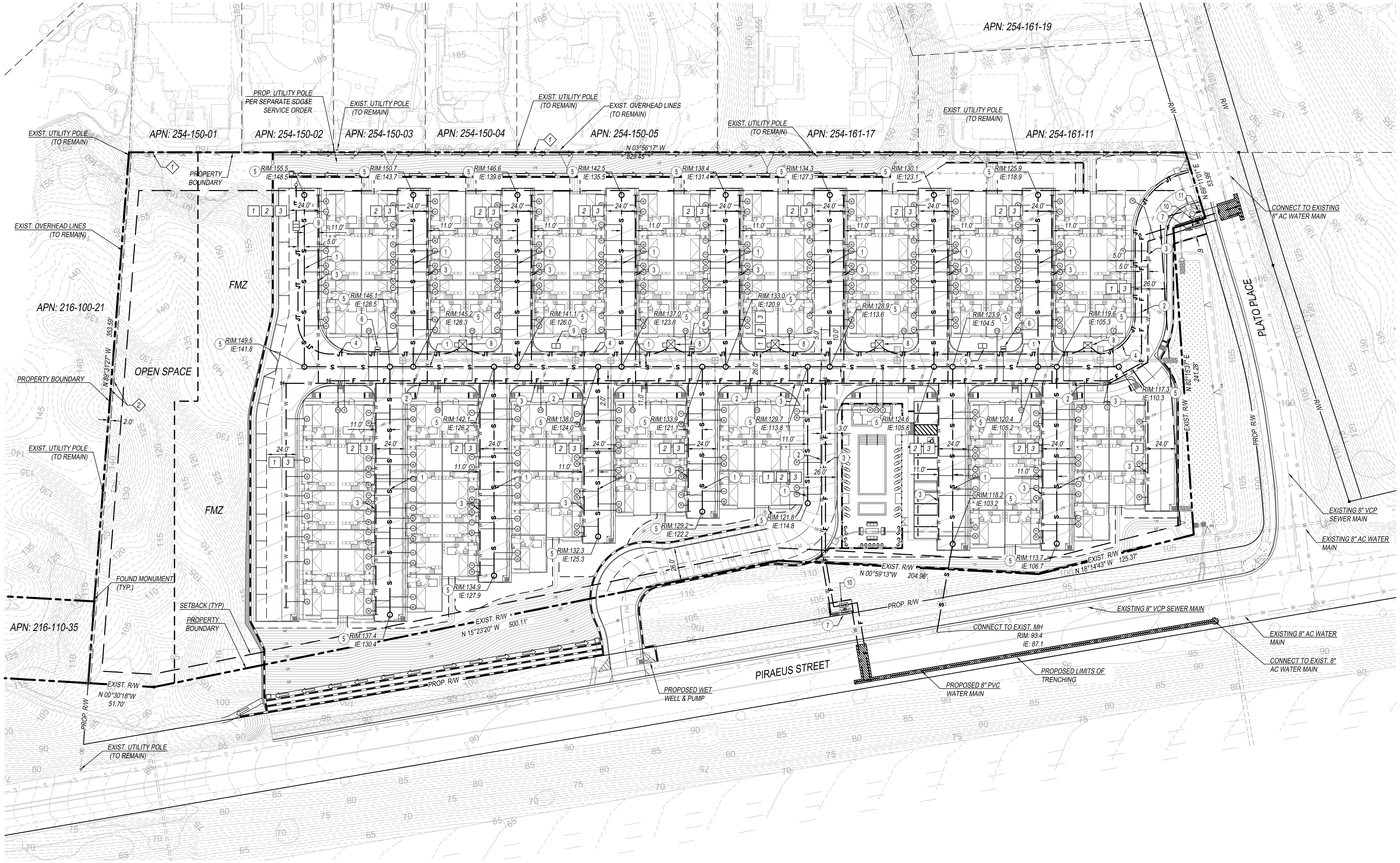

GENERAL NOTES

1. PUBLIC IMPROVEMENTS DAMAGED DURING CONSTRUCTION SHALL BE REMOVED AND REPLACED TO THE SATISFACTION OF THE CITY INSPECTOR.
2. EXISTING SURVEY MONUMENTS SHALL BE PROTECTED IN PLACE. ANY MONUMENT THAT IS DISTURBED OR DESTROYED SHALL BE REPLACED BY A LICENSED LAND SURVEYOR WHO SHALL FILE A CORNER RECORD OR RECORD OF SURVEY WITH THE COUNTY.
3. ALL EXISTING ONSITE STRUCTURES TO BE DEMOLISHED.
4. REFER TO LANDSCAPE PLAN FOR ONSITE TREES TO BE REMOVED. ADDITIONALLY, ANY LANDSCAPE WORK WITHIN THE RIGHT-OF-WAY SHALL BE MONITORED BY THE PARKS AND RECREATION DEPARTMENT.
5. FOR INFORMATION ON THE PROPOSED STORM DRAIN, SEE PRELIMINARY GRADING AND DRAINGAGE PLAN ON SHEETS 04-06.

ABBREVIATIONS

BW = BOTTOM OF WALL
FF = FINISH FLOOR
FG = FINISH GRADE
FL = FLOW LINE
FS = FINISH SURFACE
HP = HIGH POINT
IE = INVERT ELEVATION
LA = LANDSCAPE AREA
LP = LOW POINT
PUB = PUBLIC
PVT = PRIVATE
TC = TOP OF CURB
TG = TOP OF GRATE
TW = TOP OF WALL

EASEMENTS OF RECORD

1. AN EASEMENT FOR POLE LINES, UNDERGROUND CONDUITS, INGRESS AND EGRESS RIGHTS TO SAN DIEGO GAS & ELECTRIC COMPANY RECORDED OCTOBER 25, 1949 IN BOOK 3363, PAGE 154 OF OFFICIAL RECORDS.
2. AN EASEMENT FOR EITHER OR BOTH POLE LINES, UNDERGROUND CONDUITS, WITH THE RIGHT OF INGRESS AND EGRESS AND INCIDENTAL PURPOSES TO TO SAN DIEGO GAS & ELECTRIC COMPANY, RECORDED JULY 06, 1926 AS BOOK 1220, PAGE 410 OF OFFICIAL RECORDS. (2 FEET IN WIDTH)

STATE OF CALIFORNIA, RELINQUISHMENT OF ACCESS RIGHTS TO AND FROM INTERSTATE 5 RECORDED DECEMBER 4, 1961 AS DOC. NO. 209054 OF OFFICIAL RECORDS. (NOT PLOTTED, PERTAINS TO EAST SIDE OF INTERSTATE 5.

CONSTRUCTION NOTES

1. PROPOSED 8" PVC SEWER MAIN PER LWDSD S-11 (PUB)
2. PROPOSED 8" PVC FIRE MAIN (CLASS 305) PER WAS SPEC 15064 (PVT)
3. PROPOSED 4" PVC WATER MAIN (CLASS 305) PER WAS SPEC 15064 (PVT)
4. PROPOSED 24"X42" JOINT TRENCH
5. PROPOSED SEWER MANHOLE PER LWDSD S-4 (PUB)
6. PROPOSED RESIDENTIAL FIRE HYDRANT PER WAS WF-01 (PVT)
7. PROPOSED 3" METER AND BACKFLOW PER WAS WS-04
8. PROPOSED ELECTRICAL TRANSFORMER
9. PROPOSED ELECTRICAL VAULT
10. PROPOSED 8" FIRE LINE PER WF-05 & 8" RPDA (PVT) PER WAS WR-02
11. PROPOSED 2" IRRIGATION SERVICE AND METER PER WAS WS-02 & 2" RP PER WAS WR-01

PROPOSED EASEMENTS

1. PROPOSED EMERGENCY VEHICLE ACCESS EASEMENT
2. PROPOSED PUBLIC SEWER EASEMENT TO THE LEUCADIA WASTE WATER DISTRICT
3. PROPOSED PUBLIC EASEMENT OVER PRIVATE STREETS TO THE CITY OF ENCINITAS

PRELIMINARY UTILITY PLAN

SCALE: 1" = 40'

0 40 80 120
SCALE: 1" = 40'

LEGEND

SUBDIVISION BOUNDARY
R/W RIGHT-OF-WAY
SETBACK
PROPOSED 1" DOMESTIC WATER SERVICE PER WAS WS-01 (PVT)
PROPOSED 4" FIRE SERVICE PER WAS WF-05 (PVT)
PROPOSED 4" SEWER LATERAL PER LWDSD S-17 (PUB)
S PROPOSED 8" PVC SEWER MAIN (PUB)
F PROPOSED 8" PVC FIRE MAIN CLASS 305) PER WAS SPEC 15064 (PVT)
W PROPOSED 4" PVC WATER MAIN (CLASS 305) PER WAS SPEC 15064 (PVT)
JT PROPOSED 24"X42" JOINT TRENCH
PROPOSED MANHOLE PER LWDSD S-4 (PUB)
PROPOSED PVT FIRE HYDRANT (RESIDENTIAL) PER WAS WF-01
PROPOSED LIMITS OF TRENCHING
PROPOSED DG TRAIL
ROAD CENTERLINE
RETAINING WALL (PER PLAN)
PROPOSED EASEMENT

PREPARED BY:
PASCO LARET SUITER & ASSOCIATES
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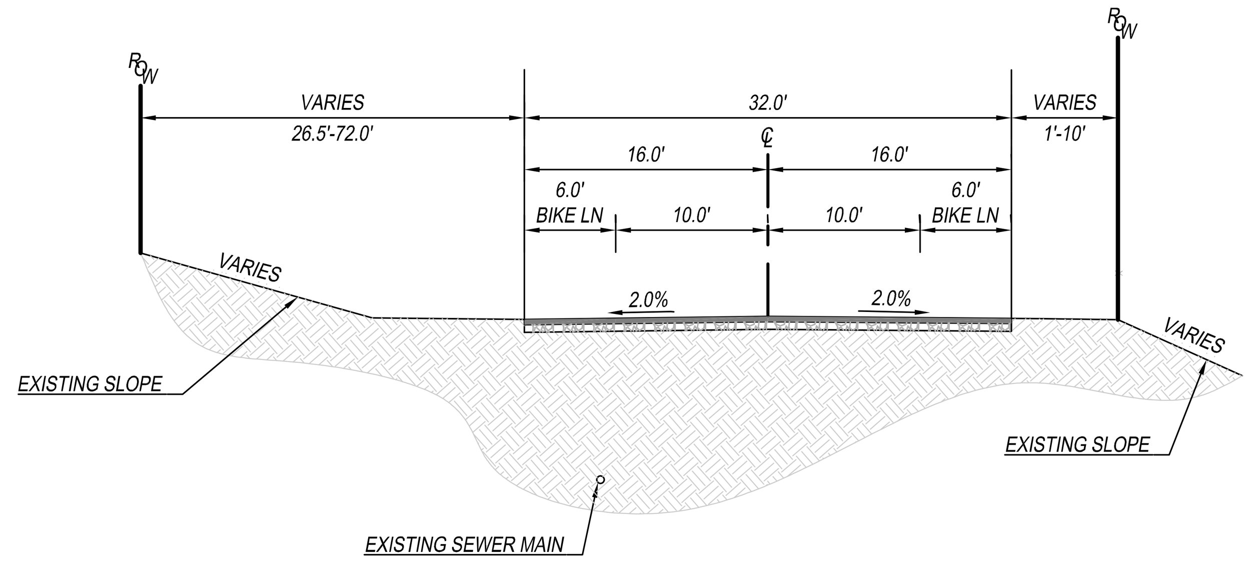
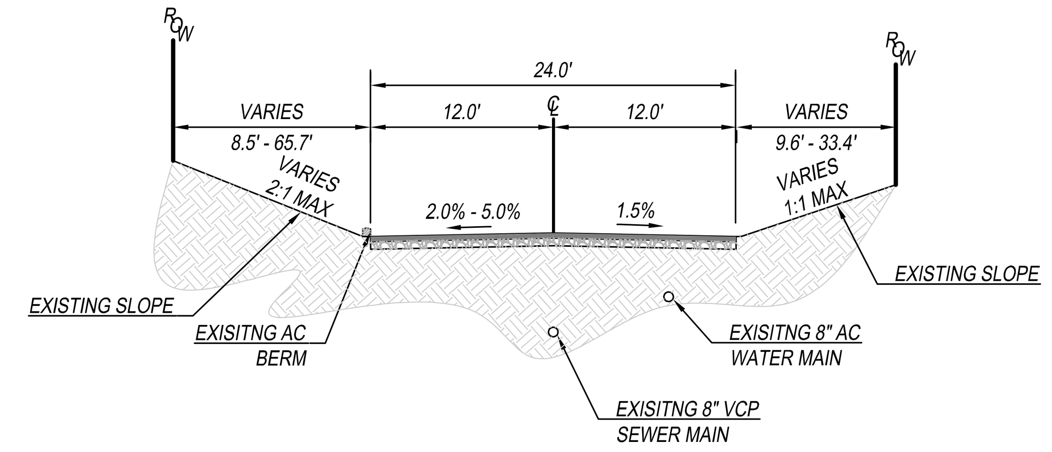
Phone 858.259.8212 | www.plsaengineering.com



TYPICAL SECTION - EXISTING PIRAEUS STREET

NOT TO SCALE



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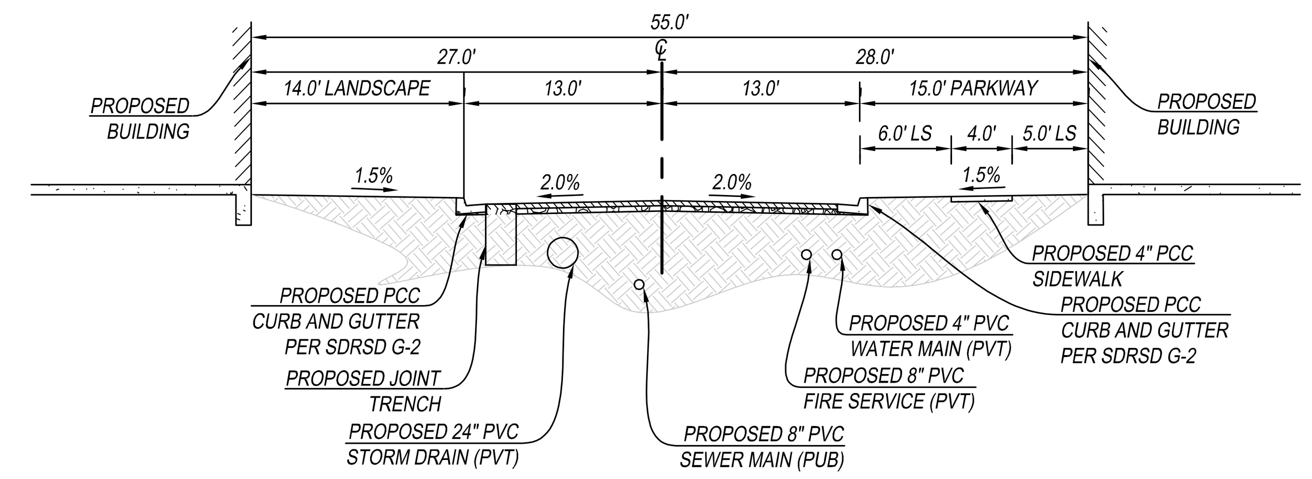

TYPICAL SECTION - PROPOSED PRIVATE STREET

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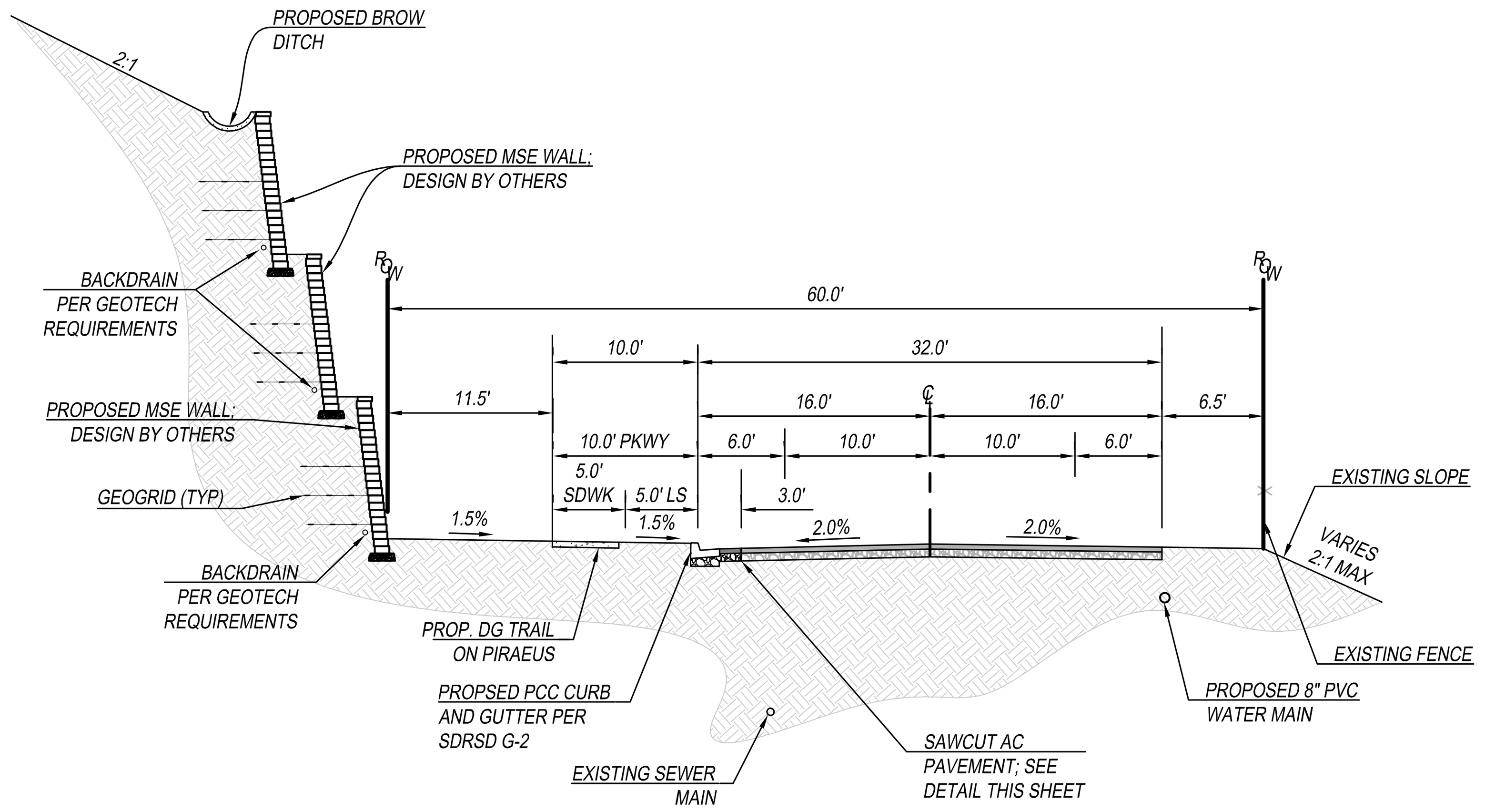

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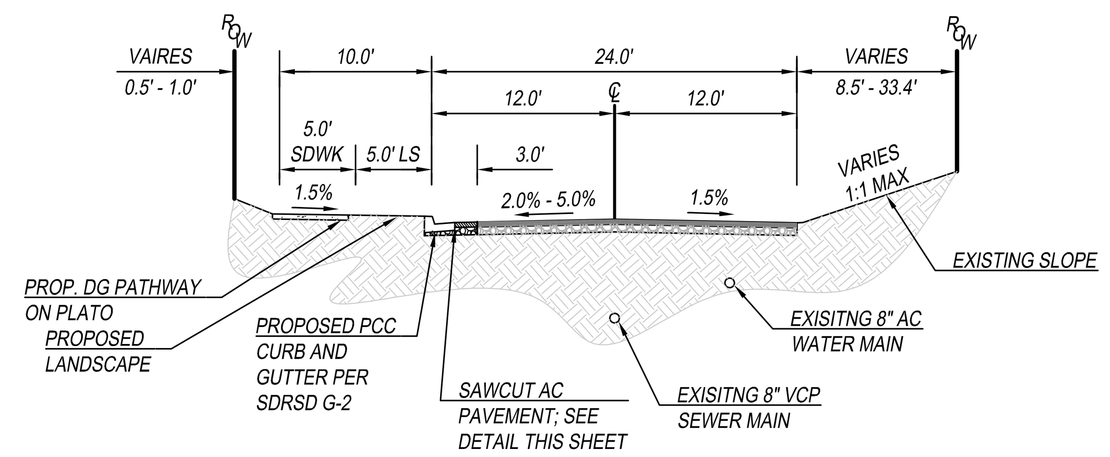

TYPICAL SECTION - PROPOSED PLATO PALACE

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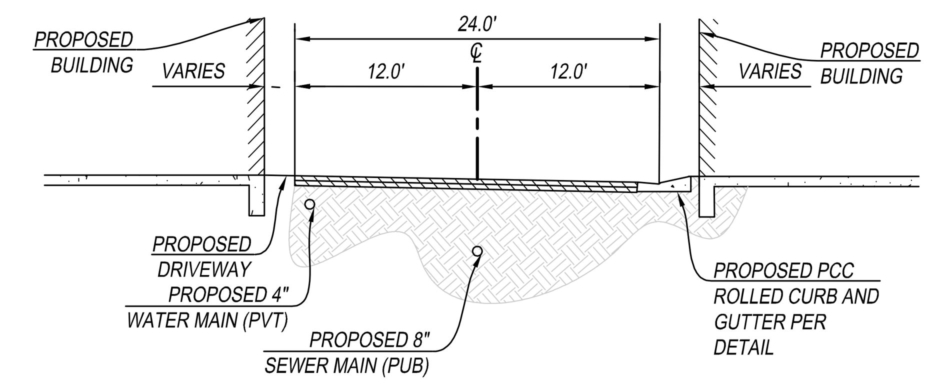
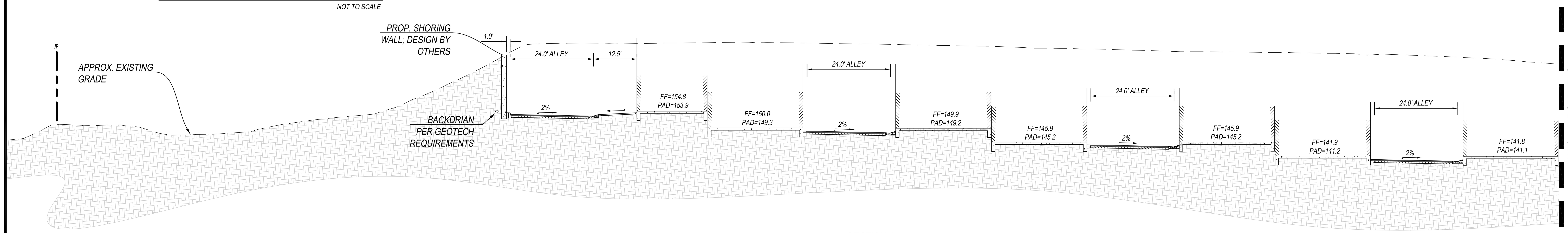


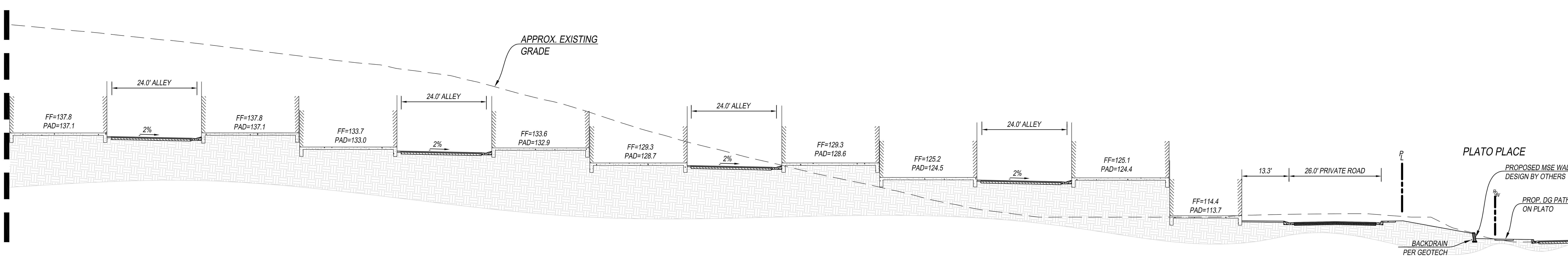
TYPICAL SECTION - PROPOSED PRIVATE ALLEY

NOT TO SCALE



SECTION A

NOT TO SCALE



SECTION A (CONTINUED)

NOT TO SCALE

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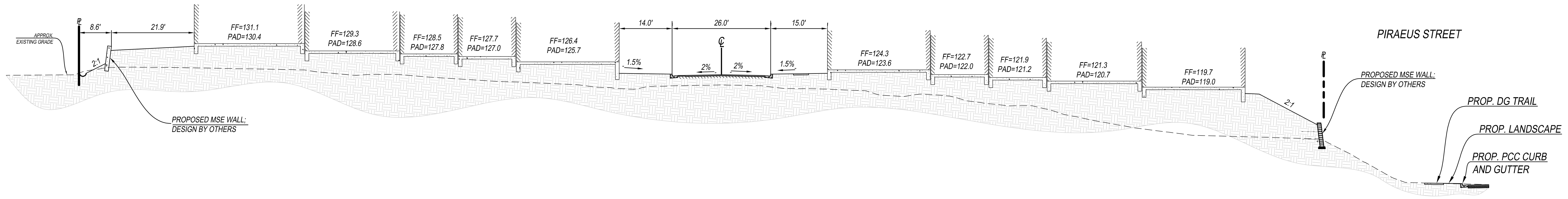

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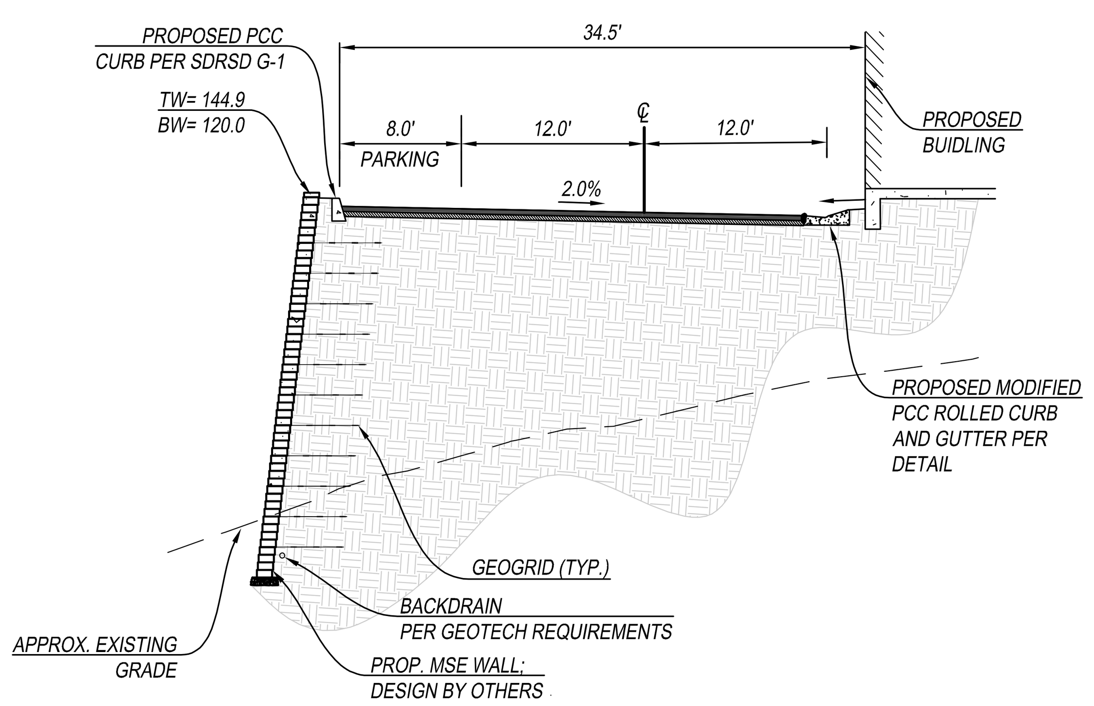
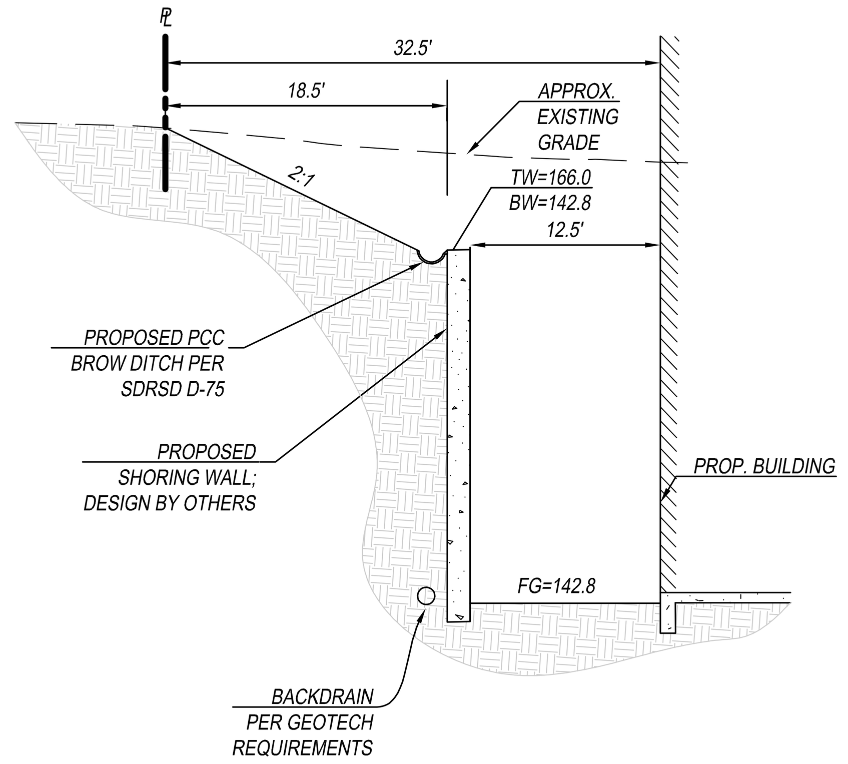
NOT TO SCALE



SECTION C

NOT TO SCALE



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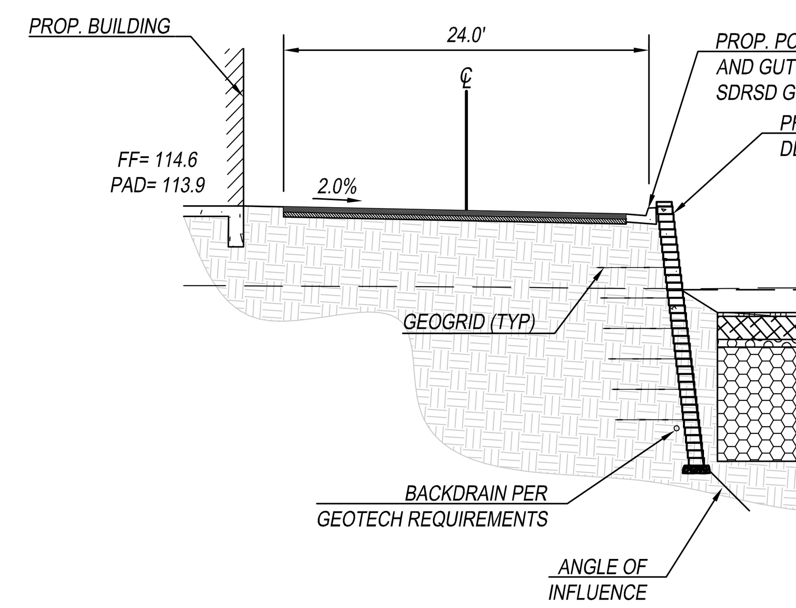

SECTION D

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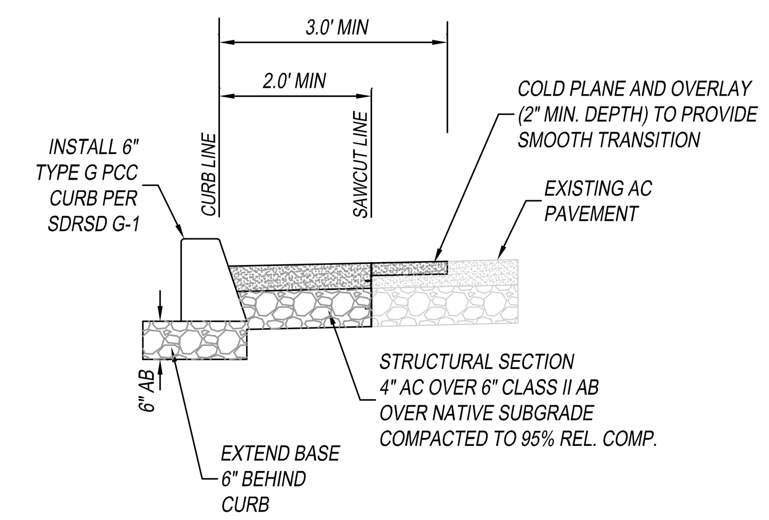
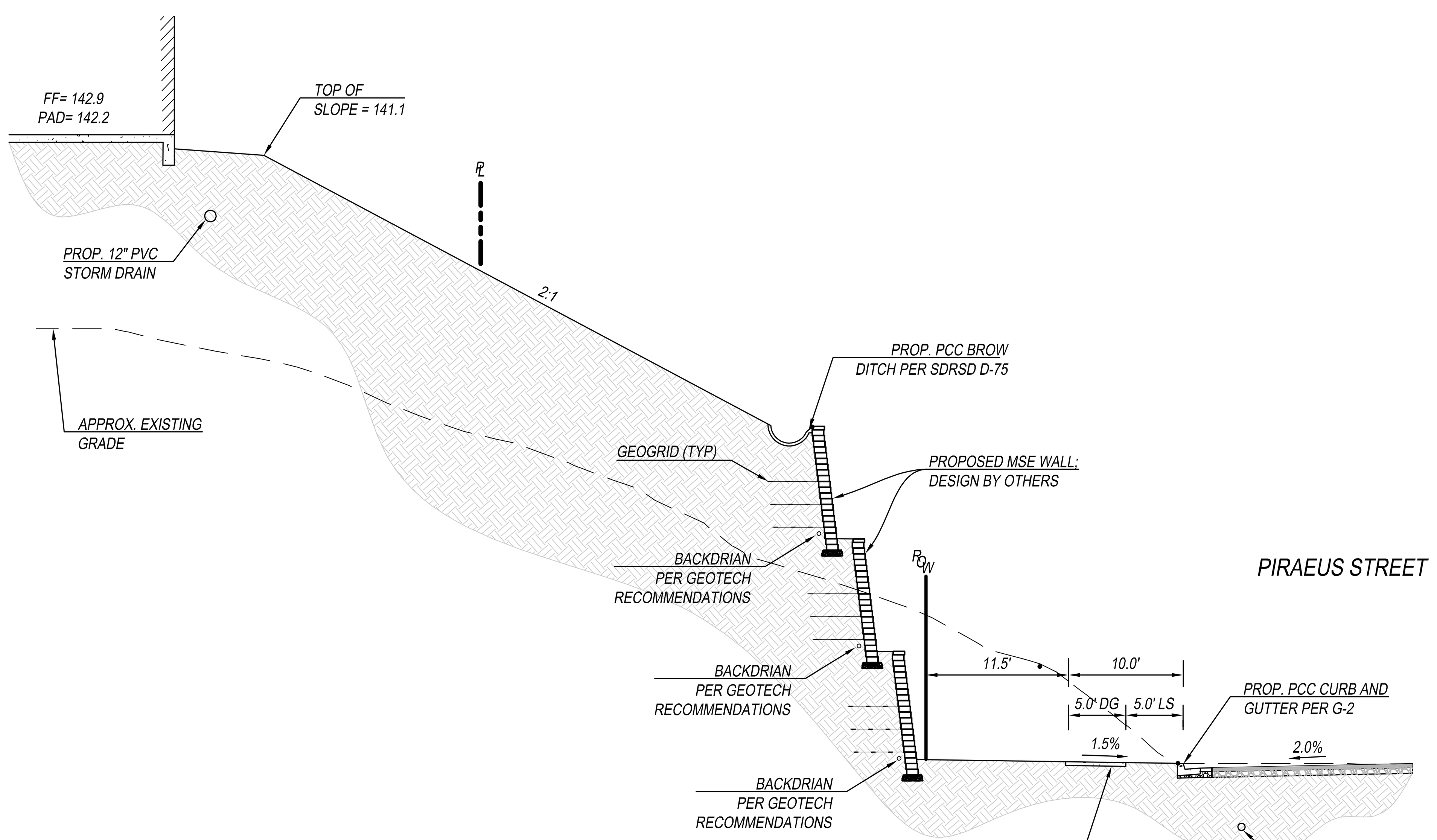


TYPICAL DETAIL - SAWCUT AC PAVEMENT

NOT TO SCALE



SECTION F

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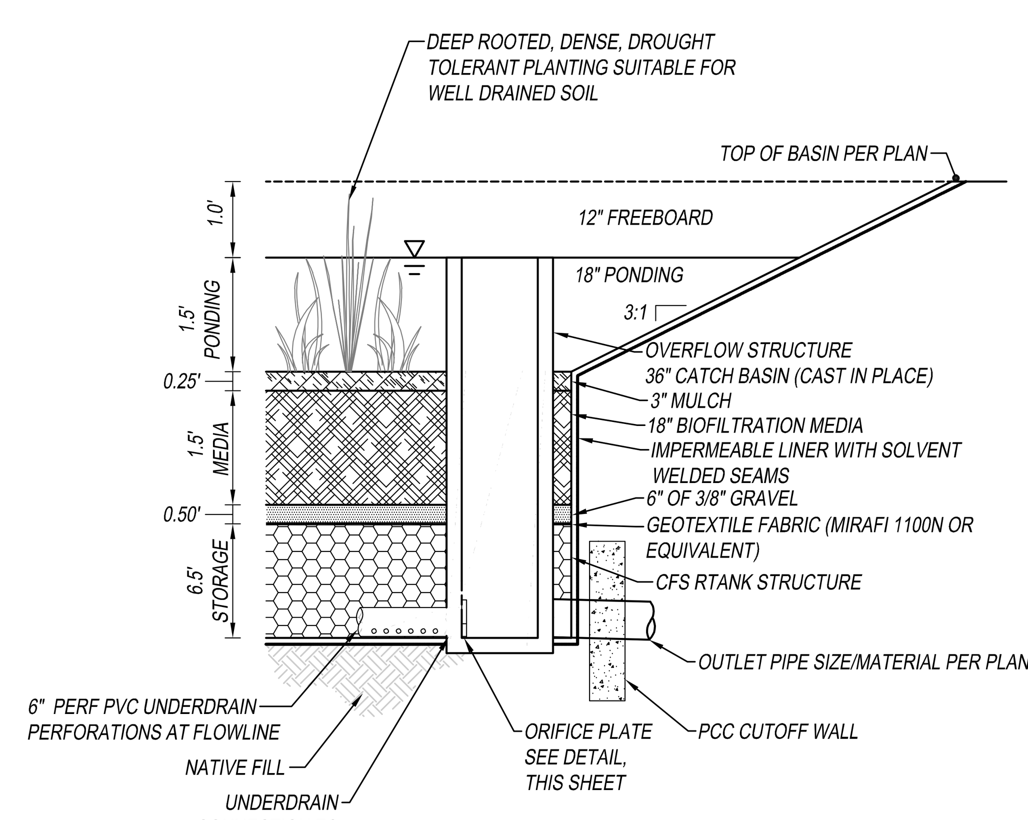
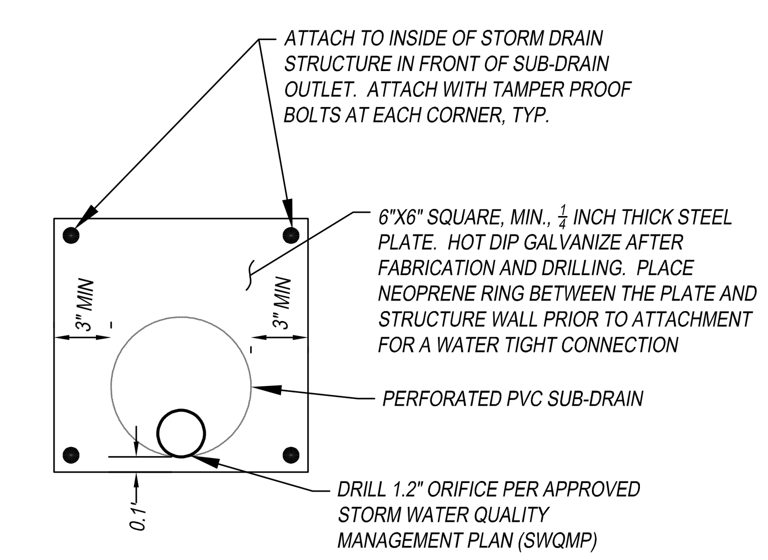


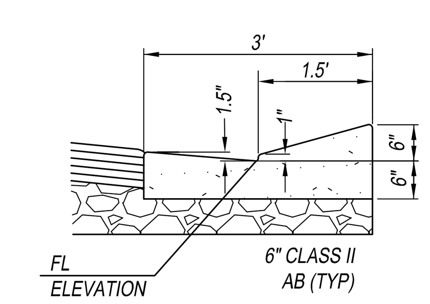
TYPICAL BASIN DETAIL

NOT TO SCALE



ORIFICE PLATE DETAIL

NOT TO SCALE



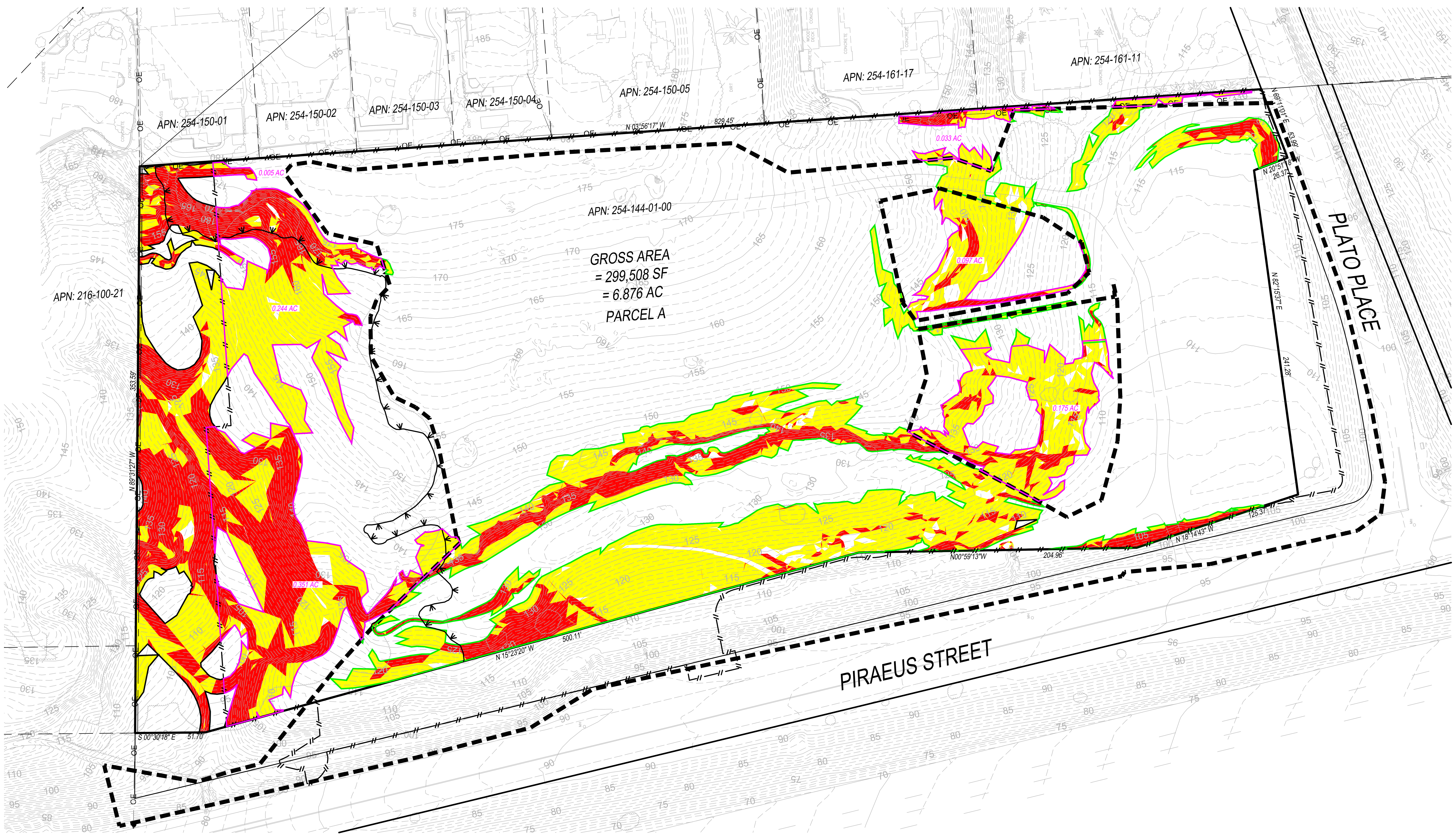
TYPICAL DETAIL - ROLLED CURB

NOT TO SCALE

PREPARED BY:
PASCO LARET SUITER & ASSOCIATES
San Diego | Encinitas | Orange County
Phone 858.259.8212 | www.plsaengineering.com

SLOPE ANALYSIS PARCEL A

PIRAEUS STREET, ENCINITAS, CA



SITE ADDRESS

PIRAEUS STREET (AT INTERSECTION OF PLATO PLACE)
ENCINITAS, CA 92024
APN: 254-144-01-00

PREVIOUS GROUND DISTURBANCE

LIMITS OF PREVIOUSLY DISTURBED AREAS PER LETTER PREPARED BE GEOCON INCORPORATED ON OCTOBER 22, 2019 TITLED "CONSULTATION: LIMITS OF AREAS OF PREVIOUS GRADING DISTURBANCE, ENCINITAS APARTMENTS"

PROPOSED GROUND DISTURBANCE

PROPOSED ENCROACHMENT INTO NATURAL STEEP SLOPE AREA DUE TO PROPOSED SITE PLAN AND GRADING / CONSTRUCTION OPERATIONS

PROPOSED ENCROACHMENT INTO STEEP SLOPE AREA PREVIOUSLY GRADED OR DISTURBED

PROPOSED LIMITS OF DISTURBANCE

APPROXIMATE LIMITS OF SENSITIVE HABITAT AREAS AS IDENTIFIED IN "VEGETATION EXHIBIT - THE CANNON PROPERTY AT PIRAEUS STREET, ENCINITAS" PREPARED BY VINCENT SCHEIDT

HILLSIDE INLAND BLUFF OVERLAY - AREA TAKEOFFS

GROSS AREA OF PARCEL	= 299,508 SF / 6.876 AC
EXISTING SLOPES GREATER THAN 25%	= 97,923 SF / 2.248 AC
EXISTING **STEEP SLOPE AREA MANUFACTURED OR PREVIOUSLY DISTURBED	= 40,835 SF / 0.937 AC
EXISTING NATURAL STEEP SLOPE AREA	= 57,083 SF / 1.311 AC
PROPOSED ENCROACHMENT INTO NATURAL STEEP SLOPE AREA	= 39,489 SF / 0.906 AC
NATURAL STEEP SLOPE AREAS TO REMAIN / BE PRESERVED IN THEIR NATURAL STATE	= 17,594 SF / 0.404 AC
PROPOSED ENCROACHMENT INTO SENSITIVE HABITAT	= 46,829 SF / 1.075 AC

**PER ENCINITAS MUNICIPAL CODE 30.34.030, STEEP SLOPE AREA IS DEFINED AS SLOPES OF GREATER THAN 25% GRADE

HILLSIDE INLAND BLUFF OVERLAY NOTES

PER CITY MUNICIPAL CODE SECTION 30.34.030, IF MORE THAN 10% OF PARCEL SLOPE EXCEED 25%, PARCEL IS SUBJECT TO HILLSIDE / INLAND BLUFF OVERLAY REGULATIONS AND SLOPES GREATER THAN 25% GRADE SHALL BE PRESERVED IN THEIR NATURAL STATE.

EXISTING SLOPES GREATER THAN 25% = 2.248 AC = 32.7% OF PROJECT SITE. THEREFORE, PARCEL IS SUBJECT TO HILLSIDE / INLAND BLUFF OVERLAY ZONE REGULATION.

PER SECTION 30.34.030, MAXIMUM ENCROACHMENT IN AREAS OF SLOPE GREATER OR EQUAL TO 25% GRADE FOR PARCELS SUBJECT TO HILLSIDE / INLAND BLUFF OVERLAY ZONE REGULATIONS IS 10% OF STEEP SLOPES. THEREFORE, PROJECT MAY ENCROACH UP TO 20,983 SF INTO SLOPES GREATER THAN 25% GRADE.

SOURCE OF TOPOGRAPHY

TOPOGRAPHY OBTAINED BY AERIAL MAPPING METHODS, FLOWN BY SAN DIEGO AERIAL SURVEYS DATED AUGUST 14, 2019

HILLSIDE INLAND BLUFF OVERLAY CALCULATIONS

	PARCEL A
GROSS AREA	299,508 SF / 6.876 AC
SLOPES GREATER THAN 25%	97,923 SF/ 2.248 AC
ALLOWABLE ENCROACHMENT INTO STEEP SLOPE AREA	9,792 SF / 0.225 AC
PROPOSED ENCROACHMENT INTO STEEP SLOPE AREA	39,489 SF / 0.906 AC
PERCENTAGE OF ENCROACHMENT INTO STEEP SLOPE AREA	40.3%

PARCEL A TOTAL GROSS LOT AREA = 6.876 AC

EXISTING SLOPES	0 - 25%	4.628 AC	(67.3% OF PROJECT SITE)
EXISTING SLOPES	25 - 40%	1.471 AC	(21.4% OF PROJECT SITE)
EXISTING SLOPES	40% +	0.777 AC	(11.3% OF PROJECT SITE)
EXISTING SLOPES	25% +	2.248 AC**	(32.7% OF PROJECT SITE)

**PER LETTER TITLED "CONSULTATION: LIMITS OF AREAS OF PREVIOUS GRADING DISTURBANCE, ENCINITAS APARTMENTS" PREPARED BY GEOCON INCORPORATED DATED OCTOBER 22, 2019, APPROXIMATELY 12,025 SF OF EXISTING STEEP SLOPE IS MANUFACTURED.

GRAPHIC SCALE 1" = 40'

40 0 40 80 120

PREPARED BY:
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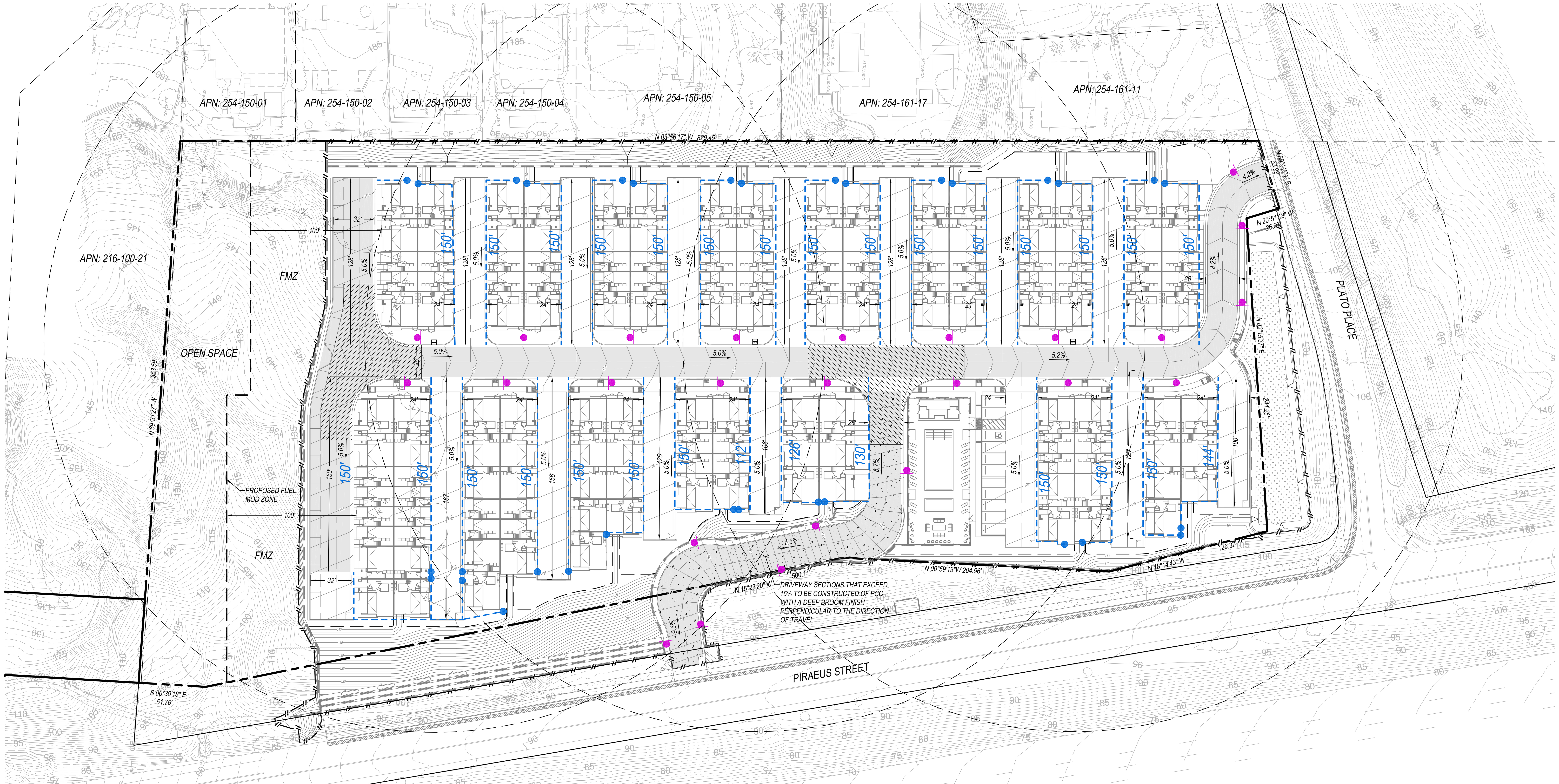
San Diego | Encinitas | Orange County
Phone 858.259.8212 | www.plsaengineering.com

FIRE ACCESS PLAN

PIRAEUS POINT

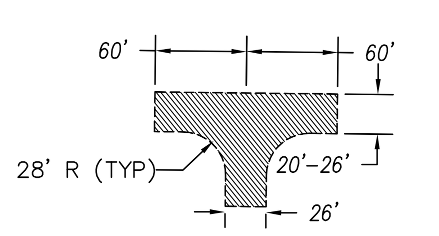


FIRE ACCESS PLAN

SCALE: 1" = 40'

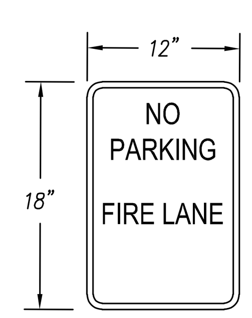
LEGEND

- PROPERTY BOUNDARY
- MOUNTABLE CURB
- PROPOSED FUEL MOD ZONE (FMZ)
- HOSE PULL
- FIRE ACCESS ROUTE (AC PAVEMENT)
- FIRE ACCESS ROUTE (CONCRETE PAVEMENT W/DEEP BROOM FINISH)
- NO PARKING SIGN
- FIRE HYDRANT RADIUS (300')



TURNAROUND DETAIL

NTS



NO PARKING SIGN DETAIL

NTS

0 40 80 120

SCALE: 1" = 40'

PREPARED BY:
PASCO LARET SUITER & ASSOCIATES
San Diego | Encinitas | Orange County
Phone 858.259.8212 | www.plsaengineering.com

ATTACHMENT 5 - COPY OF PRELIMINARY DRAINAGE STUDY

PRELIMINARY HYDROLOGY STUDY

FOR

PIRAEUS POINT
PIRAEUS STREET, ENCINITAS, CA 92024
MULTI-005158-2022

CITY OF ENCINITAS, CA

PREPARED FOR:

LENNAR HOMES OF CALIFORNIA, LLC
16465 VIA ESPRILLO, SUITE 150
ENCINITAS, CA 92024

PREPARED BY:

PASCO LARET SUITER & ASSOCIATES, INC.
1911 SAN DIEGO AVE, SUITE 100
SAN DIEGO, CA 92115
PH: (858) 259-8212

Prepared: January 19, 2022
Revised: April 5, 2022
Revised March 15, 2023

3/15/23

TYLER G. LAWSON, RCE 80356 DATE

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

1.1 Introduction

This Preliminary Hydrology Study for the proposed development at the intersection of Piraeus Street and Plato Place has been prepared to analyze the hydrologic and hydraulic characteristics of the existing and proposed project site. This report intends to present both the methodology and the calculations used for determining the runoff from the project site in both the existing condition and the post-developed (proposed) condition produced by the 100-year, 6-hour storm.

1.2 Existing Conditions

The subject property is located east of Interstate 5 and is geographically settled between Piraeus Street to the east and Plato Place to the south. The site is bordered by single family homes to the east, Interstate 5 to the west, and undeveloped open space to the north and south. The site is currently vacant and has not previously been developed. Existing site topography is generally steep with slopes ranging from 4 to over 75 percent and elevations ranging from 175 to 69 feet.

The existing site is comprised of approximately 8.55 acres. In its current state, about 70% of the site drains north via surface/sheet flow before entering an existing storm drain conveyance system at the northwest corner of the property. This is shown as drainage areas B-1 and B-2 on the Existing Condition Hydrology Node Map included in Appendix A. Once in the storm drain system, runoff from Drainage area B-1 and B-2 flows west, crossing Interstate-5 into an earthen ditch. The remainder of the site, areas A-1 and A-2, as shown on the Existing Condition Hydrology Node Map in Appendix A, flow south via surface/sheet flow and enters the existing storm drain system at the southwest corner of the property. The existing system carries runoff across Interstate-5 and discharges into an existing concrete lined ditch where it will meet runoff from Drainage Area B-1 and B-2. From this point, drainage from both basins continues north until the runoff reaches Batiquitos Lagoon and finally the Pacific Ocean.

An existing condition and post-development hydrology analysis of the existing system has been included as a part of this study to ensure the proposed project will not negatively impact the existing storm drain system. Results of the offsite analysis are provided in the Conclusions section of this report. Supporting calculations and AES output reports are provided in Appendix C.

In the existing condition, pavement, and various hardscape results in a 0% impervious basin. Based City of Encinitas Engineering Design Manual, the basin was analyzed assuming Type D soils. Based upon soil type and the lack of existing impervious area onsite, a runoff coefficient of 0.45 was used for each basin. Using the Rational Method Procedure outlined in the San Diego County Hydrology Manual, a peak flow rate and time of concentration was calculated for the basin for the 100-year, 6-hour storm event. Refer to the existing condition hydrology calculations included in Appendix C of this report for detailed analysis and the

Peak Flow Rate Comparison Table (100 Year, 6 Hour)			
Existing Condition		Post Development (Unmitigated)	
Drainage Area	Peak Flow (CFS)	Drainage Area	Peak Flow (CFS)
A-1 THRU A-2 (POC-A)	4.90	--	--
B-1 THRU B-2 (POC-B)	10.56	A-1 THRU A-18 B-1 THRU B-9 (POC-B)	33.91

Peak Flow Rate Comparison Table (100 Year, 6 Hour)			
Existing Condition		Post Development (Mitigated)	
Drainage Area	Peak Flow (CFS)	Drainage Area	Peak Flow (CFS)
A-1 THRU A-2 (POC-A)	4.90	--	--
B-1 THRU B-2 (POC-B)	10.56	A-1 THRU A-18 B-1 THRU B-9 (POC-B)	5.58

1.4 References

"Encinitas Stormwater Manual Chapter 7", Version 1.3, adopted March 17, 2010, City of Encinitas, Engineering Department

"Engineering Design Manual Chapter 6: Drainage Design Requirements", revised February 2016, City of Encinitas

"Engineering Design Manual Appendix 6: Drainage Design Requirements", October 28, 2009, City of Encinitas

"Engineering Design Manual Chapter 7: BMP Design Manual", revised February 2016, City of Encinitas

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov. Accessed May 2015

2.0 METHODOLOGY

2.1 Introduction

The hydrologic model used to perform the hydrologic analysis presented in this report utilizes the Rational Method (RM) equation, Q = CIA. The RM formula estimates the peak rate of runoff based on the variables of area, runoff coefficient, and rainfall intensity. The rainfall intensity (I) is equal to:

$$I = 7.44 \times P_6 \times D^{-0.645}$$

Where:

I = Intensity (in/hr)
P_6 = 6-hour precipitation (inches)
D = duration (minutes – use Tc)

Using the Time of Concentration (Tc), which is the time required for a given element of water that originates at the most remote point of the basin being analyzed to reach the point at which the runoff from the basin is being analyzed. The RM equation determines the storm water runoff rate (Q) for a given basin in terms of flow (typically in cubic feet per second (cfs) but sometimes as gallons per minute (gpm)). The RM equation is as follows:

$$Q = CIA$$

Where:

Q = flow (in cfs)
C = runoff coefficient, ratio of rainfall that produces storm water runoff (runoff vs. infiltration/evaporation/absorption/etc)
I = average rainfall intensity for a duration equal to the Tc for the area, in inches per hour.
A = drainage area contributing to the basin in acres.

The RM equation assumes that the storm event being analyzed delivers precipitation to the entire basin uniformly, and therefore the peak discharge rate will occur when a raindrop that falls at the most remote portion of the basin arrives at the point of analysis. The RM also assumes that the fraction of rainfall that becomes runoff or the runoff coefficient C is not affected by the storm intensity, I, or the precipitation zone number.

Rational Method calculations were performed using the AES-2016 computer program. To perform the hydrology routing, the total watershed area is divided into sub-areas which discharge at designated nodes. The procedure for the sub-area summation model is as follows:

1. Subdivide the watershed into an initial sub-area (generally 1 lot) and subsequent sub-areas, which are generally less than 10 acres in size. Assign upstream and downstream node numbers to each sub-area.

2. Estimate an initial Tc by using the appropriate nomograph or overland flow velocity estimation. The minimum Tc considered is 5.0 minutes.

3. Using the initial Tc, determine the corresponding values of I. Then Q = CIA.

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

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

SUBAREA HYDROLOGIC PROCESS

1. Confluence analysis at node.
2. Initial sub-area analysis (including time of concentration calculation).
3. Pipe flow travel time (computer estimated).
4. Pipe flow travel time (user specified).
5. Trapezoidal channel travel time.
6. Street flow analysis through sub-area.
7. User-specified information at node.
8. Addition of sub-area runoff to main line.
9. V-gutter flow through area.
10. Copy main stream data to memory bank
11. Confluence main stream data with a memory bank
12. Clear a memory bank.
31. Compute pipe-flow travel time thru subarea using computer estimated pipe size.
51. Compute trapezoidal channel flow travel time thru subarea.
81. Addition of subarea to mainline peak flow.

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

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

   Qp = Qa + Qb; Tp = Ta = Tb

2. If the collection streams have different times of concentration, the smaller of the tributary Q values may be adjusted as follows:
    a. The most frequent case is where the collection stream with the longer time of concentration has the larger Q. The smaller Q value is adjusted by a ratio of rainfall intensities.

       $$Qp = Qb + Qa\,(Ib/Ia);\ Tp = Ta$$

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

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

2.2 County of San Diego Criteria

As defined by the San Diego County Hydrology Manual (SDCHM) dated June 2003, the Rational Method is the preferred equation for determining the hydrologic characteristics of basins up to approximately one square mile in size. The County of San Diego has developed its own tables, nomographs, and methodologies for analyzing storm water runoff for areas within the county. The County has also developed precipitation isopluvial contour maps that show even lines of rainfall anticipated from a given storm event (i.e. 100-year, 6-hour storm).

One of the variables of the RM equation is the runoff coefficient, C. The runoff coefficient is dependent only upon land use and soil type and the County of San Diego has developed a table of Runoff Coefficients for Urban Areas to be applied to basin located within the County of San Diego. The table categorizes the land use, the associated development density (dwelling units per acre) and the percentage of impervious area. Each of the categories listed has an associated runoff coefficient, C, for each soil type class.

The County has also illustrated in detail the methodology for determining the Time of Concentration, in particular the Initial Time of Concentration (Ti). The County has adopted the Federal Aviation Agency's (FAA) overland time of flow equation. For this project, High Density Residential at 43 DU/acre maximum overland flow lengths are used. This equation essentially limits the flow path length for the initial time of concentration to lengths to 100 feet for slopes of 10% and greater and 95 feet for slopes up to 5%, and is dependent on land use and slope. See the "Rational Formula – Overland Time of Flow Nomograph," shown in Figure 3-3 or Table 3-2 of the San Diego County Hydrology Manual (June 2003).

The travel time (Tt) is computed by dividing the length of the flow path by the computed velocity. Figure 3-6 of the SDCHM is used to estimate time of travel for street gutter flow. Velocity in a channel is estimated by using the nomograph show in Figure 3-7 (Manning's Equation Nomograph). Travel time in natural watersheds is calculated from the Kirpich nomograph in Figure 3-4 or from the Kirpich equation.

See Appendix B of this report for San Diego County Hydrology Manual reference material.

2.3 City of Encinitas Standards

The City of Encinitas Engineering Design Manual Chapter 6 and Appendix 6 has additional requirements for hydrology reports which are outlined in the Grading, Erosion and Sediment Control Ordinance. Please refer to this manual for further details. The drainage analysis used in this study is also consistent with the requirements set forth in Section 2.3 of the City of Encinitas Engineering Design Manual.

2.4 Runoff Coefficient Determination

In accordance with City of Encinitas Engineering Design Manual, runoff coefficients are based on land use and soil type. Per the City of Encinitas Engineering Manual the soil condition used in this study is assumed to be Type D. An appropriate area-weighted runoff coefficient (C) for each Drainage Basin A and B was calculated using the methodology presented in Chapter 6 of the City of Encinitas Engineering Design Manual. Impervious areas will use a runoff coefficient of 0.90 while pervious areas will use a runoff coefficient of 0.45. These coefficients are multiplied by the percentage of total area (A) included in that class. The sum of products for all land uses is the weighted runoff coefficient (∑[C]). See the table below for weighted runoff coefficient "C" calculations. The Existing and Post-Development Hydrology Maps show the drainage basin subareas, on-site drainage system and nodal points.

$$\frac{\sum C = C_1 A_1 \text{ x } C_2 A_2}{A_1 + A_2}$$

Summary of Existing Condition Weighted Runoff Coefficients						
Drainage Basin	Total Area, A (ac)	C_1	A_1	C_2	A_2	C
A	2.48	0.9	0	0.45	2.48	0.45
B	6.07	0.9	0	0.45	6.07	0.45

Summary of Proposed Condition Weighted Runoff Coefficients						
Drainage Basin	Total Area, A (ac)	C_1	A_1	C_2	A_2	C
A	5.80	0.9	4.62	0.45	1.18	0.81
B	2.75	0.9	0	0.45	2.75	0.45

2.5 Hydraulics

The hydraulics of existing and proposed storm drain pipes were analyzed using the AES computer program. For pipe flow, a Manning's N value of 0.013 was used to reflect the use of HDPE and RCP pipe. All proposed storm drain pipes have been sized based on the proposed unmitigated flow condition for the 100-year storm event. Pipe, curb, gutter, curb inlet and catch basin capacity calculations are included in the Appendix of this report.

2.6 Detention Analysis

The HMP Biofiltration basins (BMP) provide pollutant control, hydromodification management flow control and mitigation of the 100-year storm event peak flow rate. The 100-year storm event detention analysis was performed using HydroCAD Stormwater Modeling software. The inflow runoff hydrographs to the BMPs were modeled using RatHydro which is a Rational Method Design Storm Hydrograph software that creates a hydrograph using the results of the Rational Method calculations. HydroCAD has the ability to route the 100-year 6-hour storm event inflow hydrographs through the BMPs and based on the BMP cross sectional geometry, stage storage and outlet structure data, HydroCAD calculates the detained peak flow rates and detained times to peak.

The detained flow rates and time of concentrations from the detention basins were then entered into the project's AES hydrologic study using Process Code 7 (see Section 2.1 of this report for summary of AES process codes). A mitigated condition AES report was produced for the 100-year storm event. See Appendix C for proposed mitigated condition hydrologic calculations. HydroCAD detention output reports will be provided upon final engineering.

The HMP Biofiltration facilities consists of a basin with 18 inches of engineered soil and Rtank structure storage layer of 6.5'. Runoff will be biofiltered through the engineered soil and gravel layers, then collected in a series of small PVC drainpipes and directed to a catch basin located in the HMP Biofiltration basin where runoff will be mitigated via a small HMP orifice to comply with HMP requirements. In larger storm events, runoff not filtered through the engineered soil and gravel layers will be conveyed via an overflow outlet structure. Runoff conveyed via the outlet structure will bypass the small HMP orifice and be conveyed directly to the proposed storm drain discharge pipe.

Based on the results of the HydroCAD analysis, the HMP Biofiltration facilities provide mitigation for the 100-year storm event peak flow rate, detaining the proposed condition.

APPENDIX A

Existing and Post Development Hydrology Node Maps

EXISTING CONDITION HYDROLOGY NODE MAP

PIRAEUS STREET, ENCINITAS, CA

PLAN VIEW - EXISTING CONDITION HYDROLOGY

SCALE: 1" = 50'

LEGEND

PROPERTY LINE	
RIGHT-OF-WAY	
ADJACENT PROPERTY LINE	
CENTER LINE OF ROAD	
DRAINAGE BOUNDARY	
INITIAL SUB-BASIN BOUNDARY	
DRAINAGE PATH OF TRAVEL	
EXISTING CONTOURS	175
BASIN INFORMATION	BASIN DESIGNATOR, AREA (AC), SUBAREA Q (CFS)

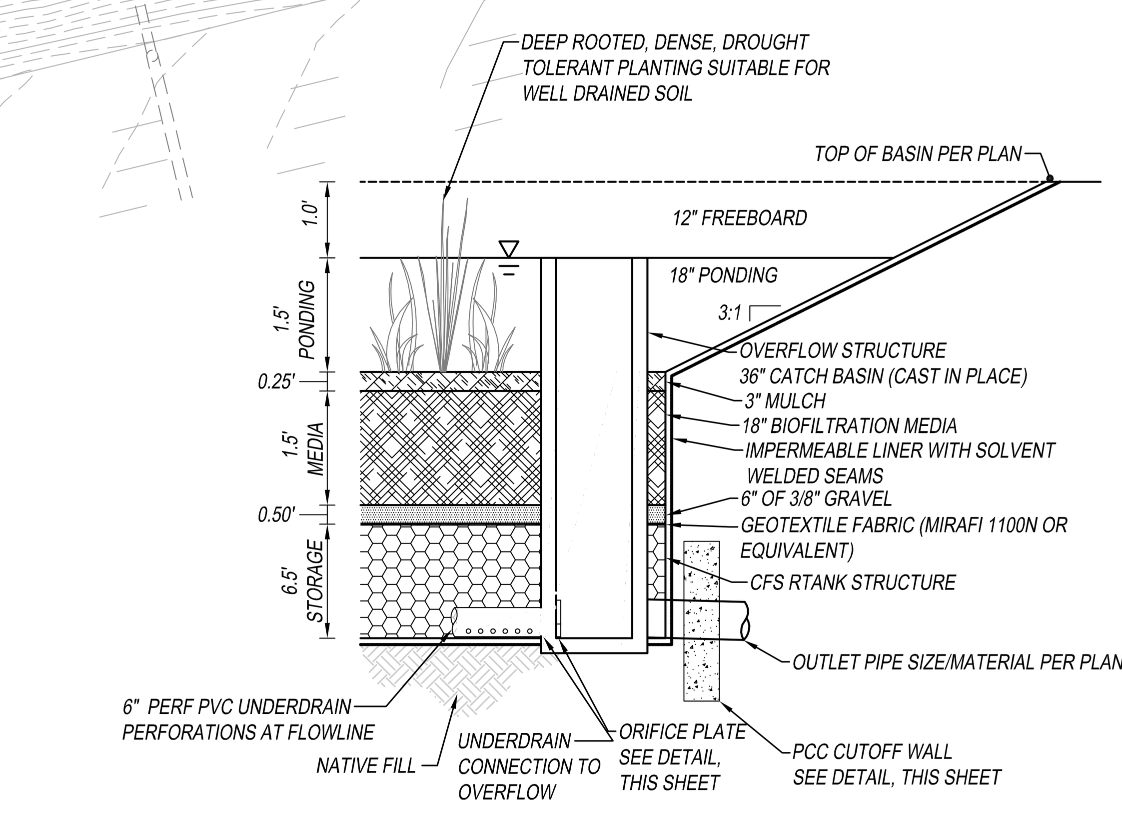
REGISTERED PROFESSIONAL ENGINEER
TYLER G LAWSON
No. 80356
Exp. 12/31/22
CIVIL
STATE OF CALIFORNIA

0 50 100 150
SCALE: 1" = 50'

PREPARED BY:
PASCO LARET SUITER & ASSOCIATES
San Diego | Encinitas | Orange County
Phone 858.259.8212 | www.plsaengineering.com

POST-DEVELOPEMENT HYDROLOGY NODE MAP

PIRAEUS STREET, ENCINITAS, CA



TYPICAL BASIN DETAIL

LEGEND

- PROPERTY LINE
- RIGHT-OF-WAY
- ADJACENT PROPERTY LINE
- CENTER LINE OF ROAD
- DRAINAGE BOUNDARY
- INITIAL SUB-BASIN BOUNDARY
- DRAINAGE PATH OF TRAVEL
- EXISTING CONTOURS 175

BASIN INFORMATION: BASIN DESIGNATOR, AREA (AC), SUBAREA Q (CFS)

REGISTERED PROFESSIONAL ENGINEER
TYLER G LARSON
No. 80356
Exp. 12/31/22
CIVIL
STATE OF CALIFORNIA

SCALE: 1" = 40'

PREPARED BY:
PASCO LARET SUITER & ASSOCIATES
San Diego | Encinitas | Orange County
Phone 858.259.8212 | www.plsaengineering.com

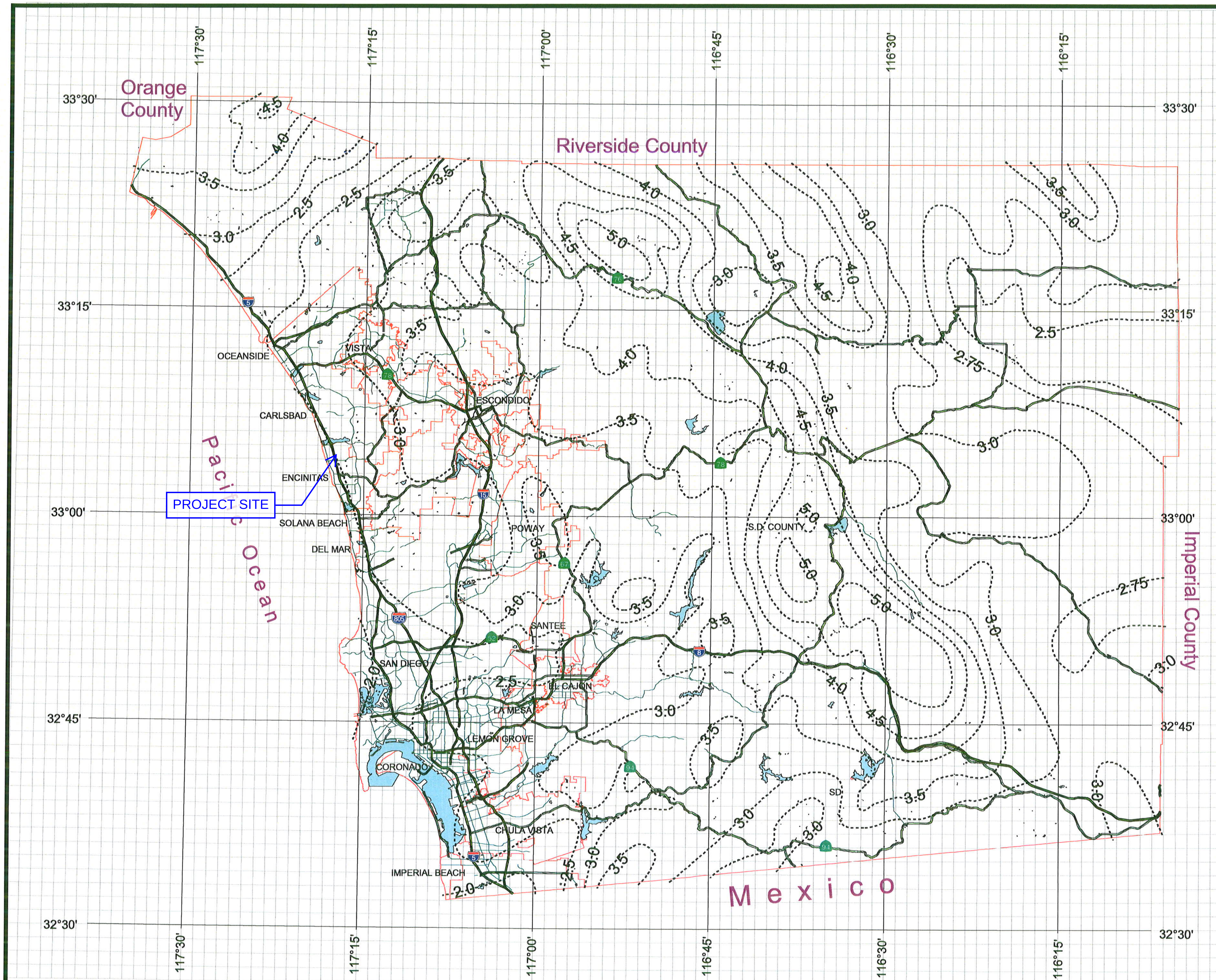
APPENDIX B

Hydrology Support Material

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours



Isopluvial (inches)

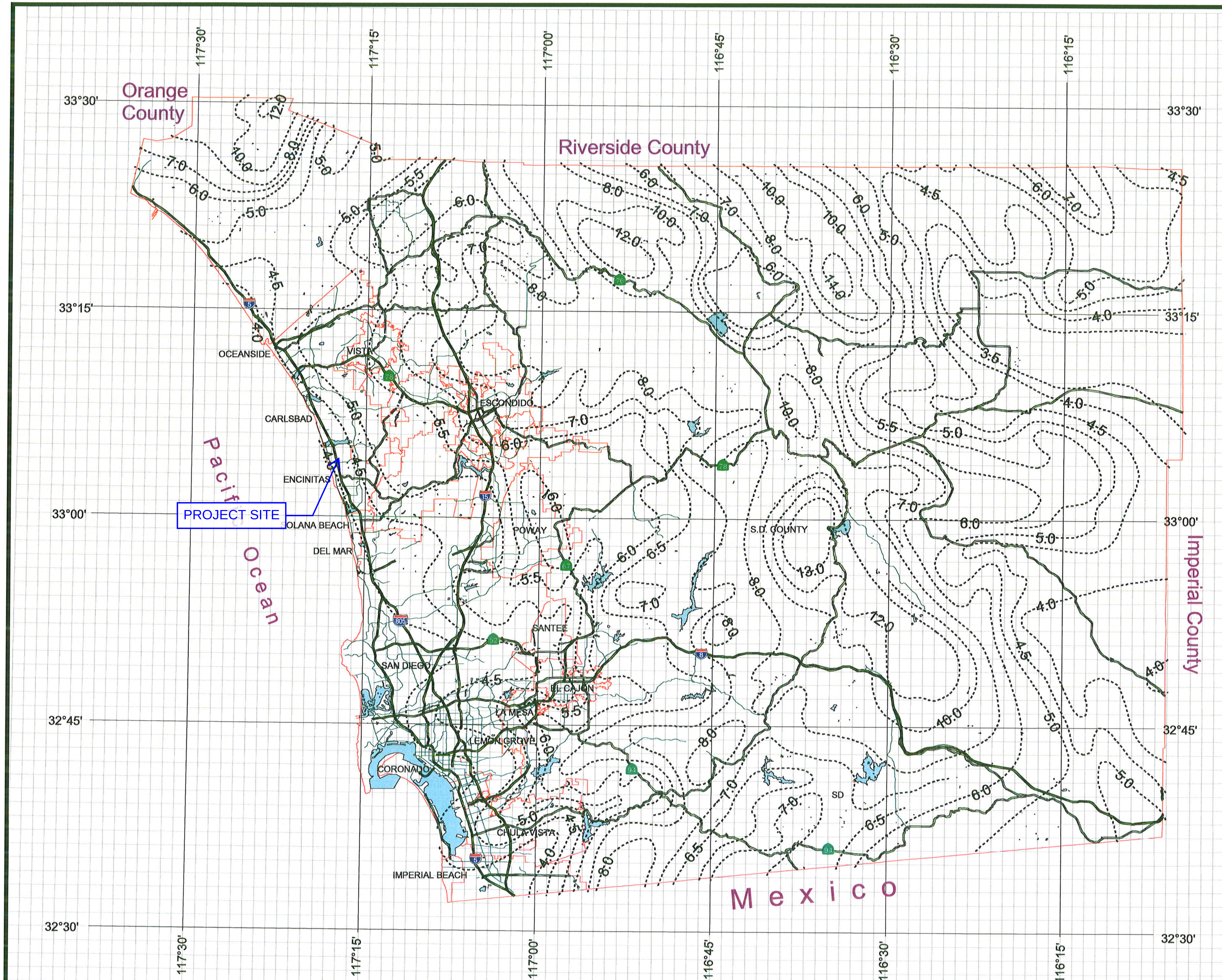
Department of Public Works
Geographic Information Services

We Have San Diego Covered!

N
W E
S

3 0 3 Miles

County of San Diego Hydrology Manual



Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

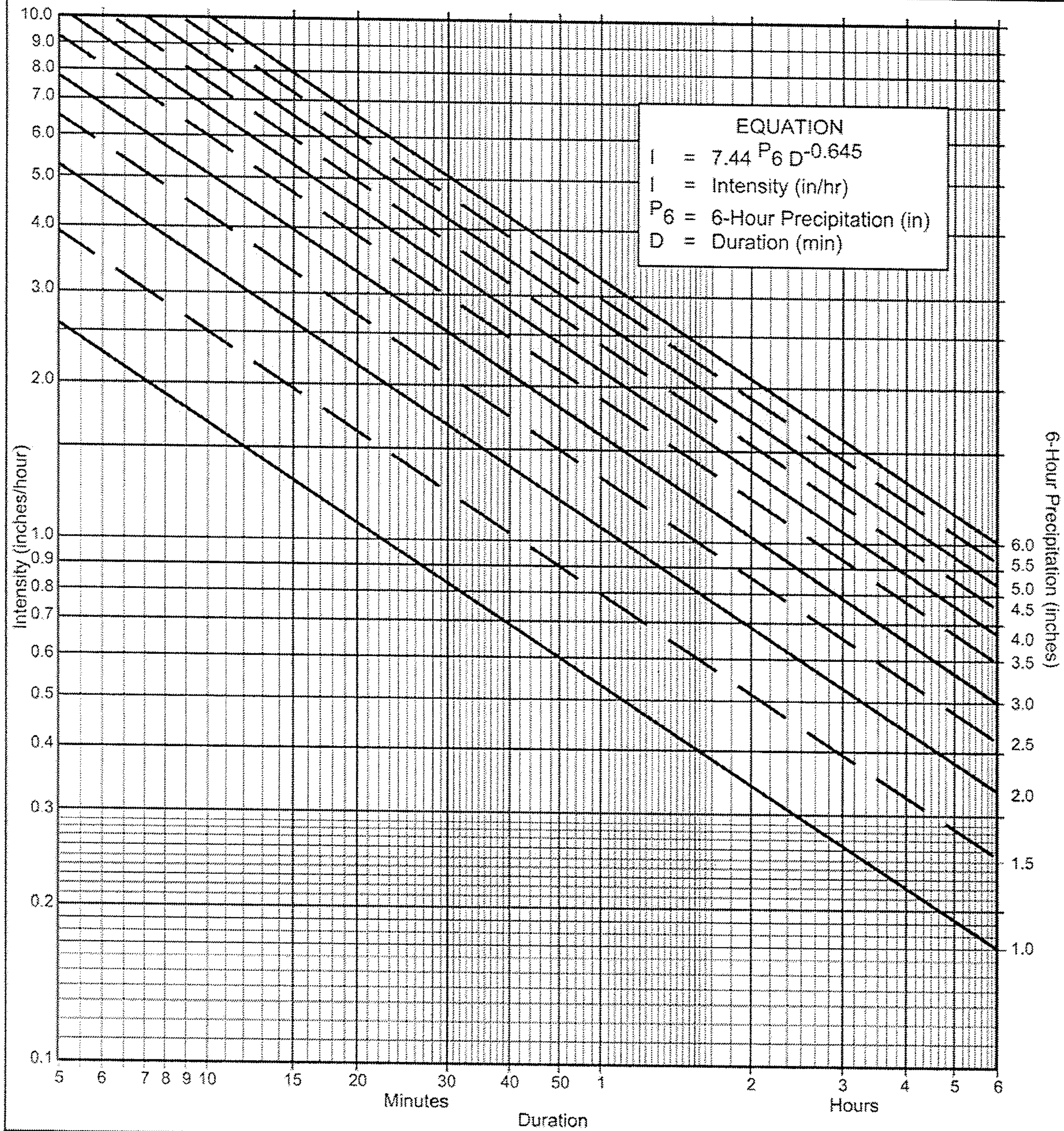
-------- Isopluvial (inches)

DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

N
W E
S

3 0 3 Miles



Directions for Application:

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

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

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

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

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

Application Form:

(a) Selected frequency 100 year

(b) P_6 = 2.5 in., P_{24} = 4.2, $\frac{P_6}{P_{24}}$ = 60 %(2)

(c) Adjusted $P_6^{(2)}$ = 2.5 in.

(d) t_x = 5.52 min.

(e) I = 6.18 in./hr.

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

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

Intensity-Duration Design Chart - Template

FIGURE

3-1

Note that the Initial Time of Concentration should be reflective of the general land-use at the upstream end of a drainage basin. A single lot with an area of two or less acres does not have a significant effect where the drainage basin area is 20 to 600 acres.

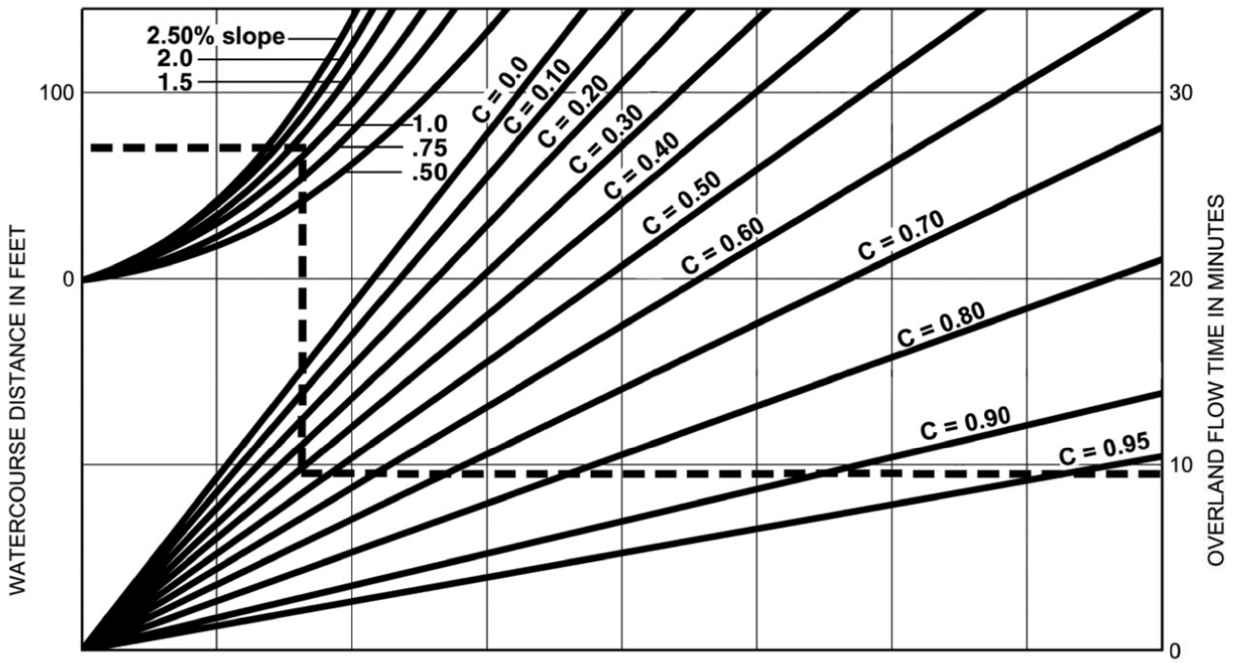
Table 3-2 provides limits of the length (Maximum Length (L_M)) of sheet flow to be used in hydrology studies. Initial T_i values based on average C values for the Land Use Element are also included. These values can be used in planning and design applications as described below. Exceptions may be approved by the "Regulating Agency" when submitted with a detailed study.

Table 3-2

MAXIMUM OVERLAND FLOW LENGTH (L_M) & INITIAL TIME OF CONCENTRATION (T_i)

Element*	DU/ Acre	.5%		1%		2%		3%		5%		10%	
		L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i
Natural		50	13.2	70	12.5	85	10.9	100	10.3	100	8.7	100	6.9
LDR	1	50	12.2	70	11.5	85	10.0	100	9.5	100	8.0	100	6.4
LDR	2	50	11.3	70	10.5	85	9.2	100	8.8	100	7.4	100	5.8
LDR	2.9	50	10.7	70	10.0	85	8.8	95	8.1	100	7.0	100	5.6
MDR	4.3	50	10.2	70	9.6	80	8.1	95	7.8	100	6.7	100	5.3
MDR	7.3	50	9.2	65	8.4	80	7.4	95	7.0	100	6.0	100	4.8
MDR	10.9	50	8.7	65	7.9	80	6.9	90	6.4	100	5.7	100	4.5
MDR	14.5	50	8.2	65	7.4	80	6.5	90	6.0	100	5.4	100	4.3
HDR	24	50	6.7	65	6.1	75	5.1	90	4.9	95	4.3	100	3.5
HDR	43	50	5.3	65	4.7	75	4.0	85	3.8	95	3.4	100	2.7
N. Com		50	5.3	60	4.5	75	4.0	85	3.8	95	3.4	100	2.7
G. Com		50	4.7	60	4.1	75	3.6	85	3.4	90	2.9	100	2.4
O.P./Com		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
Limited I.		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
General I.		50	3.7	60	3.2	70	2.7	80	2.6	90	2.3	100	1.9

*See Table 3-1 for more detailed description



EXAMPLE:

Given: Watercourse Distance (D) = 70 Feet
Slope (s) = 1.3%
Runoff Coefficient (C) = 0.41
Overland Flow Time (T) = 9.5 Minutes

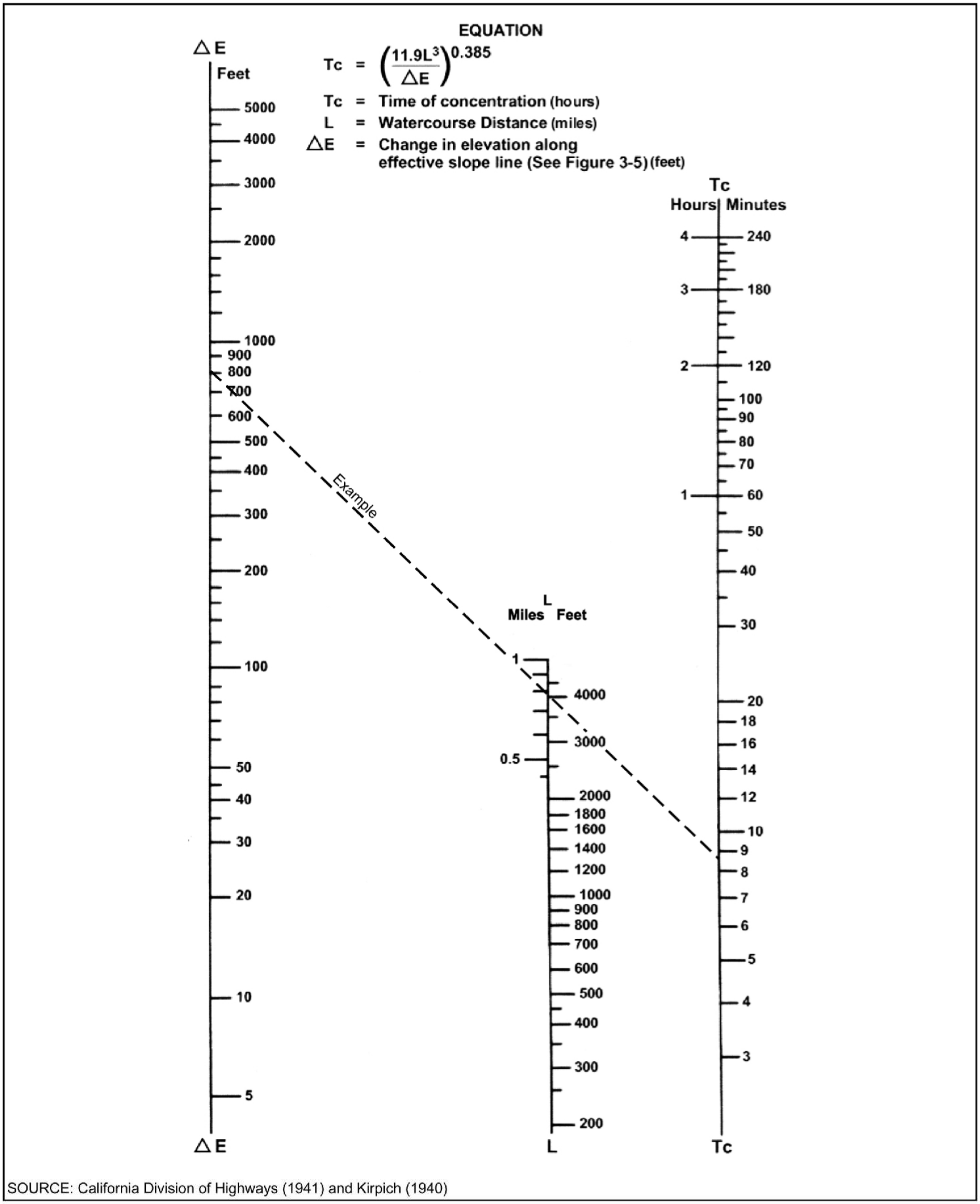
$$T = \frac{1.8\,(1.1-C)\sqrt{D}}{\sqrt[3]{s}}$$

SOURCE: Airport Drainage, Federal Aviation Administration, 1965

FIGURE

3-3

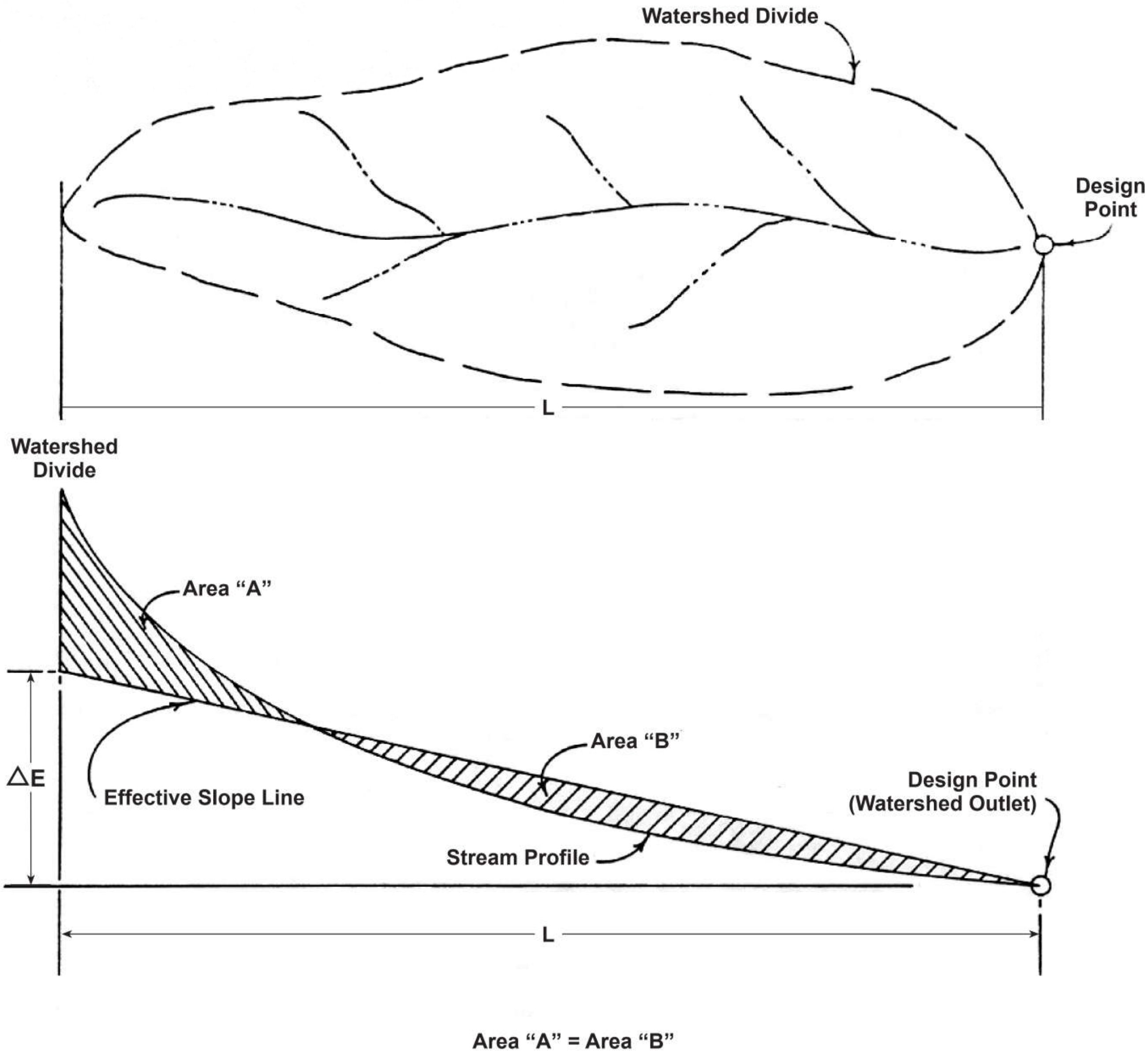
Rational Formula - Overland Time of Flow Nomograph



FIGURE

Nomograph for Determination of
Time of Concentration (Tc) or Travel Time (Tt) for Natural Watersheds

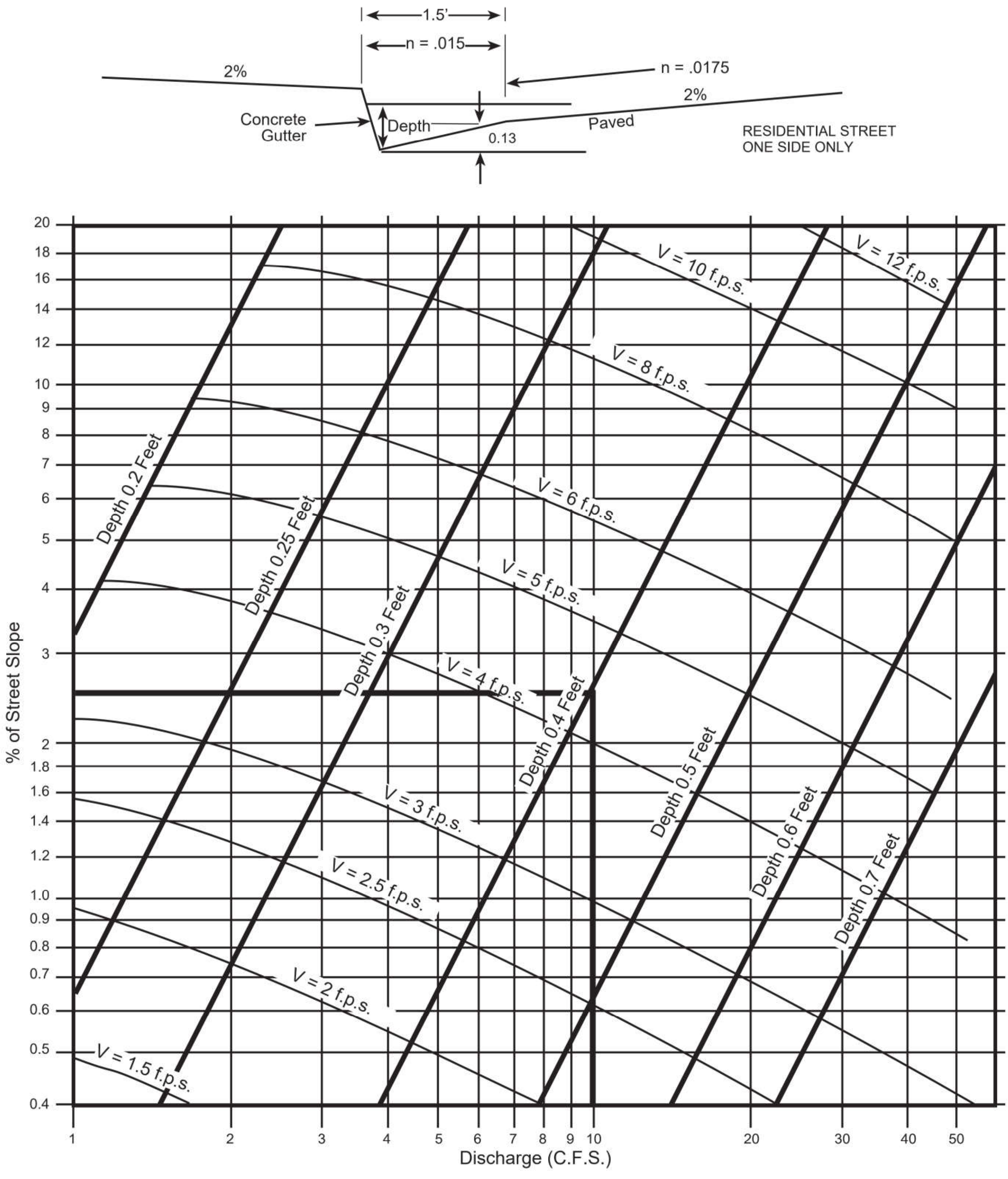
3-4



SOURCE: California Division of Highways (1941) and Kirpich (1940)

FIGURE 3-5

Computation of Effective Slope for Natural Watersheds



EXAMPLE:
Given: Q = 10 S = 2.5%
Chart gives: Depth = 0.4, Velocity = 4.4 f.p.s.

SOURCE: San Diego County Department of Special District Services Design Manual

Gutter and Roadway Discharge - Velocity Chart

FIGURE **3-6**

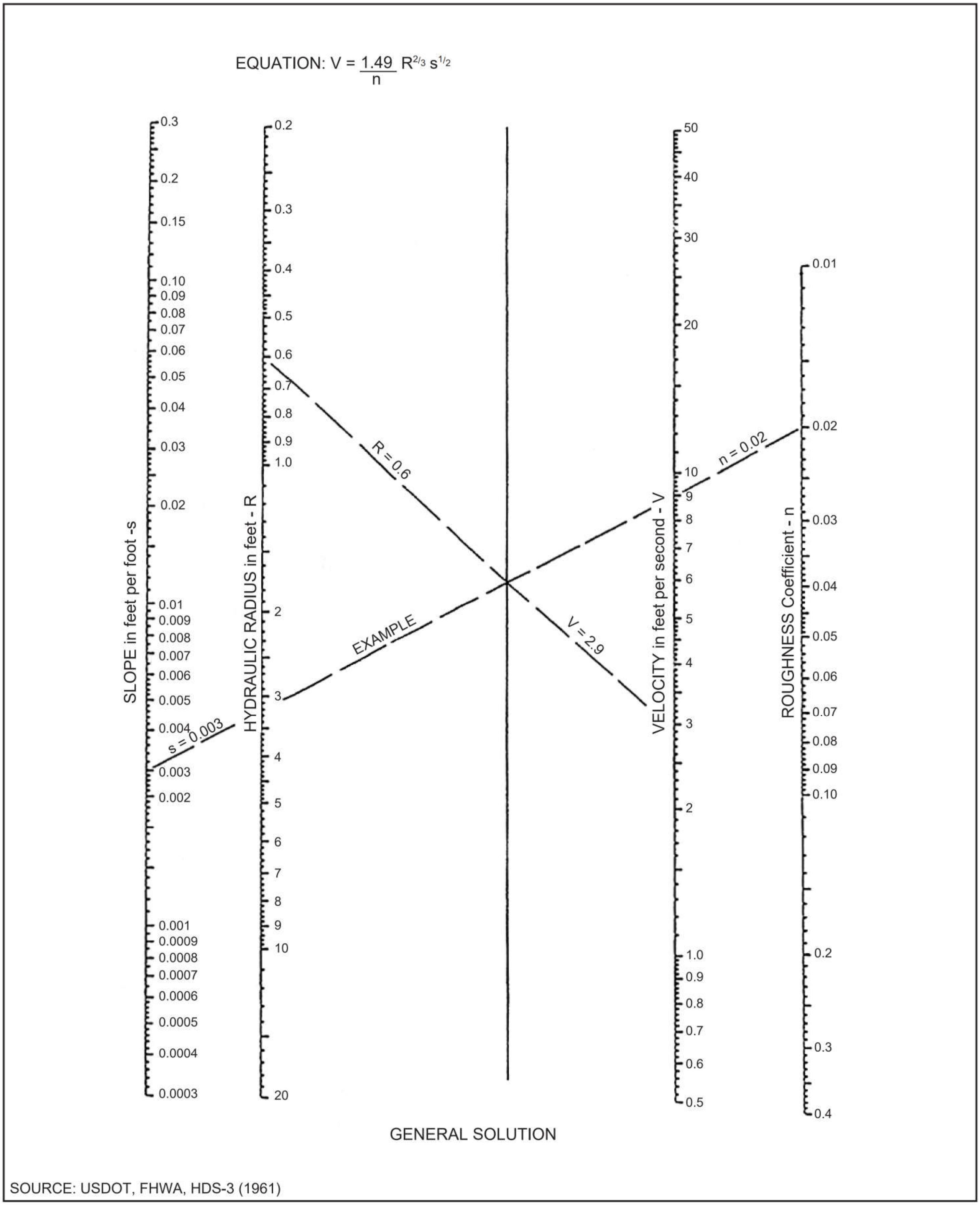


FIGURE 3-7

Manning's Equation Nomograph


117° 17' 47" W
117° 17' 38" W
472340
472370
472400
472430
472460
472490
472520
472550
33° 4' 49" N
33° 4' 38" N
3660220
3660190
3660160
3660130
3660100
3660070
3660040
3660010
3659980
3659950
3659920
Piraeus St
Leora Ln
5
RuG
ClD2
GaF
GaE
MlE
GaE
GaE
Soil Map may not be valid at this scale.
Map Scale: 1:1,550 if printed on A portrait (8.5" x 11") sheet.
Meters
0
20
40
80
120
N
Feet
0
50
100
200
300
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 16, Sep 13, 2021

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

Date(s) aerial images were photographed: Jan 23, 2020—Feb 13, 2020

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

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX C

AES Existing Condition and Post-Development Output Reports

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

             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                          2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2016 Advanced Engineering Software (aes)
              Ver. 23.0 Release Date: 07/01/2016  License ID 1452

                              Analysis prepared by:

                         PASCO LARET SUITER & ASSOCIATES
                          1911 SAN DIEGO AVE. SUITE 100
                               SAN DIEGO, CA 92110


 ************************** DESCRIPTION OF STUDY **************************
* PIRAEUS STREET, ENCINITAS                                                *
* PRE-DEVELOPMENT ANALYSIS                                                 *
*                                                                          *
 **************************************************************************

  FILE NAME: 3733PRE.DAT
  TIME/DATE OF STUDY: 10:23 03/14/2023
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.500
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

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

+--------------------------------------------------------------------------+
```

```
| BEGIN FLOWS TO POC-B                                                   |
|                                                                        |
|                                                                        |
+------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    95.00
  UPSTREAM ELEVATION(FEET) =    182.30
  DOWNSTREAM ELEVATION(FEET) =    174.40
  ELEVATION DIFFERENCE(FEET) =      7.90
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.629
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.102
  SUBAREA RUNOFF(CFS) =      0.47
  TOTAL AREA(ACRES) =      0.17   TOTAL RUNOFF(CFS) =      0.47

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    174.40  DOWNSTREAM(FEET) =     80.34
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1348.00   CHANNEL SLOPE =  0.0698
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.867
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.81
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.88
  AVERAGE FLOW DEPTH(FEET) =   0.21   TRAVEL TIME(MIN.) =   5.79
  Tc(MIN.) =   11.42
  SUBAREA AREA(ACRES) =     5.90       SUBAREA RUNOFF(CFS) =   10.27
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.450
  TOTAL AREA(ACRES) =        6.1        PEAK FLOW RATE(CFS) =      10.56

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.29   FLOW VELOCITY(FEET/SEC.) =   4.68
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =    1443.00 FEET.

+------------------------------------------------------------------------+
| END FLOWS TO POC-B                                                     |
```

```
|                                                                            |
|                                                                            |
+----------------------------------------------------------------------------+

+----------------------------------------------------------------------------+
| BEGIN FLOWS TO POC-A                                                       |
|                                                                            |
|                                                                            |
+----------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    101.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    95.00
  UPSTREAM ELEVATION(FEET) =    182.30
  DOWNSTREAM ELEVATION(FEET) =    173.36
  ELEVATION DIFFERENCE(FEET) =      8.94
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.402
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.266
  SUBAREA RUNOFF(CFS) =      0.28
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.28

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    173.36  DOWNSTREAM(FEET) =    106.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   631.00   CHANNEL SLOPE =  0.1063
  CHANNEL BASE(FEET) =   15.00   "Z" FACTOR =   8.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.389
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.70
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.64
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   3.98
  Tc(MIN.) =    9.38
  SUBAREA AREA(ACRES) =     2.38       SUBAREA RUNOFF(CFS) =    4.70
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.450
  TOTAL AREA(ACRES) =        2.5         PEAK FLOW RATE(CFS) =       4.90

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
```

```
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   3.29
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    102.00 =     726.00 FEET.

+--------------------------------------------------------------------------+
| END FLOWS TO POC-A                                                       |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        2.5  TC(MIN.) =      9.38
  PEAK FLOW RATE(CFS)   =       4.90
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                          2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2016 Advanced Engineering Software (aes)
              Ver. 23.0 Release Date: 07/01/2016  License ID 1452

                           Analysis prepared by:
                      PASCO LARET SUITER & ASSOCIATES
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                            SAN DIEGO, CA 92110


 ************************** DESCRIPTION OF STUDY **************************
 * Piraeus Street, Encinitas                                              *
 * Post-Development Unmitigated Analysis                                  *
 *                                                                        *
 **************************************************************************

  FILE NAME: 3733XSTU.DAT
  TIME/DATE OF STUDY: 14:55 03/17/2023
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.500
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   12.0      1.0    0.020/0.020/0.020   0.50    1.50 0.0312 0.125 0.0150

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

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
```

```
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8100
 S.C.S. CURVE NUMBER (AMC II) =   0
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    45.00
 UPSTREAM ELEVATION(FEET) =    181.00
 DOWNSTREAM ELEVATION(FEET) =    172.00
 ELEVATION DIFFERENCE(FEET) =      9.00
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.625
 WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.16
 TOTAL AREA(ACRES) =      0.03   TOTAL RUNOFF(CFS) =      0.16

****************************************************************************
 FLOW PROCESS FROM NODE    101.00 TO NODE    151.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   156.53  DOWNSTREAM(FEET) =   156.00
 FLOW LENGTH(FEET) =    10.50   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO  6.000
 DEPTH OF FLOW IN   6.0 INCH PIPE IS   1.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.39
 ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       0.16
 PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    1.67
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    151.00 =      55.50 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    151.00 TO NODE    102.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  156.00  DOWNSTREAM ELEVATION(FEET) =  138.54
 STREET LENGTH(FEET) =   321.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 12.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.35
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.26
   HALFSTREET FLOOD WIDTH(FEET) =    6.58
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.26
```

```
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.10
 STREET FLOW TRAVEL TIME(MIN.) =   1.26   Tc(MIN.) =    2.92
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8100
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
 SUBAREA AREA(ACRES) =    0.82      SUBAREA RUNOFF(CFS) =    4.37
 TOTAL AREA(ACRES) =        0.8        PEAK FLOW RATE(CFS) =       4.54

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.31   HALFSTREET FLOOD WIDTH(FEET) =   8.96
 FLOW VELOCITY(FEET/SEC.) =  4.93   DEPTH*VELOCITY(FT*FT/SEC.) =   1.50
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     376.50 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    114.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   128.34  DOWNSTREAM(FEET) =   128.12
 FLOW LENGTH(FEET) =     4.50   MANNING'S N =  0.013
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  10.19
 ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       4.54
 PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =    2.93
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    114.00 =     381.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    114.00 TO NODE    114.00 IS CODE =  10
----------------------------------------------------------------------------
 >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8100
 S.C.S. CURVE NUMBER (AMC II) =   0
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    95.00
 UPSTREAM ELEVATION(FEET) =    150.62
 DOWNSTREAM ELEVATION(FEET) =    146.63
 ELEVATION DIFFERENCE(FEET) =      3.99
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.086
 WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
          THE MAXIMUM OVERLAND FLOW LENGTH =    91.00
          (Reference: Table 3-1B of Hydrology Manual)
          THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
```

```
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
SUBAREA RUNOFF(CFS) =      0.69
TOTAL AREA(ACRES) =      0.13   TOTAL RUNOFF(CFS) =      0.69

****************************************************************************
FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  62
----------------------------------------------------------------------------
>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
UPSTREAM ELEVATION(FEET) =  146.63  DOWNSTREAM ELEVATION(FEET) =  140.51
STREET LENGTH(FEET) =    97.00   CURB HEIGHT(INCHES) =  6.0
STREET HALFWIDTH(FEET) = 12.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
INSIDE STREET CROSSFALL(DECIMAL) =  0.020
OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

  **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.17
  STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
  STREET FLOW DEPTH(FEET) =  0.21
  HALFSTREET FLOOD WIDTH(FEET) =    4.13
  AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.06
  PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.85
STREET FLOW TRAVEL TIME(MIN.) =   0.40   Tc(MIN.) =    3.48
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8100
S.C.S. CURVE NUMBER (AMC II) =   0
AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
SUBAREA AREA(ACRES) =    0.18      SUBAREA RUNOFF(CFS) =    0.96
TOTAL AREA(ACRES) =        0.3        PEAK FLOW RATE(CFS) =      1.65

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.23   HALFSTREET FLOOD WIDTH(FEET) =   5.17
FLOW VELOCITY(FEET/SEC.) =  4.29   DEPTH*VELOCITY(FT*FT/SEC.) =   0.98
LONGEST FLOWPATH FROM NODE    103.00 TO NODE    105.00 =     192.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   137.51  DOWNSTREAM(FEET) =   133.85
FLOW LENGTH(FEET) =    82.00   MANNING'S N =  0.013
DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.4 INCHES
```

```
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.67
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        1.65
  PIPE TRAVEL TIME(MIN.) =   0.18    Tc(MIN.) =    3.66
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    106.00 =     274.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    3.66
  RAINFALL INTENSITY(INCH/HR) =   6.59
  TOTAL STREAM AREA(ACRES) =     0.31
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.65

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    108.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    95.00
  UPSTREAM ELEVATION(FEET) =    146.18
  DOWNSTREAM ELEVATION(FEET) =    140.74
  ELEVATION DIFFERENCE(FEET) =      5.44
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.844
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.96
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.96

****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    106.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  140.74  DOWNSTREAM ELEVATION(FEET) =  136.85
  STREET LENGTH(FEET) =    70.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130
```

```
    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.36
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.22
    HALFSTREET FLOOD WIDTH(FEET) =    4.80
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.90
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.87
  STREET FLOW TRAVEL TIME(MIN.) =   0.30   Tc(MIN.) =    3.14
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
  SUBAREA AREA(ACRES) =    0.15      SUBAREA RUNOFF(CFS) =    0.80
  TOTAL AREA(ACRES) =        0.3        PEAK FLOW RATE(CFS) =       1.76

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.24   HALFSTREET FLOOD WIDTH(FEET) =   5.62
  FLOW VELOCITY(FEET/SEC.) =  4.06   DEPTH*VELOCITY(FT*FT/SEC.) =   0.97
  LONGEST FLOWPATH FROM NODE    107.00 TO NODE    106.00 =     165.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    3.14
  RAINFALL INTENSITY(INCH/HR) =   6.59
  TOTAL STREAM AREA(ACRES) =     0.33
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.76

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        1.65     3.66        6.587          0.31
      2        1.76     3.14        6.587          0.33

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        3.18     3.14       6.587
      2        3.41     3.66       6.587

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       3.41   Tc(MIN.) =    3.66
  TOTAL AREA(ACRES) =        0.6
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    106.00 =     274.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    109.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   133.85  DOWNSTREAM(FEET) =   131.86
  FLOW LENGTH(FEET) =   199.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   9.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.03
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.41
  PIPE TRAVEL TIME(MIN.) =   0.66    Tc(MIN.) =    4.32
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    109.00 =     473.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    109.00 TO NODE    110.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   131.86  DOWNSTREAM(FEET) =   129.61
  FLOW LENGTH(FEET) =    78.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.78
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.41
  PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =    4.49
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    110.00 =     551.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    4.49
  RAINFALL INTENSITY(INCH/HR) =   6.59
  TOTAL STREAM AREA(ACRES) =     0.64
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.41

****************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    95.00
  UPSTREAM ELEVATION(FEET) =    142.09
  DOWNSTREAM ELEVATION(FEET) =    136.65
```

```
  ELEVATION DIFFERENCE(FEET) =      5.44
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.844
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.96
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.96

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    113.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  136.65  DOWNSTREAM ELEVATION(FEET) =  134.29
  STREET LENGTH(FEET) =    41.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.28
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.22
    HALFSTREET FLOOD WIDTH(FEET) =    4.58
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.91
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.85
  STREET FLOW TRAVEL TIME(MIN.) =   0.17   Tc(MIN.) =    3.02
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
  SUBAREA AREA(ACRES) =    0.12      SUBAREA RUNOFF(CFS) =    0.64
  TOTAL AREA(ACRES) =        0.3        PEAK FLOW RATE(CFS) =       1.60

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.23   HALFSTREET FLOOD WIDTH(FEET) =   5.25
  FLOW VELOCITY(FEET/SEC.) =  4.07   DEPTH*VELOCITY(FT*FT/SEC.) =   0.94
  LONGEST FLOWPATH FROM NODE    111.00 TO NODE    113.00 =     136.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    113.00 TO NODE    110.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   131.29  DOWNSTREAM(FEET) =   129.61
```

```
  FLOW LENGTH(FEET) =   168.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   7.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.16
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        1.60
  PIPE TRAVEL TIME(MIN.) =   0.67    Tc(MIN.) =    3.69
  LONGEST FLOWPATH FROM NODE    111.00 TO NODE    110.00 =     304.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    3.69
  RAINFALL INTENSITY(INCH/HR) =   6.59
  TOTAL STREAM AREA(ACRES) =     0.30
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.60

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1         3.41     4.49        6.587          0.64
     2         1.60     3.69        6.587          0.30

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF       Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1         5.02     3.69       6.587
     2         5.02     4.49       6.587

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       5.02   Tc(MIN.) =    4.49
  TOTAL AREA(ACRES) =        0.9
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    110.00 =     551.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    114.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   129.61  DOWNSTREAM(FEET) =   128.12
  FLOW LENGTH(FEET) =    50.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   8.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.55
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        5.02
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =    4.59
```

```
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    114.00 =     601.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    114.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1        5.02     4.59       6.587        0.94
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    114.00 =     601.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1        4.54     2.93       6.587        0.85
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    114.00 =     381.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1       7.74       2.93        6.587
     2       9.55       4.59        6.587

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       9.55   Tc(MIN.) =    4.59
  TOTAL AREA(ACRES) =        1.8

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    114.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    115.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   128.12  DOWNSTREAM(FEET) =   127.37
  FLOW LENGTH(FEET) =    24.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.19
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.55
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    4.63
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    115.00 =     625.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    115.00 TO NODE    115.00 IS CODE =   1
----------------------------------------------------------------------------
```

```
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    4.63
  RAINFALL INTENSITY(INCH/HR) =   6.59
  TOTAL STREAM AREA(ACRES) =     1.79
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.55

******************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    530.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    30.00
  UPSTREAM ELEVATION(FEET) =    138.00
  DOWNSTREAM ELEVATION(FEET) =    136.30
  ELEVATION DIFFERENCE(FEET) =      1.70
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.604
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.32

******************************************************************************
  FLOW PROCESS FROM NODE    530.00 TO NODE    117.00 IS CODE =  62
------------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
==============================================================================
  UPSTREAM ELEVATION(FEET) =  136.30  DOWNSTREAM ELEVATION(FEET) =  131.74
  STREET LENGTH(FEET) =    78.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.80
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.19
    HALFSTREET FLOOD WIDTH(FEET) =    3.02
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.82
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.71
  STREET FLOW TRAVEL TIME(MIN.) =   0.34   Tc(MIN.) =    1.94
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
```

```
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8100
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
 SUBAREA AREA(ACRES) =    0.18      SUBAREA RUNOFF(CFS) =    0.96
 TOTAL AREA(ACRES) =        0.2        PEAK FLOW RATE(CFS) =       1.28

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.22   HALFSTREET FLOOD WIDTH(FEET) =   4.51
 FLOW VELOCITY(FEET/SEC.) =  3.99   DEPTH*VELOCITY(FT*FT/SEC.) =   0.86
 LONGEST FLOWPATH FROM NODE    116.00 TO NODE    117.00 =     108.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    117.00 TO NODE    115.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   128.74  DOWNSTREAM(FEET) =   127.37
 FLOW LENGTH(FEET) =   137.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN   9.0 INCH PIPE IS   6.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.05
 ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       1.28
 PIPE TRAVEL TIME(MIN.) =   0.56    Tc(MIN.) =    2.51
 LONGEST FLOWPATH FROM NODE    116.00 TO NODE    115.00 =     245.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    115.00 TO NODE    155.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    2.51
 RAINFALL INTENSITY(INCH/HR) =   6.59
 TOTAL STREAM AREA(ACRES) =     0.24
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.28

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)      (MIN.)   (INCH/HOUR)    (ACRE)
     1        9.55     4.63        6.587          1.79
     2        1.28     2.51        6.587          0.24

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

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF       Tc      INTENSITY
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)
     1        6.46     2.51       6.587
```

```
    2       10.83     4.63       6.587

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      10.83   Tc(MIN.) =    4.63
 TOTAL AREA(ACRES) =        2.0
 LONGEST FLOWPATH FROM NODE    103.00 TO NODE    155.00 =     625.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    115.00 TO NODE    118.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   127.37  DOWNSTREAM(FEET) =   124.46
 FLOW LENGTH(FEET) =    78.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  15.0 INCH PIPE IS  11.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  11.20
 ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      10.83
 PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =    4.74
 LONGEST FLOWPATH FROM NODE    103.00 TO NODE    118.00 =     703.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    118.00 TO NODE    118.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    4.74
 RAINFALL INTENSITY(INCH/HR) =   6.59
 TOTAL STREAM AREA(ACRES) =     2.03
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     10.83

****************************************************************************
 FLOW PROCESS FROM NODE    119.00 TO NODE    120.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8100
 S.C.S. CURVE NUMBER (AMC II) =   0
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    93.00
 UPSTREAM ELEVATION(FEET) =    133.92
 DOWNSTREAM ELEVATION(FEET) =    128.64
 ELEVATION DIFFERENCE(FEET) =      5.28
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.822
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.96
 TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.96

****************************************************************************
 FLOW PROCESS FROM NODE    120.00 TO NODE    118.00 IS CODE =  31
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   125.64  DOWNSTREAM(FEET) =   124.46
  FLOW LENGTH(FEET) =   118.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   5.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.82
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.96
  PIPE TRAVEL TIME(MIN.) =   0.52    Tc(MIN.) =    3.34
  LONGEST FLOWPATH FROM NODE    119.00 TO NODE    118.00 =     211.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    118.00 TO NODE    118.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    3.34
  RAINFALL INTENSITY(INCH/HR) =   6.59
  TOTAL STREAM AREA(ACRES) =     0.18
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.96

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       10.83     4.74        6.587          2.03
     2        0.96     3.34        6.587          0.18

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       11.79     3.34       6.587
     2       11.79     4.74       6.587

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      11.79   Tc(MIN.) =    4.74
  TOTAL AREA(ACRES) =        2.2
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    118.00 =     703.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    118.00 TO NODE    121.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   124.46  DOWNSTREAM(FEET) =   116.01
  FLOW LENGTH(FEET) =   139.00   MANNING'S N =  0.013
```

```
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   9.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.92
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.79
  PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =    4.91
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    121.00 =     842.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    121.00 TO NODE    121.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    4.91
  RAINFALL INTENSITY(INCH/HR) =   6.59
  TOTAL STREAM AREA(ACRES) =     2.21
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     11.79

****************************************************************************
  FLOW PROCESS FROM NODE    156.00 TO NODE    123.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    95.00
  UPSTREAM ELEVATION(FEET) =    143.00
  DOWNSTREAM ELEVATION(FEET) =    138.63
  ELEVATION DIFFERENCE(FEET) =      4.37
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.027
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    93.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.91
  TOTAL AREA(ACRES) =      0.17   TOTAL RUNOFF(CFS) =      0.91

****************************************************************************
  FLOW PROCESS FROM NODE    123.00 TO NODE    124.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  138.63  DOWNSTREAM ELEVATION(FEET) =  125.78
  STREET LENGTH(FEET) =   245.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020
```

```
  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.75
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.27
    HALFSTREET FLOOD WIDTH(FEET) =    7.18
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.34
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.17
  STREET FLOW TRAVEL TIME(MIN.) =   0.94   Tc(MIN.) =    3.97
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
  SUBAREA AREA(ACRES) =    0.69      SUBAREA RUNOFF(CFS) =    3.68
  TOTAL AREA(ACRES) =        0.9        PEAK FLOW RATE(CFS) =       4.59

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.31   HALFSTREET FLOOD WIDTH(FEET) =   9.03
  FLOW VELOCITY(FEET/SEC.) =  4.91   DEPTH*VELOCITY(FT*FT/SEC.) =   1.51
  LONGEST FLOWPATH FROM NODE    156.00 TO NODE    124.00 =     340.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    124.00 TO NODE    121.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   116.23  DOWNSTREAM(FEET) =   116.01
  FLOW LENGTH(FEET) =     4.50   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.21
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.59
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =    3.98
  LONGEST FLOWPATH FROM NODE    156.00 TO NODE    121.00 =     344.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    121.00 TO NODE    121.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    3.98
  RAINFALL INTENSITY(INCH/HR) =   6.59
  TOTAL STREAM AREA(ACRES) =     0.86
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.59
```

```
** CONFLUENCE DATA **
STREAM     RUNOFF       Tc      INTENSITY      AREA
NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
    1       11.79     4.91        6.587          2.21
    2        4.59     3.98        6.587          0.86

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

** PEAK FLOW RATE TABLE **
STREAM     RUNOFF       Tc      INTENSITY
NUMBER      (CFS)     (MIN.)   (INCH/HOUR)
    1       16.38     3.98        6.587
    2       16.38     4.91        6.587

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =      16.38   Tc(MIN.) =    4.91
TOTAL AREA(ACRES) =        3.1
LONGEST FLOWPATH FROM NODE    103.00 TO NODE    121.00 =     842.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    121.00 TO NODE    125.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   116.01  DOWNSTREAM(FEET) =   112.93
FLOW LENGTH(FEET) =    50.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =  15.28
ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =      16.38
PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    4.96
LONGEST FLOWPATH FROM NODE    103.00 TO NODE    125.00 =     892.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    125.00 TO NODE    125.00 IS CODE =  10
----------------------------------------------------------------------------
>>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
FLOW PROCESS FROM NODE    148.00 TO NODE    149.00 IS CODE =  21
----------------------------------------------------------------------------
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8100
S.C.S. CURVE NUMBER (AMC II) =   0
INITIAL SUBAREA FLOW-LENGTH(FEET) =    95.00
UPSTREAM ELEVATION(FEET) =    129.50
DOWNSTREAM ELEVATION(FEET) =    119.80
ELEVATION DIFFERENCE(FEET) =      9.70
```

```
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.362
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.75
  TOTAL AREA(ACRES) =      0.14   TOTAL RUNOFF(CFS) =      0.75

****************************************************************************
  FLOW PROCESS FROM NODE    149.00 TO NODE    149.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8100
  SUBAREA AREA(ACRES) =    0.23   SUBAREA RUNOFF(CFS) =    1.23
  TOTAL AREA(ACRES) =        0.4   TOTAL RUNOFF(CFS) =       1.97
  TC(MIN.) =    2.36

****************************************************************************
  FLOW PROCESS FROM NODE    149.00 TO NODE    590.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   115.80  DOWNSTREAM(FEET) =   114.25
  FLOW LENGTH(FEET) =   103.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   7.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.11
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.97
  PIPE TRAVEL TIME(MIN.) =   0.34    Tc(MIN.) =    2.70
  LONGEST FLOWPATH FROM NODE    148.00 TO NODE    590.00 =     198.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    590.00 TO NODE    590.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    2.70
  RAINFALL INTENSITY(INCH/HR) =   6.59
  TOTAL STREAM AREA(ACRES) =     0.37
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.97

****************************************************************************
  FLOW PROCESS FROM NODE    131.00 TO NODE    540.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
```

```
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    53.00
  UPSTREAM ELEVATION(FEET) =    124.30
  DOWNSTREAM ELEVATION(FEET) =    121.10
  ELEVATION DIFFERENCE(FEET) =      3.20
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.087
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.48
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.48

****************************************************************************
  FLOW PROCESS FROM NODE    540.00 TO NODE    132.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  121.10  DOWNSTREAM ELEVATION(FEET) =  117.36
  STREET LENGTH(FEET) =    65.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.04
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.20
    HALFSTREET FLOOD WIDTH(FEET) =    3.91
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.84
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.78
  STREET FLOW TRAVEL TIME(MIN.) =   0.28   Tc(MIN.) =    2.37
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
  SUBAREA AREA(ACRES) =    0.21      SUBAREA RUNOFF(CFS) =    1.12
  TOTAL AREA(ACRES) =        0.3        PEAK FLOW RATE(CFS) =       1.60

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.23   HALFSTREET FLOOD WIDTH(FEET) =   5.25
  FLOW VELOCITY(FEET/SEC.) =  4.07   DEPTH*VELOCITY(FT*FT/SEC.) =   0.94
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    132.00 =     118.00 FEET.

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

```
  FLOW PROCESS FROM NODE    132.00 TO NODE    590.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   114.36  DOWNSTREAM(FEET) =   114.25
  FLOW LENGTH(FEET) =    11.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   7.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.16
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        1.60
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    2.41
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    590.00 =     129.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    590.00 TO NODE    590.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    2.41
  RAINFALL INTENSITY(INCH/HR) =   6.59
  TOTAL STREAM AREA(ACRES) =     0.30
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.60

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        1.97     2.70        6.587          0.37
      2        1.60     2.41        6.587          0.30

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF       Tc      INTENSITY
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)
      1        3.37     2.41       6.587
      2        3.57     2.70       6.587

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       3.57   Tc(MIN.) =    2.70
  TOTAL AREA(ACRES) =        0.7
  LONGEST FLOWPATH FROM NODE    148.00 TO NODE    590.00 =     198.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    590.00 TO NODE    125.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   114.25  DOWNSTREAM(FEET) =   112.93
```

```
  FLOW LENGTH(FEET) =   132.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.30
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        3.57
  PIPE TRAVEL TIME(MIN.) =   0.42    Tc(MIN.) =    3.11
  LONGEST FLOWPATH FROM NODE    148.00 TO NODE    125.00 =     330.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    125.00 TO NODE    125.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1         3.57     3.11       6.587        0.67
  LONGEST FLOWPATH FROM NODE    148.00 TO NODE    125.00 =     330.00 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1       16.38     4.96       6.587        3.07
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    125.00 =     892.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1      13.85       3.11        6.587
     2      19.95       4.96        6.587

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      19.95   Tc(MIN.) =    4.96
  TOTAL AREA(ACRES) =        3.7

****************************************************************************
  FLOW PROCESS FROM NODE    125.00 TO NODE    126.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   112.93  DOWNSTREAM(FEET) =   108.69
  FLOW LENGTH(FEET) =    78.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.12
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      19.95
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =    5.05
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    126.00 =     970.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    126.00 TO NODE    126.00 IS CODE =   1
----------------------------------------------------------------------------
```

```
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.05
  RAINFALL INTENSITY(INCH/HR) =   6.55
  TOTAL STREAM AREA(ACRES) =     3.74
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     19.95

******************************************************************************
  FLOW PROCESS FROM NODE    133.00 TO NODE    550.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    37.00
  UPSTREAM ELEVATION(FEET) =    119.66
  DOWNSTREAM ELEVATION(FEET) =    117.30
  ELEVATION DIFFERENCE(FEET) =      2.36
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.712
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.37
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.37

******************************************************************************
  FLOW PROCESS FROM NODE    550.00 TO NODE    134.00 IS CODE =  62
------------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
==============================================================================
  UPSTREAM ELEVATION(FEET) =  117.30  DOWNSTREAM ELEVATION(FEET) =  113.12
  STREET LENGTH(FEET) =    77.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.80
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.19
    HALFSTREET FLOOD WIDTH(FEET) =    3.10
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.74
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.70
  STREET FLOW TRAVEL TIME(MIN.) =   0.34   Tc(MIN.) =    2.06
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
```

```
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8100
S.C.S. CURVE NUMBER (AMC II) =   0
AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
SUBAREA AREA(ACRES) =    0.16      SUBAREA RUNOFF(CFS) =    0.85
TOTAL AREA(ACRES) =        0.2        PEAK FLOW RATE(CFS) =       1.23

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.22   HALFSTREET FLOOD WIDTH(FEET) =   4.51
FLOW VELOCITY(FEET/SEC.) =  3.82   DEPTH*VELOCITY(FT*FT/SEC.) =   0.83
LONGEST FLOWPATH FROM NODE    133.00 TO NODE    134.00 =     114.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    134.00 TO NODE    126.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   110.12  DOWNSTREAM(FEET) =   108.69
FLOW LENGTH(FEET) =   143.00   MANNING'S N =  0.013
DEPTH OF FLOW IN   9.0 INCH PIPE IS   5.9 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   4.01
ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =       1.23
PIPE TRAVEL TIME(MIN.) =   0.59    Tc(MIN.) =    2.65
LONGEST FLOWPATH FROM NODE    133.00 TO NODE    126.00 =     257.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    126.00 TO NODE    126.00 IS CODE =   1
----------------------------------------------------------------------------
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
TOTAL NUMBER OF STREAMS =  2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MIN.) =    2.65
RAINFALL INTENSITY(INCH/HR) =   6.59
TOTAL STREAM AREA(ACRES) =     0.23
PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.23

** CONFLUENCE DATA **
STREAM     RUNOFF       Tc      INTENSITY      AREA
NUMBER      (CFS)      (MIN.)   (INCH/HOUR)    (ACRE)
    1       19.95     5.05        6.546          3.74
    2        1.23     2.65        6.587          0.23

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

** PEAK FLOW RATE TABLE **
STREAM     RUNOFF       Tc      INTENSITY
NUMBER      (CFS)     (MIN.)   (INCH/HOUR)
    1       11.70     2.65       6.587
```

```
     2       21.17     5.05       6.546

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      21.17   Tc(MIN.) =    5.05
  TOTAL AREA(ACRES) =        4.0
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    126.00 =     970.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    126.00 TO NODE    127.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   108.69  DOWNSTREAM(FEET) =   107.84
  FLOW LENGTH(FEET) =    20.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  12.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.16
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      21.17
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    5.07
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    127.00 =     990.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    127.00 TO NODE    127.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.07
  RAINFALL INTENSITY(INCH/HR) =   6.53
  TOTAL STREAM AREA(ACRES) =     3.97
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     21.17

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    600.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    95.00
  UPSTREAM ELEVATION(FEET) =    181.00
  DOWNSTREAM ELEVATION(FEET) =    172.00
  ELEVATION DIFFERENCE(FEET) =      9.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.390
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.275
  SUBAREA RUNOFF(CFS) =      0.11
  TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.11

****************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    160.00 IS CODE =  51
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    172.00  DOWNSTREAM(FEET) =    132.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   333.00   CHANNEL SLOPE =  0.1201
  CHANNEL BASE(FEET) =    1.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.507
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.29
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.59
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   1.21
  Tc(MIN.) =    6.60
  SUBAREA AREA(ACRES) =     0.14       SUBAREA RUNOFF(CFS) =    0.35
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.450
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.45

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   5.46
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    160.00 =     428.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    128.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   129.00  DOWNSTREAM(FEET) =   125.76
  FLOW LENGTH(FEET) =   122.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   3.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.52
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        0.45
  PIPE TRAVEL TIME(MIN.) =   0.45    Tc(MIN.) =    7.05
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    128.00 =     550.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    128.00 TO NODE    130.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  125.76  DOWNSTREAM ELEVATION(FEET) =  117.50
  STREET LENGTH(FEET) =   156.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
```

```
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.65
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.24
   HALFSTREET FLOOD WIDTH(FEET) =    5.47
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.96
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.93
 STREET FLOW TRAVEL TIME(MIN.) =   0.66   Tc(MIN.) =    7.70
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.984
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8100
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.727
 SUBAREA AREA(ACRES) =    0.60      SUBAREA RUNOFF(CFS) =    2.42
 TOTAL AREA(ACRES) =        0.8        PEAK FLOW RATE(CFS) =       2.83

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.27   HALFSTREET FLOOD WIDTH(FEET) =   7.25
 FLOW VELOCITY(FEET/SEC.) =  4.39   DEPTH*VELOCITY(FT*FT/SEC.) =   1.19
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    130.00 =     706.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    130.00 TO NODE    127.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   108.06  DOWNSTREAM(FEET) =   107.84
 FLOW LENGTH(FEET) =     4.50   MANNING'S N =  0.013
 DEPTH OF FLOW IN   9.0 INCH PIPE IS   6.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   8.94
 ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =        2.83
 PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =    7.71
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    127.00 =     710.50 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    127.00 TO NODE    127.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    7.71
 RAINFALL INTENSITY(INCH/HR) =   4.98
 TOTAL STREAM AREA(ACRES) =     0.78
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.83

****************************************************************************
 FLOW PROCESS FROM NODE    103.00 TO NODE    136.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    95.00
  UPSTREAM ELEVATION(FEET) =    150.62
  DOWNSTREAM ELEVATION(FEET) =    145.21
  ELEVATION DIFFERENCE(FEET) =      5.41
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.849
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.27
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.27

****************************************************************************
  FLOW PROCESS FROM NODE    136.00 TO NODE    137.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  145.21  DOWNSTREAM ELEVATION(FEET) =  117.57
  STREET LENGTH(FEET) =   543.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.25
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.22
    HALFSTREET FLOOD WIDTH(FEET) =    4.65
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.73
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.82
  STREET FLOW TRAVEL TIME(MIN.) =   2.43   Tc(MIN.) =    5.28
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.361
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
  SUBAREA AREA(ACRES) =    0.38      SUBAREA RUNOFF(CFS) =    1.96
  TOTAL AREA(ACRES) =        0.4        PEAK FLOW RATE(CFS) =       2.22

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.25   HALFSTREET FLOOD WIDTH(FEET) =   6.44
  FLOW VELOCITY(FEET/SEC.) =  4.16   DEPTH*VELOCITY(FT*FT/SEC.) =   1.06
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    137.00 =     638.00 FEET.

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

```
  FLOW PROCESS FROM NODE    137.00 TO NODE    127.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   108.72  DOWNSTREAM(FEET) =   107.84
  FLOW LENGTH(FEET) =    18.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   5.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.51
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        2.22
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    5.31
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    127.00 =     656.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    127.00 TO NODE    127.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.31
  RAINFALL INTENSITY(INCH/HR) =   6.33
  TOTAL STREAM AREA(ACRES) =     0.43
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.22

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       21.17     5.07        6.526          3.97
      2        2.83     7.71        4.980          0.78
      3        2.22     5.31        6.334          0.43

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       25.15     5.07       6.526
      2       24.71     5.31       6.334
      3       20.73     7.71       4.980

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      25.15   Tc(MIN.) =    5.07
  TOTAL AREA(ACRES) =        5.2
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    127.00 =     990.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    127.00 TO NODE    140.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
```

```
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   107.84  DOWNSTREAM(FEET) =   106.00
  FLOW LENGTH(FEET) =    46.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.31
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      25.15
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    5.13
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    140.00 =    1036.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    140.00 IS CODE =  10
--------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
==========================================================================

**************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    141.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    40.00
  UPSTREAM ELEVATION(FEET) =    117.50
  DOWNSTREAM ELEVATION(FEET) =    114.93
  ELEVATION DIFFERENCE(FEET) =      2.57
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.776
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.16
  TOTAL AREA(ACRES) =      0.03   TOTAL RUNOFF(CFS) =      0.16

**************************************************************************
  FLOW PROCESS FROM NODE    141.00 TO NODE    142.00 IS CODE =  62
--------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
==========================================================================
  UPSTREAM ELEVATION(FEET) =  114.93  DOWNSTREAM ELEVATION(FEET) =  110.22
  STREET LENGTH(FEET) =   126.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      0.45
```

```
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.16
    HALFSTREET FLOOD WIDTH(FEET) =    1.50
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.65
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.57
  STREET FLOW TRAVEL TIME(MIN.) =   0.58   Tc(MIN.) =    2.35
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
  SUBAREA AREA(ACRES) =    0.11      SUBAREA RUNOFF(CFS) =    0.59
  TOTAL AREA(ACRES) =        0.1        PEAK FLOW RATE(CFS) =       0.75

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.20   HALFSTREET FLOOD WIDTH(FEET) =   3.54
  FLOW VELOCITY(FEET/SEC.) =  3.07   DEPTH*VELOCITY(FT*FT/SEC.) =   0.60
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    142.00 =     166.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    2.35
  RAINFALL INTENSITY(INCH/HR) =   6.59
  TOTAL STREAM AREA(ACRES) =     0.14
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.75

****************************************************************************
  FLOW PROCESS FROM NODE    144.00 TO NODE    142.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    70.00
  UPSTREAM ELEVATION(FEET) =    115.00
  DOWNSTREAM ELEVATION(FEET) =    110.22
  ELEVATION DIFFERENCE(FEET) =      4.78
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.160
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.454
  SUBAREA RUNOFF(CFS) =      0.17
  TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.17

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
```

```
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.16
  RAINFALL INTENSITY(INCH/HR) =   6.45
  TOTAL STREAM AREA(ACRES) =     0.06
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.17

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        0.75     2.35        6.587          0.14
      2        0.17     5.16        6.454          0.06

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        0.83     2.35       6.587
      2        0.91     5.16       6.454

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       0.91   Tc(MIN.) =    5.16
  TOTAL AREA(ACRES) =        0.2
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    142.00 =     166.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    139.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   106.70  DOWNSTREAM(FEET) =   106.40
  FLOW LENGTH(FEET) =    25.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.04
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.91
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =    5.26
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    139.00 =     191.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    139.00 TO NODE    139.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.26
  RAINFALL INTENSITY(INCH/HR) =   6.37
  TOTAL STREAM AREA(ACRES) =     0.20
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.91
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    137.00 TO NODE    138.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =    117.57
  DOWNSTREAM ELEVATION(FEET) =    114.93
  ELEVATION DIFFERENCE(FEET) =      2.64
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.136
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.27
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.27

****************************************************************************
  FLOW PROCESS FROM NODE    138.00 TO NODE    139.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  114.93  DOWNSTREAM ELEVATION(FEET) =  110.22
  STREET LENGTH(FEET) =    91.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.40
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.16
    HALFSTREET FLOOD WIDTH(FEET) =    1.50
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.29
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.67
  STREET FLOW TRAVEL TIME(MIN.) =   0.35   Tc(MIN.) =    3.49
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
  SUBAREA AREA(ACRES) =    0.05      SUBAREA RUNOFF(CFS) =    0.27
  TOTAL AREA(ACRES) =        0.1        PEAK FLOW RATE(CFS) =       0.53
```

```
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.16   HALFSTREET FLOOD WIDTH(FEET) =   1.50
 FLOW VELOCITY(FEET/SEC.) =  4.29   DEPTH*VELOCITY(FT*FT/SEC.) =   0.67
 LONGEST FLOWPATH FROM NODE    137.00 TO NODE    139.00 =     171.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    139.00 TO NODE    139.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    3.49
 RAINFALL INTENSITY(INCH/HR) =   6.59
 TOTAL STREAM AREA(ACRES) =     0.10
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.53

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)      (MIN.)   (INCH/HOUR)    (ACRE)
     1        0.91     5.26        6.372          0.20
     2        0.53     3.49        6.587          0.10

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

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc      INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1        1.41     3.49       6.587
     2        1.42     5.26       6.372

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       1.42   Tc(MIN.) =    5.26
 TOTAL AREA(ACRES) =        0.3
 LONGEST FLOWPATH FROM NODE    130.00 TO NODE    139.00 =     191.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    139.00 TO NODE    140.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   106.40  DOWNSTREAM(FEET) =   106.00
 FLOW LENGTH(FEET) =    40.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN   9.0 INCH PIPE IS   6.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.11
 ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       1.42
 PIPE TRAVEL TIME(MIN.) =   0.16    Tc(MIN.) =    5.43
 LONGEST FLOWPATH FROM NODE    130.00 TO NODE    140.00 =     231.00 FEET.

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

```
  FLOW PROCESS FROM NODE    140.00 TO NODE    140.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1         1.42     5.43       6.249        0.30
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    140.00 =     231.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1        25.15     5.13       6.482        5.18
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    140.00 =    1036.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1      26.49       5.13        6.482
     2      25.66       5.43        6.249

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      26.49   Tc(MIN.) =    5.13
  TOTAL AREA(ACRES) =        5.5

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    140.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    140.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    146.00 TO NODE    147.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    95.00
  UPSTREAM ELEVATION(FEET) =    116.27
  DOWNSTREAM ELEVATION(FEET) =    110.79
  ELEVATION DIFFERENCE(FEET) =      5.48
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.837
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
```

```
  SUBAREA RUNOFF(CFS) =      0.69
  TOTAL AREA(ACRES) =      0.13   TOTAL RUNOFF(CFS) =      0.69

****************************************************************************
  FLOW PROCESS FROM NODE    147.00 TO NODE    140.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   107.79  DOWNSTREAM(FEET) =   106.00
  FLOW LENGTH(FEET) =     3.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   1.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.91
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        0.69
  PIPE TRAVEL TIME(MIN.) =   0.00    Tc(MIN.) =    2.84
  LONGEST FLOWPATH FROM NODE    146.00 TO NODE    140.00 =      98.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    140.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1        0.69     2.84       6.587        0.13
  LONGEST FLOWPATH FROM NODE    146.00 TO NODE    140.00 =      98.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1       26.49     5.13       6.482        5.48
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    140.00 =    1036.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1      15.37       2.84        6.587
     2      27.17       5.13        6.482

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      27.17   Tc(MIN.) =    5.13
  TOTAL AREA(ACRES) =        5.6

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    140.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    140.00 IS CODE =  81
```

```
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.482
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7951
  SUBAREA AREA(ACRES) =    0.18   SUBAREA RUNOFF(CFS) =    0.95
  TOTAL AREA(ACRES) =        5.8   TOTAL RUNOFF(CFS) =      29.84
  TC(MIN.) =    5.13

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    300.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   106.00  DOWNSTREAM(FEET) =    97.20
  FLOW LENGTH(FEET) =     3.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  75.80
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      29.84
  PIPE TRAVEL TIME(MIN.) =   0.00    Tc(MIN.) =    5.13
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    300.00 =    1039.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    300.50 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    97.20  DOWNSTREAM(FEET) =    97.10
  FLOW LENGTH(FEET) =     3.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.03
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      29.84
  PIPE TRAVEL TIME(MIN.) =   0.00    Tc(MIN.) =    5.13
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    300.50 =    1042.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    300.50 TO NODE    700.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    97.10  DOWNSTREAM(FEET) =    96.30
  FLOW LENGTH(FEET) =    29.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  16.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.99
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      29.84
```

```
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    5.17
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    700.00 =    1071.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    700.00 TO NODE    202.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   96.30  DOWNSTREAM ELEVATION(FEET) =   84.30
  STREET LENGTH(FEET) =   830.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      30.04
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.50
    HALFSTREET FLOOD WIDTH(FEET) =   12.00
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.75
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    2.37
  STREET FLOW TRAVEL TIME(MIN.) =   2.91   Tc(MIN.) =    8.08
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.833
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.795
  SUBAREA AREA(ACRES) =    0.10      SUBAREA RUNOFF(CFS) =    0.39
  TOTAL AREA(ACRES) =        5.9        PEAK FLOW RATE(CFS) =      29.84

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.50   HALFSTREET FLOOD WIDTH(FEET) =  12.00
  FLOW VELOCITY(FEET/SEC.) =  4.74   DEPTH*VELOCITY(FT*FT/SEC.) =   2.36
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    202.00 =    1901.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    700.00 TO NODE    700.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.08
  RAINFALL INTENSITY(INCH/HR) =   4.83
  TOTAL STREAM AREA(ACRES) =     5.89
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     29.84
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    174.70
  DOWNSTREAM ELEVATION(FEET) =    142.10
  ELEVATION DIFFERENCE(FEET) =     32.60
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.431
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.245
  SUBAREA RUNOFF(CFS) =      0.65
  TOTAL AREA(ACRES) =      0.23   TOTAL RUNOFF(CFS) =      0.65

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    142.10  DOWNSTREAM(FEET) =     80.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   492.00   CHANNEL SLOPE =  0.1256
  CHANNEL BASE(FEET) =    3.50   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  28.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.084
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.79
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.02
  AVERAGE FLOW DEPTH(FEET) =   0.12   TRAVEL TIME(MIN.) =   2.04
  Tc(MIN.) =    7.47
  SUBAREA AREA(ACRES) =     0.99       SUBAREA RUNOFF(CFS) =    2.26
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.450
  TOTAL AREA(ACRES) =        1.2         PEAK FLOW RATE(CFS) =       2.79

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.16   FLOW VELOCITY(FEET/SEC.) =   4.71
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     592.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.47
  RAINFALL INTENSITY(INCH/HR) =   5.08
```

```
  TOTAL STREAM AREA(ACRES) =     1.22
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.79

****************************************************************************
  FLOW PROCESS FROM NODE    510.00 TO NODE    510.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.084
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4500
  SUBAREA AREA(ACRES) =    0.13   SUBAREA RUNOFF(CFS) =    0.30
  TOTAL AREA(ACRES) =        1.4   TOTAL RUNOFF(CFS) =       3.09
  TC(MIN.) =    7.47

****************************************************************************
  FLOW PROCESS FROM NODE    510.00 TO NODE    143.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    64.00
  UPSTREAM ELEVATION(FEET) =    150.50
  DOWNSTREAM ELEVATION(FEET) =    127.00
  ELEVATION DIFFERENCE(FEET) =     23.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.345
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.12
  TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.12

****************************************************************************
  FLOW PROCESS FROM NODE    143.00 TO NODE    145.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    127.00  DOWNSTREAM(FEET) =    111.34
  CHANNEL LENGTH THRU SUBAREA(FEET) =   180.00   CHANNEL SLOPE =  0.0870
  CHANNEL BASE(FEET) =    1.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.504
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.25
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.98
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   0.75
  Tc(MIN.) =    5.10
```

```
  SUBAREA AREA(ACRES) =     0.05       SUBAREA RUNOFF(CFS) =    0.26
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.650
  TOTAL AREA(ACRES) =        0.1         PEAK FLOW RATE(CFS) =       0.38

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   4.65
  LONGEST FLOWPATH FROM NODE    510.00 TO NODE    145.00 =     244.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    145.00 TO NODE    520.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   111.34  DOWNSTREAM(FEET) =   111.00
  FLOW LENGTH(FEET) =    12.50   MANNING'S N =  0.013
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   2.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.40
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.38
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    5.15
  LONGEST FLOWPATH FROM NODE    510.00 TO NODE    520.00 =     256.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    520.00 TO NODE    202.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  111.00  DOWNSTREAM ELEVATION(FEET) =   84.34
  STREET LENGTH(FEET) =  1213.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.52
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.19
    HALFSTREET FLOOD WIDTH(FEET) =    3.17
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.38
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.45
  STREET FLOW TRAVEL TIME(MIN.) =   8.50   Tc(MIN.) =   13.64
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.447
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.734
```

```
  SUBAREA AREA(ACRES) =    0.10      SUBAREA RUNOFF(CFS) =    0.28
  TOTAL AREA(ACRES) =        0.2        PEAK FLOW RATE(CFS) =       0.48

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.19   HALFSTREET FLOOD WIDTH(FEET) =   2.95
  FLOW VELOCITY(FEET/SEC.) =  2.35   DEPTH*VELOCITY(FT*FT/SEC.) =   0.43
  LONGEST FLOWPATH FROM NODE    510.00 TO NODE    202.00 =    1469.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =   13.64
  RAINFALL INTENSITY(INCH/HR) =   3.45
  TOTAL STREAM AREA(ACRES) =     0.19
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.48

****************************************************************************
  FLOW PROCESS FROM NODE    520.00 TO NODE    204.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    111.50
  DOWNSTREAM ELEVATION(FEET) =    105.00
  ELEVATION DIFFERENCE(FEET) =      6.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.159
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    96.50
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.758
  SUBAREA RUNOFF(CFS) =      0.08
  TOTAL AREA(ACRES) =      0.03   TOTAL RUNOFF(CFS) =      0.08

****************************************************************************
  FLOW PROCESS FROM NODE    520.00 TO NODE    204.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =   6.16   RAIN INTENSITY(INCH/HOUR) =  5.76
  TOTAL AREA(ACRES) =     0.03   TOTAL RUNOFF(CFS) =      0.10

****************************************************************************
  FLOW PROCESS FROM NODE    204.00 TO NODE    202.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
```

>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<

==

ELEVATION DATA: UPSTREAM(FEET) = 105.00 DOWNSTREAM(FEET) = 84.34
CHANNEL LENGTH THRU SUBAREA(FEET) = 850.00 CHANNEL SLOPE = 0.0243
CHANNEL BASE(FEET) = 1.00 "Z" FACTOR = 2.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 1.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.758
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .4500
S.C.S. CURVE NUMBER (AMC II) = 0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 0.94
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 2.45
AVERAGE FLOW DEPTH(FEET) = 0.25 TRAVEL TIME(MIN.) = 5.78
Tc(MIN.) = 11.94
SUBAREA AREA(ACRES) = 0.95 SUBAREA RUNOFF(CFS) = 1.61
AREA-AVERAGE RUNOFF COEFFICIENT = 0.454
TOTAL AREA(ACRES) = 1.0 PEAK FLOW RATE(CFS) = 1.67

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.35 FLOW VELOCITY(FEET/SEC.) = 2.85
LONGEST FLOWPATH FROM NODE 520.00 TO NODE 202.00 = 950.00 FEET.

****

FLOW PROCESS FROM NODE 202.00 TO NODE 202.00 IS CODE = 1

>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

==

TOTAL NUMBER OF STREAMS = 4
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 4 ARE:
TIME OF CONCENTRATION(MIN.) = 11.94
RAINFALL INTENSITY(INCH/HR) = 3.76
TOTAL STREAM AREA(ACRES) = 0.98
PEAK FLOW RATE(CFS) AT CONFLUENCE = 1.67

** CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	29.84	8.08	4.833	5.89
2	2.79	7.47	5.084	1.22
3	0.48	13.64	3.447	0.19
4	1.67	11.94	3.758	0.98

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 4 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	31.70	7.47	5.084
2	33.91	8.08	4.833
3	27.36	11.94	3.758
4	25.19	13.64	3.447

```
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      33.91   Tc(MIN.) =    8.08
  TOTAL AREA(ACRES) =        8.3
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    202.00 =    1901.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.833
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6944
  SUBAREA AREA(ACRES) =    0.28   SUBAREA RUNOFF(CFS) =    0.61
  TOTAL AREA(ACRES) =        8.6   TOTAL RUNOFF(CFS) =      33.91
  TC(MIN.) =    8.08
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        8.6  TC(MIN.) =      8.08
  PEAK FLOW RATE(CFS)    =      33.91
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

           RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                      2003,1985,1981 HYDROLOGY MANUAL
        (c) Copyright 1982-2016 Advanced Engineering Software (aes)
            Ver. 23.0 Release Date: 07/01/2016  License ID 1452

                         Analysis prepared by:
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                          SAN DIEGO, CA 92110


  ************************ DESCRIPTION OF STUDY ************************
 * PIRAEUS STREET, ENCINITAS                                            *
 * POST-DEVELOPMENT MITIGATED ANALYSIS                                  *
 *                                                                      *
  **********************************************************************

   FILE NAME: 3733PSTM.DAT
   TIME/DATE OF STUDY: 23:07 03/14/2023
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.500
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   12.0      1.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

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

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
```

```
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8100
 S.C.S. CURVE NUMBER (AMC II) =   0
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    45.00
 UPSTREAM ELEVATION(FEET) =    181.00
 DOWNSTREAM ELEVATION(FEET) =    172.00
 ELEVATION DIFFERENCE(FEET) =      9.00
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.625
 WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.16
 TOTAL AREA(ACRES) =      0.03   TOTAL RUNOFF(CFS) =      0.16

****************************************************************************
 FLOW PROCESS FROM NODE    101.00 TO NODE    151.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   156.53  DOWNSTREAM(FEET) =   156.00
 FLOW LENGTH(FEET) =    10.50   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO  6.000
 DEPTH OF FLOW IN   6.0 INCH PIPE IS   1.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.39
 ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       0.16
 PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    1.67
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    151.00 =      55.50 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    151.00 TO NODE    102.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  156.00  DOWNSTREAM ELEVATION(FEET) =  138.54
 STREET LENGTH(FEET) =   321.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 12.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.35
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.26
   HALFSTREET FLOOD WIDTH(FEET) =    6.58
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.26
```

```
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =     1.10
  STREET FLOW TRAVEL TIME(MIN.) =   1.26   Tc(MIN.) =    2.92
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
  SUBAREA AREA(ACRES) =    0.82      SUBAREA RUNOFF(CFS) =    4.37
  TOTAL AREA(ACRES) =        0.8        PEAK FLOW RATE(CFS) =       4.54

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.31   HALFSTREET FLOOD WIDTH(FEET) =   8.96
  FLOW VELOCITY(FEET/SEC.) =  4.93   DEPTH*VELOCITY(FT*FT/SEC.) =   1.50
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     376.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    114.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   128.34  DOWNSTREAM(FEET) =   128.12
  FLOW LENGTH(FEET) =     4.50   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.19
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.54
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =    2.93
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    114.00 =     381.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    114.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    95.00
  UPSTREAM ELEVATION(FEET) =    150.62
  DOWNSTREAM ELEVATION(FEET) =    146.63
  ELEVATION DIFFERENCE(FEET) =      3.99
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.086
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    91.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
```

```
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.69
 TOTAL AREA(ACRES) =      0.13   TOTAL RUNOFF(CFS) =      0.69

****************************************************************************
 FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  146.63  DOWNSTREAM ELEVATION(FEET) =  140.51
 STREET LENGTH(FEET) =    97.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 12.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.17
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.21
   HALFSTREET FLOOD WIDTH(FEET) =    4.13
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.06
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.85
 STREET FLOW TRAVEL TIME(MIN.) =   0.40   Tc(MIN.) =    3.48
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8100
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
 SUBAREA AREA(ACRES) =    0.18      SUBAREA RUNOFF(CFS) =    0.96
 TOTAL AREA(ACRES) =        0.3        PEAK FLOW RATE(CFS) =       1.65

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.23   HALFSTREET FLOOD WIDTH(FEET) =   5.17
 FLOW VELOCITY(FEET/SEC.) =  4.29   DEPTH*VELOCITY(FT*FT/SEC.) =   0.98
 LONGEST FLOWPATH FROM NODE    103.00 TO NODE    105.00 =     192.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   137.51  DOWNSTREAM(FEET) =   133.85
 FLOW LENGTH(FEET) =    82.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.4 INCHES
```

```
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.67
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.65
  PIPE TRAVEL TIME(MIN.) =   0.18    Tc(MIN.) =    3.66
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    106.00 =     274.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    3.66
  RAINFALL INTENSITY(INCH/HR) =   6.59
  TOTAL STREAM AREA(ACRES) =     0.31
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.65

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    108.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    95.00
  UPSTREAM ELEVATION(FEET) =    146.18
  DOWNSTREAM ELEVATION(FEET) =    140.74
  ELEVATION DIFFERENCE(FEET) =      5.44
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.844
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.96
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.96

****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    106.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  140.74  DOWNSTREAM ELEVATION(FEET) =  136.85
  STREET LENGTH(FEET) =    70.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130
```

```
    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.36
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.22
    HALFSTREET FLOOD WIDTH(FEET) =    4.80
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.90
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.87
  STREET FLOW TRAVEL TIME(MIN.) =   0.30   Tc(MIN.) =    3.14
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
  SUBAREA AREA(ACRES) =    0.15      SUBAREA RUNOFF(CFS) =    0.80
  TOTAL AREA(ACRES) =        0.3        PEAK FLOW RATE(CFS) =       1.76

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.24   HALFSTREET FLOOD WIDTH(FEET) =   5.62
  FLOW VELOCITY(FEET/SEC.) =  4.06   DEPTH*VELOCITY(FT*FT/SEC.) =   0.97
  LONGEST FLOWPATH FROM NODE    107.00 TO NODE    106.00 =     165.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    3.14
  RAINFALL INTENSITY(INCH/HR) =   6.59
  TOTAL STREAM AREA(ACRES) =     0.33
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.76

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        1.65     3.66        6.587          0.31
      2        1.76     3.14        6.587          0.33

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        3.18     3.14       6.587
      2        3.41     3.66       6.587

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       3.41   Tc(MIN.) =    3.66
  TOTAL AREA(ACRES) =        0.6
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    106.00 =     274.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    109.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   133.85  DOWNSTREAM(FEET) =   131.86
  FLOW LENGTH(FEET) =   199.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   9.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.03
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.41
  PIPE TRAVEL TIME(MIN.) =   0.66    Tc(MIN.) =    4.32
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    109.00 =     473.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    109.00 TO NODE    110.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   131.86  DOWNSTREAM(FEET) =   129.61
  FLOW LENGTH(FEET) =    78.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.78
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.41
  PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =    4.49
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    110.00 =     551.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    4.49
  RAINFALL INTENSITY(INCH/HR) =   6.59
  TOTAL STREAM AREA(ACRES) =     0.64
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.41

****************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    95.00
  UPSTREAM ELEVATION(FEET) =    142.09
  DOWNSTREAM ELEVATION(FEET) =    136.65
```

```
 ELEVATION DIFFERENCE(FEET) =      5.44
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.844
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.96
 TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.96

****************************************************************************
 FLOW PROCESS FROM NODE    112.00 TO NODE    113.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  136.65  DOWNSTREAM ELEVATION(FEET) =  134.29
 STREET LENGTH(FEET) =    41.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 12.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.28
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.22
   HALFSTREET FLOOD WIDTH(FEET) =    4.58
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.91
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.85
 STREET FLOW TRAVEL TIME(MIN.) =   0.17   Tc(MIN.) =    3.02
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8100
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
 SUBAREA AREA(ACRES) =    0.12      SUBAREA RUNOFF(CFS) =    0.64
 TOTAL AREA(ACRES) =        0.3        PEAK FLOW RATE(CFS) =       1.60

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.23   HALFSTREET FLOOD WIDTH(FEET) =   5.25
 FLOW VELOCITY(FEET/SEC.) =  4.07   DEPTH*VELOCITY(FT*FT/SEC.) =   0.94
 LONGEST FLOWPATH FROM NODE    111.00 TO NODE    113.00 =     136.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    113.00 TO NODE    110.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   131.29  DOWNSTREAM(FEET) =   129.61
```

```
  FLOW LENGTH(FEET) =   168.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   7.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.16
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.60
  PIPE TRAVEL TIME(MIN.) =   0.67    Tc(MIN.) =    3.69
  LONGEST FLOWPATH FROM NODE    111.00 TO NODE    110.00 =     304.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    3.69
  RAINFALL INTENSITY(INCH/HR) =   6.59
  TOTAL STREAM AREA(ACRES) =     0.30
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.60

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        3.41     4.49        6.587          0.64
      2        1.60     3.69        6.587          0.30

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF       Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        5.02     3.69       6.587
      2        5.02     4.49       6.587

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       5.02   Tc(MIN.) =    4.49
  TOTAL AREA(ACRES) =        0.9
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    110.00 =     551.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    114.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   129.61  DOWNSTREAM(FEET) =   128.12
  FLOW LENGTH(FEET) =    50.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   8.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.55
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.02
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =    4.59
```

```
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    114.00 =     601.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    114.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        5.02     4.59       6.587        0.94
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    114.00 =     601.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        4.54     2.93       6.587        0.85
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    114.00 =     381.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1       7.74       2.93        6.587
      2       9.55       4.59        6.587

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       9.55   Tc(MIN.) =    4.59
  TOTAL AREA(ACRES) =        1.8

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    114.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    115.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   128.12  DOWNSTREAM(FEET) =   127.37
  FLOW LENGTH(FEET) =    24.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.19
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.55
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    4.63
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    115.00 =     625.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    115.00 TO NODE    115.00 IS CODE =   1
----------------------------------------------------------------------------
```

```
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    4.63
  RAINFALL INTENSITY(INCH/HR) =   6.59
  TOTAL STREAM AREA(ACRES) =     1.79
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.55

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    530.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    30.00
  UPSTREAM ELEVATION(FEET) =    138.00
  DOWNSTREAM ELEVATION(FEET) =    136.30
  ELEVATION DIFFERENCE(FEET) =      1.70
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.604
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE    530.00 TO NODE    117.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
==============================================================================
  UPSTREAM ELEVATION(FEET) =  136.30  DOWNSTREAM ELEVATION(FEET) =  131.74
  STREET LENGTH(FEET) =    78.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.80
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.19
    HALFSTREET FLOOD WIDTH(FEET) =    3.02
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.82
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.71
  STREET FLOW TRAVEL TIME(MIN.) =   0.34   Tc(MIN.) =    1.94
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
```

```
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
  SUBAREA AREA(ACRES) =    0.18      SUBAREA RUNOFF(CFS) =    0.96
  TOTAL AREA(ACRES) =        0.2        PEAK FLOW RATE(CFS) =       1.28

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.22   HALFSTREET FLOOD WIDTH(FEET) =   4.51
  FLOW VELOCITY(FEET/SEC.) =  3.99   DEPTH*VELOCITY(FT*FT/SEC.) =   0.86
  LONGEST FLOWPATH FROM NODE    116.00 TO NODE    117.00 =     108.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    117.00 TO NODE    115.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   128.74  DOWNSTREAM(FEET) =   127.37
  FLOW LENGTH(FEET) =   137.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   6.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.05
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.28
  PIPE TRAVEL TIME(MIN.) =   0.56    Tc(MIN.) =    2.51
  LONGEST FLOWPATH FROM NODE    116.00 TO NODE    115.00 =     245.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    115.00 TO NODE    155.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    2.51
  RAINFALL INTENSITY(INCH/HR) =   6.59
  TOTAL STREAM AREA(ACRES) =     0.24
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.28

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        9.55     4.63        6.587          1.79
      2        1.28     2.51        6.587          0.24

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        6.46     2.51       6.587
```

```
    2       10.83     4.63       6.587

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      10.83   Tc(MIN.) =    4.63
  TOTAL AREA(ACRES) =        2.0
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    155.00 =     625.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    115.00 TO NODE    118.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   127.37  DOWNSTREAM(FEET) =   124.46
  FLOW LENGTH(FEET) =    78.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  11.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.20
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.83
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =    4.74
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    118.00 =     703.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    118.00 TO NODE    118.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    4.74
  RAINFALL INTENSITY(INCH/HR) =   6.59
  TOTAL STREAM AREA(ACRES) =     2.03
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     10.83

****************************************************************************
  FLOW PROCESS FROM NODE    119.00 TO NODE    120.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    93.00
  UPSTREAM ELEVATION(FEET) =    133.92
  DOWNSTREAM ELEVATION(FEET) =    128.64
  ELEVATION DIFFERENCE(FEET) =      5.28
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.822
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.96
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.96

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    118.00 IS CODE =  31
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   125.64  DOWNSTREAM(FEET) =   124.46
  FLOW LENGTH(FEET) =   118.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   5.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.82
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.96
  PIPE TRAVEL TIME(MIN.) =   0.52    Tc(MIN.) =    3.34
  LONGEST FLOWPATH FROM NODE    119.00 TO NODE    118.00 =     211.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    118.00 TO NODE    118.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    3.34
  RAINFALL INTENSITY(INCH/HR) =   6.59
  TOTAL STREAM AREA(ACRES) =     0.18
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.96

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       10.83     4.74        6.587          2.03
      2        0.96     3.34        6.587          0.18

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       11.79     3.34       6.587
      2       11.79     4.74       6.587

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      11.79   Tc(MIN.) =    4.74
  TOTAL AREA(ACRES) =        2.2
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    118.00 =     703.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    118.00 TO NODE    121.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   124.46  DOWNSTREAM(FEET) =   116.01
  FLOW LENGTH(FEET) =   139.00   MANNING'S N =  0.013
```

```
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   9.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.92
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.79
  PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =    4.91
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    121.00 =     842.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    121.00 TO NODE    121.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    4.91
  RAINFALL INTENSITY(INCH/HR) =   6.59
  TOTAL STREAM AREA(ACRES) =     2.21
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     11.79

****************************************************************************
  FLOW PROCESS FROM NODE    156.00 TO NODE    123.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    95.00
  UPSTREAM ELEVATION(FEET) =    143.00
  DOWNSTREAM ELEVATION(FEET) =    138.63
  ELEVATION DIFFERENCE(FEET) =      4.37
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.027
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    93.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.91
  TOTAL AREA(ACRES) =      0.17   TOTAL RUNOFF(CFS) =      0.91

****************************************************************************
  FLOW PROCESS FROM NODE    123.00 TO NODE    124.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  138.63  DOWNSTREAM ELEVATION(FEET) =  125.78
  STREET LENGTH(FEET) =   245.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020
```

```
  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.75
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.27
    HALFSTREET FLOOD WIDTH(FEET) =    7.18
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.34
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.17
  STREET FLOW TRAVEL TIME(MIN.) =   0.94   Tc(MIN.) =    3.97
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
  SUBAREA AREA(ACRES) =    0.69      SUBAREA RUNOFF(CFS) =    3.68
  TOTAL AREA(ACRES) =        0.9        PEAK FLOW RATE(CFS) =       4.59

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.31   HALFSTREET FLOOD WIDTH(FEET) =   9.03
  FLOW VELOCITY(FEET/SEC.) =  4.91   DEPTH*VELOCITY(FT*FT/SEC.) =   1.51
  LONGEST FLOWPATH FROM NODE    156.00 TO NODE    124.00 =     340.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    124.00 TO NODE    121.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   116.23  DOWNSTREAM(FEET) =   116.01
  FLOW LENGTH(FEET) =     4.50   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.21
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.59
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =    3.98
  LONGEST FLOWPATH FROM NODE    156.00 TO NODE    121.00 =     344.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    121.00 TO NODE    121.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    3.98
  RAINFALL INTENSITY(INCH/HR) =   6.59
  TOTAL STREAM AREA(ACRES) =     0.86
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.59
```

```
** CONFLUENCE DATA **
STREAM     RUNOFF       Tc      INTENSITY      AREA
NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
    1       11.79     4.91        6.587          2.21
    2        4.59     3.98        6.587          0.86

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

** PEAK FLOW RATE TABLE **
STREAM     RUNOFF       Tc      INTENSITY
NUMBER      (CFS)     (MIN.)   (INCH/HOUR)
    1       16.38     3.98       6.587
    2       16.38     4.91       6.587

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =      16.38   Tc(MIN.) =    4.91
TOTAL AREA(ACRES) =        3.1
LONGEST FLOWPATH FROM NODE    103.00 TO NODE    121.00 =     842.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    121.00 TO NODE    125.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   116.01  DOWNSTREAM(FEET) =   112.93
FLOW LENGTH(FEET) =    50.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =  15.28
ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =      16.38
PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    4.96
LONGEST FLOWPATH FROM NODE    103.00 TO NODE    125.00 =     892.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    125.00 TO NODE    125.00 IS CODE =  10
----------------------------------------------------------------------------
>>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
FLOW PROCESS FROM NODE    148.00 TO NODE    149.00 IS CODE =  21
----------------------------------------------------------------------------
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8100
S.C.S. CURVE NUMBER (AMC II) =   0
INITIAL SUBAREA FLOW-LENGTH(FEET) =    95.00
UPSTREAM ELEVATION(FEET) =    129.50
DOWNSTREAM ELEVATION(FEET) =    119.80
ELEVATION DIFFERENCE(FEET) =      9.70
```

```
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.362
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.75
  TOTAL AREA(ACRES) =      0.14   TOTAL RUNOFF(CFS) =      0.75

****************************************************************************
  FLOW PROCESS FROM NODE    149.00 TO NODE    149.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8100
  SUBAREA AREA(ACRES) =    0.23   SUBAREA RUNOFF(CFS) =    1.23
  TOTAL AREA(ACRES) =        0.4   TOTAL RUNOFF(CFS) =       1.97
  TC(MIN.) =    2.36

****************************************************************************
  FLOW PROCESS FROM NODE    149.00 TO NODE    590.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   115.80  DOWNSTREAM(FEET) =   114.25
  FLOW LENGTH(FEET) =   103.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   7.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.11
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.97
  PIPE TRAVEL TIME(MIN.) =   0.34    Tc(MIN.) =    2.70
  LONGEST FLOWPATH FROM NODE    148.00 TO NODE    590.00 =     198.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    590.00 TO NODE    590.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    2.70
  RAINFALL INTENSITY(INCH/HR) =   6.59
  TOTAL STREAM AREA(ACRES) =     0.37
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.97

****************************************************************************
  FLOW PROCESS FROM NODE    131.00 TO NODE    540.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
```

```
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8100
 S.C.S. CURVE NUMBER (AMC II) =   0
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    53.00
 UPSTREAM ELEVATION(FEET) =    124.30
 DOWNSTREAM ELEVATION(FEET) =    121.10
 ELEVATION DIFFERENCE(FEET) =      3.20
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.087
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.48
 TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.48

****************************************************************************
 FLOW PROCESS FROM NODE    540.00 TO NODE    132.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  121.10  DOWNSTREAM ELEVATION(FEET) =  117.36
 STREET LENGTH(FEET) =    65.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 12.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.04
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.20
   HALFSTREET FLOOD WIDTH(FEET) =    3.91
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.84
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.78
 STREET FLOW TRAVEL TIME(MIN.) =   0.28   Tc(MIN.) =    2.37
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8100
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
 SUBAREA AREA(ACRES) =    0.21      SUBAREA RUNOFF(CFS) =    1.12
 TOTAL AREA(ACRES) =        0.3        PEAK FLOW RATE(CFS) =       1.60

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.23   HALFSTREET FLOOD WIDTH(FEET) =   5.25
 FLOW VELOCITY(FEET/SEC.) =  4.07   DEPTH*VELOCITY(FT*FT/SEC.) =   0.94
 LONGEST FLOWPATH FROM NODE    131.00 TO NODE    132.00 =     118.00 FEET.

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

```
  FLOW PROCESS FROM NODE    132.00 TO NODE    590.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   114.36  DOWNSTREAM(FEET) =   114.25
  FLOW LENGTH(FEET) =    11.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   7.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.16
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        1.60
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    2.41
  LONGEST FLOWPATH FROM NODE    131.00 TO NODE    590.00 =     129.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    590.00 TO NODE    590.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    2.41
  RAINFALL INTENSITY(INCH/HR) =   6.59
  TOTAL STREAM AREA(ACRES) =     0.30
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.60

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        1.97     2.70        6.587          0.37
      2        1.60     2.41        6.587          0.30

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        3.37     2.41       6.587
      2        3.57     2.70       6.587

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       3.57   Tc(MIN.) =    2.70
  TOTAL AREA(ACRES) =        0.7
  LONGEST FLOWPATH FROM NODE    148.00 TO NODE    590.00 =     198.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    590.00 TO NODE    125.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   114.25  DOWNSTREAM(FEET) =   112.93
```

```
  FLOW LENGTH(FEET) =   132.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.30
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.57
  PIPE TRAVEL TIME(MIN.) =   0.42    Tc(MIN.) =    3.11
  LONGEST FLOWPATH FROM NODE    148.00 TO NODE    125.00 =     330.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    125.00 TO NODE    125.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        3.57     3.11       6.587        0.67
  LONGEST FLOWPATH FROM NODE    148.00 TO NODE    125.00 =     330.00 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       16.38     4.96       6.587        3.07
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    125.00 =     892.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      13.85       3.11        6.587
      2      19.95       4.96        6.587

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      19.95   Tc(MIN.) =    4.96
  TOTAL AREA(ACRES) =         3.7

****************************************************************************
  FLOW PROCESS FROM NODE    125.00 TO NODE    126.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   112.93  DOWNSTREAM(FEET) =   108.69
  FLOW LENGTH(FEET) =    78.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.12
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      19.95
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =    5.05
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    126.00 =     970.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    126.00 TO NODE    126.00 IS CODE =   1
----------------------------------------------------------------------------
```

```
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.05
  RAINFALL INTENSITY(INCH/HR) =   6.55
  TOTAL STREAM AREA(ACRES) =     3.74
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     19.95

****************************************************************************
  FLOW PROCESS FROM NODE    133.00 TO NODE    550.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    37.00
  UPSTREAM ELEVATION(FEET) =    119.66
  DOWNSTREAM ELEVATION(FEET) =    117.30
  ELEVATION DIFFERENCE(FEET) =      2.36
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.712
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.37
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.37

****************************************************************************
  FLOW PROCESS FROM NODE    550.00 TO NODE    134.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
==============================================================================
  UPSTREAM ELEVATION(FEET) =  117.30  DOWNSTREAM ELEVATION(FEET) =  113.12
  STREET LENGTH(FEET) =    77.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.80
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.19
    HALFSTREET FLOOD WIDTH(FEET) =    3.10
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.74
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.70
  STREET FLOW TRAVEL TIME(MIN.) =   0.34   Tc(MIN.) =    2.06
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
```

```
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
  SUBAREA AREA(ACRES) =    0.16      SUBAREA RUNOFF(CFS) =    0.85
  TOTAL AREA(ACRES) =        0.2        PEAK FLOW RATE(CFS) =       1.23

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.22   HALFSTREET FLOOD WIDTH(FEET) =   4.51
  FLOW VELOCITY(FEET/SEC.) =  3.82   DEPTH*VELOCITY(FT*FT/SEC.) =   0.83
  LONGEST FLOWPATH FROM NODE    133.00 TO NODE    134.00 =     114.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    134.00 TO NODE    126.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   110.12  DOWNSTREAM(FEET) =   108.69
  FLOW LENGTH(FEET) =   143.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   5.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.01
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.23
  PIPE TRAVEL TIME(MIN.) =   0.59    Tc(MIN.) =    2.65
  LONGEST FLOWPATH FROM NODE    133.00 TO NODE    126.00 =     257.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    126.00 TO NODE    126.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    2.65
  RAINFALL INTENSITY(INCH/HR) =   6.59
  TOTAL STREAM AREA(ACRES) =     0.23
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.23

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1        19.95     5.05        6.546          3.74
     2         1.23     2.65        6.587          0.23

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1        11.70     2.65       6.587
```

```
    2       21.17     5.05       6.546

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      21.17   Tc(MIN.) =    5.05
  TOTAL AREA(ACRES) =        4.0
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    126.00 =     970.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    126.00 TO NODE    127.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   108.69  DOWNSTREAM(FEET) =   107.84
  FLOW LENGTH(FEET) =    20.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  12.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.16
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      21.17
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    5.07
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    127.00 =     990.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    127.00 TO NODE    127.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.07
  RAINFALL INTENSITY(INCH/HR) =   6.53
  TOTAL STREAM AREA(ACRES) =     3.97
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     21.17

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    600.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    95.00
  UPSTREAM ELEVATION(FEET) =    181.00
  DOWNSTREAM ELEVATION(FEET) =    172.00
  ELEVATION DIFFERENCE(FEET) =      9.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.390
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.275
  SUBAREA RUNOFF(CFS) =      0.11
  TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.11

****************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    160.00 IS CODE =  51
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    172.00  DOWNSTREAM(FEET) =    132.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   333.00   CHANNEL SLOPE =  0.1201
  CHANNEL BASE(FEET) =    1.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.507
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.29
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.59
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   1.21
  Tc(MIN.) =    6.60
  SUBAREA AREA(ACRES) =     0.14       SUBAREA RUNOFF(CFS) =    0.35
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.450
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.45

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   5.46
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    160.00 =     428.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    128.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   129.00  DOWNSTREAM(FEET) =   125.76
  FLOW LENGTH(FEET) =   122.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   3.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.52
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.45
  PIPE TRAVEL TIME(MIN.) =   0.45    Tc(MIN.) =    7.05
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    128.00 =     550.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    128.00 TO NODE    130.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  125.76  DOWNSTREAM ELEVATION(FEET) =  117.50
  STREET LENGTH(FEET) =   156.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
```

```
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.65
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.24
    HALFSTREET FLOOD WIDTH(FEET) =    5.47
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.96
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.93
  STREET FLOW TRAVEL TIME(MIN.) =   0.66   Tc(MIN.) =    7.70
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.984
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.727
  SUBAREA AREA(ACRES) =    0.60      SUBAREA RUNOFF(CFS) =    2.42
  TOTAL AREA(ACRES) =        0.8        PEAK FLOW RATE(CFS) =       2.83

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.27   HALFSTREET FLOOD WIDTH(FEET) =   7.25
  FLOW VELOCITY(FEET/SEC.) =  4.39   DEPTH*VELOCITY(FT*FT/SEC.) =   1.19
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    130.00 =     706.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    127.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   108.06  DOWNSTREAM(FEET) =   107.84
  FLOW LENGTH(FEET) =     4.50   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   6.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  8.94
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.83
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =    7.71
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    127.00 =     710.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    127.00 TO NODE    127.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.71
  RAINFALL INTENSITY(INCH/HR) =   4.98
  TOTAL STREAM AREA(ACRES) =     0.78
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.83

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    136.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =     95.00
  UPSTREAM ELEVATION(FEET) =    150.62
  DOWNSTREAM ELEVATION(FEET) =    145.21
  ELEVATION DIFFERENCE(FEET) =      5.41
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.849
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.27
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.27

****************************************************************************
  FLOW PROCESS FROM NODE    136.00 TO NODE    137.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  145.21  DOWNSTREAM ELEVATION(FEET) =  117.57
  STREET LENGTH(FEET) =   543.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.25
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.22
    HALFSTREET FLOOD WIDTH(FEET) =    4.65
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.73
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.82
  STREET FLOW TRAVEL TIME(MIN.) =   2.43   Tc(MIN.) =    5.28
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.361
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
  SUBAREA AREA(ACRES) =    0.38      SUBAREA RUNOFF(CFS) =    1.96
  TOTAL AREA(ACRES) =        0.4        PEAK FLOW RATE(CFS) =       2.22

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.25   HALFSTREET FLOOD WIDTH(FEET) =   6.44
  FLOW VELOCITY(FEET/SEC.) =  4.16   DEPTH*VELOCITY(FT*FT/SEC.) =   1.06
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    137.00 =     638.00 FEET.

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

```
  FLOW PROCESS FROM NODE    137.00 TO NODE    127.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   108.72  DOWNSTREAM(FEET) =   107.84
  FLOW LENGTH(FEET) =    18.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   5.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.51
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =         2.22
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    5.31
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    127.00 =     656.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    127.00 TO NODE    127.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.31
  RAINFALL INTENSITY(INCH/HR) =   6.33
  TOTAL STREAM AREA(ACRES) =     0.43
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.22

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       21.17     5.07        6.526          3.97
      2        2.83     7.71        4.980          0.78
      3        2.22     5.31        6.334          0.43

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       25.15     5.07       6.526
      2       24.71     5.31       6.334
      3       20.73     7.71       4.980

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      25.15   Tc(MIN.) =    5.07
  TOTAL AREA(ACRES) =        5.2
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    127.00 =     990.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    127.00 TO NODE    140.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
```

```
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   107.84  DOWNSTREAM(FEET) =   106.00
  FLOW LENGTH(FEET) =    46.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.31
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      25.15
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    5.13
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    140.00 =    1036.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    140.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
================================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    141.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
================================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    40.00
  UPSTREAM ELEVATION(FEET) =    117.50
  DOWNSTREAM ELEVATION(FEET) =    114.93
  ELEVATION DIFFERENCE(FEET) =      2.57
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.776
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.16
  TOTAL AREA(ACRES) =      0.03   TOTAL RUNOFF(CFS) =      0.16

****************************************************************************
  FLOW PROCESS FROM NODE    141.00 TO NODE    142.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
================================================================================
  UPSTREAM ELEVATION(FEET) =  114.93  DOWNSTREAM ELEVATION(FEET) =  110.22
  STREET LENGTH(FEET) =   126.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.45
```

```
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.16
    HALFSTREET FLOOD WIDTH(FEET) =    1.50
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.65
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.57
  STREET FLOW TRAVEL TIME(MIN.) =   0.58   Tc(MIN.) =    2.35
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
  SUBAREA AREA(ACRES) =    0.11      SUBAREA RUNOFF(CFS) =    0.59
  TOTAL AREA(ACRES) =        0.1        PEAK FLOW RATE(CFS) =       0.75

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.20   HALFSTREET FLOOD WIDTH(FEET) =   3.54
  FLOW VELOCITY(FEET/SEC.) =  3.07   DEPTH*VELOCITY(FT*FT/SEC.) =   0.60
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    142.00 =     166.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    2.35
  RAINFALL INTENSITY(INCH/HR) =   6.59
  TOTAL STREAM AREA(ACRES) =     0.14
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.75

****************************************************************************
  FLOW PROCESS FROM NODE    144.00 TO NODE    142.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    70.00
  UPSTREAM ELEVATION(FEET) =    115.00
  DOWNSTREAM ELEVATION(FEET) =    110.22
  ELEVATION DIFFERENCE(FEET) =      4.78
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.160
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.454
  SUBAREA RUNOFF(CFS) =      0.17
  TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.17

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
```

```
==========================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.16
  RAINFALL INTENSITY(INCH/HR) =   6.45
  TOTAL STREAM AREA(ACRES) =     0.06
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.17

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        0.75     2.35        6.587          0.14
      2        0.17     5.16        6.454          0.06

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        0.83     2.35       6.587
      2        0.91     5.16       6.454

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       0.91   Tc(MIN.) =    5.16
  TOTAL AREA(ACRES) =        0.2
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    142.00 =     166.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    139.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   106.70  DOWNSTREAM(FEET) =   106.40
  FLOW LENGTH(FEET) =    25.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.04
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.91
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =    5.26
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    139.00 =     191.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    139.00 TO NODE    139.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==========================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.26
  RAINFALL INTENSITY(INCH/HR) =   6.37
  TOTAL STREAM AREA(ACRES) =     0.20
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.91
```

```
**************************************************************************
  FLOW PROCESS FROM NODE    137.00 TO NODE    138.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =    117.57
  DOWNSTREAM ELEVATION(FEET) =    114.93
  ELEVATION DIFFERENCE(FEET) =      2.64
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.136
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.27
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.27

**************************************************************************
  FLOW PROCESS FROM NODE    138.00 TO NODE    139.00 IS CODE =  62
--------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
==========================================================================
  UPSTREAM ELEVATION(FEET) =  114.93  DOWNSTREAM ELEVATION(FEET) =  110.22
  STREET LENGTH(FEET) =    91.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.40
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.16
    HALFSTREET FLOOD WIDTH(FEET) =    1.50
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.29
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.67
  STREET FLOW TRAVEL TIME(MIN.) =   0.35   Tc(MIN.) =    3.49
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
  SUBAREA AREA(ACRES) =    0.05      SUBAREA RUNOFF(CFS) =    0.27
  TOTAL AREA(ACRES) =        0.1        PEAK FLOW RATE(CFS) =       0.53
```

```
  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.16   HALFSTREET FLOOD WIDTH(FEET) =   1.50
  FLOW VELOCITY(FEET/SEC.) =  4.29   DEPTH*VELOCITY(FT*FT/SEC.) =   0.67
  LONGEST FLOWPATH FROM NODE    137.00 TO NODE    139.00 =     171.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    139.00 TO NODE    139.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    3.49
  RAINFALL INTENSITY(INCH/HR) =   6.59
  TOTAL STREAM AREA(ACRES) =     0.10
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.53

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        0.91     5.26        6.372          0.20
      2        0.53     3.49        6.587          0.10

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        1.41     3.49       6.587
      2        1.42     5.26       6.372

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       1.42   Tc(MIN.) =    5.26
  TOTAL AREA(ACRES) =        0.3
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    139.00 =     191.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    139.00 TO NODE    140.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   106.40  DOWNSTREAM(FEET) =   106.00
  FLOW LENGTH(FEET) =    40.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   6.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.11
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        1.42
  PIPE TRAVEL TIME(MIN.) =   0.16    Tc(MIN.) =    5.43
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    140.00 =     231.00 FEET.

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

```
  FLOW PROCESS FROM NODE    140.00 TO NODE    140.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        1.42     5.43       6.249        0.30
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    140.00 =     231.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       25.15     5.13       6.482        5.18
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    140.00 =    1036.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      26.49       5.13        6.482
      2      25.66       5.43        6.249

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      26.49   Tc(MIN.) =    5.13
  TOTAL AREA(ACRES) =         5.5

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    140.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    140.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    146.00 TO NODE    147.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    95.00
  UPSTREAM ELEVATION(FEET) =    116.27
  DOWNSTREAM ELEVATION(FEET) =    110.79
  ELEVATION DIFFERENCE(FEET) =      5.48
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.837
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
```

```
  SUBAREA RUNOFF(CFS) =       0.69
  TOTAL AREA(ACRES) =       0.13   TOTAL RUNOFF(CFS) =       0.69

****************************************************************************
  FLOW PROCESS FROM NODE    147.00 TO NODE    140.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   107.79  DOWNSTREAM(FEET) =   106.00
  FLOW LENGTH(FEET) =      3.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   1.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.91
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        0.69
  PIPE TRAVEL TIME(MIN.) =   0.00    Tc(MIN.) =    2.84
  LONGEST FLOWPATH FROM NODE    146.00 TO NODE    140.00 =      98.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    140.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1        0.69     2.84       6.587        0.13
  LONGEST FLOWPATH FROM NODE    146.00 TO NODE    140.00 =      98.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1       26.49     5.13       6.482        5.48
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    140.00 =    1036.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1      15.37       2.84        6.587
     2      27.17       5.13        6.482

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      27.17   Tc(MIN.) =    5.13
  TOTAL AREA(ACRES) =          5.6

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    140.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    140.00 IS CODE =  81
```

```
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.482
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7951
  SUBAREA AREA(ACRES) =    0.18   SUBAREA RUNOFF(CFS) =    0.95
  TOTAL AREA(ACRES) =        5.8   TOTAL RUNOFF(CFS) =      29.84
  TC(MIN.) =    5.13

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    300.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   106.00  DOWNSTREAM(FEET) =    97.20
  FLOW LENGTH(FEET) =     3.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  75.80
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      29.84
  PIPE TRAVEL TIME(MIN.) =   0.00    Tc(MIN.) =    5.13
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    300.00 =    1039.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    300.50 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    97.20  DOWNSTREAM(FEET) =    97.10
  FLOW LENGTH(FEET) =     3.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.03
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      29.84
  PIPE TRAVEL TIME(MIN.) =   0.00    Tc(MIN.) =    5.13
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    300.50 =    1042.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    300.50 TO NODE    700.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    97.10  DOWNSTREAM(FEET) =    96.30
  FLOW LENGTH(FEET) =    29.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  16.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.99
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      29.84
```

```
 PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    5.17
 LONGEST FLOWPATH FROM NODE    103.00 TO NODE    700.00 =    1071.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    700.00 TO NODE    700.00 IS CODE =   7
----------------------------------------------------------------------------
 >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
 USER-SPECIFIED VALUES ARE AS FOLLOWS:
 TC(MIN) = 124.30   RAIN INTENSITY(INCH/HOUR) =  0.83
 TOTAL AREA(ACRES) =     5.80   TOTAL RUNOFF(CFS) =      0.12

****************************************************************************
 FLOW PROCESS FROM NODE    700.00 TO NODE    202.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =   96.30  DOWNSTREAM ELEVATION(FEET) =   84.30
 STREET LENGTH(FEET) =   830.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 12.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.15
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.16
   HALFSTREET FLOOD WIDTH(FEET) =    1.50
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.27
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.35
 STREET FLOW TRAVEL TIME(MIN.) =   6.10   Tc(MIN.) =  130.40
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  0.804
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8100
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.038
 SUBAREA AREA(ACRES) =    0.10      SUBAREA RUNOFF(CFS) =    0.07
 TOTAL AREA(ACRES) =        5.9        PEAK FLOW RATE(CFS) =       0.18

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.16   HALFSTREET FLOOD WIDTH(FEET) =   1.50
 FLOW VELOCITY(FEET/SEC.) =  2.27   DEPTH*VELOCITY(FT*FT/SEC.) =   0.35
 LONGEST FLOWPATH FROM NODE    103.00 TO NODE    202.00 =    1901.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    700.00 TO NODE    700.00 IS CODE =   1
----------------------------------------------------------------------------
```

```
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =  130.40
  RAINFALL INTENSITY(INCH/HR) =   0.80
  TOTAL STREAM AREA(ACRES) =     5.90
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.18

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    174.70
  DOWNSTREAM ELEVATION(FEET) =    142.10
  ELEVATION DIFFERENCE(FEET) =     32.60
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.431
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.245
  SUBAREA RUNOFF(CFS) =      0.65
  TOTAL AREA(ACRES) =      0.23   TOTAL RUNOFF(CFS) =      0.65

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    142.10  DOWNSTREAM(FEET) =     80.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   492.00   CHANNEL SLOPE =  0.1256
  CHANNEL BASE(FEET) =    3.50   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  28.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.084
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.79
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.02
  AVERAGE FLOW DEPTH(FEET) =   0.12   TRAVEL TIME(MIN.) =   2.04
  Tc(MIN.) =    7.47
  SUBAREA AREA(ACRES) =     0.99       SUBAREA RUNOFF(CFS) =    2.26
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.450
  TOTAL AREA(ACRES) =        1.2         PEAK FLOW RATE(CFS) =       2.79

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.16   FLOW VELOCITY(FEET/SEC.) =   4.71
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     592.00 FEET.

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

```
  FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.47
  RAINFALL INTENSITY(INCH/HR) =   5.08
  TOTAL STREAM AREA(ACRES) =     1.22
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.79

****************************************************************************
  FLOW PROCESS FROM NODE    510.00 TO NODE    510.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.084
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4500
  SUBAREA AREA(ACRES) =    0.13   SUBAREA RUNOFF(CFS) =    0.30
  TOTAL AREA(ACRES) =        1.4   TOTAL RUNOFF(CFS) =       3.09
  TC(MIN.) =    7.47

****************************************************************************
  FLOW PROCESS FROM NODE    510.00 TO NODE    143.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    64.00
  UPSTREAM ELEVATION(FEET) =    150.50
  DOWNSTREAM ELEVATION(FEET) =    127.00
  ELEVATION DIFFERENCE(FEET) =     23.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.345
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.12
  TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.12

****************************************************************************
  FLOW PROCESS FROM NODE    143.00 TO NODE    145.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    127.00  DOWNSTREAM(FEET) =    111.34
  CHANNEL LENGTH THRU SUBAREA(FEET) =   180.00   CHANNEL SLOPE =  0.0870
  CHANNEL BASE(FEET) =    1.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
```

```
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.504
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8100
 S.C.S. CURVE NUMBER (AMC II) =   0
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.25
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.98
 AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   0.75
 Tc(MIN.) =    5.10
 SUBAREA AREA(ACRES) =     0.05       SUBAREA RUNOFF(CFS) =    0.26
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.650
 TOTAL AREA(ACRES) =        0.1         PEAK FLOW RATE(CFS) =       0.38

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   4.65
 LONGEST FLOWPATH FROM NODE    510.00 TO NODE    145.00 =     244.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    145.00 TO NODE    520.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   111.34  DOWNSTREAM(FEET) =   111.00
 FLOW LENGTH(FEET) =    12.50   MANNING'S N =  0.013
 DEPTH OF FLOW IN   6.0 INCH PIPE IS   2.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.40
 ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       0.38
 PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    5.15
 LONGEST FLOWPATH FROM NODE    510.00 TO NODE    520.00 =     256.50 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    520.00 TO NODE    202.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  111.00  DOWNSTREAM ELEVATION(FEET) =   84.34
 STREET LENGTH(FEET) =  1213.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 12.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0130

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.52
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.19
   HALFSTREET FLOOD WIDTH(FEET) =    3.17
```

```
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.38
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.45
  STREET FLOW TRAVEL TIME(MIN.) =   8.50   Tc(MIN.) =   13.64
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.447
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.734
  SUBAREA AREA(ACRES) =    0.10      SUBAREA RUNOFF(CFS) =    0.28
  TOTAL AREA(ACRES) =        0.2        PEAK FLOW RATE(CFS) =       0.48

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.19   HALFSTREET FLOOD WIDTH(FEET) =   2.95
  FLOW VELOCITY(FEET/SEC.) =  2.35   DEPTH*VELOCITY(FT*FT/SEC.) =   0.43
  LONGEST FLOWPATH FROM NODE    510.00 TO NODE    202.00 =    1469.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =   13.64
  RAINFALL INTENSITY(INCH/HR) =   3.45
  TOTAL STREAM AREA(ACRES) =     0.19
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.48

****************************************************************************
  FLOW PROCESS FROM NODE    520.00 TO NODE    204.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    111.50
  DOWNSTREAM ELEVATION(FEET) =    105.00
  ELEVATION DIFFERENCE(FEET) =      6.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.159
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    96.50
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.758
  SUBAREA RUNOFF(CFS) =      0.08
  TOTAL AREA(ACRES) =      0.03   TOTAL RUNOFF(CFS) =      0.08

****************************************************************************
  FLOW PROCESS FROM NODE    520.00 TO NODE    204.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
```

```
USER-SPECIFIED VALUES ARE AS FOLLOWS:
TC(MIN) =   6.16   RAIN INTENSITY(INCH/HOUR) =  5.76
TOTAL AREA(ACRES) =     0.03   TOTAL RUNOFF(CFS) =      0.10

****************************************************************************
  FLOW PROCESS FROM NODE    204.00 TO NODE    202.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    105.00  DOWNSTREAM(FEET) =     84.34
  CHANNEL LENGTH THRU SUBAREA(FEET) =   850.00   CHANNEL SLOPE =  0.0243
  CHANNEL BASE(FEET) =    1.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.758
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.94
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.45
  AVERAGE FLOW DEPTH(FEET) =   0.25   TRAVEL TIME(MIN.) =   5.78
  Tc(MIN.) =   11.94
  SUBAREA AREA(ACRES) =     0.95       SUBAREA RUNOFF(CFS) =    1.61
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.454
  TOTAL AREA(ACRES) =        1.0         PEAK FLOW RATE(CFS) =       1.67

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.35   FLOW VELOCITY(FEET/SEC.) =   2.85
  LONGEST FLOWPATH FROM NODE    520.00 TO NODE    202.00 =     950.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  4 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.94
  RAINFALL INTENSITY(INCH/HR) =   3.76
  TOTAL STREAM AREA(ACRES) =     0.98
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.67

  ** CONFLUENCE DATA **
```

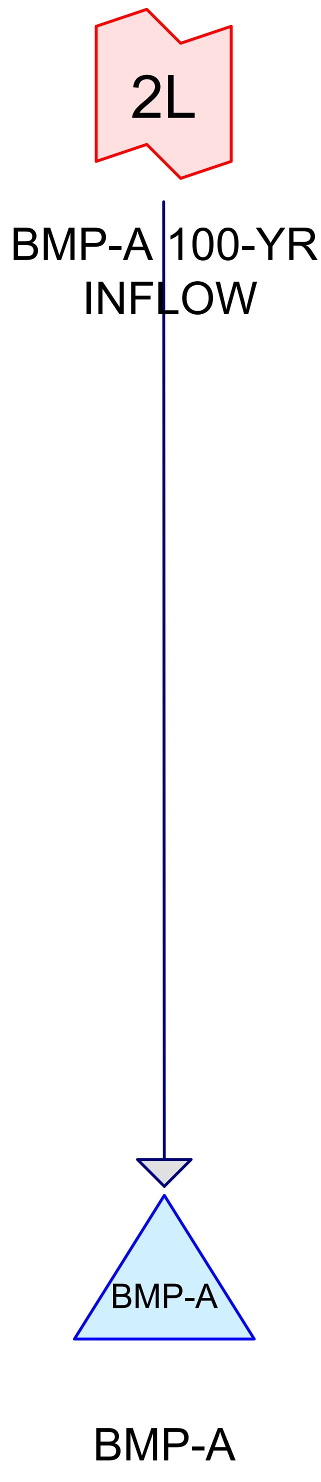
STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	0.18	130.40	0.804	5.90
2	2.79	7.47	5.084	1.22
3	0.48	13.64	3.447	0.19
4	1.67	11.94	3.758	0.98

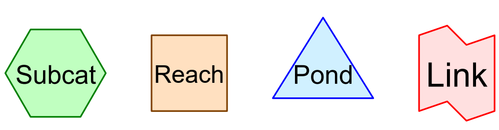
```
  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  4 STREAMS.
```

```
  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        4.11     7.47       5.084
      2        4.17    11.94       3.758
      3        3.93    13.64       3.447
      4        1.09   130.40       0.804

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       4.17   Tc(MIN.) =   11.94
  TOTAL AREA(ACRES) =        8.3
  LONGEST FLOWPATH FROM NODE    103.00 TO NODE    202.00 =    1901.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.758
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.1733
  SUBAREA AREA(ACRES) =    0.28   SUBAREA RUNOFF(CFS) =    0.47
  TOTAL AREA(ACRES) =        8.6   TOTAL RUNOFF(CFS) =       5.58
  TC(MIN.) =   11.94
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        8.6  TC(MIN.) =     11.94
  PEAK FLOW RATE(CFS)   =        5.58
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

APPENDIX D

Hydrograph and Detention Calculations





Routing Diagram for 3733 - HydroCAD (22-0908)
Prepared by {enter your company name here}, Printed 9/8/2022

Summary for Pond BMP-A: BMP-A

Inflow	=	29.89 cfs @	4.08 hrs, Volume=	0.974 af
Outflow	=	0.12 cfs @	6.07 hrs, Volume=	0.655 af, Atten= 100%, Lag= 119.3 min
Primary	=	0.12 cfs @	6.07 hrs, Volume=	0.655 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 106.71' @ 6.07 hrs Surf.Area= 5,600 sf Storage= 41,051 cf

Plug-Flow detention time= 2,479.3 min calculated for 0.655 af (67% of inflow)
Center-of-Mass det. time= 2,448.3 min (2,660.7 - 212.4)

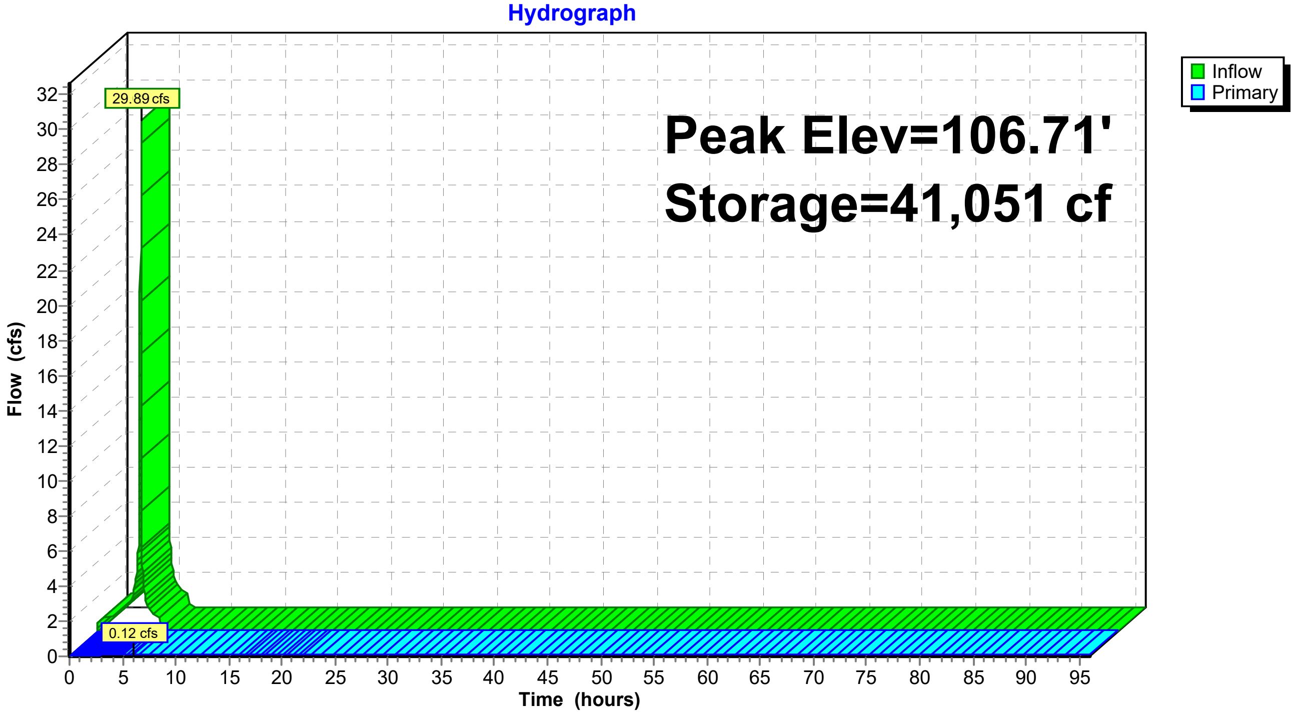
Volume	Invert	Avail.Storage	Storage Description
#1	97.25'	51,100 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
97.25	5,600	0.0	0	0	5,600
103.75	5,600	95.0	34,580	34,580	7,324
106.00	5,600	20.0	2,520	37,100	7,921
108.50	5,600	100.0	14,000	51,100	8,584

Device	Routing	Invert	Outlet Devices
#1	Primary	97.25'	**24.0" Round Culvert** L= 25.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 97.25' / 84.00' S= 0.5300 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	97.25'	**1.2" Vert. Orifice** C= 0.600
#3	Device 1	107.50'	**36.0" x 36.0" Horiz. Grate** C= 0.600 in 36.0" x 36.0" Grate (100% open area) Limited to weir flow at low heads
#4	Device 1	107.50'	**36.0" x 36.0" Horiz. Grate** C= 0.600 in 36.0" x 36.0" Grate (100% open area) Limited to weir flow at low heads
#5	Device 2	97.25'	**5.000 in/hr Exfiltration over Surface area below 106.00'**

Primary OutFlow Max=0.12 cfs @ 6.07 hrs HW=106.71' (Free Discharge)
└─**1=Culvert** (Passes 0.12 cfs of 54.98 cfs potential flow)
  ├─**2=Orifice** (Orifice Controls 0.12 cfs @ 14.77 fps)
  │ └─**5=Exfiltration** (Passes 0.12 cfs of 0.65 cfs potential flow)
  ├─**3=Grate** (Controls 0.00 cfs)
  └─**4=Grate** (Controls 0.00 cfs)

Pond BMP-A: BMP-A



<Name>

Gutter

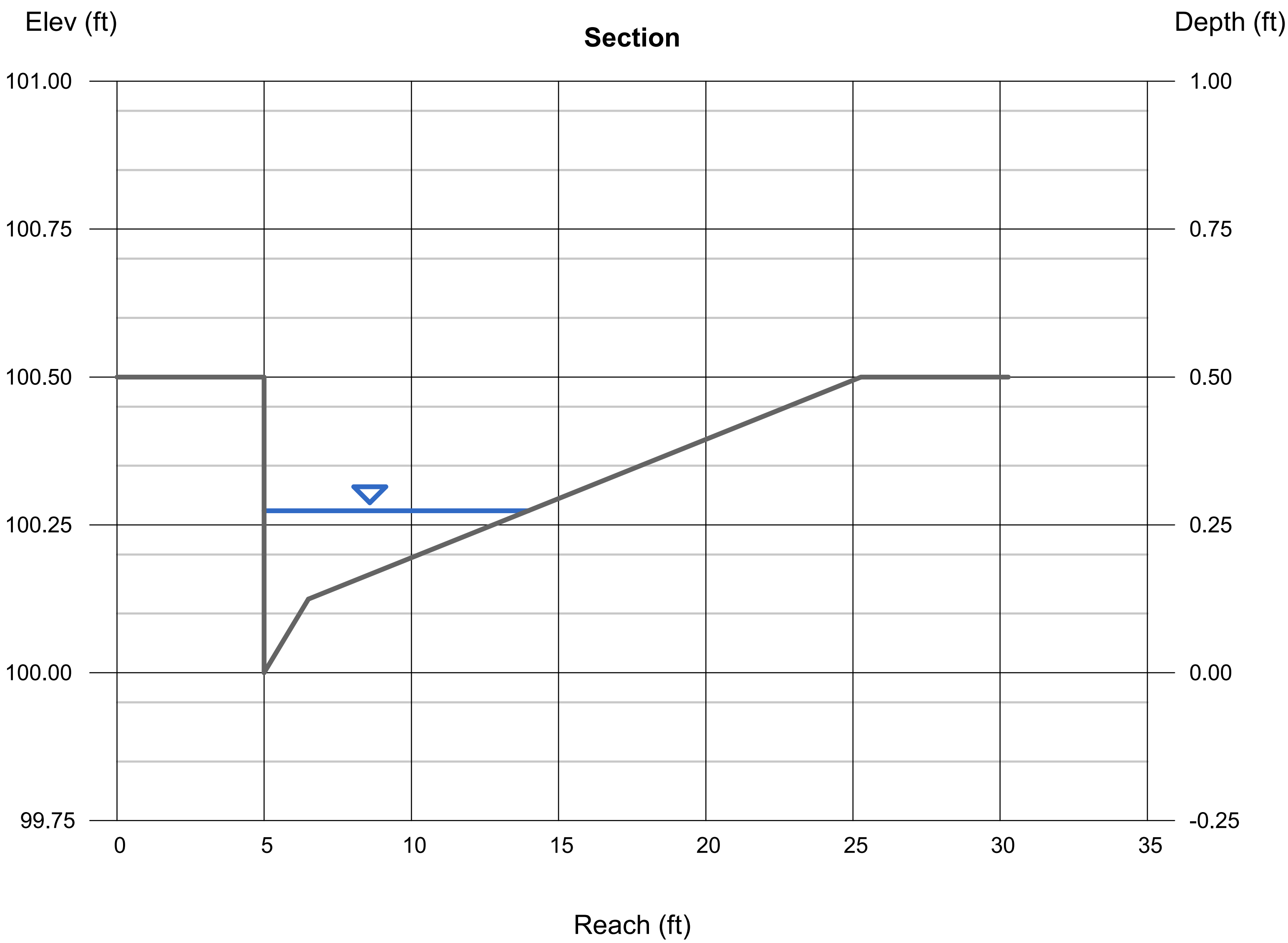
Cross Sl, Sx (ft/ft)	= 0.020
Cross Sl, Sw (ft/ft)	= 0.083
Gutter Width (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 1.00
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 2.65

Highlighted

Depth (ft)	= 0.27
Q (cfs)	= 2.650
Area (sqft)	= 0.88
Velocity (ft/s)	= 3.02
Wetted Perim (ft)	= 9.26
Crit Depth, Yc (ft)	= 0.33
Spread Width (ft)	= 8.98
EGL (ft)	= 0.42



ATTACHMENT 6 - COPY OF GEOTECHNICAL INVESTIGATION

GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

GEOTECHNICAL INVESTIGATION

PIRAEUS POINT
ENCINITAS, CALIFORNIA

PREPARED FOR

LENNAR
SAN DIEGO, CALIFORNIA

JANUARY 31, 2022
PROJECT NO. G2307-32-05

GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. G2307-32-05
January 31, 2022

Lennar
16465 Via Esprillo, Suite 150
San Diego, California 92127

Attention: Mr. David Shepherd

Subject: GEOTECHNICAL INVESTIGATION
PIRAEUS POINT
ENCINITAS, CALIFORNIA

Dear Mr. Shepherd:

In accordance with your request, we have performed a geotechnical investigation on the subject property located in Encinitas, California. The accompanying report presents our findings, conclusions and recommendations relative to the geotechnical aspects of developing the property as presently proposed.

The results of our study indicate that the site can be developed as planned, provided the recommendations of this report are incorporated into the design and construction of the project. If there are any questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

Troy K. Reist CEG 2408	Trevor E. Myers RCE 63773	David B. Evans CEG 1860

TKR:TEM:DBE:am

(e-mail) Addressee
(e-mail) Pasco Laret Suiter & Associates
Attention: Mr. Tadd Dolfo

TABLE OF CONTENTS

TABLE OF CONTENTS (Concluded)

GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

The purpose of this study was to evaluate the proposed grading for a residential development in Encinitas, California (see *Vicinity Map*, Figure 1). This report provides recommendations relative to the geotechnical engineering aspects of developing the property as presently proposed based on the conditions encountered during two field investigations.

The scope of our previous and recent studies consisted of the following:

- Reviewing aerial photographs and readily available published and unpublished geologic literature.
- Reviewing the digital plans prepared by Pasco Laret Suiter & Associates.
- Down-hole logging and sampling of four large-diameter borings (see Appendix A).
- Logging and sampling of six hollow-stem auger borings (see Appendix A).
- Performing laboratory tests on selected soil samples to evaluate their physical characteristics for engineering analysis (see Appendix B).
- Performing slope stability analyses along representative geologic cross sections (see Appendix C).
- Performing liquefaction analyses (see Appendix D).
- Preparing this report, geologic cross sections and a geologic map presenting our exploratory information and our conclusions and recommendations regarding the geotechnical aspects of developing the property as presently proposed.

The approximate locations of the exploratory borings are shown on the *Geologic Map*, Figure 2. *Geologic Cross-Sections* A-A′ through G-G′ (Figures 3 through 5) represent our interpretation of the geologic conditions across the site and served as the basis for our slope stability analysis.

2. SITE AND PROJECT DESCRIPTION

The roughly 7-acre property is primarily in a natural condition and consists of a rectangular-shaped parcel that slopes westward with elevations ranging from 180 feet Mean Sea Level (MSL) along the northeast property boundary to 80 feet MSL at the northwest corner of the site. A generally west-flowing drainage is located along the northern portion of the property and has created localized steep topography. A residential development is located to the east, Plato Place to the south and Piraeus Street to the west.

The site is essentially undeveloped other than a slope excavation along the western property margin presumed to be associated with grading of Piraeus Street. In 2001, a landslide occurred on the site that closed adjacent Piraeus Street. We understand that the City of Encinitas removed portions of the slide and installed two groundwater observation wells and two horizontal drains. The excavated soil was placed within a depression on the southern portion of the property. The western property margin currently contains the landslide remnant with an upper scarp area that has down dropped approximately 5 to 10 feet. The lower portion of the slope face adjacent to Piraeus Street was track walked with a bull dozer during repair operations.

It is our understanding that the property will be developed to create a residential development with approximately 15 building pads to support 149, 3-story condominium homes with parking garages, including 15 affordable homes, a pool house and swimming pool. In addition, associated infrastructure improvements consisting of wet and dry utilities, roadways, off-street parking, retaining walls and sidewalks are planned throughout the project.

Maximum cut and fill thicknesses not considering remedial grading will be on the order of 30 feet. Fill slopes are designed at 2:1 (horizontal:vertical) or flatter, with maximum heights of approximately 20 feet. Retaining walls are planned with a maximum height of approximately 30 feet. We understand cantilevered micropile and soil nail walls are proposed along the eastern property boundary with mechanically-stabilized earth (MSE) retaining walls along the western and northern property lines.

The site location, descriptions, and proposed development discussed above are based on site investigations, review of the project plans, and our discussions with you. Once project grading plans are prepared, Geocon Incorporated should be contacted to update this geotechnical report.

3. SOIL AND GEOLOGIC CONDITIONS

During our field investigations, we encountered three surficial soil deposits (previously-placed fill, landslide debris and alluvium) and two geologic units (Quaternary-age Very Old Paralic Deposits and Eocene-age Santiago Formation). The estimated lateral extent of these units is shown on the Geologic Map, Figure 2. Figures 3 through 5 present Geologic Cross-Sections providing our interpretation of the subsurface geologic conditions. The descriptions of the soil and geologic conditions are presented on the boring logs located in Appendix A and described herein in order of increasing age.

3.1 Previously-Placed Fill (Qpf)

Previously-placed fill exists within the southern portion of the site. This material was likely placed during construction of Plato Place and during the landslide removal in 2001. We encountered approximately 15 feet of previously placed fill in our borings. The material generally consists of loose to very dense, moist, yellowish to grayish brown, clayey, fine to coarse sand with trace gravel and some organics. The upper approximately 5 feet of this soil has a variable moisture content and density, and is considered unsuitable for support of additional fill and/or structural loads in its present condition and will require remedial grading. The lower portion of the fill was evaluated for its density, moisture content, and compression characteristics, and was found to be generally suitable for support of additional fill and/or structural loads in its present condition.

3.2 Landslide Debris (Qls)

Landslide debris is present on the western approximately one-third of the site as shown on Figure 2. During our review of the 1953 stereo photographs of the property, the landslide was not distinguishable. Later aerial photographs suggest the first movement of the landslide occurred in 2001. The landslide extends from Piraeus Street at its toe roughly 140 feet into the property to the east. The landslide debris is unsuitable to be left in place and complete removal will be required during remedial grading operations. The complete removal will result in a buttress fill which will mitigate potential future instabilities.

3.3 Alluvium (Qal)

Alluvium exists below the previously-placed fill on the southern portion of the site to depths up to 55 feet below existing grades. The alluvium is generally composed of medium dense, damp to wet, dark yellowish brown, clayey to silty, fine to coarse sand. Perched groundwater was encountered within the alluvium at depths varying from 38 to 49 feet below the ground surface. The alluvium is considered generally suitable in its current condition for support of additional fill and/or structural loads based on laboratory analysis, as discussed herein.

3.4 Very Old Paralic Deposits ($Qvop_{13}$)

Very Old Paralic Deposits are exposed across the majority of the site above elevations of approximately 138 feet MSL. These deposits lie unconformably on the older Santiago Formation with a slightly undulating contact. The Very Old Paralic Deposits consist of medium dense to dense, damp to moist, reddish to yellowish brown, silty, fine to coarse sand with some cobble layers and cohesionless sand layers. The Very Old Paralic Deposits have adequate strength characteristics for support of the proposed improvements.

3.5 Santiago Formation (Tsa)

We encountered the Santiago Formation in our large diameter borings at depths ranging from approximately 14 feet to 32 feet below existing grades; and in our small diameter borings below the alluvium at depths ranging from 50 feet to 55 feet below existing ground. In addition, the Santiago Formation is exposed in the natural slopes within the drainage to the north of proposed development and in the adjacent to Piraeus Street. The Santiago Formation consists of dense to very dense, moist, olive to yellowish brown, massive to weakly laminated, silty, fine to coarse sandstone. In addition, the Santiago Formation contains interbeds of hard, moist, grayish olive, claystone. Discrete seepage zones were encountered within this unit as shown on the boring logs.

Our study revealed a continuous 1- to 1.5-foot-thick bedding plane shear zone (BPS) at a depth varying from 43 to 63 feet below the existing ground. The orientation of this zone appears to be westerly dipping with elevations varying from 110 feet to 117 feet MSL. A second BPS zone was encountered roughly 15 feet above the lower BPS. The sheared material consists of soft, remolded plastic clay gouge. The lower BPS was appears to be the causative feature that resulted in landsliding in the western portion of the site.

4. GROUNDWATER/SEEPAGE

We encountered seepage within the alluvial soils located below the previously placed fill in the southern portion of the site. The seepage elevations varied from approximately 38 to 49 feet below the existing ground surface and the seepage appeared to be perched within the lower 12 feet of the alluvium. Some perched seepage was also observed within the Santiago Formation. Groundwater/seepage conditions are dependent on seasonal precipitation, irrigation, and land use, among other factors, and vary as a result. Proper surface drainage will be important for future performance of the project.

A static groundwater table was not observed in the excavations performed during this study. The existing seepage elevations in buried alluvial areas, however, may fluctuate seasonally. It should be noted that areas where perched water or seepage was not encountered may exhibit groundwater during rainy periods.

5. SLOPE STABILITY EVALUATION

Six geologic cross-sections, A-A′ through C-C’ and E-E’ through G-G′ (Figures 3 through 5), were prepared to aid in evaluating the stability of the proposed slopes and retaining walls. Shear strength parameters for the soil and geologic materials encountered were determined from laboratory direct shear tests. Residual shear strengths were used for bedding plane shear features determined from laboratory test results, using the *Journal of Geotechnical and Geoenvironmental Engineering, Drained Shear Strength Parameters for Analysis of Landslides (Stark, Choi, McCone, 2005)* and engineering judgment.

Table 5.1 presents the soil strength parameters that were utilized in the slope stability analyses. The values were derived from laboratory test results and experience with similar soil and geologic conditions.

TABLE 5.1
SOIL STRENGTH PARAMETERS

Soil Condition	Angle of Internal Friction ϕ (degrees)	Cohesion c (psf)
Compacted Fill	28	300
Very Old Paralic Deposits	28	350
Santiago Formation (ML/CL)	23	500
Santiago Formation (SM/SP)	33	750
Alluvium	28	200
Bedding Plane Shear (BPS)	8	100

In accordance with Special Publication 117 guidelines, site-specific seismic slope stability analyses are required for sites located within mapped hazard zones. Seismic Hazard Zone maps published by CDMG, including landslide hazard zones, have not been published for San Diego County due to the relatively low seismic risk compared with other jurisdictions in Southern California. Therefore, it is our opinion that seismic slope stability analyses are not required in San Diego County. However, to satisfy City of Encinitas requirements, seismic slope stability analyses on the most critical failure surfaces have been performed in accordance with *Recommended Procedures for Implementation of DMG Special Publication 117: Guidelines for Analyzing and Mitigating Landslide Hazards in California*, prepared by the Southern California Earthquake Center (SCEC), dated June 2002.

The seismic slope stability analysis was performed using an acceleration of 0.23g, corresponding to a 10 percent probability of exceedance in 50 years, based on a deaggregation analysis for the site. A modal magnitude and modal distance of 6.9 and 6.3 kilometers, respectively, was used in the analysis. A plot of the hazard contribution from the deaggregation analysis is presented as Figure C-42.

Using the parameters discussed herein, an equivalent site acceleration, k_{EQ}, of 0.132g was calculated to perform the screening analysis. The screening analysis was performed using an acceleration of 0.132g resulting in factors of safety ranging between 1.0 and 2.7. A slope is considered acceptable by the screening analysis if the calculated factor of safety is greater than 1.0 using k_{EQ}; therefore, the most critical failure surfaces depicted on Cross-sections A-A′ through C-C′ and E-E’ through G-G’, pass the screening analysis for the seismic slope stability, as shown on Figure C-43.

The output files and calculated factor of safety for the cross sections used for the stability analyses are presented in Appendix C and summarized in Table 5.2.

TABLE 5.2
SLOPE STABILITY SUMMARY

Cross Section	Figure Number	Condition Analyzed	Factor of Safety	
			Static	Pseudo-Static
A-A'	C-1/C-2	Block type failure on BPS thru fill (west portion)	4.4	2.7
	C-3/C-4	Circular type failure behind MSE wall	1.7	1.5
	C-5/C-6	Block type failure on BPS (east portion)	2.2	1.2
	C-7/C-8	Circular type failure behind shoring wall	1.5	1.2
	C-9/C-10	Circular type failure behind soil nail wall	3.0	2.2
B-B'	C-11/C-12	Circular type failure behind MSE wall	2.0	1.7
	C-13/C-14	Block type failure on upper BPS	1.5	1.0
	C-15/C-16	Circular type failure behind shoring walls	1.5	1.2
	C-17/C-18	Block type failure on lower BPS	1.8	1.0
	C-19/C-20	Block type failure on upper BPS	1.6	1.0
C-C'	C-21/C-22	Circular type failure behind MSE wall	3.1	2.3
	C-23/C-24	Block type failure on lower BPS	2.7	1.1
	C-25/C-26	Block type failure on upper BPS	1.8	1.5
	C-27/C-28	Circular type failure behind shoring walls	1.8	1.3
E-E'	C-29/C-30	Block type failure on BPS	1.6	1.2
	C-31/C-32	Circular type failure behind MSE wall	1.5	1.2
F-F'	C-33/C-34	Block type failure on BPS	2.0	1.3
	C-35/C-36	Circular type failure behind MSE wall	1.8	1.4
G-G'	C-37/C-38	Block type failure on BPS	2.3	1.4
	C-39/C-40	Circular type failure behind MSE wall	1.6	1.2

Note – Groundwater was incorporated into the analysis and generally placed at the first occurrence of seepage as encountered in our borings.

The results of the analyses indicate that full removal of the existing landslide and replacement with compacted fill will result in a static factor of safety of at least 1.5. The approximate limits of remedial grading are shown on the *Geologic Map* and depicted on the *Geologic Cross-Sections* (red landslide area). The depth and extent of remedial grading of these areas may need to be modified depending on the conditions observed during grading.

6. GEOLOGIC HAZARDS

6.1 Faulting and Seismicity

Based on our recent exploratory borings and a review of published geologic maps and reports, the site is not located on any known "active," "potentially active" or "inactive" fault traces as defined by the California Geological Survey (CGS).

The Newport-Inglewood Fault and Rose Canyon Fault Zone, located approximately 13 miles west of the site, are the closest known active faults. The CGS considers a fault seismically active when evidence suggests seismic activity within roughly the last 11,000 years. The CGS has included portions of the Rose Canyon Fault zone within an Alquist-Priolo Earthquake Fault Zone. Based upon a review of available geologic data and published reports, the site is not located within a State of California Earthquake Fault Zone.

6.2 Seismicity

Considerations important in seismic design include the frequency and duration of motion and the soil conditions underlying the site. Seismic design of structures should be evaluated in accordance with the California Building Code (CBC) guidelines currently adopted by the local agency. The risk associated with strong ground motion due to earthquake at the site is high; however, the risk is no greater than that for the region.

6.3 Liquefaction and Seismically Induced Settlement

Liquefaction typically occurs when a site is located in a zone with seismic activity, onsite soils are cohesionless, groundwater is encountered within 50 feet of the surface, and soil densities are less than about 70 percent of the maximum dry densities. If the four previous criteria are met, a seismic event could result in a rapid pore water pressure increase from the earthquake-generated ground accelerations. We performed liquefaction analyses and the results indicate a low potential for liquefaction and seismically-induced settlement. Our analysis assumed that the first occurrence of perched seepage in the borings represents a "water table". The results of the analyses are presented in Appendix D.

The site is not located within a state-designated liquefaction hazard zone. The County of San Diego Hazard Mitigation Plan (2017) maps the site within a zone with a low liquefiable risk. The current standard of practice, as outlined in the *Recommended Procedures for Implementation of DMG Special Publication 117A, Guidelines for Analyzing and Mitigating Liquefaction in California* requires liquefaction analysis to a depth of 50 feet below the lowest portion of the proposed structures. We analyzed our recent Borings B-1 through B-3 located within the southern area of the site where deep alluvium and perched seepage was encountered. We explored to a maximum depth of approximately 52-1/2 feet in this area. We do not expect there is a liquefaction potential within areas of the site mapped as Very Old Paralic Deposits or Santiago Formation due to the dense nature of the materials and lack of groundwater.

We used the methods following the methodology of NCEER (2001 and 2008) to perform a liquefaction evaluation. We used a computed site acceleration of 0.56g (based on ASCE 7-16) and a modal magnitude of 6.9 as evaluated from the NSHM 2014 Dynamic edition using a recurrence interval of 2,475 years (2% in 50 years) on the United States Geological Survey web site.

We used the blow counts for the liquefaction analysis based on the driven samplers in the field. In addition, we adjusted blow counts using a California sampler by two-thirds to obtain equivalent Standard Penetration Test (SPT) values. The blow counts were also adjusted for boring diameter, sampling method, rod length, overburden pressure, and energy delivered to the sampler corresponding to a driving-energy of 60 percent ($N_{1|60}$). We further adjusted the blow counts for estimated fines content and calculated a factor of safety. A site is considered to be susceptible to liquefaction when the computed factor of safety is less than 1.0. The results of our liquefaction analysis indicate factors of safety greater than 1.0 within the alluvial soil below the assumed groundwater table and the liquefaction potential is considered low.

6.4 Landslides

A landslide was encountered on the site as described in Section 2. This deposit will be completely removed during remedial grading for the proposed development.

6.5 Settlement Considerations

Estimates of potential settlement are generally based on the thickness of alluvium left-in-place, the thickness of additional fill to achieve finish grade, and the compressibility characteristics of the alluvial materials. The rate of settlement is generally based on the drainage path that would allow for pore water pressure dissipation.

The alluvial deposits beneath the southern portion of the site were found to be slightly to moderately compressible when subjected to increased vertical stress. Laboratory consolidation tests were performed on samples of the alluvium to aid in evaluating the magnitude and time rate of settlement that could occur from the proposed fill and building loads presently planned. We have conservatively assumed a groundwater elevation at first occurrence of seepage for the analysis. Based on the test results and analysis, it is estimated that approximately 4 to 5 inches of settlement could occur and take approximately 2 months without geotechnical mitigation. Construction of improvements in the area where alluvium is left in place should be delayed until primary consolidation is essentially complete. It should be noted that the magnitude of the total settlement and the associated time rate of consolidation may not be uniform throughout the site. Settlement monitoring during grading will verify when primary compression has occurred, and improvement construction may commence.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 General

7.1.1 From a geotechnical engineering standpoint, it is our opinion that the site is suitable for development provided the recommendations presented herein are implemented in design and construction of the project.

7.1.2 The site is underlain by surficial soil consisting of previously-placed fill, landslide debris, and alluvium. Two geologic units consisting of Very Old Paralic Deposits and the Santiago Formation are also present on the site. Remedial grading of the upper portion of previously-placed fill and complete removal of the landslide debris will be required. The Very Old Paralic Deposits and the Santiago Formation are considered adequate for the support of compacted fill and/or structural loads.

7.1.3 Removal of the landslide in the western approximately one-third of the property will provide adequate slope stability for the central portion of the site. A buttress will be necessary along the northwest development margin to mitigate naturally occurring bedrock shear zones and provide acceptable slope stability. Details of these mitigation features are provided in Sections 7.4 and 7.8 and on Figures 2 through 5. This information should be updated once detailed grading plans are prepared.

7.1.4 The alluvium encountered beneath the previously placed fill in the southern portion of the site is considered slightly to moderately compressible when subjected to increased vertical stress due to fill or structural loads. Our settlement analysis indicates approximately 4 to 5 inches of settlement may occur as a result of placing approximately 10 feet of additional fill. As a consequence, construction of the proposed improvements, including underground utilities should be delayed until the primary consolidation of the alluvial deposits is essentially complete. Surcharge loading of this area may be considered to reduce the amount of time to achieve primary consolidation.

7.1.5 We encountered seepage within the alluvium in the southern portion of the site at depths ranging from approximately 38 to 49 feet below the existing ground surface. We also encountered seepage conditions within the formational materials in large-diameter Borings LB-1, 2 and 4 at depths of approximately 40½, 44 and 40 feet below existing grade, respectively.

7.1.6 We expect the proposed structures in areas underlain by Very Old Paralic Deposits, Santiago Formation, or properly compacted fill overlying these formations can be founded on conventional shallow foundations. The proposed structures in areas underlain by significant differential fill thickness or previously placed fill and alluvium left in place should be founded on mat slabs or post-tensioned foundations designed to accommodate the anticipated settlement. Any proposed buildings within the influence of the reinforced zones of MSE retaining walls should be supported on deep foundations.

7.1.7 Soil nail wall construction may encounter flowing cohesionless sand within the Very Old Paralic Deposits. This condition was encountered in Boring LB-2 from 22.5 to 28 feet. Special drilling/construction techniques may be necessary if these conditions are encountered during project development.

7.2 Excavation and Soil Characteristics

7.2.1 Excavation of the surficial soil should generally be possible with moderate to heavy effort using conventional, heavy-duty equipment during grading and trenching operations. Excavation of the Very Old Paralic Deposits and the Santiago Formation should generally be possible with heavy to very heavy effort using conventional, heavy-duty equipment during grading and trenching operations.

7.2.2 We performed laboratory tests on samples of the site materials to evaluate the expansion potential of the site soils. Appendix B presents results of the laboratory expansion index tests. The soil encountered in the field investigation is considered to be “non-expansive” and “expansive” (expansion index [EI] of 20 or less and greater than 20, respectively) as defined by 2019 California Building Code [CBC] Section 1803.5.3. Table 7.2.1 presents soil classifications based on the expansion index. We expect a majority of the soil encountered possess a “very low” to “low” expansion potential (EI of 50 or less) in accordance with ASTM D 4829. However, the claystone and siltstone layers within the Santiago Formation would likely consist of “medium” to “high” expansive soils EI of 51 to 130).

TABLE 7.2.1
EXPANSION CLASSIFICATION BASED ON EXPANSION INDEX

<table>
<tr><th>Expansion Index (EI)</th><th>ASTM D 4829 Expansion Classification</th><th>2019 CBC Expansion Classification</th></tr>
<tr><td>0 – 20</td><td>Very Low</td><td>Non-Expansive</td></tr>
<tr><td>21 – 50</td><td>Low</td><td rowspan="4">Expansive</td></tr>
<tr><td>51 – 90</td><td>Medium</td></tr>
<tr><td>91 – 130</td><td>High</td></tr>
<tr><td>Greater Than 130</td><td>Very High</td></tr>
</table>

7.2.3 The laboratory test results indicate that the near-surface on-site materials at the locations tested possess *Not Applicable* sulfate severity and *S0* exposure to concrete structures as defined by 2019 CBC Section 1904 and ACI 318-14 Chapter 19. Table 7.2.2 presents a summary of concrete requirements set forth by 2019 CBC Section 1904 and ACI 318. ACI guidelines should be followed when determining the type of concrete to be used. The presence of water-soluble sulfates is not a visually discernible characteristic; therefore, other soil samples from the site could yield different concentrations. Additionally, over time landscaping activities (i.e., addition of fertilizers and other soil nutrients) may affect the concentration.

TABLE 7.2.2
REQUIREMENTS FOR CONCRETE EXPOSED TO SULFATE-CONTAINING SOLUTIONS

Exposure Class		Water-Soluble Sulfate (SO_4) Percent by Weight	Cement Type (ASTM C 150)	Maximum Water to Cement Ratio by Weight[1]	Minimum Compressive Strength (psi)
S0		$SO_4<0.10$	No Type Restriction	n/a	2,500
S1		$0.10\leq SO_4<0.20$	II	0.50	4,000
S2		$0.20\leq SO_4\leq 2.00$	V	0.45	4,500
S3	Option 1	$SO_4>2.00$	V+Pozzolan or Slag	0.45	4,500
	Option 2		V	0.40	5,000

[1] Maximum water to cement ratio limits do not apply to lightweight concrete

7.2.4 Geocon Incorporated does not practice in the field of corrosion engineering; therefore, further evaluation by a corrosion engineer may be needed to incorporate the necessary precautions to avoid premature corrosion of underground pipes and buried metal in direct contact with the soils.

7.3 Soil Nail Wall

7.3.1 In general, ground conditions are moderately suited to soil nail wall construction techniques. However, relatively cohesionless sands were encountered in Boring LB-2 indicating the potential for raveling or caving of the unsupported excavation. Casing or specialized drilling techniques may be required where low cohesion sands are encountered.

7.3.2 Testing of the soil nails should be performed in accordance with the guidelines of the Federal Highway Administration or similar guidelines. At least two verification tests should be performed to confirm design assumptions for each soil/rock type encountered. Verification tests nails should be sacrificial and should not be used to support the proposed wall. The bond length should be adjusted to allow for pullout testing of the verification nails to evaluate the ultimate bond stress. A minimum of 5 percent of the production nails should also be proof tested and a minimum of 4 sacrificial nails should be tested at the discretion of Geocon Incorporated. Consideration should be given to testing sacrificial nails with an adjusted bond length rather than testing production nails. Geocon Incorporated should observe the nail installation and perform the nail testing.

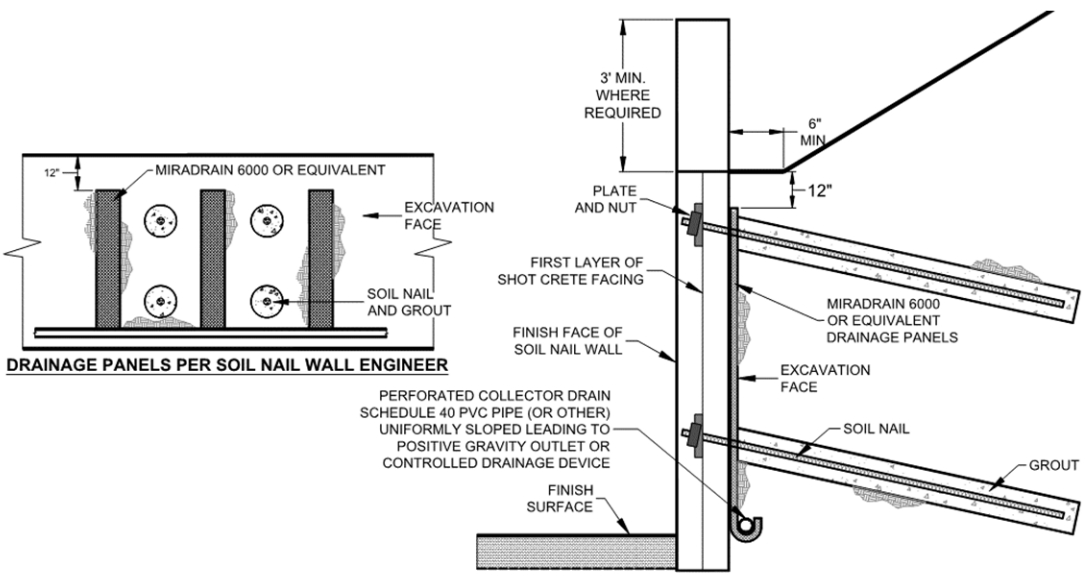
7.3.3 The soil strength parameters listed in Table 7.3.1 can be used in design of the soil nails. The bond stress is dependent on drilling method, diameter, and construction method. Therefore, the designer should evaluate the bond stress based on the existing soil conditions and the construction method.

TABLE 7.3.1
SOIL STRENGTH PARAMETERS FOR SOIL NAIL WALLS

Description	Cohesion (psf)	Friction Angle (degrees)	Estimated Ultimate Bond Stress (psi)*
Previously Placed Fill	300	28	10
Very Old Paralic Deposits	350	28	10
Santiago Formation	750	33	20

*Assuming gravity fed, open hole drilling techniques.

7.3.4 A drain system should be incorporated into the design of the soil nail wall as shown herein. Corrosion protection should also be provided if the wall is intended to be a permanent structure.



7.4 Buttresses

7.4.1 A drained buttress will be required on the north and northwest portion of the property to provide an acceptable factor of safety for the proposed MSE wall and slope. In addition, removal of the landslide debris in the western approximately one-third of the property will effectively provide adequate buttressing of the hillside in this area.

7.4.2 A typical buttress detail is shown on Figure 6. *Section 7* in Appendix E provides cut off wall and headwall details for the heel drains. Depending on the geologic conditions exposed, deeper and/or wider keyways may be necessary. The actual recommended keyway dimensions, as well as backdrain geometry and drain connection points should be determined as grading plans progress.

7.5 Grading

7.5.1 All grading should be performed in accordance with the attached *Recommended Grading Specifications* (Appendix E). Where the recommendations of this section conflict with Appendix E, the recommendations of this section take precedence. All earthwork should be observed and all fills tested for proper compaction by Geocon Incorporated.

7.5.2 Site preparation should begin with the removal of all deleterious material and vegetation. The depth of removal should be such that material exposed in cut areas or soils to be used as fill are relatively free of organic matter. Material generated during stripping and/or site demolition should be exported from the site.

7.5.3 All potentially compressible surficial soils within areas where structural improvements are planned, or where discussed herein, should be removed to firm natural ground and properly compacted prior to placing additional fill and/or structural load (i.e. the upper 5 feet of previously-placed fill, landslide debris, and other surficial deposits). Deeper than normal benching and/or stripping operations for sloping ground surfaces will be required where the thickness of potentially compressible surficial deposits exceeds 3 feet. The actual extent of unsuitable soil removals will be determined in the field during grading by the engineering geologist and/or geotechnical engineer.

7.5.4 A pre-construction meeting with a city inspector, owner, grading contractor, civil engineer, and a representative of Geocon Incorporated should be held prior to the beginning of grading and development operations. Grading requirements and construction methods can be discussed at that time.

7.5.5 Grading of the site should commence with the removal of vegetation and debris within the limits of development. Existing underground improvements should be removed and the resulting depressions properly backfilled in accordance with the procedures described herein.

7.5.6 To reduce the potential for differential settlement, it is recommended that the cut portion of cut/fill transition building pads be undercut at least 3 feet and replaced with properly compacted "very low" to "low" expansive fill soils. Where the thickness of the fill below the building pad exceeds 15 feet, the depth of the undercut should be increased to one-fifth of the maximum fill thickness.

7.5.7 Sharp fill differentials may result from removal of the landslide. Where these conditions occur beneath proposed buildings, additional undercutting or special foundation design considerations may be necessary.

7.5.8 The site should be brought to final subgrade elevations with structural fill compacted in layers. In general, soil native to the site is suitable for use as fill if relatively free from vegetation, debris and other deleterious material. Layers of fill should be no thicker than will allow for adequate bonding and compaction. Fill, including backfill and scarified ground surfaces, should be compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content, as determined in accordance with ASTM D 1557. Fill materials placed below optimum moisture content may require additional moisture conditioning prior to placing additional fill.

7.5.9 Import fill, if necessary, should consist of granular materials with a "very low" to "low" expansion potential (EI of 50 or less) free of deleterious material or rock larger than 3 inches and should be compacted as recommended above. Geocon Incorporated should be notified of the import soil source and should perform laboratory testing of import soil prior to its arrival at the site to determine its suitability as fill material.

7.5.10 It is the responsibility of the contractor and their competent person to ensure that all excavations, temporary slopes and trenches are properly constructed and maintained in accordance with applicable OSHA regulations in order to maintain safety and the stability of adjacent existing improvements.

7.6 Settlement Monitoring

7.6.1 The proposed structural areas underlain by previously-placed fill and alluvium should be monitored for settlement after the additional fill is placed to achieve finish grades. In general, surface settlement plates should be placed at several locations within the southern development footprint and read periodically until primary consolidation has essentially ceased. Survey readings should be performed regularly following placement of the proposed fill. Specific details regarding the location and type of monitoring device as well as monitoring frequency will be provided once the development plans have been finalized. The possibility of surcharge loading to accelerate the magnitude of settlement should be considered as grading plans progress.

7.7 Seismic Design Criteria

7.7.1 Table 7.7.1 summarizes site-specific design criteria obtained from the 2019 California Building Code (CBC; Based on the 2018 International Building Code [IBC] and ASCE 7-16), Chapter 16 Structural Design, Section 1613 Earthquake Loads. We used the computer program *U.S. Seismic Design Maps*, provided by the Structural Engineers Association (SEA) to calculate the seismic design parameters. The short spectral response uses a period of 0.2 second. We evaluated the Site Class based on the discussion in Section 1613.2.2 of the 2019 CBC and Table 20.3-1 of ASCE 7-16. The values presented herein are for the risk-targeted maximum considered earthquake (MCE_R). Sites designated as Site Class D, E and F may require additional analyses if requested by the project structural engineer and client.

TABLE 7.7.1
2019 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	2019 CBC Reference
Site Class	D	Section 1613.2.2
MCE_R Ground Motion Spectral Response Acceleration – Class B (short), S_S	1.134g	Figure 1613.2.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.406g	Figure 1613.2.1(2)
Site Coefficient, F_A	1.046	Table 1613.2.3(1)
Site Coefficient, F_V	1.894	Table 1613.2.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	1.187g	Section 1613.2.3 (Eqn 16-36)
Site Class Modified MCE_R Spectral Response Acceleration – (1 sec), S_{M1}	0.769g	Section 1613.2.3 (Eqn 16-37)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.791g	Section 1613.2.4 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.512g	Section 1613.2.4 (Eqn 16-39)

***Note:** Using the code-based values presented in this table, in lieu of a performing a ground motion hazard analysis, requires the exceptions outlined in ASCE 7-16 Section 11.4.8 be followed by the project structural engineer. Per Section 11.4.8 of ASCE/SEI 7-16, a ground motion hazard analysis should be performed for projects for Site Class "E" sites with Ss greater than or equal to 1.0g and for Site Class "D" and "E" sites with S1 greater than 0.2g. Section 11.4.8 also provides exceptions which indicates that the ground motion hazard analysis may be waived provided the exceptions are followed.

7.7.2 Table 7.7.2 presents the mapped maximum considered geometric mean (MCE_G) seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-16.

TABLE 7.7.2
ASCE 7-16 PEAK GROUND ACCELERATION

Parameter	Value	ASCE 7-16 Reference
Mapped MCE_G Peak Ground Acceleration, PGA	0.505g	Figure 22-9
Site Coefficient, F_{PGA}	1.1	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.556g	Section 11.8.3 (Eqn 11.8-1)

7.7.3 Conformance to the criteria in Tables 7.7.1 and 7.7.2 for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur in the event of a large earthquake. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

7.7.4 The project structural engineer and architect should evaluate the appropriate Risk Category and Seismic Design Category for the planned structures. The values presented herein assume a Risk Category of I and resulting in a Seismic Design Category D. Table 7.7.3 presents a summary of the risk categories in accordance with ASCE 7-16.

TABLE 7.7.3
ASCE 7-16 RISK CATEGORIES

Risk Category	Building Use	Examples
I	Low risk to Human Life at Failure	Barn, Storage Shelter
II	Nominal Risk to Human Life at Failure (Buildings Not Designated as I, III or IV)	Residential, Commercial and Industrial Buildings
III	Substantial Risk to Human Life at Failure	Theaters, Lecture Halls, Dining Halls, Schools, Prisons, Small Healthcare Facilities, Infrastructure Plants, Storage for Explosives/Toxins
IV	Essential Facilities	Hazardous Material Facilities, Hospitals, Fire and Rescue, Emergency Shelters, Police Stations, Power Stations, Aviation Control Facilities, National Defense, Water Storage

7.8 Slope Stability

7.8.1 We performed slope stability analyses using the two-dimensional computer program GeoStudio 2018 created by Geo-Slope International Ltd. We calculated the factor of safety for the planned slopes for rotational-mode and block-mode analyses using the Spencer's method. Output of the computer program including the calculated factor of safety and the failure surfaces are presented in Appendix C.

7.8.2 We used average drained direct shear strength parameters based on laboratory tests and our experience with similar soil types in nearby areas for the slope stability analyses. Our calculations indicate the proposed slopes, constructed of on-site materials, should have calculated factors of safety (FOS) of at least 1.5 and 1.0 under static and pseudo-static conditions, respectively, for deep-seated failure when the recommendations of this report are followed.

7.8.3 We selected Cross-Sections A-A' through C-C' and E-E' through G-G' to perform the slope stability analyses.

7.8.4 The results of the slope stability analyses are presented as Figures C-1 through C-43. The results of the surficial slope stability analyses are presented in Figure C-41. A plot of the seismic deaggregation hazard contribution is shown as Figure C-42. The seismic slope stability screening analysis results are presented as Figure C-43.

7.8.5 Based on the compression characteristics of the landslide debris and results of the slope stability analyses, complete removal of landslide materials is required. In addition, a buttress will be required within the Bedding Plane Shear (BPS) zone shown on Cross-Sections E-E' through G-G' is recommended. A buttress with an approximately 15-foot wide keyway is required to achieve an acceptable factor of safety. The buttress design has assumed a 1:1 (horizontal to vertical) backcut extending down to intercept the critical bedding plane shear zones. Figure 6 provides a general buttress detail for use in design and construction.

7.8.6 The planned buttress keyway and heel drains should be surveyed during construction. We based the buttress width and depth presented on the Geologic Map on the results of the slope stability analysis. The buttress and landslide removal will require drains located at the heel of the excavations as shown on Figure 6 and should be as-built and surveyed by the project civil engineer. Prior to outletting, the final 20-foot segment of the buttress subdrain should consist of non-perforated drainpipe. At the non-perforated/perforated interface, a seepage cutoff wall should be constructed on the downslope side of the junction. Subdrains that discharge into a natural drainage course or open space area should be provided with a permanent headwall structure, as presented in Appendix E.

7.8.7 Excavations, including buttress fills, should be observed during grading by an engineering geologist with Geocon to evaluate whether soil and geologic conditions do not differ significantly from those expected or identified in this report.

7.8.8 We performed the slope stability analyses based on the interpretation of geologic conditions encountered during our field investigation. We should evaluate the geologic conditions during the grading operations to check if the conditions observed during grading are consistent with our interpretations. Additional slope stability analyses and modifications to the proposed buttress may be required during the grading operations as conditions warrant.

7.8.9 Slopes should be landscaped with drought-tolerant vegetation having variable root depths and requiring minimal landscape irrigation. In addition, slopes should be drained and properly maintained to reduce erosion.

7.9 Foundation Recommendations - General

7.9.1 Proposed structures supported on compacted fill over Very Old Paralic Deposits or Santiago Formation may be designed using conventional shallow foundations. Proposed structures supported on compacted fill over previously-placed fill and alluvium, should be designed using mat slabs or post-tensioned slabs with 2-inches of total settlement or drilled pier foundations. Proposed structures supported on MSE retaining wall backfill should be designed using drilled pier foundations.

7.10 Shallow Foundation and Concrete Slabs-On-Grade Recommendations

7.10.1 Proposed structures supported on compacted fill over Very Old Paralic Deposits or Santiago Formation may be designed using conventional shallow foundations. Proposed structures supported on compacted fill over previously-placed fill and alluvium, should be designed using mat slabs or post-tensioned slabs with 2-inches of total settlement or drilled pier foundations. Proposed structures supported on MSE retaining wall backfill should be design using drilled pier foundations.

7.10.2 The foundation recommendations herein are for proposed one- to three-story residential structures. The foundation recommendations have been separated into three categories based on either the maximum and differential fill thickness or Expansion Index. The foundation category criteria are presented in Table 7.10.1.

TABLE 7.10.1
FOUNDATION CATEGORY CRITERIA

Foundation Category	Maximum Fill Thickness, T (Feet)	Differential Fill Thickness, D (Feet)	Expansion Index (EI)
I	T<20	--	EI≤50
II	20≤T<50	10≤D<20	50<EI≤90
III	T≥50	D≥20	90<EI≤130

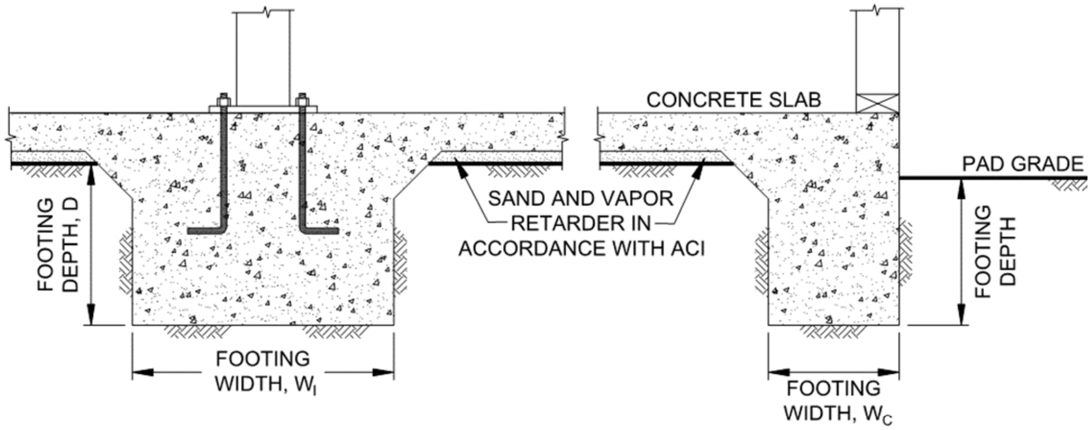
7.10.3 We will provide final foundation categories for each building or lot after finish pad grades have been achieved, the underlying underlying fill-bedrock geometry is evaluated and we perform laboratory testing of the subgrade soil. However, any structures supported on previously-placed fill and alluvium should be designed using Foundation Category III parameters and consider the total settlement due to additional structural loads and additional settlement due to the potential for hydrocollapse.

7.10.4 Table 7.10.2 presents minimum foundation and interior concrete slab design criteria for conventional foundation systems.

TABLE 7.10.2
CONVENTIONAL FOUNDATION RECOMMENDATIONS BY CATEGORY

Foundation Category	Minimum Footing Embedment Depth, D (inches)	Minimum Continuous Footing Reinforcement	Minimum Footing Width (Inches)
I	12	Two No. 4 bars, one top and one bottom	12 – Continuous, W_C 24 – Isolated, W_I
II	18	Four No. 4 bars, two top and two bottom	
III	24	Four No. 5 bars, two top and two bottom	

7.10.5 The foundations should be embedded in accordance with the recommendations herein and the Wall/Column Footing Dimension Detail. The embedment depths should be measured from the lowest adjacent pad grade for both interior and exterior footings. Footings should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope (unless designed with a post-tensioned foundation system as discussed herein).



Wall/Column Footing Dimension Detail

7.10.6 The proposed structures can be supported on a shallow foundation system founded in the compacted fill/formational materials. Table 7.10.3 provides a summary of the foundation design recommendations.

TABLE 7.10.3
SUMMARY OF FOUNDATION RECOMMENDATIONS

Parameter	Value
Allowable Bearing Capacity	2,000 psf
Bearing Capacity Increase	500 psf per Foot of Depth
	300 psf per Foot of Width
Maximum Allowable Bearing Capacity	3,500 psf
Estimated Total Settlement*	1 Inch
Estimated Differential Settlement	½ Inch in 40 Feet

(*) The estimated total settlement is 2-inches with 1-inch differential in 40 feet beneath structures supported by previously-placed fill and alluvium

7.10.7 The bearing capacity values presented herein are for dead plus live loads and may be increased by one-third when considering transient loads due to wind or seismic forces.

7.10.8 The concrete slab-on-grades should be a designed in accordance with Table 7.10.4.

TABLE 7.10.4
CONVENTIONAL SLAB-ON-GRADE RECOMMENDATIONS BY CATEGORY

Foundation Category	Minimum Concrete Slab Thickness (inches)	Interior Slab Reinforcement	Typical Slab Underlayment
I	4	6 x 6 - 10/10 welded wire mesh at slab mid-point	3 to 4 Inches of Sand/Gravel/Base
II	4	No. 3 bars at 24 inches on center, both directions	
III	5	No. 3 bars at 18 inches on center, both directions	

7.10.9 Slabs that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials should be underlain by a vapor retarder. The vapor retarder design should be consistent with the guidelines presented in the American Concrete Institute's (ACI) *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (ACI 302.2R-06). The vapor retarder used should be specified by the project architect or developer based on the type of floor covering that will be installed and if the structure will possess a humidity controlled environment.

7.10.10 The bedding sand thickness should be determined by the project foundation engineer, architect, and/or developer. However, we should be contacted to provide recommendations if the bedding sand is thicker than 6 inches. It is common to see 3 inches and 4 inches of sand below the concrete slab-on-grade for 5-inch and 4-inch thick slabs, respectively, in the southern California area. The foundation design engineer should provide appropriate concrete mix design criteria and curing measures to assure proper curing of the slab by reducing the potential for rapid moisture loss and subsequent cracking and/or slab curl. We suggest that the foundation design engineer present the concrete mix design and proper curing methods on the foundation plans. It is critical that the foundation contractor understands and follows the recommendations presented on the foundation plans.

7.10.11 As an alternative to the conventional foundation recommendations, consideration should be given to the use of post-tensioned concrete slab and foundation systems for the support of the proposed structures. The post-tensioned systems (foundation dimensions and embedment depths, slab thickness and steel placement) should be designed by a structural engineer experienced in post-tensioned slab design and design criteria of the Post-Tensioning Institute (PTI) DC 10.5-12 *Standard Requirements for Design and Analysis of Shallow Post-Tensioned Concrete Foundations on Expansive Soils* or *WRI/CRSI Design of Slab-on-Ground Foundations*, as required by the 2019 California Building Code (CBC Section 1808.6.2). Although this procedure was developed for expansive soil conditions, it can also be used to reduce the potential for foundation distress due to differential fill settlement. The post-tensioned design should incorporate the geotechnical parameters presented in Table 7.10.5 for the particular Foundation Category designated. The parameters presented in Table 7.10.5 are based on the guidelines presented in the PTI DC 10.5 design manual.

TABLE 7.10.5
POST-TENSIONED FOUNDATION SYSTEM DESIGN PARAMETERS

Post-Tensioning Institute (PTI) DC10.5 Design Parameters	Foundation Category		
	I	II	III
Thornthwaite Index	-20	-20	-20
Equilibrium Suction	3.9	3.9	3.9
Edge Lift Moisture Variation Distance, e_M (Feet)	5.3	5.1	4.9
Edge Lift, y_M (Inches)	0.61	1.10	1.58
Center Lift Moisture Variation Distance, e_M (Feet)	9.0	9.0	9.0
Center Lift, y_M (Inches)	0.30	0.47	0.66

7.10.12 The foundations for the post-tensioned slabs should be embedded in accordance with the recommendations of the structural engineer. If a post-tensioned mat foundation system is planned, the slab should possess a thickened edge with a minimum width of 12 inches and extend below the clean sand or crushed rock layer.

7.10.13 If the structural engineer proposes a post-tensioned foundation design method other than PTI, DC 10.5:

- The deflection criteria presented in Table 7.10.5 are still applicable.
- Interior stiffener beams should be used for Foundation Categories II and III.
- The width of the perimeter foundations should be at least 12 inches.
- The perimeter footing embedment depths should be at least 12 inches, 18 inches and 24 inches for foundation categories I, II, and III, respectively. The embedment depths should be measured from the lowest adjacent pad grade.

7.10.14 Foundation systems for the lots that possess a foundation Category I and a “very low” expansion potential (expansion index of 20 or less) can be designed using the method described in Section 1808 of the 2019 CBC. If post-tensioned foundations are planned, an alternative, commonly accepted design method (other than PTI) can be used. However, the post-tensioned foundation system should be designed with a total and differential deflection of 1 inch. Geocon Incorporated should be contacted to review the plans and provide additional information, if necessary.

7.10.15 If an alternate design method is contemplated, Geocon Incorporated should be contacted to evaluate if additional expansion index testing should be performed to identify the lots that possess a “very low” expansion potential (expansion index of 20 or less).

7.10.16 Our experience indicates post-tensioned slabs may be susceptible to excessive edge lift from tensioning, regardless of the underlying soil conditions. Placing reinforcing steel at the bottom of the perimeter footings and the interior stiffener beams may mitigate this potential. The structural engineer should design the foundation system to reduce the potential of edge lift occurring for the proposed structures.

7.10.17 During the construction of the post-tension foundation system, the concrete should be placed monolithically. Under no circumstances should cold joints form between the footings/grade beams and the slab during the construction of the post-tension foundation system unless designed by the structural engineer.

7.10.18 Isolated footings outside of the slab area, if present, should have the minimum embedment depth and width recommended for conventional foundations for a particular Foundation Category. The use of isolated footings, which are located beyond the perimeter of the building and support structural elements connected to the building, are not recommended for Category III. Where this condition cannot be avoided, the isolated footings should be connected to the building foundation system with grade beams in both directions. In addition, consideration should be given to connecting patio slabs, which exceed 5 feet in width, to the building foundation to reduce the potential for future separation to occur.

7.10.19 Interior stiffening beams should be incorporated into the design of the foundation system in accordance with the PTI design procedures.

7.10.20 Special subgrade presaturation is not deemed necessary prior to placing concrete; however, the exposed foundation and slab subgrade soil should be moisture conditioned, as necessary, to maintain a moist condition as would be expected in any such concrete placement.

7.10.21 Where buildings or other improvements are planned near the top of a slope 3:1 (horizontal:vertical) or steeper, special foundation and/or design considerations are recommended due to the tendency for lateral soil movement to occur.

- For fill slopes less than 20 feet high or cut slopes regardless of height, footings should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope.

- When located next to a descending 3:1 (horizontal:vertical) fill slope or steeper, the foundations should be extended to a depth where the minimum horizontal distance is equal to H/3 (where H equals the vertical distance from the top of the fill slope to the base of the fill soil) with a minimum of 7 feet but need not exceed 40 feet. The horizontal distance is measured from the outer, deepest edge of the footing to the face of the slope. A post-tensioned slab and foundation system or mat foundation system can be used to reduce the potential for distress in the structures associated with strain softening and lateral fill extension. Specific design parameters or recommendations for either of these alternatives can be provided once the building location and fill slope geometry have been determined.

- If swimming pools are planned, Geocon Incorporated should be contacted for a review of specific site conditions.

- Swimming pools located within 7 feet of the top of cut or fill slopes are not recommended. Where such a condition cannot be avoided, the portion of the swimming pool wall within 7 feet of the slope face be designed assuming that the adjacent soil provides no lateral support. This recommendation applies to fill slopes up to 30 feet in height, and cut slopes regardless of height. For swimming pools located near the top of fill slopes greater than 30 feet in height, additional recommendations may be required and Geocon Incorporated should be contacted for a review of specific site conditions.

- Although other improvements, which are relatively rigid or brittle, such as concrete flatwork or masonry walls, may experience some distress if located near the top of a slope, it is generally not economical to mitigate this potential. It may be possible, however, to incorporate design measures which would permit some lateral soil movement without causing extensive distress. Geocon Incorporated should be consulted for specific recommendations.

7.10.22 The recommendations of this report are intended to reduce the potential for cracking of slabs and foundations due to expansive soil (if present), differential settlement of fill soil with varying thicknesses. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade placed on such conditions may still exhibit some cracking due to soil movement and/or shrinkage. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entrant slab corners occur.

7.10.23 Concrete slabs should be provided with adequate crack-control joints, construction joints and/or expansion joints to reduce unsightly shrinkage cracking. The design of joints should consider criteria of the American Concrete Institute when establishing crack-control spacing. Additional steel reinforcing, concrete admixtures and/or closer crack control joint spacing should be considered where concrete-exposed finished floors are planned.

7.10.24 Geocon Incorporated should be consulted to provide additional design parameters as required by the structural engineer.

7.10.25 We should observe the foundation excavations prior to the placement of reinforcing steel to check that the exposed soil conditions are similar to those expected and that they have been extended to the appropriate bearing strata. If unexpected soil conditions are encountered, foundation modifications may be required.

7.11 Mat Foundation

7.11.1 We understand the proposed structures underlain by compacted fill over previously-placed fill and alluvium may be supported on a mat foundation. A mat foundation consists of a thick, rigid concrete mat that allows the entire footprint of the structure to carry building loads. In addition, the mat can tolerate significantly greater differential movements such as those associated with expansive soils or differential settlement. In this case, the mat foundation may be used below the water table if adequately waterproofed to reduce the potential for seepage. Table 7.11 provides a summary of the foundation design recommendations.

TABLE 7.11
SUMMARY OF MAT FOUNDATION RECOMMENDATIONS

Parameter	Value
Design Perimeter Foundation Width	12 inches
Minimum Foundation Depth	Extend Below Slab Underlayment
Minimum Steel Reinforcement	Per Structural Engineer
Bearing Capacity	500 psf
Estimated Total Settlement	2 Inches
Estimated Differential Settlement	1 Inch in 40 Feet
Modulus of Subgrade Reaction	125 pci
Design Expansion Index	50 or less

7.11.2 The modulus of subgrade reaction values should be modified as necessary using standard equations for mat size as required by the structural engineer. This value is a unit value for use with a 1-foot square footing. The modulus should be reduced in accordance with the following equation when used with larger foundations:

$$K_R = K\left[\frac{B+1}{2B}\right]^2$$

where: K_R = reduced subgrade modulus
K = unit subgrade modulus
B = foundation width (in feet)

7.11.3 A mat foundation system will allow the structure to settle with the ground and should have sufficient rigidity to allow the structure to move as a single unit. Re-leveling of the mat foundation could be necessary through the use of mud jacking, compaction grouting or other similar techniques if differential settlement occurs

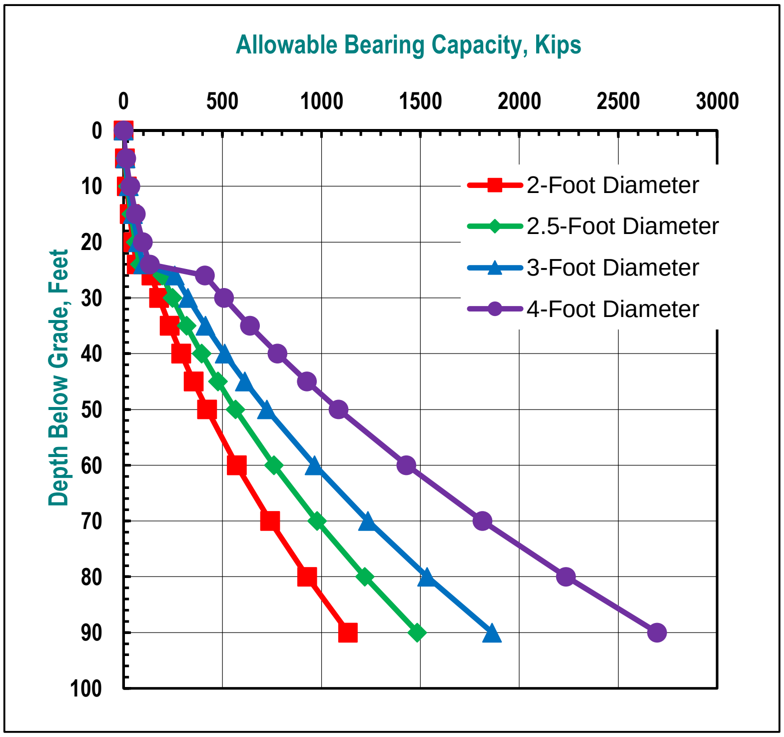
7.11.4 Slabs that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials should be underlain by a vapor retarder. The vapor retarder design should be consistent with the guidelines presented in the American Concrete Institute's (ACI) *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (ACI 302.2R-06). In addition, the membrane should be installed in accordance with manufacturer's recommendations and ASTM requirements and installed in a manner that prevents puncture. The vapor retarder used should be specified by the project architect or developer based on the type of floor covering that will be installed and if the structure will possess a humidity controlled environment.

7.11.5 The bedding sand thickness should be determined by the project foundation engineer, architect, and/or developer. However, we should be contacted to provide recommendations if the bedding sand is thicker than 6 inches. The foundation design engineer should provide appropriate concrete mix design criteria and curing measures to assure proper curing of the slab by reducing the potential for rapid moisture loss and subsequent cracking and/or slab curl. We suggest that the foundation design engineer present the concrete mix design and proper curing methods on the foundation plans. It is critical that the foundation contractor understands and follows the recommendations presented on the foundation plans.

7.12 Drilled Pier Recommendations

7.12.1 Drilled piers should be used for foundation support for structures supported within the influence of MSE wall backfill or structures supported on compacted fill over previously-placed fill and alluvium if the 2-inches of total settlement is prohibitive for mat or post-tensioned slabs. The foundation recommendations herein assume that the piers will extend through the fill into the Santiago Formation. The piers should be embedded at least 5 feet within the formational materials. For design purposes, a fill thickness of 25 feet was used to compute the allowable bearing capacities shown below. Once actual foundation types and locations are determined, revised allowable capacities may be provided based on actual site conditions.

7.12.2 Piers can be designed to develop support by end bearing within the formational materials and skin friction within the formational materials and portions of the fill soil. The end bearing capacity can be determined by the End Bearing Capacity Chart. These allowable values possess a factor of safety of 2 and 3 for skin friction and end bearing, respectively.



Allowable Bearing Capacity Chart

7.12.3 Piers can be designed to develop support by end bearing within the formational materials and skin friction within the formational materials and portions of the fill soil using the design parameters presented in Table 7.12.

TABLE 7.12
SUMMARY OF DRILLED PIER RECOMMENDATIONS

Parameter	Value
Minimum Pile Diameter	2 Feet
Minimum Pile Spacing	3 Times Pile Diameter
Minimum Foundation Embedment Depth	10 Feet
	5 Feet in Formational Materials
Allowable End Bearing Capacity	Per Chart
Allowable Skin Friction Capacity	300 psf (Fill Materials)
	750 psf (Santiago Formation)
Estimated Total Settlement	½ Inch
Estimated Differential Settlement	½ Inch in 40 Feet

7.12.4 The design length of the drilled piers should be determined by the designer based on the elevation of the pile cap or grade beam and the elevation of the top of the formational materials obtained from the Geologic Map and Geologic Cross-Sections presented herein. It is difficult to evaluate the exact length of the proposed drilled piers due to the variable thickness of the existing fill; therefore, some variation should be expected during drilling operations.

7.12.5 If pier spacing is at least three times the maximum dimension of the pier, no reduction in axial capacity for group effects is considered necessary. If piles are spaced between 2 and 3 pile diameters (center to center), the single pile axial capacity should be reduced by 25 percent. Geocon Incorporated should be contacted to provide single-pile capacity if piers are spaced closer than 2 diameters.

7.12.6 The allowable downward capacity may be increased by one-third when considering transient wind or seismic loads.

7.12.7 The existing materials may contain gravel and cobble and may possess very dense zones; therefore, the drilling contractor should expect difficult drilling conditions during excavations for the piers. Because a significant portion of the piers capacity will be developed by end bearing, the bottom of the borehole should be cleaned of loose cuttings prior to the placement of steel and concrete. Experience indicates that backspinning the auger does not remove loose material and a flat cleanout plate is necessary. We expect localized seepage may be encountered during the drilling operations and casing may be required to maintain the integrity of the pier excavation, particularly if seepage or sidewall instability is encountered. Concrete should be placed within the excavation as soon as possible after the auger/cleanout plate is withdrawn to reduce the potential for discontinuities or caving.

7.12.8 Pile settlement of production piers is expected to be on the order of ½ inch if the piers are loaded to their allowable capacities. Geocon should provide updated settlement estimates once the foundation plans are available. Settlements should be essentially complete shortly after completion of the building superstructure.

7.13 Concrete Flatwork

7.13.1 Exterior concrete flatwork not subject to vehicular traffic should be constructed in accordance with the recommendations herein. Slab panels should be a minimum of 4 inches thick and, when in excess of 8 feet square, should be reinforced with 6 x 6 - W2.9/W2.9 (6 x 6 - 6/6) welded wire mesh or No. 3 reinforcing bars spaced at least

18 inches center-to-center in both directions to reduce the potential for cracking. In addition, concrete flatwork should be provided with crack control joints to reduce and/or control shrinkage cracking. Crack control spacing should be determined by the project structural engineer based upon the slab thickness and intended usage. Criteria of the American Concrete Institute (ACI) should be taken into consideration when establishing crack control spacing. Subgrade soil for exterior slabs not subjected to vehicle loads should be compacted in accordance with criteria presented in the grading section prior to concrete placement. Subgrade soil should be properly compacted and the moisture content of subgrade soil should be checked prior to placing concrete. The recommendations herein assume the upper 3 feet of subgrade soil will possess a “very low” to “medium” expansion potential (expansion index of 90 or less).

7.13.2 Even with the incorporation of the recommendations within this report, the exterior concrete flatwork has a likelihood of experiencing some uplift due to expansive soil beneath grade; therefore, the steel reinforcement should overlap continuously in flatwork to reduce the potential for vertical offsets within flatwork. Additionally, flatwork should be structurally connected to the curbs, where possible, to reduce the potential for offsets between the curbs and the flatwork.

7.13.3 Where exterior flatwork abuts the structure at entrant or exit points, the exterior slab should be dowelled into the structure’s foundation stemwall. This recommendation is intended to reduce the potential for differential elevations that could result from differential settlement or minor heave of the flatwork. Dowelling details should be designed by the project structural engineer.

7.13.4 The recommendations presented herein are intended to reduce the potential for cracking of slabs and foundations as a result of differential movement. However, even with the incorporation of the recommendations presented herein, foundations and slabs-on-grade will still crack. The occurrence of concrete shrinkage cracks is independent of the soil supporting characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, the use of crack control joints and proper concrete placement and curing. Literature provided by the Portland Concrete Association (PCA) and American Concrete Institute (ACI) present recommendations for proper concrete mix, construction, and curing practices, and should be incorporated into project construction.

7.14 Retaining Walls

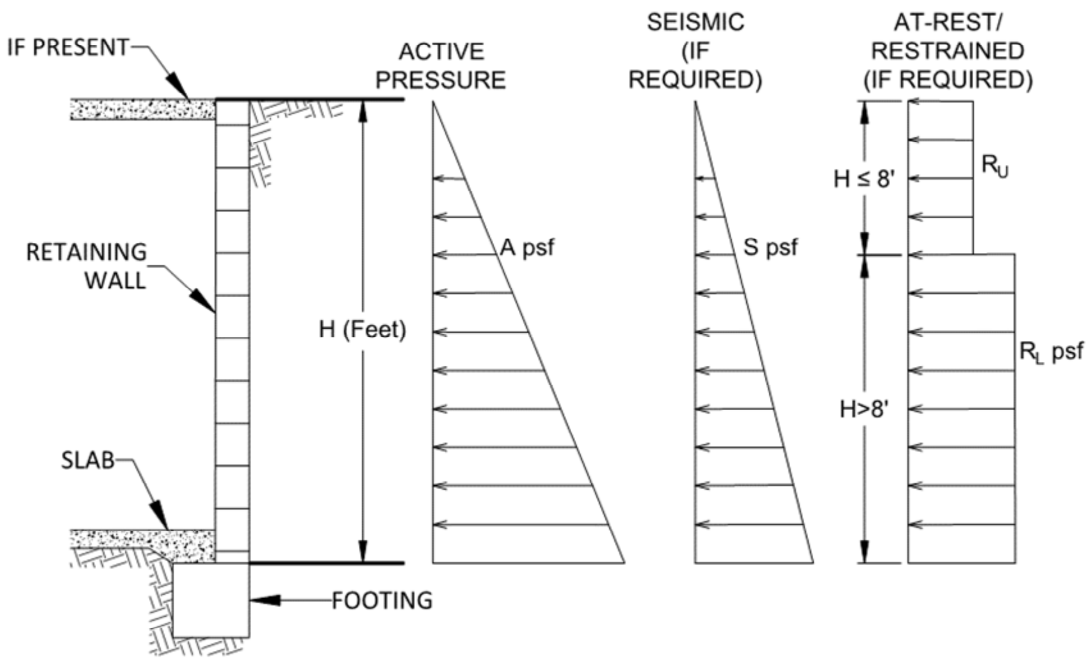
7.14.1 Retaining walls should be designed using the values presented in Table 7.14.1. Soil with an expansion index (EI) of greater than 50 should not be used as backfill material behind retaining walls.

TABLE 7.14.1
RETAINING WALL DESIGN RECOMMENDATIONS

Parameter	Value
Active Soil Pressure, A (Fluid Density, Level Backfill)	35 pcf
Active Soil Pressure, A (Fluid Density, 2:1 Sloping Backfill)	50 pcf
Seismic Pressure, S	21H psf
At-Rest/Restrained Walls Additional Uniform Pressure, R_U (0 to 8 Feet High)	7H psf
At-Rest/Restrained Walls Additional Uniform Pressure, R_L (8+ Feet High)	13H psf
Expected Expansion Index for the Subject Property	EI≤50

H equals the height of the retaining portion of the wall.

7.14.2 The project retaining walls should be designed as shown in the Retaining Wall Loading Diagram.



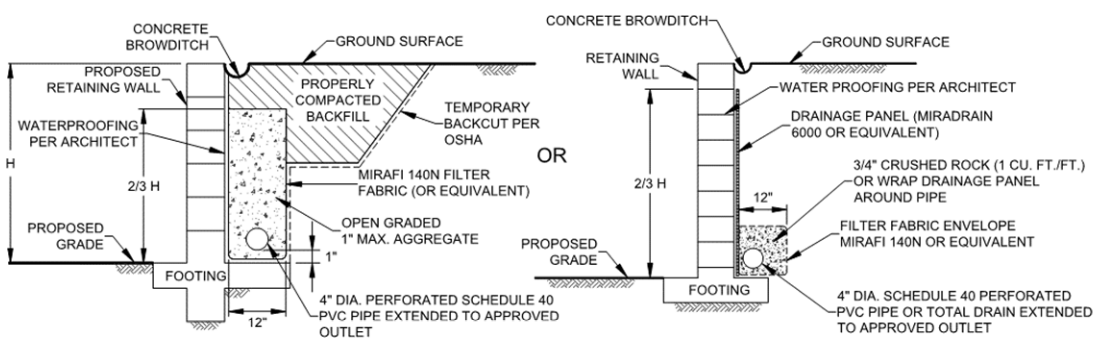
Retaining Wall Loading Diagram

7.14.3 Unrestrained walls are those that are allowed to rotate more than 0.001H (where H equals the height of the retaining portion of the wall) at the top of the wall. Where walls are restrained from movement at the top (at-rest condition), an additional uniform pressure should be applied to the wall. For retaining walls subject to vehicular loads within a horizontal distance equal to two-thirds the wall height, a surcharge equivalent to 2 feet of fill soil should be added.

7.14.4 The structural engineer should determine the Seismic Design Category for the project in accordance with Section 1613.3.5 of the 2019 CBC or Section 11.6 of ASCE 7-16. For structures assigned to Seismic Design Category of D, E, or F, retaining walls that support more than 6 feet of backfill should be designed with seismic lateral pressure in accordance with Section 1803.5.12 of the 2019 CBC. The seismic load is dependent on the retained height where H is the height of the wall, in feet, and the calculated loads result in pounds per square foot (psf) exerted at the base of the wall and zero at the top of the wall.

7.14.5 Retaining walls should be designed to ensure stability against overturning sliding, and excessive foundation pressure. Where a keyway is extended below the wall base with the intent to engage passive pressure and enhance sliding stability, it is not necessary to consider active pressure on the keyway.

7.14.6 Drainage openings through the base of the wall (weep holes) should not be used where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall. The recommendations herein assume a properly compacted granular (EI of 90 or less) free-draining backfill material with no hydrostatic forces or imposed surcharge load. The retaining wall should be properly drained as shown in the Typical Retaining Wall Drainage Detail. If conditions different than those described are expected, or if specific drainage details are desired, Geocon Incorporated should be contacted for additional recommendations.



Typical Retaining Wall Drainage Detail

7.14.7 The retaining walls may be designed using either the active and restrained (at-rest) loading condition or the active and seismic loading condition as suggested by the structural engineer. Typically, it appears the design of the restrained condition for retaining wall loading may be adequate for the seismic design of the retaining walls. However, the active earth pressure combined with the seismic design load should be reviewed and also considered in the design of the retaining walls.

7.14.8 In general, wall foundations should be designed in accordance with Table 7.14.2. The proximity of the foundation to the top of a slope steeper than 3:1 could impact the allowable soil bearing pressure. Therefore, retaining wall foundations should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope.

TABLE 7.14.2
SUMMARY OF RETAINING WALL FOUNDATION RECOMMENDATIONS

Parameter	Value
Minimum Retaining Wall Foundation Width	12 inches
Minimum Retaining Wall Foundation Depth	12 Inches
Minimum Steel Reinforcement	Per Structural Engineer
Allowable Bearing Capacity	2,000 psf
Estimated Total Settlement	½ Inch
Estimated Differential Settlement	½ Inch in 40 Feet

7.14.9 The recommendations presented herein are generally applicable to the design of rigid concrete or masonry retaining walls. In the event that other types of walls (such as mechanically stabilized earth [MSE] walls, soil nail walls, or soldier pile walls) are planned, Geocon Incorporated should be consulted for additional recommendations.

7.14.10 Unrestrained walls will move laterally when backfilled and loading is applied. The amount of lateral deflection is dependent on the wall height, the type of soil used for backfill, and loads acting on the wall. The retaining walls and improvements above the retaining walls should be designed to incorporate an appropriate amount of lateral deflection as determined by the structural engineer.

7.14.11 Soil contemplated for use as retaining wall backfill, including import materials, should be identified in the field prior to backfill. At that time, Geocon Incorporated should obtain samples for laboratory testing to evaluate its suitability. Modified lateral earth pressures may be necessary if the backfill soil does not meet the required expansion index or shear strength. City or regional standard wall designs, if used, are based on a specific active lateral earth pressure and/or soil friction angle. In this regard, on-site soil to be used as backfill may or may not meet the values for standard wall designs. Geocon Incorporated should be consulted to assess the suitability of the on-site soil for use as wall backfill if standard wall designs will be used.

7.15 Lateral Loading

7.15.1 To resist lateral loads, a passive pressure exerted by an equivalent fluid density of 300 pounds per cubic foot (pcf) should be used for the design of footings or shear keys. The allowable passive pressure assumes a horizontal surface extending at least 5 feet, or three times the surface generating the passive pressure, whichever is greater. The upper 12 inches of material in areas not protected by floor slabs or pavement should not be included in design for passive resistance.

7.15.2 If friction is to be used to resist lateral loads, an allowable coefficient of friction between soil and concrete of 0.35 should be used for design. The friction coefficient may be reduced depending on the vapor barrier or waterproofing material used for construction in accordance with the manufacturer's recommendations.

7.15.3 The passive and frictional resistant loads can be combined for design purposes. The lateral passive pressures may be increased by one-third when considering transient loads due to wind or seismic forces.

7.16 Mechanically Stabilized Earth (MSE) Retaining Walls

7.16.1 Mechanized stabilized earth (MSE) retaining walls can be used on the property. MSE retaining walls are alternative walls that consist of modular block facing units with geogrid reinforced earth behind the block. The reinforcement grid attaches to the block units and is typically placed at specified vertical intervals and embedment lengths. The grid length and spacing will be determined by the wall designer.

7.16.2 The geotechnical parameters listed in Table 7.16 can be used for preliminary design of the MSE walls. Soil with an expansion index (EI) of greater than 50 should not be used as backfill material behind retaining walls. In addition, some wall designers request soil with a plasticity index greater than 20, a liquid limit greater than 40 and a fines content greater than 35 percent should not be used for soil within the reinforcing zone. This may require import of select materials for the wall backfilling operations or selectively stockpiling of granular soils. Once the backfill source has been determined, laboratory testing should be performed to check that the shear strength parameters used in the design of the MSE walls meet or exceed the required strength within the reinforced zone.

TABLE 7.16
GEOTECHNICAL PARAMETERS FOR MSE WALLS

Parameter	Reinforced Zone	Retained Zone	Foundation Zone
Angle of Internal Friction	28 degrees	28 degrees	28 degrees
Cohesion	0 psf	0 psf	0 psf
Wet Unit Density	125 pcf	125 pcf	125 pcf

7.16.3 The soil parameters presented in Table 7.16 are based on our experience with MSE wall contractors on previous projects. The wet unit density values presented in Table 7.16 can be used for design but actual in-place densities may range from approximately 110 to 135 pounds per cubic foot. Geocon has no way of knowing which materials will actually be used as backfill behind the wall during construction. It is up to the wall designers to use their judgment in selection of the design parameters. As such, once backfill materials have been selected and/or stockpiled, sufficient shear tests should be conducted on samples of the proposed backfill materials to check that they conform to actual design values. Results should be provided to the designer to re-evaluate stability of the walls. Dependent upon test results, the designer may require modifications to the original wall design (e.g., longer reinforcement embedment lengths and/or steel reinforcement).

7.16.4 The foundation zone is the area where the footing is embedded, the reinforced zone is the area of the backfill that possesses the reinforcing fabric, and the retained zone is the area behind the reinforced zone.

7.16.5 Wall foundations having a minimum depth and width of one foot may be designed for an allowable soil bearing pressure of 2,000 psf. The MSE walls should be designed for a total and differential settlement of 1-inch and ½-inch in 40 feet, respectively. The planned MSE walls should be designed to accommodate the anticipated settlement.

7.16.6 Backfill materials within the reinforced zone should be compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content in accordance with ASTM D 1557. This is applicable to the entire embedment width of the reinforcement. Typically, wall designers specify no heavy compaction equipment within 3 feet of the face of the wall. However, smaller equipment (e.g., walk-behind, self-driven compactors or hand whackers) can be used to compact the materials without causing deformation of the wall. If the designer specifies no compactive effort for this zone, the materials are essentially not properly compacted and the reinforcement grid within the uncompacted zone should not be relied upon for reinforcement, and overall embedment lengths will have to be increased to account for the difference.

7.16.7 The wall should be provided with a drainage system sufficient to prevent excessive seepage through the wall and the base of the wall, thus preventing hydrostatic pressures behind the wall.

7.16.8 Geosynthetic reinforcement must elongate to develop full tensile resistance. This elongation generally results in movement at the top of the wall. The amount of movement is dependent upon the height of the wall (e.g., higher walls rotate more) and the type of reinforcing grid used. In addition, over time the reinforcement grid has been known to exhibit creep (sometimes as much as 5 percent) and can undergo additional movement. Given this condition, the owner should be aware that structures and pavement placed within the reinforced and retained zones of the wall may undergo movement.

7.16.9 The MSE wall contractor should provide the estimated deformation of wall and adjacent ground in associated with wall construction. The calculated horizontal and vertical deformations should be determined by the wall designer. The estimated movements should be provided to the project structural engineer to determine if the planned improvements can tolerate the expected movements.

7.16.10 The MSE wall designer/contractor should review this report, including the slope stability requirements, and incorporate our recommendations as presented herein. We should be provided the plans for the MSE walls to check if they are in conformance with our recommendations prior to issuance of a permit and construction.

7.17 Preliminary Pavement Recommendations

7.17.1 We calculated the flexible pavement sections in general conformance with the *Caltrans Method of Flexible Pavement Design* (Highway Design Manual, Section 608.4) using estimated Traffic Indices (TI's) of 5.0, 6.0 and 7.0 for the interior roadways. The project civil engineer and owner should review the pavement designations to determine appropriate locations for pavement thickness. We have assumed an R-Value of 15 and 78 for the subgrade soil and base materials, respectively, based on laboratory test results for the purposes of this preliminary analysis. The final pavement sections should be based on the R-Value of the subgrade soil encountered at final subgrade elevation once site grading and utility trench backfill is completed. Table 7.17.1 presents the preliminary flexible pavement sections.

TABLE 7.17.1
PRELIMINARY FLEXIBLE PAVEMENT SECTION

Location	Assumed Traffic Index	Assumed Subgrade R-Value	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)
Interior Roadways (light-duty)	5.0	15	3	8
Interior Roadways (medium duty)	6.0	15	4	10
Interior Roadways (heavy duty)	7.0	15	4	13

7.17.2 Prior to placing base materials, the upper 12 inches of the subgrade soil should be scarified, moisture conditioned as necessary, and recompacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content as determined by ASTM D 1557. Similarly, the base material should be compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content. Asphalt concrete should be compacted to a density of at least 95 percent of the laboratory Hveem density in accordance with ASTM D 2726.

7.17.3 Base materials should conform to Section 26-1.02B of the *Standard Specifications for The State of California Department of Transportation (Caltrans)* with a ¾-inch maximum size aggregate. The asphalt concrete should conform to Section 203-6 of the *Standard Specifications for Public Works Construction (Greenbook).*

7.17.4 The base thickness can be reduced if a reinforcement geogrid is used during the installation of the pavement. Geocon should be contact for additional recommendations, if required.

7.17.5 A rigid Portland cement concrete (PCC) pavement section should be placed in driveway entrance aprons, cross-gutters and trash bin loading/storage areas. The concrete pad for trash truck areas should be large enough such that the truck wheels will be positioned on the concrete during loading. We calculated the rigid pavement section in general conformance with the procedure recommended by the American Concrete Institute report ACI 330R-08 *Guide for Design and Construction of Concrete Parking Lots* using the parameters presented in Table 7.17.2.

TABLE 7.17.2
RIGID PAVEMENT DESIGN PARAMETERS

Design Parameter	Design Value
Modulus of subgrade reaction, k	100 pci
Modulus of rupture for concrete, M_R	500 psi
Traffic Category, TC	B and C
Average daily truck traffic, ADTT	25 and 100

7.17.6 Based on the criteria presented herein, the PCC pavement sections should have a minimum thickness as presented in Table 7.17.3.

TABLE 7.17.3
RIGID PAVEMENT RECOMMENDATIONS

Location	Portland Cement Concrete (inches)
Medium Duty Areas (TC=B)	6.0
Heavy Duty Areas (TC=C)	7.0

7.17.7 The PCC pavement should be placed over subgrade soil that is compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content. This pavement section is based on a minimum concrete compressive strength of approximately 3,000 psi (pounds per square inch). Base materials will not be required beneath concrete improvements including cross-gutters, curb and gutters, and sidewalks.

7.17.8 A thickened edge or integral curb should be constructed on the outside of concrete slabs subjected to wheel loads. The thickened edge should be 1.2 times the slab thickness or a minimum thickness of 2 inches, whichever results in a thicker edge, and taper back to the recommended slab thickness 4 feet behind the face of the slab (e.g., a 7.5-inch-thick slab would have a 9.5-inch-thick edge). Reinforcing steel will not be necessary within the concrete for geotechnical purposes with the possible exception of dowels at construction joints as discussed herein.

7.17.9 To control the location and spread of concrete shrinkage cracks, crack-control joints (weakened plane joints) should be included in the design of the concrete pavement slab. Crack-control joints should not exceed 30 times the slab thickness with a maximum spacing of 15 feet for slabs 6 inches and thicker and should be sealed with an appropriate sealant to prevent the migration of water through the control joint to the subgrade materials. The depth of the crack-control joints should be determined by the referenced ACI report. The depth of the crack-control joints should be at least ¼ of the slab thickness when using a conventional saw, or at least 1 inch when using early-entry saws on slabs 9 inches or less in thickness, as determined by the referenced ACI report discussed in the pavement section herein. Cuts at least ¼ inch wide are required for sealed joints, and a ⅜ inch wide cut is commonly recommended. A narrow joint width of $^{1}/_{10}$ to $^{1}/_{8}$-inch wide is common for unsealed joints.

7.17.10 Concrete curb/gutter should be placed on soil subgrade compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content. Cross-gutters should be placed on subgrade soil compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content. Base materials should not be placed below the curb/gutter, cross-gutters, or sidewalk so water is not able to migrate from the adjacent parkways to the pavement sections.

7.17.11 The performance of pavement is highly dependent on providing positive surface drainage away from the edge of the pavement. Ponding of water on or adjacent to the pavement and subgrade will likely result in pavement distress and subgrade failure. Drainage from landscaped areas should be directed to controlled drainage structures. Landscape areas adjacent to the edge of asphalt pavements are not recommended due to the potential for surface or irrigation water to infiltrate the underlying permeable aggregate base and cause distress. Where such a condition cannot be avoided, consideration should be given to incorporating measures that will significantly reduce the potential for subsurface water migration into the aggregate base. If planter islands are planned, the perimeter curb should extend at least 6 inches below the level of the base materials.

7.18 Site Drainage and Moisture Protection

7.18.1 Adequate site drainage is critical to reduce the potential for differential soil movement, erosion and subsurface seepage. Under no circumstances should water be allowed to pond adjacent to footings. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2019 CBC 1804.4 or other applicable standards. In addition, surface drainage should be directed away from the top of slopes into swales or other controlled drainage devices. Roof and pavement drainage should be directed into conduits that carry runoff away from the proposed structure.

7.18.2 Underground utilities should be leak free. Utility and irrigation lines should be checked periodically for leaks, and detected leaks should be repaired promptly. Detrimental soil movement could occur if water is allowed to infiltrate the soil for prolonged periods of time.

7.18.3 Landscaping planters adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. Area drains to collect excess irrigation water and transmit it to drainage structures or impervious above-grade planter boxes can be used. In addition, where landscaping is planned adjacent to the pavement, construction of a cutoff wall along the edge of the pavement that extends at least 6 inches below the bottom of the base material should be considered.

7.18.4 We should perform a storm water management study when grading plans have been prepared detailing the type and location of the proposed BMPs.

7.19 Grading and Foundation Plan Review

7.19.1 Geocon Incorporated should review the grading plans and foundation plans for the project prior to final design submittal to evaluate whether additional analyses and/or recommendations are required.

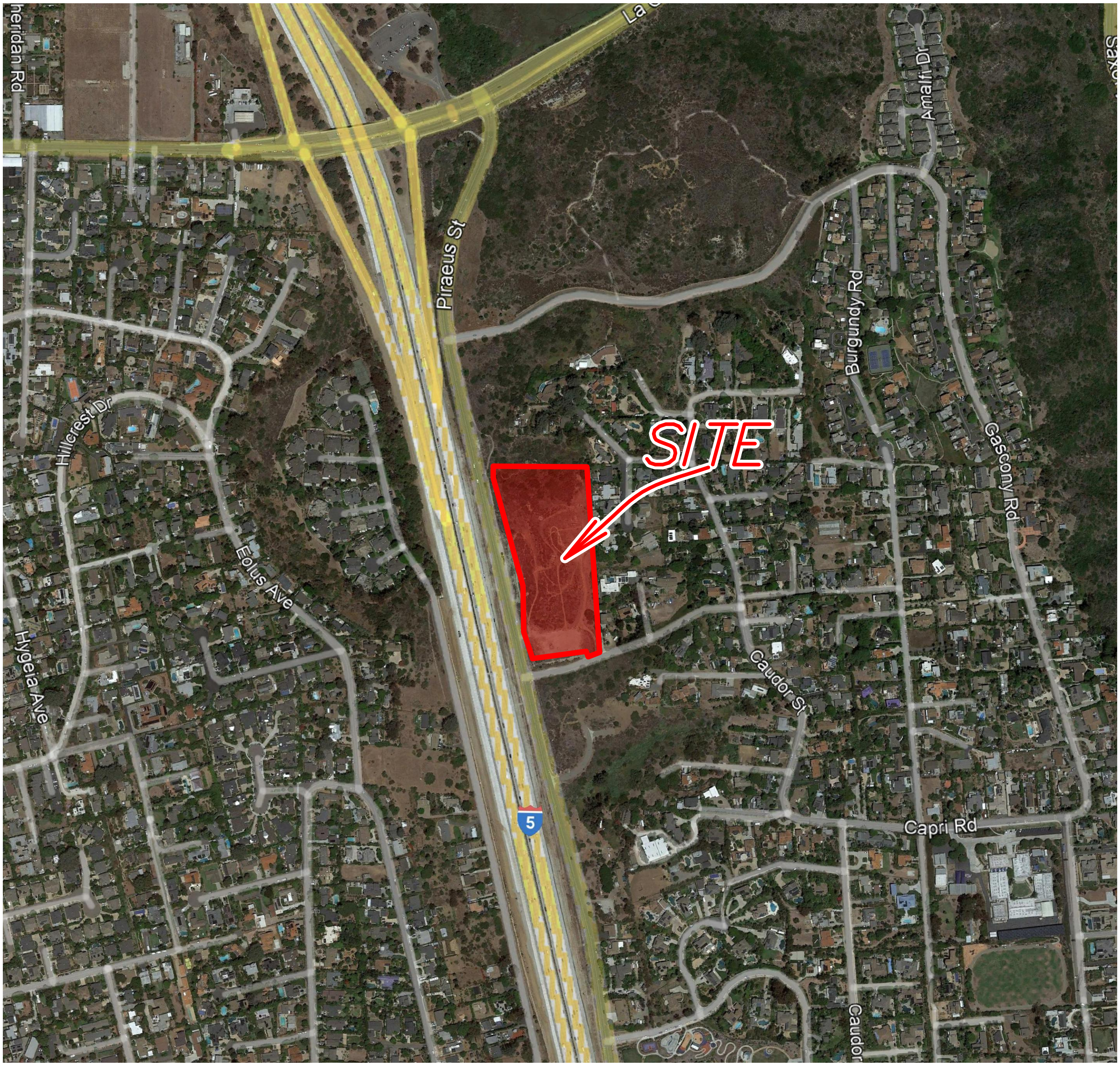
LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The firm that performed the geotechnical investigation for the project should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to check that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. A copy of the letter should be provided to the regulatory agency for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development, or a written acknowledgement of their concurrence with the recommendations presented in our report. They should also perform additional analyses deemed necessary to assume the role of Geotechnical Engineer of Record.

2. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon Incorporated should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon Incorporated.

3. This report is issued with the understanding that it is the responsibility of the owner, or of his representative, to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and that the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

4. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.



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NO SCALE

VICINITY MAP

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PIRAEUS POINT
ENCINITAS, CALIFORNIA

TM / RA		DSK/GTYPD	DATE 01 - 31 - 2022	PROJECT NO. G2307 - 32 - 05	FIG. 1

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