.369
Qmax(2) =
         0.904 *    1.000 *  1028.943) +
         1.000 *    1.000 *  1694.176) + =    2624.363

Total of 2 main streams to confluence:
Flow rates before confluence point:
    1029.943    1695.176
Maximum flow rates at confluence using above data:
     2624.369     2624.363
Area of streams before confluence:
      573.055      769.030
Effective area values after confluence:
     1227.971     1342.085


Results of confluence:
Total flow rate =   2624.369(CFS)
Time of concentration =    20.494 min.
Effective stream area after confluence  =   1227.971(Ac.)
Study area average Pervious fraction(Ap) =  0.868
Study area average soil loss rate(Fm) =    0.202(In/Hr)
Study area total =    1342.09(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      830.000 to Point/Station      840.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   615.000(Ft.)
Downstream point/station elevation =   610.000(Ft.)
Pipe length  =   150.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =  2624.369(CFS)
Nearest computed pipe diameter  =    114.00(In.)
Calculated individual pipe flow  =  2624.369(CFS)
Normal flow depth in pipe =   93.09(In.)
Flow top width inside pipe =   88.24(In.)
```

```
Critical depth could not be calculated.
Pipe flow velocity =     42.35(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    20.55 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station      840.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =   1227.971(Ac.)
Runoff from this stream =   2624.369(CFS)
Time of concentration =   20.55 min.
Rainfall intensity =     2.167(In/Hr)
Area averaged loss rate (Fm) =    0.2017(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8682
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      330.000 to Point/Station      331.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.175(In/Hr)
Initial subarea data:
Initial area flow distance =   260.000(Ft.)
Top (of initial area) elevation =   886.600(Ft.)
Bottom (of initial area) elevation =   866.000(Ft.)
Difference in elevation =    20.600(Ft.)
Slope =    0.07923  s(%)=       7.92
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.725 min.
Rainfall intensity =      4.079(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.861
Subarea runoff =      2.178(CFS)
Total initial stream area =       0.620(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      331.000 to Point/Station      332.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =   866.000(Ft.)
End of street segment elevation =   793.000(Ft.)
Length of street segment  =   710.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
```

```
Distance from curb to property line  =   8.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0130
 Manning's N from gutter to grade break =  0.0130
 Manning's N from grade break to crown =  0.0130
Estimated mean flow rate at midpoint of street =    11.186(CFS)
Depth of flow =   0.285(Ft.), Average velocity =   7.450(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   7.900(Ft.)
Flow velocity =   7.45(Ft/s)
Travel time =    1.59 min.     TC =    8.31  min.
 Adding area flow to street
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.175(In/Hr)
Rainfall intensity =      3.618(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.856
Subarea runoff =     17.836(CFS) for    5.840(Ac.)
Total runoff =     20.015(CFS)    Total area =        6.46(Ac.)
Area averaged Fm value =    0.175(In/Hr)
Street flow at end of street =     20.015(CFS)
Half street flow at end of street =     10.007(CFS)
Depth of flow =   0.332(Ft.), Average velocity =   8.480(Ft/s)
Flow width (from curb towards crown)=  10.264(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      332.000 to Point/Station      333.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =   785.000(Ft.)
Downstream point/station elevation =   720.000(Ft.)
Pipe length  =   925.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    20.015(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    20.015(CFS)
Normal flow depth in pipe =   11.30(In.)
Flow top width inside pipe =   17.40(In.)
Critical depth could not be calculated.
Pipe flow velocity =     17.14(Ft/s)
Travel time through pipe =    0.90 min.
Time of concentration (TC) =     9.21 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      333.000 to Point/Station      333.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
PARK subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
```

```
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.8500  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.212(In/Hr)
Time of concentration =     9.21 min.
Rainfall intensity =      3.413(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.848
Subarea runoff =     22.289(CFS) for    8.150(Ac.)
Total runoff =     42.304(CFS)    Total area =       14.61(Ac.)
Area averaged Fm value =    0.196(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      333.000 to Point/Station      840.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     51.843(CFS)
Depth of flow =   0.978(Ft.), Average velocity =   7.623(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =     51.843(CFS)
  '      '    flow top width =      8.911(Ft.)
  '      '     velocity=    7.623(Ft/s)
  '      '    area =      6.800(Sq.Ft)
  '      '    Froude number =     1.538

Upstream point elevation =   720.000(Ft.)
Downstream point elevation =   610.000(Ft.)
Flow length =  1090.000(Ft.)
Travel time  =    2.38 min.
Time of concentration =   11.60 min.
Depth of flow =   0.978(Ft.)
Average velocity =   7.623(Ft/s)
Total irregular channel flow =    51.843(CFS)
Irregular channel normal depth above invert elev. =   0.978(Ft.)
Average velocity of channel(s) =   7.623(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.996(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.835
Subarea runoff =     18.992(CFS) for    9.900(Ac.)
Total runoff =     61.296(CFS)    Total area =       24.51(Ac.)
Area averaged Fm value =    0.218(In/Hr)
```

```
Depth of flow =   1.071(Ft.), Average velocity =   8.011(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      330.000 to Point/Station      840.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     24.510(Ac.)
Runoff from this stream =     61.296(CFS)
Time of concentration =   11.60 min.
Rainfall intensity =     2.996(In/Hr)
Area averaged loss rate (Fm) =    0.2178(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8711
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1   1227.97  2624.369     20.55    0.202      2.167
2     24.51    61.296     11.60    0.218      2.996
Qmax(1) =
         1.000 *    1.000 *  2624.369) +
         0.702 *    1.000 *    61.296) + =    2667.373
Qmax(2) =
         1.422 *    0.564 *  2624.369) +
         1.000 *    1.000 *    61.296) + =    2166.523

Total of 2 main streams to confluence:
Flow rates before confluence point:
    2625.369      62.296
Maximum flow rates at confluence using above data:
     2667.373     2166.523
Area of streams before confluence:
     1227.971       24.510
Effective area values after confluence:
     1252.481      717.297


Results of confluence:
Total flow rate =   2667.373(CFS)
Time of concentration =    20.553 min.
Effective stream area after confluence  =   1252.481(Ac.)
Study area average Pervious fraction(Ap) =  0.868
Study area average soil loss rate(Fm) =    0.202(In/Hr)
Study area total =    1252.48(Ac.)
End of computations, total study area =         1379.21 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.869
Area averaged SCS curve number (AMC 2) =  73.1
```

10-YEAR PROPOSED CONDITION

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2004 Version 8.0
Rational Hydrology Study, Date: 12/07/12 File Name: 1200prop10.roc

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ESPERANZA HILLS
PROPOSED CONDITION (ONSITE AND OFFSITE)
10-YEAR
R:\09\1200\PRELIM\REPORTS\HYDRO\RATIONAL\PROPOSED\1200A10

Program License Serial Number 6062

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 10.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

++
Process from Point/Station 10.000 to Point/Station 15.000
**** INITIAL AREA EVALUATION ****

C1

UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 74.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.250(In/Hr)
Max Catchment Loss (Fm) = 0.250(In/Hr)
Initial subarea data:
Initial area flow distance = 300.000(Ft.)
Top (of initial area) elevation = 1780.000(Ft.)
Bottom (of initial area) elevation = 1670.000(Ft.)
Difference in elevation = 110.000(Ft.)
Slope = 0.36667 s(%)= 36.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.189 min.
Rainfall intensity = 2.559(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.812
Subarea runoff = 1.932(CFS)
Total initial stream area = 0.930(Ac.)

++
Process from Point/Station 15.000 to Point/Station 20.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

C2

Estimated mean flow rate at midpoint of channel = 5.356(CFS)
Depth of flow = 0.204(Ft.), Average velocity = 4.853(Ft/s)

```
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number     'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =      5.356(CFS)
   '      '    flow top width =     5.816(Ft.)
   '      '    velocity=    4.853(Ft/s)
   '      '    area =      1.104(Sq.Ft)
   '      '    Froude number =     1.963

Upstream point elevation =  1670.000(Ft.)
Downstream point elevation =  1590.000(Ft.)
Flow length =   320.000(Ft.)
Travel time  =    1.10 min.
Time of concentration =   12.29 min.
Depth of flow =   0.204(Ft.)
Average velocity =   4.853(Ft/s)
Total irregular channel flow =     5.356(CFS)
Irregular channel normal depth above invert elev. =   0.204(Ft.)
Average velocity of channel(s) =   4.853(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.425(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.807
Subarea runoff =     6.778(CFS) for    3.520(Ac.)
Total runoff =      8.711(CFS)    Total area =       4.45(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.272(Ft.), Average velocity =   5.779(Ft/s)


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Process from Point/Station       20.000 to Point/Station       25.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     13.664(CFS)
Depth of flow =   0.352(Ft.), Average velocity =   6.802(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
```

```
Sub-Channel flow  =     13.664(CFS)
  '     '    flow top width =      6.409(Ft.)
  '     '     velocity=    6.802(Ft/s)
  '     '    area =      2.009(Sq.Ft)
  '     '    Froude number =     2.141

Upstream point elevation =  1590.000(Ft.)
Downstream point elevation =  1450.000(Ft.)
Flow length =   550.000(Ft.)
Travel time  =    1.35 min.
Time of concentration =   13.64 min.
Depth of flow =   0.352(Ft.)
Average velocity =   6.802(Ft/s)
Total irregular channel flow =    13.664(CFS)
Irregular channel normal depth above invert elev. =   0.352(Ft.)
Average velocity of channel(s) =   6.802(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.680
Decimal fraction soil group D = 0.320
SCS curve number for soil(AMC 2)  = 75.92
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.234(In/Hr)
Max Catchment Loss (Fm) =     0.234(In/Hr)
Rainfall intensity =     2.285(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.805
Subarea runoff =      9.828(CFS) for    5.630(Ac.)
Total runoff =     18.539(CFS)    Total area =       10.08(Ac.)
Area averaged Fm value =    0.241(In/Hr)
Depth of flow =   0.421(Ft.), Average velocity =   7.546(Ft/s)


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Process from Point/Station       25.000 to Point/Station       30.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     29.063(CFS)
Depth of flow =   0.538(Ft.), Average velocity =   8.895(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     29.063(CFS)
  '     '    flow top width =      7.151(Ft.)
  '     '     velocity=    8.895(Ft/s)
  '     '    area =      3.267(Sq.Ft)
  '     '    Froude number =     2.319

Upstream point elevation =  1450.000(Ft.)
Downstream point elevation =  1290.000(Ft.)
Flow length =   600.000(Ft.)
Travel time  =    1.12 min.
```

```
Time of concentration =   14.76 min.
Depth of flow =   0.538(Ft.)
Average velocity =   8.895(Ft/s)
Total irregular channel flow =    29.063(CFS)
Irregular channel normal depth above invert elev. =   0.538(Ft.)
Average velocity of channel(s) =   8.895(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.500
SCS curve number for soil(AMC 2)  = 77.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.225(In/Hr)
Max Catchment Loss (Fm) =     0.225(In/Hr)
Rainfall intensity =      2.183(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.804
Subarea runoff =     20.987(CFS) for   12.430(Ac.)
Total runoff =     39.525(CFS)    Total area =       22.51(Ac.)
Area averaged Fm value =    0.232(In/Hr)
Depth of flow =   0.641(Ft.), Average velocity =   9.819(Ft/s)


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Process from Point/Station       28.000 to Point/Station       30.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Time of concentration =    14.76 min.
Rainfall intensity =      2.183(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.802
Subarea runoff =     23.575(CFS) for   13.550(Ac.)
Total runoff =     63.101(CFS)    Total area =       36.06(Ac.)
Area averaged Fm value =    0.239(In/Hr)


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Process from Point/Station       30.000 to Point/Station       40.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     74.512(CFS)
Depth of flow =   1.104(Ft.), Average velocity =   9.360(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
```

```
----------------------------------------------------------------
Sub-Channel flow  =     74.512(CFS)
  '      '    flow top width =      9.417(Ft.)
  '      '     velocity=    9.360(Ft/s)
  '      '    area =      7.961(Sq.Ft)
  '      '    Froude number =     1.794

Upstream point elevation =  1290.000(Ft.)
Downstream point elevation =  1170.000(Ft.)
Flow length =   900.000(Ft.)
Travel time  =    1.60 min.
Time of concentration =   16.36 min.
Depth of flow =   1.104(Ft.)
Average velocity =   9.360(Ft/s)
Total irregular channel flow =    74.512(CFS)
Irregular channel normal depth above invert elev. =   1.104(Ft.)
Average velocity of channel(s) =   9.360(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.680
Decimal fraction soil group D = 0.320
SCS curve number for soil(AMC 2)  = 75.92
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.234(In/Hr)
Max Catchment Loss (Fm) =     0.234(In/Hr)
Rainfall intensity =     2.058(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.796
Subarea runoff =     22.727(CFS) for   16.320(Ac.)
Total runoff =     85.828(CFS)    Total area =       52.38(Ac.)
Area averaged Fm value =    0.237(In/Hr)
Depth of flow =   1.192(Ft.), Average velocity =   9.753(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       40.000 to Point/Station       85.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1170.000(Ft.)
Downstream point/station elevation =  1162.000(Ft.)
Pipe length  =   198.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    85.828(CFS)
Nearest computed pipe diameter  =    33.00(In.)
Calculated individual pipe flow  =    85.828(CFS)
Normal flow depth in pipe =   22.48(In.)
Flow top width inside pipe =   30.76(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.92(Ft/s)
Travel time through pipe =    0.17 min.
Time of concentration (TC) =    16.53 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       85.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     52.380(Ac.)
Runoff from this stream =     85.828(CFS)
```

```
Time of concentration =   16.53 min.
Rainfall intensity =     2.046(In/Hr)
Area averaged loss rate (Fm) =    0.2374(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       60.000 to Point/Station      70.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1655.000(Ft.)
Bottom (of initial area) elevation =  1550.000(Ft.)
Difference in elevation =   105.000(Ft.)
Slope =    0.35000  s(%)=      35.00
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.294 min.
Rainfall intensity =    2.545(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.812
Subarea runoff =      4.524(CFS)
Total initial stream area =      2.190(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       70.000 to Point/Station       75.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    10.808(CFS)
Depth of flow =   0.260(Ft.), Average velocity =   7.524(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     10.808(CFS)
  '     '    flow top width =      6.041(Ft.)
  '     '     velocity=    7.524(Ft/s)
  '     '    area =      1.437(Sq.Ft)
  '     '    Froude number =     2.719

Upstream point elevation =  1550.000(Ft.)
Downstream point elevation =  1340.000(Ft.)
Flow length =   470.000(Ft.)
Travel time  =    1.04 min.
Time of concentration =   12.34 min.
Depth of flow =   0.260(Ft.)
```

```
Average velocity =   7.524(Ft/s)
Total irregular channel flow =    10.808(CFS)
Irregular channel normal depth above invert elev. =   0.260(Ft.)
Average velocity of channel(s) =   7.524(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =     2.420(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.807
Subarea runoff =     12.504(CFS) for    6.530(Ac.)
Total runoff =     17.028(CFS)    Total area =     8.72(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.340(Ft.), Average velocity =   8.823(Ft/s)


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Process from Point/Station       75.000 to Point/Station       80.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    30.833(CFS)
Depth of flow =   0.600(Ft.), Average velocity =   8.296(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     30.833(CFS)
  '      '    flow top width =      7.398(Ft.)
  '      '     velocity=    8.296(Ft/s)
  '      '    area =      3.717(Sq.Ft)
  '      '    Froude number =     2.063

Upstream point elevation =  1340.000(Ft.)
Downstream point elevation =  1180.000(Ft.)
Flow length =   780.000(Ft.)
Travel time  =    1.57 min.
Time of concentration =   13.90 min.
Depth of flow =   0.600(Ft.)
Average velocity =   8.296(Ft/s)
Total irregular channel flow =    30.833(CFS)
Irregular channel normal depth above invert elev. =   0.600(Ft.)
Average velocity of channel(s) =   8.296(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
```

```
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.259(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.800
Subarea runoff =     27.551(CFS) for   15.930(Ac.)
Total runoff =     44.579(CFS)     Total area =     24.65(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.739(Ft.), Average velocity =   9.320(Ft/s)


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Process from Point/Station       80.000 to Point/Station       85.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1180.000(Ft.)
Downstream point/station elevation =  1162.000(Ft.)
Pipe length  =   165.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    44.579(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    44.579(CFS)
Normal flow depth in pipe =   14.90(In.)
Flow top width inside pipe =   19.07(In.)
Critical depth could not be calculated.
Pipe flow velocity =     24.43(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =    14.01 min.


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Process from Point/Station       60.000 to Point/Station       85.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     24.650(Ac.)
Runoff from this stream =     44.579(CFS)
Time of concentration =   14.01 min.
Rainfall intensity =     2.249(In/Hr)
Area averaged loss rate (Fm) =    0.2500(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     52.38    85.828     16.53    0.237      2.046
2     24.65    44.579     14.01    0.250      2.249
Qmax(1) =
         1.000 *    1.000 *    85.828) +
         0.899 *    1.000 *    44.579) + =     125.883
Qmax(2) =
         1.112 *    0.848 *    85.828) +
         1.000 *    1.000 *    44.579) + =     125.516

Total of 2 streams to confluence:
Flow rates before confluence point:
      85.828      44.579
Maximum flow rates at confluence using above data:
```

```
      125.883      125.516
Area of streams before confluence:
       52.380       24.650
Effective area values after confluence:
       77.030       69.064
Results of confluence:
Total flow rate =    125.883(CFS)
Time of concentration =  16.528 min.
Effective stream area after confluence =    77.030(Ac.)
Study area average Pervious fraction(Ap) =  1.000
Study area average soil loss rate(Fm) =    0.241(In/Hr)
Study area total (this main stream) =      77.03(Ac.)


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Process from Point/Station      85.000 to Point/Station      302.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1162.000(Ft.)
Downstream point/station elevation =  1100.000(Ft.)
Pipe length  =  1177.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =  125.883(CFS)
Nearest computed pipe diameter  =   36.00(In.)
Calculated individual pipe flow  =  125.883(CFS)
Normal flow depth in pipe =   24.86(In.)
Flow top width inside pipe =   33.28(In.)
Critical depth could not be calculated.
Pipe flow velocity =     24.18(Ft/s)
Travel time through pipe =    0.81 min.
Time of concentration (TC) =    17.34 min.


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Process from Point/Station      85.000 to Point/Station      302.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     77.030(Ac.)
Runoff from this stream =    125.883(CFS)
Time of concentration =   17.34 min.
Rainfall intensity =     1.991(In/Hr)
Area averaged loss rate (Fm) =    0.2414(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Program is now starting with Main Stream No. 2


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Process from Point/Station      300.000 to Point/Station      301.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.500
SCS curve number for soil(AMC 2)  = 72.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.225(In/Hr)
Max Catchment Loss (Fm) =     0.158(In/Hr)
Initial subarea data:
```

```
Initial area flow distance =   285.000(Ft.)
Top (of initial area) elevation =  1275.000(Ft.)
Bottom (of initial area) elevation =  1272.000(Ft.)
Difference in elevation =     3.000(Ft.)
Slope =    0.01053  s(%)=       1.05
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.446 min.
Rainfall intensity =      2.661(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.847
Subarea runoff =      1.735(CFS)
Total initial stream area =     0.770(Ac.)


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Process from Point/Station      301.000 to Point/Station      302.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
Top of street segment elevation =  1272.500(Ft.)
End of street segment elevation =  1115.300(Ft.)
Length of street segment  =  3270.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =    0.020
Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =    8.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
Gutter width =    2.000(Ft.)
Gutter hike from flowline =   2.000(In.)
 Manning's N in gutter =  0.0130
 Manning's N from gutter to grade break =  0.0130
 Manning's N from grade break to crown =  0.0130
Estimated mean flow rate at midpoint of street =    24.550(CFS)
Depth of flow =   0.389(Ft.), Average velocity =   6.649(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  13.113(Ft.)
Flow velocity =   6.65(Ft/s)
Travel time =    8.20 min.     TC =   18.64  min.
 Adding area flow to street
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.880
Decimal fraction soil group D = 0.120
SCS curve number for soil(AMC 2)  = 69.72
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.244(In/Hr)
Max Catchment Loss (Fm) =     0.171(In/Hr)
Rainfall intensity =    1.910(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.820
Subarea runoff =     45.507(CFS) for   29.410(Ac.)
Total runoff =     47.243(CFS)    Total area =       30.18(Ac.)
Area averaged Fm value =    0.170(In/Hr)
Street flow at end of street =     47.243(CFS)
Half street flow at end of street =    23.621(CFS)
Depth of flow =   0.468(Ft.), Average velocity =   7.784(Ft/s)
Flow width (from curb towards crown)=  17.052(Ft.)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      300.000 to Point/Station      302.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      30.180(Ac.)
Runoff from this stream =      47.243(CFS)
Time of concentration =   18.64 min.
Rainfall intensity =     1.910(In/Hr)
Area averaged loss rate (Fm) =    0.1705(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm      Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     77.03   125.883     17.34    0.241      1.991
2     30.18    47.243     18.64    0.170      1.910
Qmax(1) =
         1.000 *    1.000 *   125.883) +
         1.047 *    0.930 *    47.243) + =     171.869
Qmax(2) =
         0.954 *    1.000 *   125.883) +
         1.000 *    1.000 *    47.243) + =     167.299

Total of 2 main streams to confluence:
Flow rates before confluence point:
     126.883      48.243
Maximum flow rates at confluence using above data:
      171.869      167.299
Area of streams before confluence:
       77.030       30.180
Effective area values after confluence:
      105.100      107.210


Results of confluence:
Total flow rate =    171.869(CFS)
Time of concentration =    17.340 min.
Effective stream area after confluence  =    105.100(Ac.)
Study area average Pervious fraction(Ap) =  0.916
Study area average soil loss rate(Fm) =    0.221(In/Hr)
Study area total =     107.21(Ac.)


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Process from Point/Station      303.000 to Point/Station      304.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.140(In/Hr)
Initial subarea data:
```

```
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1275.200(Ft.)
Bottom (of initial area) elevation =  1272.500(Ft.)
Difference in elevation =     2.700(Ft.)
Slope =    0.00900  s(%)=      0.90
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.002 min.
Rainfall intensity =      2.584(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.851
Subarea runoff =      2.397(CFS)
Total initial stream area =      1.090(Ac.)


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Process from Point/Station      304.000 to Point/Station      302.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1272.500(Ft.)
End of street segment elevation =  1115.300(Ft.)
Length of street segment   =  2562.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =    0.020
Slope from grade break to crown (v/hz) =    0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =    8.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
Gutter width =    2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0130
 Manning's N from gutter to grade break =  0.0130
 Manning's N from grade break to crown =  0.0130
Estimated mean flow rate at midpoint of street =     25.493(CFS)
Depth of flow =   0.380(Ft.), Average velocity =   7.363(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  12.667(Ft.)
Flow velocity =   7.36(Ft/s)
Travel time =    5.80 min.     TC =   16.80  min.
 Adding area flow to street
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.680
Decimal fraction soil group D = 0.320
SCS curve number for soil(AMC 2)  = 70.92
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.234(In/Hr)
Max Catchment Loss (Fm) =     0.164(In/Hr)
Rainfall intensity =      2.027(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.828
Subarea runoff =     46.038(CFS) for   27.780(Ac.)
Total runoff =     48.435(CFS)     Total area =       28.87(Ac.)
Area averaged Fm value =    0.163(In/Hr)
Street flow at end of street =     48.435(CFS)
Half street flow at end of street =     24.218(CFS)
Depth of flow =   0.455(Ft.), Average velocity =   8.590(Ft/s)
Flow width (from curb towards crown)=  16.410(Ft.)
```

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Process from Point/Station      303.000 to Point/Station      302.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      28.870(Ac.)
Runoff from this stream =      48.435(CFS)
Time of concentration =    16.80 min.
Rainfall intensity =      2.027(In/Hr)
Area averaged loss rate (Fm) =     0.1629(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1      77.03   125.883      17.34    0.241      1.991
2      30.18    47.243      18.64    0.170      1.910
3      28.87    48.435      16.80    0.163      2.027
Qmax(1) =
          1.000 *    1.000 *   125.883) +
          1.047 *    0.930 *    47.243) +
          0.981 *    1.000 *    48.435) + =     219.361
Qmax(2) =
          0.954 *    1.000 *   125.883) +
          1.000 *    1.000 *    47.243) +
          0.937 *    1.000 *    48.435) + =     212.688
Qmax(3) =
          1.021 *    0.969 *   125.883) +
          1.067 *    0.901 *    47.243) +
          1.000 *    1.000 *    48.435) + =     218.389

Total of 3 main streams to confluence:
Flow rates before confluence point:
     126.883      48.243      49.435
Maximum flow rates at confluence using above data:
      219.361      212.688      218.389
Area of streams before confluence:
       77.030       30.180       28.870
Effective area values after confluence:
      133.970      136.080      130.708


Results of confluence:
Total flow rate =     219.361(CFS)
Time of concentration =     17.340 min.
Effective stream area after confluence  =     133.970(Ac.)
Study area average Pervious fraction(Ap) =  0.870
Study area average soil loss rate(Fm) =     0.209(In/Hr)
Study area total =      136.08(Ac.)


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Process from Point/Station      302.000 to Point/Station      132.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1105.000(Ft.)
Downstream point/station elevation =  1048.000(Ft.)
```

```
Pipe length  =   344.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   219.361(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =   219.361(CFS)
Normal flow depth in pipe =   24.54(In.)
Flow top width inside pipe =   33.54(In.)
Critical depth could not be calculated.
Pipe flow velocity =     42.75(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =    17.47 min.


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Process from Point/Station       10.000 to Point/Station      132.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    133.970(Ac.)
Runoff from this stream =    219.361(CFS)
Time of concentration =  17.47 min.
Rainfall intensity =     1.982(In/Hr)
Area averaged loss rate (Fm) =    0.2090(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8698
Program is now starting with Main Stream No. 2


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Process from Point/Station      100.000 to Point/Station      110.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1610.000(Ft.)
Bottom (of initial area) elevation =  1560.000(Ft.)
Difference in elevation =    50.000(Ft.)
Slope =    0.16667  s(%)=      16.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.101 min.
Rainfall intensity =      2.338(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.804
Subarea runoff =      5.148(CFS)
Total initial stream area =       2.740(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      115.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     14.128(CFS)
Depth of flow =   0.348(Ft.), Average velocity =   7.127(Ft/s)
      ******* Irregular Channel Data ***********
```

```
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     14.128(CFS)
  '     '    flow top width =      6.392(Ft.)
  '     '     velocity=    7.127(Ft/s)
  '     '    area =      1.982(Sq.Ft)
  '     '    Froude number =     2.255

Upstream point elevation =  1560.000(Ft.)
Downstream point elevation =  1390.000(Ft.)
Flow length =   600.000(Ft.)
Travel time  =    1.40 min.
Time of concentration =   14.50 min.
Depth of flow =   0.348(Ft.)
Average velocity =   7.127(Ft/s)
Total irregular channel flow =   14.128(CFS)
Irregular channel normal depth above invert elev. =   0.348(Ft.)
Average velocity of channel(s) =   7.127(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.740
Decimal fraction soil group D = 0.260
SCS curve number for soil(AMC 2)  = 75.56
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.237(In/Hr)
Max Catchment Loss (Fm) =     0.237(In/Hr)
Rainfall intensity =     2.205(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.802
Subarea runoff =     17.866(CFS) for   10.270(Ac.)
Total runoff =     23.014(CFS)    Total area =      13.01(Ac.)
Area averaged Fm value =    0.240(In/Hr)
Depth of flow =   0.462(Ft.), Average velocity =   8.407(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      115.000 to Point/Station      129.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     33.075(CFS)
Depth of flow =   0.611(Ft.), Average velocity =   8.703(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     33.075(CFS)
```

```
'      '    flow top width =      7.443(Ft.)
'      '     velocity=    8.703(Ft/s)
'      '    area =      3.800(Sq.Ft)
'      '    Froude number =     2.146

Upstream point elevation =  1390.000(Ft.)
Downstream point elevation =  1180.000(Ft.)
Flow length =   950.000(Ft.)
Travel time  =    1.82 min.
Time of concentration =   16.32 min.
Depth of flow =   0.611(Ft.)
Average velocity =   8.703(Ft/s)
Total irregular channel flow =    33.075(CFS)
Irregular channel normal depth above invert elev. =   0.611(Ft.)
Average velocity of channel(s) =   8.703(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.840
Decimal fraction soil group D = 0.160
SCS curve number for soil(AMC 2)  = 74.96
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=    0.242(In/Hr)
Max Catchment Loss (Fm) =    0.242(In/Hr)
Rainfall intensity =      2.061(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.795
Subarea runoff =     20.065(CFS) for   13.290(Ac.)
Total runoff =     43.079(CFS)    Total area =     26.30(Ac.)
Area averaged Fm value =    0.241(In/Hr)
Depth of flow =   0.709(Ft.), Average velocity =   9.461(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      129.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     26.300(Ac.)
Runoff from this stream =     43.079(CFS)
Time of concentration =   16.32 min.
Rainfall intensity =     2.061(In/Hr)
Area averaged loss rate (Fm) =    0.2409(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      122.000 to Point/Station      124.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
```

```
Top (of initial area) elevation =  1615.000(Ft.)
Bottom (of initial area) elevation =  1495.000(Ft.)
Difference in elevation =   120.000(Ft.)
Slope =    0.40000  s(%)=      40.00
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.996 min.
Rainfall intensity =      2.584(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.813
Subarea runoff =      2.647(CFS)
Total initial stream area =        1.260(Ac.)


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Process from Point/Station      124.000 to Point/Station      126.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      5.879(CFS)
Depth of flow =   0.210(Ft.), Average velocity =   5.175(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =      5.879(CFS)
  '      '    flow top width =      5.839(Ft.)
  '      '     velocity=    5.175(Ft/s)
  '      '    area =      1.136(Sq.Ft)
  '      '    Froude number =      2.067

Upstream point elevation =  1495.000(Ft.)
Downstream point elevation =  1385.000(Ft.)
Flow length =   400.000(Ft.)
Travel time  =    1.29 min.
Time of concentration =   12.28 min.
Depth of flow =   0.210(Ft.)
Average velocity =   5.175(Ft/s)
Total irregular channel flow =      5.879(CFS)
Irregular channel normal depth above invert elev. =   0.210(Ft.)
Average velocity of channel(s) =   5.175(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.425(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.807
Subarea runoff =      6.379(CFS) for    3.350(Ac.)
Total runoff =      9.026(CFS)    Total area =       4.61(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.270(Ft.), Average velocity =   6.035(Ft/s)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      125.000 to Point/Station      126.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Time of concentration =    12.28 min.
Rainfall intensity =      2.425(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.807
Subarea runoff =     13.372(CFS) for    6.830(Ac.)
Total runoff =     22.398(CFS)    Total area =       11.44(Ac.)
Area averaged Fm value =    0.250(In/Hr)


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Process from Point/Station      126.000 to Point/Station      128.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     32.000(CFS)
Depth of flow =   0.627(Ft.), Average velocity =   8.163(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =     32.000(CFS)
   '      '    flow top width =      7.507(Ft.)
   '      '     velocity=    8.163(Ft/s)
   '      '    area =     3.920(Sq.Ft)
   '      '    Froude number =     1.991

Upstream point elevation =  1385.000(Ft.)
Downstream point elevation =  1300.000(Ft.)
Flow length =   450.000(Ft.)
Travel time  =    0.92 min.
Time of concentration =   13.20 min.
Depth of flow =   0.627(Ft.)
Average velocity =   8.163(Ft/s)
Total irregular channel flow =    32.000(CFS)
Irregular channel normal depth above invert elev. =   0.627(Ft.)
Average velocity of channel(s) =   8.163(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
```

```
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =     2.327(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.803
Subarea runoff =     19.142(CFS) for   10.780(Ac.)
Total runoff =     41.540(CFS)     Total area =     22.22(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.726(Ft.), Average velocity =   8.862(Ft/s)


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Process from Point/Station      128.000 to Point/Station      129.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     55.030(CFS)
Depth of flow =   0.837(Ft.), Average velocity =   9.857(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             50.00
      2            100.00              0.00
      3            105.00              0.00
      4            205.00             50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     55.030(CFS)
  '      '    flow top width =      8.346(Ft.)
  '      '     velocity=    9.857(Ft/s)
  '      '    area =      5.583(Sq.Ft)
  '      '    Froude number =     2.124

Upstream point elevation =  1300.000(Ft.)
Downstream point elevation =  1180.000(Ft.)
Flow length =   600.000(Ft.)
Travel time  =    1.01 min.
Time of concentration =   14.22 min.
Depth of flow =   0.837(Ft.)
Average velocity =   9.857(Ft/s)
Total irregular channel flow =    55.030(CFS)
Irregular channel normal depth above invert elev. =   0.837(Ft.)
Average velocity of channel(s) =   9.857(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =     2.231(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.799
Subarea runoff =     26.926(CFS) for   16.190(Ac.)
Total runoff =     68.465(CFS)     Total area =     38.41(Ac.)
Area averaged Fm value =    0.250(In/Hr)
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Depth of flow =   0.944(Ft.), Average velocity =  10.529(Ft/s)

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Process from Point/Station      122.000 to Point/Station      129.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =    38.410(Ac.)
Runoff from this stream =      68.465(CFS)
Time of concentration =    14.22 min.
Rainfall intensity =      2.231(In/Hr)
Area averaged loss rate (Fm) =     0.2500(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)      (min) (In/Hr)      (In/Hr)


1     26.30    43.079     16.32    0.241      2.061
2     38.41    68.465     14.22    0.250      2.231
Qmax(1) =
         1.000 *    1.000 *    43.079) +
         0.914 *    1.000 *    68.465) + =     105.678
Qmax(2) =
         1.093 *    0.871 *    43.079) +
         1.000 *    1.000 *    68.465) + =     109.486

Total of 2 streams to confluence:
Flow rates before confluence point:
      43.079      68.465
Maximum flow rates at confluence using above data:
      105.678      109.486
Area of streams before confluence:
       26.300       38.410
Effective area values after confluence:
       64.710       61.318
Results of confluence:
Total flow rate =     109.486(CFS)
Time of concentration =    14.218 min.
Effective stream area after confluence =     61.318(Ac.)
Study area average Pervious fraction(Ap) =  1.000
Study area average soil loss rate(Fm) =    0.246(In/Hr)
Study area total (this main stream) =     64.71(Ac.)


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Process from Point/Station      129.000 to Point/Station      130.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    150.155(CFS)
Depth of flow =   1.917(Ft.), Average velocity =   8.869(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
```

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     4            205.00              50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =    150.155(CFS)
  '     '    flow top width =     12.667(Ft.)
  '     '     velocity=    8.869(Ft/s)
  '     '    area =     16.931(Sq.Ft)
  '     '    Froude number =     1.352

Upstream point elevation =  1180.000(Ft.)
Downstream point elevation =  1056.000(Ft.)
Flow length =  1870.000(Ft.)
Travel time  =    3.51 min.
Time of concentration =   17.73 min.
Depth of flow =   1.917(Ft.)
Average velocity =   8.869(Ft/s)
Total irregular channel flow =   150.155(CFS)
Irregular channel normal depth above invert elev. =   1.917(Ft.)
Average velocity of channel(s) =   8.869(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.940
Decimal fraction soil group D = 0.060
SCS curve number for soil(AMC 2)  = 74.36
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.247(In/Hr)
Max Catchment Loss (Fm) =     0.247(In/Hr)
Rainfall intensity =      1.965(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.787
Subarea runoff =     81.268(CFS) for   62.000(Ac.)
Total runoff =    190.754(CFS)    Total area =      123.32(Ac.)
Area averaged Fm value =    0.247(In/Hr)
Depth of flow =   2.162(Ft.), Average velocity =   9.461(Ft/s)


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Process from Point/Station      130.000 to Point/Station      132.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
-------------------------------------------------------------------------
Upstream point/station elevation =  1050.000(Ft.)
Downstream point/station elevation =  1048.000(Ft.)
Pipe length  =   500.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   190.754(CFS)
Nearest computed pipe diameter  =     66.00(In.)
Calculated individual pipe flow  =  190.754(CFS)
Normal flow depth in pipe =   48.87(In.)
Flow top width inside pipe =   57.87(In.)
Critical Depth =   46.35(In.)
Pipe flow velocity =     10.11(Ft/s)
Travel time through pipe =   0.82 min.
Time of concentration (TC) =    18.56 min.


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Process from Point/Station      130.000 to Point/Station      132.000
**** CONFLUENCE OF MAIN STREAMS ****
-------------------------------------------------------------------------
The following data inside Main Stream is listed:
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In Main Stream number: 2
Stream flow area =    123.318(Ac.)
Runoff from this stream =    190.754(CFS)
Time of concentration =   18.56 min.
Rainfall intensity =     1.915(In/Hr)
Area averaged loss rate (Fm) =    0.2466(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm     Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)    (In/Hr)


1    133.97   219.361     17.47    0.209      1.982
2    123.32   190.754     18.56    0.247      1.915
Qmax(1) =
         1.000 *    1.000 *   219.361) +
         1.040 *    0.942 *   190.754) + =     406.214
Qmax(2) =
         0.962 *    1.000 *   219.361) +
         1.000 *    1.000 *   190.754) + =     401.817

Total of 2 main streams to confluence:
Flow rates before confluence point:
     220.361     191.754
Maximum flow rates at confluence using above data:
      406.214     401.817
Area of streams before confluence:
      133.970     123.318
Effective area values after confluence:
      250.097     257.288


Results of confluence:
Total flow rate =    406.214(CFS)
Time of concentration =    17.474 min.
Effective stream area after confluence  =    250.097(Ac.)
Study area average Pervious fraction(Ap) =  0.932
Study area average soil loss rate(Fm) =  0.227(In/Hr)
Study area total =    257.29(Ac.)


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Process from Point/Station     132.000 to Point/Station      305.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1048.000(Ft.)
Downstream point/station elevation =  1032.000(Ft.)
Pipe length  =  1025.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   406.214(CFS)
Nearest computed pipe diameter  =     66.00(In.)
Calculated individual pipe flow  =   406.214(CFS)
Normal flow depth in pipe =   52.30(In.)
Flow top width inside pipe =   53.54(In.)
Critical Depth =   62.52(In.)
Pipe flow velocity =     20.12(Ft/s)
Travel time through pipe =   0.85 min.
Time of concentration (TC) =    18.32 min.
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Process from Point/Station      132.000 to Point/Station      305.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
RESIDENTIAL(2.5 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.750
Decimal fraction soil group D = 0.250
SCS curve number for soil(AMC 2)  = 70.50
Pervious ratio(Ap) = 0.9000  Max loss rate(Fp)=     0.237(In/Hr)
Max Catchment Loss (Fm) =     0.214(In/Hr)
Time of concentration =   18.32 min.
Rainfall intensity =     1.929(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.794
Subarea runoff =      5.135(CFS) for   18.340(Ac.)
Total runoff =    411.349(CFS)    Total area =      268.44(Ac.)
Area averaged Fm value =    0.226(In/Hr)


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Process from Point/Station      10.000 to Point/Station      305.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    268.437(Ac.)
Runoff from this stream =    411.349(CFS)
Time of concentration =   18.32 min.
Rainfall intensity =     1.929(In/Hr)
Area averaged loss rate (Fm) =    0.2261(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9300


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Process from Point/Station      306.000 to Point/Station      307.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.175(In/Hr)
Initial subarea data:
Initial area flow distance =   330.000(Ft.)
Top (of initial area) elevation =  1127.400(Ft.)
Bottom (of initial area) elevation =  1120.000(Ft.)
Difference in elevation =     7.400(Ft.)
Slope =    0.02242  s(%)=      2.24
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.522 min.
NOTE: Distance EXCEEDS recommended maximum value of   328.084(Ft.)
for this Development Type
Rainfall intensity =     2.807(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.844
Subarea runoff =      2.558(CFS)
Total initial stream area =      1.080(Ac.)
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Process from Point/Station      307.000 to Point/Station      305.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1120.000(Ft.)
End of street segment elevation =  1042.000(Ft.)
Length of street segment  =  1423.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz) =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   8.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =    27.825(CFS)
Depth of flow =   0.411(Ft.), Average velocity =   6.459(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  14.239(Ft.)
Flow velocity =   6.46(Ft/s)
Travel time =    3.67 min.     TC =   13.19  min.
 Adding area flow to street
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.860
Decimal fraction soil group D = 0.140
SCS curve number for soil(AMC 2)  = 69.84
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.243(In/Hr)
Max Catchment Loss (Fm) =     0.170(In/Hr)
Rainfall intensity =      2.328(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.834
Subarea runoff =     50.421(CFS) for   26.200(Ac.)
Total runoff =     52.978(CFS)    Total area =       27.28(Ac.)
Area averaged Fm value =    0.170(In/Hr)
Street flow at end of street =     52.978(CFS)
Half street flow at end of street =     26.489(CFS)
Depth of flow =   0.493(Ft.), Average velocity =   7.613(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  18.000(Ft.)


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Process from Point/Station      306.000 to Point/Station      305.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     27.280(Ac.)
Runoff from this stream =     52.978(CFS)
Time of concentration =   13.19 min.
Rainfall intensity =     2.328(In/Hr)
Area averaged loss rate (Fm) =    0.1703(In/Hr)
```

```
Area averaged Pervious ratio (Ap) = 0.7000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    268.44   411.349     18.32    0.226      1.929
2     27.28    52.978     13.19    0.170      2.328
Qmax(1) =
         1.000 *    1.000 *   411.349) +
         0.815 *    1.000 *    52.978) + =     454.524
Qmax(2) =
         1.235 *    0.720 *   411.349) +
         1.000 *    1.000 *    52.978) + =     418.656

Total of 2 streams to confluence:
Flow rates before confluence point:
     411.349      52.978
Maximum flow rates at confluence using above data:
      454.524      418.656
Area of streams before confluence:
      268.437       27.280
Effective area values after confluence:
      295.717      220.580
Results of confluence:
Total flow rate =    454.524(CFS)
Time of concentration =    18.323 min.
Effective stream area after confluence =    295.717(Ac.)
Study area average Pervious fraction(Ap) =  0.909
Study area average soil loss rate(Fm) =    0.221(In/Hr)
Study area total (this main stream) =     295.72(Ac.)


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Process from Point/Station      305.000 to Point/Station      305.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.550
Decimal fraction soil group D = 0.450
SCS curve number for soil(AMC 2)  = 76.70
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.228(In/Hr)
Max Catchment Loss (Fm) =     0.228(In/Hr)
Time of concentration =    18.32 min.
Rainfall intensity =      1.929(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.797
Subarea runoff =     16.016(CFS) for   10.460(Ac.)
Total runoff =    470.540(CFS)    Total area =      306.18(Ac.)
Area averaged Fm value =    0.221(In/Hr)


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Process from Point/Station      305.000 to Point/Station      308.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1032.000(Ft.)
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Downstream point/station elevation =   989.000(Ft.)
Pipe length  =   673.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =   470.540(CFS)
Nearest computed pipe diameter  =     57.00(In.)
Calculated individual pipe flow  =   470.540(CFS)
Normal flow depth in pipe =   44.16(In.)
Flow top width inside pipe =   47.63(In.)
Critical depth could not be calculated.
Pipe flow velocity =    31.94(Ft/s)
Travel time through pipe =    0.35 min.
Time of concentration (TC) =    18.67 min.


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Process from Point/Station      308.000 to Point/Station      308.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.640
Decimal fraction soil group D = 0.360
SCS curve number for soil(AMC 2)  = 76.16
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.232(In/Hr)
Max Catchment Loss (Fm) =     0.232(In/Hr)
The area added to the existing stream with this TC
does not add flow per Para 6b, Page D-15 of the OCHM,
therefore the upstream flow rate of Q =   470.540(CFS) is being used
Time of concentration =    18.67 min.
Rainfall intensity =      1.908(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.796
Subarea runoff =      0.000(CFS) for    3.350(Ac.)
Total runoff =    470.540(CFS)    Total area =      309.53(Ac.)
Area averaged Fm value =    0.221(In/Hr)


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Process from Point/Station      308.000 to Point/Station      308.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
PARK subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.850
Decimal fraction soil group D = 0.150
SCS curve number for soil(AMC 2)  = 69.90
Pervious ratio(Ap) = 0.8500  Max loss rate(Fp)=     0.242(In/Hr)
Max Catchment Loss (Fm) =     0.206(In/Hr)
Time of concentration =    18.67 min.
Rainfall intensity =      1.908(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.796
Subarea runoff =     10.162(CFS) for    7.090(Ac.)
Total runoff =    480.702(CFS)    Total area =      316.62(Ac.)
Area averaged Fm value =    0.221(In/Hr)


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Process from Point/Station      308.000 to Point/Station      312.000
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**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =    989.000(Ft.)
Downstream point/station elevation =    920.000(Ft.)
Pipe length  =  1587.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =    480.702(CFS)
Nearest computed pipe diameter  =     63.00(In.)
Calculated individual pipe flow  =    480.702(CFS)
Normal flow depth in pipe =    46.58(In.)
Flow top width inside pipe =    55.31(In.)
Critical depth could not be calculated.
Pipe flow velocity =     28.01(Ft/s)
Travel time through pipe =    0.94 min.
Time of concentration (TC) =    19.62 min.


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Process from Point/Station      308.000 to Point/Station      312.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.175(In/Hr)
The area added to the existing stream with this TC
does not add flow per Para 6b, Page D-15 of the OCHM,
therefore the upstream flow rate of Q =    480.702(CFS) is being used
Time of concentration =    19.62 min.
Rainfall intensity =      1.855(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.793
Subarea runoff =      0.000(CFS) for    8.010(Ac.)
Total runoff =    480.702(CFS)    Total area =      324.63(Ac.)
Area averaged Fm value =    0.220(In/Hr)


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Process from Point/Station      308.000 to Point/Station      312.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    324.627(Ac.)
Runoff from this stream =    480.702(CFS)
Time of concentration =   19.62 min.
Rainfall intensity =     1.855(In/Hr)
Area averaged loss rate (Fm) =    0.2199(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9062


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Process from Point/Station      309.000 to Point/Station      310.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
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Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.140(In/Hr)
Initial subarea data:
Initial area flow distance =   330.000(Ft.)
Top (of initial area) elevation =  1077.000(Ft.)
Bottom (of initial area) elevation =  1070.000(Ft.)
Difference in elevation =     7.000(Ft.)
Slope =    0.02121  s(%)=       2.12
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.629 min.
NOTE: Distance EXCEEDS recommended maximum value of   328.084(Ft.)
for this Development Type
Rainfall intensity =      2.789(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.855
Subarea runoff =    3.051(CFS)
Total initial stream area =        1.280(Ac.)


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Process from Point/Station      310.000 to Point/Station      311.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1070.000(Ft.)
End of street segment elevation =   932.000(Ft.)
Length of street segment  =  1705.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   8.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =    33.226(CFS)
Depth of flow =   0.409(Ft.), Average velocity =   7.815(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  14.139(Ft.)
Flow velocity =   7.82(Ft/s)
Travel time =    3.64 min.     TC =   13.26  min.
 Adding area flow to street
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.360
Decimal fraction soil group D = 0.640
SCS curve number for soil(AMC 2)  = 72.84
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.218(In/Hr)
Max Catchment Loss (Fm) =     0.153(In/Hr)
Rainfall intensity =      2.321(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.841
Subarea runoff =     60.214(CFS) for   31.130(Ac.)
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Total runoff =     63.265(CFS)     Total area =       32.41(Ac.)
Area averaged Fm value =    0.152(In/Hr)
Street flow at end of street =     63.265(CFS)
Half street flow at end of street =     31.633(CFS)
Depth of flow =   0.491(Ft.), Average velocity =   9.187(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  18.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      311.000 to Point/Station      311.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=    0.200(In/Hr)
Max Catchment Loss (Fm) =     0.140(In/Hr)
Time of concentration =    13.26 min.
Rainfall intensity =      2.321(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.842
Subarea runoff =     17.921(CFS) for    9.130(Ac.)
Total runoff =     81.187(CFS)     Total area =      41.54(Ac.)
Area averaged Fm value =    0.149(In/Hr)


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Process from Point/Station      311.000 to Point/Station      312.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =   922.000(Ft.)
Downstream point/station elevation =   920.000(Ft.)
Pipe length  =    50.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    81.187(CFS)
Nearest computed pipe diameter  =    30.00(In.)
Calculated individual pipe flow  =    81.187(CFS)
Normal flow depth in pipe =   24.31(In.)
Flow top width inside pipe =   23.52(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.05(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    13.31 min.


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Process from Point/Station      309.000 to Point/Station      312.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     41.540(Ac.)
Runoff from this stream =     81.187(CFS)
Time of concentration =   13.31 min.
Rainfall intensity =     2.317(In/Hr)
Area averaged loss rate (Fm) =    0.1494(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7000
Summary of stream data:
```

```
Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1    324.63   480.702     19.62    0.220      1.855
2     41.54    81.187     13.31    0.149      2.317
Qmax(1) =
        1.000 *    1.000 *   480.702) +
        0.787 *    1.000 *    81.187) + =     544.585
Qmax(2) =
        1.283 *    0.678 *   480.702) +
        1.000 *    1.000 *    81.187) + =     499.402

Total of 2 streams to confluence:
Flow rates before confluence point:
     480.702      81.187
Maximum flow rates at confluence using above data:
      544.585      499.402
Area of streams before confluence:
      324.627       41.540
Effective area values after confluence:
      366.167      261.754
Results of confluence:
Total flow rate =    544.585(CFS)
Time of concentration =    19.618 min.
Effective stream area after confluence =    366.167(Ac.)
Study area average Pervious fraction(Ap) =  0.883
Study area average soil loss rate(Fm) =    0.212(In/Hr)
Study area total (this main stream) =     366.17(Ac.)


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Process from Point/Station      312.000 to Point/Station      314.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   920.000(Ft.)
Downstream point/station elevation =   812.000(Ft.)
Pipe length  =  1935.00(Ft.)  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   544.585(CFS)
Nearest computed pipe diameter  =    60.00(In.)
Calculated individual pipe flow  =  544.585(CFS)
Normal flow depth in pipe =   43.89(In.)
Flow top width inside pipe =   53.18(In.)
Critical depth could not be calculated.
Pipe flow velocity =     35.39(Ft/s)
Travel time through pipe =    0.91 min.
Time of concentration (TC) =    20.53 min.


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Process from Point/Station      312.000 to Point/Station      314.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
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Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.140(In/Hr)
Time of concentration =    20.53 min.
Rainfall intensity =      1.807(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.797
Subarea runoff =     30.523(CFS) for   32.920(Ac.)
Total runoff =    575.109(CFS)    Total area =      399.09(Ac.)
Area averaged Fm value =    0.206(In/Hr)


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Process from Point/Station      312.000 to Point/Station      314.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    399.087(Ac.)
Runoff from this stream =    575.109(CFS)
Time of concentration =   20.53 min.
Rainfall intensity =     1.807(In/Hr)
Area averaged loss rate (Fm) =    0.2059(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8678
Program is now starting with Main Stream No. 2


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Process from Point/Station      315.000 to Point/Station      316.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.140(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =   996.200(Ft.)
Bottom (of initial area) elevation =   990.000(Ft.)
Difference in elevation =     6.200(Ft.)
Slope =    0.02067  s(%)=       2.07
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.317 min.
Rainfall intensity =      2.842(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.856
Subarea runoff =      1.751(CFS)
Total initial stream area =        0.720(Ac.)


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Process from Point/Station      316.000 to Point/Station      317.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =   990.000(Ft.)
End of street segment elevation =   834.000(Ft.)
Length of street segment  =  2683.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
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Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   8.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =    57.569(CFS)
Depth of flow =   0.499(Ft.), Average velocity =   8.010(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  18.000(Ft.)
Flow velocity =   8.01(Ft/s)
Travel time =    5.58 min.     TC =   14.90  min.
 Adding area flow to street
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.750
Decimal fraction soil group D = 0.250
SCS curve number for soil(AMC 2)  = 70.50
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.237(In/Hr)
Max Catchment Loss (Fm) =     0.166(In/Hr)
Rainfall intensity =      2.171(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.831
Subarea runoff =    111.511(CFS) for   62.030(Ac.)
Total runoff =    113.262(CFS)    Total area =       62.75(Ac.)
Area averaged Fm value =    0.166(In/Hr)
Street flow at end of street =    113.262(CFS)
Half street flow at end of street =     56.631(CFS)
Depth of flow =   0.615(Ft.), Average velocity =   9.421(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    5.76(Ft.)
Flow width (from curb towards crown)=  18.000(Ft.)


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Process from Point/Station      315.000 to Point/Station      317.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     62.750(Ac.)
Runoff from this stream =    113.262(CFS)
Time of concentration =   14.90 min.
Rainfall intensity =     2.171(In/Hr)
Area averaged loss rate (Fm) =    0.1659(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7000


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Process from Point/Station      200.000 to Point/Station      210.000
**** INITIAL AREA EVALUATION ****
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UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 79.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1515.000(Ft.)
Bottom (of initial area) elevation =  1370.000(Ft.)
Difference in elevation =   145.000(Ft.)
Slope =    0.48333  s(%)=     48.33
TC = k(0.706)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.995 min.
Rainfall intensity =      3.102(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.827
Subarea runoff =      2.336(CFS)
Total initial stream area =        0.910(Ac.)


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Process from Point/Station      210.000 to Point/Station      214.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      7.639(CFS)
Depth of flow =   0.216(Ft.), Average velocity =   6.496(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =      7.639(CFS)
  '     '    flow top width =      5.866(Ft.)
  '     '     velocity=    6.496(Ft/s)
  '     '    area =      1.176(Sq.Ft)
  '     '    Froude number =     2.557

Upstream point elevation =  1370.000(Ft.)
Downstream point elevation =  1245.000(Ft.)
Flow length =   300.000(Ft.)
Travel time  =    0.77 min.
Time of concentration =    8.76 min.
Depth of flow =   0.216(Ft.)
Average velocity =   6.496(Ft/s)
Total irregular channel flow =     7.639(CFS)
Irregular channel normal depth above invert elev. =    0.216(Ft.)
Average velocity of channel(s) =   6.496(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.580
Decimal fraction soil group D = 0.420
```

```
SCS curve number for soil(AMC 2)  = 81.10
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.229(In/Hr)
Max Catchment Loss (Fm) =     0.229(In/Hr)
Rainfall intensity =      2.943(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.829
Subarea runoff =    10.520(CFS) for    4.360(Ac.)
Total runoff =     12.856(CFS)    Total area =       5.27(Ac.)
Area averaged Fm value =    0.233(In/Hr)
Depth of flow =   0.294(Ft.), Average velocity =   7.821(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      214.000 to Point/Station     216.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     20.558(CFS)
Depth of flow =   0.499(Ft.), Average velocity =   6.863(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =     20.559(CFS)
   '      '   flow top width =      6.998(Ft.)
   '      '    velocity=    6.863(Ft/s)
   '      '   area =      2.996(Sq.Ft)
   '      '   Froude number =     1.848

Upstream point elevation =  1245.000(Ft.)
Downstream point elevation =  1150.000(Ft.)
Flow length =   550.000(Ft.)
Travel time  =    1.34 min.
Time of concentration =   10.10 min.
Depth of flow =   0.499(Ft.)
Average velocity =   6.863(Ft/s)
Total irregular channel flow =    20.558(CFS)
Irregular channel normal depth above invert elev. =   0.499(Ft.)
Average velocity of channel(s) =   6.863(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.730
Decimal fraction soil group D = 0.270
SCS curve number for soil(AMC 2)  = 80.35
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.236(In/Hr)
Max Catchment Loss (Fm) =     0.236(In/Hr)
Rainfall intensity =      2.713(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.822
Subarea runoff =    15.317(CFS) for    7.360(Ac.)
Total runoff =     28.173(CFS)    Total area =      12.63(Ac.)
Area averaged Fm value =    0.235(In/Hr)
Depth of flow =   0.598(Ft.), Average velocity =   7.602(Ft/s)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      216.000 to Point/Station      220.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     59.743(CFS)
Depth of flow =   0.866(Ft.), Average velocity =  10.251(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =     59.743(CFS)
  '     '    flow top width =      8.463(Ft.)
  '     '     velocity=   10.251(Ft/s)
  '     '    area =      5.828(Sq.Ft)
  '     '    Froude number =     2.177

Upstream point elevation =  1150.000(Ft.)
Downstream point elevation =  1050.000(Ft.)
Flow length =   480.000(Ft.)
Travel time  =    0.78 min.
Time of concentration =   10.88 min.
Depth of flow =   0.866(Ft.)
Average velocity =  10.251(Ft/s)
Total irregular channel flow =    59.743(CFS)
Irregular channel normal depth above invert elev. =   0.866(Ft.)
Average velocity of channel(s) =  10.251(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.420
Decimal fraction soil group D = 0.580
SCS curve number for soil(AMC 2)  = 81.90
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.221(In/Hr)
Max Catchment Loss (Fm) =     0.221(In/Hr)
Rainfall intensity =      2.600(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.822
Subarea runoff =     63.075(CFS) for   30.060(Ac.)
Total runoff =     91.248(CFS)    Total area =       42.69(Ac.)
Area averaged Fm value =    0.225(In/Hr)
Depth of flow =   1.092(Ft.), Average velocity =  11.630(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      220.000 to Point/Station      230.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    134.658(CFS)
Depth of flow =   1.799(Ft.), Average velocity =   8.708(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
```

```
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
-----------------------------------------------------------------
Sub-Channel flow  =    134.658(CFS)
   '     '   flow top width =     12.195(Ft.)
   '     '    velocity=    8.708(Ft/s)
   '     '   area =     15.464(Sq.Ft)
   '     '   Froude number =     1.363

Upstream point elevation =  1050.000(Ft.)
Downstream point elevation =   920.000(Ft.)
Flow length =  1900.000(Ft.)
Travel time  =    3.64 min.
Time of concentration =   14.52 min.
Depth of flow =   1.799(Ft.)
Average velocity =   8.708(Ft/s)
Total irregular channel flow =   134.658(CFS)
Irregular channel normal depth above invert elev. =   1.799(Ft.)
Average velocity of channel(s) =   8.708(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.730
Decimal fraction soil group D = 0.270
SCS curve number for soil(AMC 2)  = 80.35
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.236(In/Hr)
Max Catchment Loss (Fm) =     0.236(In/Hr)
Rainfall intensity =      2.204(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.805
Subarea runoff =     86.732(CFS) for   57.570(Ac.)
Total runoff =    177.980(CFS)    Total area =      100.26(Ac.)
Area averaged Fm value =    0.232(In/Hr)
Depth of flow =   2.072(Ft.), Average velocity =   9.393(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      230.000 to Point/Station      317.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
-------------------------------------------------------------------------
Upstream point/station elevation =   920.000(Ft.)
Downstream point/station elevation =   827.000(Ft.)
Pipe length  =  2810.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =   177.980(CFS)
Nearest computed pipe diameter  =    45.00(In.)
Calculated individual pipe flow  =   177.980(CFS)
Normal flow depth in pipe =   34.45(In.)
Flow top width inside pipe =   38.13(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.62(Ft/s)
Travel time through pipe =    2.39 min.
Time of concentration (TC) =    16.90 min.
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      317.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =    100.260(Ac.)
Runoff from this stream =    177.980(CFS)
Time of concentration =   16.90 min.
Rainfall intensity =     2.020(In/Hr)
Area averaged loss rate (Fm) =    0.2316(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     62.75   113.262     14.90    0.166      2.171
2    100.26   177.980     16.90    0.232      2.020
Qmax(1) =
         1.000 *    1.000 *   113.262) +
         1.085 *    0.881 *   177.980) + =     283.426
Qmax(2) =
         0.924 *    1.000 *   113.262) +
         1.000 *    1.000 *   177.980) + =     282.684

Total of 2 streams to confluence:
Flow rates before confluence point:
     113.262     177.980
Maximum flow rates at confluence using above data:
      283.426      282.684
Area of streams before confluence:
       62.750      100.260
Effective area values after confluence:
      151.119      163.010
Results of confluence:
Total flow rate =    283.426(CFS)
Time of concentration =    14.900 min.
Effective stream area after confluence =    151.119(Ac.)
Study area average Pervious fraction(Ap) =  0.885
Study area average soil loss rate(Fm) =    0.206(In/Hr)
Study area total (this main stream) =     163.01(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      317.000 to Point/Station      314.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =   827.000(Ft.)
Downstream point/station elevation =   812.000(Ft.)
Pipe length  =   326.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   283.426(CFS)
Nearest computed pipe diameter  =     48.00(In.)
Calculated individual pipe flow  =   283.426(CFS)
Normal flow depth in pipe =   36.27(In.)
Flow top width inside pipe =   41.25(In.)
Critical depth could not be calculated.
Pipe flow velocity =     27.82(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =    15.09 min.
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      315.000 to Point/Station      314.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =    151.119(Ac.)
Runoff from this stream =    283.426(CFS)
Time of concentration =   15.09 min.
Rainfall intensity =     2.155(In/Hr)
Area averaged loss rate (Fm) =    0.2064(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8845
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)      (min) (In/Hr)     (In/Hr)


1    399.09   575.109     20.53    0.206      1.807
2    151.12   283.426     15.09    0.206      2.155
Qmax(1) =
         1.000 *    1.000 *   575.109) +
         0.821 *    1.000 *   283.426) + =     807.897
Qmax(2) =
         1.217 *    0.735 *   575.109) +
         1.000 *    1.000 *   283.426) + =     798.245

Total of 2 main streams to confluence:
Flow rates before confluence point:
     576.109     284.426
Maximum flow rates at confluence using above data:
      807.897      798.245
Area of streams before confluence:
      399.087      151.119
Effective area values after confluence:
      550.206      444.556


Results of confluence:
Total flow rate =    807.897(CFS)
Time of concentration =    20.530 min.
Effective stream area after confluence  =    550.206(Ac.)
Study area average Pervious fraction(Ap) =  0.872
Study area average soil loss rate(Fm) =    0.206(In/Hr)
Study area total =     550.21(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      314.000 to Point/Station      830.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =   812.000(Ft.)
Downstream point/station elevation =   615.000(Ft.)
Pipe length  =  1621.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   807.897(CFS)
Nearest computed pipe diameter  =     60.00(In.)
Calculated individual pipe flow  =   807.897(CFS)
Normal flow depth in pipe =   44.08(In.)
```

```
Flow top width inside pipe =   52.98(In.)
Critical depth could not be calculated.
Pipe flow velocity =     52.25(Ft/s)
Travel time through pipe =    0.52 min.
Time of concentration (TC) =    21.05 min.


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Process from Point/Station      314.000 to Point/Station      830.000
**** SUBAREA FLOW ADDITION ****

------------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.090
Decimal fraction soil group C = 0.490
Decimal fraction soil group D = 0.420
SCS curve number for soil(AMC 2)  = 70.35
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.233(In/Hr)
Max Catchment Loss (Fm) =     0.163(In/Hr)
The area added to the existing stream with this TC
does not add flow per Para 6b, Page D-15 of the OCHM,
therefore the upstream flow rate of Q =    807.897(CFS) is being used
Time of concentration =    21.05 min.
Rainfall intensity =      1.782(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.796
Subarea runoff =      0.000(CFS) for   10.880(Ac.)
Total runoff =    807.897(CFS)    Total area =      561.09(Ac.)
Area averaged Fm value =    0.205(In/Hr)


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Process from Point/Station       10.000 to Point/Station      803.000
**** CONFLUENCE OF MAIN STREAMS ****

------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    561.086(Ac.)
Runoff from this stream =    807.897(CFS)
Time of concentration =   21.05 min.
Rainfall intensity =     1.782(In/Hr)
Area averaged loss rate (Fm) =    0.2052(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8690
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      150.000 to Point/Station      160.000
**** INITIAL AREA EVALUATION ****

------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
```

```
Top (of initial area) elevation =  1575.000(Ft.)
Bottom (of initial area) elevation =  1350.000(Ft.)
Difference in elevation =   225.000(Ft.)
Slope =    0.75000  s(%)=      75.00
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.697 min.
Rainfall intensity =      2.777(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.819
Subarea runoff =     3.230(CFS)
Total initial stream area =        1.420(Ac.)


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Process from Point/Station      160.000 to Point/Station      162.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     10.822(CFS)
Depth of flow =   0.264(Ft.), Average velocity =   7.427(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number     'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     10.822(CFS)
  '      '    flow top width =      6.055(Ft.)
  '      '     velocity=    7.427(Ft/s)
  '      '    area =      1.457(Sq.Ft)
  '      '    Froude number =     2.668

Upstream point elevation =  1350.000(Ft.)
Downstream point elevation =  1200.000(Ft.)
Flow length =   350.000(Ft.)
Travel time  =    0.79 min.
Time of concentration =   10.48 min.
Depth of flow =   0.264(Ft.)
Average velocity =   7.427(Ft/s)
Total irregular channel flow =    10.822(CFS)
Irregular channel normal depth above invert elev. =   0.264(Ft.)
Average velocity of channel(s) =   7.427(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.960
Decimal fraction soil group D = 0.040
SCS curve number for soil(AMC 2)  = 74.24
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.248(In/Hr)
Max Catchment Loss (Fm) =     0.248(In/Hr)
Rainfall intensity =      2.656(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.816
Subarea runoff =    15.125(CFS) for    7.050(Ac.)
Total runoff =     18.355(CFS)    Total area =        8.47(Ac.)
Area averaged Fm value =    0.248(In/Hr)
Depth of flow =   0.359(Ft.), Average velocity =   8.932(Ft/s)
```

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Process from Point/Station      162.000 to Point/Station      164.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     30.009(CFS)
Depth of flow =   0.564(Ft.), Average velocity =   8.674(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =     30.009(CFS)
   '      '    flow top width =      7.258(Ft.)
   '      '     velocity=    8.674(Ft/s)
   '      '    area =      3.460(Sq.Ft)
   '      '    Froude number =     2.214

Upstream point elevation =  1200.000(Ft.)
Downstream point elevation =  1020.000(Ft.)
Flow length =   750.000(Ft.)
Travel time  =    1.44 min.
Time of concentration =   11.92 min.
Depth of flow =   0.564(Ft.)
Average velocity =   8.674(Ft/s)
Total irregular channel flow =    30.009(CFS)
Irregular channel normal depth above invert elev. =   0.564(Ft.)
Average velocity of channel(s) =   8.674(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.660
Decimal fraction soil group D = 0.340
SCS curve number for soil(AMC 2)  = 76.04
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.233(In/Hr)
Max Catchment Loss (Fm) =     0.233(In/Hr)
Rainfall intensity =      2.467(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.813
Subarea runoff =     23.251(CFS) for   12.280(Ac.)
Total runoff =     41.606(CFS)    Total area =       20.75(Ac.)
Area averaged Fm value =    0.239(In/Hr)
Depth of flow =   0.680(Ft.), Average velocity =   9.626(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      163.000 to Point/Station      164.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.970
```

```
Decimal fraction soil group D = 0.030
SCS curve number for soil(AMC 2)  = 74.18
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.249(In/Hr)
Max Catchment Loss (Fm) =     0.249(In/Hr)
Time of concentration =    11.92 min.
Rainfall intensity =      2.467(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.811
Subarea runoff =     26.198(CFS) for   13.120(Ac.)
Total runoff =     67.804(CFS)    Total area =       33.87(Ac.)
Area averaged Fm value =    0.243(In/Hr)


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Process from Point/Station      164.000 to Point/Station      170.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     89.470(CFS)
Depth of flow =   1.350(Ft.), Average velocity =   8.609(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =     89.470(CFS)
  '     '    flow top width =     10.399(Ft.)
  '     '     velocity=    8.609(Ft/s)
  '     '    area =     10.393(Sq.Ft)
  '     '    Froude number =     1.518

Upstream point elevation =  1020.000(Ft.)
Downstream point elevation =   920.000(Ft.)
Flow length =  1100.000(Ft.)
Travel time  =    2.13 min.
Time of concentration =   14.05 min.
Depth of flow =   1.350(Ft.)
Average velocity =   8.609(Ft/s)
Total irregular channel flow =    89.470(CFS)
Irregular channel normal depth above invert elev. =   1.350(Ft.)
Average velocity of channel(s) =   8.609(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.340
Decimal fraction soil group D = 0.660
SCS curve number for soil(AMC 2)  = 77.96
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.217(In/Hr)
Max Catchment Loss (Fm) =     0.217(In/Hr)
Rainfall intensity =      2.245(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.807
Subarea runoff =     43.282(CFS) for   27.410(Ac.)
Total runoff =    111.086(CFS)    Total area =       61.28(Ac.)
Area averaged Fm value =    0.231(In/Hr)
```

```
Depth of flow =   1.513(Ft.), Average velocity =   9.150(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      168.000 to Point/Station      170.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.410
Decimal fraction soil group D = 0.590
SCS curve number for soil(AMC 2)  = 81.95
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.220(In/Hr)
Max Catchment Loss (Fm) =     0.220(In/Hr)
Time of concentration =  14.05 min.
Rainfall intensity =      2.245(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.809
Subarea runoff =    58.264(CFS) for   31.970(Ac.)
Total runoff =    169.350(CFS)    Total area =    93.25(Ac.)
Area averaged Fm value =    0.228(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      170.000 to Point/Station      175.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    199.893(CFS)
Depth of flow =   2.313(Ft.), Average velocity =   8.978(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------------
Sub-Channel flow  =    199.893(CFS)
  '     '    flow top width =     14.252(Ft.)
  '     '     velocity=    8.978(Ft/s)
  '     '    area =     22.264(Sq.Ft)
  '     '    Froude number =    1.266

Upstream point elevation =   920.000(Ft.)
Downstream point elevation =   850.000(Ft.)
Flow length =  1260.000(Ft.)
Travel time  =    2.34 min.
Time of concentration =   16.39 min.
Depth of flow =   2.313(Ft.)
Average velocity =   8.978(Ft/s)
Total irregular channel flow =   199.893(CFS)
Irregular channel normal depth above invert elev. =   2.313(Ft.)
Average velocity of channel(s) =   8.978(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
```

```
Decimal fraction soil group C = 0.120
Decimal fraction soil group D = 0.880
SCS curve number for soil(AMC 2)  = 79.28
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.206(In/Hr)
Max Catchment Loss (Fm) =     0.206(In/Hr)
Rainfall intensity =      2.056(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.803
Subarea runoff =     60.989(CFS) for   46.190(Ac.)
Total runoff =    230.338(CFS)    Total area =     139.44(Ac.)
Area averaged Fm value =    0.220(In/Hr)
Depth of flow =   2.480(Ft.), Average velocity =   9.323(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      175.000 to Point/Station      180.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    261.559(CFS)
Depth of flow =   2.618(Ft.), Average velocity =   9.758(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =    261.559(CFS)
  '      '    flow top width =     15.473(Ft.)
  '      '     velocity=    9.758(Ft/s)
  '      '    area =     26.803(Sq.Ft)
  '      '    Froude number =     1.307

Upstream point elevation =   850.000(Ft.)
Downstream point elevation =   730.000(Ft.)
Flow length =  2090.000(Ft.)
Travel time  =    3.57 min.
Time of concentration =   19.96 min.
Depth of flow =   2.618(Ft.)
Average velocity =   9.758(Ft/s)
Total irregular channel flow =   261.559(CFS)
Irregular channel normal depth above invert elev. =   2.618(Ft.)
Average velocity of channel(s) =   9.758(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.100
Decimal fraction soil group C = 0.130
Decimal fraction soil group D = 0.770
SCS curve number for soil(AMC 2)  = 77.32
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.217(In/Hr)
Max Catchment Loss (Fm) =     0.217(In/Hr)
Rainfall intensity =      1.836(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.793
Subarea runoff =     62.353(CFS) for   61.660(Ac.)
Total runoff =    292.692(CFS)    Total area =     201.10(Ac.)
```

```
Area averaged Fm value =    0.219(In/Hr)
Depth of flow =   2.765(Ft.), Average velocity =  10.051(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      178.000 to Point/Station      180.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Time of concentration =    19.96 min.
Rainfall intensity =      1.836(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.790
Subarea runoff =     45.803(CFS) for   32.080(Ac.)
Total runoff =    338.494(CFS)    Total area =      233.18(Ac.)
Area averaged Fm value =    0.223(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      180.000 to Point/Station      184.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    339.010(CFS)
Depth of flow =   3.133(Ft.), Average velocity =   9.606(Ft/s)
     ******* Irregular Channel Data ***********
---------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
---------------------------------------------------------------
Sub-Channel flow  =    339.010(CFS)
  '     '    flow top width =     17.531(Ft.)
  '     '     velocity=    9.606(Ft/s)
  '     '    area =     35.291(Sq.Ft)
  '     '    Froude number =     1.193

Upstream point elevation =   730.000(Ft.)
Downstream point elevation =   705.000(Ft.)
Flow length =   546.000(Ft.)
Travel time  =    0.95 min.
Time of concentration =   20.91 min.
Depth of flow =   3.133(Ft.)
Average velocity =   9.606(Ft/s)
Total irregular channel flow =   339.010(CFS)
Irregular channel normal depth above invert elev. =   3.133(Ft.)
Average velocity of channel(s) =   9.606(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
```

```
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.600
Decimal fraction soil group D = 0.400
SCS curve number for soil(AMC 2)  = 76.40
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.230(In/Hr)
Max Catchment Loss (Fm) =     0.230(In/Hr)
Rainfall intensity =      1.788(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.787
Subarea runoff =      0.947(CFS) for    7.880(Ac.)
Total runoff =    339.442(CFS)    Total area =    241.06(Ac.)
Area averaged Fm value =    0.224(In/Hr)
Depth of flow =   3.135(Ft.), Average velocity =   9.609(Ft/s)


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Process from Point/Station      180.000 to Point/Station      184.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =    241.060(Ac.)
Runoff from this stream =    339.442(CFS)
Time of concentration =   20.91 min.
Rainfall intensity =     1.788(In/Hr)
Area averaged loss rate (Fm) =    0.2237(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


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Process from Point/Station      181.000 to Point/Station      182.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 61.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.300(In/Hr)
Max Catchment Loss (Fm) =     0.300(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1225.000(Ft.)
Bottom (of initial area) elevation =  1175.000(Ft.)
Difference in elevation =    50.000(Ft.)
Slope =    0.16667  s(%)=      16.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.101 min.
Rainfall intensity =      2.338(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.784
Subarea runoff =      2.384(CFS)
Total initial stream area =        1.300(Ac.)


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Process from Point/Station      182.000 to Point/Station      184.000
**** STREET INLET + AREA  + PIPE  TRAVEL TIME ****
------------------------------------------------------------------------
Top of street segment elevation =  1175.000(Ft.)
End of street segment elevation =   915.000(Ft.)
```

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Length of street segment   =  2250.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  13.000(Ft.)
Distance from crown to crossfall grade break  =   5.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.017
Slope from grade break to crown (v/hz)  =   0.017
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   2.000(Ft.)
Slope from curb to property line (v/hz) =   0.017
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
No street inlet installed at this point
Estimated mean flow rate at midpoint of street =    29.934(CFS)
Depth of flow =   0.366(Ft.), Average velocity =   8.628(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  13.000(Ft.)
Flow velocity =   8.63(Ft/s)
Travel time =    4.35 min.     TC =   17.45  min.
 Adding area flow to street
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.290
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.710
SCS curve number for soil(AMC 2)  = 69.49
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=     0.229(In/Hr)
Max Catchment Loss (Fm) =     0.183(In/Hr)
Rainfall intensity =      1.984(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.815
Subarea runoff =     54.941(CFS) for   34.160(Ac.)
Total runoff =     57.325(CFS)    Total area =       35.46(Ac.)
Area averaged Fm value =    0.187(In/Hr)
Street flow at end of street =    57.325(CFS)
Half street flow at end of street =     28.663(CFS)
Depth of flow =   0.430(Ft.), Average velocity =  11.168(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  13.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      181.000 to Point/Station      184.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     35.460(Ac.)
Runoff from this stream =     57.325(CFS)
Time of concentration =   17.45 min.
Rainfall intensity =     1.984(In/Hr)
Area averaged loss rate (Fm) =    0.1875(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8073
Summary of stream data:

Stream  Area  Flow rate      TC     Fm      Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)
```

```
1    241.06   339.442     20.91    0.224      1.788
2     35.46    57.325     17.45    0.187      1.984
Qmax(1) =
         1.000 *    1.000 *   339.442) +
         0.891 *    1.000 *    57.325) + =     390.529
Qmax(2) =
         1.125 *    0.834 *   339.442) +
         1.000 *    1.000 *    57.325) + =     375.941

Total of 2 streams to confluence:
Flow rates before confluence point:
     339.442      57.325
Maximum flow rates at confluence using above data:
      390.529      375.941
Area of streams before confluence:
      241.060       35.460
Effective area values after confluence:
      276.520      236.600
Results of confluence:
Total flow rate =    390.529(CFS)
Time of concentration =    20.909 min.
Effective stream area after confluence =    276.520(Ac.)
Study area average Pervious fraction(Ap) =  0.975
Study area average soil loss rate(Fm) =    0.219(In/Hr)
Study area total (this main stream) =    276.52(Ac.)


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Process from Point/Station      184.000 to Point/Station      190.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    390.569(CFS)
Depth of flow =   3.478(Ft.), Average velocity =   9.392(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =    390.569(CFS)
  '     '   flow top width =     18.913(Ft.)
  '     '    velocity=    9.392(Ft/s)
  '     '   area =     41.587(Sq.Ft)
  '     '   Froude number =     1.116

Upstream point elevation =   705.000(Ft.)
Downstream point elevation =   665.000(Ft.)
Flow length =  1025.000(Ft.)
Travel time  =    1.82 min.
Time of concentration =   22.73 min.
Depth of flow =   3.478(Ft.)
Average velocity =   9.392(Ft/s)
Total irregular channel flow =   390.569(CFS)
Irregular channel normal depth above invert elev. =   3.478(Ft.)
Average velocity of channel(s) =   9.392(Ft/s)
```

```
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 80.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.200(In/Hr)
The area added to the existing stream with this TC
does not add flow per Para 6b, Page D-15 of the OCHM,
therefore the upstream flow rate of Q =    390.529(CFS) is being used
Rainfall intensity =      1.705(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.785
Subarea runoff =      0.000(CFS) for   14.480(Ac.)
Total runoff =    390.529(CFS)    Total area =     291.00(Ac.)
Area averaged Fm value =    0.218(In/Hr)
Depth of flow =   3.478(Ft.), Average velocity =   9.391(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      184.000 to Point/Station      190.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =    291.000(Ac.)
Runoff from this stream =    390.529(CFS)
Time of concentration =   22.73 min.
Rainfall intensity =     1.705(In/Hr)
Area averaged loss rate (Fm) =    0.2181(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9765


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Process from Point/Station      186.000 to Point/Station      188.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 61.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.300(In/Hr)
Max Catchment Loss (Fm) =     0.300(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1085.000(Ft.)
Bottom (of initial area) elevation =   990.000(Ft.)
Difference in elevation =    95.000(Ft.)
Slope =    0.31667  s(%)=      31.67
TC = k(0.935)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.522 min.
Rainfall intensity =      2.516(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.793
Subarea runoff =      3.650(CFS)
Total initial stream area =        1.830(Ac.)
```

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Process from Point/Station      188.000 to Point/Station      190.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     20.990(CFS)
Depth of flow =   0.487(Ft.), Average velocity =   7.221(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------------
Sub-Channel flow  =     20.990(CFS)
  '      '    flow top width =      6.947(Ft.)
  '      '     velocity=    7.221(Ft/s)
  '      '    area =      2.907(Sq.Ft)
  '      '    Froude number =     1.967

Upstream point elevation =   990.000(Ft.)
Downstream point elevation =   665.000(Ft.)
Flow length =  1650.000(Ft.)
Travel time  =    3.81 min.
Time of concentration =   15.33 min.
Depth of flow =   0.487(Ft.)
Average velocity =   7.221(Ft/s)
Total irregular channel flow =    20.990(CFS)
Irregular channel normal depth above invert elev. =   0.487(Ft.)
Average velocity of channel(s) =   7.221(Ft/s)
 Adding area flow to channel
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.030
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.970
SCS curve number for soil(AMC 2)  = 74.43
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=     0.203(In/Hr)
Max Catchment Loss (Fm) =     0.162(In/Hr)
Rainfall intensity =      2.136(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.827
Subarea runoff =     34.584(CFS) for   19.820(Ac.)
Total runoff =     38.234(CFS)    Total area =       21.65(Ac.)
Area averaged Fm value =    0.174(In/Hr)
Depth of flow =   0.685(Ft.), Average velocity =   8.760(Ft/s)


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Process from Point/Station      186.000 to Point/Station      190.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     21.650(Ac.)
Runoff from this stream =     38.234(CFS)
Time of concentration =   15.33 min.
Rainfall intensity =     2.136(In/Hr)
Area averaged loss rate (Fm) =    0.1740(In/Hr)
```

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Area averaged Pervious ratio (Ap) = 0.8169
Summary of stream data:

Stream  Area  Flow rate      TC     Fm      Rainfall Intensity
 No.    (Ac.)   (CFS)      (min) (In/Hr)     (In/Hr)


1    291.00   390.529     22.73    0.218      1.705
2     21.65    38.234     15.33    0.174      2.136
Qmax(1) =
         1.000 *    1.000 *   390.529) +
         0.780 *    1.000 *    38.234) + =     420.356
Qmax(2) =
         1.290 *    0.675 *   390.529) +
         1.000 *    1.000 *    38.234) + =     378.106

Total of 2 streams to confluence:
Flow rates before confluence point:
     390.529      38.234
Maximum flow rates at confluence using above data:
      420.356      378.106
Area of streams before confluence:
      291.000       21.650
Effective area values after confluence:
     312.650      217.936
Results of confluence:
Total flow rate =    420.356(CFS)
Time of concentration =    22.728 min.
Effective stream area after confluence =    312.650(Ac.)
Study area average Pervious fraction(Ap) =  0.965
Study area average soil loss rate(Fm) =    0.215(In/Hr)
Study area total (this main stream) =     312.65(Ac.)


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Process from Point/Station      190.000 to Point/Station      195.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    422.454(CFS)
Depth of flow =   3.615(Ft.), Average velocity =   9.556(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              50.00
      2            100.00               0.00
      3            105.00               0.00
      4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    422.454(CFS)
  '      '    flow top width =     19.459(Ft.)
  '      '     velocity=    9.556(Ft/s)
  '      '    area =     44.207(Sq.Ft)
  '      '    Froude number =     1.117

Upstream point elevation =   665.000(Ft.)
Downstream point elevation =   620.000(Ft.)
Flow length =  1162.000(Ft.)
Travel time  =    2.03 min.
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```
Time of concentration =   24.75 min.
Depth of flow =   3.615(Ft.)
Average velocity =   9.556(Ft/s)
Total irregular channel flow =   422.454(CFS)
Irregular channel normal depth above invert elev. =   3.615(Ft.)
Average velocity of channel(s) =   9.556(Ft/s)
 Adding area flow to channel
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.380
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.620
SCS curve number for soil(AMC 2)  = 67.78
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=     0.238(In/Hr)
Max Catchment Loss (Fm) =     0.190(In/Hr)
Rainfall intensity =      1.623(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.782
Subarea runoff =      4.145(CFS) for   21.880(Ac.)
Total runoff =    424.500(CFS)    Total area =     334.53(Ac.)
Area averaged Fm value =    0.213(In/Hr)
Depth of flow =   3.623(Ft.), Average velocity =   9.568(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      190.000 to Point/Station      195.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =    334.530(Ac.)
Runoff from this stream =    424.500(CFS)
Time of concentration =   24.75 min.
Rainfall intensity =     1.623(In/Hr)
Area averaged loss rate (Fm) =    0.2134(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9546


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      193.000 to Point/Station      195.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
------------------------------------------------------------------------
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.200
Decimal fraction soil group C = 0.300
Decimal fraction soil group D = 0.500
SCS curve number for soil(AMC 2)  = 69.40
Pervious ratio(Ap) = 0.8000  Max loss rate(Fp)=     0.235(In/Hr)
Max Catchment Loss (Fm) =     0.188(In/Hr)
Rainfall intensity =      1.652(In/Hr) for a    10.0 year storm
User specified values are as follows:
TC =  24.00 min.  Rain intensity =      1.65(In/Hr)
Total area =       434.50(Ac.)  Total runoff =    946.00(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      193.000 to Point/Station      195.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
```

```
Stream flow area =    434.500(Ac.)
Runoff from this stream =    946.000(CFS)
Time of concentration =   24.00 min.
Rainfall intensity =     1.652(In/Hr)
Area averaged loss rate (Fm) =    0.1880(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm      Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)      (In/Hr)


1    334.53   424.500     24.75    0.213       1.623
2    434.50   946.000     24.00    0.188       1.652
Qmax(1) =
         1.000 *    1.000 *   424.500) +
         0.980 *    1.000 *   946.000) + =    1351.727
Qmax(2) =
         1.021 *    0.970 *   424.500) +
         1.000 *    1.000 *   946.000) + =    1366.040

Total of 2 streams to confluence:
Flow rates before confluence point:
     424.500     946.000
Maximum flow rates at confluence using above data:
     1351.727     1366.040
Area of streams before confluence:
      334.530      434.500
Effective area values after confluence:
      769.030      758.830
Results of confluence:
Total flow rate =   1366.040(CFS)
Time of concentration =    24.000 min.
Effective stream area after confluence =    758.830(Ac.)
Study area average Pervious fraction(Ap) =  0.867
Study area average soil loss rate(Fm) =    0.199(In/Hr)
Study area total (this main stream) =     769.03(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     195.000 to Point/Station     830.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   620.000(Ft.)
Downstream point/station elevation =   615.000(Ft.)
Pipe length  =   150.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =  1366.040(CFS)
Nearest computed pipe diameter  =     90.00(In.)
Calculated individual pipe flow  =  1366.040(CFS)
Normal flow depth in pipe =   71.77(In.)
Flow top width inside pipe =   72.34(In.)
Critical depth could not be calculated.
Pipe flow velocity =     36.16(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    24.07 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      150.000 to Point/Station      830.000
**** CONFLUENCE OF MAIN STREAMS ****
```

```
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     758.830(Ac.)
Runoff from this stream =   1366.040(CFS)
Time of concentration =   24.07 min.
Rainfall intensity =     1.650(In/Hr)
Area averaged loss rate (Fm) =    0.1991(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8673
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)      (min) (In/Hr)     (In/Hr)


1    561.09   807.897     21.05    0.205      1.782
2    758.83  1366.040     24.07    0.199      1.650
Qmax(1) =
         1.000 *    1.000 *   807.897) +
         1.091 *    0.874 *  1366.040) + =    2110.970
Qmax(2) =
         0.916 *    1.000 *   807.897) +
         1.000 *    1.000 *  1366.040) + =    2106.366

Total of 2 main streams to confluence:
Flow rates before confluence point:
     808.897    1367.040
Maximum flow rates at confluence using above data:
     2110.970     2106.366
Area of streams before confluence:
      561.086      758.830
Effective area values after confluence:
     1224.632     1319.916


Results of confluence:
Total flow rate =   2110.970(CFS)
Time of concentration =    21.047 min.
Effective stream area after confluence  =   1224.632(Ac.)
Study area average Pervious fraction(Ap) =  0.868
Study area average soil loss rate(Fm) =   0.202(In/Hr)
Study area total =    1319.92(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      830.000 to Point/Station      840.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   615.000(Ft.)
Downstream point/station elevation =   610.000(Ft.)
Pipe length  =   150.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =  2110.970(CFS)
Nearest computed pipe diameter  =    105.00(In.)
Calculated individual pipe flow  =  2110.970(CFS)
Normal flow depth in pipe =   85.89(In.)
Flow top width inside pipe =   81.02(In.)
Critical depth could not be calculated.
Pipe flow velocity =    40.09(Ft/s)
Travel time through pipe =   0.06 min.
Time of concentration (TC) =    21.11 min.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station      840.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    1224.632(Ac.)
Runoff from this stream =    2110.970(CFS)
Time of concentration =    21.11 min.
Rainfall intensity =      1.779(In/Hr)
Area averaged loss rate (Fm) =     0.2017(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8680
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      330.000 to Point/Station      331.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.175(In/Hr)
Initial subarea data:
Initial area flow distance =    260.000(Ft.)
Top (of initial area) elevation =    886.600(Ft.)
Bottom (of initial area) elevation =    866.000(Ft.)
Difference in elevation =     20.600(Ft.)
Slope =    0.07923   s(%)=      7.92
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =     6.725 min.
Rainfall intensity =      3.425(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.854
Subarea runoff =      1.814(CFS)
Total initial stream area =        0.620(Ac.)


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Process from Point/Station      331.000 to Point/Station      332.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =    866.000(Ft.)
End of street segment elevation =    793.000(Ft.)
Length of street segment   =    710.000(Ft.)
Height of curb above gutter flowline  =     6.0(In.)
Width of half street (curb to crown)  =   18.000(Ft.)
Distance from crown to crossfall grade break  =   10.000(Ft.)
Slope from gutter to grade break (v/hz) =    0.020
Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =    8.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
Gutter width =    2.000(Ft.)
Gutter hike from flowline =   2.000(In.)
```

```
 Manning's N in gutter =  0.0130
 Manning's N from gutter to grade break =  0.0130
 Manning's N from grade break to crown =  0.0130
Estimated mean flow rate at midpoint of street =     9.256(CFS)
Depth of flow =   0.271(Ft.), Average velocity =   7.159(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   7.210(Ft.)
Flow velocity =   7.16(Ft/s)
Travel time =    1.65 min.     TC =    8.38  min.
 Adding area flow to street
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.7000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.175(In/Hr)
Rainfall intensity =     3.020(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.848
Subarea runoff =     14.728(CFS) for    5.840(Ac.)
Total runoff =     16.542(CFS)    Total area =     6.46(Ac.)
Area averaged Fm value =    0.175(In/Hr)
Street flow at end of street =     16.542(CFS)
Half street flow at end of street =    8.271(CFS)
Depth of flow =   0.316(Ft.), Average velocity =   8.120(Ft/s)
Flow width (from curb towards crown)=   9.444(Ft.)


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Process from Point/Station      332.000 to Point/Station      333.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   785.000(Ft.)
Downstream point/station elevation =   720.000(Ft.)
Pipe length  =   925.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    16.542(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    16.542(CFS)
Normal flow depth in pipe =   11.86(In.)
Flow top width inside pipe =   12.21(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.90(Ft/s)
Travel time through pipe =    0.97 min.
Time of concentration (TC) =     9.35 min.


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Process from Point/Station      333.000 to Point/Station      333.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
PARK subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.8500  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.212(In/Hr)
```

```
Time of concentration =     9.35 min.
Rainfall intensity =      2.836(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.838
Subarea runoff =     18.178(CFS) for    8.150(Ac.)
Total runoff =     34.720(CFS)    Total area =       14.61(Ac.)
Area averaged Fm value =    0.196(In/Hr)


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Process from Point/Station      333.000 to Point/Station     840.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     42.264(CFS)
Depth of flow =   0.874(Ft.), Average velocity =   7.170(Ft/s)
     ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
     1              0.00              50.00
     2            100.00               0.00
     3            105.00               0.00
     4            205.00              50.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =     42.264(CFS)
  '     '    flow top width =      8.495(Ft.)
  '     '     velocity=    7.170(Ft/s)
  '     '    area =      5.895(Sq.Ft)
  '     '    Froude number =     1.517

Upstream point elevation =   720.000(Ft.)
Downstream point elevation =   610.000(Ft.)
Flow length =  1090.000(Ft.)
Travel time  =    2.53 min.
Time of concentration =   11.88 min.
Depth of flow =   0.874(Ft.)
Average velocity =   7.170(Ft/s)
Total irregular channel flow =    42.264(CFS)
Irregular channel normal depth above invert elev. =   0.874(Ft.)
Average velocity of channel(s) =   7.170(Ft/s)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 74.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      2.472(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.821
Subarea runoff =     15.011(CFS) for    9.900(Ac.)
Total runoff =     49.731(CFS)    Total area =       24.51(Ac.)
Area averaged Fm value =    0.218(In/Hr)
Depth of flow =   0.956(Ft.), Average velocity =   7.529(Ft/s)


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Process from Point/Station      330.000 to Point/Station      840.000
**** CONFLUENCE OF MAIN STREAMS ****
--------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     24.510(Ac.)
Runoff from this stream =     49.731(CFS)
Time of concentration =   11.88 min.
Rainfall intensity =     2.472(In/Hr)
Area averaged loss rate (Fm) =    0.2178(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8711
Summary of stream data:

Stream  Area  Flow rate      TC     Fm      Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1   1224.63  2110.970     21.11    0.202      1.779
2     24.51    49.731     11.88    0.218      2.472
Qmax(1) =
         1.000 *    1.000 *  2110.970) +
         0.692 *    1.000 *    49.731) + =    2145.399
Qmax(2) =
         1.440 *    0.563 *  2110.970) +
         1.000 *    1.000 *    49.731) + =    1760.585

Total of 2 main streams to confluence:
Flow rates before confluence point:
    2111.970      50.731
Maximum flow rates at confluence using above data:
     2145.399     1760.585
Area of streams before confluence:
     1224.632       24.510
Effective area values after confluence:
     1249.142      713.795

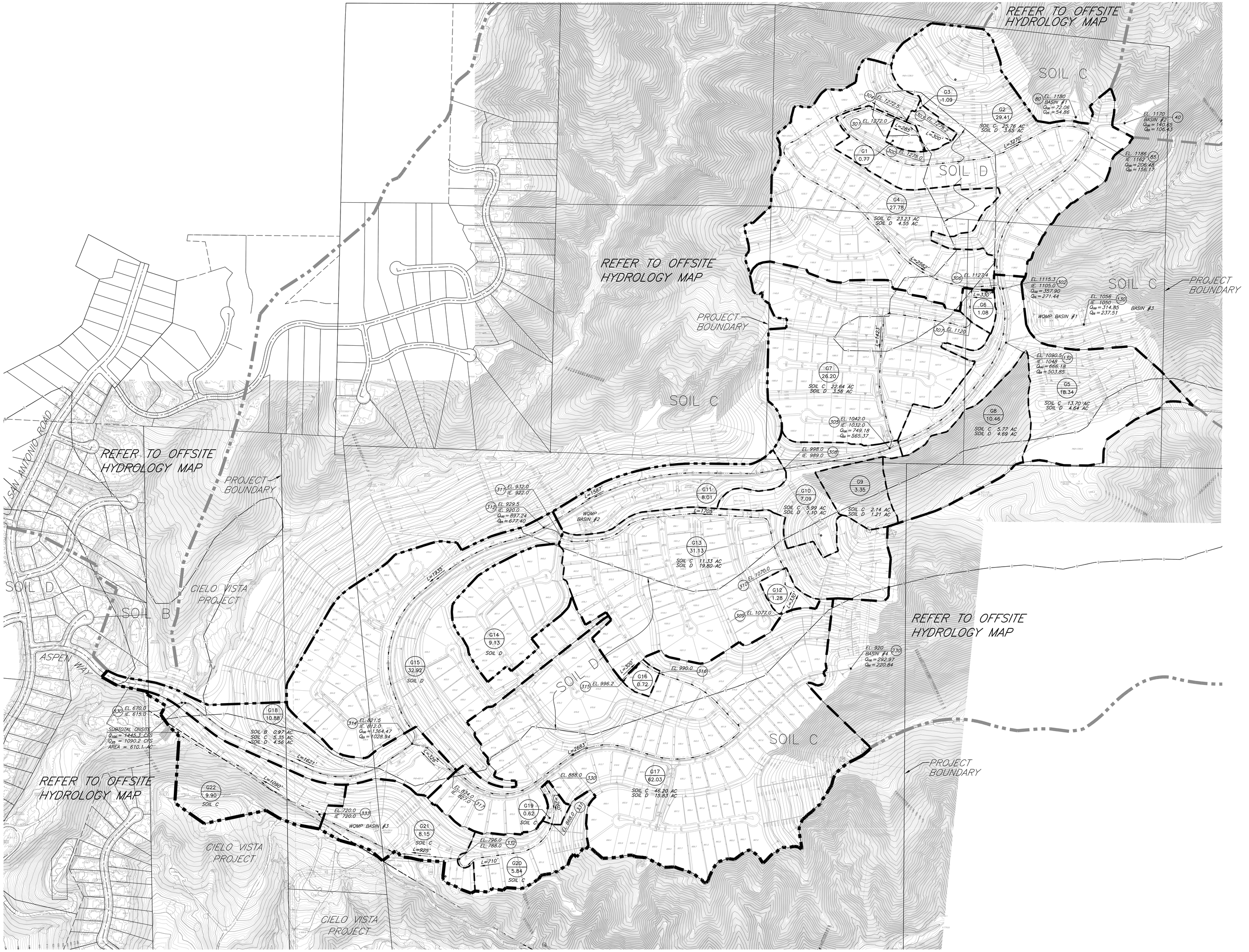

Results of confluence:
Total flow rate =   2145.399(CFS)
Time of concentration =    21.109 min.
Effective stream area after confluence  =   1249.142(Ac.)
Study area average Pervious fraction(Ap) =  0.868
Study area average soil loss rate(Fm) =    0.202(In/Hr)
Study area total =    1249.14(Ac.)
End of computations, total study area =        1379.21 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.869
Area averaged SCS curve number (AMC 2) =  73.1
```

Appendix

H

PROPOSED CONDITION HYDROLOGIC KEY MAPS (ONSITE AND OFFSITE)



LEGEND

- MAJOR WATERSHED BOUNDARY
- MINOR WATERSHED BOUNDARY
- SUBAREA BOUNDARY
- NODAL POINT REFERENCE
- 304 EL. 1172.0 — ELEVATION @ NODE
- IE. 1166.0 — PIPE INVERT ELEVATION
- Q_{100} = 23.26 — FLOW 100-YEAR STORM (CFS)
- Q_{25} = 17.92 — FLOW 25-YEAR STORM (CFS)
- CATCH BASIN & STORM DRAIN
- M2 / 6.36 — SUBAREA DESIGNATION / SUBAREA ACREAGE
- HYDROLOGIC SOILS GROUP BOUNDARY
- SOIL A — HYDROLOGIC SOILS GROUP

FIGURE 11

PROPOSED CONDITION HYDROLOGY KEY MAP

FOR

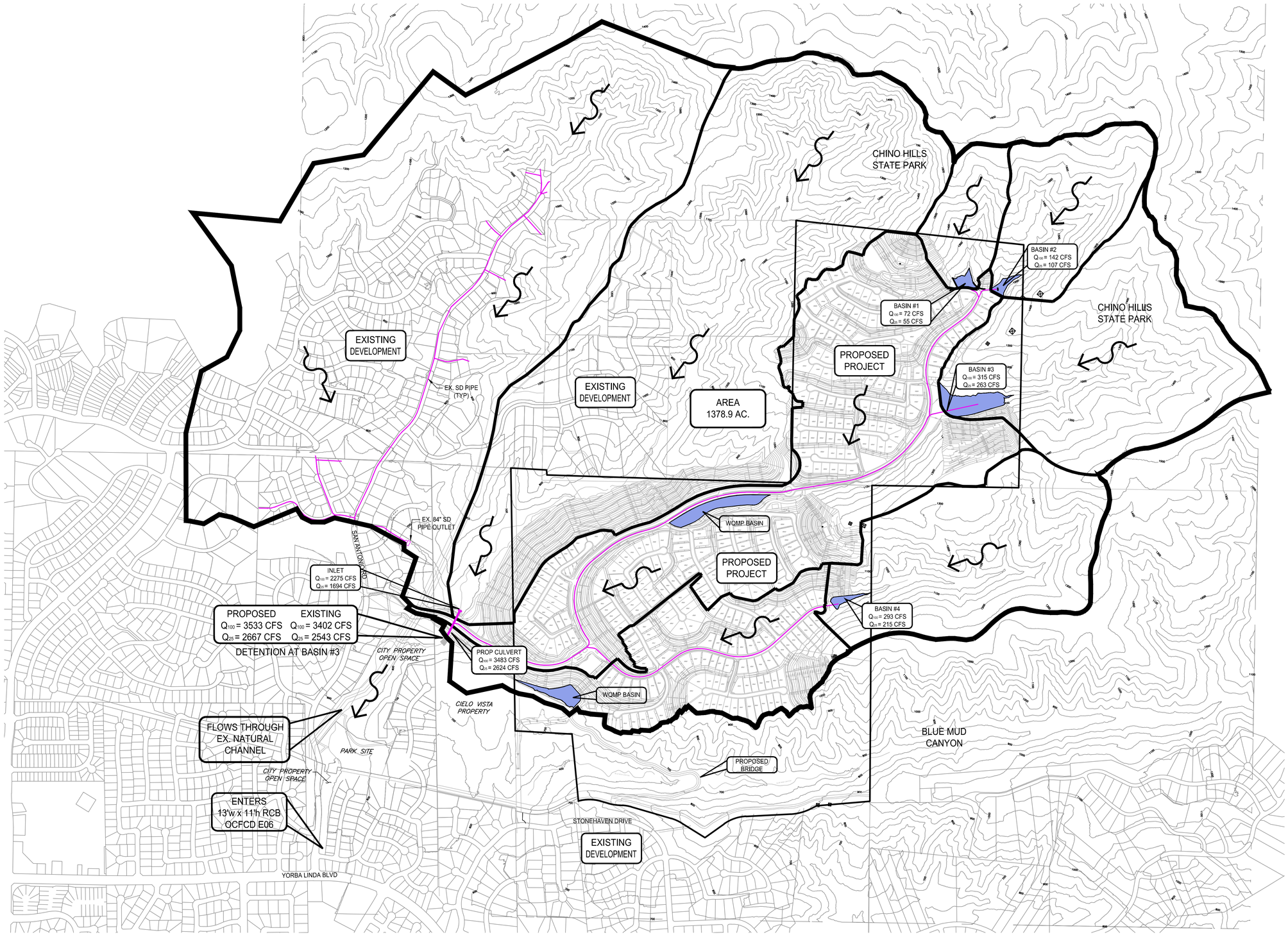
ESPERANZA HILLS – OPTION 2

COUNTY OF ORANGE

HYD: VAE	SHEET 1 OF 1
DRAFT: VAE	KWC ENGINEERS
CHECK: MCT	CIVIL ENGINEERING · PLANNING · LAND DEVELOPMENT CONSULTING MANAGEMENT 1880 CORTON AVENUE, SUITE 100 • CORONA, CA. 92881-3370 • 951-734-2130

K:\DPL\2005\PRELIM\HDR\RPTS\WQMP\ESPERANZA HILLS - Option 2\Proposed Hydro Map.dwg, 10/24/2013 9:13 AM, Plotted by: Paul PC Account

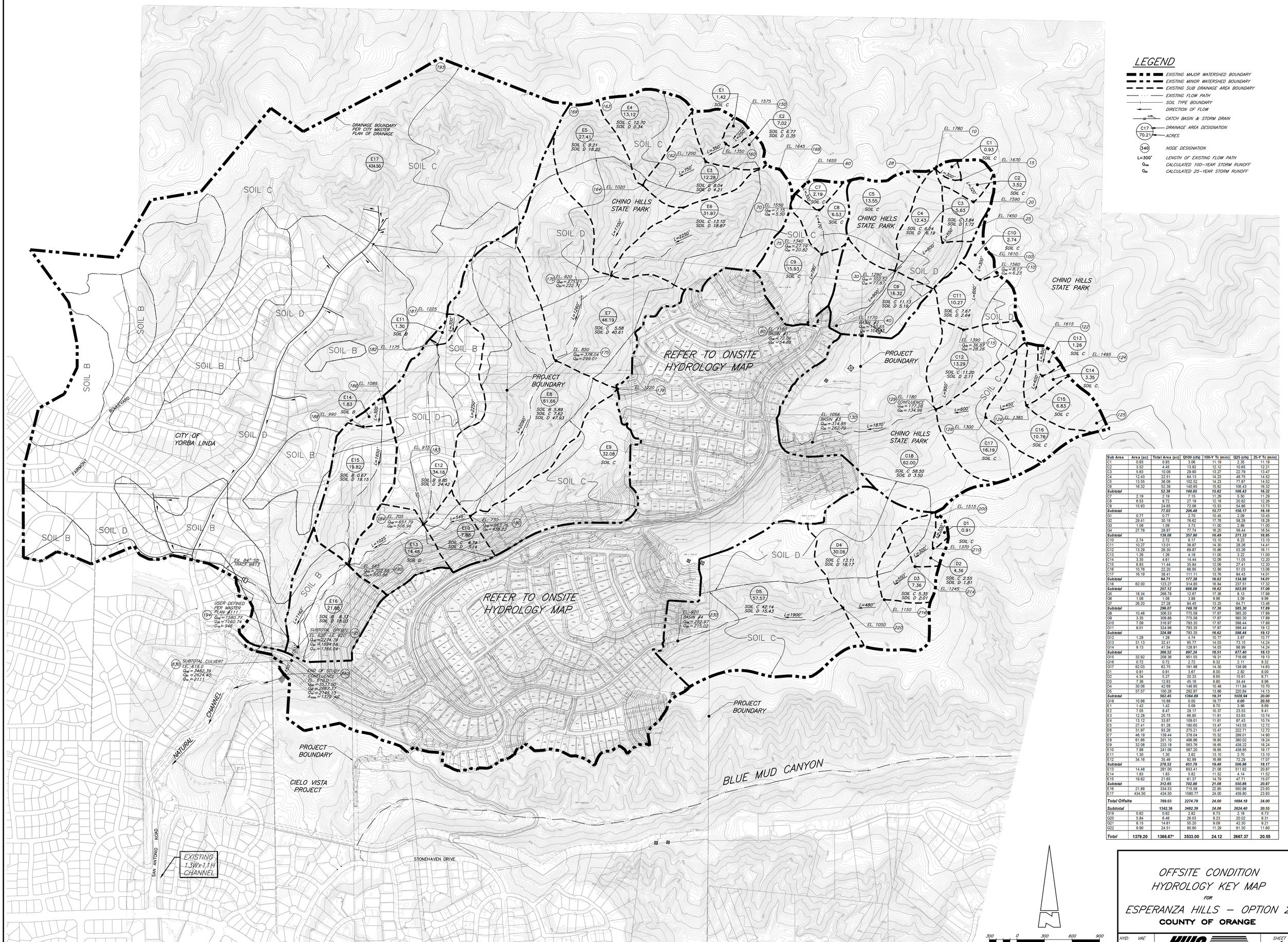
ESPERANZA HILLS OPTION 2 - CONCEPTUAL DRAINAGE EXHIBIT



OPTION 2
DATE: 03-05-2013
FIGURE 10A

KWC ENGINEERS
CIVIL ENGINEERS • PLANNERS • SURVEYORS
3880 COMPTON AVENUE, SUITE 100 • CORONA, CA. 92881-3370 • 951-734-2130

2009.1220.4 R:\09\1200\PRELIM\REPORTS\HYDRO Option 2\Conceptual Hydro Exhibit.dwg 06/24/2013 08:37



Sub Area	Area (ac)	Total Area (ac)	Q100 (cfs)	100-Y Tc (min)	Q25 (cfs)	25-Y Tc (min)
C1	0.93	0.93	3.06	11.19	2.35	11.19
C2	3.52	4.45	13.92	12.12	10.65	12.21
C3	5.63	10.08	29.90	13.27	22.79	13.47
C4	12.43	22.51	64.13	14.23	48.75	14.52
C5	13.55	36.06	102.52	14.23	77.87	14.52
C6	16.32	52.38	140.65	15.62	106.43	16.32
Subtotal		***52.38***	***140.65***	***15.62***	***106.43***	***16.32***
C7	2.19	2.19	7.15	11.29	5.50	11.29
C8	6.53	8.72	27.19	12.18	20.82	12.26
C9	15.93	24.65	72.06	13.53	54.86	13.73
Subtotal		***77.03***	***206.48***	***15.77***	***156.17***	***16.18***
G1	0.77	0.77	2.70	10.45	2.09	10.45
G2	29.41	30.18	76.62	17.78	58.28	18.28
G3	1.09	1.09	3.73	11.00	2.89	11.00
G4	27.78	28.87	77.74	16.20	59.44	16.54
Subtotal		***136.08***	***357.90***	***16.49***	***271.33***	***16.95***
C10	2.74	2.72	8.17	13.10	6.23	13.10
C11	10.27	13.01	36.87	14.30	28.26	14.41
C12	13.29	26.30	69.87	15.86	53.26	16.11
C13	1.26	1.26	4.18	11.00	3.22	11.00
C14	3.35	4.61	14.44	12.09	11.05	12.20
C15	6.83	11.44	35.84	12.09	27.41	12.20
C16	10.76	22.20	66.95	12.88	51.03	13.06
C17	16.19	38.41	111.11	13.76	84.43	14.01
Subtotal		***64.71***	***177.28***	***16.62***	***134.88***	***14.01***
C18	62.00	123.27	314.85	16.84	237.51	17.32
Subtotal		***257.12***	***666.08***	***16.62***	***503.85***	***17.08***
G5	18.34	268.79	12.67	17.36	8.13	17.89
G6	1.08	1.08	3.88	9.96	3.09	9.96
G7	26.20	27.28	84.45	13.25	64.71	13.46
Subtotal		***296.07***	***749.18***	***17.36***	***585.30***	***17.89***
G8	10.46	306.53	775.58	17.67	585.30	17.89
G9	3.35	309.88	775.58	17.67	585.30	17.89
G10	7.09	316.97	793.35	17.67	598.44	17.89
G11	8.01	324.98	793.35	17.67	598.44	19.12
Subtotal		***324.98***	793.35	***16.62***	***598.44***	***19.12***
G12	1.28	1.28	4.74	10.77	3.67	10.77
G13	31.13	32.41	95.77	14.03	73.15	14.24
G14	9.13	41.54	128.91	14.03	98.99	14.24
Subtotal		***366.52***	***897.24***	***18.51***	***677.40***	***19.13***
G15	32.92	208.36	951.55	19.31	716.66	19.13
G16	0.72	0.72	2.72	9.32	2.11	9.32
G17	62.03	62.75	181.98	14.30	138.98	14.63
D1	0.91	0.91	3.67	8.00	2.82	8.00
D2	4.34	5.27	20.33	8.65	15.61	8.71
D3	7.36	12.63	45.16	9.80	34.44	9.96
D4	30.06	42.69	146.95	10.48	111.84	10.70
D5	57.57	100.26	292.97	13.66	220.84	14.13
Subtotal		***562.45***	***1364.89***	***19.31***	***1028.94***	***20.00***
G18	10.88	10.88	0.00	19.77	***0.00***	***20.50***
E1	1.42	1.42	5.09	9.70	3.98	8.69
E2	7.05	8.47	29.17	10.37	23.53	9.41
E3	12.28	20.75	66.85	11.61	53.63	10.74
E4	13.12	33.87	109.01	11.61	87.43	10.74
E5	27.41	61.28	180.65	13.47	143.55	12.72
E6	31.97	93.26	275.21	13.47	222.71	12.72
E7	46.19	139.44	378.04	15.52	299.01	14.90
E8	61.66	201.10	486.96	18.65	380.02	18.24
E9	32.08	233.18	563.76	18.65	438.22	18.24
E10	7.88	241.06	567.20	18.65	438.85	19.17
E11	1.30	1.30	3.82	13.10	2.70	13.10
E12	34.16	35.46	92.99	16.69	72.29	17.07
Subtotal		***276.52***	***651.79***	***19.48***	***506.96***	***19.17***
E13	14.48	291.00	653.41	21.08	511.62	20.87
E14	1.83	1.83	5.82	11.52	4.14	11.52
E15	19.82	21.65	61.37	14.79	47.71	15.07
Subtotal		***312.65***	***702.89***	***21.08***	***550.86***	***20.87***
E16	21.88	334.53	715.58	22.85	550.86	23.93
E17	434.50	434.50	1580.77	24.00	439.80	23.93
Total Offsite		***769.03***	***2274.79***	***24.00***	***1694.18***	***24.00***
Subtotal		***1342.36***	***3482.39***	***24.06***	***2624.40***	***20.55***
G19	0.62	0.62	2.82	6.73	2.18	6.73
G20	5.84	6.46	26.03	8.23	20.02	8.31
G21	8.15	14.61	55.20	9.09	42.30	9.21
G22	9.90	24.51	80.80	11.29	61.30	11.60
Total	**1379.20**	**1366.87***	**3533.00**	**24.12**	**2667.37**	**20.55**

OFFSITE CONDITION HYDROLOGY KEY MAP
FOR
ESPERANZA HILLS – OPTION 2
COUNTY OF ORANGE

HYD: VAE
DRAFT: VAE
CHECK: MCT

KWC ENGINEERS
CIVIL ENGINEERING, PLANNING AND CONSTRUCTION MANAGEMENT
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SHEET 1 OF 1

FIGURE 10

R:\OVA\1200\PRELIM\REPORTS\HYDRO\Offsite Proposed Hydro Map.dwg (1/18/2013 10:00 AM) Plotted by: Paul PC Account

Appendix

I

EXISTING CONDITION HYDROLOGY UNIT HYDROGRAPH METHOD

U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/30/12 File Name UNIT10Y24HEX.out

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Orange County Unit Hydrograph Hydrology Method
Manual Date(s) - October 1986, November 1996

Program License Serial Number 6062

ESPERANZA HILLS
DETENTION BASIN ANALYSIS
EXISTING CONDITION
10-YEAR 24-HOUR

Storm Event Year = 10

Antecedent Moisture Condition = 2

English (in-lb) Input Units Used

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	Area (Ac.)	Area Fraction	Soil Group	Fp (In/Hr)	Ap (dec.)	Fm (In/Hr)
56.0	17.0	0.03	B	0.300	0.990	0.297
69.0	404.8	0.66	C	0.250	0.990	0.248
75.0	188.4	0.31	D	0.200	0.990	0.198

Area-averaged adjusted loss rate Fm (In/Hr) = 0.234

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC2)	S	Pervious Yield Fr
16.83	0.028	56.0	56.0	7.86	0.121
0.17	0.000	98.0	98.0	0.20	0.936
400.70	0.657	69.0	69.0	4.49	0.289
4.05	0.007	98.0	98.0	0.20	0.936
186.51	0.306	75.0	75.0	3.33	0.389
1.88	0.003	98.0	98.0	0.20	0.936

Area-averaged catchment yield fraction, Y = 0.321
Area-averaged low loss fraction, Yb = 0.679

++

User entry of time of concentration = 0.400 (hours)
Watershed area = 610.14(Ac.)
Catchment Lag time = 0.320 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 26.0417
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.234(In/Hr)
Average low loss rate fraction (Yb) = 0.679 (decimal)
FOOTHILL S-Graph Selected
Computed peak 5-minute rainfall = 0.340(In)
Computed peak 30-minute rainfall = 0.720(In)
Specified peak 1-hour rainfall = 0.950(In)
Computed peak 3-hour rainfall = 1.590(In)
Specified peak 6-hour rainfall = 2.200(In)
Specified peak 24-hour rainfall = 3.680(In)

Rainfall depth area reduction factors:
Using a total area of 610.14(Ac.) (Ref: fig. E-4)

5-minute factor = 0.971 Adjusted rainfall = 0.330(In)
30-minute factor = 0.971 Adjusted rainfall = 0.699(In)
1-hour factor = 0.971 Adjusted rainfall = 0.923(In)
3-hour factor = 0.996 Adjusted rainfall = 1.584(In)
6-hour factor = 0.998 Adjusted rainfall = 2.196(In)
24-hour factor = 0.999 Adjusted rainfall = 3.677(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
(K = 7378.88 (CFS))		
1	1.798	132.686
2	7.274	404.072
3	16.833	705.347
4	37.688	1538.813
5	59.997	1646.186
6	69.792	722.738
7	76.395	487.241
8	81.484	375.536
9	85.434	291.490
10	88.638	236.346
11	91.210	189.797
12	93.310	155.006
13	94.977	122.981
14	96.242	93.367
15	97.248	74.201
16	97.917	49.352
17	98.256	25.051
18	98.555	22.063
19	98.818	19.366
20	99.045	16.756
21	99.203	11.683
22	99.380	13.018
23	99.587	15.345

24	99.748	11.831
25	99.852	7.689
26	99.928	5.614
27	100.000	5.304

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.3303	0.3303
2	0.4415	0.1112
3	0.5232	0.0817
4	0.5902	0.0670
5	0.6480	0.0578
6	0.6994	0.0514
7	0.7439	0.0445
8	0.7847	0.0408
9	0.8225	0.0378
10	0.8579	0.0354
11	0.8913	0.0333
12	0.9228	0.0316
13	0.9599	0.0371
14	0.9955	0.0356
15	1.0299	0.0344
16	1.0631	0.0332
17	1.0953	0.0322
18	1.1265	0.0312
19	1.1569	0.0304
20	1.1865	0.0296
21	1.2153	0.0288
22	1.2434	0.0281
23	1.2709	0.0275
24	1.2978	0.0269
25	1.3241	0.0263
26	1.3499	0.0258
27	1.3752	0.0253
28	1.4000	0.0248
29	1.4244	0.0244
30	1.4483	0.0240
31	1.4719	0.0236
32	1.4951	0.0232
33	1.5179	0.0228
34	1.5403	0.0225
35	1.5624	0.0221
36	1.5842	0.0218
37	1.6048	0.0206
38	1.6251	0.0203
39	1.6451	0.0200
40	1.6648	0.0197
41	1.6843	0.0195
42	1.7035	0.0192
43	1.7225	0.0190
44	1.7413	0.0188
45	1.7598	0.0185
46	1.7781	0.0183
47	1.7962	0.0181
48	1.8141	0.0179
49	1.8318	0.0177
50	1.8493	0.0175
51	1.8666	0.0173

52	1.8838	0.0171
53	1.9008	0.0170
54	1.9176	0.0168
55	1.9342	0.0166
56	1.9507	0.0165
57	1.9670	0.0163
58	1.9832	0.0162
59	1.9992	0.0160
60	2.0151	0.0159
61	2.0309	0.0157
62	2.0465	0.0156
63	2.0620	0.0155
64	2.0773	0.0154
65	2.0925	0.0152
66	2.1076	0.0151
67	2.1226	0.0150
68	2.1375	0.0149
69	2.1522	0.0147
70	2.1669	0.0146
71	2.1814	0.0145
72	2.1958	0.0144
73	2.2071	0.0113
74	2.2183	0.0112
75	2.2294	0.0111
76	2.2404	0.0110
77	2.2513	0.0109
78	2.2622	0.0108
79	2.2729	0.0107
80	2.2836	0.0107
81	2.2941	0.0106
82	2.3046	0.0105
83	2.3150	0.0104
84	2.3254	0.0103
85	2.3356	0.0103
86	2.3458	0.0102
87	2.3559	0.0101
88	2.3660	0.0100
89	2.3759	0.0100
90	2.3858	0.0099
91	2.3956	0.0098
92	2.4054	0.0098
93	2.4151	0.0097
94	2.4247	0.0096
95	2.4343	0.0096
96	2.4438	0.0095
97	2.4532	0.0094
98	2.4626	0.0094
99	2.4719	0.0093
100	2.4812	0.0093
101	2.4904	0.0092
102	2.4995	0.0091
103	2.5086	0.0091
104	2.5176	0.0090
105	2.5266	0.0090
106	2.5355	0.0089
107	2.5444	0.0089
108	2.5532	0.0088
109	2.5620	0.0088

110	2.5707		0.0087
111	2.5794		0.0087
112	2.5880		0.0086
113	2.5966		0.0086
114	2.6051		0.0085
115	2.6136		0.0085
116	2.6220		0.0084
117	2.6304		0.0084
118	2.6387		0.0083
119	2.6470		0.0083
120	2.6553		0.0083
121	2.6635		0.0082
122	2.6716		0.0082
123	2.6797		0.0081
124	2.6878		0.0081
125	2.6959		0.0080
126	2.7039		0.0080
127	2.7118		0.0080
128	2.7198		0.0079
129	2.7276		0.0079
130	2.7355		0.0078
131	2.7433		0.0078
132	2.7511		0.0078
133	2.7588		0.0077
134	2.7665		0.0077
135	2.7742		0.0077
136	2.7818		0.0076
137	2.7894		0.0076
138	2.7969		0.0076
139	2.8044		0.0075
140	2.8119		0.0075
141	2.8194		0.0075
142	2.8268		0.0074
143	2.8342		0.0074
144	2.8415		0.0074
145	2.8489		0.0073
146	2.8562		0.0073
147	2.8634		0.0073
148	2.8707		0.0072
149	2.8779		0.0072
150	2.8850		0.0072
151	2.8922		0.0071
152	2.8993		0.0071
153	2.9063		0.0071
154	2.9134		0.0071
155	2.9204		0.0070
156	2.9274		0.0070
157	2.9344		0.0070
158	2.9413		0.0069
159	2.9482		0.0069
160	2.9551		0.0069
161	2.9620		0.0069
162	2.9688		0.0068
163	2.9756		0.0068
164	2.9824		0.0068
165	2.9891		0.0068
166	2.9958		0.0067
167	3.0025		0.0067

168	3.0092	0.0067
169	3.0159	0.0066
170	3.0225	0.0066
171	3.0291	0.0066
172	3.0357	0.0066
173	3.0422	0.0066
174	3.0488	0.0065
175	3.0553	0.0065
176	3.0617	0.0065
177	3.0682	0.0065
178	3.0746	0.0064
179	3.0811	0.0064
180	3.0874	0.0064
181	3.0938	0.0064
182	3.1002	0.0063
183	3.1065	0.0063
184	3.1128	0.0063
185	3.1191	0.0063
186	3.1253	0.0063
187	3.1316	0.0062
188	3.1378	0.0062
189	3.1440	0.0062
190	3.1502	0.0062
191	3.1563	0.0062
192	3.1624	0.0061
193	3.1686	0.0061
194	3.1747	0.0061
195	3.1807	0.0061
196	3.1868	0.0061
197	3.1928	0.0060
198	3.1988	0.0060
199	3.2048	0.0060
200	3.2108	0.0060
201	3.2168	0.0060
202	3.2227	0.0059
203	3.2287	0.0059
204	3.2346	0.0059
205	3.2405	0.0059
206	3.2463	0.0059
207	3.2522	0.0059
208	3.2580	0.0058
209	3.2638	0.0058
210	3.2696	0.0058
211	3.2754	0.0058
212	3.2812	0.0058
213	3.2869	0.0057
214	3.2927	0.0057
215	3.2984	0.0057
216	3.3041	0.0057
217	3.3097	0.0057
218	3.3154	0.0057
219	3.3211	0.0056
220	3.3267	0.0056
221	3.3323	0.0056
222	3.3379	0.0056
223	3.3435	0.0056
224	3.3491	0.0056
225	3.3546	0.0056

226	3.3601	0.0055
227	3.3657	0.0055
228	3.3712	0.0055
229	3.3767	0.0055
230	3.3821	0.0055
231	3.3876	0.0055
232	3.3931	0.0054
233	3.3985	0.0054
234	3.4039	0.0054
235	3.4093	0.0054
236	3.4147	0.0054
237	3.4201	0.0054
238	3.4254	0.0054
239	3.4308	0.0053
240	3.4361	0.0053
241	3.4414	0.0053
242	3.4467	0.0053
243	3.4520	0.0053
244	3.4573	0.0053
245	3.4626	0.0053
246	3.4678	0.0052
247	3.4730	0.0052
248	3.4783	0.0052
249	3.4835	0.0052
250	3.4887	0.0052
251	3.4939	0.0052
252	3.4990	0.0052
253	3.5042	0.0052
254	3.5093	0.0051
255	3.5145	0.0051
256	3.5196	0.0051
257	3.5247	0.0051
258	3.5298	0.0051
259	3.5349	0.0051
260	3.5399	0.0051
261	3.5450	0.0051
262	3.5500	0.0050
263	3.5551	0.0050
264	3.5601	0.0050
265	3.5651	0.0050
266	3.5701	0.0050
267	3.5751	0.0050
268	3.5801	0.0050
269	3.5850	0.0050
270	3.5900	0.0050
271	3.5949	0.0049
272	3.5998	0.0049
273	3.6048	0.0049
274	3.6097	0.0049
275	3.6146	0.0049
276	3.6194	0.0049
277	3.6243	0.0049
278	3.6292	0.0049
279	3.6340	0.0048
280	3.6389	0.0048
281	3.6437	0.0048
282	3.6485	0.0048
283	3.6533	0.0048

284	3.6581	0.0048
285	3.6629	0.0048
286	3.6677	0.0048
287	3.6724	0.0048
288	3.6772	0.0048

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0048	0.0032	0.0015
2	0.0048	0.0032	0.0015
3	0.0048	0.0032	0.0015
4	0.0048	0.0033	0.0015
5	0.0048	0.0033	0.0015
6	0.0048	0.0033	0.0016
7	0.0048	0.0033	0.0016
8	0.0049	0.0033	0.0016
9	0.0049	0.0033	0.0016
10	0.0049	0.0033	0.0016
11	0.0049	0.0033	0.0016
12	0.0049	0.0033	0.0016
13	0.0050	0.0034	0.0016
14	0.0050	0.0034	0.0016
15	0.0050	0.0034	0.0016
16	0.0050	0.0034	0.0016
17	0.0050	0.0034	0.0016
18	0.0050	0.0034	0.0016
19	0.0051	0.0034	0.0016
20	0.0051	0.0034	0.0016
21	0.0051	0.0035	0.0016
22	0.0051	0.0035	0.0016
23	0.0051	0.0035	0.0016
24	0.0051	0.0035	0.0017
25	0.0052	0.0035	0.0017
26	0.0052	0.0035	0.0017
27	0.0052	0.0035	0.0017
28	0.0052	0.0035	0.0017
29	0.0052	0.0036	0.0017
30	0.0053	0.0036	0.0017
31	0.0053	0.0036	0.0017
32	0.0053	0.0036	0.0017
33	0.0053	0.0036	0.0017
34	0.0053	0.0036	0.0017
35	0.0054	0.0036	0.0017
36	0.0054	0.0037	0.0017
37	0.0054	0.0037	0.0017
38	0.0054	0.0037	0.0017
39	0.0055	0.0037	0.0018
40	0.0055	0.0037	0.0018
41	0.0055	0.0037	0.0018
42	0.0055	0.0037	0.0018
43	0.0056	0.0038	0.0018
44	0.0056	0.0038	0.0018
45	0.0056	0.0038	0.0018
46	0.0056	0.0038	0.0018
47	0.0056	0.0038	0.0018
48	0.0057	0.0038	0.0018

49	0.0057	0.0039	0.0018
50	0.0057	0.0039	0.0018
51	0.0057	0.0039	0.0018
52	0.0058	0.0039	0.0019
53	0.0058	0.0039	0.0019
54	0.0058	0.0039	0.0019
55	0.0059	0.0040	0.0019
56	0.0059	0.0040	0.0019
57	0.0059	0.0040	0.0019
58	0.0059	0.0040	0.0019
59	0.0060	0.0040	0.0019
60	0.0060	0.0041	0.0019
61	0.0060	0.0041	0.0019
62	0.0060	0.0041	0.0019
63	0.0061	0.0041	0.0020
64	0.0061	0.0041	0.0020
65	0.0061	0.0042	0.0020
66	0.0062	0.0042	0.0020
67	0.0062	0.0042	0.0020
68	0.0062	0.0042	0.0020
69	0.0063	0.0042	0.0020
70	0.0063	0.0043	0.0020
71	0.0063	0.0043	0.0020
72	0.0063	0.0043	0.0020
73	0.0064	0.0043	0.0021
74	0.0064	0.0044	0.0021
75	0.0065	0.0044	0.0021
76	0.0065	0.0044	0.0021
77	0.0065	0.0044	0.0021
78	0.0066	0.0044	0.0021
79	0.0066	0.0045	0.0021
80	0.0066	0.0045	0.0021
81	0.0067	0.0045	0.0021
82	0.0067	0.0045	0.0022
83	0.0068	0.0046	0.0022
84	0.0068	0.0046	0.0022
85	0.0068	0.0046	0.0022
86	0.0069	0.0047	0.0022
87	0.0069	0.0047	0.0022
88	0.0069	0.0047	0.0022
89	0.0070	0.0047	0.0022
90	0.0070	0.0048	0.0023
91	0.0071	0.0048	0.0023
92	0.0071	0.0048	0.0023
93	0.0072	0.0049	0.0023
94	0.0072	0.0049	0.0023
95	0.0073	0.0049	0.0023
96	0.0073	0.0049	0.0023
97	0.0074	0.0050	0.0024
98	0.0074	0.0050	0.0024
99	0.0075	0.0051	0.0024
100	0.0075	0.0051	0.0024
101	0.0076	0.0051	0.0024
102	0.0076	0.0052	0.0024
103	0.0077	0.0052	0.0025
104	0.0077	0.0052	0.0025
105	0.0078	0.0053	0.0025
106	0.0078	0.0053	0.0025

107	0.0079	0.0054	0.0025
108	0.0079	0.0054	0.0025
109	0.0080	0.0054	0.0026
110	0.0080	0.0055	0.0026
111	0.0081	0.0055	0.0026
112	0.0082	0.0055	0.0026
113	0.0083	0.0056	0.0027
114	0.0083	0.0056	0.0027
115	0.0084	0.0057	0.0027
116	0.0084	0.0057	0.0027
117	0.0085	0.0058	0.0027
118	0.0086	0.0058	0.0028
119	0.0087	0.0059	0.0028
120	0.0087	0.0059	0.0028
121	0.0088	0.0060	0.0028
122	0.0089	0.0060	0.0029
123	0.0090	0.0061	0.0029
124	0.0090	0.0061	0.0029
125	0.0091	0.0062	0.0029
126	0.0092	0.0062	0.0030
127	0.0093	0.0063	0.0030
128	0.0094	0.0064	0.0030
129	0.0095	0.0064	0.0031
130	0.0096	0.0065	0.0031
131	0.0097	0.0066	0.0031
132	0.0098	0.0066	0.0031
133	0.0099	0.0067	0.0032
134	0.0100	0.0068	0.0032
135	0.0101	0.0069	0.0032
136	0.0102	0.0069	0.0033
137	0.0103	0.0070	0.0033
138	0.0104	0.0071	0.0033
139	0.0106	0.0072	0.0034
140	0.0107	0.0072	0.0034
141	0.0108	0.0074	0.0035
142	0.0109	0.0074	0.0035
143	0.0111	0.0075	0.0036
144	0.0112	0.0076	0.0036
145	0.0144	0.0098	0.0046
146	0.0145	0.0099	0.0047
147	0.0147	0.0100	0.0047
148	0.0149	0.0101	0.0048
149	0.0151	0.0102	0.0049
150	0.0152	0.0103	0.0049
151	0.0155	0.0105	0.0050
152	0.0156	0.0106	0.0050
153	0.0159	0.0108	0.0051
154	0.0160	0.0109	0.0052
155	0.0163	0.0111	0.0052
156	0.0165	0.0112	0.0053
157	0.0168	0.0114	0.0054
158	0.0170	0.0115	0.0055
159	0.0173	0.0118	0.0056
160	0.0175	0.0119	0.0056
161	0.0179	0.0121	0.0058
162	0.0181	0.0123	0.0058
163	0.0185	0.0126	0.0060
164	0.0188	0.0127	0.0060

165	0.0192	0.0130	0.0062
166	0.0195	0.0132	0.0063
167	0.0200	0.0136	0.0064
168	0.0203	0.0138	0.0065
169	0.0218	0.0148	0.0070
170	0.0221	0.0150	0.0071
171	0.0228	0.0155	0.0073
172	0.0232	0.0157	0.0074
173	0.0240	0.0163	0.0077
174	0.0244	0.0165	0.0078
175	0.0253	0.0172	0.0081
176	0.0258	0.0175	0.0083
177	0.0269	0.0182	0.0086
178	0.0275	0.0187	0.0088
179	0.0288	0.0195	0.0094
180	0.0296	0.0195	0.0101
181	0.0312	0.0195	0.0118
182	0.0322	0.0195	0.0127
183	0.0344	0.0195	0.0149
184	0.0356	0.0195	0.0162
185	0.0316	0.0195	0.0121
186	0.0333	0.0195	0.0139
187	0.0378	0.0195	0.0184
188	0.0408	0.0195	0.0213
189	0.0514	0.0195	0.0319
190	0.0578	0.0195	0.0383
191	0.0817	0.0195	0.0622
192	0.1112	0.0195	0.0918
193	0.3303	0.0195	0.3108
194	0.0670	0.0195	0.0475
195	0.0445	0.0195	0.0250
196	0.0354	0.0195	0.0159
197	0.0371	0.0195	0.0176
198	0.0332	0.0195	0.0138
199	0.0304	0.0195	0.0109
200	0.0281	0.0191	0.0090
201	0.0263	0.0179	0.0085
202	0.0248	0.0168	0.0080
203	0.0236	0.0160	0.0076
204	0.0225	0.0152	0.0072
205	0.0206	0.0140	0.0066
206	0.0197	0.0134	0.0063
207	0.0190	0.0129	0.0061
208	0.0183	0.0124	0.0059
209	0.0177	0.0120	0.0057
210	0.0171	0.0116	0.0055
211	0.0166	0.0113	0.0053
212	0.0162	0.0110	0.0052
213	0.0157	0.0107	0.0051
214	0.0154	0.0104	0.0049
215	0.0150	0.0102	0.0048
216	0.0146	0.0099	0.0047
217	0.0113	0.0077	0.0036
218	0.0110	0.0075	0.0035
219	0.0107	0.0073	0.0035
220	0.0105	0.0071	0.0034
221	0.0103	0.0070	0.0033
222	0.0100	0.0068	0.0032

223	0.0098	0.0067	0.0032
224	0.0096	0.0065	0.0031
225	0.0094	0.0064	0.0030
226	0.0093	0.0063	0.0030
227	0.0091	0.0062	0.0029
228	0.0089	0.0061	0.0029
229	0.0088	0.0059	0.0028
230	0.0086	0.0058	0.0028
231	0.0085	0.0058	0.0027
232	0.0083	0.0057	0.0027
233	0.0082	0.0056	0.0026
234	0.0081	0.0055	0.0026
235	0.0080	0.0054	0.0026
236	0.0078	0.0053	0.0025
237	0.0077	0.0052	0.0025
238	0.0076	0.0052	0.0025
239	0.0075	0.0051	0.0024
240	0.0074	0.0050	0.0024
241	0.0073	0.0050	0.0024
242	0.0072	0.0049	0.0023
243	0.0071	0.0048	0.0023
244	0.0071	0.0048	0.0023
245	0.0070	0.0047	0.0022
246	0.0069	0.0047	0.0022
247	0.0068	0.0046	0.0022
248	0.0067	0.0046	0.0022
249	0.0066	0.0045	0.0021
250	0.0066	0.0045	0.0021
251	0.0065	0.0044	0.0021
252	0.0064	0.0044	0.0021
253	0.0064	0.0043	0.0020
254	0.0063	0.0043	0.0020
255	0.0062	0.0042	0.0020
256	0.0062	0.0042	0.0020
257	0.0061	0.0042	0.0020
258	0.0061	0.0041	0.0019
259	0.0060	0.0041	0.0019
260	0.0059	0.0040	0.0019
261	0.0059	0.0040	0.0019
262	0.0058	0.0040	0.0019
263	0.0058	0.0039	0.0019
264	0.0057	0.0039	0.0018
265	0.0057	0.0039	0.0018
266	0.0056	0.0038	0.0018
267	0.0056	0.0038	0.0018
268	0.0055	0.0038	0.0018
269	0.0055	0.0037	0.0018
270	0.0054	0.0037	0.0018
271	0.0054	0.0037	0.0017
272	0.0054	0.0036	0.0017
273	0.0053	0.0036	0.0017
274	0.0053	0.0036	0.0017
275	0.0052	0.0036	0.0017
276	0.0052	0.0035	0.0017
277	0.0052	0.0035	0.0017
278	0.0051	0.0035	0.0016
279	0.0051	0.0034	0.0016
280	0.0050	0.0034	0.0016

281	0.0050	0.0034	0.0016
282	0.0050	0.0034	0.0016
283	0.0049	0.0034	0.0016
284	0.0049	0.0033	0.0016
285	0.0049	0.0033	0.0016
286	0.0048	0.0033	0.0016
287	0.0048	0.0033	0.0015
288	0.0048	0.0032	0.0015

Total soil rain loss = 2.08(In)
Total effective rainfall = 1.60(In)
Peak flow rate in flood hydrograph = 772.03(CFS)

++

24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0 200.0 400.0 600.0 800.0
0+ 5	0.0014	0.20	Q
0+10	0.0070	0.82	Q
0+15	0.0201	1.90	Q
0+20	0.0494	4.26	Q
0+25	0.0962	6.78	Q
0+30	0.1506	7.91	Q
0+35	0.2104	8.68	Q
0+40	0.2743	9.28	Q
0+45	0.3415	9.76	Q
0+50	0.4115	10.15	Q
0+55	0.4836	10.48	Q
1+ 0	0.5576	10.75	Q
1+ 5	0.6332	10.97	Q
1+10	0.7100	11.15	Q
1+15	0.7879	11.30	Q
1+20	0.8665	11.42	Q
1+25	0.9457	11.50	Q
1+30	1.0253	11.57	Q
1+35	1.1055	11.64	Q
1+40	1.1861	11.71	Q
1+45	1.2672	11.77	Q
1+50	1.3486	11.83	Q
1+55	1.4306	11.89	Q
2+ 0	1.5129	11.96	Q
2+ 5	1.5956	12.01	Q
2+10	1.6787	12.06	Q
2+15	1.7621	12.12	Q
2+20	1.8459	12.16	Q
2+25	1.9299	12.21	Q
2+30	2.0143	12.25	Q
2+35	2.0990	12.30	QV
2+40	2.1840	12.34	QV
2+45	2.2693	12.39	QV
2+50	2.3550	12.44	QV
2+55	2.4410	12.49	QV

3+ 0	2.5273	12.53	QV				
3+ 5	2.6140	12.58	QV				
3+10	2.7010	12.63	QV				
3+15	2.7883	12.68	QV				
3+20	2.8760	12.73	QV				
3+25	2.9640	12.78	QV				
3+30	3.0524	12.84	QV				
3+35	3.1412	12.89	QV				
3+40	3.2303	12.94	QV				
3+45	3.3198	12.99	QV				
3+50	3.4096	13.05	QV				
3+55	3.4999	13.10	QV				
4+ 0	3.5905	13.16	QV				
4+ 5	3.6815	13.21	QV				
4+10	3.7728	13.27	QV				
4+15	3.8646	13.32	QV				
4+20	3.9568	13.38	QV				
4+25	4.0493	13.44	QV				
4+30	4.1423	13.50	Q V				
4+35	4.2356	13.56	Q V				
4+40	4.3294	13.62	Q V				
4+45	4.4236	13.68	Q V				
4+50	4.5182	13.74	Q V				
4+55	4.6133	13.80	Q V				
5+ 0	4.7088	13.86	Q V				
5+ 5	4.8047	13.93	Q V				
5+10	4.9011	13.99	Q V				
5+15	4.9979	14.06	Q V				
5+20	5.0951	14.12	Q V				
5+25	5.1929	14.19	Q V				
5+30	5.2910	14.26	Q V				
5+35	5.3897	14.33	Q V				
5+40	5.4888	14.39	Q V				
5+45	5.5885	14.46	Q V				
5+50	5.6886	14.54	Q V				
5+55	5.7892	14.61	Q V				
6+ 0	5.8903	14.68	Q V				
6+ 5	5.9919	14.75	Q V				
6+10	6.0940	14.83	Q V				
6+15	6.1967	14.90	Q V				
6+20	6.2999	14.98	Q V				
6+25	6.4036	15.06	Q V				
6+30	6.5078	15.14	Q V				
6+35	6.6126	15.22	Q V				
6+40	6.7180	15.30	Q V				
6+45	6.8239	15.38	Q V				
6+50	6.9304	15.46	Q V				
6+55	7.0375	15.55	Q V				
7+ 0	7.1452	15.63	Q V				
7+ 5	7.2535	15.72	Q V				
7+10	7.3624	15.81	Q V				
7+15	7.4719	15.90	Q V				
7+20	7.5820	15.99	Q V				
7+25	7.6927	16.08	Q V				
7+30	7.8042	16.18	Q V				
7+35	7.9162	16.27	Q V				
7+40	8.0289	16.37	Q V				
7+45	8.1423	16.47	Q V				

7+50	8.2564	16.56	Q	V
7+55	8.3712	16.67	Q	V
8+ 0	8.4867	16.77	Q	V
8+ 5	8.6029	16.87	Q	V
8+10	8.7198	16.98	Q	V
8+15	8.8375	17.09	Q	V
8+20	8.9559	17.20	Q	V
8+25	9.0751	17.31	Q	V
8+30	9.1951	17.42	Q	V
8+35	9.3159	17.54	Q	V
8+40	9.4375	17.65	Q	V
8+45	9.5599	17.77	Q	V
8+50	9.6831	17.89	Q	V
8+55	9.8072	18.02	Q	V
9+ 0	9.9322	18.14	Q	V
9+ 5	10.0580	18.27	Q	V
9+10	10.1848	18.40	Q	V
9+15	10.3124	18.54	Q	V
9+20	10.4410	18.67	Q	V
9+25	10.5706	18.81	Q	V
9+30	10.7011	18.95	Q	V
9+35	10.8326	19.09	Q	V
9+40	10.9651	19.24	Q	V
9+45	11.0986	19.39	Q	V
9+50	11.2332	19.54	Q	V
9+55	11.3689	19.70	Q	V
10+ 0	11.5056	19.86	Q	V
10+ 5	11.6435	20.02	Q	V
10+10	11.7825	20.18	Q	V
10+15	11.9227	20.35	Q	V
10+20	12.0640	20.53	Q	V
10+25	12.2066	20.70	Q	V
10+30	12.3505	20.88	Q	V
10+35	12.4956	21.07	Q	V
10+40	12.6420	21.26	Q	V
10+45	12.7897	21.45	Q	V
10+50	12.9389	21.65	Q	V
10+55	13.0894	21.86	Q	V
11+ 0	13.2413	22.06	Q	V
11+ 5	13.3948	22.28	Q	V
11+10	13.5497	22.50	Q	V
11+15	13.7062	22.72	Q	V
11+20	13.8643	22.95	Q	V
11+25	14.0240	23.19	Q	V
11+30	14.1854	23.43	Q	V
11+35	14.3485	23.68	Q	V
11+40	14.5134	23.94	Q	V
11+45	14.6801	24.21	Q	V
11+50	14.8486	24.48	Q	V
11+55	15.0192	24.76	Q	V
12+ 0	15.1917	25.05	Q	V
12+ 5	15.3671	25.48	Q	V
12+10	15.5474	26.17	Q	V
12+15	15.7346	27.18	Q	V
12+20	15.9343	29.01	Q	V
12+25	16.1475	30.95	Q	V
12+30	16.3680	32.02	Q	V
12+35	16.5944	32.87	Q	V

12+40	16.8260	33.63	
12+45	17.0623	34.32	
12+50	17.3032	34.97	
12+55	17.5484	35.60	
13+ 0	17.7977	36.20	
13+ 5	18.0511	36.80	
13+10	18.3086	37.38	
13+15	18.5701	37.97	
13+20	18.8356	38.55	
13+25	19.1051	39.13	
13+30	19.3787	39.73	
13+35	19.6567	40.36	
13+40	19.9391	41.01	
13+45	20.2262	41.69	
13+50	20.5182	42.40	
13+55	20.8153	43.15	
14+ 0	21.1179	43.93	
14+ 5	21.4263	44.79	
14+10	21.7415	45.77	
14+15	22.0644	46.89	
14+20	22.3972	48.31	
14+25	22.7403	49.82	
14+30	23.0924	51.13	
14+35	23.4536	52.44	
14+40	23.8241	53.80	
14+45	24.2045	55.23	
14+50	24.5953	56.75	
14+55	24.9975	58.40	
15+ 0	25.4125	60.25	
15+ 5	25.8435	62.59	
15+10	26.2961	65.72	
15+15	26.7797	70.22	
15+20	27.3073	76.60	
15+25	27.8823	83.49	
15+30	28.5019	89.96	
15+35	29.1639	96.13	
15+40	29.8430	98.61	
15+45	30.5569	103.65	
15+50	31.3849	120.24	
15+55	32.3950	146.67	
16+ 0	33.7040	190.07	
16+ 5	35.6341	280.25	
16+10	38.4804	413.28	
16+15	42.3082	555.79	
16+20	47.6252	772.03	
16+25	52.7792	748.36	
16+30	55.9576	461.50	
16+35	58.3599	348.82	
16+40	60.3435	288.01	
16+45	62.0237	243.98	
16+50	63.4466	206.60	
16+55	64.6519	175.01	
17+ 0	65.6870	150.30	
17+ 5	66.5784	129.43	
17+10	67.3439	111.15	
17+15	68.0094	96.62	
17+20	68.5746	82.08	
17+25	69.0543	69.65	

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22+20	79.0425	13.75	Q				V	
22+25	79.1363	13.62	Q				V	
22+30	79.2293	13.50	Q				V	
22+35	79.3215	13.39	Q				V	
22+40	79.4129	13.27	Q				V	
22+45	79.5036	13.16	Q				V	
22+50	79.5934	13.05	Q				V	
22+55	79.6826	12.94	Q				V	
23+ 0	79.7710	12.84	Q				V	
23+ 5	79.8587	12.74	Q				V	
23+10	79.9458	12.64	Q				V	
23+15	80.0321	12.54	Q				V	
23+20	80.1178	12.44	Q				V	
23+25	80.2028	12.35	Q				V	
23+30	80.2872	12.25	Q				V	
23+35	80.3710	12.16	Q				V	
23+40	80.4541	12.07	Q				V	
23+45	80.5367	11.99	Q				V	
23+50	80.6186	11.90	Q				V	
23+55	80.7000	11.82	Q				V	
24+ 0	80.7808	11.73	Q				V	
24+ 5	80.8597	11.45	Q				V	
24+10	80.9337	10.75	Q				V	
24+15	80.9999	9.61	Q				V	
24+20	81.0494	7.20	Q				V	
24+25	81.0814	4.64	Q				V	
24+30	81.1055	3.50	Q				V	
24+35	81.1244	2.74	Q				V	
24+40	81.1391	2.15	Q				V	
24+45	81.1508	1.69	Q				V	
24+50	81.1598	1.32	Q				V	
24+55	81.1668	1.02	Q				V	
25+ 0	81.1722	0.77	Q				V	
25+ 5	81.1762	0.58	Q				V	
25+10	81.1792	0.44	Q				V	
25+15	81.1814	0.32	Q				V	
25+20	81.1830	0.24	Q				V	
25+25	81.1844	0.20	Q				V	
25+30	81.1856	0.17	Q				V	
25+35	81.1865	0.14	Q				V	
25+40	81.1873	0.11	Q				V	
25+45	81.1879	0.09	Q				V	
25+50	81.1884	0.07	Q				V	
25+55	81.1887	0.05	Q				V	
26+ 0	81.1889	0.03	Q				V	
26+ 5	81.1890	0.02	Q				V	
26+10	81.1891	0.01	Q				V	

U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/30/12 File Name UNIT25Y24HEX.out

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Orange County Unit Hydrograph Hydrology Method
Manual Date(s) - October 1986, November 1996

Program License Serial Number 6062

ESPERANZA HILLS
DETENTION BASIN
EXISTING CONDITION
25-YEAR 24-HOUR

Storm Event Year = 25

Antecedent Moisture Condition = 2

English (in-lb) Input Units Used

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******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	Area (Ac.)	Area Fraction	Soil Group	Fp (In/Hr)	Ap (dec.)	Fm (In/Hr)
56.0	17.0	0.03	B	0.300	0.990	0.297
69.0	404.8	0.66	C	0.250	0.990	0.248
75.0	188.4	0.31	D	0.200	0.990	0.198

Area-averaged adjusted loss rate Fm (In/Hr) = 0.234

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC2)	S	Pervious Yield Fr
16.83	0.028	56.0	56.0	7.86	0.176
0.17	0.000	98.0	98.0	0.20	0.947
400.70	0.657	69.0	69.0	4.49	0.355
4.05	0.007	98.0	98.0	0.20	0.947
186.51	0.306	75.0	75.0	3.33	0.455
1.88	0.003	98.0	98.0	0.20	0.947

Area-averaged catchment yield fraction, Y = 0.387
Area-averaged low loss fraction, Yb = 0.613

++

User entry of time of concentration = 0.390 (hours)
Watershed area = 610.14(Ac.)
Catchment Lag time = 0.312 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 26.7094
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.234(In/Hr)
Average low loss rate fraction (Yb) = 0.613 (decimal)
FOOTHILL S-Graph Selected
Computed peak 5-minute rainfall = 0.400(In)
Computed peak 30-minute rainfall = 0.870(In)
Specified peak 1-hour rainfall = 1.150(In)
Computed peak 3-hour rainfall = 1.940(In)
Specified peak 6-hour rainfall = 2.710(In)
Specified peak 24-hour rainfall = 4.490(In)

Rainfall depth area reduction factors:
Using a total area of 610.14(Ac.) (Ref: fig. E-4)

5-minute factor = 0.971 Adjusted rainfall = 0.389(In)
30-minute factor = 0.971 Adjusted rainfall = 0.845(In)
1-hour factor = 0.971 Adjusted rainfall = 1.117(In)
3-hour factor = 0.996 Adjusted rainfall = 1.933(In)
6-hour factor = 0.998 Adjusted rainfall = 2.705(In)
24-hour factor = 0.999 Adjusted rainfall = 4.487(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
(K = 7378.88 (CFS))		
1	1.856	136.937
2	7.556	420.591
3	17.700	748.530
4	40.272	1665.532
5	61.390	1558.336
6	70.851	698.084
7	77.333	478.289
8	82.319	367.918
9	86.186	285.343
10	89.317	231.067
11	91.817	184.453
12	93.847	149.750
13	95.420	116.069
14	96.622	88.717
15	97.544	68.012
16	98.068	38.688
17	98.388	23.605
18	98.674	21.126
19	98.937	19.400
20	99.125	13.869
21	99.290	12.153
22	99.494	15.076
23	99.692	14.634

24	99.811	8.732
25	99.906	7.014
26	99.962	4.164
27	100.000	2.791

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.3886	0.3886
2	0.5248	0.1363
3	0.6257	0.1009
4	0.7088	0.0831
5	0.7809	0.0720
6	0.8451	0.0642
7	0.8992	0.0541
8	0.9489	0.0497
9	0.9950	0.0461
10	1.0381	0.0431
11	1.0787	0.0406
12	1.1171	0.0385
13	1.1626	0.0455
14	1.2064	0.0438
15	1.2487	0.0423
16	1.2896	0.0409
17	1.3292	0.0396
18	1.3677	0.0385
19	1.4051	0.0374
20	1.4415	0.0364
21	1.4771	0.0355
22	1.5117	0.0347
23	1.5457	0.0339
24	1.5788	0.0332
25	1.6113	0.0325
26	1.6432	0.0319
27	1.6744	0.0312
28	1.7051	0.0307
29	1.7352	0.0301
30	1.7648	0.0296
31	1.7940	0.0291
32	1.8226	0.0287
33	1.8508	0.0282
34	1.8786	0.0278
35	1.9060	0.0274
36	1.9330	0.0270
37	1.9588	0.0258
38	1.9843	0.0255
39	2.0094	0.0251
40	2.0343	0.0248
41	2.0587	0.0245
42	2.0829	0.0242
43	2.1068	0.0239
44	2.1304	0.0236
45	2.1538	0.0233
46	2.1768	0.0231
47	2.1997	0.0228
48	2.2222	0.0226
49	2.2445	0.0223
50	2.2666	0.0221
51	2.2885	0.0219

52	2.3101	0.0216
53	2.3316	0.0214
54	2.3528	0.0212
55	2.3738	0.0210
56	2.3946	0.0208
57	2.4152	0.0206
58	2.4357	0.0204
59	2.4560	0.0203
60	2.4761	0.0201
61	2.4960	0.0199
62	2.5157	0.0198
63	2.5353	0.0196
64	2.5547	0.0194
65	2.5740	0.0193
66	2.5931	0.0191
67	2.6121	0.0190
68	2.6309	0.0188
69	2.6496	0.0187
70	2.6681	0.0185
71	2.6866	0.0184
72	2.7048	0.0183
73	2.7185	0.0137
74	2.7320	0.0135
75	2.7454	0.0134
76	2.7587	0.0133
77	2.7719	0.0132
78	2.7850	0.0131
79	2.7980	0.0130
80	2.8109	0.0129
81	2.8237	0.0128
82	2.8363	0.0127
83	2.8489	0.0126
84	2.8614	0.0125
85	2.8738	0.0124
86	2.8861	0.0123
87	2.8983	0.0122
88	2.9104	0.0121
89	2.9224	0.0120
90	2.9344	0.0119
91	2.9462	0.0119
92	2.9580	0.0118
93	2.9697	0.0117
94	2.9813	0.0116
95	2.9929	0.0115
96	3.0043	0.0115
97	3.0157	0.0114
98	3.0270	0.0113
99	3.0383	0.0112
100	3.0494	0.0112
101	3.0605	0.0111
102	3.0716	0.0110
103	3.0825	0.0110
104	3.0934	0.0109
105	3.1042	0.0108
106	3.1150	0.0108
107	3.1257	0.0107
108	3.1363	0.0106
109	3.1469	0.0106

110	3.1574	0.0105
111	3.1678	0.0104
112	3.1782	0.0104
113	3.1886	0.0103
114	3.1988	0.0103
115	3.2090	0.0102
116	3.2192	0.0102
117	3.2293	0.0101
118	3.2394	0.0100
119	3.2494	0.0100
120	3.2593	0.0099
121	3.2692	0.0099
122	3.2790	0.0098
123	3.2888	0.0098
124	3.2985	0.0097
125	3.3082	0.0097
126	3.3179	0.0096
127	3.3275	0.0096
128	3.3370	0.0095
129	3.3465	0.0095
130	3.3559	0.0094
131	3.3653	0.0094
132	3.3747	0.0094
133	3.3840	0.0093
134	3.3933	0.0093
135	3.4025	0.0092
136	3.4117	0.0092
137	3.4208	0.0091
138	3.4299	0.0091
139	3.4389	0.0091
140	3.4480	0.0090
141	3.4569	0.0090
142	3.4659	0.0089
143	3.4747	0.0089
144	3.4836	0.0089
145	3.4924	0.0088
146	3.5012	0.0088
147	3.5099	0.0087
148	3.5186	0.0087
149	3.5273	0.0087
150	3.5359	0.0086
151	3.5445	0.0086
152	3.5530	0.0086
153	3.5615	0.0085
154	3.5700	0.0085
155	3.5785	0.0084
156	3.5869	0.0084
157	3.5953	0.0084
158	3.6036	0.0083
159	3.6119	0.0083
160	3.6202	0.0083
161	3.6284	0.0082
162	3.6366	0.0082
163	3.6448	0.0082
164	3.6530	0.0081
165	3.6611	0.0081
166	3.6692	0.0081
167	3.6772	0.0081

168	3.6852		0.0080
169	3.6932		0.0080
170	3.7012		0.0080
171	3.7091		0.0079
172	3.7170		0.0079
173	3.7249		0.0079
174	3.7328		0.0078
175	3.7406		0.0078
176	3.7484		0.0078
177	3.7561		0.0078
178	3.7638		0.0077
179	3.7716		0.0077
180	3.7792		0.0077
181	3.7869		0.0077
182	3.7945		0.0076
183	3.8021		0.0076
184	3.8097		0.0076
185	3.8172		0.0075
186	3.8247		0.0075
187	3.8322		0.0075
188	3.8397		0.0075
189	3.8471		0.0074
190	3.8546		0.0074
191	3.8620		0.0074
192	3.8693		0.0074
193	3.8767		0.0073
194	3.8840		0.0073
195	3.8913		0.0073
196	3.8986		0.0073
197	3.9058		0.0072
198	3.9130		0.0072
199	3.9202		0.0072
200	3.9274		0.0072
201	3.9346		0.0072
202	3.9417		0.0071
203	3.9488		0.0071
204	3.9559		0.0071
205	3.9630		0.0071
206	3.9700		0.0070
207	3.9770		0.0070
208	3.9840		0.0070
209	3.9910		0.0070
210	3.9980		0.0070
211	4.0049		0.0069
212	4.0118		0.0069
213	4.0187		0.0069
214	4.0256		0.0069
215	4.0325		0.0069
216	4.0393		0.0068
217	4.0461		0.0068
218	4.0529		0.0068
219	4.0597		0.0068
220	4.0665		0.0068
221	4.0732		0.0067
222	4.0799		0.0067
223	4.0866		0.0067
224	4.0933		0.0067
225	4.1000		0.0067

226	4.1066	0.0066
227	4.1132	0.0066
228	4.1198	0.0066
229	4.1264	0.0066
230	4.1330	0.0066
231	4.1395	0.0066
232	4.1461	0.0065
233	4.1526	0.0065
234	4.1591	0.0065
235	4.1656	0.0065
236	4.1720	0.0065
237	4.1785	0.0064
238	4.1849	0.0064
239	4.1913	0.0064
240	4.1977	0.0064
241	4.2041	0.0064
242	4.2104	0.0064
243	4.2168	0.0063
244	4.2231	0.0063
245	4.2294	0.0063
246	4.2357	0.0063
247	4.2420	0.0063
248	4.2482	0.0063
249	4.2545	0.0062
250	4.2607	0.0062
251	4.2669	0.0062
252	4.2731	0.0062
253	4.2793	0.0062
254	4.2855	0.0062
255	4.2916	0.0062
256	4.2978	0.0061
257	4.3039	0.0061
258	4.3100	0.0061
259	4.3161	0.0061
260	4.3222	0.0061
261	4.3282	0.0061
262	4.3343	0.0060
263	4.3403	0.0060
264	4.3463	0.0060
265	4.3523	0.0060
266	4.3583	0.0060
267	4.3643	0.0060
268	4.3702	0.0060
269	4.3762	0.0059
270	4.3821	0.0059
271	4.3880	0.0059
272	4.3939	0.0059
273	4.3998	0.0059
274	4.4057	0.0059
275	4.4116	0.0059
276	4.4174	0.0058
277	4.4232	0.0058
278	4.4291	0.0058
279	4.4349	0.0058
280	4.4407	0.0058
281	4.4465	0.0058
282	4.4522	0.0058
283	4.4580	0.0058

284	4.4637	0.0057
285	4.4695	0.0057
286	4.4752	0.0057
287	4.4809	0.0057
288	4.4866	0.0057

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0057	0.0035	0.0022
2	0.0057	0.0035	0.0022
3	0.0057	0.0035	0.0022
4	0.0057	0.0035	0.0022
5	0.0058	0.0035	0.0022
6	0.0058	0.0035	0.0022
7	0.0058	0.0036	0.0022
8	0.0058	0.0036	0.0023
9	0.0058	0.0036	0.0023
10	0.0059	0.0036	0.0023
11	0.0059	0.0036	0.0023
12	0.0059	0.0036	0.0023
13	0.0059	0.0036	0.0023
14	0.0059	0.0036	0.0023
15	0.0060	0.0037	0.0023
16	0.0060	0.0037	0.0023
17	0.0060	0.0037	0.0023
18	0.0060	0.0037	0.0023
19	0.0061	0.0037	0.0023
20	0.0061	0.0037	0.0023
21	0.0061	0.0037	0.0024
22	0.0061	0.0038	0.0024
23	0.0062	0.0038	0.0024
24	0.0062	0.0038	0.0024
25	0.0062	0.0038	0.0024
26	0.0062	0.0038	0.0024
27	0.0062	0.0038	0.0024
28	0.0063	0.0038	0.0024
29	0.0063	0.0039	0.0024
30	0.0063	0.0039	0.0024
31	0.0063	0.0039	0.0025
32	0.0064	0.0039	0.0025
33	0.0064	0.0039	0.0025
34	0.0064	0.0039	0.0025
35	0.0064	0.0040	0.0025
36	0.0065	0.0040	0.0025
37	0.0065	0.0040	0.0025
38	0.0065	0.0040	0.0025
39	0.0066	0.0040	0.0025
40	0.0066	0.0040	0.0025
41	0.0066	0.0041	0.0026
42	0.0066	0.0041	0.0026
43	0.0067	0.0041	0.0026
44	0.0067	0.0041	0.0026
45	0.0067	0.0041	0.0026
46	0.0067	0.0041	0.0026
47	0.0068	0.0042	0.0026
48	0.0068	0.0042	0.0026

49	0.0068	0.0042	0.0026
50	0.0069	0.0042	0.0027
51	0.0069	0.0042	0.0027
52	0.0069	0.0042	0.0027
53	0.0070	0.0043	0.0027
54	0.0070	0.0043	0.0027
55	0.0070	0.0043	0.0027
56	0.0070	0.0043	0.0027
57	0.0071	0.0043	0.0027
58	0.0071	0.0044	0.0028
59	0.0072	0.0044	0.0028
60	0.0072	0.0044	0.0028
61	0.0072	0.0044	0.0028
62	0.0072	0.0044	0.0028
63	0.0073	0.0045	0.0028
64	0.0073	0.0045	0.0028
65	0.0074	0.0045	0.0028
66	0.0074	0.0045	0.0029
67	0.0074	0.0046	0.0029
68	0.0075	0.0046	0.0029
69	0.0075	0.0046	0.0029
70	0.0075	0.0046	0.0029
71	0.0076	0.0047	0.0029
72	0.0076	0.0047	0.0029
73	0.0077	0.0047	0.0030
74	0.0077	0.0047	0.0030
75	0.0078	0.0048	0.0030
76	0.0078	0.0048	0.0030
77	0.0078	0.0048	0.0030
78	0.0079	0.0048	0.0030
79	0.0079	0.0049	0.0031
80	0.0080	0.0049	0.0031
81	0.0080	0.0049	0.0031
82	0.0081	0.0049	0.0031
83	0.0081	0.0050	0.0031
84	0.0081	0.0050	0.0032
85	0.0082	0.0050	0.0032
86	0.0082	0.0051	0.0032
87	0.0083	0.0051	0.0032
88	0.0083	0.0051	0.0032
89	0.0084	0.0052	0.0033
90	0.0084	0.0052	0.0033
91	0.0085	0.0052	0.0033
92	0.0086	0.0052	0.0033
93	0.0086	0.0053	0.0033
94	0.0087	0.0053	0.0033
95	0.0087	0.0054	0.0034
96	0.0088	0.0054	0.0034
97	0.0089	0.0054	0.0034
98	0.0089	0.0055	0.0034
99	0.0090	0.0055	0.0035
100	0.0090	0.0055	0.0035
101	0.0091	0.0056	0.0035
102	0.0091	0.0056	0.0035
103	0.0092	0.0057	0.0036
104	0.0093	0.0057	0.0036
105	0.0094	0.0057	0.0036
106	0.0094	0.0058	0.0036

107	0.0095	0.0058	0.0037
108	0.0095	0.0059	0.0037
109	0.0096	0.0059	0.0037
110	0.0097	0.0059	0.0037
111	0.0098	0.0060	0.0038
112	0.0098	0.0060	0.0038
113	0.0099	0.0061	0.0038
114	0.0100	0.0061	0.0039
115	0.0101	0.0062	0.0039
116	0.0102	0.0062	0.0039
117	0.0103	0.0063	0.0040
118	0.0103	0.0063	0.0040
119	0.0104	0.0064	0.0040
120	0.0105	0.0064	0.0041
121	0.0106	0.0065	0.0041
122	0.0107	0.0066	0.0041
123	0.0108	0.0066	0.0042
124	0.0109	0.0067	0.0042
125	0.0110	0.0068	0.0043
126	0.0111	0.0068	0.0043
127	0.0112	0.0069	0.0043
128	0.0113	0.0069	0.0044
129	0.0115	0.0070	0.0044
130	0.0115	0.0071	0.0045
131	0.0117	0.0072	0.0045
132	0.0118	0.0072	0.0046
133	0.0119	0.0073	0.0046
134	0.0120	0.0074	0.0047
135	0.0122	0.0075	0.0047
136	0.0123	0.0075	0.0048
137	0.0125	0.0077	0.0048
138	0.0126	0.0077	0.0049
139	0.0128	0.0078	0.0049
140	0.0129	0.0079	0.0050
141	0.0131	0.0080	0.0051
142	0.0132	0.0081	0.0051
143	0.0134	0.0082	0.0052
144	0.0135	0.0083	0.0052
145	0.0183	0.0112	0.0071
146	0.0184	0.0113	0.0071
147	0.0187	0.0115	0.0072
148	0.0188	0.0115	0.0073
149	0.0191	0.0117	0.0074
150	0.0193	0.0118	0.0075
151	0.0196	0.0120	0.0076
152	0.0198	0.0121	0.0076
153	0.0201	0.0123	0.0078
154	0.0203	0.0124	0.0078
155	0.0206	0.0127	0.0080
156	0.0208	0.0128	0.0081
157	0.0212	0.0130	0.0082
158	0.0214	0.0131	0.0083
159	0.0219	0.0134	0.0085
160	0.0221	0.0135	0.0085
161	0.0226	0.0138	0.0087
162	0.0228	0.0140	0.0088
163	0.0233	0.0143	0.0090
164	0.0236	0.0145	0.0091

165	0.0242	0.0148	0.0094
166	0.0245	0.0150	0.0095
167	0.0251	0.0154	0.0097
168	0.0255	0.0156	0.0099
169	0.0270	0.0165	0.0104
170	0.0274	0.0168	0.0106
171	0.0282	0.0173	0.0109
172	0.0287	0.0176	0.0111
173	0.0296	0.0182	0.0115
174	0.0301	0.0185	0.0117
175	0.0312	0.0192	0.0121
176	0.0319	0.0195	0.0124
177	0.0332	0.0195	0.0137
178	0.0339	0.0195	0.0144
179	0.0355	0.0195	0.0161
180	0.0364	0.0195	0.0170
181	0.0385	0.0195	0.0190
182	0.0396	0.0195	0.0201
183	0.0423	0.0195	0.0228
184	0.0438	0.0195	0.0243
185	0.0385	0.0195	0.0190
186	0.0406	0.0195	0.0211
187	0.0461	0.0195	0.0266
188	0.0497	0.0195	0.0302
189	0.0642	0.0195	0.0448
190	0.0720	0.0195	0.0526
191	0.1009	0.0195	0.0814
192	0.1363	0.0195	0.1168
193	0.3886	0.0195	0.3691
194	0.0831	0.0195	0.0637
195	0.0541	0.0195	0.0346
196	0.0431	0.0195	0.0236
197	0.0455	0.0195	0.0261
198	0.0409	0.0195	0.0214
199	0.0374	0.0195	0.0179
200	0.0347	0.0195	0.0152
201	0.0325	0.0195	0.0130
202	0.0307	0.0188	0.0119
203	0.0291	0.0179	0.0113
204	0.0278	0.0170	0.0107
205	0.0258	0.0158	0.0100
206	0.0248	0.0152	0.0096
207	0.0239	0.0147	0.0092
208	0.0231	0.0141	0.0089
209	0.0223	0.0137	0.0086
210	0.0216	0.0133	0.0084
211	0.0210	0.0129	0.0081
212	0.0204	0.0125	0.0079
213	0.0199	0.0122	0.0077
214	0.0194	0.0119	0.0075
215	0.0190	0.0116	0.0073
216	0.0185	0.0114	0.0072
217	0.0137	0.0084	0.0053
218	0.0133	0.0082	0.0051
219	0.0130	0.0080	0.0050
220	0.0127	0.0078	0.0049
221	0.0124	0.0076	0.0048
222	0.0121	0.0074	0.0047

223	0.0119	0.0073	0.0046
224	0.0116	0.0071	0.0045
225	0.0114	0.0070	0.0044
226	0.0112	0.0068	0.0043
227	0.0110	0.0067	0.0042
228	0.0108	0.0066	0.0042
229	0.0106	0.0065	0.0041
230	0.0104	0.0064	0.0040
231	0.0102	0.0063	0.0040
232	0.0100	0.0062	0.0039
233	0.0099	0.0061	0.0038
234	0.0097	0.0060	0.0038
235	0.0096	0.0059	0.0037
236	0.0094	0.0058	0.0037
237	0.0093	0.0057	0.0036
238	0.0092	0.0056	0.0035
239	0.0091	0.0056	0.0035
240	0.0089	0.0055	0.0035
241	0.0088	0.0054	0.0034
242	0.0087	0.0053	0.0034
243	0.0086	0.0053	0.0033
244	0.0085	0.0052	0.0033
245	0.0084	0.0051	0.0032
246	0.0083	0.0051	0.0032
247	0.0082	0.0050	0.0032
248	0.0081	0.0050	0.0031
249	0.0080	0.0049	0.0031
250	0.0079	0.0048	0.0031
251	0.0078	0.0048	0.0030
252	0.0077	0.0047	0.0030
253	0.0077	0.0047	0.0030
254	0.0076	0.0046	0.0029
255	0.0075	0.0046	0.0029
256	0.0074	0.0045	0.0029
257	0.0073	0.0045	0.0028
258	0.0073	0.0045	0.0028
259	0.0072	0.0044	0.0028
260	0.0071	0.0044	0.0028
261	0.0071	0.0043	0.0027
262	0.0070	0.0043	0.0027
263	0.0069	0.0043	0.0027
264	0.0069	0.0042	0.0027
265	0.0068	0.0042	0.0026
266	0.0068	0.0041	0.0026
267	0.0067	0.0041	0.0026
268	0.0066	0.0041	0.0026
269	0.0066	0.0040	0.0025
270	0.0065	0.0040	0.0025
271	0.0065	0.0040	0.0025
272	0.0064	0.0039	0.0025
273	0.0064	0.0039	0.0025
274	0.0063	0.0039	0.0024
275	0.0063	0.0038	0.0024
276	0.0062	0.0038	0.0024
277	0.0062	0.0038	0.0024
278	0.0061	0.0038	0.0024
279	0.0061	0.0037	0.0024
280	0.0060	0.0037	0.0023

281	0.0060	0.0037	0.0023
282	0.0060	0.0037	0.0023
283	0.0059	0.0036	0.0023
284	0.0059	0.0036	0.0023
285	0.0058	0.0036	0.0023
286	0.0058	0.0036	0.0022
287	0.0058	0.0035	0.0022
288	0.0057	0.0035	0.0022

Total soil rain loss = 2.25(In)
Total effective rainfall = 2.24(In)
Peak flow rate in flood hydrograph = 991.08(CFS)

++

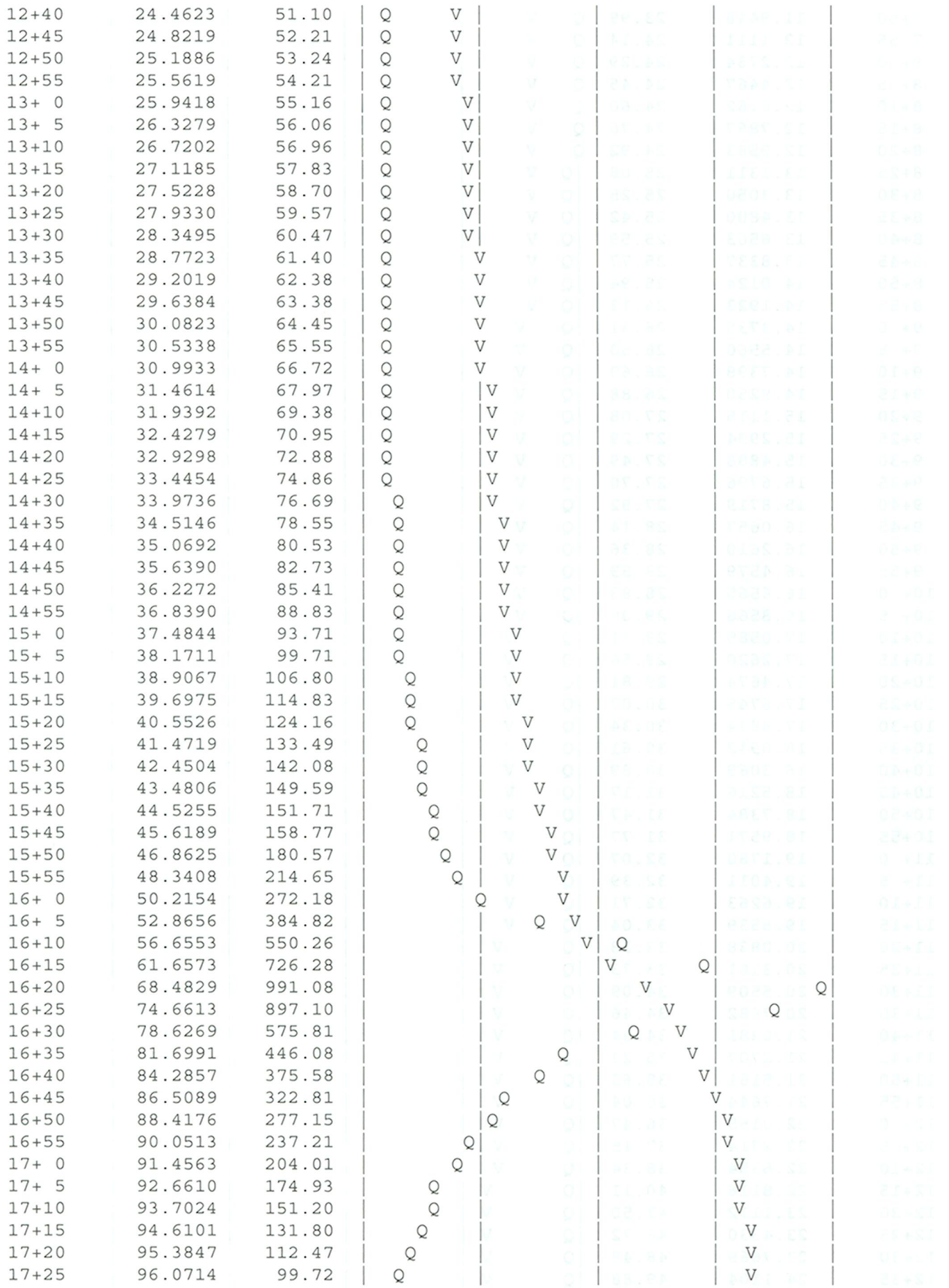
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	250.0	500.0	750.0	1000.0
0+ 5	0.0021	0.30	Q				
0+10	0.0105	1.23	Q				
0+15	0.0304	2.88	Q				
0+20	0.0755	6.56	Q				
0+25	0.1444	10.01	Q				
0+30	0.2241	11.58	Q				
0+35	0.3114	12.67	Q				
0+40	0.4045	13.52	Q				
0+45	0.5022	14.19	Q				
0+50	0.6038	14.75	Q				
0+55	0.7085	15.21	Q				
1+ 0	0.8159	15.59	Q				
1+ 5	0.9253	15.90	Q				
1+10	1.0365	16.15	Q				
1+15	1.1492	16.35	Q				
1+20	1.2628	16.49	Q				
1+25	1.3771	16.60	Q				
1+30	1.4922	16.71	Q				
1+35	1.6080	16.81	Q				
1+40	1.7244	16.90	Q				
1+45	1.8414	16.99	Q				
1+50	1.9590	17.08	Q				
1+55	2.0774	17.18	Q				
2+ 0	2.1962	17.26	Q				
2+ 5	2.3156	17.34	Q				
2+10	2.4356	17.41	Q				
2+15	2.5560	17.48	Q				
2+20	2.6768	17.55	Q				
2+25	2.7981	17.61	Q				
2+30	2.9199	17.68	QV				
2+35	3.0421	17.75	QV				
2+40	3.1648	17.82	QV				
2+45	3.2880	17.88	QV				
2+50	3.4117	17.95	QV				
2+55	3.5358	18.02	QV				

3+ 0	3.6604	18.10	QV				
3+ 5	3.7855	18.17	QV				
3+10	3.9111	18.24	QV				
3+15	4.0373	18.31	QV				
3+20	4.1639	18.39	QV				
3+25	4.2910	18.46	QV				
3+30	4.4187	18.53	QV				
3+35	4.5468	18.61	QV				
3+40	4.6755	18.69	QV				
3+45	4.8048	18.76	QV				
3+50	4.9345	18.84	QV				
3+55	5.0649	18.92	QV				
4+ 0	5.1957	19.00	QV				
4+ 5	5.3272	19.08	QV				
4+10	5.4592	19.17	QV				
4+15	5.5917	19.25	QV				
4+20	5.7249	19.33	Q V				
4+25	5.8586	19.42	Q V				
4+30	5.9929	19.50	Q V				
4+35	6.1278	19.59	Q V				
4+40	6.2634	19.68	Q V				
4+45	6.3995	19.77	Q V				
4+50	6.5362	19.86	Q V				
4+55	6.6736	19.95	Q V				
5+ 0	6.8116	20.04	Q V				
5+ 5	6.9503	20.13	Q V				
5+10	7.0896	20.23	Q V				
5+15	7.2295	20.32	Q V				
5+20	7.3701	20.42	Q V				
5+25	7.5114	20.51	Q V				
5+30	7.6534	20.61	Q V				
5+35	7.7960	20.71	Q V				
5+40	7.9394	20.82	Q V				
5+45	8.0835	20.92	Q V				
5+50	8.2282	21.02	Q V				
5+55	8.3737	21.13	Q V				
6+ 0	8.5200	21.23	Q V				
6+ 5	8.6669	21.34	Q V				
6+10	8.8147	21.45	Q V				
6+15	8.9632	21.56	Q V				
6+20	9.1124	21.67	Q V				
6+25	9.2625	21.79	Q V				
6+30	9.4133	21.90	Q V				
6+35	9.5650	22.02	Q V				
6+40	9.7175	22.14	Q V				
6+45	9.8708	22.26	Q V				
6+50	10.0249	22.38	Q V				
6+55	10.1799	22.50	Q V				
7+ 0	10.3358	22.63	Q V				
7+ 5	10.4925	22.76	Q V				
7+10	10.6501	22.89	Q V				
7+15	10.8087	23.02	Q V				
7+20	10.9681	23.15	Q V				
7+25	11.1285	23.29	Q V				
7+30	11.2898	23.42	Q V				
7+35	11.4521	23.56	Q V				
7+40	11.6153	23.70	Q V				
7+45	11.7796	23.85	Q V				

7+50	11.9448	23.99	Q	V
7+55	12.1111	24.14	Q	V
8+ 0	12.2784	24.29	Q	V
8+ 5	12.4467	24.45	Q	V
8+10	12.6162	24.60	Q	V
8+15	12.7867	24.76	Q	V
8+20	12.9583	24.92	Q	V
8+25	13.1311	25.08	Q	V
8+30	13.3050	25.25	Q	V
8+35	13.4800	25.42	Q	V
8+40	13.6563	25.59	Q	V
8+45	13.8337	25.77	Q	V
8+50	14.0124	25.94	Q	V
8+55	14.1923	26.13	Q	V
9+ 0	14.3735	26.31	Q	V
9+ 5	14.5560	26.50	Q	V
9+10	14.7398	26.69	Q	V
9+15	14.9250	26.88	Q	V
9+20	15.1115	27.08	Q	V
9+25	15.2994	27.29	Q	V
9+30	15.4888	27.49	Q	V
9+35	15.6796	27.70	Q	V
9+40	15.8719	27.92	Q	V
9+45	16.0657	28.14	Q	V
9+50	16.2610	28.36	Q	V
9+55	16.4579	28.59	Q	V
10+ 0	16.6565	28.83	Q	V
10+ 5	16.8566	29.06	Q	V
10+10	17.0585	29.31	Q	V
10+15	17.2620	29.56	Q	V
10+20	17.4674	29.81	Q	V
10+25	17.6745	30.07	Q	V
10+30	17.8834	30.34	Q	V
10+35	18.0942	30.61	Q	V
10+40	18.3069	30.89	Q	V
10+45	18.5216	31.17	Q	V
10+50	18.7384	31.47	Q	V
10+55	18.9571	31.77	Q	V
11+ 0	19.1780	32.07	Q	V
11+ 5	19.4011	32.39	Q	V
11+10	19.6263	32.71	Q	V
11+15	19.8539	33.04	Q	V
11+20	20.0838	33.38	Q	V
11+25	20.3161	33.73	Q	V
11+30	20.5509	34.09	Q	V
11+35	20.7882	34.46	Q	V
11+40	21.0281	34.84	Q	V
11+45	21.2707	35.23	Q	V
11+50	21.5161	35.63	Q	V
11+55	21.7644	36.04	Q	V
12+ 0	22.0155	36.47	Q	V
12+ 5	22.2714	37.15	Q	V
12+10	22.5354	38.34	Q	V
12+15	22.8116	40.11	Q	V
12+20	23.1112	43.50	Q	V
12+25	23.4330	46.72	Q	V
12+30	23.7669	48.48	Q	V
12+35	24.1104	49.88	Q	V



12+40	24.4623	51.10	Q V
12+45	24.8219	52.21	Q V
12+50	25.1886	53.24	Q V
12+55	25.5619	54.21	Q V
13+ 0	25.9418	55.16	Q V
13+ 5	26.3279	56.06	Q V
13+10	26.7202	56.96	Q V
13+15	27.1185	57.83	Q V
13+20	27.5228	58.70	Q V
13+25	27.9330	59.57	Q V
13+30	28.3495	60.47	Q V
13+35	28.7723	61.40	Q V
13+40	29.2019	62.38	Q V
13+45	29.6384	63.38	Q V
13+50	30.0823	64.45	Q V
13+55	30.5338	65.55	Q V
14+ 0	30.9933	66.72	Q V
14+ 5	31.4614	67.97	Q V
14+10	31.9392	69.38	Q V
14+15	32.4279	70.95	Q V
14+20	32.9298	72.88	Q V
14+25	33.4454	74.86	Q V
14+30	33.9736	76.69	Q V
14+35	34.5146	78.55	Q V
14+40	35.0692	80.53	Q V
14+45	35.6390	82.73	Q V
14+50	36.2272	85.41	Q V
14+55	36.8390	88.83	Q V
15+ 0	37.4844	93.71	Q V
15+ 5	38.1711	99.71	Q V
15+10	38.9067	106.80	Q V
15+15	39.6975	114.83	Q V
15+20	40.5526	124.16	Q V
15+25	41.4719	133.49	Q V
15+30	42.4504	142.08	Q V
15+35	43.4806	149.59	Q V
15+40	44.5255	151.71	Q V
15+45	45.6189	158.77	Q V
15+50	46.8625	180.57	Q V
15+55	48.3408	214.65	Q V
16+ 0	50.2154	272.18	Q V
16+ 5	52.8656	384.82	Q V
16+10	56.6553	550.26	Q V
16+15	61.6573	726.28	Q V
16+20	68.4829	991.08	Q V
16+25	74.6613	897.10	Q V
16+30	78.6269	575.81	Q V
16+35	81.6991	446.08	Q V
16+40	84.2857	375.58	Q V
16+45	86.5089	322.81	Q V
16+50	88.4176	277.15	Q V
16+55	90.0513	237.21	Q V
17+ 0	91.4563	204.01	Q V
17+ 5	92.6610	174.93	Q V
17+10	93.7024	151.20	Q V
17+15	94.6101	131.80	Q V
17+20	95.3847	112.47	Q V
17+25	96.0714	99.72	Q V

17+30	96.7097	92.68	Q			V	
17+35	97.3093	87.07	Q			V	
17+40	97.8688	81.23	Q			V	
17+45	98.4006	77.22	Q			V	
17+50	98.9160	74.84	Q			V	
17+55	99.4090	71.59	Q			V	
18+ 0	99.8704	66.99	Q			V	
18+ 5	100.3081	63.56	Q			V	
18+10	100.7190	59.66	Q			V	
18+15	101.1038	55.87	Q			V	
18+20	101.4510	50.41	Q			V	
18+25	101.7691	46.19	Q			V	
18+30	102.0699	43.67	Q			V	
18+35	102.3569	41.68	Q			V	
18+40	102.6322	39.96	Q			V	
18+45	102.8972	38.49	Q			V	
18+50	103.1534	37.19	Q			V	
18+55	103.4015	36.03	Q			V	
19+ 0	103.6425	34.99	Q			V	
19+ 5	103.8770	34.06	Q			V	
19+10	104.1058	33.21	Q			V	
19+15	104.3292	32.44	Q			V	
19+20	104.5479	31.75	Q			V	
19+25	104.7622	31.12	Q			V	
19+30	104.9724	30.53	Q			V	
19+35	105.1788	29.96	Q			V	
19+40	105.3814	29.43	Q			V	
19+45	105.5806	28.92	Q			V	
19+50	105.7763	28.42	Q			V	
19+55	105.9688	27.95	Q			V	
20+ 0	106.1583	27.51	Q			V	
20+ 5	106.3448	27.08	Q			V	
20+10	106.5285	26.68	Q			V	
20+15	106.7096	26.29	Q			V	
20+20	106.8882	25.92	Q			V	
20+25	107.0643	25.57	Q			V	
20+30	107.2380	25.23	Q			V	
20+35	107.4095	24.90	Q			V	
20+40	107.5787	24.58	Q			V	
20+45	107.7459	24.27	Q			V	
20+50	107.9109	23.97	Q			V	
20+55	108.0740	23.68	Q			V	
21+ 0	108.2352	23.40	Q			V	
21+ 5	108.3944	23.13	Q			V	
21+10	108.5519	22.86	Q			V	
21+15	108.7075	22.60	Q			V	
21+20	108.8615	22.35	Q			V	
21+25	109.0138	22.11	Q			V	
21+30	109.1644	21.88	Q			V	
21+35	109.3135	21.65	Q			V	
21+40	109.4611	21.42	Q			V	
21+45	109.6071	21.21	Q			V	
21+50	109.7517	21.00	Q			V	
21+55	109.8949	20.79	Q			V	
22+ 0	110.0367	20.59	Q			V	
22+ 5	110.1771	20.39	Q			V	
22+10	110.3162	20.20	Q			V	
22+15	110.4541	20.01	Q			V	

22+20	110.5906	19.83	Q				V
22+25	110.7260	19.65	Q				V
22+30	110.8601	19.48	Q				V
22+35	110.9931	19.31	Q				V
22+40	111.1249	19.14	Q				V
22+45	111.2556	18.98	Q				V
22+50	111.3853	18.82	Q				V
22+55	111.5138	18.66	Q				V
23+ 0	111.6413	18.51	Q				V
23+ 5	111.7677	18.36	Q				V
23+10	111.8932	18.22	Q				V
23+15	112.0177	18.07	Q				V
23+20	112.1412	17.93	Q				V
23+25	112.2637	17.79	Q				V
23+30	112.3853	17.66	Q				V
23+35	112.5060	17.53	Q				V
23+40	112.6258	17.40	Q				V
23+45	112.7448	17.27	Q				V
23+50	112.8628	17.14	Q				V
23+55	112.9801	17.02	Q				V
24+ 0	113.0965	16.90	Q				V
24+ 5	113.2100	16.48	Q				V
24+10	113.3164	15.44	Q				V
24+15	113.4107	13.69	Q				V
24+20	113.4791	9.94	Q				V
24+25	113.5235	6.45	Q				V
24+30	113.5571	4.87	Q				V
24+35	113.5832	3.79	Q				V
24+40	113.6035	2.95	Q				V
24+45	113.6194	2.31	Q				V
24+50	113.6317	1.78	Q				V
24+55	113.6411	1.36	Q				V
25+ 0	113.6481	1.03	Q				V
25+ 5	113.6534	0.76	Q				V
25+10	113.6573	0.56	Q				V
25+15	113.6601	0.41	Q				V
25+20	113.6623	0.32	Q				V
25+25	113.6642	0.27	Q				V
25+30	113.6657	0.22	Q				V
25+35	113.6669	0.18	Q				V
25+40	113.6679	0.14	Q				V
25+45	113.6687	0.12	Q				V
25+50	113.6693	0.08	Q				V
25+55	113.6696	0.05	Q				V
26+ 0	113.6699	0.03	Q				V
26+ 5	113.6700	0.02	Q				V
26+10	113.6700	0.01	Q				V

U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/30/12 File Name UNIT100Y24HEX.out

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Orange County Unit Hydrograph Hydrology Method
Manual Date(s) - October 1986, November 1996

Program License Serial Number 6062

ESPERANZA HILLS
DETENTION BASIN ANALYSIS
EXISTING CONDITION
100-YEAR 24-HOUR

Storm Event Year = 100

Antecedent Moisture Condition = 3

English (in-lb) Input Units Used

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	Area (Ac.)	Area Fraction	Soil Group	Fp (In/Hr)	Ap (dec.)	Fm (In/Hr)
56.0	17.0	0.03	B	0.300	0.990	0.297
69.0	404.8	0.66	C	0.250	0.990	0.248
75.0	188.4	0.31	D	0.200	0.990	0.198

Area-averaged adjusted loss rate Fm (In/Hr) = 0.234

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC3)	S	Pervious Yield Fr
16.83	0.028	56.0	75.8	3.19	0.541
0.17	0.000	98.0	98.0	0.20	0.958
400.70	0.657	69.0	86.2	1.60	0.725
4.05	0.007	98.0	98.0	0.20	0.958
186.51	0.306	75.0	91.0	0.99	0.816
1.88	0.003	98.0	98.0	0.20	0.958

Area-averaged catchment yield fraction, Y = 0.750
Area-averaged low loss fraction, Yb = 0.250

++

User entry of time of concentration = 0.380 (hours)
Watershed area = 610.14(Ac.)
Catchment Lag time = 0.304 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 27.4123
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.234(In/Hr)
Average low loss rate fraction (Yb) = 0.250 (decimal)
FOOTHILL S-Graph Selected
Computed peak 5-minute rainfall = 0.520(In)
Computed peak 30-minute rainfall = 1.090(In)
Specified peak 1-hour rainfall = 1.450(In)
Computed peak 3-hour rainfall = 2.430(In)
Specified peak 6-hour rainfall = 3.360(In)
Specified peak 24-hour rainfall = 5.630(In)

Rainfall depth area reduction factors:
Using a total area of 610.14(Ac.) (Ref: fig. E-4)

5-minute factor = 0.971 Adjusted rainfall = 0.505(In)
30-minute factor = 0.971 Adjusted rainfall = 1.059(In)
1-hour factor = 0.971 Adjusted rainfall = 1.409(In)
3-hour factor = 0.996 Adjusted rainfall = 2.421(In)
6-hour factor = 0.998 Adjusted rainfall = 3.354(In)
24-hour factor = 0.999 Adjusted rainfall = 5.626(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
(K = 7378.88 (CFS))		
1	1.917	141.473
2	7.859	438.458
3	18.656	796.680
4	42.934	1791.447
5	62.742	1461.612
6	71.907	676.286
7	78.280	470.232
8	83.157	359.885
9	86.946	279.591
10	89.995	224.980
11	92.425	179.317
12	94.371	143.555
13	95.841	108.512
14	96.986	84.438
15	97.793	59.554
16	98.199	29.944
17	98.518	23.583
18	98.797	20.577
19	99.040	17.891
20	99.207	12.369
21	99.396	13.908
22	99.614	16.123
23	99.767	11.281

24	99.874	7.923
25	99.943	5.071
26	100.000	4.191

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.5051	0.5051
2	0.6726	0.1675
3	0.7952	0.1226
4	0.8955	0.1003
5	0.9820	0.0865
6	1.0588	0.0768
7	1.1282	0.0694
8	1.1920	0.0638
9	1.2512	0.0592
10	1.3067	0.0555
11	1.3590	0.0523
12	1.4085	0.0496
13	1.4652	0.0567
14	1.5198	0.0545
15	1.5724	0.0526
16	1.6232	0.0508
17	1.6725	0.0493
18	1.7203	0.0478
19	1.7667	0.0465
20	1.8120	0.0453
21	1.8561	0.0441
22	1.8992	0.0431
23	1.9413	0.0421
24	1.9824	0.0412
25	2.0228	0.0403
26	2.0623	0.0395
27	2.1010	0.0387
28	2.1390	0.0380
29	2.1763	0.0373
30	2.2130	0.0367
31	2.2491	0.0361
32	2.2846	0.0355
33	2.3195	0.0349
34	2.3539	0.0344
35	2.3878	0.0339
36	2.4212	0.0334
37	2.4526	0.0314
38	2.4835	0.0309
39	2.5140	0.0305
40	2.5441	0.0301
41	2.5738	0.0297
42	2.6031	0.0293
43	2.6321	0.0289
44	2.6607	0.0286
45	2.6889	0.0283
46	2.7168	0.0279
47	2.7444	0.0276
48	2.7717	0.0273
49	2.7987	0.0270
50	2.8254	0.0267
51	2.8518	0.0264
52	2.8780	0.0261

53	2.9039	0.0259
54	2.9295	0.0256
55	2.9549	0.0254
56	2.9800	0.0251
57	3.0049	0.0249
58	3.0295	0.0247
59	3.0540	0.0244
60	3.0782	0.0242
61	3.1022	0.0240
62	3.1260	0.0238
63	3.1496	0.0236
64	3.1730	0.0234
65	3.1962	0.0232
66	3.2192	0.0230
67	3.2420	0.0228
68	3.2647	0.0227
69	3.2872	0.0225
70	3.3095	0.0223
71	3.3316	0.0221
72	3.3536	0.0220
73	3.3709	0.0173
74	3.3881	0.0172
75	3.4051	0.0170
76	3.4219	0.0169
77	3.4387	0.0167
78	3.4553	0.0166
79	3.4717	0.0165
80	3.4881	0.0163
81	3.5043	0.0162
82	3.5204	0.0161
83	3.5363	0.0160
84	3.5522	0.0158
85	3.5679	0.0157
86	3.5835	0.0156
87	3.5990	0.0155
88	3.6144	0.0154
89	3.6296	0.0153
90	3.6448	0.0152
91	3.6599	0.0151
92	3.6748	0.0150
93	3.6897	0.0149
94	3.7044	0.0148
95	3.7191	0.0147
96	3.7336	0.0146
97	3.7481	0.0145
98	3.7625	0.0144
99	3.7768	0.0143
100	3.7910	0.0142
101	3.8051	0.0141
102	3.8191	0.0140
103	3.8330	0.0139
104	3.8468	0.0138
105	3.8606	0.0138
106	3.8743	0.0137
107	3.8879	0.0136
108	3.9014	0.0135
109	3.9148	0.0134
110	3.9282	0.0134

111	3.9415	0.0133
112	3.9547	0.0132
113	3.9679	0.0131
114	3.9809	0.0131
115	3.9939	0.0130
116	4.0068	0.0129
117	4.0197	0.0129
118	4.0325	0.0128
119	4.0452	0.0127
120	4.0579	0.0127
121	4.0704	0.0126
122	4.0830	0.0125
123	4.0954	0.0125
124	4.1078	0.0124
125	4.1201	0.0123
126	4.1324	0.0123
127	4.1446	0.0122
128	4.1568	0.0121
129	4.1689	0.0121
130	4.1809	0.0120
131	4.1929	0.0120
132	4.2048	0.0119
133	4.2166	0.0119
134	4.2284	0.0118
135	4.2402	0.0117
136	4.2519	0.0117
137	4.2635	0.0116
138	4.2751	0.0116
139	4.2866	0.0115
140	4.2981	0.0115
141	4.3095	0.0114
142	4.3209	0.0114
143	4.3323	0.0113
144	4.3435	0.0113
145	4.3548	0.0112
146	4.3660	0.0112
147	4.3771	0.0111
148	4.3882	0.0111
149	4.3992	0.0110
150	4.4102	0.0110
151	4.4212	0.0109
152	4.4321	0.0109
153	4.4429	0.0109
154	4.4537	0.0108
155	4.4645	0.0108
156	4.4752	0.0107
157	4.4859	0.0107
158	4.4966	0.0106
159	4.5072	0.0106
160	4.5177	0.0106
161	4.5282	0.0105
162	4.5387	0.0105
163	4.5491	0.0104
164	4.5595	0.0104
165	4.5699	0.0104
166	4.5802	0.0103
167	4.5905	0.0103
168	4.6007	0.0102

169	4.6109	0.0102
170	4.6211	0.0102
171	4.6312	0.0101
172	4.6413	0.0101
173	4.6513	0.0101
174	4.6614	0.0100
175	4.6713	0.0100
176	4.6813	0.0099
177	4.6912	0.0099
178	4.7011	0.0099
179	4.7109	0.0098
180	4.7207	0.0098
181	4.7305	0.0098
182	4.7402	0.0097
183	4.7499	0.0097
184	4.7596	0.0097
185	4.7692	0.0096
186	4.7788	0.0096
187	4.7884	0.0096
188	4.7979	0.0095
189	4.8074	0.0095
190	4.8169	0.0095
191	4.8264	0.0094
192	4.8358	0.0094
193	4.8452	0.0094
194	4.8545	0.0094
195	4.8638	0.0093
196	4.8731	0.0093
197	4.8824	0.0093
198	4.8916	0.0092
199	4.9008	0.0092
200	4.9100	0.0092
201	4.9192	0.0091
202	4.9283	0.0091
203	4.9374	0.0091
204	4.9464	0.0091
205	4.9555	0.0090
206	4.9645	0.0090
207	4.9734	0.0090
208	4.9824	0.0090
209	4.9913	0.0089
210	5.0002	0.0089
211	5.0091	0.0089
212	5.0179	0.0088
213	5.0268	0.0088
214	5.0356	0.0088
215	5.0443	0.0088
216	5.0531	0.0087
217	5.0618	0.0087
218	5.0705	0.0087
219	5.0791	0.0087
220	5.0878	0.0086
221	5.0964	0.0086
222	5.1050	0.0086
223	5.1136	0.0086
224	5.1221	0.0085
225	5.1306	0.0085
226	5.1391	0.0085

227	5.1476	0.0085
228	5.1560	0.0085
229	5.1645	0.0084
230	5.1729	0.0084
231	5.1813	0.0084
232	5.1896	0.0084
233	5.1980	0.0083
234	5.2063	0.0083
235	5.2146	0.0083
236	5.2228	0.0083
237	5.2311	0.0082
238	5.2393	0.0082
239	5.2475	0.0082
240	5.2557	0.0082
241	5.2638	0.0082
242	5.2720	0.0081
243	5.2801	0.0081
244	5.2882	0.0081
245	5.2963	0.0081
246	5.3043	0.0081
247	5.3124	0.0080
248	5.3204	0.0080
249	5.3284	0.0080
250	5.3364	0.0080
251	5.3443	0.0080
252	5.3523	0.0079
253	5.3602	0.0079
254	5.3681	0.0079
255	5.3759	0.0079
256	5.3838	0.0079
257	5.3916	0.0078
258	5.3995	0.0078
259	5.4073	0.0078
260	5.4150	0.0078
261	5.4228	0.0078
262	5.4305	0.0077
263	5.4383	0.0077
264	5.4460	0.0077
265	5.4537	0.0077
266	5.4613	0.0077
267	5.4690	0.0077
268	5.4766	0.0076
269	5.4842	0.0076
270	5.4918	0.0076
271	5.4994	0.0076
272	5.5070	0.0076
273	5.5145	0.0075
274	5.5221	0.0075
275	5.5296	0.0075
276	5.5371	0.0075
277	5.5445	0.0075
278	5.5520	0.0075
279	5.5594	0.0074
280	5.5669	0.0074
281	5.5743	0.0074
282	5.5817	0.0074
283	5.5891	0.0074
284	5.5964	0.0074

285	5.6038	0.0073
286	5.6111	0.0073
287	5.6184	0.0073
288	5.6257	0.0073

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0073	0.0018	0.0055
2	0.0073	0.0018	0.0055
3	0.0073	0.0018	0.0055
4	0.0074	0.0018	0.0055
5	0.0074	0.0018	0.0055
6	0.0074	0.0019	0.0056
7	0.0074	0.0019	0.0056
8	0.0075	0.0019	0.0056
9	0.0075	0.0019	0.0056
10	0.0075	0.0019	0.0056
11	0.0075	0.0019	0.0057
12	0.0076	0.0019	0.0057
13	0.0076	0.0019	0.0057
14	0.0076	0.0019	0.0057
15	0.0077	0.0019	0.0057
16	0.0077	0.0019	0.0058
17	0.0077	0.0019	0.0058
18	0.0077	0.0019	0.0058
19	0.0078	0.0019	0.0058
20	0.0078	0.0019	0.0058
21	0.0078	0.0020	0.0059
22	0.0078	0.0020	0.0059
23	0.0079	0.0020	0.0059
24	0.0079	0.0020	0.0059
25	0.0079	0.0020	0.0060
26	0.0080	0.0020	0.0060
27	0.0080	0.0020	0.0060
28	0.0080	0.0020	0.0060
29	0.0081	0.0020	0.0060
30	0.0081	0.0020	0.0061
31	0.0081	0.0020	0.0061
32	0.0081	0.0020	0.0061
33	0.0082	0.0020	0.0061
34	0.0082	0.0021	0.0062
35	0.0082	0.0021	0.0062
36	0.0083	0.0021	0.0062
37	0.0083	0.0021	0.0062
38	0.0083	0.0021	0.0063
39	0.0084	0.0021	0.0063
40	0.0084	0.0021	0.0063
41	0.0085	0.0021	0.0063
42	0.0085	0.0021	0.0064
43	0.0085	0.0021	0.0064
44	0.0085	0.0021	0.0064
45	0.0086	0.0021	0.0064
46	0.0086	0.0022	0.0065
47	0.0087	0.0022	0.0065
48	0.0087	0.0022	0.0065
49	0.0087	0.0022	0.0066

50	0.0088	0.0022	0.0066
51	0.0088	0.0022	0.0066
52	0.0088	0.0022	0.0066
53	0.0089	0.0022	0.0067
54	0.0089	0.0022	0.0067
55	0.0090	0.0022	0.0067
56	0.0090	0.0023	0.0068
57	0.0091	0.0023	0.0068
58	0.0091	0.0023	0.0068
59	0.0091	0.0023	0.0069
60	0.0092	0.0023	0.0069
61	0.0092	0.0023	0.0069
62	0.0093	0.0023	0.0069
63	0.0093	0.0023	0.0070
64	0.0094	0.0023	0.0070
65	0.0094	0.0024	0.0071
66	0.0094	0.0024	0.0071
67	0.0095	0.0024	0.0071
68	0.0095	0.0024	0.0072
69	0.0096	0.0024	0.0072
70	0.0096	0.0024	0.0072
71	0.0097	0.0024	0.0073
72	0.0097	0.0024	0.0073
73	0.0098	0.0025	0.0074
74	0.0098	0.0025	0.0074
75	0.0099	0.0025	0.0074
76	0.0099	0.0025	0.0075
77	0.0100	0.0025	0.0075
78	0.0101	0.0025	0.0075
79	0.0101	0.0025	0.0076
80	0.0102	0.0025	0.0076
81	0.0102	0.0026	0.0077
82	0.0103	0.0026	0.0077
83	0.0104	0.0026	0.0078
84	0.0104	0.0026	0.0078
85	0.0105	0.0026	0.0079
86	0.0105	0.0026	0.0079
87	0.0106	0.0027	0.0079
88	0.0106	0.0027	0.0080
89	0.0107	0.0027	0.0080
90	0.0108	0.0027	0.0081
91	0.0109	0.0027	0.0081
92	0.0109	0.0027	0.0082
93	0.0110	0.0027	0.0082
94	0.0110	0.0028	0.0083
95	0.0111	0.0028	0.0084
96	0.0112	0.0028	0.0084
97	0.0113	0.0028	0.0085
98	0.0113	0.0028	0.0085
99	0.0114	0.0029	0.0086
100	0.0115	0.0029	0.0086
101	0.0116	0.0029	0.0087
102	0.0116	0.0029	0.0087
103	0.0117	0.0029	0.0088
104	0.0118	0.0030	0.0089
105	0.0119	0.0030	0.0089
106	0.0120	0.0030	0.0090
107	0.0121	0.0030	0.0091

108	0.0121	0.0030	0.0091
109	0.0123	0.0031	0.0092
110	0.0123	0.0031	0.0092
111	0.0125	0.0031	0.0093
112	0.0125	0.0031	0.0094
113	0.0127	0.0032	0.0095
114	0.0127	0.0032	0.0095
115	0.0129	0.0032	0.0096
116	0.0129	0.0032	0.0097
117	0.0131	0.0033	0.0098
118	0.0131	0.0033	0.0099
119	0.0133	0.0033	0.0100
120	0.0134	0.0033	0.0100
121	0.0135	0.0034	0.0101
122	0.0136	0.0034	0.0102
123	0.0138	0.0034	0.0103
124	0.0138	0.0035	0.0104
125	0.0140	0.0035	0.0105
126	0.0141	0.0035	0.0106
127	0.0143	0.0036	0.0107
128	0.0144	0.0036	0.0108
129	0.0146	0.0036	0.0109
130	0.0147	0.0037	0.0110
131	0.0149	0.0037	0.0111
132	0.0150	0.0037	0.0112
133	0.0152	0.0038	0.0114
134	0.0153	0.0038	0.0115
135	0.0155	0.0039	0.0116
136	0.0156	0.0039	0.0117
137	0.0158	0.0040	0.0119
138	0.0160	0.0040	0.0120
139	0.0162	0.0041	0.0122
140	0.0163	0.0041	0.0122
141	0.0166	0.0042	0.0124
142	0.0167	0.0042	0.0125
143	0.0170	0.0043	0.0128
144	0.0172	0.0043	0.0129
145	0.0220	0.0055	0.0165
146	0.0221	0.0055	0.0166
147	0.0225	0.0056	0.0169
148	0.0227	0.0057	0.0170
149	0.0230	0.0058	0.0173
150	0.0232	0.0058	0.0174
151	0.0236	0.0059	0.0177
152	0.0238	0.0060	0.0178
153	0.0242	0.0061	0.0182
154	0.0244	0.0061	0.0183
155	0.0249	0.0062	0.0187
156	0.0251	0.0063	0.0188
157	0.0256	0.0064	0.0192
158	0.0259	0.0065	0.0194
159	0.0264	0.0066	0.0198
160	0.0267	0.0067	0.0200
161	0.0273	0.0068	0.0205
162	0.0276	0.0069	0.0207
163	0.0283	0.0071	0.0212
164	0.0286	0.0072	0.0214
165	0.0293	0.0073	0.0220

166	0.0297	0.0074	0.0223
167	0.0305	0.0076	0.0229
168	0.0309	0.0077	0.0232
169	0.0334	0.0084	0.0250
170	0.0339	0.0085	0.0254
171	0.0349	0.0087	0.0262
172	0.0355	0.0089	0.0266
173	0.0367	0.0092	0.0275
174	0.0373	0.0093	0.0280
175	0.0387	0.0097	0.0290
176	0.0395	0.0099	0.0296
177	0.0412	0.0103	0.0309
178	0.0421	0.0105	0.0316
179	0.0441	0.0110	0.0331
180	0.0453	0.0113	0.0339
181	0.0478	0.0120	0.0359
182	0.0493	0.0123	0.0369
183	0.0526	0.0132	0.0394
184	0.0545	0.0136	0.0409
185	0.0496	0.0124	0.0372
186	0.0523	0.0131	0.0392
187	0.0592	0.0148	0.0444
188	0.0638	0.0159	0.0478
189	0.0768	0.0192	0.0576
190	0.0865	0.0195	0.0670
191	0.1226	0.0195	0.1032
192	0.1675	0.0195	0.1480
193	0.5051	0.0195	0.4857
194	0.1003	0.0195	0.0809
195	0.0694	0.0174	0.0520
196	0.0555	0.0139	0.0416
197	0.0567	0.0142	0.0425
198	0.0508	0.0127	0.0381
199	0.0465	0.0116	0.0349
200	0.0431	0.0108	0.0323
201	0.0403	0.0101	0.0302
202	0.0380	0.0095	0.0285
203	0.0361	0.0090	0.0271
204	0.0344	0.0086	0.0258
205	0.0314	0.0078	0.0235
206	0.0301	0.0075	0.0226
207	0.0289	0.0072	0.0217
208	0.0279	0.0070	0.0209
209	0.0270	0.0068	0.0202
210	0.0261	0.0065	0.0196
211	0.0254	0.0063	0.0190
212	0.0247	0.0062	0.0185
213	0.0240	0.0060	0.0180
214	0.0234	0.0059	0.0175
215	0.0228	0.0057	0.0171
216	0.0223	0.0056	0.0167
217	0.0173	0.0043	0.0130
218	0.0169	0.0042	0.0127
219	0.0165	0.0041	0.0123
220	0.0161	0.0040	0.0121
221	0.0157	0.0039	0.0118
222	0.0154	0.0038	0.0115
223	0.0151	0.0038	0.0113

224	0.0148	0.0037	0.0111
225	0.0145	0.0036	0.0108
226	0.0142	0.0035	0.0106
227	0.0139	0.0035	0.0104
228	0.0137	0.0034	0.0103
229	0.0134	0.0034	0.0101
230	0.0132	0.0033	0.0099
231	0.0130	0.0033	0.0097
232	0.0128	0.0032	0.0096
233	0.0126	0.0031	0.0094
234	0.0124	0.0031	0.0093
235	0.0122	0.0031	0.0092
236	0.0120	0.0030	0.0090
237	0.0119	0.0030	0.0089
238	0.0117	0.0029	0.0088
239	0.0115	0.0029	0.0086
240	0.0114	0.0028	0.0085
241	0.0112	0.0028	0.0084
242	0.0111	0.0028	0.0083
243	0.0109	0.0027	0.0082
244	0.0108	0.0027	0.0081
245	0.0107	0.0027	0.0080
246	0.0106	0.0026	0.0079
247	0.0104	0.0026	0.0078
248	0.0103	0.0026	0.0077
249	0.0102	0.0026	0.0076
250	0.0101	0.0025	0.0076
251	0.0100	0.0025	0.0075
252	0.0099	0.0025	0.0074
253	0.0098	0.0024	0.0073
254	0.0097	0.0024	0.0073
255	0.0096	0.0024	0.0072
256	0.0095	0.0024	0.0071
257	0.0094	0.0023	0.0070
258	0.0093	0.0023	0.0070
259	0.0092	0.0023	0.0069
260	0.0091	0.0023	0.0068
261	0.0090	0.0023	0.0068
262	0.0090	0.0022	0.0067
263	0.0089	0.0022	0.0067
264	0.0088	0.0022	0.0066
265	0.0087	0.0022	0.0065
266	0.0086	0.0022	0.0065
267	0.0086	0.0021	0.0064
268	0.0085	0.0021	0.0064
269	0.0084	0.0021	0.0063
270	0.0084	0.0021	0.0063
271	0.0083	0.0021	0.0062
272	0.0082	0.0021	0.0062
273	0.0082	0.0020	0.0061
274	0.0081	0.0020	0.0061
275	0.0080	0.0020	0.0060
276	0.0080	0.0020	0.0060
277	0.0079	0.0020	0.0059
278	0.0079	0.0020	0.0059
279	0.0078	0.0020	0.0058
280	0.0077	0.0019	0.0058
281	0.0077	0.0019	0.0058

282	0.0076	0.0019	0.0057
283	0.0076	0.0019	0.0057
284	0.0075	0.0019	0.0056
285	0.0075	0.0019	0.0056
286	0.0074	0.0019	0.0056
287	0.0074	0.0018	0.0055
288	0.0073	0.0018	0.0055

Total soil rain loss = 1.26(In)
Total effective rainfall = 4.37(In)
Peak flow rate in flood hydrograph = 1352.32(CFS)

++

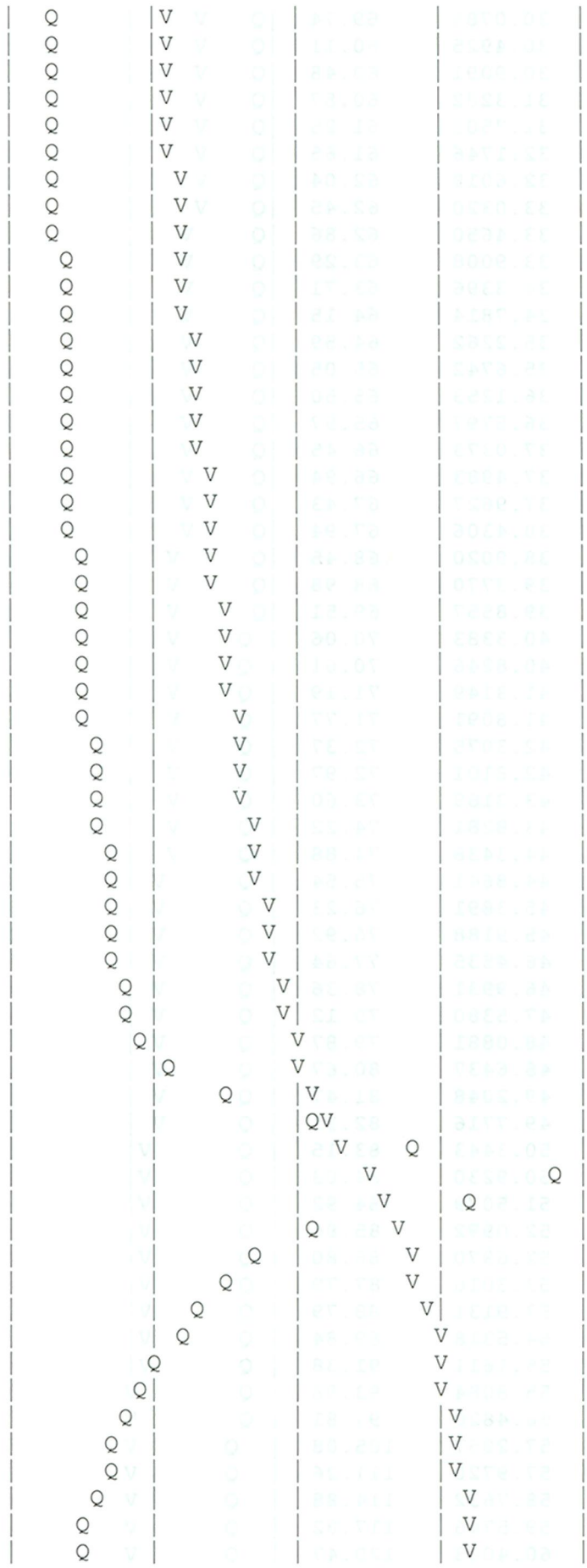
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	350.0	700.0	1050.0	1400.0
0+ 5	0.0053	0.77	Q				
0+10	0.0272	3.18	Q				
0+15	0.0792	7.54	Q				
0+20	0.1988	17.37	Q				
0+25	0.3738	25.42	Q				
0+30	0.5749	29.20	Q				
0+35	0.7944	31.87	Q				
0+40	1.0281	33.94	Q				
0+45	1.2732	35.58	VQ				
0+50	1.5276	36.93	VQ				
0+55	1.7896	38.04	VQ				
1+ 0	2.0578	38.95	VQ				
1+ 5	2.3311	39.68	VQ				
1+10	2.6085	40.28	VQ				
1+15	2.8891	40.74	VQ				
1+20	3.1718	41.05	VQ				
1+25	3.4563	41.32	VQ				
1+30	3.7426	41.57	VQ				
1+35	4.0306	41.82	VQ				
1+40	4.3201	42.03	VQ				
1+45	4.6111	42.26	VQ				
1+50	4.9038	42.50	VQ				
1+55	5.1980	42.71	VQ				
2+ 0	5.4935	42.91	VQ				
2+ 5	5.7902	43.09	|Q				
2+10	6.0883	43.27	|Q				
2+15	6.3874	43.43	|Q				
2+20	6.6876	43.59	|Q				
2+25	6.9889	43.75	|Q				
2+30	7.2914	43.92	|Q				
2+35	7.5950	44.08	|Q				
2+40	7.8997	44.25	|Q				
2+45	8.2056	44.42	|Q				
2+50	8.5127	44.59	|Q				
2+55	8.8209	44.76	|Q				
3+ 0	9.1304	44.93	|Q				

3+ 5	9.4410	45.11	Q				
3+10	9.7529	45.28	Q				
3+15	10.0660	45.46	Q				
3+20	10.3803	45.64	Q				
3+25	10.6959	45.82	Q				
3+30	11.0128	46.01	Q				
3+35	11.3310	46.20	QV				
3+40	11.6504	46.39	QV				
3+45	11.9712	46.57	QV				
3+50	12.2933	46.77	QV				
3+55	12.6167	46.96	QV				
4+ 0	12.9415	47.16	QV				
4+ 5	13.2677	47.36	QV				
4+10	13.5952	47.56	QV				
4+15	13.9241	47.76	QV				
4+20	14.2545	47.97	QV				
4+25	14.5863	48.17	QV				
4+30	14.9195	48.39	QV				
4+35	15.2542	48.60	QV				
4+40	15.5904	48.81	QV				
4+45	15.9280	49.03	QV				
4+50	16.2672	49.25	QV				
4+55	16.6079	49.47	QV				
5+ 0	16.9502	49.70	Q V				
5+ 5	17.2940	49.92	Q V				
5+10	17.6394	50.16	Q V				
5+15	17.9865	50.39	Q V				
5+20	18.3351	50.63	Q V				
5+25	18.6854	50.86	Q V				
5+30	19.0374	51.11	Q V				
5+35	19.3911	51.35	Q V				
5+40	19.7464	51.60	Q V				
5+45	20.1035	51.85	Q V				
5+50	20.4624	52.11	Q V				
5+55	20.8230	52.36	Q V				
6+ 0	21.1854	52.63	Q V				
6+ 5	21.5497	52.89	Q V				
6+10	21.9157	53.16	Q V				
6+15	22.2837	53.43	Q V				
6+20	22.6536	53.70	Q V				
6+25	23.0253	53.98	Q V				
6+30	23.3991	54.27	Q V				
6+35	23.7747	54.55	Q V				
6+40	24.1524	54.84	Q V				
6+45	24.5322	55.13	Q V				
6+50	24.9139	55.44	Q V				
6+55	25.2978	55.74	Q V				
7+ 0	25.6838	56.05	Q V				
7+ 5	26.0719	56.35	Q V				
7+10	26.4622	56.67	Q V				
7+15	26.8547	56.99	Q V				
7+20	27.2495	57.32	Q V				
7+25	27.6465	57.65	Q V				
7+30	28.0459	57.99	Q V				
7+35	28.4476	58.32	Q V				
7+40	28.8516	58.67	Q V				
7+45	29.2581	59.02	Q V				
7+50	29.6671	59.38	Q V				

7+55	30.0785	59.74	|Q V |
8+ 0	30.4925	60.11	|Q V |
8+ 5	30.9091	60.48	|Q V |
8+10	31.3282	60.87	|Q V |
8+15	31.7501	61.25	|Q V |
8+20	32.1746	61.65	|Q V |
8+25	32.6019	62.04	|Q V |
8+30	33.0320	62.45	|Q V |
8+35	33.4650	62.86	|Q V |
8+40	33.9008	63.29	|Q V |
8+45	34.3396	63.71	|Q V |
8+50	34.7814	64.15	|Q V |
8+55	35.2262	64.59	|Q V |
9+ 0	35.6742	65.05	|Q V |
9+ 5	36.1253	65.50	|Q V |
9+10	36.5797	65.97	|Q V |
9+15	37.0373	66.45	|Q V |
9+20	37.4983	66.94	|Q V |
9+25	37.9627	67.43	|Q V |
9+30	38.4306	67.94	|Q V |
9+35	38.9020	68.45	|Q V |
9+40	39.3770	68.98	|Q V |
9+45	39.8557	69.51	|Q V |
9+50	40.3383	70.06	| Q V |
9+55	40.8246	70.61	| Q V |
10+ 0	41.3149	71.19	| Q V |
10+ 5	41.8091	71.77	| Q V |
10+10	42.3075	72.37	| Q V |
10+15	42.8101	72.97	| Q V |
10+20	43.3169	73.60	| Q V |
10+25	43.8281	74.22	| Q V |
10+30	44.3438	74.88	| Q V |
10+35	44.8641	75.54	| Q V |
10+40	45.3891	76.23	| Q V |
10+45	45.9188	76.92	| Q V |
10+50	46.4535	77.64	| Q V |
10+55	46.9931	78.36	| Q V |
11+ 0	47.5380	79.12	| Q V |
11+ 5	48.0881	79.87	| Q V |
11+10	48.6437	80.67	| Q V |
11+15	49.2048	81.47	| Q V |
11+20	49.7716	82.31	| Q V |
11+25	50.3443	83.15	| Q V|
11+30	50.9230	84.03	| Q V|
11+35	51.5079	84.92	| Q V|
11+40	52.0992	85.86	| Q V|
11+45	52.6970	86.80	| Q V|
11+50	53.3016	87.79	| Q V|
11+55	53.9131	88.79	| Q V|
12+ 0	54.5318	89.84	| Q V|
12+ 5	55.1611	91.38	| Q V|
12+10	55.8084	93.98	| Q V
12+15	56.4820	97.81	| Q V
12+20	57.2057	105.08	| Q V
12+25	57.9720	111.26	| Q V
12+30	58.7632	114.88	| Q V
12+35	59.5746	117.82	| Q V
12+40	60.4043	120.47	| Q V

12+45	61.2504	122.86	
12+50	62.1125	125.17	
12+55	62.9894	127.34	
13+ 0	63.8812	129.48	
13+ 5	64.7871	131.54	
13+10	65.7073	133.62	
13+15	66.6415	135.64	
13+20	67.5898	137.69	
13+25	68.5523	139.75	
13+30	69.5298	141.94	
13+35	70.5226	144.15	
13+40	71.5316	146.51	
13+45	72.5573	148.92	
13+50	73.6008	151.52	
13+55	74.6625	154.17	
14+ 0	75.7439	157.01	
14+ 5	76.8463	160.08	
14+10	77.9740	163.74	
14+15	79.1304	167.90	
14+20	80.3254	173.52	
14+25	81.5573	178.87	
14+30	82.8222	183.66	
14+35	84.1195	188.37	
14+40	85.4513	193.38	
14+45	86.8184	198.50	
14+50	88.2241	204.10	
14+55	89.6698	209.93	
15+ 0	91.1601	216.39	
15+ 5	92.6975	223.23	
15+10	94.2880	230.94	
15+15	95.9356	239.22	
15+20	97.6485	248.72	
15+25	99.4262	258.12	
15+30	101.2667	267.24	
15+35	103.1627	275.30	
15+40	105.0857	279.21	
15+45	107.0723	288.46	
15+50	109.2045	309.60	
15+55	111.5620	342.31	
16+ 0	114.3132	399.47	
16+ 5	117.9820	532.71	
16+10	123.1380	748.66	
16+15	129.9116	983.53	
16+20	139.2252	1352.32	
16+25	147.1368	1148.77	
16+30	152.4108	765.78	
16+35	156.6784	619.66	
16+40	160.3782	537.22	
16+45	163.6461	474.50	
16+50	166.5573	422.70	
16+55	169.1598	377.89	
17+ 0	171.5004	339.84	
17+ 5	173.5994	304.79	
17+10	175.4977	275.63	
17+15	177.2064	248.11	
17+20	178.7284	220.99	
17+25	180.1443	205.59	
17+30	181.4820	194.24	

17+35	182.7521	184.42		Q			V
17+40	183.9561	174.81		Q			V
17+45	185.1178	168.68		Q			V
17+50	186.2411	163.11		Q			V
17+55	187.3104	155.26		Q			V
18+ 0	188.3324	148.40		Q			V
18+ 5	189.3091	141.81		Q			V
18+10	190.2415	135.38		Q			V
18+15	191.1167	127.09		Q			V
18+20	191.9259	117.49		Q			V
18+25	192.6794	109.41		Q			V
18+30	193.3975	104.27	Q				V
18+35	194.0864	100.03	Q				V
18+40	194.7502	96.37	Q				V
18+45	195.3917	93.15	Q				V
18+50	196.0133	90.26	Q				V
18+55	196.6170	87.66	Q				V
19+ 0	197.2045	85.30	Q				V
19+ 5	197.7773	83.17	Q				V
19+10	198.3367	81.23	Q				V
19+15	198.8839	79.45	Q				V
19+20	199.4202	77.86	Q				V
19+25	199.9461	76.36	Q				V
19+30	200.4622	74.94	Q				V
19+35	200.9691	73.59	Q				V
19+40	201.4672	72.32	Q				V
19+45	201.9568	71.10	Q				V
19+50	202.4383	69.91	Q				V
19+55	202.9121	68.79	Q				V
20+ 0	203.3785	67.73	Q				V
20+ 5	203.8380	66.71	Q				V
20+10	204.2907	65.74	Q				V
20+15	204.7371	64.81	Q				V
20+20	205.1773	63.92	Q				V
20+25	205.6116	63.06	Q				V
20+30	206.0401	62.23	Q				V
20+35	206.4632	61.43	Q				V
20+40	206.8809	60.65	Q				V
20+45	207.2934	59.90	Q				V
20+50	207.7009	59.17	Q				V
20+55	208.1036	58.47	Q				V
21+ 0	208.5016	57.78	Q				V
21+ 5	208.8950	57.12	Q				V
21+10	209.2840	56.48	Q				V
21+15	209.6686	55.85	Q				V
21+20	210.0491	55.25	Q				V
21+25	210.4256	54.66	Q				V
21+30	210.7981	54.08	Q				V
21+35	211.1667	53.53	Q				V
21+40	211.5316	52.98	Q				V
21+45	211.8928	52.45	Q				V
21+50	212.2505	51.94	Q				V
21+55	212.6048	51.44	Q				V
22+ 0	212.9556	50.94	Q				V
22+ 5	213.3032	50.47	Q				V
22+10	213.6476	50.00	Q				V
22+15	213.9888	49.54	Q				V
22+20	214.3269	49.10	Q				V

22+25	214.6621	48.66	|Q	|	|	|	V |
22+30	214.9943	48.24	|Q	|	|	|	V |
22+35	215.3237	47.82	|Q	|	|	|	V |
22+40	215.6502	47.42	|Q	|	|	|	V |
22+45	215.9741	47.02	|Q	|	|	|	V |
22+50	216.2952	46.63	|Q	|	|	|	V |
22+55	216.6138	46.25	|Q	|	|	|	V|
23+ 0	216.9297	45.88	|Q	|	|	|	V|
23+ 5	217.2432	45.51	|Q	|	|	|	V|
23+10	217.5542	45.16	|Q	|	|	|	V|
23+15	217.8628	44.81	|Q	|	|	|	V|
23+20	218.1690	44.46	|Q	|	|	|	V|
23+25	218.4729	44.13	|Q	|	|	|	V|
23+30	218.7746	43.80	|Q	|	|	|	V|
23+35	219.0740	43.47	|Q	|	|	|	V|
23+40	219.3712	43.16	|Q	|	|	|	V|
23+45	219.6663	42.85	|Q	|	|	|	V|
23+50	219.9592	42.54	|Q	|	|	|	V|
23+55	220.2501	42.24	|Q	|	|	|	V|
24+ 0	220.5390	41.94	|Q	|	|	|	V|
24+ 5	220.8206	40.88	|Q	|	|	|	V|
24+10	221.0837	38.21	|Q	|	|	|	V|
24+15	221.3151	33.60	Q	|	|	|	V|
24+20	221.4776	23.59	Q	|	|	|	V|
24+25	221.5840	15.45	Q	|	|	|	V|
24+30	221.6643	11.66	Q	|	|	|	V|
24+35	221.7263	9.01	Q	|	|	|	V|
24+40	221.7744	6.98	Q	|	|	|	V|
24+45	221.8117	5.41	Q	|	|	|	V|
24+50	221.8402	4.14	Q	|	|	|	V|
24+55	221.8618	3.14	Q	|	|	|	V|
25+ 0	221.8779	2.33	Q	|	|	|	V|
25+ 5	221.8897	1.72	Q	|	|	|	V|
25+10	221.8984	1.25	Q	|	|	|	V|
25+15	221.9047	0.92	Q	|	|	|	V|
25+20	221.9098	0.75	Q	|	|	|	V|
25+25	221.9140	0.61	Q	|	|	|	V|
25+30	221.9175	0.50	Q	|	|	|	V|
25+35	221.9202	0.40	Q	|	|	|	V|
25+40	221.9224	0.33	Q	|	|	|	V|
25+45	221.9241	0.25	Q	|	|	|	V|
25+50	221.9252	0.16	Q	|	|	|	V|
25+55	221.9259	0.09	Q	|	|	|	V|
26+ 0	221.9262	0.05	Q	|	|	|	V|
26+ 5	221.9264	0.02	Q	|	|	|	V

Appendix

J

PROPOSED CONDITION HYDROLOGY UNIT HYDROGRAPH METHOD

3

PROPOSED CONDITION HYDROLOGY
UNIT HYDROGRAPH METHOD

U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/30/12 File Name UNIT10Y24HPR.out

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Orange County Unit Hydrograph Hydrology Method
Manual Date(s) - October 1986, November 1996

Program License Serial Number 6062

ESPERANZA HILLS
DETENTION BASIN ANALYSIS
PROPOSED CONDITION
10 YEAR 24 HOUR

Storm Event Year = 10

Antecedent Moisture Condition = 2

English (in-lb) Input Units Used
++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	Area (Ac.)	Area Fraction	Soil Group	Fp (In/Hr)	Ap (dec.)	Fm (In/Hr)
56.0	17.0	0.03	B	0.300	0.910	0.273
69.0	404.8	0.66	C	0.250	0.910	0.228
75.0	188.4	0.31	D	0.200	0.910	0.182

Area-averaged adjusted loss rate Fm (In/Hr) = 0.215

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC2)	S	Pervious Yield Fr
15.47	0.025	56.0	56.0	7.86	0.121
1.53	0.003	98.0	98.0	0.20	0.936
368.32	0.604	69.0	69.0	4.49	0.289
36.43	0.060	98.0	98.0	0.20	0.936
171.43	0.281	75.0	75.0	3.33	0.389
16.96	0.028	98.0	98.0	0.20	0.936

Area-averaged catchment yield fraction, Y = 0.371
Area-averaged low loss fraction, Yb = 0.629
++

User entry of time of concentration = 0.350 (hours)
Watershed area = 610.14(Ac.)
Catchment Lag time = 0.280 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 29.7619
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.215(In/Hr)
Average low loss rate fraction (Yb) = 0.629 (decimal)
FOOTHILL S-Graph Selected
Computed peak 5-minute rainfall = 0.340(In)
Computed peak 30-minute rainfall = 0.720(In)
Specified peak 1-hour rainfall = 0.950(In)
Computed peak 3-hour rainfall = 1.590(In)
Specified peak 6-hour rainfall = 2.200(In)
Specified peak 24-hour rainfall = 3.680(In)

Rainfall depth area reduction factors:
Using a total area of 610.14(Ac.) (Ref: fig. E-4)

5-minute factor = 0.971 Adjusted rainfall = 0.330(In)
30-minute factor = 0.971 Adjusted rainfall = 0.699(In)
1-hour factor = 0.971 Adjusted rainfall = 0.923(In)
3-hour factor = 0.996 Adjusted rainfall = 1.584(In)
6-hour factor = 0.998 Adjusted rainfall = 2.196(In)
24-hour factor = 0.999 Adjusted rainfall = 3.677(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
(K = 7378.88 (CFS))		
1	2.128	157.038
2	8.922	501.306
3	22.234	982.240
4	51.048	2126.224
5	66.754	1158.883
6	75.119	617.216
7	81.149	444.950
8	85.674	333.905
9	89.229	262.309
10	92.005	204.894
11	94.197	161.717
12	95.822	119.889
13	97.052	90.809
14	97.875	60.725
15	98.279	29.754
16	98.613	24.652
17	98.908	21.817
18	99.125	15.988
19	99.312	13.770
20	99.543	17.063
21	99.739	14.470
22	99.859	8.841
23	99.939	5.942

24	100.000	4.480

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.3303	0.3303
2	0.4415	0.1112
3	0.5232	0.0817
4	0.5902	0.0670
5	0.6480	0.0578
6	0.6994	0.0514
7	0.7439	0.0445
8	0.7847	0.0408
9	0.8225	0.0378
10	0.8579	0.0354
11	0.8913	0.0333
12	0.9228	0.0316
13	0.9599	0.0371
14	0.9955	0.0356
15	1.0299	0.0344
16	1.0631	0.0332
17	1.0953	0.0322
18	1.1265	0.0312
19	1.1569	0.0304
20	1.1865	0.0296
21	1.2153	0.0288
22	1.2434	0.0281
23	1.2709	0.0275
24	1.2978	0.0269
25	1.3241	0.0263
26	1.3499	0.0258
27	1.3752	0.0253
28	1.4000	0.0248
29	1.4244	0.0244
30	1.4483	0.0240
31	1.4719	0.0236
32	1.4951	0.0232
33	1.5179	0.0228
34	1.5403	0.0225
35	1.5624	0.0221
36	1.5842	0.0218
37	1.6048	0.0206
38	1.6251	0.0203
39	1.6451	0.0200
40	1.6648	0.0197
41	1.6843	0.0195
42	1.7035	0.0192
43	1.7225	0.0190
44	1.7413	0.0188
45	1.7598	0.0185
46	1.7781	0.0183
47	1.7962	0.0181
48	1.8141	0.0179
49	1.8318	0.0177
50	1.8493	0.0175
51	1.8666	0.0173
52	1.8838	0.0171
53	1.9008	0.0170
54	1.9176	0.0168

55	1.9342	0.0166
56	1.9507	0.0165
57	1.9670	0.0163
58	1.9832	0.0162
59	1.9992	0.0160
60	2.0151	0.0159
61	2.0309	0.0157
62	2.0465	0.0156
63	2.0620	0.0155
64	2.0773	0.0154
65	2.0925	0.0152
66	2.1076	0.0151
67	2.1226	0.0150
68	2.1375	0.0149
69	2.1522	0.0147
70	2.1669	0.0146
71	2.1814	0.0145
72	2.1958	0.0144
73	2.2071	0.0113
74	2.2183	0.0112
75	2.2294	0.0111
76	2.2404	0.0110
77	2.2513	0.0109
78	2.2622	0.0108
79	2.2729	0.0107
80	2.2836	0.0107
81	2.2941	0.0106
82	2.3046	0.0105
83	2.3150	0.0104
84	2.3254	0.0103
85	2.3356	0.0103
86	2.3458	0.0102
87	2.3559	0.0101
88	2.3660	0.0100
89	2.3759	0.0100
90	2.3858	0.0099
91	2.3956	0.0098
92	2.4054	0.0098
93	2.4151	0.0097
94	2.4247	0.0096
95	2.4343	0.0096
96	2.4438	0.0095
97	2.4532	0.0094
98	2.4626	0.0094
99	2.4719	0.0093
100	2.4812	0.0093
101	2.4904	0.0092
102	2.4995	0.0091
103	2.5086	0.0091
104	2.5176	0.0090
105	2.5266	0.0090
106	2.5355	0.0089
107	2.5444	0.0089
108	2.5532	0.0088
109	2.5620	0.0088
110	2.5707	0.0087
111	2.5794	0.0087
112	2.5880	0.0086

113	2.5966		0.0086
114	2.6051		0.0085
115	2.6136		0.0085
116	2.6220		0.0084
117	2.6304		0.0084
118	2.6387		0.0083
119	2.6470		0.0083
120	2.6553		0.0083
121	2.6635		0.0082
122	2.6716		0.0082
123	2.6797		0.0081
124	2.6878		0.0081
125	2.6959		0.0080
126	2.7039		0.0080
127	2.7118		0.0080
128	2.7198		0.0079
129	2.7276		0.0079
130	2.7355		0.0078
131	2.7433		0.0078
132	2.7511		0.0078
133	2.7588		0.0077
134	2.7665		0.0077
135	2.7742		0.0077
136	2.7818		0.0076
137	2.7894		0.0076
138	2.7969		0.0076
139	2.8044		0.0075
140	2.8119		0.0075
141	2.8194		0.0075
142	2.8268		0.0074
143	2.8342		0.0074
144	2.8415		0.0074
145	2.8489		0.0073
146	2.8562		0.0073
147	2.8634		0.0073
148	2.8707		0.0072
149	2.8779		0.0072
150	2.8850		0.0072
151	2.8922		0.0071
152	2.8993		0.0071
153	2.9063		0.0071
154	2.9134		0.0071
155	2.9204		0.0070
156	2.9274		0.0070
157	2.9344		0.0070
158	2.9413		0.0069
159	2.9482		0.0069
160	2.9551		0.0069
161	2.9620		0.0069
162	2.9688		0.0068
163	2.9756		0.0068
164	2.9824		0.0068
165	2.9891		0.0068
166	2.9958		0.0067
167	3.0025		0.0067
168	3.0092		0.0067
169	3.0159		0.0066
170	3.0225		0.0066

171	3.0291	0.0066
172	3.0357	0.0066
173	3.0422	0.0066
174	3.0488	0.0065
175	3.0553	0.0065
176	3.0617	0.0065
177	3.0682	0.0065
178	3.0746	0.0064
179	3.0811	0.0064
180	3.0874	0.0064
181	3.0938	0.0064
182	3.1002	0.0063
183	3.1065	0.0063
184	3.1128	0.0063
185	3.1191	0.0063
186	3.1253	0.0063
187	3.1316	0.0062
188	3.1378	0.0062
189	3.1440	0.0062
190	3.1502	0.0062
191	3.1563	0.0062
192	3.1624	0.0061
193	3.1686	0.0061
194	3.1747	0.0061
195	3.1807	0.0061
196	3.1868	0.0061
197	3.1928	0.0060
198	3.1988	0.0060
199	3.2048	0.0060
200	3.2108	0.0060
201	3.2168	0.0060
202	3.2227	0.0059
203	3.2287	0.0059
204	3.2346	0.0059
205	3.2405	0.0059
206	3.2463	0.0059
207	3.2522	0.0059
208	3.2580	0.0058
209	3.2638	0.0058
210	3.2696	0.0058
211	3.2754	0.0058
212	3.2812	0.0058
213	3.2869	0.0057
214	3.2927	0.0057
215	3.2984	0.0057
216	3.3041	0.0057
217	3.3097	0.0057
218	3.3154	0.0057
219	3.3211	0.0056
220	3.3267	0.0056
221	3.3323	0.0056
222	3.3379	0.0056
223	3.3435	0.0056
224	3.3491	0.0056
225	3.3546	0.0056
226	3.3601	0.0055
227	3.3657	0.0055
228	3.3712	0.0055

229	3.3767	0.0055
230	3.3821	0.0055
231	3.3876	0.0055
232	3.3931	0.0054
233	3.3985	0.0054
234	3.4039	0.0054
235	3.4093	0.0054
236	3.4147	0.0054
237	3.4201	0.0054
238	3.4254	0.0054
239	3.4308	0.0053
240	3.4361	0.0053
241	3.4414	0.0053
242	3.4467	0.0053
243	3.4520	0.0053
244	3.4573	0.0053
245	3.4626	0.0053
246	3.4678	0.0052
247	3.4730	0.0052
248	3.4783	0.0052
249	3.4835	0.0052
250	3.4887	0.0052
251	3.4939	0.0052
252	3.4990	0.0052
253	3.5042	0.0052
254	3.5093	0.0051
255	3.5145	0.0051
256	3.5196	0.0051
257	3.5247	0.0051
258	3.5298	0.0051
259	3.5349	0.0051
260	3.5399	0.0051
261	3.5450	0.0051
262	3.5500	0.0050
263	3.5551	0.0050
264	3.5601	0.0050
265	3.5651	0.0050
266	3.5701	0.0050
267	3.5751	0.0050
268	3.5801	0.0050
269	3.5850	0.0050
270	3.5900	0.0050
271	3.5949	0.0049
272	3.5998	0.0049
273	3.6048	0.0049
274	3.6097	0.0049
275	3.6146	0.0049
276	3.6194	0.0049
277	3.6243	0.0049
278	3.6292	0.0049
279	3.6340	0.0048
280	3.6389	0.0048
281	3.6437	0.0048
282	3.6485	0.0048
283	3.6533	0.0048
284	3.6581	0.0048
285	3.6629	0.0048
286	3.6677	0.0048

287	3.6724	0.0048	
288	3.6772	0.0048	

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0048	0.0030	0.0018
2	0.0048	0.0030	0.0018
3	0.0048	0.0030	0.0018
4	0.0048	0.0030	0.0018
5	0.0048	0.0030	0.0018
6	0.0048	0.0030	0.0018
7	0.0048	0.0031	0.0018
8	0.0049	0.0031	0.0018
9	0.0049	0.0031	0.0018
10	0.0049	0.0031	0.0018
11	0.0049	0.0031	0.0018
12	0.0049	0.0031	0.0018
13	0.0050	0.0031	0.0018
14	0.0050	0.0031	0.0018
15	0.0050	0.0031	0.0019
16	0.0050	0.0031	0.0019
17	0.0050	0.0032	0.0019
18	0.0050	0.0032	0.0019
19	0.0051	0.0032	0.0019
20	0.0051	0.0032	0.0019
21	0.0051	0.0032	0.0019
22	0.0051	0.0032	0.0019
23	0.0051	0.0032	0.0019
24	0.0051	0.0032	0.0019
25	0.0052	0.0033	0.0019
26	0.0052	0.0033	0.0019
27	0.0052	0.0033	0.0019
28	0.0052	0.0033	0.0019
29	0.0052	0.0033	0.0019
30	0.0053	0.0033	0.0020
31	0.0053	0.0033	0.0020
32	0.0053	0.0033	0.0020
33	0.0053	0.0034	0.0020
34	0.0053	0.0034	0.0020
35	0.0054	0.0034	0.0020
36	0.0054	0.0034	0.0020
37	0.0054	0.0034	0.0020
38	0.0054	0.0034	0.0020
39	0.0055	0.0034	0.0020
40	0.0055	0.0034	0.0020
41	0.0055	0.0035	0.0020
42	0.0055	0.0035	0.0020
43	0.0056	0.0035	0.0021
44	0.0056	0.0035	0.0021
45	0.0056	0.0035	0.0021
46	0.0056	0.0035	0.0021
47	0.0056	0.0036	0.0021
48	0.0057	0.0036	0.0021
49	0.0057	0.0036	0.0021
50	0.0057	0.0036	0.0021
51	0.0057	0.0036	0.0021

52	0.0058	0.0036	0.0021
53	0.0058	0.0036	0.0022
54	0.0058	0.0037	0.0022
55	0.0059	0.0037	0.0022
56	0.0059	0.0037	0.0022
57	0.0059	0.0037	0.0022
58	0.0059	0.0037	0.0022
59	0.0060	0.0037	0.0022
60	0.0060	0.0038	0.0022
61	0.0060	0.0038	0.0022
62	0.0060	0.0038	0.0022
63	0.0061	0.0038	0.0023
64	0.0061	0.0038	0.0023
65	0.0061	0.0039	0.0023
66	0.0062	0.0039	0.0023
67	0.0062	0.0039	0.0023
68	0.0062	0.0039	0.0023
69	0.0063	0.0039	0.0023
70	0.0063	0.0040	0.0023
71	0.0063	0.0040	0.0023
72	0.0063	0.0040	0.0024
73	0.0064	0.0040	0.0024
74	0.0064	0.0040	0.0024
75	0.0065	0.0041	0.0024
76	0.0065	0.0041	0.0024
77	0.0065	0.0041	0.0024
78	0.0066	0.0041	0.0024
79	0.0066	0.0042	0.0024
80	0.0066	0.0042	0.0025
81	0.0067	0.0042	0.0025
82	0.0067	0.0042	0.0025
83	0.0068	0.0042	0.0025
84	0.0068	0.0043	0.0025
85	0.0068	0.0043	0.0025
86	0.0069	0.0043	0.0025
87	0.0069	0.0043	0.0026
88	0.0069	0.0044	0.0026
89	0.0070	0.0044	0.0026
90	0.0070	0.0044	0.0026
91	0.0071	0.0045	0.0026
92	0.0071	0.0045	0.0026
93	0.0072	0.0045	0.0027
94	0.0072	0.0045	0.0027
95	0.0073	0.0046	0.0027
96	0.0073	0.0046	0.0027
97	0.0074	0.0046	0.0027
98	0.0074	0.0046	0.0027
99	0.0075	0.0047	0.0028
100	0.0075	0.0047	0.0028
101	0.0076	0.0048	0.0028
102	0.0076	0.0048	0.0028
103	0.0077	0.0048	0.0028
104	0.0077	0.0048	0.0029
105	0.0078	0.0049	0.0029
106	0.0078	0.0049	0.0029
107	0.0079	0.0050	0.0029
108	0.0079	0.0050	0.0029
109	0.0080	0.0050	0.0030

110	0.0080	0.0051	0.0030
111	0.0081	0.0051	0.0030
112	0.0082	0.0051	0.0030
113	0.0083	0.0052	0.0031
114	0.0083	0.0052	0.0031
115	0.0084	0.0053	0.0031
116	0.0084	0.0053	0.0031
117	0.0085	0.0054	0.0032
118	0.0086	0.0054	0.0032
119	0.0087	0.0055	0.0032
120	0.0087	0.0055	0.0032
121	0.0088	0.0055	0.0033
122	0.0089	0.0056	0.0033
123	0.0090	0.0056	0.0033
124	0.0090	0.0057	0.0034
125	0.0091	0.0058	0.0034
126	0.0092	0.0058	0.0034
127	0.0093	0.0059	0.0035
128	0.0094	0.0059	0.0035
129	0.0095	0.0060	0.0035
130	0.0096	0.0060	0.0035
131	0.0097	0.0061	0.0036
132	0.0098	0.0061	0.0036
133	0.0099	0.0062	0.0037
134	0.0100	0.0063	0.0037
135	0.0101	0.0064	0.0038
136	0.0102	0.0064	0.0038
137	0.0103	0.0065	0.0038
138	0.0104	0.0065	0.0039
139	0.0106	0.0067	0.0039
140	0.0107	0.0067	0.0040
141	0.0108	0.0068	0.0040
142	0.0109	0.0069	0.0041
143	0.0111	0.0070	0.0041
144	0.0112	0.0070	0.0042
145	0.0144	0.0091	0.0053
146	0.0145	0.0091	0.0054
147	0.0147	0.0093	0.0055
148	0.0149	0.0093	0.0055
149	0.0151	0.0095	0.0056
150	0.0152	0.0096	0.0056
151	0.0155	0.0097	0.0057
152	0.0156	0.0098	0.0058
153	0.0159	0.0100	0.0059
154	0.0160	0.0101	0.0059
155	0.0163	0.0103	0.0061
156	0.0165	0.0104	0.0061
157	0.0168	0.0106	0.0062
158	0.0170	0.0107	0.0063
159	0.0173	0.0109	0.0064
160	0.0175	0.0110	0.0065
161	0.0179	0.0113	0.0066
162	0.0181	0.0114	0.0067
163	0.0185	0.0117	0.0069
164	0.0188	0.0118	0.0070
165	0.0192	0.0121	0.0071
166	0.0195	0.0122	0.0072
167	0.0200	0.0126	0.0074

168	0.0203	0.0128	0.0075
169	0.0218	0.0137	0.0081
170	0.0221	0.0139	0.0082
171	0.0228	0.0143	0.0085
172	0.0232	0.0146	0.0086
173	0.0240	0.0151	0.0089
174	0.0244	0.0153	0.0090
175	0.0253	0.0159	0.0094
176	0.0258	0.0162	0.0096
177	0.0269	0.0169	0.0100
178	0.0275	0.0173	0.0102
179	0.0288	0.0179	0.0109
180	0.0296	0.0179	0.0117
181	0.0312	0.0179	0.0133
182	0.0322	0.0179	0.0143
183	0.0344	0.0179	0.0165
184	0.0356	0.0179	0.0177
185	0.0316	0.0179	0.0137
186	0.0333	0.0179	0.0154
187	0.0378	0.0179	0.0200
188	0.0408	0.0179	0.0229
189	0.0514	0.0179	0.0335
190	0.0578	0.0179	0.0399
191	0.0817	0.0179	0.0638
192	0.1112	0.0179	0.0933
193	0.3303	0.0179	0.3124
194	0.0670	0.0179	0.0491
195	0.0445	0.0179	0.0266
196	0.0354	0.0179	0.0175
197	0.0371	0.0179	0.0192
198	0.0332	0.0179	0.0153
199	0.0304	0.0179	0.0125
200	0.0281	0.0177	0.0104
201	0.0263	0.0166	0.0098
202	0.0248	0.0156	0.0092
203	0.0236	0.0148	0.0087
204	0.0225	0.0141	0.0083
205	0.0206	0.0129	0.0076
206	0.0197	0.0124	0.0073
207	0.0190	0.0119	0.0070
208	0.0183	0.0115	0.0068
209	0.0177	0.0111	0.0066
210	0.0171	0.0108	0.0064
211	0.0166	0.0105	0.0062
212	0.0162	0.0102	0.0060
213	0.0157	0.0099	0.0058
214	0.0154	0.0097	0.0057
215	0.0150	0.0094	0.0056
216	0.0146	0.0092	0.0054
217	0.0113	0.0071	0.0042
218	0.0110	0.0069	0.0041
219	0.0107	0.0068	0.0040
220	0.0105	0.0066	0.0039
221	0.0103	0.0065	0.0038
222	0.0100	0.0063	0.0037
223	0.0098	0.0062	0.0036
224	0.0096	0.0061	0.0036
225	0.0094	0.0059	0.0035

226	0.0093	0.0058	0.0034
227	0.0091	0.0057	0.0034
228	0.0089	0.0056	0.0033
229	0.0088	0.0055	0.0033
230	0.0086	0.0054	0.0032
231	0.0085	0.0053	0.0031
232	0.0083	0.0052	0.0031
233	0.0082	0.0052	0.0030
234	0.0081	0.0051	0.0030
235	0.0080	0.0050	0.0030
236	0.0078	0.0049	0.0029
237	0.0077	0.0049	0.0029
238	0.0076	0.0048	0.0028
239	0.0075	0.0047	0.0028
240	0.0074	0.0047	0.0028
241	0.0073	0.0046	0.0027
242	0.0072	0.0045	0.0027
243	0.0071	0.0045	0.0026
244	0.0071	0.0044	0.0026
245	0.0070	0.0044	0.0026
246	0.0069	0.0043	0.0026
247	0.0068	0.0043	0.0025
248	0.0067	0.0042	0.0025
249	0.0066	0.0042	0.0025
250	0.0066	0.0041	0.0024
251	0.0065	0.0041	0.0024
252	0.0064	0.0040	0.0024
253	0.0064	0.0040	0.0024
254	0.0063	0.0040	0.0023
255	0.0062	0.0039	0.0023
256	0.0062	0.0039	0.0023
257	0.0061	0.0038	0.0023
258	0.0061	0.0038	0.0022
259	0.0060	0.0038	0.0022
260	0.0059	0.0037	0.0022
261	0.0059	0.0037	0.0022
262	0.0058	0.0037	0.0022
263	0.0058	0.0036	0.0021
264	0.0057	0.0036	0.0021
265	0.0057	0.0036	0.0021
266	0.0056	0.0035	0.0021
267	0.0056	0.0035	0.0021
268	0.0055	0.0035	0.0021
269	0.0055	0.0035	0.0020
270	0.0054	0.0034	0.0020
271	0.0054	0.0034	0.0020
272	0.0054	0.0034	0.0020
273	0.0053	0.0033	0.0020
274	0.0053	0.0033	0.0020
275	0.0052	0.0033	0.0019
276	0.0052	0.0033	0.0019
277	0.0052	0.0032	0.0019
278	0.0051	0.0032	0.0019
279	0.0051	0.0032	0.0019
280	0.0050	0.0032	0.0019
281	0.0050	0.0032	0.0019
282	0.0050	0.0031	0.0018
283	0.0049	0.0031	0.0018

284	0.0049	0.0031	0.0018
285	0.0049	0.0031	0.0018
286	0.0048	0.0030	0.0018
287	0.0048	0.0030	0.0018
288	0.0048	0.0030	0.0018

Total soil rain loss = 1.92(In)
Total effective rainfall = 1.75(In)
Peak flow rate in flood hydrograph = 923.64(CFS)

++

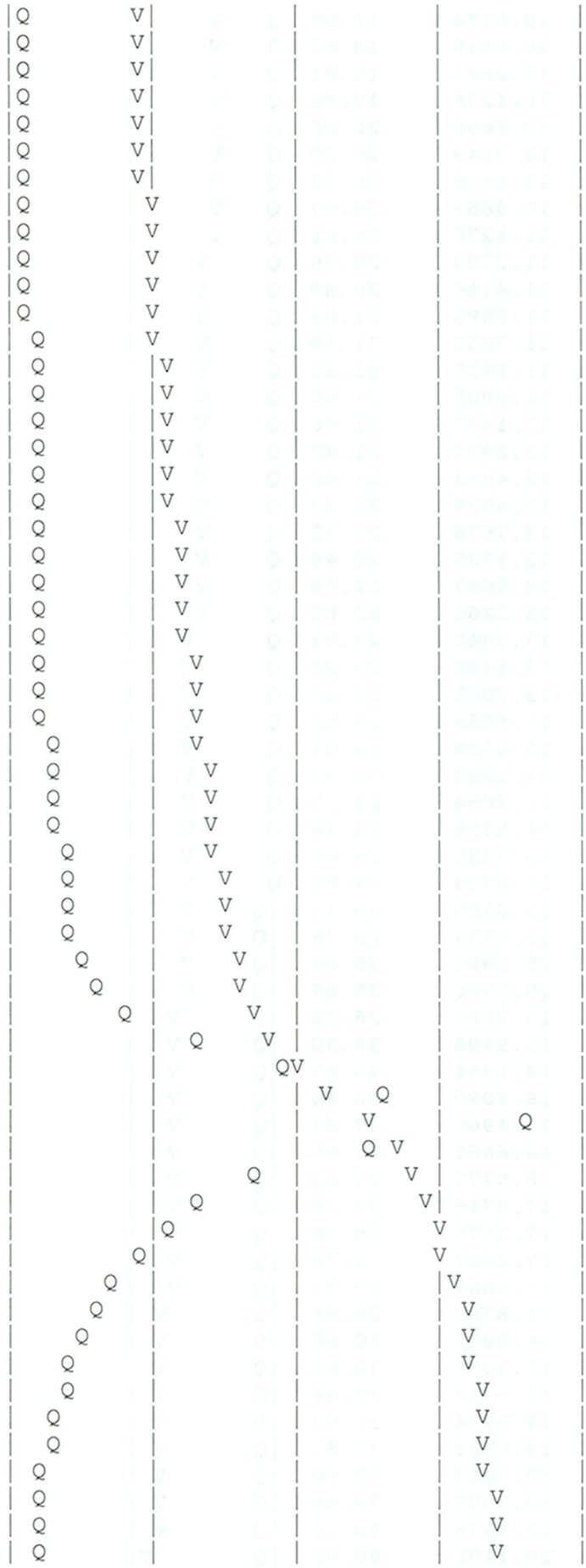
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	250.0	500.0	750.0	1000.0
0+ 5	0.0019	0.28	Q				
0+10	0.0099	1.16	Q				
0+15	0.0299	2.90	Q				
0+20	0.0757	6.66	Q				
0+25	0.1358	8.72	Q				
0+30	0.2035	9.84	Q				
0+35	0.2769	10.65	Q				
0+40	0.3546	11.28	Q				
0+45	0.4357	11.78	Q				
0+50	0.5196	12.18	Q				
0+55	0.6057	12.51	Q				
1+ 0	0.6936	12.76	Q				
1+ 5	0.7829	12.96	Q				
1+10	0.8732	13.12	Q				
1+15	0.9642	13.21	Q				
1+20	1.0558	13.30	Q				
1+25	1.1480	13.39	Q				
1+30	1.2407	13.46	Q				
1+35	1.3339	13.53	Q				
1+40	1.4277	13.61	Q				
1+45	1.5219	13.68	Q				
1+50	1.6166	13.75	Q				
1+55	1.7117	13.81	Q				
2+ 0	1.8072	13.87	Q				
2+ 5	1.9031	13.92	Q				
2+10	1.9993	13.97	Q				
2+15	2.0959	14.02	Q				
2+20	2.1928	14.07	Q				
2+25	2.2901	14.12	QV				
2+30	2.3877	14.18	QV				
2+35	2.4857	14.23	QV				
2+40	2.5841	14.29	QV				
2+45	2.6829	14.34	QV				
2+50	2.7821	14.40	QV				
2+55	2.8816	14.45	QV				
3+ 0	2.9815	14.51	QV				
3+ 5	3.0818	14.56	QV				
3+10	3.1825	14.62	QV				

3+15	3.2836	14.68	QV	
3+20	3.3851	14.74	QV	
3+25	3.4870	14.80	QV	
3+30	3.5894	14.86	QV	
3+35	3.6921	14.92	QV	
3+40	3.7953	14.98	QV	
3+45	3.8988	15.04	QV	
3+50	4.0029	15.10	QV	
3+55	4.1073	15.17	QV	
4+ 0	4.2122	15.23	QV	
4+ 5	4.3175	15.29	QV	
4+10	4.4233	15.36	QV	
4+15	4.5296	15.42	Q V	
4+20	4.6363	15.49	Q V	
4+25	4.7434	15.56	Q V	
4+30	4.8511	15.63	Q V	
4+35	4.9592	15.70	Q V	
4+40	5.0677	15.77	Q V	
4+45	5.1768	15.84	Q V	
4+50	5.2864	15.91	Q V	
4+55	5.3964	15.98	Q V	
5+ 0	5.5070	16.05	Q V	
5+ 5	5.6181	16.13	Q V	
5+10	5.7297	16.20	Q V	
5+15	5.8418	16.28	Q V	
5+20	5.9544	16.36	Q V	
5+25	6.0676	16.43	Q V	
5+30	6.1813	16.51	Q V	
5+35	6.2955	16.59	Q V	
5+40	6.4104	16.67	Q V	
5+45	6.5257	16.75	Q V	
5+50	6.6417	16.84	Q V	
5+55	6.7582	16.92	Q V	
6+ 0	6.8753	17.01	Q V	
6+ 5	6.9930	17.09	Q V	
6+10	7.1113	17.18	Q V	
6+15	7.2302	17.26	Q V	
6+20	7.3497	17.36	Q V	
6+25	7.4699	17.44	Q V	
6+30	7.5907	17.54	Q V	
6+35	7.7121	17.63	Q V	
6+40	7.8341	17.73	Q V	
6+45	7.9568	17.82	Q V	
6+50	8.0803	17.92	Q V	
6+55	8.2043	18.01	Q V	
7+ 0	8.3291	18.12	Q V	
7+ 5	8.4545	18.21	Q V	
7+10	8.5807	18.32	Q V	
7+15	8.7076	18.42	Q V	
7+20	8.8352	18.53	Q V	
7+25	8.9635	18.63	Q V	
7+30	9.0926	18.75	Q V	
7+35	9.2225	18.85	Q V	
7+40	9.3531	18.97	Q V	
7+45	9.4845	19.08	Q V	
7+50	9.6168	19.20	Q V	
7+55	9.7498	19.31	Q V	
8+ 0	9.8837	19.44	Q V	

8+ 5	10.0184	19.56	Q	V
8+10	10.1539	19.68	Q	V
8+15	10.2903	19.81	Q	V
8+20	10.4276	19.94	Q	V
8+25	10.5658	20.06	Q	V
8+30	10.7049	20.20	Q	V
8+35	10.8449	20.33	Q	V
8+40	10.9859	20.47	Q	V
8+45	11.1278	20.61	Q	V
8+50	11.2707	20.75	Q	V
8+55	11.4146	20.89	Q	V
9+ 0	11.5595	21.04	Q	V
9+ 5	11.7055	21.19	Q	V
9+10	11.8525	21.35	Q	V
9+15	12.0005	21.50	Q	V
9+20	12.1497	21.66	Q	V
9+25	12.2999	21.82	Q	V
9+30	12.4513	21.98	Q	V
9+35	12.6039	22.15	Q	V
9+40	12.7576	22.32	Q	V
9+45	12.9125	22.49	Q	V
9+50	13.0687	22.68	Q	V
9+55	13.2261	22.85	Q	V
10+ 0	13.3848	23.04	Q	V
10+ 5	13.5448	23.23	Q	V
10+10	13.7061	23.43	Q	V
10+15	13.8688	23.62	Q	V
10+20	14.0329	23.83	Q	V
10+25	14.1984	24.03	Q	V
10+30	14.3654	24.25	Q	V
10+35	14.5338	24.46	Q	V
10+40	14.7038	24.69	Q	V
10+45	14.8754	24.91	Q	V
10+50	15.0485	25.15	Q	V
10+55	15.2233	25.38	Q	V
11+ 0	15.3998	25.63	Q	V
11+ 5	15.5780	25.87	Q	V
11+10	15.7580	26.14	Q	V
11+15	15.9398	26.39	Q	V
11+20	16.1234	26.67	Q	V
11+25	16.3090	26.94	Q	V
11+30	16.4965	27.23	Q	V
11+35	16.6861	27.52	Q	V
11+40	16.8777	27.83	Q	V
11+45	17.0715	28.13	Q	V
11+50	17.2675	28.46	Q	V
11+55	17.4657	28.78	Q	V
12+ 0	17.6664	29.13	Q	V
12+ 5	17.8705	29.65	Q	V
12+10	18.0812	30.58	Q	V
12+15	18.3019	32.05	Q	V
12+20	18.5418	34.84	Q	V
12+25	18.7934	36.53	Q	V
12+30	19.0529	37.67	Q	V
12+35	19.3187	38.60	Q	V
12+40	19.5905	39.46	Q	V
12+45	19.8675	40.22	Q	V
12+50	20.1496	40.96	Q	V

12+55	20.4364	41.65	
13+ 0	20.7280	42.34	
13+ 5	21.0240	42.98	
13+10	21.3247	43.65	
13+15	21.6296	44.27	
13+20	21.9392	44.95	
13+25	22.2533	45.61	
13+30	22.5725	46.34	
13+35	22.8965	47.05	
13+40	23.2260	47.85	
13+45	23.5609	48.63	
13+50	23.9018	49.49	
13+55	24.2485	50.34	
14+ 0	24.6017	51.29	
14+ 5	24.9617	52.28	
14+10	25.3302	53.50	
14+15	25.7082	54.88	
14+20	26.0993	56.80	
14+25	26.5014	58.38	
14+30	26.9141	59.94	
14+35	27.3373	61.44	
14+40	27.7718	63.10	
14+45	28.2178	64.75	
14+50	28.6766	66.62	
14+55	29.1487	68.54	
15+ 0	29.6370	70.91	
15+ 5	30.1450	73.76	
15+10	30.6818	77.94	
15+15	31.2566	83.45	
15+20	31.8834	91.01	
15+25	32.5600	98.25	
15+30	33.2856	105.36	
15+35	34.0443	110.16	
15+40	34.8037	110.27	
15+45	35.6287	119.79	
15+50	36.5952	140.32	
15+55	37.7671	170.17	
16+ 0	39.2999	222.55	
16+ 5	41.5412	325.45	
16+10	44.9217	490.85	
16+15	49.5499	672.01	
16+20	55.9111	923.64	
16+25	60.2256	626.47	
16+30	63.1600	426.07	
16+35	65.4668	334.95	
16+40	67.3959	280.11	
16+45	69.0204	235.88	
16+50	70.3796	197.35	
16+55	71.5245	166.25	
17+ 0	72.4895	140.12	
17+ 5	73.3149	119.84	
17+10	74.0145	101.58	
17+15	74.6047	85.70	
17+20	75.1399	77.71	
17+25	75.6356	71.98	
17+30	76.0945	66.64	
17+35	76.5272	62.83	
17+40	76.9451	60.67	

17+45	77.3391	57.21	Q			V
17+50	77.7056	53.23	Q			V
17+55	78.0511	50.16	Q			V
18+ 0	78.3798	47.72	Q			V
18+ 5	78.6879	44.74	Q			V
18+10	78.9821	42.71	Q			V
18+15	79.2601	40.37	Q			V
18+20	79.5143	36.90	Q			V
18+25	79.7526	34.61	Q			V
18+30	79.9801	33.02	Q			V
18+35	80.1984	31.71	Q			V
18+40	80.4090	30.57	Q			V
18+45	80.6126	29.57	Q			V
18+50	80.8102	28.68	Q			V
18+55	81.0022	27.88	Q			V
19+ 0	81.1892	27.16	Q			V
19+ 5	81.3718	26.51	Q			V
19+10	81.5503	25.92	Q			V
19+15	81.7251	25.39	Q			V
19+20	81.8966	24.89	Q			V
19+25	82.0648	24.42	Q			V
19+30	82.2299	23.98	Q			V
19+35	82.3921	23.55	Q			V
19+40	82.5515	23.14	Q			V
19+45	82.7082	22.76	Q			V
19+50	82.8624	22.39	Q			V
19+55	83.0142	22.04	Q			V
20+ 0	83.1637	21.70	Q			V
20+ 5	83.3109	21.39	Q			V
20+10	83.4561	21.08	Q			V
20+15	83.5993	20.79	Q			V
20+20	83.7405	20.50	Q			V
20+25	83.8798	20.23	Q			V
20+30	84.0173	19.97	Q			V
20+35	84.1531	19.71	Q			V
20+40	84.2871	19.46	Q			V
20+45	84.4195	19.22	Q			V
20+50	84.5503	18.99	Q			V
20+55	84.6796	18.77	Q			V
21+ 0	84.8074	18.55	Q			V
21+ 5	84.9337	18.34	Q			V
21+10	85.0585	18.13	Q			V
21+15	85.1821	17.93	Q			V
21+20	85.3042	17.74	Q			V
21+25	85.4251	17.55	Q			V
21+30	85.5447	17.37	Q			V
21+35	85.6631	17.19	Q			V
21+40	85.7803	17.02	Q			V
21+45	85.8964	16.85	Q			V
21+50	86.0113	16.68	Q			V
21+55	86.1251	16.52	Q			V
22+ 0	86.2378	16.37	Q			V
22+ 5	86.3494	16.21	Q			V
22+10	86.4601	16.06	Q			V
22+15	86.5697	15.92	Q			V
22+20	86.6783	15.78	Q			V
22+25	86.7860	15.64	Q			V
22+30	86.8928	15.50	Q			V

22+35	86.9986	15.37	Q				V
22+40	87.1036	15.24	Q				V
22+45	87.2076	15.11	Q				V
22+50	87.3108	14.99	Q				V
22+55	87.4132	14.86	Q				V
23+ 0	87.5147	14.74	Q				V
23+ 5	87.6155	14.63	Q				V
23+10	87.7154	14.51	Q				V
23+15	87.8146	14.40	Q				V
23+20	87.9131	14.29	Q				V
23+25	88.0107	14.18	Q				V
23+30	88.1077	14.08	Q				V
23+35	88.2039	13.97	Q				V
23+40	88.2995	13.87	Q				V
23+45	88.3943	13.77	Q				V
23+50	88.4885	13.67	Q				V
23+55	88.5820	13.58	Q				V
24+ 0	88.6749	13.48	Q				V
24+ 5	88.7652	13.11	Q				V
24+10	88.8488	12.14	Q				V
24+15	88.9200	10.33	Q				V
24+20	88.9649	6.52	Q				V
24+25	88.9955	4.44	Q				V
24+30	89.0183	3.32	Q				V
24+35	89.0357	2.51	Q				V
24+40	89.0488	1.91	Q				V
24+45	89.0587	1.44	Q				V
24+50	89.0660	1.07	Q				V
24+55	89.0714	0.77	Q				V
25+ 0	89.0752	0.56	Q				V
25+ 5	89.0779	0.39	Q				V
25+10	89.0799	0.28	Q				V
25+15	89.0814	0.23	Q				V
25+20	89.0827	0.18	Q				V
25+25	89.0837	0.14	Q				V
25+30	89.0845	0.12	Q				V
25+35	89.0851	0.09	Q				V
25+40	89.0855	0.06	Q				V
25+45	89.0858	0.03	Q				V
25+50	89.0859	0.02	Q				V
25+55	89.0860	0.01	Q				V

U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/30/12 File Name UNIT25Y24HPR.out

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Orange County Unit Hydrograph Hydrology Method
Manual Date(s) - October 1986, November 1996

Program License Serial Number 6062

ESPERANZA HILLS
DETENTION BASIN ANALYSIS
PROPOSED CONDITION
25 YEAR 24 HOUR

Storm Event Year = 25

Antecedent Moisture Condition = 2

English (in-lb) Input Units Used

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	Area (Ac.)	Area Fraction	Soil Group	Fp (In/Hr)	Ap (dec.)	Fm (In/Hr)
56.0	17.0	0.03	B	0.300	0.910	0.273
69.0	404.8	0.66	C	0.250	0.910	0.228
75.0	188.4	0.31	D	0.200	0.910	0.182

Area-averaged adjusted loss rate Fm (In/Hr) = 0.215

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC2)	S	Pervious Yield Fr
15.47	0.025	56.0	56.0	7.86	0.176
1.53	0.003	98.0	98.0	0.20	0.947
368.32	0.604	69.0	69.0	4.49	0.355
36.43	0.060	98.0	98.0	0.20	0.947
171.43	0.281	75.0	75.0	3.33	0.455
16.96	0.028	98.0	98.0	0.20	0.947

Area-averaged catchment yield fraction, Y = 0.432
Area-averaged low loss fraction, Yb = 0.568

++

User entry of time of concentration = 0.340 (hours)
Watershed area = 610.14(Ac.)
Catchment Lag time = 0.272 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 30.6373
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.215(In/Hr)
Average low loss rate fraction (Yb) = 0.568 (decimal)
FOOTHILL S-Graph Selected
Computed peak 5-minute rainfall = 0.400(In)
Computed peak 30-minute rainfall = 0.870(In)
Specified peak 1-hour rainfall = 1.150(In)
Computed peak 3-hour rainfall = 1.940(In)
Specified peak 6-hour rainfall = 2.710(In)
Specified peak 24-hour rainfall = 4.490(In)

Rainfall depth area reduction factors:
Using a total area of 610.14(Ac.) (Ref: fig. E-4)

5-minute factor = 0.971 Adjusted rainfall = 0.389(In)
30-minute factor = 0.971 Adjusted rainfall = 0.845(In)
1-hour factor = 0.971 Adjusted rainfall = 1.117(In)
3-hour factor = 0.996 Adjusted rainfall = 1.933(In)
6-hour factor = 0.998 Adjusted rainfall = 2.705(In)
24-hour factor = 0.999 Adjusted rainfall = 4.487(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
(K = 7378.88 (CFS))		
1	2.209	162.974
2	9.338	526.071
3	23.817	1068.409
4	53.629	2199.779
5	68.080	1066.303
6	76.201	599.251
7	82.106	435.690
8	86.530	326.469
9	89.990	255.341
10	92.674	197.995
11	94.751	153.249
12	96.271	112.198
13	97.412	84.218
14	98.062	47.964
15	98.428	26.965
16	98.749	23.677
17	99.027	20.516
18	99.217	14.032
19	99.434	16.037
20	99.669	17.303
21	99.812	10.585
22	99.916	7.653
23	100.000	6.200

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.3886	0.3886
2	0.5248	0.1363
3	0.6257	0.1009
4	0.7088	0.0831
5	0.7809	0.0720
6	0.8451	0.0642
7	0.8992	0.0541
8	0.9489	0.0497
9	0.9950	0.0461
10	1.0381	0.0431
11	1.0787	0.0406
12	1.1171	0.0385
13	1.1626	0.0455
14	1.2064	0.0438
15	1.2487	0.0423
16	1.2896	0.0409
17	1.3292	0.0396
18	1.3677	0.0385
19	1.4051	0.0374
20	1.4415	0.0364
21	1.4771	0.0355
22	1.5117	0.0347
23	1.5457	0.0339
24	1.5788	0.0332
25	1.6113	0.0325
26	1.6432	0.0319
27	1.6744	0.0312
28	1.7051	0.0307
29	1.7352	0.0301
30	1.7648	0.0296
31	1.7940	0.0291
32	1.8226	0.0287
33	1.8508	0.0282
34	1.8786	0.0278
35	1.9060	0.0274
36	1.9330	0.0270
37	1.9588	0.0258
38	1.9843	0.0255
39	2.0094	0.0251
40	2.0343	0.0248
41	2.0587	0.0245
42	2.0829	0.0242
43	2.1068	0.0239
44	2.1304	0.0236
45	2.1538	0.0233
46	2.1768	0.0231
47	2.1997	0.0228
48	2.2222	0.0226
49	2.2445	0.0223
50	2.2666	0.0221
51	2.2885	0.0219
52	2.3101	0.0216
53	2.3316	0.0214
54	2.3528	0.0212
55	2.3738	0.0210

56	2.3946	0.0208
57	2.4152	0.0206
58	2.4357	0.0204
59	2.4560	0.0203
60	2.4761	0.0201
61	2.4960	0.0199
62	2.5157	0.0198
63	2.5353	0.0196
64	2.5547	0.0194
65	2.5740	0.0193
66	2.5931	0.0191
67	2.6121	0.0190
68	2.6309	0.0188
69	2.6496	0.0187
70	2.6681	0.0185
71	2.6866	0.0184
72	2.7048	0.0183
73	2.7185	0.0137
74	2.7320	0.0135
75	2.7454	0.0134
76	2.7587	0.0133
77	2.7719	0.0132
78	2.7850	0.0131
79	2.7980	0.0130
80	2.8109	0.0129
81	2.8237	0.0128
82	2.8363	0.0127
83	2.8489	0.0126
84	2.8614	0.0125
85	2.8738	0.0124
86	2.8861	0.0123
87	2.8983	0.0122
88	2.9104	0.0121
89	2.9224	0.0120
90	2.9344	0.0119
91	2.9462	0.0119
92	2.9580	0.0118
93	2.9697	0.0117
94	2.9813	0.0116
95	2.9929	0.0115
96	3.0043	0.0115
97	3.0157	0.0114
98	3.0270	0.0113
99	3.0383	0.0112
100	3.0494	0.0112
101	3.0605	0.0111
102	3.0716	0.0110
103	3.0825	0.0110
104	3.0934	0.0109
105	3.1042	0.0108
106	3.1150	0.0108
107	3.1257	0.0107
108	3.1363	0.0106
109	3.1469	0.0106
110	3.1574	0.0105
111	3.1678	0.0104
112	3.1782	0.0104
113	3.1886	0.0103

114	3.1988	0.0103
115	3.2090	0.0102
116	3.2192	0.0102
117	3.2293	0.0101
118	3.2394	0.0100
119	3.2494	0.0100
120	3.2593	0.0099
121	3.2692	0.0099
122	3.2790	0.0098
123	3.2888	0.0098
124	3.2985	0.0097
125	3.3082	0.0097
126	3.3179	0.0096
127	3.3275	0.0096
128	3.3370	0.0095
129	3.3465	0.0095
130	3.3559	0.0094
131	3.3653	0.0094
132	3.3747	0.0094
133	3.3840	0.0093
134	3.3933	0.0093
135	3.4025	0.0092
136	3.4117	0.0092
137	3.4208	0.0091
138	3.4299	0.0091
139	3.4389	0.0091
140	3.4480	0.0090
141	3.4569	0.0090
142	3.4659	0.0089
143	3.4747	0.0089
144	3.4836	0.0089
145	3.4924	0.0088
146	3.5012	0.0088
147	3.5099	0.0087
148	3.5186	0.0087
149	3.5273	0.0087
150	3.5359	0.0086
151	3.5445	0.0086
152	3.5530	0.0086
153	3.5615	0.0085
154	3.5700	0.0085
155	3.5785	0.0084
156	3.5869	0.0084
157	3.5953	0.0084
158	3.6036	0.0083
159	3.6119	0.0083
160	3.6202	0.0083
161	3.6284	0.0082
162	3.6366	0.0082
163	3.6448	0.0082
164	3.6530	0.0081
165	3.6611	0.0081
166	3.6692	0.0081
167	3.6772	0.0081
168	3.6852	0.0080
169	3.6932	0.0080
170	3.7012	0.0080
171	3.7091	0.0079

172	3.7170		0.0079
173	3.7249		0.0079
174	3.7328		0.0078
175	3.7406		0.0078
176	3.7484		0.0078
177	3.7561		0.0078
178	3.7638		0.0077
179	3.7716		0.0077
180	3.7792		0.0077
181	3.7869		0.0077
182	3.7945		0.0076
183	3.8021		0.0076
184	3.8097		0.0076
185	3.8172		0.0075
186	3.8247		0.0075
187	3.8322		0.0075
188	3.8397		0.0075
189	3.8471		0.0074
190	3.8546		0.0074
191	3.8620		0.0074
192	3.8693		0.0074
193	3.8767		0.0073
194	3.8840		0.0073
195	3.8913		0.0073
196	3.8986		0.0073
197	3.9058		0.0072
198	3.9130		0.0072
199	3.9202		0.0072
200	3.9274		0.0072
201	3.9346		0.0072
202	3.9417		0.0071
203	3.9488		0.0071
204	3.9559		0.0071
205	3.9630		0.0071
206	3.9700		0.0070
207	3.9770		0.0070
208	3.9840		0.0070
209	3.9910		0.0070
210	3.9980		0.0070
211	4.0049		0.0069
212	4.0118		0.0069
213	4.0187		0.0069
214	4.0256		0.0069
215	4.0325		0.0069
216	4.0393		0.0068
217	4.0461		0.0068
218	4.0529		0.0068
219	4.0597		0.0068
220	4.0665		0.0068
221	4.0732		0.0067
222	4.0799		0.0067
223	4.0866		0.0067
224	4.0933		0.0067
225	4.1000		0.0067
226	4.1066		0.0066
227	4.1132		0.0066
228	4.1198		0.0066
229	4.1264		0.0066

230	4.1330	0.0066
231	4.1395	0.0066
232	4.1461	0.0065
233	4.1526	0.0065
234	4.1591	0.0065
235	4.1656	0.0065
236	4.1720	0.0065
237	4.1785	0.0064
238	4.1849	0.0064
239	4.1913	0.0064
240	4.1977	0.0064
241	4.2041	0.0064
242	4.2104	0.0064
243	4.2168	0.0063
244	4.2231	0.0063
245	4.2294	0.0063
246	4.2357	0.0063
247	4.2420	0.0063
248	4.2482	0.0063
249	4.2545	0.0062
250	4.2607	0.0062
251	4.2669	0.0062
252	4.2731	0.0062
253	4.2793	0.0062
254	4.2855	0.0062
255	4.2916	0.0062
256	4.2978	0.0061
257	4.3039	0.0061
258	4.3100	0.0061
259	4.3161	0.0061
260	4.3222	0.0061
261	4.3282	0.0061
262	4.3343	0.0060
263	4.3403	0.0060
264	4.3463	0.0060
265	4.3523	0.0060
266	4.3583	0.0060
267	4.3643	0.0060
268	4.3702	0.0060
269	4.3762	0.0059
270	4.3821	0.0059
271	4.3880	0.0059
272	4.3939	0.0059
273	4.3998	0.0059
274	4.4057	0.0059
275	4.4116	0.0059
276	4.4174	0.0058
277	4.4232	0.0058
278	4.4291	0.0058
279	4.4349	0.0058
280	4.4407	0.0058
281	4.4465	0.0058
282	4.4522	0.0058
283	4.4580	0.0058
284	4.4637	0.0057
285	4.4695	0.0057
286	4.4752	0.0057
287	4.4809	0.0057

288 4.4866 0.0057

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0057	0.0032	0.0025
2	0.0057	0.0032	0.0025
3	0.0057	0.0033	0.0025
4	0.0057	0.0033	0.0025
5	0.0058	0.0033	0.0025
6	0.0058	0.0033	0.0025
7	0.0058	0.0033	0.0025
8	0.0058	0.0033	0.0025
9	0.0058	0.0033	0.0025
10	0.0059	0.0033	0.0025
11	0.0059	0.0033	0.0025
12	0.0059	0.0034	0.0026
13	0.0059	0.0034	0.0026
14	0.0059	0.0034	0.0026
15	0.0060	0.0034	0.0026
16	0.0060	0.0034	0.0026
17	0.0060	0.0034	0.0026
18	0.0060	0.0034	0.0026
19	0.0061	0.0034	0.0026
20	0.0061	0.0035	0.0026
21	0.0061	0.0035	0.0026
22	0.0061	0.0035	0.0026
23	0.0062	0.0035	0.0027
24	0.0062	0.0035	0.0027
25	0.0062	0.0035	0.0027
26	0.0062	0.0035	0.0027
27	0.0062	0.0035	0.0027
28	0.0063	0.0036	0.0027
29	0.0063	0.0036	0.0027
30	0.0063	0.0036	0.0027
31	0.0063	0.0036	0.0027
32	0.0064	0.0036	0.0027
33	0.0064	0.0036	0.0028
34	0.0064	0.0036	0.0028
35	0.0064	0.0037	0.0028
36	0.0065	0.0037	0.0028
37	0.0065	0.0037	0.0028
38	0.0065	0.0037	0.0028
39	0.0066	0.0037	0.0028
40	0.0066	0.0037	0.0028
41	0.0066	0.0038	0.0029
42	0.0066	0.0038	0.0029
43	0.0067	0.0038	0.0029
44	0.0067	0.0038	0.0029
45	0.0067	0.0038	0.0029
46	0.0067	0.0038	0.0029
47	0.0068	0.0038	0.0029
48	0.0068	0.0039	0.0029
49	0.0068	0.0039	0.0030
50	0.0069	0.0039	0.0030
51	0.0069	0.0039	0.0030
52	0.0069	0.0039	0.0030

53	0.0070	0.0040	0.0030
54	0.0070	0.0040	0.0030
55	0.0070	0.0040	0.0030
56	0.0070	0.0040	0.0030
57	0.0071	0.0040	0.0031
58	0.0071	0.0040	0.0031
59	0.0072	0.0041	0.0031
60	0.0072	0.0041	0.0031
61	0.0072	0.0041	0.0031
62	0.0072	0.0041	0.0031
63	0.0073	0.0041	0.0032
64	0.0073	0.0042	0.0032
65	0.0074	0.0042	0.0032
66	0.0074	0.0042	0.0032
67	0.0074	0.0042	0.0032
68	0.0075	0.0042	0.0032
69	0.0075	0.0043	0.0032
70	0.0075	0.0043	0.0033
71	0.0076	0.0043	0.0033
72	0.0076	0.0043	0.0033
73	0.0077	0.0044	0.0033
74	0.0077	0.0044	0.0033
75	0.0078	0.0044	0.0034
76	0.0078	0.0044	0.0034
77	0.0078	0.0045	0.0034
78	0.0079	0.0045	0.0034
79	0.0079	0.0045	0.0034
80	0.0080	0.0045	0.0034
81	0.0080	0.0046	0.0035
82	0.0081	0.0046	0.0035
83	0.0081	0.0046	0.0035
84	0.0081	0.0046	0.0035
85	0.0082	0.0047	0.0035
86	0.0082	0.0047	0.0036
87	0.0083	0.0047	0.0036
88	0.0083	0.0047	0.0036
89	0.0084	0.0048	0.0036
90	0.0084	0.0048	0.0036
91	0.0085	0.0048	0.0037
92	0.0086	0.0049	0.0037
93	0.0086	0.0049	0.0037
94	0.0087	0.0049	0.0037
95	0.0087	0.0050	0.0038
96	0.0088	0.0050	0.0038
97	0.0089	0.0050	0.0038
98	0.0089	0.0050	0.0038
99	0.0090	0.0051	0.0039
100	0.0090	0.0051	0.0039
101	0.0091	0.0052	0.0039
102	0.0091	0.0052	0.0039
103	0.0092	0.0052	0.0040
104	0.0093	0.0053	0.0040
105	0.0094	0.0053	0.0040
106	0.0094	0.0053	0.0041
107	0.0095	0.0054	0.0041
108	0.0095	0.0054	0.0041
109	0.0096	0.0055	0.0042
110	0.0097	0.0055	0.0042

111	0.0098	0.0056	0.0042
112	0.0098	0.0056	0.0043
113	0.0099	0.0056	0.0043
114	0.0100	0.0057	0.0043
115	0.0101	0.0057	0.0044
116	0.0102	0.0058	0.0044
117	0.0103	0.0058	0.0044
118	0.0103	0.0059	0.0045
119	0.0104	0.0059	0.0045
120	0.0105	0.0060	0.0045
121	0.0106	0.0060	0.0046
122	0.0107	0.0061	0.0046
123	0.0108	0.0061	0.0047
124	0.0109	0.0062	0.0047
125	0.0110	0.0063	0.0048
126	0.0111	0.0063	0.0048
127	0.0112	0.0064	0.0049
128	0.0113	0.0064	0.0049
129	0.0115	0.0065	0.0050
130	0.0115	0.0066	0.0050
131	0.0117	0.0066	0.0051
132	0.0118	0.0067	0.0051
133	0.0119	0.0068	0.0052
134	0.0120	0.0068	0.0052
135	0.0122	0.0069	0.0053
136	0.0123	0.0070	0.0053
137	0.0125	0.0071	0.0054
138	0.0126	0.0071	0.0054
139	0.0128	0.0073	0.0055
140	0.0129	0.0073	0.0056
141	0.0131	0.0074	0.0057
142	0.0132	0.0075	0.0057
143	0.0134	0.0076	0.0058
144	0.0135	0.0077	0.0058
145	0.0183	0.0104	0.0079
146	0.0184	0.0105	0.0080
147	0.0187	0.0106	0.0081
148	0.0188	0.0107	0.0081
149	0.0191	0.0109	0.0083
150	0.0193	0.0109	0.0083
151	0.0196	0.0111	0.0085
152	0.0198	0.0112	0.0085
153	0.0201	0.0114	0.0087
154	0.0203	0.0115	0.0088
155	0.0206	0.0117	0.0089
156	0.0208	0.0118	0.0090
157	0.0212	0.0121	0.0092
158	0.0214	0.0122	0.0093
159	0.0219	0.0124	0.0094
160	0.0221	0.0125	0.0095
161	0.0226	0.0128	0.0097
162	0.0228	0.0130	0.0099
163	0.0233	0.0133	0.0101
164	0.0236	0.0134	0.0102
165	0.0242	0.0137	0.0105
166	0.0245	0.0139	0.0106
167	0.0251	0.0143	0.0109
168	0.0255	0.0145	0.0110

169	0.0270	0.0153	0.0117
170	0.0274	0.0155	0.0118
171	0.0282	0.0160	0.0122
172	0.0287	0.0163	0.0124
173	0.0296	0.0168	0.0128
174	0.0301	0.0171	0.0130
175	0.0312	0.0177	0.0135
176	0.0319	0.0179	0.0140
177	0.0332	0.0179	0.0153
178	0.0339	0.0179	0.0160
179	0.0355	0.0179	0.0176
180	0.0364	0.0179	0.0185
181	0.0385	0.0179	0.0206
182	0.0396	0.0179	0.0217
183	0.0423	0.0179	0.0244
184	0.0438	0.0179	0.0259
185	0.0385	0.0179	0.0206
186	0.0406	0.0179	0.0227
187	0.0461	0.0179	0.0282
188	0.0497	0.0179	0.0318
189	0.0642	0.0179	0.0464
190	0.0720	0.0179	0.0541
191	0.1009	0.0179	0.0830
192	0.1363	0.0179	0.1184
193	0.3886	0.0179	0.3707
194	0.0831	0.0179	0.0652
195	0.0541	0.0179	0.0362
196	0.0431	0.0179	0.0252
197	0.0455	0.0179	0.0276
198	0.0409	0.0179	0.0230
199	0.0374	0.0179	0.0195
200	0.0347	0.0179	0.0168
201	0.0325	0.0179	0.0146
202	0.0307	0.0174	0.0133
203	0.0291	0.0165	0.0126
204	0.0278	0.0158	0.0120
205	0.0258	0.0147	0.0112
206	0.0248	0.0141	0.0107
207	0.0239	0.0136	0.0103
208	0.0231	0.0131	0.0100
209	0.0223	0.0127	0.0096
210	0.0216	0.0123	0.0094
211	0.0210	0.0119	0.0091
212	0.0204	0.0116	0.0088
213	0.0199	0.0113	0.0086
214	0.0194	0.0110	0.0084
215	0.0190	0.0108	0.0082
216	0.0185	0.0105	0.0080
217	0.0137	0.0078	0.0059
218	0.0133	0.0076	0.0057
219	0.0130	0.0074	0.0056
220	0.0127	0.0072	0.0055
221	0.0124	0.0070	0.0054
222	0.0121	0.0069	0.0052
223	0.0119	0.0067	0.0051
224	0.0116	0.0066	0.0050
225	0.0114	0.0065	0.0049
226	0.0112	0.0063	0.0048

227	0.0110	0.0062	0.0047
228	0.0108	0.0061	0.0046
229	0.0106	0.0060	0.0046
230	0.0104	0.0059	0.0045
231	0.0102	0.0058	0.0044
232	0.0100	0.0057	0.0043
233	0.0099	0.0056	0.0043
234	0.0097	0.0055	0.0042
235	0.0096	0.0054	0.0041
236	0.0094	0.0054	0.0041
237	0.0093	0.0053	0.0040
238	0.0092	0.0052	0.0040
239	0.0091	0.0051	0.0039
240	0.0089	0.0051	0.0039
241	0.0088	0.0050	0.0038
242	0.0087	0.0049	0.0038
243	0.0086	0.0049	0.0037
244	0.0085	0.0048	0.0037
245	0.0084	0.0048	0.0036
246	0.0083	0.0047	0.0036
247	0.0082	0.0046	0.0035
248	0.0081	0.0046	0.0035
249	0.0080	0.0045	0.0035
250	0.0079	0.0045	0.0034
251	0.0078	0.0044	0.0034
252	0.0077	0.0044	0.0033
253	0.0077	0.0043	0.0033
254	0.0076	0.0043	0.0033
255	0.0075	0.0043	0.0032
256	0.0074	0.0042	0.0032
257	0.0073	0.0042	0.0032
258	0.0073	0.0041	0.0031
259	0.0072	0.0041	0.0031
260	0.0071	0.0041	0.0031
261	0.0071	0.0040	0.0031
262	0.0070	0.0040	0.0030
263	0.0069	0.0039	0.0030
264	0.0069	0.0039	0.0030
265	0.0068	0.0039	0.0029
266	0.0068	0.0038	0.0029
267	0.0067	0.0038	0.0029
268	0.0066	0.0038	0.0029
269	0.0066	0.0037	0.0028
270	0.0065	0.0037	0.0028
271	0.0065	0.0037	0.0028
272	0.0064	0.0037	0.0028
273	0.0064	0.0036	0.0028
274	0.0063	0.0036	0.0027
275	0.0063	0.0036	0.0027
276	0.0062	0.0035	0.0027
277	0.0062	0.0035	0.0027
278	0.0061	0.0035	0.0027
279	0.0061	0.0035	0.0026
280	0.0060	0.0034	0.0026
281	0.0060	0.0034	0.0026
282	0.0060	0.0034	0.0026
283	0.0059	0.0034	0.0026
284	0.0059	0.0033	0.0025

285	0.0058	0.0033	0.0025
286	0.0058	0.0033	0.0025
287	0.0058	0.0033	0.0025
288	0.0057	0.0032	0.0025

Total soil rain loss = 2.08(In)
Total effective rainfall = 2.41(In)
Peak flow rate in flood hydrograph = 1148.30(CFS)

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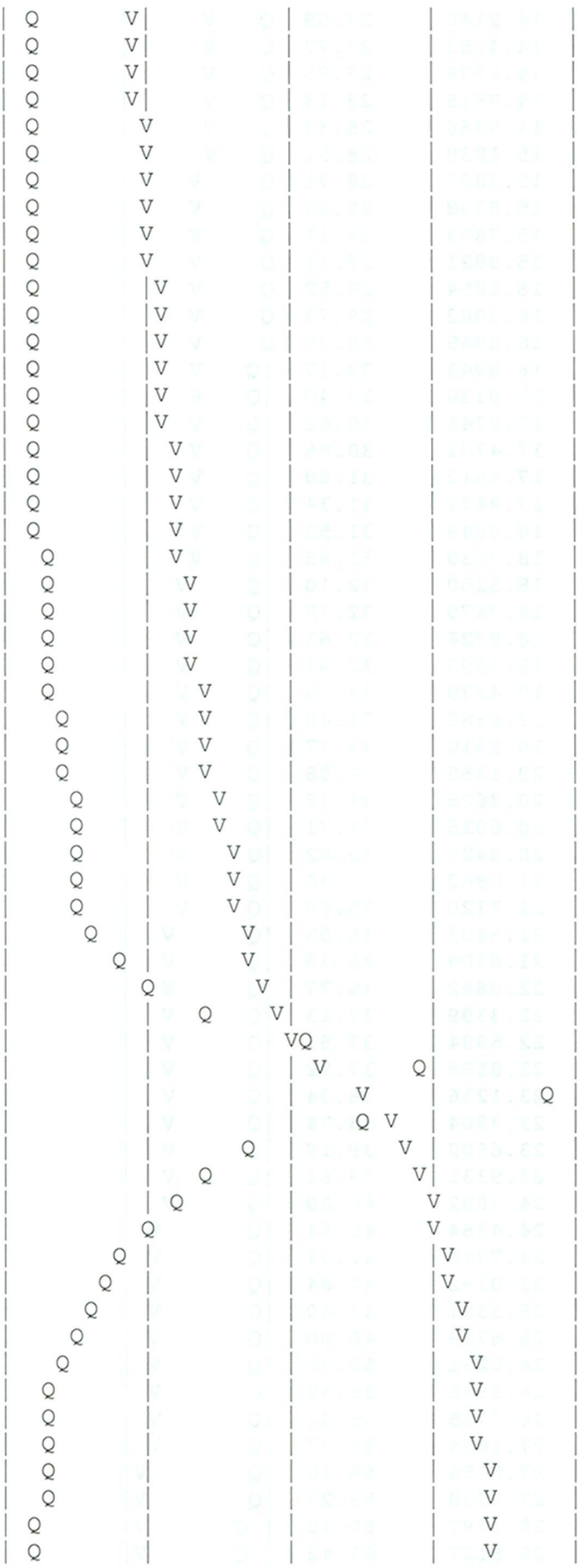
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	300.0	600.0	900.0	1200.0
0+ 5	0.0028	0.40	Q				
0+10	0.0144	1.70	Q				
0+15	0.0442	4.33	Q				
0+20	0.1114	9.75	Q				
0+25	0.1968	12.40	Q				
0+30	0.2927	13.92	Q				
0+35	0.3962	15.04	Q				
0+40	0.5057	15.89	Q				
0+45	0.6198	16.57	Q				
0+50	0.7377	17.12	Q				
0+55	0.8585	17.55	Q				
1+ 0	0.9817	17.89	Q				
1+ 5	1.1068	18.15	Q				
1+10	1.2330	18.34	Q				
1+15	1.3602	18.46	Q				
1+20	1.4882	18.59	Q				
1+25	1.6171	18.70	Q				
1+30	1.7466	18.81	Q				
1+35	1.8768	18.91	Q				
1+40	2.0078	19.02	Q				
1+45	2.1395	19.12	Q				
1+50	2.2718	19.21	Q				
1+55	2.4046	19.29	Q				
2+ 0	2.5379	19.36	Q				
2+ 5	2.6718	19.43	Q				
2+10	2.8061	19.51	Q				
2+15	2.9409	19.58	Q				
2+20	3.0763	19.65	QV				
2+25	3.2121	19.72	QV				
2+30	3.3485	19.80	QV				
2+35	3.4853	19.87	QV				
2+40	3.6228	19.95	QV				
2+45	3.7607	20.03	QV				
2+50	3.8992	20.11	QV				
2+55	4.0382	20.18	QV				
3+ 0	4.1777	20.27	QV				
3+ 5	4.3178	20.34	QV				
3+10	4.4585	20.43	QV				
3+15	4.5998	20.51	QV				

3+20	4.7416	20.59	QV
3+25	4.8840	20.67	QV
3+30	5.0269	20.76	QV
3+35	5.1705	20.84	QV
3+40	5.3146	20.93	QV
3+45	5.4594	21.02	QV
3+50	5.6047	21.11	QV
3+55	5.7507	21.19	QV
4+ 0	5.8973	21.29	QV
4+ 5	6.0445	21.38	QV
4+10	6.1924	21.47	Q V
4+15	6.3409	21.56	Q V
4+20	6.4900	21.66	Q V
4+25	6.6398	21.75	Q V
4+30	6.7903	21.85	Q V
4+35	6.9414	21.94	Q V
4+40	7.0933	22.05	Q V
4+45	7.2458	22.14	Q V
4+50	7.3990	22.25	Q V
4+55	7.5529	22.35	Q V
5+ 0	7.7075	22.45	Q V
5+ 5	7.8628	22.55	Q V
5+10	8.0189	22.66	Q V
5+15	8.1757	22.77	Q V
5+20	8.3333	22.88	Q V
5+25	8.4916	22.98	Q V
5+30	8.6507	23.10	Q V
5+35	8.8105	23.21	Q V
5+40	8.9712	23.33	Q V
5+45	9.1326	23.44	Q V
5+50	9.2948	23.56	Q V
5+55	9.4579	23.67	Q V
6+ 0	9.6218	23.80	Q V
6+ 5	9.7865	23.91	Q V
6+10	9.9520	24.04	Q V
6+15	10.1184	24.16	Q V
6+20	10.2858	24.29	Q V
6+25	10.4539	24.42	Q V
6+30	10.6230	24.55	Q V
6+35	10.7930	24.68	Q V
6+40	10.9639	24.82	Q V
6+45	11.1357	24.95	Q V
6+50	11.3085	25.09	Q V
6+55	11.4823	25.23	Q V
7+ 0	11.6570	25.37	Q V
7+ 5	11.8327	25.51	Q V
7+10	12.0094	25.66	Q V
7+15	12.1871	25.80	Q V
7+20	12.3659	25.96	Q V
7+25	12.5457	26.11	Q V
7+30	12.7266	26.27	Q V
7+35	12.9086	26.42	Q V
7+40	13.0916	26.58	Q V
7+45	13.2758	26.74	Q V
7+50	13.4611	26.91	Q V
7+55	13.6475	27.07	Q V
8+ 0	13.8352	27.25	Q V
8+ 5	14.0240	27.41	Q V

8+10	14.2140	27.59	Q	V			
8+15	14.4053	27.77	Q	V			
8+20	14.5978	27.95	Q	V			
8+25	14.7915	28.13	Q	V			
8+30	14.9866	28.33	Q	V			
8+35	15.1830	28.51	Q	V			
8+40	15.3807	28.71	Q	V			
8+45	15.5798	28.90	Q	V			
8+50	15.7803	29.11	Q	V			
8+55	15.9821	29.31	Q	V			
9+ 0	16.1854	29.52	Q	V			
9+ 5	16.3902	29.73	Q	V			
9+10	16.5965	29.95	Q	V			
9+15	16.8043	30.17	Q	V			
9+20	17.0136	30.40	Q	V			
9+25	17.2245	30.62	Q	V			
9+30	17.4371	30.86	Q	V			
9+35	17.6512	31.09	Q	V			
9+40	17.8671	31.34	Q	V			
9+45	18.0846	31.58	Q	V			
9+50	18.3039	31.85	Q	V			
9+55	18.5250	32.10	Q	V			
10+ 0	18.7479	32.37	Q	V			
10+ 5	18.9726	32.63	Q	V			
10+10	19.1993	32.91	Q	V			
10+15	19.4279	33.19	Q	V			
10+20	19.6585	33.48	Q	V			
10+25	19.8910	33.77	Q	V			
10+30	20.1258	34.08	Q	V			
10+35	20.3625	34.38	Q	V			
10+40	20.6015	34.71	Q	V			
10+45	20.8427	35.02	Q	V			
10+50	21.0862	35.36	Q	V			
10+55	21.3320	35.69	Q	V			
11+ 0	21.5803	36.05	Q	V			
11+ 5	21.8309	36.39	Q	V			
11+10	22.0842	36.77	Q	V			
11+15	22.3399	37.13	Q	V			
11+20	22.5984	37.53	Q	V			
11+25	22.8595	37.92	Q	V			
11+30	23.1236	38.34	Q	V			
11+35	23.3904	38.74	Q	V			
11+40	23.6602	39.19	Q	V			
11+45	23.9331	39.61	Q	V			
11+50	24.2092	40.09	Q	V			
11+55	24.4884	40.54	Q	V			
12+ 0	24.7710	41.04	Q	V			
12+ 5	25.0592	41.84	Q	V			
12+10	25.3581	43.40	Q	V			
12+15	25.6749	46.00	Q	V			
12+20	26.0251	50.85	Q	V			
12+25	26.3936	53.50	Q	V			
12+30	26.7745	55.31	Q	V			
12+35	27.1654	56.77	Q	V			
12+40	27.5656	58.10	Q	V			
12+45	27.9738	59.27	Q	V			
12+50	28.3897	60.40	Q	V			
12+55	28.8127	61.42	Q	V			

13+ 0	29.2427	62.44	
13+ 5	29.6793	63.38	
13+10	30.1224	64.34	
13+15	30.5717	65.24	
13+20	31.0278	66.23	
13+25	31.4905	67.18	
13+30	31.9604	68.23	
13+35	32.4374	69.26	
13+40	32.9223	70.41	
13+45	33.4149	71.53	
13+50	33.9161	72.77	
13+55	34.4257	73.99	
14+ 0	34.9446	75.35	
14+ 5	35.4731	76.74	
14+10	36.0133	78.43	
14+15	36.5662	80.29	
14+20	37.1360	82.73	
14+25	37.7198	84.77	
14+30	38.3183	86.91	
14+35	38.9311	88.98	
14+40	39.5602	91.34	
14+45	40.2067	93.88	
14+50	40.8762	97.21	
14+55	41.5750	101.47	
15+ 0	42.3151	107.46	
15+ 5	43.0994	113.89	
15+10	43.9389	121.88	
15+15	44.8362	130.30	
15+20	45.8051	140.69	
15+25	46.8399	150.25	
15+30	47.9369	159.28	
15+35	49.0703	164.57	
15+40	50.1988	163.86	
15+45	51.4154	176.65	
15+50	52.8154	203.27	
15+55	54.4848	242.40	
16+ 0	56.6308	311.60	
16+ 5	59.6602	439.87	
16+10	64.1012	644.83	
16+15	70.1022	871.36	
16+20	78.0106	1148.30	
16+25	83.1809	750.72	
16+30	86.8458	532.15	
16+35	89.7878	427.18	
16+40	92.2924	363.67	
16+45	94.4268	309.91	
16+50	96.2346	262.50	
16+55	97.7670	222.51	
17+ 0	99.0588	187.57	
17+ 5	100.1643	160.52	
17+10	101.0990	135.71	
17+15	101.9171	118.79	
17+20	102.6684	109.08	
17+25	103.3671	101.46	
17+30	104.0162	94.25	
17+35	104.6369	90.12	
17+40	105.2300	86.11	
17+45	105.7830	80.30	

17+50	106.3054	75.86	Q			V	
17+55	106.8028	72.21	Q			V	
18+ 0	107.2698	67.82	Q			V	
18+ 5	107.7190	65.22	Q			V	
18+10	108.1480	62.29	Q			V	
18+15	108.5511	58.53	Q			V	
18+20	108.9141	52.70	Q			V	
18+25	109.2532	49.24	Q			V	
18+30	109.5756	46.82	Q			V	
18+35	109.8843	44.82	Q			V	
18+40	110.1812	43.11	Q			V	
18+45	110.4679	41.63	Q			V	
18+50	110.7455	40.31	Q			V	
18+55	111.0151	39.14	Q			V	
19+ 0	111.2775	38.10	Q			V	
19+ 5	111.5334	37.16	Q			V	
19+10	111.7837	36.34	Q			V	
19+15	112.0288	35.59	Q			V	
19+20	112.2690	34.88	Q			V	
19+25	112.5047	34.21	Q			V	
19+30	112.7359	33.58	Q			V	
19+35	112.9631	32.98	Q			V	
19+40	113.1862	32.40	Q			V	
19+45	113.4055	31.85	Q			V	
19+50	113.6213	31.33	Q			V	
19+55	113.8336	30.83	Q			V	
20+ 0	114.0428	30.37	Q			V	
20+ 5	114.2489	29.92	Q			V	
20+10	114.4520	29.49	Q			V	
20+15	114.6523	29.08	Q			V	
20+20	114.8498	28.68	Q			V	
20+25	115.0447	28.29	Q			V	
20+30	115.2370	27.92	Q			V	
20+35	115.4268	27.56	Q			V	
20+40	115.6142	27.21	Q			V	
20+45	115.7993	26.88	Q			V	
20+50	115.9821	26.55	Q			V	
20+55	116.1628	26.23	Q			V	
21+ 0	116.3414	25.93	Q			V	
21+ 5	116.5179	25.63	Q			V	
21+10	116.6924	25.34	Q			V	
21+15	116.8650	25.06	Q			V	
21+20	117.0357	24.79	Q			V	
21+25	117.2045	24.52	Q			V	
21+30	117.3716	24.26	Q			V	
21+35	117.5370	24.01	Q			V	
21+40	117.7007	23.77	Q			V	
21+45	117.8627	23.53	Q			V	
21+50	118.0231	23.30	Q			V	
21+55	118.1820	23.07	Q			V	
22+ 0	118.3394	22.85	Q			V	
22+ 5	118.4953	22.63	Q			V	
22+10	118.6497	22.42	Q			V	
22+15	118.8027	22.22	Q			V	
22+20	118.9544	22.02	Q			V	
22+25	119.1046	21.82	Q			V	
22+30	119.2536	21.63	Q			V	
22+35	119.4013	21.44	Q			V	

22+40	119.5477	21.26	Q				V
22+45	119.6929	21.08	Q				V
22+50	119.8369	20.91	Q				V
22+55	119.9797	20.73	Q				V
23+ 0	120.1213	20.57	Q				V
23+ 5	120.2618	20.40	Q				V
23+10	120.4012	20.24	Q				V
23+15	120.5395	20.08	Q				V
23+20	120.6768	19.93	Q				V
23+25	120.8130	19.78	Q				V
23+30	120.9482	19.63	Q				V
23+35	121.0824	19.48	Q				V
23+40	121.2155	19.34	Q				V
23+45	121.3478	19.20	Q				V
23+50	121.4790	19.06	Q				V
23+55	121.6094	18.93	Q				V
24+ 0	121.7388	18.79	Q				V
24+ 5	121.8646	18.26	Q				V
24+10	121.9806	16.85	Q				V
24+15	122.0777	14.11	Q				V
24+20	122.1371	8.61	Q				V
24+25	122.1780	5.94	Q				V
24+30	122.2084	4.43	Q				V
24+35	122.2314	3.33	Q				V
24+40	122.2486	2.50	Q				V
24+45	122.2614	1.86	Q				V
24+50	122.2708	1.36	Q				V
24+55	122.2775	0.97	Q				V
25+ 0	122.2823	0.69	Q				V
25+ 5	122.2856	0.48	Q				V
25+10	122.2881	0.36	Q				V
25+15	122.2901	0.29	Q				V
25+20	122.2917	0.23	Q				V
25+25	122.2929	0.18	Q				V
25+30	122.2939	0.14	Q				V
25+35	122.2946	0.10	Q				V
25+40	122.2950	0.06	Q				V
25+45	122.2953	0.03	Q				V
25+50	122.2954	0.02	Q				V

U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/30/12 File Name UNIT100Y24HPR.out

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Orange County Unit Hydrograph Hydrology Method
Manual Date(s) - October 1986, November 1996

Program License Serial Number 6062

ESPERANZA HILLS
DETENTION BASIN ANALYSIS
PROPOSED CONDITION
100 YEAR 24 HOUR

Storm Event Year = 100

Antecedent Moisture Condition = 3

English (in-lb) Input Units Used

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	Area (Ac.)	Area Fraction	Soil Group	Fp (In/Hr)	Ap (dec.)	Fm (In/Hr)
56.0	17.0	0.03	B	0.300	0.910	0.273
69.0	404.8	0.66	C	0.250	0.910	0.228
75.0	188.4	0.31	D	0.200	0.910	0.182

Area-averaged adjusted loss rate Fm (In/Hr) = 0.215

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC3)	S	Pervious Yield Fr
15.47	0.025	56.0	75.8	3.19	0.541
1.53	0.003	98.0	98.0	0.20	0.958
368.32	0.604	69.0	86.2	1.60	0.725
36.43	0.060	98.0	98.0	0.20	0.958
171.43	0.281	75.0	91.0	0.99	0.816
16.96	0.028	98.0	98.0	0.20	0.958

Area-averaged catchment yield fraction, Y = 0.767
Area-averaged low loss fraction, Yb = 0.233

++

User entry of time of concentration = 0.400 (hours)
Watershed area = 610.14(Ac.)
Catchment Lag time = 0.320 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 26.0417
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.215(In/Hr)
Average low loss rate fraction (Yb) = 0.233 (decimal)
FOOTHILL S-Graph Selected
Computed peak 5-minute rainfall = 0.520(In)
Computed peak 30-minute rainfall = 1.090(In)
Specified peak 1-hour rainfall = 1.450(In)
Computed peak 3-hour rainfall = 2.430(In)
Specified peak 6-hour rainfall = 3.360(In)
Specified peak 24-hour rainfall = 5.630(In)

Rainfall depth area reduction factors:
Using a total area of 610.14(Ac.) (Ref: fig. E-4)

5-minute factor = 0.971 Adjusted rainfall = 0.505(In)
30-minute factor = 0.971 Adjusted rainfall = 1.059(In)
1-hour factor = 0.971 Adjusted rainfall = 1.409(In)
3-hour factor = 0.996 Adjusted rainfall = 2.421(In)
6-hour factor = 0.998 Adjusted rainfall = 3.354(In)
24-hour factor = 0.999 Adjusted rainfall = 5.626(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
(K = 7378.88 (CFS))		
1	1.798	132.686
2	7.274	404.072
3	16.833	705.347
4	37.688	1538.813
5	59.997	1646.186
6	69.792	722.738
7	76.395	487.241
8	81.484	375.536
9	85.434	291.490
10	88.638	236.346
11	91.210	189.797
12	93.310	155.006
13	94.977	122.981
14	96.242	93.367
15	97.248	74.201
16	97.917	49.352
17	98.256	25.051
18	98.555	22.063
19	98.818	19.366
20	99.045	16.756
21	99.203	11.683
22	99.380	13.018
23	99.587	15.345

24	99.748	11.831
25	99.852	7.689
26	99.928	5.614
27	100.000	5.304

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.5051	0.5051
2	0.6726	0.1675
3	0.7952	0.1226
4	0.8955	0.1003
5	0.9820	0.0865
6	1.0588	0.0768
7	1.1282	0.0694
8	1.1920	0.0638
9	1.2512	0.0592
10	1.3067	0.0555
11	1.3590	0.0523
12	1.4085	0.0496
13	1.4652	0.0567
14	1.5198	0.0545
15	1.5724	0.0526
16	1.6232	0.0508
17	1.6725	0.0493
18	1.7203	0.0478
19	1.7667	0.0465
20	1.8120	0.0453
21	1.8561	0.0441
22	1.8992	0.0431
23	1.9413	0.0421
24	1.9824	0.0412
25	2.0228	0.0403
26	2.0623	0.0395
27	2.1010	0.0387
28	2.1390	0.0380
29	2.1763	0.0373
30	2.2130	0.0367
31	2.2491	0.0361
32	2.2846	0.0355
33	2.3195	0.0349
34	2.3539	0.0344
35	2.3878	0.0339
36	2.4212	0.0334
37	2.4526	0.0314
38	2.4835	0.0309
39	2.5140	0.0305
40	2.5441	0.0301
41	2.5738	0.0297
42	2.6031	0.0293
43	2.6321	0.0289
44	2.6607	0.0286
45	2.6889	0.0283
46	2.7168	0.0279
47	2.7444	0.0276
48	2.7717	0.0273
49	2.7987	0.0270
50	2.8254	0.0267
51	2.8518	0.0264

52	2.8780	0.0261
53	2.9039	0.0259
54	2.9295	0.0256
55	2.9549	0.0254
56	2.9800	0.0251
57	3.0049	0.0249
58	3.0295	0.0247
59	3.0540	0.0244
60	3.0782	0.0242
61	3.1022	0.0240
62	3.1260	0.0238
63	3.1496	0.0236
64	3.1730	0.0234
65	3.1962	0.0232
66	3.2192	0.0230
67	3.2420	0.0228
68	3.2647	0.0227
69	3.2872	0.0225
70	3.3095	0.0223
71	3.3316	0.0221
72	3.3536	0.0220
73	3.3709	0.0173
74	3.3881	0.0172
75	3.4051	0.0170
76	3.4219	0.0169
77	3.4387	0.0167
78	3.4553	0.0166
79	3.4717	0.0165
80	3.4881	0.0163
81	3.5043	0.0162
82	3.5204	0.0161
83	3.5363	0.0160
84	3.5522	0.0158
85	3.5679	0.0157
86	3.5835	0.0156
87	3.5990	0.0155
88	3.6144	0.0154
89	3.6296	0.0153
90	3.6448	0.0152
91	3.6599	0.0151
92	3.6748	0.0150
93	3.6897	0.0149
94	3.7044	0.0148
95	3.7191	0.0147
96	3.7336	0.0146
97	3.7481	0.0145
98	3.7625	0.0144
99	3.7768	0.0143
100	3.7910	0.0142
101	3.8051	0.0141
102	3.8191	0.0140
103	3.8330	0.0139
104	3.8468	0.0138
105	3.8606	0.0138
106	3.8743	0.0137
107	3.8879	0.0136
108	3.9014	0.0135
109	3.9148	0.0134

110	3.9282		0.0134
111	3.9415		0.0133
112	3.9547		0.0132
113	3.9679		0.0131
114	3.9809		0.0131
115	3.9939		0.0130
116	4.0068		0.0129
117	4.0197		0.0129
118	4.0325		0.0128
119	4.0452		0.0127
120	4.0579		0.0127
121	4.0704		0.0126
122	4.0830		0.0125
123	4.0954		0.0125
124	4.1078		0.0124
125	4.1201		0.0123
126	4.1324		0.0123
127	4.1446		0.0122
128	4.1568		0.0121
129	4.1689		0.0121
130	4.1809		0.0120
131	4.1929		0.0120
132	4.2048		0.0119
133	4.2166		0.0119
134	4.2284		0.0118
135	4.2402		0.0117
136	4.2519		0.0117
137	4.2635		0.0116
138	4.2751		0.0116
139	4.2866		0.0115
140	4.2981		0.0115
141	4.3095		0.0114
142	4.3209		0.0114
143	4.3323		0.0113
144	4.3435		0.0113
145	4.3548		0.0112
146	4.3660		0.0112
147	4.3771		0.0111
148	4.3882		0.0111
149	4.3992		0.0110
150	4.4102		0.0110
151	4.4212		0.0109
152	4.4321		0.0109
153	4.4429		0.0109
154	4.4537		0.0108
155	4.4645		0.0108
156	4.4752		0.0107
157	4.4859		0.0107
158	4.4966		0.0106
159	4.5072		0.0106
160	4.5177		0.0106
161	4.5282		0.0105
162	4.5387		0.0105
163	4.5491		0.0104
164	4.5595		0.0104
165	4.5699		0.0104
166	4.5802		0.0103
167	4.5905		0.0103

168	4.6007		0.0102
169	4.6109		0.0102
170	4.6211		0.0102
171	4.6312		0.0101
172	4.6413		0.0101
173	4.6513		0.0101
174	4.6614		0.0100
175	4.6713		0.0100
176	4.6813		0.0099
177	4.6912		0.0099
178	4.7011		0.0099
179	4.7109		0.0098
180	4.7207		0.0098
181	4.7305		0.0098
182	4.7402		0.0097
183	4.7499		0.0097
184	4.7596		0.0097
185	4.7692		0.0096
186	4.7788		0.0096
187	4.7884		0.0096
188	4.7979		0.0095
189	4.8074		0.0095
190	4.8169		0.0095
191	4.8264		0.0094
192	4.8358		0.0094
193	4.8452		0.0094
194	4.8545		0.0094
195	4.8638		0.0093
196	4.8731		0.0093
197	4.8824		0.0093
198	4.8916		0.0092
199	4.9008		0.0092
200	4.9100		0.0092
201	4.9192		0.0091
202	4.9283		0.0091
203	4.9374		0.0091
204	4.9464		0.0091
205	4.9555		0.0090
206	4.9645		0.0090
207	4.9734		0.0090
208	4.9824		0.0090
209	4.9913		0.0089
210	5.0002		0.0089
211	5.0091		0.0089
212	5.0179		0.0088
213	5.0268		0.0088
214	5.0356		0.0088
215	5.0443		0.0088
216	5.0531		0.0087
217	5.0618		0.0087
218	5.0705		0.0087
219	5.0791		0.0087
220	5.0878		0.0086
221	5.0964		0.0086
222	5.1050		0.0086
223	5.1136		0.0086
224	5.1221		0.0085
225	5.1306		0.0085

226	5.1391	0.0085
227	5.1476	0.0085
228	5.1560	0.0085
229	5.1645	0.0084
230	5.1729	0.0084
231	5.1813	0.0084
232	5.1896	0.0084
233	5.1980	0.0083
234	5.2063	0.0083
235	5.2146	0.0083
236	5.2228	0.0083
237	5.2311	0.0082
238	5.2393	0.0082
239	5.2475	0.0082
240	5.2557	0.0082
241	5.2638	0.0082
242	5.2720	0.0081
243	5.2801	0.0081
244	5.2882	0.0081
245	5.2963	0.0081
246	5.3043	0.0081
247	5.3124	0.0080
248	5.3204	0.0080
249	5.3284	0.0080
250	5.3364	0.0080
251	5.3443	0.0080
252	5.3523	0.0079
253	5.3602	0.0079
254	5.3681	0.0079
255	5.3759	0.0079
256	5.3838	0.0079
257	5.3916	0.0078
258	5.3995	0.0078
259	5.4073	0.0078
260	5.4150	0.0078
261	5.4228	0.0078
262	5.4305	0.0077
263	5.4383	0.0077
264	5.4460	0.0077
265	5.4537	0.0077
266	5.4613	0.0077
267	5.4690	0.0077
268	5.4766	0.0076
269	5.4842	0.0076
270	5.4918	0.0076
271	5.4994	0.0076
272	5.5070	0.0076
273	5.5145	0.0075
274	5.5221	0.0075
275	5.5296	0.0075
276	5.5371	0.0075
277	5.5445	0.0075
278	5.5520	0.0075
279	5.5594	0.0074
280	5.5669	0.0074
281	5.5743	0.0074
282	5.5817	0.0074
283	5.5891	0.0074

284	5.5964	0.0074
285	5.6038	0.0073
286	5.6111	0.0073
287	5.6184	0.0073
288	5.6257	0.0073

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0073	0.0017	0.0056
2	0.0073	0.0017	0.0056
3	0.0073	0.0017	0.0056
4	0.0074	0.0017	0.0056
5	0.0074	0.0017	0.0057
6	0.0074	0.0017	0.0057
7	0.0074	0.0017	0.0057
8	0.0075	0.0017	0.0057
9	0.0075	0.0017	0.0057
10	0.0075	0.0018	0.0058
11	0.0075	0.0018	0.0058
12	0.0076	0.0018	0.0058
13	0.0076	0.0018	0.0058
14	0.0076	0.0018	0.0058
15	0.0077	0.0018	0.0059
16	0.0077	0.0018	0.0059
17	0.0077	0.0018	0.0059
18	0.0077	0.0018	0.0059
19	0.0078	0.0018	0.0060
20	0.0078	0.0018	0.0060
21	0.0078	0.0018	0.0060
22	0.0078	0.0018	0.0060
23	0.0079	0.0018	0.0060
24	0.0079	0.0018	0.0061
25	0.0079	0.0019	0.0061
26	0.0080	0.0019	0.0061
27	0.0080	0.0019	0.0061
28	0.0080	0.0019	0.0061
29	0.0081	0.0019	0.0062
30	0.0081	0.0019	0.0062
31	0.0081	0.0019	0.0062
32	0.0081	0.0019	0.0062
33	0.0082	0.0019	0.0063
34	0.0082	0.0019	0.0063
35	0.0082	0.0019	0.0063
36	0.0083	0.0019	0.0063
37	0.0083	0.0019	0.0064
38	0.0083	0.0019	0.0064
39	0.0084	0.0020	0.0064
40	0.0084	0.0020	0.0064
41	0.0085	0.0020	0.0065
42	0.0085	0.0020	0.0065
43	0.0085	0.0020	0.0065
44	0.0085	0.0020	0.0066
45	0.0086	0.0020	0.0066
46	0.0086	0.0020	0.0066
47	0.0087	0.0020	0.0066
48	0.0087	0.0020	0.0067

49	0.0087	0.0020	0.0067
50	0.0088	0.0020	0.0067
51	0.0088	0.0021	0.0068
52	0.0088	0.0021	0.0068
53	0.0089	0.0021	0.0068
54	0.0089	0.0021	0.0068
55	0.0090	0.0021	0.0069
56	0.0090	0.0021	0.0069
57	0.0091	0.0021	0.0069
58	0.0091	0.0021	0.0070
59	0.0091	0.0021	0.0070
60	0.0092	0.0021	0.0070
61	0.0092	0.0022	0.0071
62	0.0093	0.0022	0.0071
63	0.0093	0.0022	0.0071
64	0.0094	0.0022	0.0072
65	0.0094	0.0022	0.0072
66	0.0094	0.0022	0.0072
67	0.0095	0.0022	0.0073
68	0.0095	0.0022	0.0073
69	0.0096	0.0022	0.0074
70	0.0096	0.0022	0.0074
71	0.0097	0.0023	0.0074
72	0.0097	0.0023	0.0075
73	0.0098	0.0023	0.0075
74	0.0098	0.0023	0.0075
75	0.0099	0.0023	0.0076
76	0.0099	0.0023	0.0076
77	0.0100	0.0023	0.0077
78	0.0101	0.0023	0.0077
79	0.0101	0.0024	0.0078
80	0.0102	0.0024	0.0078
81	0.0102	0.0024	0.0078
82	0.0103	0.0024	0.0079
83	0.0104	0.0024	0.0079
84	0.0104	0.0024	0.0080
85	0.0105	0.0024	0.0080
86	0.0105	0.0025	0.0081
87	0.0106	0.0025	0.0081
88	0.0106	0.0025	0.0082
89	0.0107	0.0025	0.0082
90	0.0108	0.0025	0.0083
91	0.0109	0.0025	0.0083
92	0.0109	0.0025	0.0084
93	0.0110	0.0026	0.0084
94	0.0110	0.0026	0.0085
95	0.0111	0.0026	0.0085
96	0.0112	0.0026	0.0086
97	0.0113	0.0026	0.0086
98	0.0113	0.0026	0.0087
99	0.0114	0.0027	0.0088
100	0.0115	0.0027	0.0088
101	0.0116	0.0027	0.0089
102	0.0116	0.0027	0.0089
103	0.0117	0.0027	0.0090
104	0.0118	0.0028	0.0090
105	0.0119	0.0028	0.0091
106	0.0120	0.0028	0.0092

107	0.0121	0.0028	0.0093
108	0.0121	0.0028	0.0093
109	0.0123	0.0029	0.0094
110	0.0123	0.0029	0.0095
111	0.0125	0.0029	0.0096
112	0.0125	0.0029	0.0096
113	0.0127	0.0030	0.0097
114	0.0127	0.0030	0.0098
115	0.0129	0.0030	0.0099
116	0.0129	0.0030	0.0099
117	0.0131	0.0030	0.0100
118	0.0131	0.0031	0.0101
119	0.0133	0.0031	0.0102
120	0.0134	0.0031	0.0102
121	0.0135	0.0032	0.0104
122	0.0136	0.0032	0.0104
123	0.0138	0.0032	0.0106
124	0.0138	0.0032	0.0106
125	0.0140	0.0033	0.0107
126	0.0141	0.0033	0.0108
127	0.0143	0.0033	0.0109
128	0.0144	0.0034	0.0110
129	0.0146	0.0034	0.0112
130	0.0147	0.0034	0.0112
131	0.0149	0.0035	0.0114
132	0.0150	0.0035	0.0115
133	0.0152	0.0035	0.0116
134	0.0153	0.0036	0.0117
135	0.0155	0.0036	0.0119
136	0.0156	0.0036	0.0120
137	0.0158	0.0037	0.0121
138	0.0160	0.0037	0.0122
139	0.0162	0.0038	0.0124
140	0.0163	0.0038	0.0125
141	0.0166	0.0039	0.0127
142	0.0167	0.0039	0.0128
143	0.0170	0.0040	0.0130
144	0.0172	0.0040	0.0132
145	0.0220	0.0051	0.0168
146	0.0221	0.0052	0.0170
147	0.0225	0.0052	0.0172
148	0.0227	0.0053	0.0174
149	0.0230	0.0054	0.0176
150	0.0232	0.0054	0.0178
151	0.0236	0.0055	0.0181
152	0.0238	0.0056	0.0182
153	0.0242	0.0057	0.0186
154	0.0244	0.0057	0.0187
155	0.0249	0.0058	0.0191
156	0.0251	0.0059	0.0193
157	0.0256	0.0060	0.0196
158	0.0259	0.0060	0.0198
159	0.0264	0.0062	0.0203
160	0.0267	0.0062	0.0205
161	0.0273	0.0064	0.0209
162	0.0276	0.0064	0.0212
163	0.0283	0.0066	0.0217
164	0.0286	0.0067	0.0219

165	0.0293	0.0068	0.0225
166	0.0297	0.0069	0.0228
167	0.0305	0.0071	0.0234
168	0.0309	0.0072	0.0237
169	0.0334	0.0078	0.0256
170	0.0339	0.0079	0.0260
171	0.0349	0.0081	0.0268
172	0.0355	0.0083	0.0272
173	0.0367	0.0086	0.0281
174	0.0373	0.0087	0.0286
175	0.0387	0.0090	0.0297
176	0.0395	0.0092	0.0303
177	0.0412	0.0096	0.0316
178	0.0421	0.0098	0.0323
179	0.0441	0.0103	0.0338
180	0.0453	0.0106	0.0347
181	0.0478	0.0112	0.0367
182	0.0493	0.0115	0.0378
183	0.0526	0.0123	0.0403
184	0.0545	0.0127	0.0418
185	0.0496	0.0116	0.0380
186	0.0523	0.0122	0.0401
187	0.0592	0.0138	0.0454
188	0.0638	0.0149	0.0489
189	0.0768	0.0179	0.0589
190	0.0865	0.0179	0.0686
191	0.1226	0.0179	0.1047
192	0.1675	0.0179	0.1496
193	0.5051	0.0179	0.4872
194	0.1003	0.0179	0.0824
195	0.0694	0.0162	0.0532
196	0.0555	0.0129	0.0425
197	0.0567	0.0132	0.0435
198	0.0508	0.0119	0.0390
199	0.0465	0.0108	0.0356
200	0.0431	0.0100	0.0330
201	0.0403	0.0094	0.0309
202	0.0380	0.0089	0.0291
203	0.0361	0.0084	0.0277
204	0.0344	0.0080	0.0264
205	0.0314	0.0073	0.0241
206	0.0301	0.0070	0.0231
207	0.0289	0.0068	0.0222
208	0.0279	0.0065	0.0214
209	0.0270	0.0063	0.0207
210	0.0261	0.0061	0.0200
211	0.0254	0.0059	0.0195
212	0.0247	0.0058	0.0189
213	0.0240	0.0056	0.0184
214	0.0234	0.0055	0.0179
215	0.0228	0.0053	0.0175
216	0.0223	0.0052	0.0171
217	0.0173	0.0040	0.0133
218	0.0169	0.0039	0.0129
219	0.0165	0.0038	0.0126
220	0.0161	0.0038	0.0123
221	0.0157	0.0037	0.0121
222	0.0154	0.0036	0.0118

223	0.0151	0.0035	0.0115
224	0.0148	0.0034	0.0113
225	0.0145	0.0034	0.0111
226	0.0142	0.0033	0.0109
227	0.0139	0.0032	0.0107
228	0.0137	0.0032	0.0105
229	0.0134	0.0031	0.0103
230	0.0132	0.0031	0.0101
231	0.0130	0.0030	0.0100
232	0.0128	0.0030	0.0098
233	0.0126	0.0029	0.0096
234	0.0124	0.0029	0.0095
235	0.0122	0.0028	0.0094
236	0.0120	0.0028	0.0092
237	0.0119	0.0028	0.0091
238	0.0117	0.0027	0.0090
239	0.0115	0.0027	0.0088
240	0.0114	0.0027	0.0087
241	0.0112	0.0026	0.0086
242	0.0111	0.0026	0.0085
243	0.0109	0.0026	0.0084
244	0.0108	0.0025	0.0083
245	0.0107	0.0025	0.0082
246	0.0106	0.0025	0.0081
247	0.0104	0.0024	0.0080
248	0.0103	0.0024	0.0079
249	0.0102	0.0024	0.0078
250	0.0101	0.0024	0.0077
251	0.0100	0.0023	0.0077
252	0.0099	0.0023	0.0076
253	0.0098	0.0023	0.0075
254	0.0097	0.0023	0.0074
255	0.0096	0.0022	0.0073
256	0.0095	0.0022	0.0073
257	0.0094	0.0022	0.0072
258	0.0093	0.0022	0.0071
259	0.0092	0.0021	0.0071
260	0.0091	0.0021	0.0070
261	0.0090	0.0021	0.0069
262	0.0090	0.0021	0.0069
263	0.0089	0.0021	0.0068
264	0.0088	0.0021	0.0067
265	0.0087	0.0020	0.0067
266	0.0086	0.0020	0.0066
267	0.0086	0.0020	0.0066
268	0.0085	0.0020	0.0065
269	0.0084	0.0020	0.0065
270	0.0084	0.0020	0.0064
271	0.0083	0.0019	0.0064
272	0.0082	0.0019	0.0063
273	0.0082	0.0019	0.0063
274	0.0081	0.0019	0.0062
275	0.0080	0.0019	0.0062
276	0.0080	0.0019	0.0061
277	0.0079	0.0018	0.0061
278	0.0079	0.0018	0.0060
279	0.0078	0.0018	0.0060
280	0.0077	0.0018	0.0059

281	0.0077	0.0018	0.0059
282	0.0076	0.0018	0.0059
283	0.0076	0.0018	0.0058
284	0.0075	0.0018	0.0058
285	0.0075	0.0017	0.0057
286	0.0074	0.0017	0.0057
287	0.0074	0.0017	0.0057
288	0.0073	0.0017	0.0056

Total soil rain loss = 1.17(In)
Total effective rainfall = 4.45(In)
Peak flow rate in flood hydrograph = 1269.27(CFS)

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24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	325.0	650.0	975.0	1300.0
0+ 5	0.0051	0.74	Q				
0+10	0.0258	3.00	Q				
0+15	0.0737	6.96	Q				
0+20	0.1811	15.59	Q				
0+25	0.3522	24.84	Q				
0+30	0.5517	28.97	Q				
0+35	0.7706	31.79	Q				
0+40	1.0047	33.99	VQ				
0+45	1.2508	35.74	VQ				
0+50	1.5068	37.18	VQ				
0+55	1.7711	38.36	VQ				
1+ 0	2.0421	39.36	VQ				
1+ 5	2.3189	40.18	VQ				
1+10	2.6001	40.84	VQ				
1+15	2.8852	41.40	VQ				
1+20	3.1732	41.81	VQ				
1+25	3.4631	42.10	VQ				
1+30	3.7549	42.37	VQ				
1+35	4.0485	42.63	VQ				
1+40	4.3437	42.87	VQ				
1+45	4.6405	43.09	VQ				
1+50	4.9388	43.31	VQ				
1+55	5.2388	43.56	VQ				
2+ 0	5.5403	43.78	VQ				
2+ 5	5.8432	43.98	|Q				
2+10	6.1474	44.17	|Q				
2+15	6.4529	44.36	|Q				
2+20	6.7595	44.53	|Q				
2+25	7.0673	44.69	|Q				
2+30	7.3763	44.86	|Q				
2+35	7.6864	45.03	|Q				
2+40	7.9976	45.20	|Q				
2+45	8.3101	45.37	|Q				
2+50	8.6237	45.54	|Q				
2+55	8.9386	45.72	|Q				

3+ 0	9.2547	45.89	|Q	|	|	|	|
3+ 5	9.5720	46.07	|Q	|	|	|	|
3+10	9.8905	46.25	|Q	|	|	|	|
3+15	10.2103	46.44	|Q	|	|	|	|
3+20	10.5314	46.62	|Q	|	|	|	|
3+25	10.8538	46.81	|Q	|	|	|	|
3+30	11.1774	46.99	|Q	|	|	|	|
3+35	11.5024	47.18	|QV	|	|	|	|
3+40	11.8286	47.38	|QV	|	|	|	|
3+45	12.1563	47.57	|QV	|	|	|	|
3+50	12.4852	47.77	|QV	|	|	|	|
3+55	12.8156	47.96	|QV	|	|	|	|
4+ 0	13.1473	48.16	|QV	|	|	|	|
4+ 5	13.4804	48.37	|QV	|	|	|	|
4+10	13.8149	48.57	|QV	|	|	|	|
4+15	14.1508	48.78	|QV	|	|	|	|
4+20	14.4882	48.99	|QV	|	|	|	|
4+25	14.8271	49.20	|QV	|	|	|	|
4+30	15.1674	49.41	|QV	|	|	|	|
4+35	15.5092	49.63	|QV	|	|	|	|
4+40	15.8525	49.85	|QV	|	|	|	|
4+45	16.1974	50.07	|QV	|	|	|	|
4+50	16.5438	50.30	|QV	|	|	|	|
4+55	16.8917	50.52	|QV	|	|	|	|
5+ 0	17.2413	50.75	|Q V	|	|	|	|
5+ 5	17.5924	50.99	|Q V	|	|	|	|
5+10	17.9452	51.22	|Q V	|	|	|	|
5+15	18.2996	51.46	|Q V	|	|	|	|
5+20	18.6556	51.70	|Q V	|	|	|	|
5+25	19.0133	51.94	|Q V	|	|	|	|
5+30	19.3728	52.19	|Q V	|	|	|	|
5+35	19.7339	52.44	|Q V	|	|	|	|
5+40	20.0968	52.69	|Q V	|	|	|	|
5+45	20.4615	52.95	|Q V	|	|	|	|
5+50	20.8279	53.21	|Q V	|	|	|	|
5+55	21.1962	53.47	|Q V	|	|	|	|
6+ 0	21.5662	53.74	|Q V	|	|	|	|
6+ 5	21.9382	54.01	|Q V	|	|	|	|
6+10	22.3120	54.28	|Q V	|	|	|	|
6+15	22.6877	54.56	|Q V	|	|	|	|
6+20	23.0654	54.84	|Q V	|	|	|	|
6+25	23.4450	55.12	|Q V	|	|	|	|
6+30	23.8266	55.41	|Q V	|	|	|	|
6+35	24.2102	55.70	|Q V	|	|	|	|
6+40	24.5958	56.00	|Q V	|	|	|	|
6+45	24.9835	56.30	|Q V	|	|	|	|
6+50	25.3734	56.60	|Q V	|	|	|	|
6+55	25.7653	56.91	|Q V	|	|	|	|
7+ 0	26.1594	57.22	|Q V	|	|	|	|
7+ 5	26.5557	57.54	|Q V	|	|	|	|
7+10	26.9542	57.86	|Q V	|	|	|	|
7+15	27.3549	58.19	|Q V	|	|	|	|
7+20	27.7579	58.52	|Q V	|	|	|	|
7+25	28.1633	58.86	|Q V	|	|	|	|
7+30	28.5710	59.20	|Q V	|	|	|	|
7+35	28.9811	59.55	|Q V	|	|	|	|
7+40	29.3936	59.90	|Q V	|	|	|	|
7+45	29.8086	60.26	|Q V	|	|	|	|

7+50	30.2261	60.62	Q V			
7+55	30.6461	60.99	Q V			
8+ 0	31.0687	61.36	Q V			
8+ 5	31.4940	61.75	Q V			
8+10	31.9219	62.13	Q V			
8+15	32.3525	62.53	Q V			
8+20	32.7858	62.92	Q V			
8+25	33.2220	63.33	Q V			
8+30	33.6610	63.75	Q V			
8+35	34.1030	64.17	Q V			
8+40	34.5478	64.59	Q V			
8+45	34.9957	65.03	Q V			
8+50	35.4467	65.47	Q V			
8+55	35.9007	65.93	Q V			
9+ 0	36.3579	66.39	Q V			
9+ 5	36.8183	66.86	Q V			
9+10	37.2820	67.33	Q V			
9+15	37.7491	67.82	Q V			
9+20	38.2196	68.31	Q V			
9+25	38.6935	68.82	Q V			
9+30	39.1710	69.33	Q V			
9+35	39.6521	69.86	Q V			
9+40	40.1368	70.39	Q V			
9+45	40.6254	70.94	Q V			
9+50	41.1177	71.49	Q V			
9+55	41.6140	72.06	Q V			
10+ 0	42.1143	72.64	Q V			
10+ 5	42.6186	73.23	Q V			
10+10	43.1271	73.84	Q V			
10+15	43.6399	74.46	Q V			
10+20	44.1570	75.09	Q V			
10+25	44.6786	75.73	Q V			
10+30	45.2047	76.39	Q V			
10+35	45.7355	77.07	Q V			
10+40	46.2710	77.76	Q V			
10+45	46.8115	78.47	Q V			
10+50	47.3569	79.19	Q V			
10+55	47.9074	79.94	Q V			
11+ 0	48.4632	80.70	Q V			
11+ 5	49.0243	81.48	Q V			
11+10	49.5909	82.28	Q V			
11+15	50.1633	83.10	Q V			
11+20	50.7414	83.94	Q V			
11+25	51.3254	84.81	Q V			
11+30	51.9156	85.69	Q V			
11+35	52.5121	86.61	Q V			
11+40	53.1150	87.55	Q V			
11+45	53.7246	88.52	Q V			
11+50	54.3411	89.51	Q V			
11+55	54.9646	90.53	Q V			
12+ 0	55.5953	91.59	Q V			
12+ 5	56.2368	93.14	Q V			
12+10	56.8956	95.65	Q V			
12+15	57.5792	99.26	Q V			
12+20	58.3078	105.79	Q V			
12+25	59.0844	112.76	Q V			
12+30	59.8873	116.58	Q V			
12+35	60.7114	119.66	Q V			

12+40	61.5543	122.38	
12+45	62.4144	124.89	
12+50	63.2907	127.24	
12+55	64.1826	129.51	
13+ 0	65.0896	131.70	
13+ 5	66.0116	133.86	
13+10	66.9480	135.98	
13+15	67.8992	138.11	
13+20	68.8649	140.22	
13+25	69.8453	142.34	
13+30	70.8407	144.53	
13+35	71.8518	146.82	
13+40	72.8792	149.18	
13+45	73.9237	151.65	
13+50	74.9859	154.23	
13+55	76.0669	156.96	
14+ 0	77.1675	159.80	
14+ 5	78.2898	162.96	
14+10	79.4370	166.58	
14+15	80.6130	170.76	
14+20	81.8258	176.09	
14+25	83.0778	181.80	
14+30	84.3632	186.63	
14+35	85.6819	191.47	
14+40	87.0350	196.47	
14+45	88.4243	201.73	
14+50	89.8519	207.29	
14+55	91.3207	213.26	
15+ 0	92.8336	219.68	
15+ 5	94.3947	226.67	
15+10	96.0082	234.29	
15+15	97.6800	242.74	
15+20	99.4164	252.12	
15+25	101.2188	261.72	
15+30	103.0838	270.80	
15+35	105.0092	279.57	
15+40	106.9698	284.67	
15+45	108.9839	292.45	
15+50	111.1353	312.39	
15+55	113.5078	344.49	
16+ 0	116.2523	398.49	
16+ 5	119.8657	524.67	
16+10	124.8414	722.48	
16+15	131.2959	937.19	
16+20	140.0374	1269.27	
16+25	148.5515	1236.24	
16+30	154.0858	803.58	
16+35	158.5096	642.35	
16+40	162.3383	555.93	
16+45	165.7297	492.43	
16+50	168.7610	440.15	
16+55	171.4798	394.77	
17+ 0	173.9373	356.83	
17+ 5	176.1577	322.41	
17+10	178.1624	291.07	
17+15	179.9877	265.03	
17+20	181.6282	238.21	
17+25	183.1056	214.51	

17+30	184.4979	202.17		Q		V
17+35	185.8189	191.81		Q		V
17+40	187.0764	182.59		Q		V
17+45	188.2719	173.60		Q		V
17+50	189.4276	167.80		Q		V
17+55	190.5478	162.66		Q		V
18+ 0	191.6192	155.57		Q		V
18+ 5	192.6401	148.23		Q		V
18+10	193.6125	141.19		Q		V
18+15	194.5360	134.09		Q		V
18+20	195.3820	122.84		Q		V
18+25	196.1649	113.69		Q		V
18+30	196.9097	108.14		Q		V
18+35	197.6237	103.68		Q		V
18+40	198.3110	99.79		Q		V
18+45	198.9748	96.38		Q		V
18+50	199.6175	93.33		Q		V
18+55	200.2414	90.58		Q		V
19+ 0	200.8480	88.08		Q		V
19+ 5	201.4391	85.82		Q		V
19+10	202.0159	83.76		Q		V
19+15	202.5796	81.86		Q		V
19+20	203.1315	80.13		Q		V
19+25	203.6726	78.57		Q		V
19+30	204.2036	77.09		Q		V
19+35	204.7248	75.69		Q		V
19+40	205.2369	74.35		Q		V
19+45	205.7402	73.09		Q		V
19+50	206.2352	71.87		Q		V
19+55	206.7221	70.70		Q		V
20+ 0	207.2013	69.58		Q		V
20+ 5	207.6732	68.52		Q		V
20+10	208.1381	67.51		Q		V
20+15	208.5963	66.53		Q		V
20+20	209.0482	65.61		Q		V
20+25	209.4939	64.72		Q		V
20+30	209.9337	63.86		Q		V
20+35	210.3678	63.03		Q		V
20+40	210.7964	62.23		Q		V
20+45	211.2196	61.45		Q		V
20+50	211.6377	60.70		Q		V
20+55	212.0508	59.98		Q		V
21+ 0	212.4590	59.27		Q		V
21+ 5	212.8625	58.59		Q		V
21+10	213.2614	57.93		Q		V
21+15	213.6559	57.28		Q		V
21+20	214.0461	56.66		Q		V
21+25	214.4321	56.05		Q		V
21+30	214.8140	55.46		Q		V
21+35	215.1920	54.88		Q		V
21+40	215.5661	54.32		Q		V
21+45	215.9365	53.78		Q		V
21+50	216.3032	53.25		Q		V
21+55	216.6663	52.73		Q		V
22+ 0	217.0260	52.22		Q		V
22+ 5	217.3823	51.73		Q		V
22+10	217.7352	51.25		Q		V
22+15	218.0849	50.78		Q		V

22+20	218.4315	50.32	|Q	|	|	V |
22+25	218.7750	49.87	|Q	|	|	V |
22+30	219.1155	49.44	|Q	|	|	V |
22+35	219.4530	49.01	|Q	|	|	V |
22+40	219.7877	48.59	|Q	|	|	V |
22+45	220.1195	48.18	|Q	|	|	V |
22+50	220.4486	47.78	|Q	|	|	V |
22+55	220.7750	47.39	|Q	|	|	V|
23+ 0	221.0988	47.01	|Q	|	|	V|
23+ 5	221.4199	46.63	|Q	|	|	V|
23+10	221.7386	46.27	|Q	|	|	V|
23+15	222.0547	45.91	|Q	|	|	V|
23+20	222.3685	45.55	|Q	|	|	V|
23+25	222.6798	45.21	|Q	|	|	V|
23+30	222.9888	44.87	|Q	|	|	V|
23+35	223.2955	44.54	|Q	|	|	V|
23+40	223.6000	44.21	|Q	|	|	V|
23+45	223.9023	43.89	|Q	|	|	V|
23+50	224.2024	43.58	|Q	|	|	V|
23+55	224.5004	43.27	|Q	|	|	V|
24+ 0	224.7963	42.96	|Q	|	|	V|
24+ 5	225.0850	41.93	|Q	|	|	V|
24+10	225.3563	39.38	|Q	|	|	V|
24+15	225.5986	35.18	|Q	|	|	V|
24+20	225.7800	26.35	Q	|	|	V|
24+25	225.8970	16.98	Q	|	|	V|
24+30	225.9854	12.83	Q	|	|	V|
24+35	226.0544	10.03	Q	|	|	V|
24+40	226.1085	7.86	Q	|	|	V|
24+45	226.1511	6.18	Q	|	|	V|
24+50	226.1843	4.82	Q	|	|	V|
24+55	226.2100	3.73	Q	|	|	V|
25+ 0	226.2295	2.84	Q	|	|	V|
25+ 5	226.2442	2.13	Q	|	|	V|
25+10	226.2551	1.59	Q	|	|	V|
25+15	226.2632	1.17	Q	|	|	V|
25+20	226.2693	0.89	Q	|	|	V|
25+25	226.2744	0.74	Q	|	|	V|
25+30	226.2786	0.61	Q	|	|	V|
25+35	226.2820	0.50	Q	|	|	V|
25+40	226.2848	0.40	Q	|	|	V|
25+45	226.2871	0.33	Q	|	|	V|
25+50	226.2889	0.26	Q	|	|	V|
25+55	226.2901	0.17	Q	|	|	V|
26+ 0	226.2908	0.11	Q	|	|	V|
26+ 5	226.2912	0.06	Q	|	|	V|
26+10	226.2914	0.03	Q	|	|	V

Appendix

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STREET CAPACITY CALCULATIONS

TABLE 5
STREET CAPACITY CALCULATIONS

Right-of-Way Width	Street Slope	Full Street Capacity		Half Street Capacity	
		100-Year Flow (Right-of-Way)	10-Year Flow (Top-of-Curb)	100-Year Flow (Right-of-Way)	10-Year Flow (Top-of-Curb)
(ft.)	(%)	(cfs)	(cfs)	(cfs)	(cfs)
44	1	50.0	25.8	25.0	12.9
44	2	70.6	36.5	35.3	18.3
44	3	86.5	44.7	43.3	22.4
44	4	99.8	51.6	49.9	25.8
44	5	111.6	57.7	55.8	28.9
44	6	122.3	63.2	61.2	31.6
44	7	132.1	68.3	66.1	34.2
44	8	141.2	73.0	70.6	36.5
44	9	149.8	77.4	74.9	38.7
44	10	157.9	81.6	79.0	40.8
52	1	59.9	25.1	30.0	12.6
52	2	84.7	35.5	42.4	17.8
52	3	103.7	43.5	51.9	21.8
52	4	119.8	50.2	59.9	25.1
52	5	133.9	56.1	67.0	28.1
52	6	146.7	61.5	73.4	30.8
52	7	158.5	66.4	79.3	33.2
52	8	169.4	71.0	84.7	35.5
52	9	179.7	75.3	89.9	37.7
52	10	189.4	79.4	94.7	39.7
90	1	62.2	24.2	31.1	12.1
90	2	88.0	34.3	44.0	17.2
90	3	107.8	42.0	53.9	21.0
90	4	124.5	48.5	62.3	24.3
90	5	139.1	54.2	69.6	27.1
90	6	152.4	59.4	76.2	29.7
90	7	164.6	64.1	82.3	32.1
90	8	176.0	68.6	88.0	34.3
90	9	186.7	72.7	93.4	36.4
90	10	196.8	76.7	98.4	38.4

44' RW Street Flow - Top of Curb - 1%

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.01000	ft/ft
Normal Depth	0.50	ft

Section Definitions

Station (ft)	Elevation (ft)
0+00	1.00
0+07	0.86
0+07	0.36
0+09	0.53
0+09	0.56
0+22	0.78
0+35	0.56
0+35	0.53
0+37	0.36
0+37	0.86
0+44	1.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 1.00)	(0+09, 0.56)	0.016
(0+09, 0.56)	(0+35, 0.53)	0.013
(0+35, 0.53)	(0+44, 1.00)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

44' RW Street Flow - Top of Curb - 1%

Results

Discharge		25.82	ft³/s
Elevation Range	0.36 to 1.00 ft		
Flow Area		6.57	ft²
Wetted Perimeter		30.75	ft
Hydraulic Radius		0.21	ft
Top Width		30.00	ft
Normal Depth		0.50	ft
Critical Depth		0.58	ft
Critical Slope		0.00438	ft/ft
Velocity		3.93	ft/s
Velocity Head		0.24	ft
Specific Energy		0.74	ft
Froude Number		1.48	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	1.00	ft
Length	100.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	1.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.50	ft
Critical Depth	0.58	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.00438	ft/ft

52' RW Street Flow - Top of Curb - 1%

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.01000	ft/ft
Normal Depth	0.50	ft

Section Definitions

Station (ft)	Elevation (ft)
0+00	1.00
0+08	0.84
0+08	0.34
0+10	0.51
0+10	0.54
0+26	0.81
0+42	0.54
0+42	0.51
0+44	0.34
0+44	0.84
0+52	1.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 1.00)	(0+10, 0.54)	0.016
(0+10, 0.54)	(0+42, 0.54)	0.013
(0+42, 0.54)	(0+52, 1.00)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

52' RW Street Flow - Top of Curb - 1%

Results

Discharge		25.10	ft³/s
Elevation Range	0.34 to 1.00 ft		
Flow Area		6.92	ft²
Wetted Perimeter		36.75	ft
Hydraulic Radius		0.19	ft
Top Width		36.00	ft
Normal Depth		0.50	ft
Critical Depth		0.56	ft
Critical Slope		0.00445	ft/ft
Velocity		3.63	ft/s
Velocity Head		0.20	ft
Specific Energy		0.70	ft
Froude Number		1.46	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	1.00	ft
Length	100.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	1.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.50	ft
Critical Depth	0.56	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.00445	ft/ft

90' RW Street Flow - Top of Curb - 1%

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.01000	ft/ft
Normal Depth	0.50	ft

Section Definitions

Station (ft)	Elevation (ft)
0+00	1.00
0+08	0.84
0+08	0.34
0+10	0.51
0+10	0.54
0+38	1.02
0+38	1.52
0+45	1.66
0+52	1.52
0+52	1.02
0+52	1.00
0+80	0.54
0+80	0.51
0+82	0.34
0+82	0.84
0+90	1.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 1.00)	(0+10, 0.54)	0.016
(0+10, 0.54)	(0+80, 0.54)	0.013
(0+80, 0.54)	(0+90, 1.00)	0.016

90' RW Street Flow - Top of Curb - 1%

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Discharge		24.24	ft³/s
Elevation Range	0.34 to 1.66 ft		
Flow Area		7.04	ft²
Wetted Perimeter		40.72	ft
Hydraulic Radius		0.17	ft
Top Width		39.96	ft
Normal Depth		0.50	ft
Critical Depth		0.56	ft
Critical Slope		0.00468	ft/ft
Velocity		3.44	ft/s
Velocity Head		0.18	ft
Specific Energy		0.68	ft
Froude Number		1.45	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	1.00	ft
Length	100.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	1.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.50	ft
Critical Depth	0.56	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.00468	ft/ft

Messages

Messages	Flow is divided.

Appendix

L

CATCH BASIN SIZING CALCULATIONS

CATCH BASIN SIZING
SUMMARY TABLE

Street Slope (%)	C.B. Width (ft.)	Flow Intercepted (cfs)
2	21	31
3	21	26
4	21	23
5	21	22
6	21	21
7	21	20
8	21	19
9	21	18
10	21	17
Sump	21	30

Catch Basin Sizing - 21' Width on 2% Street

Project Description

Solve For	Curb Opening Length

Input Data

Discharge	31.00	ft³/s
Slope	0.02000	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Efficiency	50.00	%
Local Depression	4.00	in
Local Depression Width	4.00	ft

Results

Curb Opening Length	20.98	ft
Intercepted Flow	15.50	ft³/s
Bypass Flow	15.50	ft³/s
Spread	22.93	ft
Depth	0.52	ft
Flow Area	4.60	ft²
Gutter Depression	0.13	ft
Total Depression	0.47	ft
Velocity	6.73	ft/s
Equivalent Cross Slope	0.04809	ft/ft
Length Factor	0.32	
Total Interception Length	65.65	ft

Curb Inlet In Sag - 21' Width

Project Description

Solve For	Spread

Input Data

Discharge		30.00	ft³/s
Gutter Width		2.00	ft
Gutter Cross Slope		0.08	ft/ft
Road Cross Slope		0.02	ft/ft
Curb Opening Length		21.00	ft
Opening Height		0.50	ft
Curb Throat Type	Vertical		
Local Depression		2.50	in
Local Depression Width		4.00	ft
Throat Incline Angle		0.00	degrees

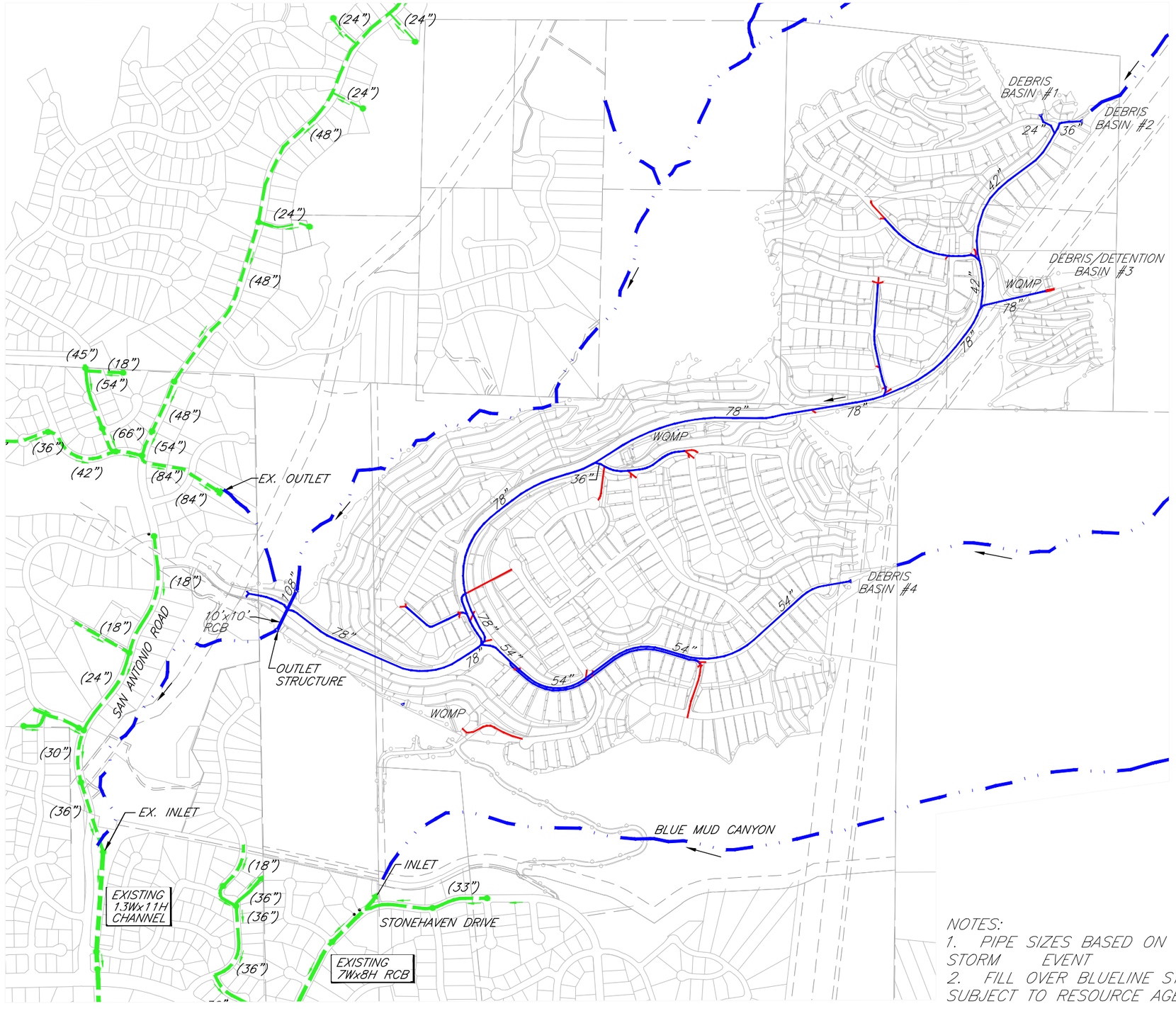
Results

Spread	35.18	ft
Depth	0.72	ft
Gutter Depression	0.13	ft
Total Depression	0.33	ft

Appendix

N

STORM DRAIN PIPE SIZING EXHIBIT



LEGEND

- EXISTING BLUELINE STREAM PER USGS MAP
- PROPOSED PUBLIC STORM DRAIN LINE
- PROPOSED PRIVATE STORM DRAIN LINE
- EXISTING STORM DRAIN PIPE
- 12" PIPE SIZE (INCHES)

800' 0 800'

SCALE IN FEET

NOTES:
1. PIPE SIZES BASED ON 100 YEAR STORM EVENT
2. FILL OVER BLUELINE STREAMS IS SUBJECT TO RESOURCE AGENCY APPROVAL.

ASPEN WAY – OPTION 2

EXHIBIT B

ESPERANZA HILLS
PROPOSED STORM DRAIN FACILITIES

KWC ENGINEERS
CIVIL ENGINEERS • PLANNERS • SURVEYORS
1880 COMPTON AVENUE, SUITE 100 • CORONA, CA. 92881-3370 • 951-734-2130

JN 09.1200.4.09 R:\09\1200\PRELIM\REPORTS\HYDRO\Storm Drain Pipe Sizing.dwg 12/05/2012 11:22

Appendix

O

DEBRIS BASIN SIZING

LOS ANGELES DISTIRCT METHOD FOR PREDICTION OF DEBRIS YIELD

February 1992, updated February 2000

For Watershed areas from 0.1 square mile to 3.0 square miles, use equation 1 as shown on page 15

LOG Dy = 0.65(LOG P) + 0.62(LOG RR) + 0.18(LOG A) + 0.12(FF)

Where:

Dy = Unit Debris Yield (yd^3/mi^2)
P = Maximum 1-Hour Precipitation (inches, taken to two decimal places after the decimal points, times 100)
RR = Relief Ratio (ft/mi) (Highest Watershed Elev-Basin Elev)/Maximum Length
A = Drainage Area (ac)
FF = Non-Dimensional Fire factor

UNDEVELOPED TRIBUTARY AREA (BASIN #1)

P = 200 (OC Hydrology Manual Figure B-1)
RR = 1655-1180 ft/ 0.29 mi = 1618 ft/mi
A = 24.65 acres = 0.0385 mi^2
FF = 4.5 (Debris Method Figure 2)

LOG(P) = 2.301
LOG(RR) = 3.209
LOG(A) = 1.392

LOG (Dy) = 0.65(2.301) + 0.62(3.209) + 0.18(1.392) + 0.12(4.5)

LOG (Dy) = 1.4957 + 1.9896 + 0.2506 + 0.54 = 4.276

Dy = 18,871CY/mi^2

REDUCED ADJUSTED UNIT DEBRIS BY STUDY ACREAGE

THEREFORE DY = 727 CY

DEBRIS YIELD = 727 CY = 0.45 AC-FT

SAFETY FACTOR IS 1.25, THEREFORE THE TOTAL DEBRIS YIELD IS: 909 CY

USE DEBRIS YIELD = 909 CY = 0.56 AC-FT

UNDEVELOPED TRIBUTARY AREA (BASIN #2)

P = 200 (OC Hydrology Manual Figure B-1)
RR = 1780-1170 ft/ 0.506 mi = 1206 ft/mi
A = 52.4 acres = 0.0819 mi^2
FF = 4.5 (Debris Method Figure 2)

LOG(P) = 2.301
LOG(RR) = 3.085
LOG(A) = 1.723

LOG (Dy) = 0.65(2.301) + 0.62(3.081) + 0.18(1.719) + 0.12(4.5)

LOG (Dy) = 1.4957 + 1.910 + 0.309 + 0.454 = 4.258

Dy = 18,134 CY/mi^2

REDUCED ADJUSTED UNIT DEBRIS BY STUDY ACREAGE

THEREFORE DY = 1,485 CY

DEBRIS YIELD = 1,485 CY = 0.92 AC-FT

SAFETY FACTOR IS 1.25, THEREFORE THE TOTAL DEBRIS YIELD IS: 1,856 CY

USE DEBRIS YIELD = 1,856 CY = 1.15 AC-FT

UNDEVELOPED TRIBUTARY AREA (BASIN #3)

P = 200 (OC Hydrology Manual Figure B-1)
RR = 1615-1056 ft/ 0.653 mi = 860.6 ft/mi
A = 123.22 acres = 0.193 mi^2
FF = 4.5 (Debris Method Figure 2)

LOG(P) = 2.301
LOG(RR) = 2.935
LOG(A) = 2.091

LOG (Dy) = 0.65(2.301) + 0.62(2.935) + 0.18(2.091) + 0.12(4.5)

LOG (Dy) = 1.4957 + 1.820 + 0.376 + 0.54 = 4.232

Dy = 17,050 CY/mi^2

REDUCED ADJUSTED UNIT DEBRIS BY STUDY ACREAGE

THEREFORE DY = 3,291 CY

DEBRIS YIELD = 3,291 CY = 2.04 AC-FT

SAFETY FACTOR IS 1.25, THEREFORE THE TOTAL DEBRIS YIELD IS: 4,113 CY

USE DEBRIS YIELD = 4,113 CY = 2.55 AC-FT

UNDEVELOPED TRIBUTARY AREA (BASIN #4)

P = 200 (OC Hydrology Manual Figure B-1)
RR = 1515-920 ft/ 0.668 mi = 890.0 ft/mi
A = 100.3 acres = 0.157 mi^2
FF = 4.5 (Debris Method Figure 2)

LOG(P) = 2.301
LOG(RR) = 2.949
LOG(A) = 2.001

LOG (Dy) = 0.65(2.301) + 0.62(2.949) + 0.18(2.001) + 0.12(4.5)

LOG (Dy) = 1.4957 + 1.829 + 0.360 + 0.54 = 4.465

Dy = 16,758 CY/mi^2

REDUCED ADJUSTED UNIT DEBRIS BY STUDY ACREAGE

THEREFORE DY = 2,631 CY

DEBRIS YIELD = 2,631 CY = 1.63 AC-FT

SAFETY FACTOR IS 1.25, THEREFORE THE TOTAL DEBRIS YIELD IS: 3,289 CY

USE DEBRIS YIELD = 3,289 CY = 2.04 AC-FT

UNDEVELOPED TRIBUTARY AREA (BLUE MUD CANYON)

P = 200 (OC Hydrology Manual Figure B-1)
RR = 1645-570 ft/ 2.75 mi = 390.9 ft/mi
A = 647.6 acres = 1.01 mi^2
FF = 4.5 (Debris Method Figure 2 – 4 years)

LOG(P) = 2.301
LOG(RR) = 2.592
LOG(A) = 2.811

LOG (Dy) = 0.65(2.301) + 0.62(2.592) + 0.18(2.811) + 0.12(4.5)

LOG (Dy) = 1.4957 + 1.607 + 0.506 + 0.54 = 4.149

Dy = 14,082 CY/mi^2

REDUCED ADJUSTED UNIT DEBRIS BY STUDY ACREAGE

THEREFORE DY = 14,223 CY

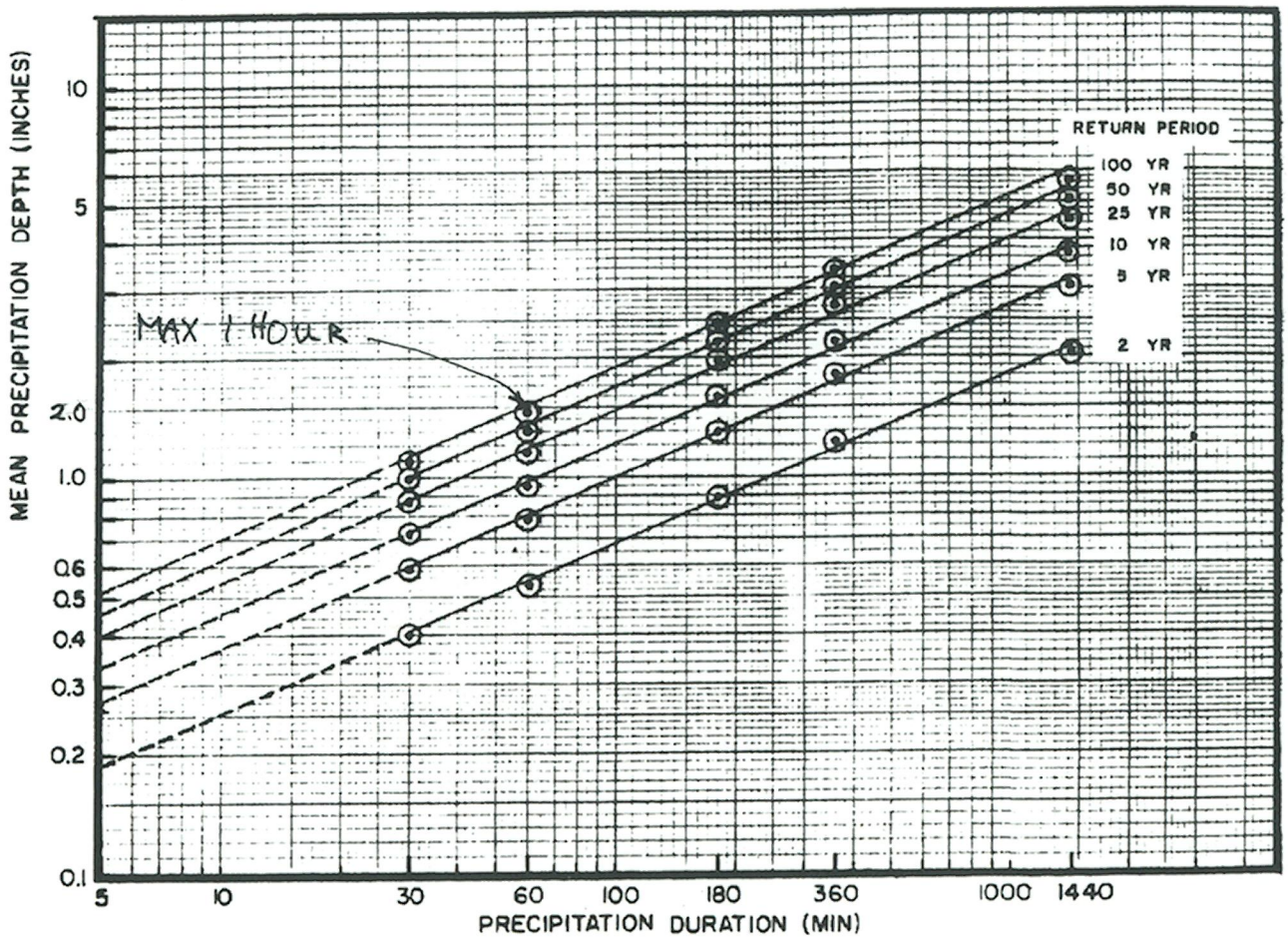
DEBRIS YIELD = 14,223 CY = 8.73 AC-FT

SAFETY FACTOR IS 1.25, THEREFORE THE TOTAL DEBRIS YIELD IS: 5,719 CY

USE DEBRIS YIELD = 17,778 CY = 11.02 AC-FT

Regression Equations: $D(t) = at^b$
(D= Depth in inches, t= duration in minutes)

Return Frequency (years)	a	b
2	0.095	0.426
5	0.131	0.438
10	0.170	0.427
25	0.200	0.434
50	0.225	0.434
100	0.259	0.427



ORANGE COUNTY
HYDROLOGY MANUAL

MEAN PRECIPITATION DEPTHS FOR NONMOUNTAINOUS AREAS

Figure B-1

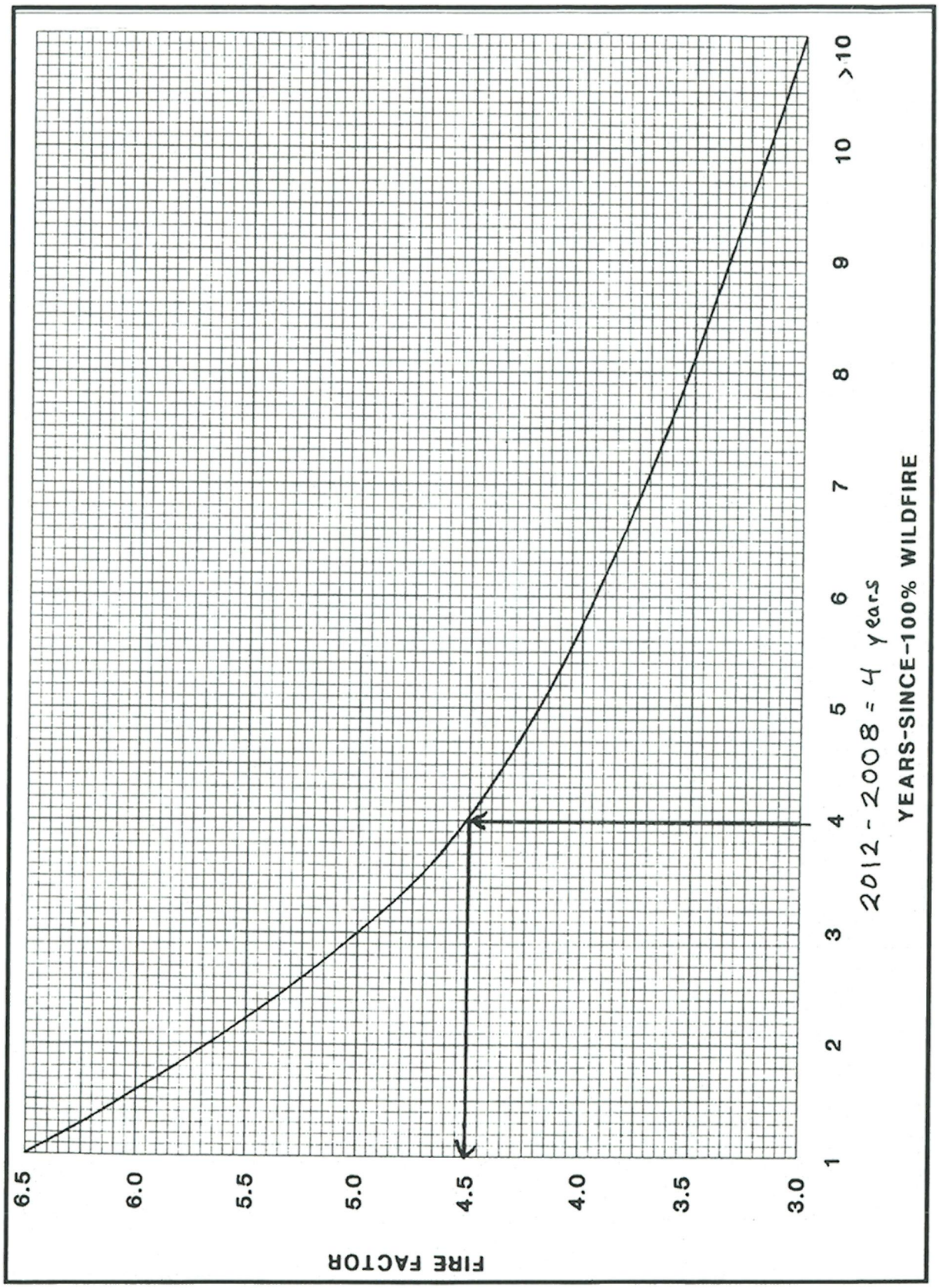
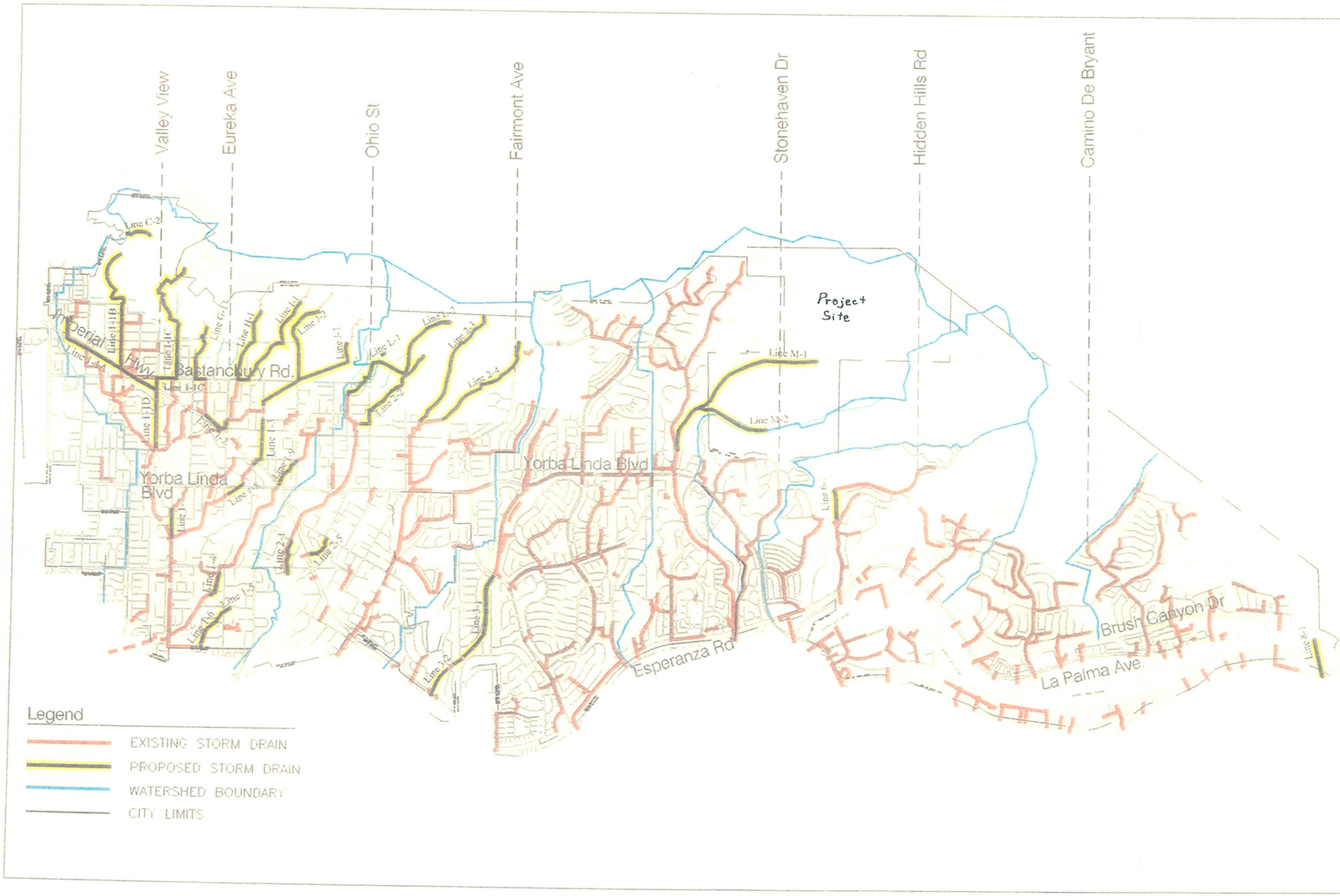


Figure 2: Fire Factor Curve for Watersheds 0.1 to 3.0 mi²

Appendix

P

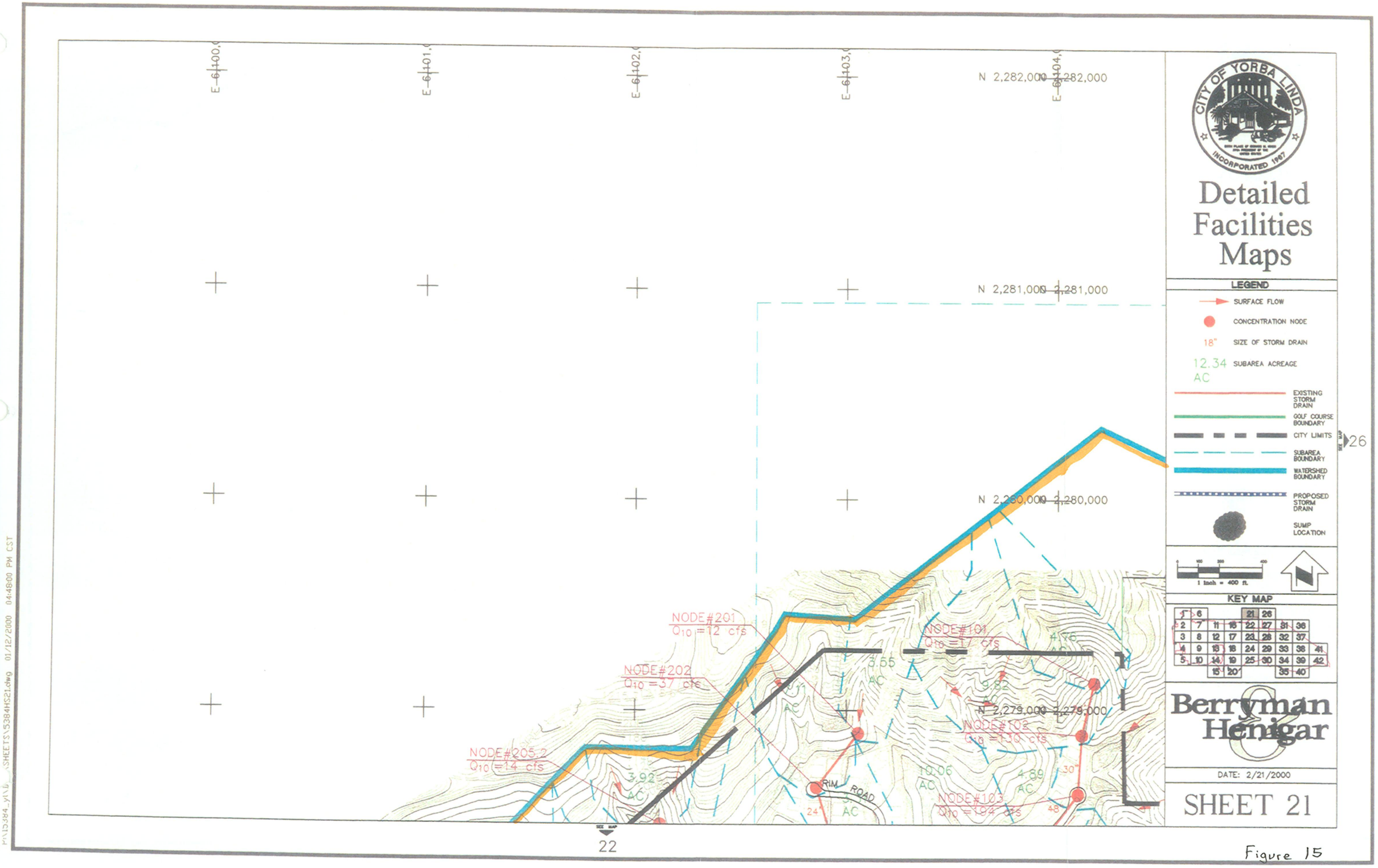
MASTER PLAN EXHIBITS



Facilities Summary Plan
Master Plan of Drainage

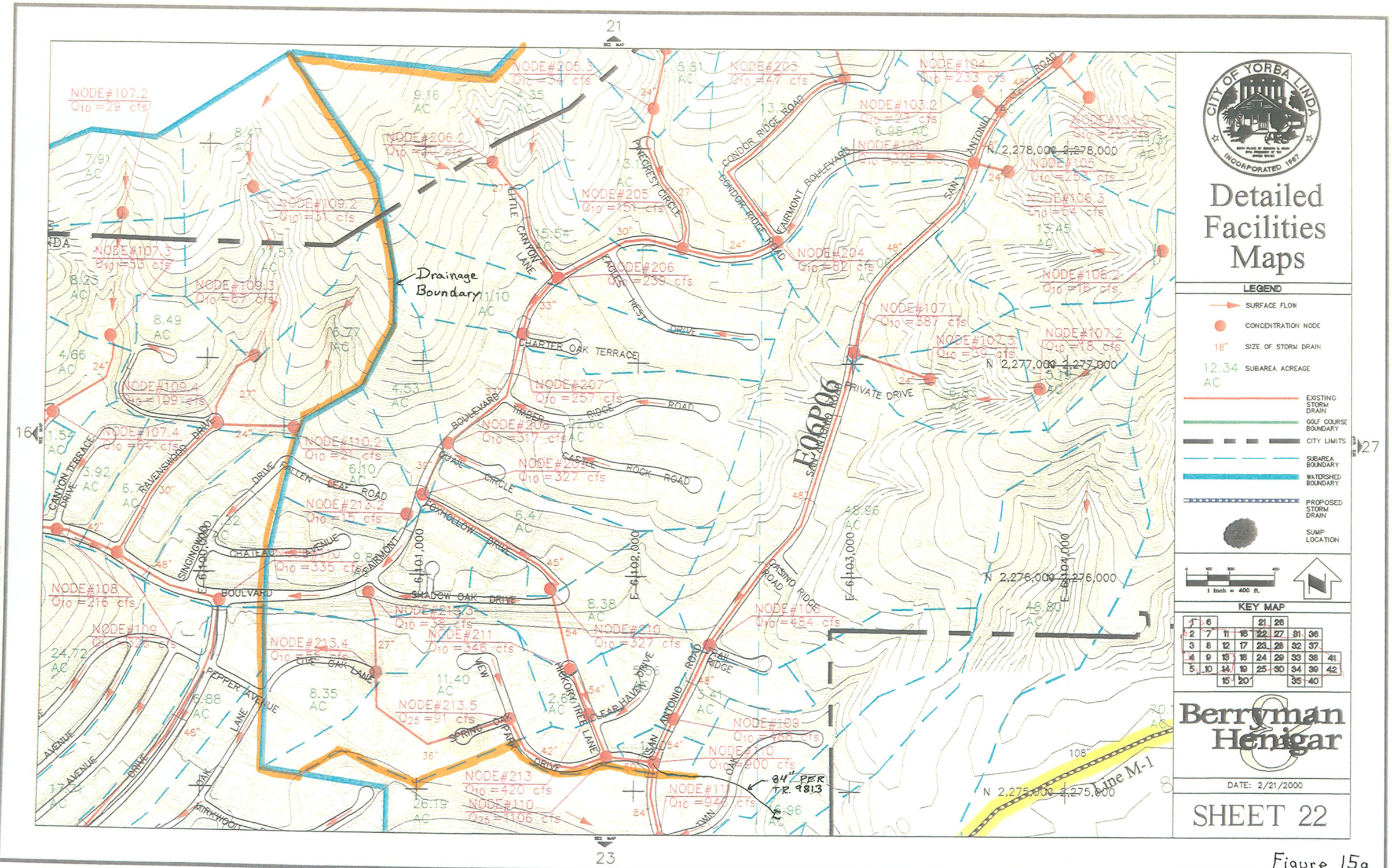
Berryman Henigar

Figure 14



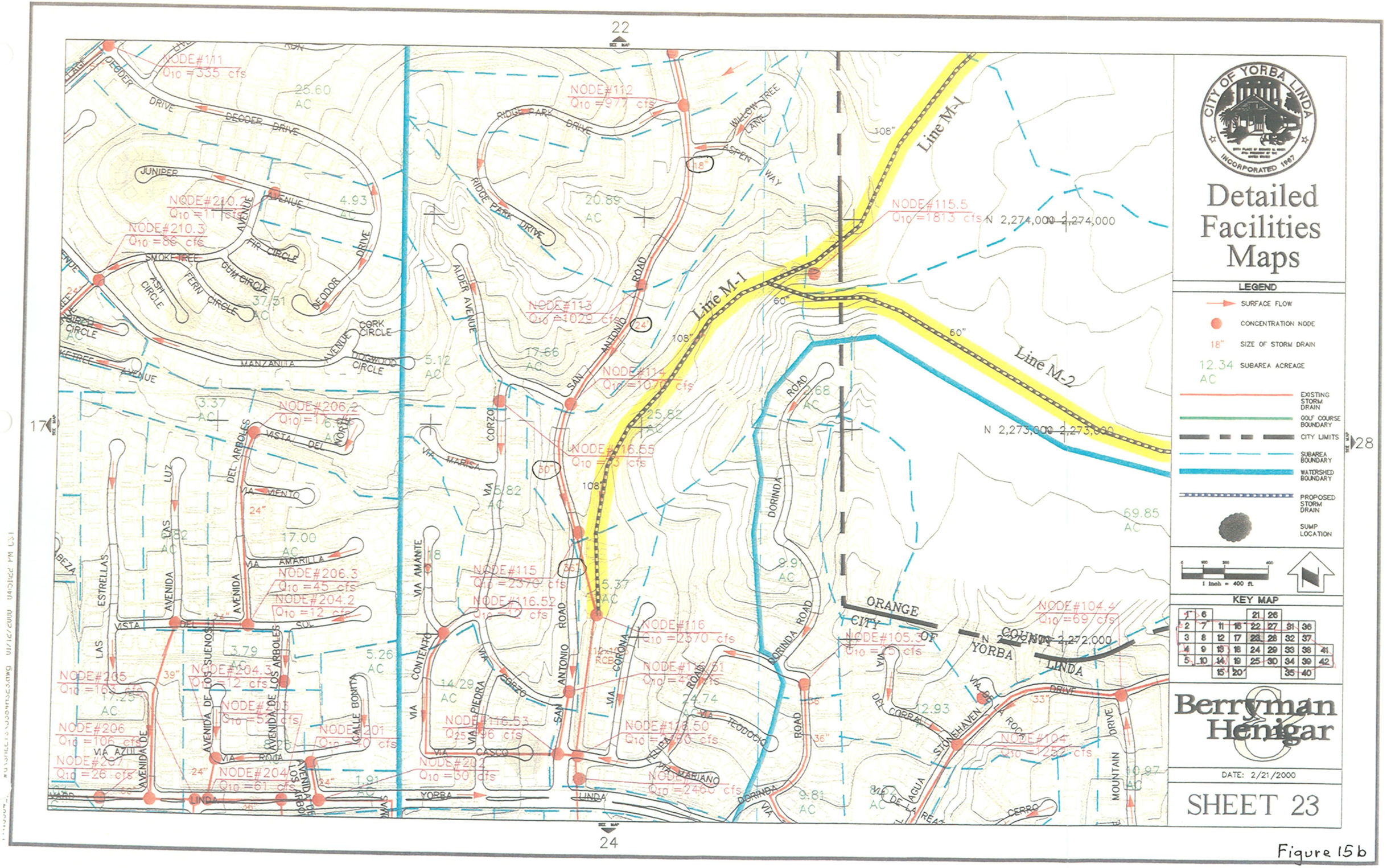
Detailed Facilities Maps
CITY OF YORBA LINDA
INCORPORATED 1967
LEGEND
SURFACE FLOW
CONCENTRATION NODE
18" SIZE OF STORM DRAIN
12.34 AC SUBAREA ACREAGE
EXISTING STORM DRAIN
GOLF COURSE BOUNDARY
CITY LIMITS
SUBAREA BOUNDARY
WATERSHED BOUNDARY
PROPOSED STORM DRAIN
SUMP LOCATION
1 inch = 400 ft.
KEY MAP
Berryman & Henigar
DATE: 2/21/2000
SHEET 21
N 2,282,000
N 2,281,000
N 2,280,000
N 2,279,000
NODE#201 Q10 =12 cfs
NODE#202 Q10 =37 cfs
NODE#205.2 Q10 =14 cfs
NODE#101 Q10 =17 cfs
NODE#102 Q10 =130 cfs
NODE#103 Q10 =194 cfs
RIM ROAD
3.55 AC
3.92 AC
10.06 AC
4.89 AC
26
22

Figure 15



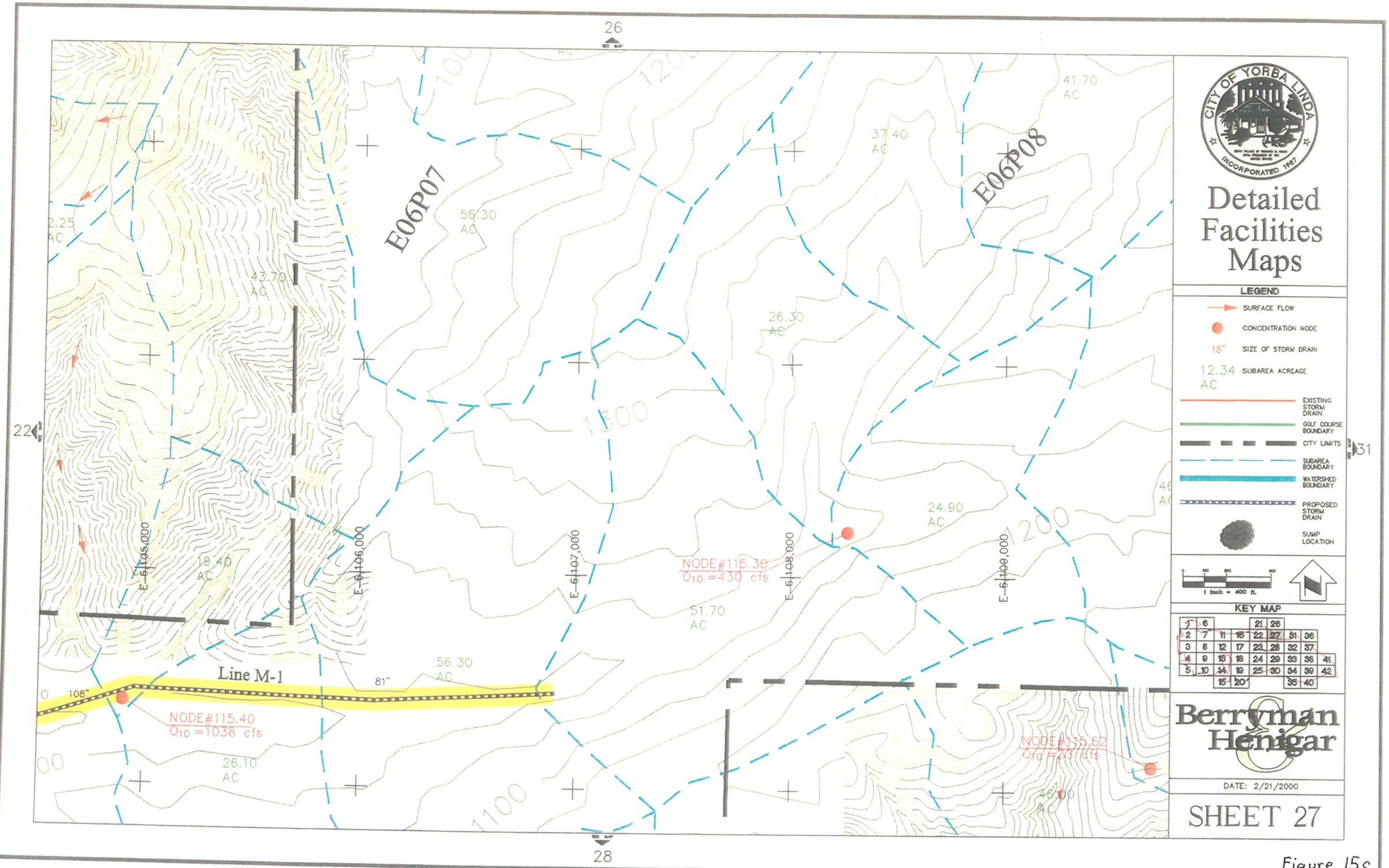
Detailed Facilities Maps
CITY OF YORBA LINDA
INCORPORATED 1967
LEGEND
SURFACE FLOW
CONCENTRATION NODE
18" SIZE OF STORM DRAIN
12.34 AC SUBAREA ACREAGE
EXISTING STORM DRAIN
GOLF COURSE BOUNDARY
CITY LIMITS
SUBAREA BOUNDARY
WATERSHED BOUNDARY
PROPOSED STORM DRAIN
SUMP LOCATION
1 inch = 400 ft.
KEY MAP
Berryman & Henigar
DATE: 2/21/2000
SHEET 22
Drainage Boundary
84" PER TR. 9813
Line M-1
E06P06
21
23
16
27

Figure 15a



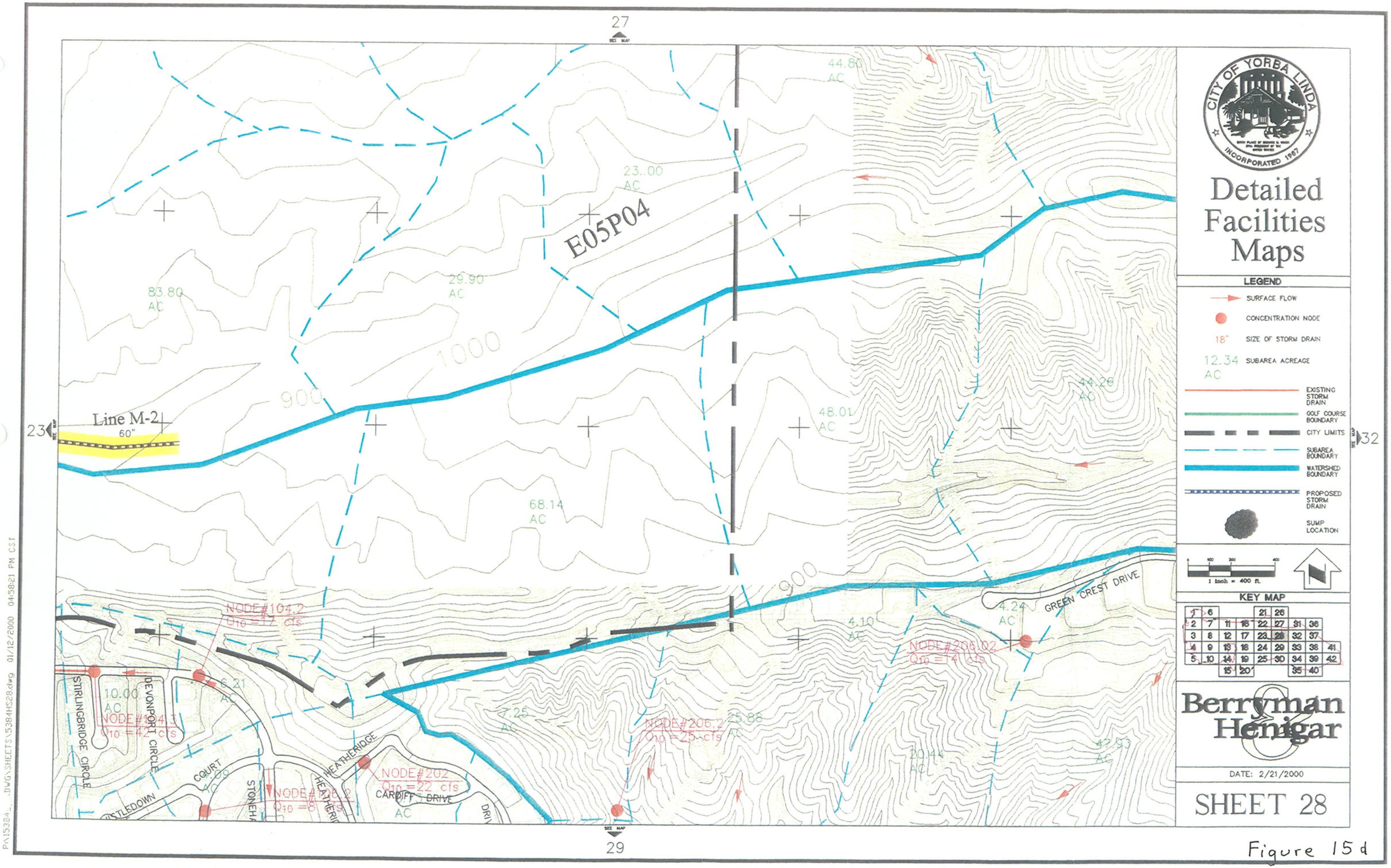
CITY OF YORBA LINDA
INCORPORATED 1967
Detailed Facilities Maps
LEGEND
SURFACE FLOW
CONCENTRATION NODE
18" SIZE OF STORM DRAIN
12.34 AC SUBAREA ACREAGE
EXISTING STORM DRAIN
GOLF COURSE BOUNDARY
CITY LIMITS
SUBAREA BOUNDARY
WATERSHED BOUNDARY
PROPOSED STORM DRAIN
SUMP LOCATION
1 inch = 400 ft.
KEY MAP
Berryman Henigar
DATE: 2/21/2000
SHEET 23
Line M-1
Line M-2
ORANGE COUNTY
CITY OF YORBA LINDA
N 2,274,000
N 2,273,000
N 2,272,000
22
24
17
28

Figure 15b



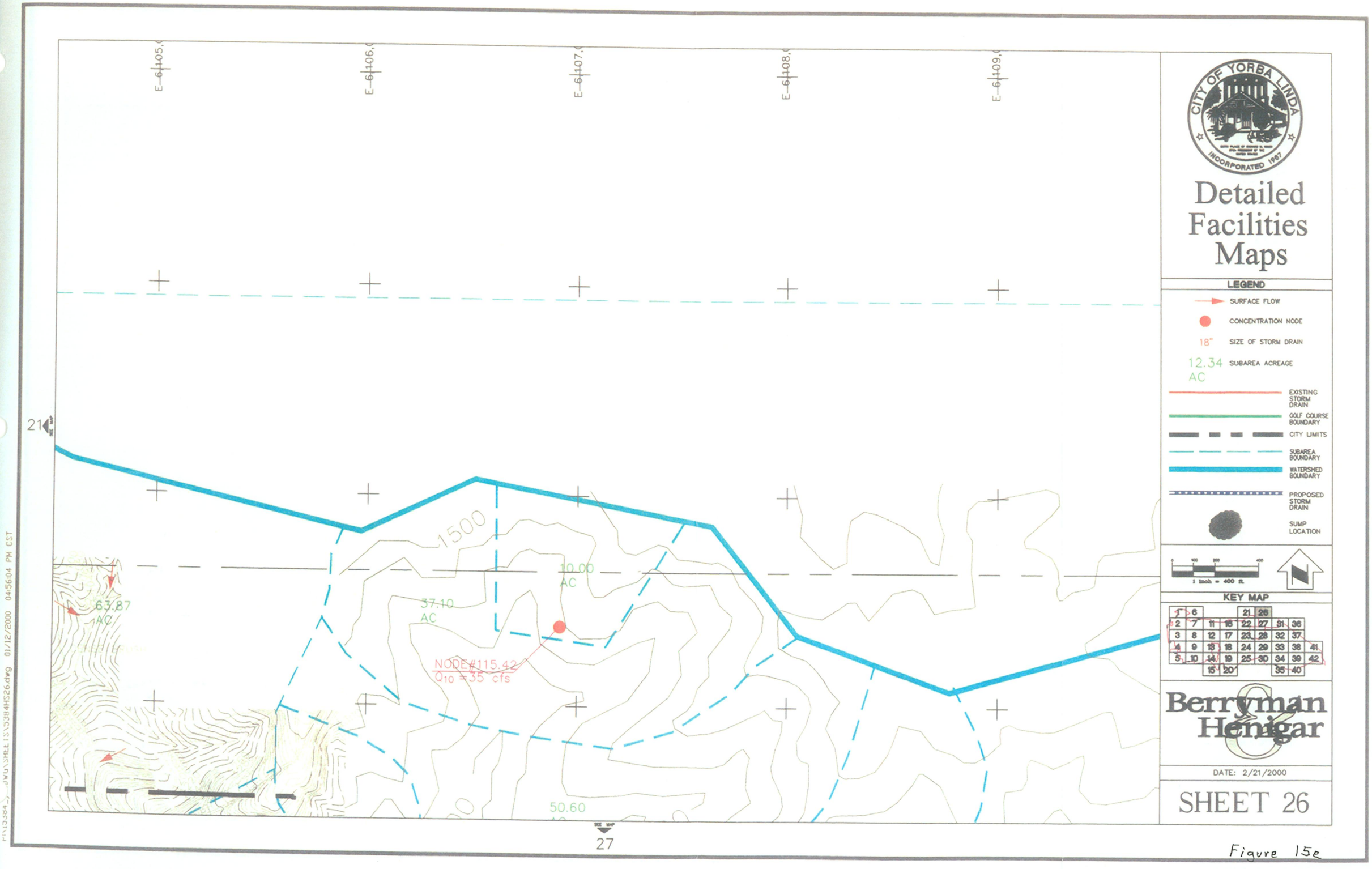
26
SEE MAP
22
31
28
E06P07
E06P08
Line M-1
NODE#115.30
Q10 =430 cfs
NODE#115.40
Q10 =1038 cfs
NODE#115.52
Q10 =33 cfs
E-6|105,000
E-6|106,000
E-6|107,000
E-6|108,000
E-6|109,000
108"
81"
56.30 AC
43.70 AC
37.40 AC
41.70 AC
26.30 AC
24.90 AC
19.40 AC
51.70 AC
26.10 AC
46.00 AC
1300
1200
1100
CITY OF YORBA LINDA
INCORPORATED 1967
Detailed Facilities Maps
LEGEND
SURFACE FLOW
CONCENTRATION NODE
18" SIZE OF STORM DRAIN
12.34 AC SUBAREA ACREAGE
EXISTING STORM DRAIN
GOLF COURSE BOUNDARY
CITY LIMITS
SUBAREA BOUNDARY
WATERSHED BOUNDARY
PROPOSED STORM DRAIN
SUMP LOCATION
1 inch = 400 ft.
KEY MAP
Berryman Henigar
DATE: 2/21/2000
SHEET 27

Figure 15c



27
SEE MAP
23
32
29
E05P04
Line M-2
60"
83.80 AC
29.90 AC
23.00 AC
44.80 AC
48.01 AC
44.26 AC
68.14 AC
4.10 AC
4.24 AC
7.25 AC
25.88 AC
20.44 AC
47.93 AC
10.00 AC
6.21 AC
900
1000
NODE#104.2
Q10 =17 cfs
NODE#104.3
Q10 =42 cfs
NODE#206.2
Q10 =25 cfs
NODE#206.02
Q10 =14 cfs
NODE#202
Q10 =22 cfs
NODE#206.2
Q10 =8 cfs
STIRLINGBRIDGE CIRCLE
DEVONPORT CIRCLE
HEATHERIDGE
CARDIFF DRIVE
GREEN CREST DRIVE
CITY OF YORBA LINDA
INCORPORATED 1967
Detailed Facilities Maps
LEGEND
SURFACE FLOW
CONCENTRATION NODE
18" SIZE OF STORM DRAIN
12.34 AC SUBAREA ACREAGE
EXISTING STORM DRAIN
GOLF COURSE BOUNDARY
CITY LIMITS
SUBAREA BOUNDARY
WATERSHED BOUNDARY
PROPOSED STORM DRAIN
SUMP LOCATION
1 inch = 400 ft.
KEY MAP
Berryman & Henigar
DATE: 2/21/2000
SHEET 28

Figure 15d



E-6105,0
E-6106,0
E-6107,0
E-6108,0
E-6109,0
21
1500
10.00
AC
37.10
AC
63.87
AC
NODE#115.42
Q10 =35 cfs
50.60
27
CITY OF YORBA LINDA
INCORPORATED 1987
Detailed Facilities Maps
LEGEND
SURFACE FLOW
CONCENTRATION NODE
18" SIZE OF STORM DRAIN
12.34 AC SUBAREA ACREAGE
EXISTING STORM DRAIN
GOLF COURSE BOUNDARY
CITY LIMITS
SUBAREA BOUNDARY
WATERSHED BOUNDARY
PROPOSED STORM DRAIN
SUMP LOCATION
1 inch = 400 ft.
KEY MAP
Berryman & Henigar
DATE: 2/21/2000
SHEET 26

Figure 15e

Appendix

Q
REFERENCE STORM DRAIN PLANS

IMPROVEMENT PLANS FOR TRACT 9813 IN THE CITY OF YORBA LINDA

GENERAL NOTES

1. ALL WORK SHALL CONFORM TO STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION; THE ORANGE COUNTY ENVIRONMENTAL MANAGEMENT AGENCY STANDARD PLANS; AND THE STANDARD SPECIFICATIONS OF THE CITY OF YORBA LINDA, LATEST EDITIONS.
2. ALL EXISTING IMPROVEMENTS INCLUDING CURB AND GUTTERS, SIDEWALKS, ASPHALT CONCRETE OR P.C.C. PAVING, WHICH ARE BEING JOINED OR MATCHED IN CONNECTION WITH THIS PROJECT, SHALL BE JOINED OR MATCHED IN A MANNER SATISFACTORY TO THE CITY ENGINEER, INCLUDING NECESSARY SAWCUTTING, REMOVAL, REPLACEMENT AND CAPPING.
3. ANY EXISTING TRAVEL WAYS IN WHICH EXCAVATION IS MADE IN CONJUNCTION WITH THIS PROJECT SHALL BE COVERED BY A SEPARATE PERMIT. THIS AREA SHALL BE PROPERLY POSTED AND LIGHTED IN CONFORMANCE WITH THE STATE MANUAL OF WARNING SIGNS, LIGHTS, AND DEVICES FOR USE IN PERFORMANCE OF WORK UPON HIGHWAYS IN ORDER TO ELIMINATE ANY HAZARDS. STREETS SHALL BE SURFACED WITH A MINIMUM OF 4" OF ASPHALT AT THE END OF EACH WORKING DAY.
4. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND SHALL NOTIFY THE CITY ENGINEER (994-7170) 48 HOURS PRIOR TO STARTING EACH PHASE OF CONSTRUCTION AND PRIOR TO REQUIRING INSPECTION.
5. ALL UTILITIES SHALL BE INSTALLED PRIOR TO PAVING OF STREETS; ALL TRENCHES SHALL BE FULLY COMPACTED TO THE SATISFACTION OF THE CITY ENGINEER. MANHOLE AND VALVE BOX FRAMES SHALL BE ADJUSTED TO FINISHED GRADES AFTER COMPLETION OF CONSTRUCTION.
6. THE CONTRACTOR SHALL DETERMINE THE LINE LOCATION OF ANY UNDERGROUND UTILITY PRIOR TO LAYING ANY LINES WHICH ARE TO CONNECT TO EXISTING SEWERS OR STORM DRAINS. THESE LINES SHALL BE EXPOSED AND JOINT ELEVATIONS VERIFIED. ANY CHANGE IN GRADE OR DEVIATION FROM THE PLANS MUST BE APPROVED BY THE CITY ENGINEER.
7. A MINIMUM OF TWO WEEKS AFTER THE COMPLETION OF THE A.C. SURFACING OR AS DIRECTED BY THE CITY ENGINEER, AN ASPHALT EMULSION SEAL COAT, SS-1H, SHALL BE APPLIED AT THE APPROXIMATE RATE OF 0.1 GAL. PER SQ. YD.
8. STREET NAME SIGNS AND TRAFFIC CONTROL SIGNS, TYPE AND LOCATIONS SHALL BE DESIGNATED BY THE CITY ENGINEER.
9. STAKES FOR CRB CONSTRUCTION ARE TO BE OFFSET FROM FACE OF CURBS.
10. THE ENGINEER SHALL FURNISH GRADE SHEETS TO THE CITY INSPECTOR FOR CONSTRUCTION OF IMPROVEMENTS.
11. IF DRIVEWAY DEPRESSIONS ARE MADE IN ANY CURB, DRIVEWAY APPROACHES ARE THEN TO BE MADE PART OF THE IMPROVEMENT PLAN AND SHALL BE CONSTRUCTED IN ACCORDANCE WITH STANDARD PLAN NO. 209 OF THE OCEMA STANDARD PLANS.
12. ADVERTISING SIGNS WILL NOT BE PERMITTED WITHIN STREET RIGHT-OF-WAY.
13. TREES SHALL BE PLANTED WITHIN THE STREET RIGHT-OF-WAY IN ACCORDANCE WITH CITY OF YORBA LINDA REQUIREMENTS.
14. STREET LIGHTS ARE TO BE INSTALLED BY SOUTHERN CALIFORNIA EDISON COMPANY PER PLAN APPROVED BY THE CITY OF YOUBA LINDA.
15. STRUCTURAL SECTION OF PAVEMENT SHALL BE DETERMINED BY THE CITY'S SOILS ENGINEER AND APPROVED BY THE CITY ENGINEER.
16. PRIME COAT SHALL CONSIST OF M.C.-70 LIQUID ASPHALT APPLIED AT THE RATE OF 0.25 GAL. PER SQ. YD. AT LEAST 12 HOURS PRIOR TO ASPHALT PAVING OPERATIONS.
17. ALL EXISTING PAVEMENT WITHIN THIS PROJECT SHALL EITHER BE REMOVED OR STRUCTURALLY TESTED TO VERIFY THE STRUCTURAL CAPABILITIES AND THE RESULTS SHALL BE APPROVED BY THE CITY ENGINEER.
18. COMPACTION TESTING SHALL BE PERFORMED BY THE CITY'S SOILS ENGINEER AT THE DIRECTION OF THE CITY ENGINEER.
19. INTERIOR AND EXTERIOR STREET IMPROVEMENTS SHALL BE CONSTRUCTED PRIOR TO THE ISSUANCE OF BUILDING PERMITS TO THE SATISFACTION OF THE CITY ENGINEER.
20. SEWER MAIN AND LATERALS SHALL BE CONSTRUCTED, BACKFILL COMPACTED AND TESTED PRIOR TO CONSTRUCTION OF THE CURB AND GUTTER.
21. THE CURB AND GUTTER SHALL BE "ETCHED" SHOWING LATERAL LOCATIONS; "S" FOR SEWER, "G" FOR GAS, AND "E" FOR ELECTRICAL.
22. DRIVEWAYS SHALL BE LOCATED PER APPROVED PLOT PLAN BY DEVELOPER'S ENGINEER. STAKES SHALL BE SET ON CENTERLINE OF APPROACH WITH OVERALL MARKED ON WITNESS STAKE. W=BOTTOM OF "X" WIDTH.
23. STREET CENTERLINE AND INTERMEDIATE VERTICAL CONTROL STAKING (GRID FLEXATIONS) SHALL BE PROVIDED ABY DEVELOPER'S ENGINEER AS REQUIRED BY CITY INSPECTOR.
24. TRAFFIC CONTROL AND SAFETY DEVICES SHALL BE PLACED AND MAINTAINED PER THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION, MANUAL OF WARNING SIGNS, LIGHTS, AND DEVICES FOR USE IN PERFORMANCE OF WORK UPON HIGHWAYS AND TO THE SATISFACTION OF THE CITY ENGINEER.
25. NOTICE TO CONTRACTORS: EXISTENCE AND LOCATIONS OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN OF THESE PLANS ARE OBTAINED BY A SEARCH OF THE AVAILABLE RECORDS. APPROVAL OF THESE PLANS BY THE CITY OF YORBA LINDA DOES NOT CONSTITUTE A REPRESENTATION AS TO THE ACCURACY OR COMPLETENESS OF THE LOCATION OR EXISTENCE OR NON-EXISTENCE OF ANY UNDERGROUND UTILITY PIPE OR STRUCTURE WITHIN THE LIMITS OF THIS PROJECT. THE CONTRACTOR IS REQUIRED TO TAKE ALL DUE PRECAUTIONARY MEANS TO PROTECT THE UTILITY LINES NOT OF RECORD OR NOT SHOWN ON THESE PLANS.
26. PRIVATE ENGINEER'S NOTICE: PRIOR TO CONSTRUCTION, SEWER AND WATER CONTRACTORS SHALL ASCERTAIN THE CORRECTNESS OF WATER SERVICES AND SEWER LATERAL LOCATIONS WITH THE DEVELOPER. ANY DEVIATION FROM LOCATIONS SHOWN ON THESE PLANS SHALL BE REPORTED TO THE ENGINEER FOR ADJUSTMENT PRIOR TO CALLING FOR ANY CONSTRUCTION STAKING REQUIRED.
27. THE FINAL OR SURFACE LAYER OF ASPHALT CONCRETE SHALL NOT BE PLACED UNTIL ALL ON-SITE IMPROVEMENTS HAVE BEEN COMPLETED, INCLUDING ALL GRADING AND UNTIL ALL UNACCEPTABLE CONCRETE WORK HAS BEEN REMOVED AND REPLACED UNLESS APPROVED OTHERWISE BY THE ENGINEER. PER OCEMA STD. #805.
28. ALL STREET LIGHTS SHOULD BE LOCATED 18" BEHIND CURB.

WATER NOTES

1. THE WATER SYSTEM SHALL BE INSTALLED IN CONFORMANCE WITH THE YORBA LINDA COUNTY WATER DISTRICT "STANDARD SPECIFICATIONS FOR CONSTRUCTION OF WATER MAINS".
2. ALL SERVICES TO BE 1" PLASTIC WITH 1" METER, UNLESS OTHERWISE NOTED.
3. FIRE HYDRANTS TO BE MUELLER A-423-MODERN IMPROVED OR APPROVED EQUAL. A-442 VALVE OPENING SIZE SHALL BE 5-1/2" AND 4"X2-1/2" HOSE OUTLETS.
4. ALL WATER MAINS TO BE CLASS 150-ASBESTOS CEMENT, UNLESS NOTED TO BE CLASS 200 SIZED AS SHOWN.
5. METERS TO BE INSTALLED BY YORBA LINDA WATER DISTRICT.
6. IN ACCORDANCE WITH ASSEMBLY BILL 1366, THE CONTRACTOR SHALL OBTAIN A PERMIT FROM THE STATE OF CALIFORNIA, DIVISION OF INDUSTRIAL SAFETY PRIOR TO ANY TRENCH EXCAVATION. A COPY OF SAID PERMIT SHALL BE KEPT AT THE JOB SITE AND AVAILABLE TO DISTRICT REPRESENTATIVE UPON REQUEST.
7. ALL TRENCH BACKFILL SHALL BE COMPACTED TO A MINIMUM OF 90% REL. DENSITY.
8. CONTRACTOR SHALL NOTIFY WATER DISTRICT INSPECTOR 48 HOURS PRIOR TO STARTING ANY PHASE OF CONSTRUCTION.
9. WATER VALVES ARE TO BE PLACED OUT OF SPANDREL AREA.
10. ALL WATER MAINS SHALL MAINTAIN DEPTH OF 54" TO FLOWLINE FROM TOP OF CURB.
11. BUTTERFLY VALVES MAY BE SUBSTITUTED FOR GATE VALVES OVER 12".
12. ALL VALVE BOXES SHALL BE BROUGHT TO GRADE AFTER EACH LIFT OF ROADWAY PAVING
13. ALL LANDSCAPE METER LOCATIONS SHALL BE NOTED TO YORBA LINDA WATER DISTRICT.
14. MINIMUM DISTANCE BETWEEN STREET LIGHT STANDARD AND FIRE HYDRANT 10 0 FEET.

SEWER NOTES

1. ALL SEWER WORK SHALL COMPLY WITH THE GENERAL PROVISIONS, STANDARD SPECIFICATIONS AND STANDARD PLANS FOR SEWER CONSTRUCTION OF THE YORBA LINDA WATER DISTRICT, LATEST EDITION.
2. THE CONTRACTOR SHALL NOTIFY THE CITY ENGINEER AT LEAST 24 HOURS PRIOR TO THE NEED OF ANY INSPECTION.
3. VITRIFIED CLAY PIPE SEWERS SHALL HAVE JOINTS OF THE MECHANICAL COMPRESSION TYPE, SUCH AS "WEDGELOCK", "SPEED SEAL MAINLINE" OR "BANDSEAL" OR APPROVED EQUAL.
4. THE USE OF PORTLAND CEMENT IN ANY FORM WILL NOT BE PERMITTED FOR JOINTS.
5. MANHOLE COVERS SHALL BE LEFT AT LEAST 6" BELOW SUBGRADE AND BROUGHT TO FINAL GRADE UPON COMPLETION OF PAVING. FINAL MANHOLE SEATING SHALL BE 1/0" BELOW ASPHALT SURFACE.
6. FOUR INCH (4") A.B.S. SEWER HOUSE CONNECTIONS SHALL BE LAID TO GRADE AS ESTABLISHED BY THE ENGINEER FOR THE SUBDIVIDER SO THAT THE 4" A.B.S. WILL HAVE A MINIMUM COVER OF FIVE AND ONE-HALF (5.5 FEET) FROM TOP OF CURB TO TOP OF PIPE — PER Y.L.W.D. STD'S.
7. FINAL TESTING FOR PIPELINE LEAKAGE SHALL BE MADE IN THE PRESENCE OF THE INSPECTOR FOR THE CITY. AFTER BACKFILL HAS BEEN COMPLETED BY THE CONTRACTOR AND INSPECTED, APPROVED AND ACCEPTED BY THE CITY ENGINEER.
8. ALL SEWER LINES SHALL BE BALLED IN THE PRESENCE OF THE INSPECTOR FOR THE CITY AFTER FINAL TESTING AND MANHOLE COVERS HAVE BEEN BROUGHT TO GRDE UPON COMPLETION OF PAVING. BALLING MUST BE COMPLETED TO THE SATISFACTION OF THE CITY ENGINEER PRIOR TO OCCUPANCE RELEASES BEING ISSUED.
9. WHERE THE SEWER HOUSE CONNECTION COVER IS LESS THAN 5.5 FEET AND DOES NOT COMPLY WITH NOTE NO. 6 ABOVE, THE CONTRACTOR SHALL SUBSTITUTE C.I.P. (SEE DET. B) WITH RUBBER RING JOINTS) FOR A.B.S. OR CONCRETE ENCASE THE 4" A.B.S. PER DISTRICT STANDARD. THE C.I.P. OR CONCRETE ENCASED A.B.S. SHALL BE LAID AFTER THE WATER LINE IS INSTALLED SHALL BE LAID A MINIMUM DISTANCE OF 9 FEET EACH SIDE OF THE WATER LINE CROSSING WITH A 6" VERTICAL CLEARANCE BETWEEN THE WATER LINE AND THE HOUSE CONNECTION.
10. THE SUBDIVIDER'S ENGINEER SHALL SET A TOP OF CURB STAKE AT ALL SEWER LATERAL CONNECTIONS.
11. A 4" X 4" REDWOOD POST PAINTED WHITE (4' - 6" WITH 3' -0" ABOVE GROUND) SHALL BE SET AS A MANHOLE REFERENCE, WHEN SEWER IS NOT CONSTRUCTED IN THE STREET RIGHT-OF-WAY, AT THE DIRECTION OF THE ENGINEER.
12. ALL TRENCH BACKFILL SHALL BE COMPACTED TO A MINIMUM OF 90% REL. DENSITY.
13. THE SUBDIVIDER'S ENGINEER SHALL FURNISH A COMPLETE SET OF "AS-BUILT" PLANS ON ORIGINAL LINENS OR MYLAR TO THE CITY ENGINEER AT THE COMPLETION OF THE SEWER WORK AND PRIOR TO PAVING STREETS SHOWING LOCATION OF WYES AND END OF HOUSE LATERALS AT PROPERTY LINE.
14. THE CONTRACTOR'S ATTENTION IS DIRECTED TO SECTION 4-10, "SAFETY AND ACCIDENT PREVENTION" OF THE YORBA LINDA WATER DISTRICT'S SPECIFICATIONS.
15. IF THE BOTTOM AF THE WATER MAIN DOES NOT CLEAR THE TOP OF THE SANITARY SEWER BY 3', CONCRETE ENCASEMENT OF THE SEWER WITH STEEL REINFORCING WILL BE REQUIRED, AND EXTENDING 5' EACH SIDE OF WATER MAIN MEASURED AT RIGHT ANGLES OF THE WATER MAIN.
16. SEWER LATERAL CONNECTIONS SHALL ENTER THE MAINLINE AT A POINT DOWNSTREAM OF A MANHOLE. SEWER LATERAL CONNECTIONS AT PROPERTY LINE SHALL NOT BE MADE UNTIL MAINLINE HAS BEEN AIR TESTED AND ACCEPTED FOR LEAKAGE BY THE CITY OF YORBA LINDA.
17. THE DEVELOPER SHALL FURNISH CONTRACTOR AND CITY INSPECTOR "WYE" STATIONING WITH ALL MAINLINE SEWER CUT SHEETS.
18. SEWER STATIONING SHOWN THUS: 0 + 00.00
19. ACRYLONITRILE-BUTADIENE-STYRENE (A.B.S.) PLASTIC SEWER PIPE SHALL CONFORM TO THE REQUIREMENTS OF SECTIONS 207-14 AND 207-15 OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION.
20. SOLID WALL PLASTIC PIPE SHALL HAVE AN SDR RATIO OF OUTSIDE DIAMETER TO THICKNESS OF 23.5.
21. PLASTIC PIPE SHALL BE BEDDED IN STRICT ACCORDANCE WITH THE BEDDING DETAILS HEREON. CASE 2 BEDDING SHALL BE USED FOR PIPE WITH FROM 4' TO 17' COVER. BEDDING MATERIAL SHALL BE NO. 4 AGGREGATE OR 1/2" CRUSHED ROCK. IF COVER IS LESS THAN 9', SAND MAY BE SUBSTITUTED. CASE 4 BEDDING SHALL BE USED FOR COVER GREATER THAN 17'. SEE DETAIL SHEET 2.
22. HOUSE CONNECTIONS CUT THROUGH THE PIPE WILL NOT BE ACCEPTED.
23. A SEAL, WATERSTOP, OR COUPLING SHALL BE PLACED OR GROUTED INTO THE MANHOLE TO ACCEPT THE PLASTIC SEWER PIPE.
24. ALL EXPOSED ENDS OF A.B.S. COMPOSITE PIPE SHALL BE THOROUGHLY COATED WITH SOLVENT CEMENT PRIOR TO JOINING.
25. ALL MAINELINE PLASTIC (A.B.S.) PIPE SHALL BE MANDRELL TESTED PER SECTION 306-1.4.6 OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION. THE TEST SHALL COMMENCE AT LEAST 40 HOURS AFTER BACKFILL.
26. STANDARD 12.5' LENGTHS OF A.B.S. COMPOSITE PIPE SHALL NOT BE PLACED ON A CURVE WITH A RADIUS LESS THAN 540'. SMALLER RADIUS CURVES SHALL CONSTRUCTED USING 3 DEGREE DEFLECTION FITTINGS.

STORM DRAIN NOTES

1. ALL CONCRETE IN REINFORCED CONCRETE STRUCTURES MUST BE 3250 P.S.I. IN 28 DAYS. TYPE V PORTLAND CEMENT CONCRETE, CLASS A.
2. ALL PIPE LENGTHS ARE HORIZONTAL PROJECTIONS, UNLESS OTHERWISE SHOWN.
3. FOR TRENCH EXCAVATIONS IN NATIVE SOIL, SHORING SHALL BE PROVIDED TO SATISFY STATE OF CALIFORNIA SAFETY REQUIREMENTS.
4. PIPE CONSTRUCTION IN FILL AREA MUST BE COORDINATED WITH THE GRADING TO INSURE THAT WHEN THE FILL OPERATION HAS BEEN COMPLETED AT GRADE A MINIMUM OF ONE FOOT ABOVE THE TOP OF PIPE OR TO FIVE FEET (MAXIMUM) ABOVE THE PROPOSED SUBGRADE OF THE PIPE. THE STORM DRAIN TRENCH SHALL BE EXCAVATED AND THE PIPE INSTALLED.
5. ALL WORK MUST BE IN CONFORMANCE WITH THE ORANGE COUNTY E.M.A. STANDARD SPECIFICATIONS WHICH MAY BE PURCHASED FROM THE COUNTY AND KEPT ON THE JOB SITE AT ALL TIMES.
6. THE CONTRACTOR MUST NOTIFY THE CITY OF YORBA LINDA INSPECTOR AT LEAST (2) WORKING DAYS PRIOR TO COMMENCEMENT OF ANY CONSTRUCTION.
7. ALL FILLS MUST BE COMPACTED TO 90% RELATIVE COMPACTION AS DETERMINED BY THE CALIFORNIA TEST METHOD NO. 216-F, 1963 "FIVE LAYER METHOD". ALL BACKFILL MATERIAL MUST BE FREE OF VEGETABLE MATTER.
8. ALL SURVEYING REQUIRED FOR VERTICAL AND HORIZONTAL ALIGNMENT MUST BE PROVIDED BY THE CONTRACTOR OR DEVELOPER AND SUFFICIENT REFERENCE STAKING MUST BE IN ACCORDANCE WITH THE REQUEST OF THE CITY OF YORBA LINDA INSPECTOR.
9. ALL REINFORCED CONCRETE PIPE MUST BE BEDDED IN ACCORDANCE PIPE BEDDING DETAIL PER O.C.E.M.A. STD. PLAN 319.
10. PRIOR TO THE PLACEMENT OF STORM DRAIN IMPROVEMENTS, THE DEVELOPER'S SOILS ENGINEER SHALL CERTIFY IN WRITING TO THE CITY ENGINEER THAT THE STORM DRAINS' SUBGRADE IS OF ADEQUATE STRENGTH TO SUPPORT THE STRUCTURES AND ANY ANTICIPATED LOADS.
11. PRIOR TO THE COMMENCEMENT OF CONSTRUCTION, THE DEVELOPER'S CONTRACTOR SHALL OBTAIN A PERMIT FROM THE STATE DIVISION OF INDUSTRIAL SAFETY. A COPY OF THE PERMIT SHALL BE KEPT ON THE JOB SITE AT ALL TIMES.
12. WHENEVER APPLICABLE, THE DEVELOPER SHALL OBTAIN A PERMIT FROM THE STATE DEPT. OF FISH AND GAME IN ACCORDANCE WITH SECTION 1602 OF THE CALIFORNIA FISH AND GAME CODE PRIOR TO COMMENCEMENT OF CONSTRUCTION.
13. ALL STEEL THAT IS TO BE CONTINUOUS SHALL BE LAPPED A MINIMUM OF 45 BAR DIAMETERS.
14. ALL MATERIALS TESTING FOR THE DRAINAGE FACILITIES SHALL BE PROVIDED BY THE CONTRACTOR OR DEVELOPER IN ACCORDANCE WITH THE NUMBER, LOCATION AND FREQUENCY REQUESTED BY THE CITY ENGINEER.
15. CHAMFER ALL EXPOSED EDGES OF CONCRETE 3/4" MIN.
16. A PERMIT FOR WORK WITHIN EXISTING STREET RIGHT OF WAY IS REQUIRED FROM THE CITY OF YORBA LINDA FOR ANY ENCROACHMENT NECESSARY FOR CONSTRUCTION IN THE STREET RIGHT OF WAY.
17. LENGTH OF MANHOLE STRUCTURES MAY BE INCREASED TO MEET PIPE ENDS AT OPTION OF CONTRACTOR AS LONG AS REINFORCING STEEL IS CONTINUED AS REQUIRED. ANY CHANGE IN SPUR LOCATION MUST BE APPROVED BY THE ENGINEER.
18. FLOOR OF MANHOLE STRUCTURE SHALL BE STEEL TROWELED TO SPRING LINE.
19. BODY OF MANHOLE STRUCTURE, INCLUDING SPUR, MUST BE POURED IN ONE CONTINUOUS OPERATION, EXCEPT THAT CONSTRUCTION JOINT AT THE SPRING LINE WITH A LONGITUDINAL KEY IS PERMITTED.
20. ALL REINFORCING BARS MUST BE SECURELY HELD IN PLACE IN THE FORMS. TWO WAY MATS OF STEEL MUST BE WIRED TOGETHER BOTH WAYS AT ALTERNATE INTERSECTIONS.
21. STORM DRAIN BACKFILL FOR ALL FACILITIES WITHIN STREET RIGHT OF WAY IS TO BE PLACED AND COMPACTED UNDER CITY OF YORBA LINDA INSPECTION AND MEET OR EXCEED O.C.E.M.A. MINIMUM STANDARDS.
22. ALL PIPE TO BE BANDED AND GROUTED.
23. AREA DRAIN PIPE SHALL BE ;
    A. ACRYLONITRILE BUTADIENE STYRENE (A.B.S.) SOLID WALL PIPE CONFORMING TO A.S.T.M. D 2751 OR35.
    OR B. POLYVINYL CHLORIDE PLASTIC (P.V.C.) PIPE CONFORMING TO A.S.T.M. D 3034, SDR 35.
    OR C. ASBESTOS CEMENT PIPE (A.C.P.) CONFORMING TO A.S.T.M. C-663.
    OR D. APPROVED EQUAL.
24. R.C.P. SHALL COMPLY WITH ALL A.S.T.M. APPLICABLE STANDARDS.

ED. RCP IN HORIZONTAL AND VERTICAL CURVES SHALL BE BEVELLED PER MANUFACTURERS RECOMMENDATIONS

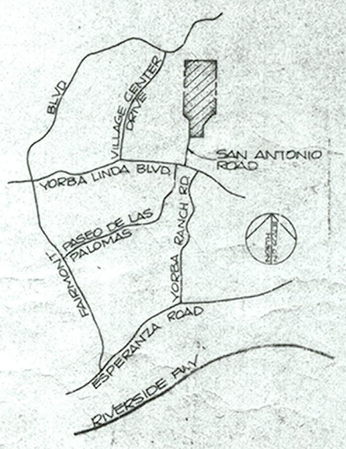
INDEX OF STREETS & TITLES

SH #	DESCRIPTION
1	GENERAL NOTES, WATER, SEWER & STORM DRAIN NOTES
2	INDEX MAP, STREET SECTIONS & DETAILS
3 & 3.6	STREET PLAN & PROFILE - SAN ANTONIO ROAD
7	STREET PLAN & PROFILE
8	STREET PLAN & PROFILE
9	STREET PLAN & PROFILE
10	STREET PLAN & PROFILE
11	STREET PLAN & PROFILE
12, 13	STREET PLAN & PROFILE
14	STREET PLAN & PROFILE
15	STREET PLAN & SEWER PROFILE (PRIVATE DRIVE)
16	SEWER IMP. "LINE A" & "LINE B"
17, 18	STORM DRAIN IMPR. "LINE A"
19	STORM DRAIN IMPR. "LINE B"
20	STORM DRAIN IMPR. "LINE C"
21, 22	STORM DRAIN IMPR. "LINE D"
23	STORM DRAIN IMPR. "LINE E"
24	STREET PLAN & PROFILE, GRADING

LEGEND:

- FIRE HYDRANT
- A.C.P. WATER MAIN & BLOW OFF VALVE
- A.C.P. WATER MAIN & GATE VALVE
- ABD. TYP. TYPE SEWER & MANHOLE
- STREET LIGHT
- STREET NAME SIGN
- STOP SIGN
- BARRICADE

VICINITY MAP



NOTICE TO CONTRACTOR:

THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS ARE OBTAINED BY A SEARCH OF THE AVAILABLE RECORDS. APPROVAL OF THIS PLAN BY THE CITY OF YORBA LINDA DOES NOT CONSTITUTE A REPRESENTATION AS TO THE ACCURACY OR COMPLETENESS OF THE LOCATION OR EXISTENCE OR NON-EXISTENCE OF ANY UNDERGROUND UTILITY PIPE OR STRUCTURE WITHIN THE LIMITS OF THIS PROJECT. THE CONTRACTOR IS REQUIRED TO TAKE ALL DUE PRECAUTIONARY MEANS TO PROTECT THE UTILITY LINES NOT OF RECORD OR NOT SHOWN ON THIS PLAN.

NOTE:

CONTRACTOR AGREES THAT HE SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT INCLUDING SAFETY OF ALL PERSONS AND PROPERTY THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS ABD THAT THE CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD THE OWNER AND THE ENGINEER HARMLESS FROM ANY AND ALL LIABILITY REAL OR ALLEGED IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS EXCEPTING FOR LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNER OR THE ENGINEER.

APPROVED FOR STORM DRAIN ONLY:
ROY STEPHENSON 8/21/86 DATE

BJH 7/21/86

REGISTERED PROFESSIONAL ENGINEER DOUGLAS SNYDER NO. 24068 CIVIL STATE OF CALIFORNIA

YORBA LINDA WATER DISTRICT	ORANGE COUNTY FIRE DEPT.
APPROVED BY:	APPROVED BY: JAN 16 1987
Ralph Hoffman 9-16-86	3-14-86
GENERAL MANAGER DATE	DATE
	J-84-01

REVISIONS

NO	DESCRIPTION:	APPRD.	DATE:
1	ADDED SHEET NO. 24, GRADING & STREET IMP. FOR EXTENSION OF SAN ANTONIO RD.		
2	CHANGED SIZE OF STREET LIGHTS ON SAN ANTONIO RD. TO 22,000 LUMENS, SHTS. 2 - 12A		11/21/86
3	DELETED WATER LOOP, SHT. 15		11/21/86

BASIS OF BEARINGS

THE BEARING OF N 1°22'00" E 18 SHOWN FOR THE EASTERLY LINE OF TRACT NO. 10011, AS FILED IN BOOK 460, PAGES 4-15 OF MISCELLANEOUS MAPS, WAS USED.

BENCH MARK

IN THE SOUTHWEST PART OF THE INTERSECTION OF YORBA LINDA BLVD. AND OHIO STREET TO THE SOUTH 38.5' WEST OF THE CENTER OF THE STREET, 50' NORTH ALONG THE EXTENSION OF THE WEST CURB OF OHIO STREET FROM THE SOUTHWEST CURB RETURN, SET IN THE TOP, 1.5' SOUTHEAST OF THE NORTHWEST END OF A CONCRETE HEADWALL OF A CULVERT UNDER THE STREET, MARKED BY MILE POST 10.00 AND ABOUT 3' LOWER THAN SIDEWALK.
ELEVATION 429.132 1970 ADJ.

SOILS/GEOLOGISTS

EARTH RESEARCH ASSOCIATES, INC.
3001 REDHILL AVENUE
THE ESPLANADE, IV SUITE 120
COSTA MESA, CALIFORNIA
92626
(714) 549-8921

REPORT DATE: 4-28-86

CITY ENGINEER

ROY STEPHENSON 9/18/86 DATE

OWNER

WARMINGTON HOMES
3090 PULLMAN STREET
COSTA MESA CALIFORNIA
92626
(714) 557-5511

ENGINEER

HUNSAKER & ASSOCIATES INC,
THREE HUGHES, IRVINE CA 92718.
(714) 855-3600

DOUGLAS SNYDER 3-4-87 DATE

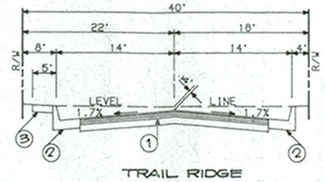
CITY OF YORBA LINDA

IMPROVEMENT PLANS FOR TRACT 9813
GENERAL NOTES, SEWER, WATER & STORM DRAIN NOTES
SHEET 1 OF 24

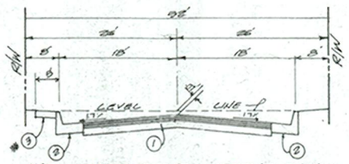
9401

ESTIMATE OF QUANTITIES

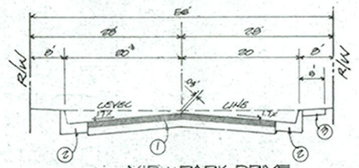
NO.	DESCRIPTION	QUANITY	UNIT	
	STREETS			
1.	CONST. "A.C. W/SEALCOAT OVER "A.B.W/PRIMECOAT	401,476	SF	
2.	CONST. 6" CONC. CURB & GUTTER TYPE 'D' PER O.C.E.M.A. STD 201	22,524	LF	
3.	CONST. SIDEWALK PER O.C.E.M.A. STD. 206	52,863	SF	
4.	CONST. SIDEWALK RETURN & ACCESS RAMP PER O.C.E.M.A. STD. 111	22	EA	
5.	INSTALL STREET LIGHT (5800 LUMENS) PER O.C.E.M.A. STD. 411	38	EA	⚠
6.	FEATHER OVER EXIST. A.C. FOR SMOOTH JOIN	145	EA	
7.	INSTALL STREET NAME SIGN PER O.C.E.M.A. STD. 407	11	EA	
8.	INSTALL "NOT A THROUGH STREET" SIGN PER O.C.E.M.A. STD W-53	10	EA	
9.	INSTALL LOCAL DEPRESSION PER O.C.E.M.A. STD 308 & DETAIL	2	EA	
10.	INSTALL TIMBER BARRICADE TYPE III PER O.C.E.M.A. STD. 404	80	LF	
11.	CONST. DEPRESSED CURB DRIVEWAY APPROACH PER O.C.E.M.A. STD. 209	224	SF	
12.	INSTALL PARKWAY CULVERT TYPE 'B' PER O.C.E.M.A. STD. 309	5	EA	
13.	CONST. ALLEY APRON PER O.C.E.M.A. STD 206	300	SF	
14.	VARIABLE A.C. OAP	18,900	SF	
15.	SAWCUT EXIST. A.C. & REMOVE	1,650	LF	
16.	RELOCATE FIRE HYDRANT	1	EA	
17.	ADJUST TO GRADE	14	EA	
18.	INSTALL STREET LIGHT (22,000 LUMENS) PER O.C.E.M.A. STD 411	21	EA	⚠
	-SEWER-			
25.	INSTALL 10" V.C.P. SEWER PER Y.L.W.D. STDS & SPECS	4,078	LF	
26.	INSTALL 8" V.C.P. SEWER PER Y.L.W.D. STDS & SPECS	6,801	LF	
27.	INSTALL 48" DIA MANHOLE TYPE I PER Y.L.W.D. STD. SP3	51	EA	* SEE STREET IMPROVEMENT PLANS FOR LOCATION OF SIDEWALKS
28.	INSTALL 4" V.C.P. LATERAL PER Y.L.W.D. STD. SP2A	4,130	LF	
29.	INSTALL SEWER CLEANOUT PER Y.L.W.D. STD SP 7	—		
30.	INSTALL CONC. ANCHOR BLOCK PER Y.L.W.D. STD. SP. 10	7	EA	
31.	REMOVE PLUG & JOIN	1	EA	
32.	CONST CONC. ENCASEMENT PER Y.L.W.D. STDS.	1	EA.	
	WATER			
60.	INSTALL CONC. ANCHOR BLOCK PER Y.L.W.D. STD. SP-10	5	EA	
62.	INSTALL 90° ELBOW RT x FLG.	1	EA	
61.	INSTALL 1" IRRIGATION METER	1	EA	
33.	INSTALL 6" GV. FLG. x RT.	3	EA	
34.	INSTALL 12"x10" REDUCER FLG. x RT.	1	EA	
35.	INSTALL 10" ADAPTER FLG x RT.	1	EA	
36.	REMOVE BLIND FLANGE.	1	EA	
37.	INSTALL 10" GATE VALVE FLG x RT	11	EA	
38.	INSTALL 10" PCP CLASS 100 WATER MAIN	2015	LF	
39.	INSTALL 10" PCP CLASS 200 WATER MAIN	1,000	LF	
60.	INSTALL 6" ACP WATER MAIN	855	LF	
50.	INSTALL 10"x8" TEE ALL FLG.	5	EA	
40.	INSTALL 8" A.C.P. WATER MAIN	8,536	LF	⚠
41.	INSTALL 8" TEE ALL FLG.	6	EA	
42.	INSTALL 8" GATE VALVE FLG. x RT.	28	EA	
43.	INSTALL 8" ADAPTER FLG. x RT.	5	EA	
44.	INSTALL FIRE HYDRANT ASSEMBLY PER Y.L. W.D. STD 5	30	EA.	⚠
45.	INSTALL DEADEND BLOW-OFF PER Y.L. W.D. STD 6	11	EA	⚠
46.	INSTALL TYP AIR VACUUM	1	EA	
65.	INSTALL 1½" IRRIGATION METER	3	EA.	
47.	INSTALL 10" x 8" REDUCER FLG x R.T.	3	EA.	
48.	INSTALL 10"x6" TEE ALL FLG	1	EA	
49.	INSTALL 6" IRRIGATION METER	5	EA	
50.	INSTALL 4" MAIN - IRRIGATION SLEEVE	5	EA	
51.	INSTALL 22½° ELBOW RT. x RT.	1	EA.	
52.	REMOVE EXIST. TEMP BLOW-OFF & JOIN	3	EA.	
53.	INSTALL 3" WIRE SLEEVE	5	EA.	
54.	INSTALL 45° ELBOW RT. x RT.	1	EA.	
55.	INSTALL 1" WATER SERVICE TYPE 4 METER TYPE	134	EA.	
57.	INSTALL 10" ADAPTER FLG x RT	5	EA	
58.	INSTALL 8"x6" TEE ALL FLG	4	EA.	
	STORM DRAIN			
70.	CONSTR. INLET TYPE III PER O.C.E.M.A. STD. No. 326	3	EA.	
80.	INSTALL 18" R.C.P. (SEE PROFILE FOR D-LOAD)	3080	L.F.	
81.	INSTALL 21" R.C.P. (SEE PROFILE FOR D-LOAD)	—	L.F.	
82.	INSTALL 24" R.C.P. (SEE PROFILE FOR D-LOAD)	890	L.F.	
83.	INSTALL 30" R.C.P. (SEE PROFILE FOR D-LOAD)	999	L.F.	
84.	INSTALL 36" R.C.P. (SEE PROFILE FOR D-LOAD)	674	L.F.	
85.	CONSTRUCT PIPE ENTRANCE TO EARTH CHANNEL PER O.C.E.M.A. STD. 326	1	EA	
86.	INSTALL 42" R.C.P. (SEE PROFILE FOR D-LOAD)	582	L.F.	
87.	INSTALL 45" R.C.P. (SEE PROFILE FOR D-LOAD)	32	L.F.	
88.	INSTALL 48" R.C.P. (SEE PROFILE FOR D-LOAD)	553	L.F.	
89.	INSTALL 54" R.C.P. (SEE PROFILE FOR D-LOAD)	750	L.F.	
90.	INSTALL 84" R.C.P. (SEE PROFILE FOR D-LOAD)	618	L.F.	
91.	CONST. INLET TYPE I PER O.C.E.M.A. STD 301	5	EA	
92.	CONST. INLET TYPE II PER O.C.E.M.A. STD 302	15	EA	
93.	CONST. JUNCTION STRUCTURE TYPE I PER O.C.E.M.A. STD. 310	13	EA	
94.	CONST. JUNCTION STRUCTURE TYPE II PER O.C.E.M.A. STD. 310	6	EA	
95.	CONST. JUNCTION STRUCTURE TYPE III PER O.C.E.M.A. STD. 310	5	EA	
96.	CONST. JUNCTION STRUCTURE TYPE IV PER O.C.E.M.A. STD 310	3	EA	
97.	CONST. JUNCTION STRUCTURE TYPE VI PER O.C.E.M.A. STD. 310	5	EA	
98.	CONST. CONC. COLLAR PER O.C.E.M.A. STD 317	9	EA	
99.	CONST. DOWNDRAIN TO PIPE TRANSITION PER O.C.E.M.A. STD 331	1	EA	
100.	CONST. PIPE SLOPE ANCHOR PER O.C.E.M.A. STD. 333	19	EA	
101.	CONST. ENERGY DISSIPATOR PER DETAIL SHEET 17	1	EA	
102.	CONST. PIPE INLET PER DETAIL SHEET 19	1	EA	
103.	CONST. RIP RAP PER O.C.E.M.A. STD 809	1,100	S.F.	
104.	INSTALL 66" R.C.P. (SEE PROFILE FOR D-LOAD)	207	L.F.	



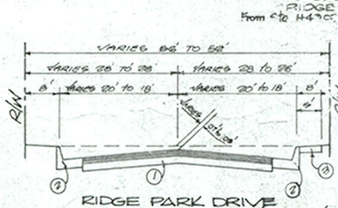
TRAIL RIDGE



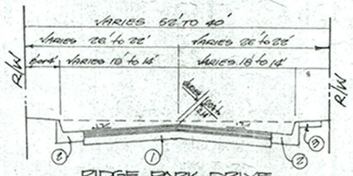
VIEW PARK DRIVE, SPRING OAK
VIA CORZO ALDER AVENUE
WILLOW TREE LANE, TWIN OAK
CLEAR HAVEN DR.
HICKORY TREE LANE
RIDGE PARK DRIVE From STA 7+08.16 to STA 15+17.35



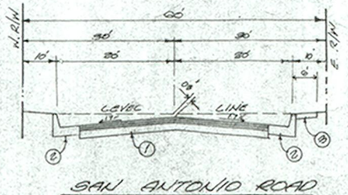
VIEW PARK DRIVE
ASPEN WAY
RIDGE PARK DRIVE
From STA 14+70.00 to STA 21+05.00



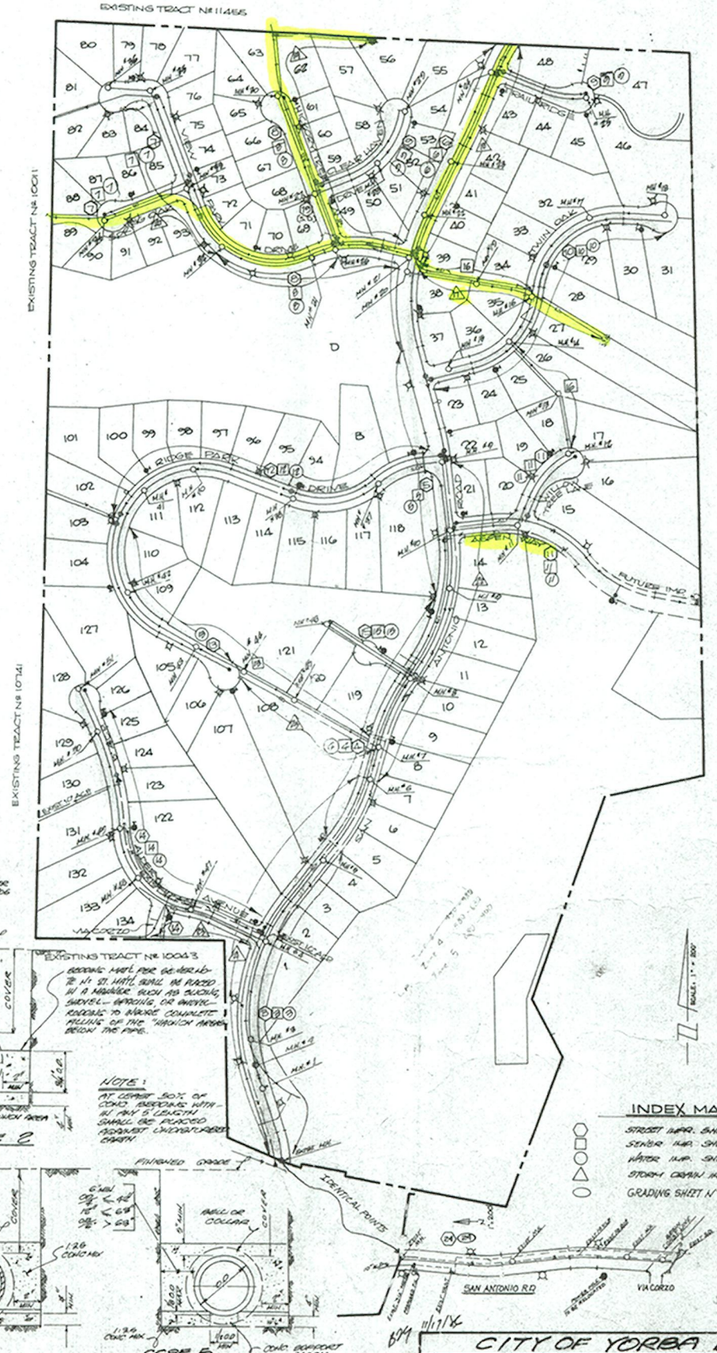
RIDGE PARK DRIVE
TRANSITION FROM 56' TO 52' WIDTH
FROM STA: 5+68.16 TO STA: 7+68.16

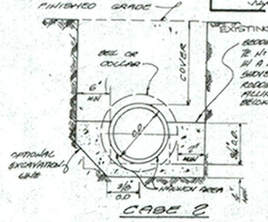


RIDGE PARK DRIVE
TRANSITION FROM 52' TO 40' WIDTH
FROM STA: 15+17.35 TO STA: 16+49.99



SAN ANTONIO ROAD





BEDDING DETAILS

Hunsaker & Associates
IRVINE
PLANNING-ENGINEERING-SURVEYING
Newport Beach • Irvine, CA 92718
Offices: Carlsbad • Irvine • Ontario
(714) 855-3636

REVISIONS

	INFO	DATE	DESCRIPTION
⚠1	BM	11/16	ADDED STREET LIGHT QUALITY FOR 5800 & 22,000 LUMENS
⚠2			400 S/S L.F. 8" A.C.P., 1-F.H. DELETE 1-BLOW-OFF

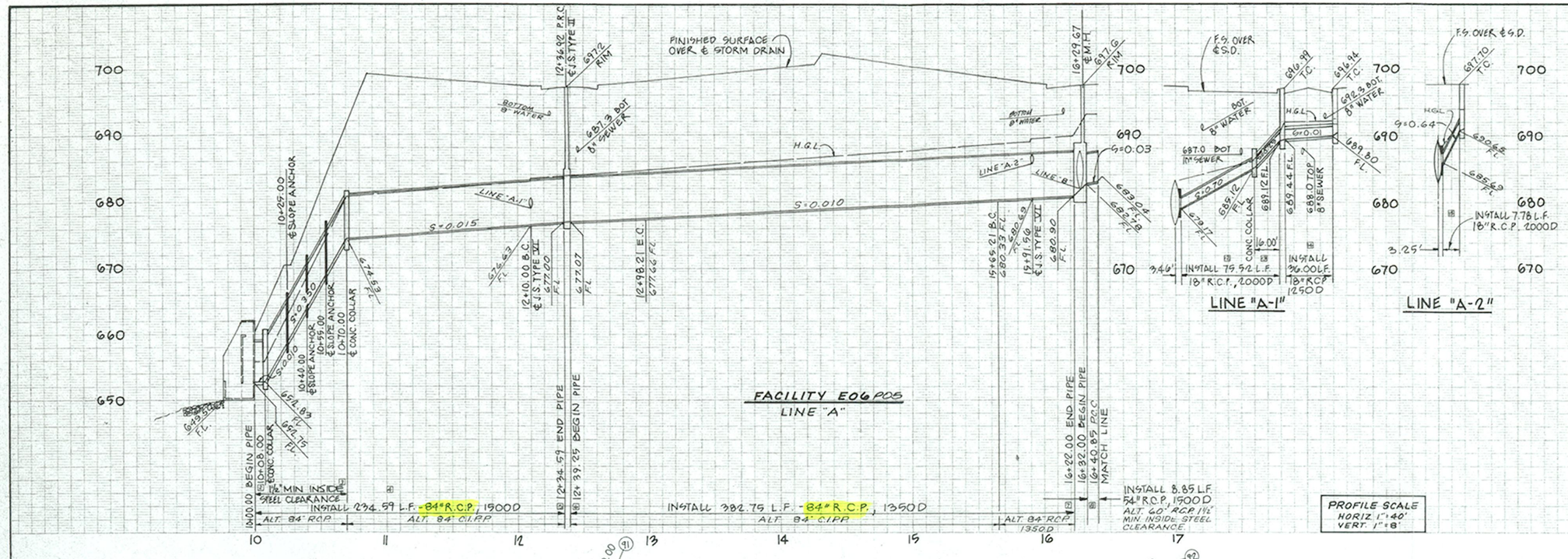
JAN 15 1987

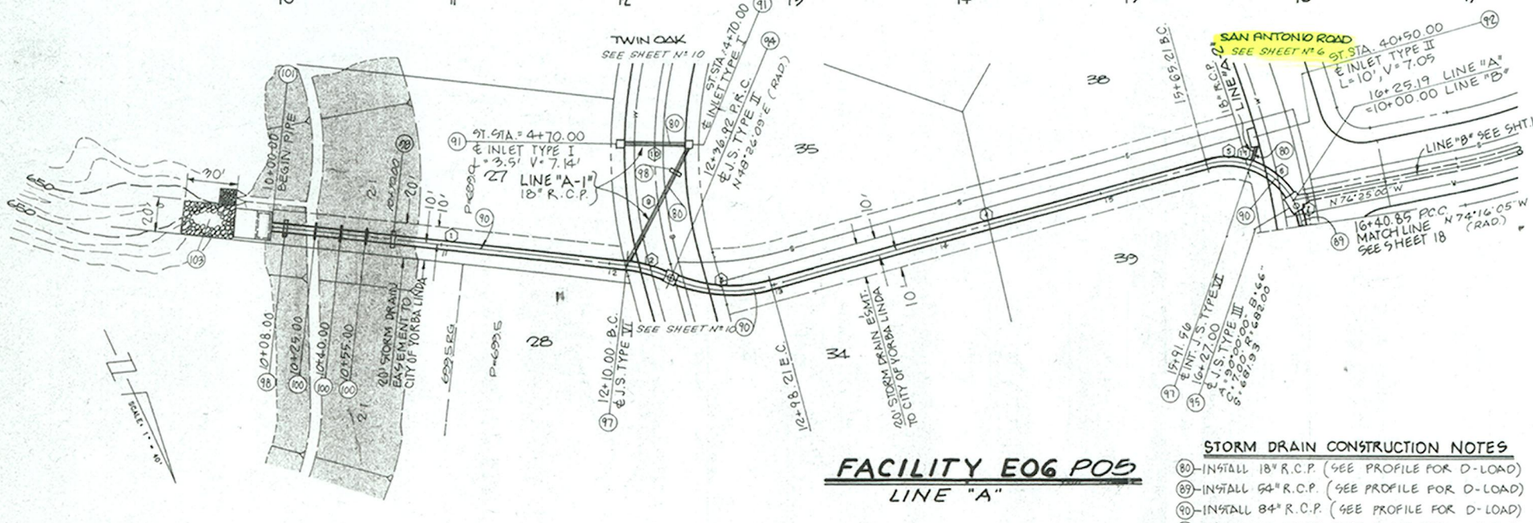
CITY OF YORBA LINDA
IMPROVEMENT PLANS FOR:
TRACT № 9813
INDEX MAP, STREET SECTIONS, QUANTITY ESTIMATE, BEDDING DETAILS

PLANS PREPARED UNDER THE SUPERVISION OF:
DOUGLAS SNYDER R.C.E. 24068 — DATE 7/18/86
EXPIRES 12-31-87

SHEET 2 OF 24 SHEETS

VESTING TENTATIVE TRACT № 9813
BM DWG. #





FACILITY E06 P05
LINE "A"

DATA

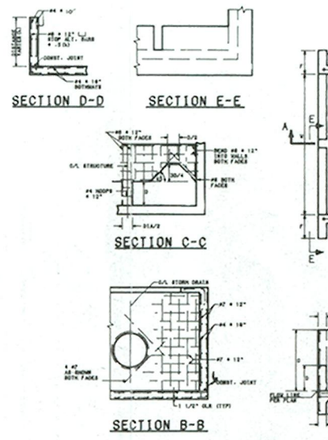
	DELTA/BEARING	RADIUS	LEN./DIST.	TANGENT
1	N 58°42'00"W		210.00	
2	17°08'09"	90.00	26.92	13.56
3	39°01'09"	90.00	61.29	31.89
4	N 80°35'00"W		267.00	
5	33°33'14"	45.00	26.35	13.57
6	42°49'35"	45.00	33.64	17.65
7	19°56'06"	45.00	15.66	7.91
9	N 52°34'04"E		78.98	
10	N 64°06'26"W		36.00	
11	N 42°58'14"E		11.03	

STORM DRAIN CONSTRUCTION NOTES

80 – INSTALL 18" R.C.P. (SEE PROFILE FOR D-LOAD)
89 – INSTALL 54" R.C.P. (SEE PROFILE FOR D-LOAD)
90 – INSTALL 84" R.C.P. (SEE PROFILE FOR D-LOAD)
91 – CONSTRUCT INLET TYPE I PER OCEMA STD. 301
92 – CONSTRUCT INLET TYPE II PER OCEMA STD. 302
94 – CONSTRUCT JUNCTION STRUCTURE TYPE II PER OCEMA STD. 311
95 – CONSTRUCT JUNCTION STRUCTURE TYPE III PER OCEMA STD. 312
97 – CONSTRUCT JUNCTION STRUCTURE TYPE VI PER OCEMA STD. 315
78 – CONSTRUCT CONCRETE COLLAR PER OCEMA STD. 317
100 – CONSTRUCT PIPE SLOPE ANCHOR PER OCEMA STD. 333
101 – CONSTRUCT ENERGY DISSIPATOR PER DETAIL ON SHEET 17
103 – CONSTRUCT UNGROUTED RIP-RAP ON GEOTEXTILE FABRIC PER OCEMA STD. 809 & 808

REVISIONS

MARK	DATE	



ENERGY DISSIPATOR DETAILS

LINE A	D	14'-1"	15'	14'-1"	10'-9"	3'-6"	1'-6"	3'-3"	8'-6"	11'-3"	24'-0"	15'	20'	84"
SYMBOL		T (P)	T (P)	T (P)	A	B	C	D	E	F	G	H	J	K

ENERGY DISSIPATOR DIMENSIONS

JAN 15 1987

B.M. 11/17/86

CITY OF YORBA LINDA
STORM DRAIN IMPROVEMENT PLANS FOR
TRACT 9813
FACILITY E06 P05
FROM STA: 10+00.00 TO STA: 16+40.85

Hunsaker & Associates IRVINE, INC.
PLANNING-ENGINEERING-SURVEYING
Three Hughes • Irvine, CA 92718
Offices: Carlsbad • Irvine • Ontario
(714) 855-3600

PLANS PREPARED UNDER THE SUPERVISION OF:
DOUGLAS SNYDER, R.C.E. 24068 DATE 3-4-86
EXPIRATION DATE: 6-30-87

SHEET 17 OF 24 SHEETS

WO NO 1262
EN 1965-8

THOMPSON BLUEPRINT 98347

S.D. LINE A SHEET 1 - 366E20.53PF1 9813 627 25-Feb-86 13:16 / 107-9813+650